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Global Conference on Environmental Services for Sustainable Development

22 April 2016, Greater Noida



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SERVICES EXPORT PROMOTION COUNCIL



Global Conference on Environmental Services for Sustainable Development

22 April 2016, Greater Noida

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Preface

The Ministry of Commerce and Industry, Government of India; in association with Services Export Promotion Council (SEPC) and Confederation of Indian Industry (CII) is organizing the second edition of the Global Exhibition on Services (GES) from 21 to 23 April 2016 at India Expo Mart, Greater Noida, Delhi, NCR, India. The GES aims to provide a platform to all the participants from the services industry and other related industry to interact with, and explore new business avenues. This second edition of GES will provide the well required thrust to the services industry.

As a part of GES, a one day Global Conference on Environmental Services for Sustainable Development is being organised, which will be the confluence of great minds in the environmental services sector. At the conference, we will have thought leaders brainstorm on issues like Green Development, Renewable Energy, Climate Change and Biodiversity.

It is in this context, we present to you this publication covering a broad range of critical issues related to environment like strategy for water security, managing the water energy nexus, sustainable mining, corporate sustainability, carbon pricing, renewable energy, biodiversity for SMEs, etc. Some of these will be deliberated upon at the Global Conference on Environmental Services for Sustainable Development to be organized on 22nd April 2016 at Greater Noida by CII-ITC Centre of Excellence for Sustainable Development.

Narayan G. Hegde, Managing Trustee & President of BAIF Development Research Foundation talks about the strategy for water security in India. He discusses the reasons for water crisis and lists down priority areas for action, like, commissioning of well planned, time bound irrigation projects and development of local capabilities etc. Indra Guha, Executive Director - Climate Change & Sustainability Services, E&Y has written about managing

the water-energy nexus and how climate change affects this nexus. He has outlined the ways by which water-energy nexus can be managed. Santosh Deshmukh, from Jain Irrigation builds a strong case for efficient water management when he says that India should be water wise and should think about sustainable use of water in both rural and urban areas.

S Majumdar, CSO, JSW Group tells us the importance of creating innovative solutions and lasting positive impacts for the stakeholders across all interventions in an organization's operations. He has stated that how his company, JSW believes in creating growth while balancing utilisation of natural resources and social development in its business decisions. L S Shekhawat, COO, Hindustan Zinc Ltd., discusses a very critical but important area, i.e. sustainable mining, in his article he highlights that sustainable development has emerged as an important concern in the scenario of mining. He discusses the approach to sustainable mining and how HZL a leading integrated zinc manufacturer has created the framework for sustainability.

Sandeep Shrivastava, Head – Environment & Sustainability, Ambuja Cements briefs us about Ambuja's Tryst with Corporate Sustainability. He takes us through some of the initiatives adopted at Ambuja like promotion of green construction, energy efficiency, water conservation, carbon mitigation, biodiversity conservation, community development, health & safety and stakeholder engagement. Damandeep Singh brings to us the merits of carbon pricing. He says that carbon pricing is key to preparing for the new low-carbon economy, because it offers a powerful and flexible financial tool to prepare for the new, low-carbon economy. Naresh Badhwar presents the case of GHG accounting and its risk and opportunities. He focuses on the importance of managing GHG emissions along the value chain by companies.



Niranjan Khatri, Former, General Manager – Environment of ITC Ltd. has reflected upon the importance of energy for economic growth and human development. By discussing his experience with solar concentrators he demonstrates that energy efficiency is easy to implement, provided we are prepared to develop the required mind set, and modify our attitude, to the way we currently use energy. Wijnand Broer, Deputy Director, CREM BV enlists what SMEs can do in practice to manage biodiversity at their end and as part of their sustainability policy. PPS Pangli explores how breakthroughs in basic and other modern sciences have offered voluminous opportunities for developing transformative technologies for agriculture. He emphasizes on the importance of policies in developing agriculture sector.

We convey our gratitude to our authors who have provided their valuable support in developing this publication.

Strategy for Water Security in India



N G Hegde
Managing Trustee and
President
BAIF Development
Research Foundation
Pune

Dr Narayan Hegde is serving with a reputed non-profit organisation, BAIF Development Research Foundation since 1974. In 1993, he became Managing Trustee and President of BAIF and continued till his superannuation in 2009. During this period, the activities of BAIF were expanded ten-fold in 15 states, with over 4000 professionals, benefitting 4.0 million farmers. Dr Hegde continues with BAIF, as Principal Adviser and Trustee. He is Managing Trustee of Nisargopchar Gram Sudhar Trust, Urulikanchan, Pune; Trustee of M.S. Swaminathan Research Foundation, Chennai; Trustee of GALVmed, United Kingdom; Chairman of South Asia Regional Advisory Committee; Chairman of Children's Future, Pune; Vice President and Trustee of Kannada Sangh, Pune; Trustee of National Agro Foundation, Chennai; AME Foundation, Bangalore; Trustee of Agri Biotech Foundation, Hyderabad; Chairman of India 800 Foundation and Chronic Care Foundation, New Delhi; Director of Ushdev International Ltd., Mumbai; and Chairman of Editorial Board of the Marathi edition of "Sharad Krishi". He has received various recognitions like the National Award by the National Council of Educational Research and Training, for the book 'Mother Nature'; Community Welfare Award, Indian Merchants' Chamber, Mumbai; Vocational Service Award by Rotary Club of Poona West; Distinguished Alumni Award by Vaikunth Mehta National Institute of Cooperative Management (VAMNICON), Pune; Fellow of The National Academy of Sciences, India, Allahabad.

Water Resources in India

Water is life because plants and animals cannot live without water. India with an annual rainfall of 1170 mm is not a water poor country, but with severe neglect and over-exploitation, water is becoming a scarce commodity. As the demand for water is steadily increasing for human and livestock consumption, crop production and industrial use, immediate attention is needed to make efficient use of available water resources and develop additional sources.

Out of 4000 billion m³ sweet water available in India annually, 1047 billion m³ is lost due to evaporation,

transpiration and runoff and only 1123 billion m³ water is available for use. This usable water consists of 728 billion m³ surface water and 395 billion m³ ground water. Water consumed during 2006 was 829 billion m³ which is likely to increase to 1093 billion m³ in 2025 and 1047 billion m³ in 2050. While the consumption of water in India will increase by over 50%, the supply will increase only by 5-10% during the next 12-15 years. This will lead to water scarcity, affecting food production, biodiversity and the environment (Govt. of India, 2009).

Main reason for the water crisis in India is because we have not been making good use of rain water, due to lack of awareness and poor water storage capacity. Over



60-80 million ha of denuded forestlands and wastelands across the country are unable to retain rainwater, which in turn would have ensured recharging of ground water and conservation of biodiversity. In the absence of infiltration of rain water in the forests, the rivers emerging from these mountains are unable to sustain the flow of water throughout the year.

While 40% of the cropping area in India is under irrigation, the potential is to irrigate 140 million ha, 76 million ha through surface water and 64 million ha with ground water. The irrigation efficiency is also low, due to flood irrigation, excessive watering and cultivation of crop and varieties which are not water efficient. Thus, the solution is to tap all the available water resources and make efficient use of it.

Strategy for Water Resources Development and Use

Increasing Water Storage Capacity: Activities such as farm ponds, percolation tanks, water reservoirs and construction of small and medium size dams on rivers can retain more surface water, while increasing the ground water recharge. Series of contour bunds will facilitate percolation of water in the soil and improve the ground water table, while reducing soil erosion.

In the absence of efficient watershed development, flooding of rivers and silting of rivers beds and reservoirs will be more frequent. Presently 8-10 million ha are affected by floods over year. Interlinking of rivers will help in preventing floods while improving water distribution in the country. Control of water flow and floods will prevent soil erosion. Presently, billions of tons of fertile soils along with precious nutrients are washed out of our fertile agricultural lands and forests. The amount of nutrients lost due to soil erosion is almost equivalent to the chemical fertilisers produced in the country. Reforestation of degraded forests and development of wastelands through afforestation will help in soil and water conservation and prevent flooding of rivers (IDSA, 2010).

Watershed Development: Development of watersheds

is an important programme to make best use of the rainwater for agricultural production while improving soil conservation and biodiversity. Fortunately, the Government of India has given top priority to watershed development to provide assured water supply of agriculture in rain fed areas. Under the watershed development programme, the catchment area of a basin is considered as a unit and efforts are made to harness rainwater by treating the land from the ridge to the valley. It is estimated that over 63% of the cultivated lands in the rain fed areas need to be brought under watershed development to conserve soil and water, which in turn would improve the crop yields as well as ground water table.

Watershed development programme introduced almost about three decades ago, had covered over 87 million ha by the end of the Eleventh Five Year Plan. However, a large number of watersheds are still subjected to heavy soil erosion, due to poor quality soil conservation work undertaken in the past and lack of convergence with other agricultural development activities. There is scope for developing over 125 million ha under the watershed. The watershed development programmes need additional budget to converge soil and water conservation with improved agricultural practices.

Efficient Irrigation Practices: Efficiency in irrigation is most essential, if the country wants to address the challenge of water crisis. As most of the crops are watered through flood irrigation, over 70% of the water used for irrigation is wasted. Furthermore, as the water supplied is not measured, farmers have a tendency to flood the field with excessive water without any additional cost. Such a practice has been creating a negative impact by way of increased cost of leached nutrients, pollution of ground water, increase in soil salinity and increase of pests and diseases. Shifting from flood irrigation to micro-irrigation systems will not only reduce the water requirement but also bring down the cost of production, while increasing the area under irrigation. Simultaneously, metered supply of irrigation water and formation of water users' group for water distribution would significantly improve

water use efficiency and reduce the cost of agricultural production.

Control of Water Pollution and Water Recycling: Excessive consumption of water for agriculture, industries and domestic purpose is leading to water pollution, because such excess water is transformed into saline water, sewage or effluent and becomes unfit for use. Thus, discharge of sewage and effluent into water bodies and rivers must be banned. The offenders must be punished and enforced to recycle waste water for agriculture and industrial production, after proper treatment. This will help in keeping the water sources clean and reduce water shortage in the future. Desalination of sea water is presently expensive, but with solar power, it can be a viable alternative to meet the water needs in coastal areas.

Priority Areas for Action

As the time is running out, it is necessary to act on priority in the following areas:

- Commissioning of well planned, time bound irrigation projects;

References

1. Govt. of India. 2009. Background note for consultation meeting with Policy makers on review of National Water Policy. Ministry of Water Resources. 50 pp.
2. IDSA. 2010. Water Security for India: External dynamics. IDSA Task Force Report.



More Smiles Per Ton of Steel



S Mazumdar
Chief Sustainability Officer
JSW Group

Dr S Majumdar is the Chief Sustainability Officer for the JSW Group since 2014, and is responsible for the design, development and implementation of a sustainability framework that enhances global competitiveness. He is a member of the Expert Groups of several leading organisations such as the World Steel Association, the Global Reporting Initiative, Confederation of Indian Industry, and many more.

Dr Majumdar has 26 years of qualitative experience in the fields of corporate sustainability, sustainability strategy, climate change, environment management, CSR, voluntary disclosures, business excellence, sustainability performance assessment, biodiversity, LCA, industrial safety, energy management, and others. He has handled policy work, research, capacity building and consulting assignments for various industry sectors; has worked with the government and industry; and is familiar with emerging concepts, issues and opportunities for businesses.

Prior to joining JSW he worked in the Confederation of Indian Industry [CII] as Principal Counsellor with the CII-ITC Centre of Excellence for Sustainable Development. Earlier, he was with Procter & Gamble India handling Environment, Regulatory Affairs, Technical External Relations and Sustainability.

“Sustainability at JSW Steel is about creating as many positive impacts as possible in terms of economic, environmental and social aspects of the business in an integrated manner, ultimately contributing to more smiles per ton of steel manufactured”

Sustainability Report 2014-15, JSW Steel Ltd.

About the JSW Group

Part of the OP Jindal Group, it is an INR 55,000 crore (USD 11 billion) conglomerate with significant presence across various sectors, viz., steel, energy, minerals, cement and infrastructure. With a workforce of over 40,000 individuals representing multiple nationalities, JSW is well-known to be a strategic first-mover and to venture away from status quo, have the conviction to make

fundamental changes and drive operational excellence. JSW Steel is the flagship company of the JSW Group, and is among the world’s most illustrious steel companies.

JSW believes that it is important to create a happy and socio-economically inclusive India, hence it is in constant pursuit of making life better for communities with its various initiatives in the fields of health, education, livelihood and sports along with art and culture.

Sustainability at JSW

JSW believes in creating growth while balancing utilisation of natural resources and social development in its business decisions. It also believes in pursuing its business objectives ethically, transparently and with accountability to its stakeholders across the value chain. JSW is committed to promote integrated responsible behavior and value for social and environmental well-being. JSW's commitment to do business responsibly is built into the core values of the company to conduct every aspect of business responsibly and sustainably.



The company has a sustainability policy which highlights its commitment to also address environmental issues through efficient use of natural resources, promoting use of renewable energy, minimisation of wastes, water management, protecting the biodiversity and reducing the carbon footprint.

Creating More Smiles per Ton of Steel Produced

Sustainability at JSW Steel is about creating as many positive impacts as possible in terms of economic, environmental and social aspects of the business in an integrated manner, ultimately contributing to **more smiles per ton of steel manufactured**.

The Group's Vision is "Global recognition for quality and efficiency while nurturing nature and society". JSW is on an accelerated growth path - expanding capacities, building new manufacturing facilities, and making acquisitions. Such diversified yet rapid growth poses challenges in deploying common standards of operational excellence that are clean and safe. To complement this growth, the Group companies have taken up the challenge to decouple growth and its impact on the environment and resources. JSW Steel has been a front-runner, and has taken several steps to achieve this. First, the company articulated its policies on quality, environment, occupational health & safety, and several other key

subjects. Second, these policies were deployed through certified management systems and processes based on Six Sigma, TPM and TQM. Third, the company's continual improvement efforts are supplemented by project-level innovations and interventions, to improve resource stewardship and ultimately overall performance. This has helped JSW Steel have the distinction of achieving the lowest conversion cost in the world.

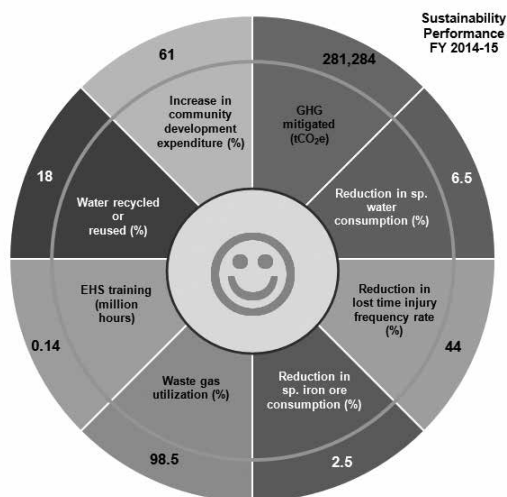
Water Security

The Company monitors the use of its water resources and quality of effluent discharged. It always endeavours to prevent pollutants at source, monitor the operation of all the pollution control equipment, and continually improve the treatment such that discharges and emissions are significantly within all the regulatory limits. JSW Steel could lower the water intensity of its operations down to 4.57 m³ / ton of steel (2014-15), with nearly a fifth of the water used was from a recycled source. The company is acutely aware that water is scarce, and competes with many other uses in the surrounding regions. To alleviate this risk the Company has undertaken several initiatives under natural resource management, providing interventions for watershed development and agricultural yield improvement covering about 8,000 hectares of land, as well as enabling better livelihoods and a better quality of life.

Raw Material Security

JSW Steel's resource stewardship efforts resulted in an improvement of 2.5% in the use of iron ore and use of iron scrap to the extent of 0.85 million tonnes in 2014-15, compared to the previous year.





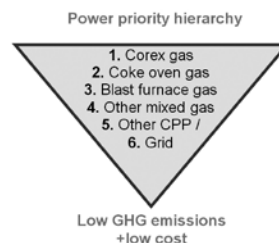
Shift to a Low Carbon Growth Path with Triple Bottom Line Benefits

JSW Steel is undertaking extra efforts to increasingly shift transportation of raw materials and products in India by rail. In FY 2014-15, about 83% of all goods were transported via rail, as compared to 76% in FY 2013-14.

At JSW Steel, focus on reducing the GHG footprint is a well-established priority. The company has incorporated climate change as factors while shaping and reviewing its business strategy, and therefore has consistently invested in clean technologies.



JSW Steel was the pioneer in India to invest in the Corex technology at the Vijayanagar Works. As opposed to the conventional blast furnace route, this technology offers several advantages in terms of ability to use low-grade iron ore that was hitherto ignored by the integrated iron and steel manufacturers in India. This utilization of a “wasted” resource not only obviates the need to mine iron ore, it enhances raw material security for the country, avoids energy and emissions associated with the mining, and has resulted in the reduction of about a million metric tons equivalent annually.



Further, the company has developed a power priority hierarchy based on low-to-high emissions. This approach has resulted in the recovery of nearly 99% of waste energy at Vijayanagar Works alone, and over 99% of the power required is produced in-house.

In April 2015, the Vijayanagar Works of JSW Steel was conferred with the coveted Prime Minister’s trophy for excellence in performance as the best integrated steel plant in India for the Financial Year 2012-13.

In 2014-15, Vijayanagar Works invested over INR 25 crores (~USD 3.8 million) on energy conservation projects alone, resulting in financial savings of over 4 times the investment, with a consequent lowering of the specific energy consumption figure by 0.68 Gcal / ton of crude steel produced.



End Note

The roadmap to sustainability is dynamic and never-ending, and is all about integrated thinking. This top-down approach starts with the Board, and cascades down to the manufacturing sites. The ability to create innovative solutions and lasting positive impacts for the stakeholders across all interventions is what has helped JSW reach where it has so far. This only whets the appetite for further growth and further success, possible only by greater endeavours constantly.

Managing the Water Energy Nexus- A Cross-Sectoral Perspective for India



Indra Guha
Executive Director
Climate Change and
Sustainability Services
Ernst & Young LLP-Delhi

Mr Indra Guha is a Civil Engineer from BE College, Sibpur with Master's from IIT Kharagpur. Later on, he went on to do management from IIM Kolkata. He has been with the Advisory Services of EY for 12 years now, and specializes in Climate Change & Sustainability Strategy, Reporting and Assurance, Due Diligence, Climate Change Advisory. His experience spans over more than 18 years with projects across various industry sectors.

Mr Guha has been leading teams on projects in the Steel, Cement, Fertilizer, Paper, Sugar, Renewable Energy (wind, hydro, biomass), Oil and Gas sector. His expertise is in assisting Corporates in their public reporting initiatives on non-financial performance. He led several sustainability strategy engagements with companies both in India and outside. Mr Guha also assists organisations in assessing their compliance and framing of governance structures, benchmarking the performances in environmental and social parameters against best practices.

(The author would like to thank Anindya Bhattacharya & Deepika Duggal for their help in preparing the article.)

• Outlining the Water-Energy Nexus

Energy and water are fundamental human needs facing escalating demands and shrinking availability in emerging economies like India predominantly as a consequence of economic and population growth and climate change. Water is an extremely relevant component in all phases of energy production and electricity generation. Correspondingly, energy is prerequisite to extract, transport, and deliver water for diverse human consumptions, and further treat waste waters for safe disposal to environment and reuse. This trade-off between energy and water resources is termed as 'Water-Energy Nexus'.

India's energy demand has been doubled since beginning of the century but energy consumption per capita is still only around one-third of the global average and nearly 240 million people have no access to electricity (International Energy Agency 2015). In case of water resource, the per capita availability in the country has been reducing progressively from 1816 cubic meters in 2001 to 1545 cubic meters in 2011¹ (Ministry of Water Resources, River Development and Ganga Rejuvenation 2015). Although India has made significant progress in socio-economic development in recent years, challenges persist in safeguarding water and energy resources for the vast population.

1. <http://pib.nic.in/newsite/PrintRelease.aspx?relid=119797>



• Climate change and Water-Energy Nexus

The current stress on water resources is expected to exacerbate as one of the prominent impacts of climate variability and related extreme weather events, adding to the vulnerability of people and ecosystems, particularly in water scarce and marginal regions. The rising temperatures and shifting rain patterns enhance uncertainty in energy development. The widespread mass losses from glaciers and reductions in snow cover over decades are projected to reduce the water availability (Intergovernmental Panel on Climate Change, Climate Change 2007: Synthesis Report 2007), increasing the energy demand to ensure water availability. Climate change amplifies the already intense competition over water and energy resources by affecting both the demand and availability of the water and energy resources (World Business Council for Sustainable Development 2009).

• Managing the Water Energy Nexus

The Water-Energy Nexus can be appropriately managed through a two-pronged approach, considering both facets of the nexus, namely, a) Energy to Water; b) Water to Energy.

a) Energy to Water

In some developed countries, energy sector, mainly thermal power plants, account for about 40% of the total water available (World Economic Forum 2011). In case of India, as shown in figure 1, over 75 % of the installed power plants are located in areas with water scarcity and water stress.

Distribution of thermal power plants in river basins

| River basin | Thermal power capacity distribution (%) |
|---------------------|---|
| Ganga | 35 |
| Indus | 7 |
| Luni | 6 |
| Mahanadi | 9 |
| Brahmani and Batami | 3 |
| Godavari | 11 |
| Tapi | 6 |
| Krishna | 5 |
| EFRs | 7 |
| WFRs | 6 |
| Brahmaputra | 0.5 |
| Others | 5.5 |

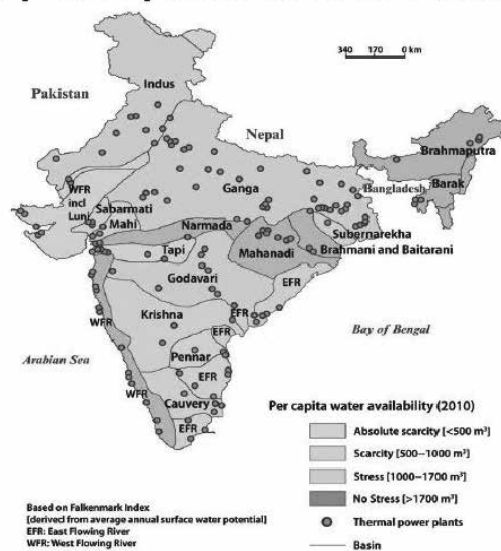


Figure 1: Distribution of thermal power plants in river basins of India

Source: (Bhattacharya and Mitra 2013)

Also, the long term water supply-demand gap, as shown in figure 2 below, further projects non-availability of surface water to meet any additional demand beyond 2040.

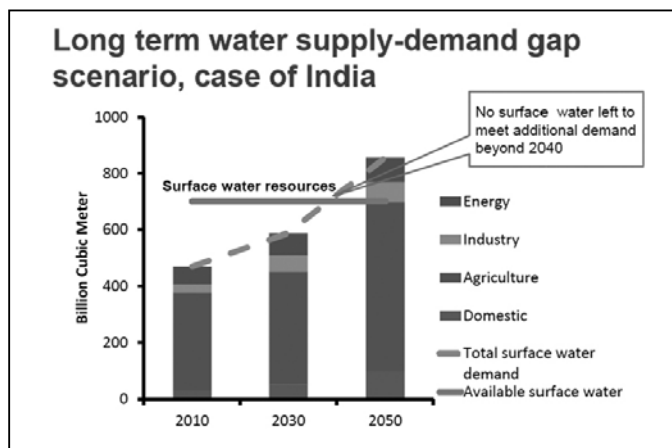


Figure 2: Long term water supply-demand gap scenario, case of India

Source: (Bhattacharya and Mitra 2013)

Given the above scenario, this article attempts to draw possible solutions for the water scarce regions of India including amendments in perspective planning criteria, cooling technologies, demand-side management, and measures to improve water availability (Bhattacharya and Mitra 2013).

◆ Perspective planning of geographic location

In addition to the resource mobilisation capability and choice of fuel, another key factor in planning a thermal power plant is the choice of location of sites for setting thermal stations. The location of the thermal power plant should be decided on the basis of the availability of water resources with preference to coastal belts in order to use sea water for cooling purposes. In case of inland areas, thermal power plants should be set up around river basins that are expected to be at relatively lower water stress in future. Proximity to coal reserves is equally economical, avoiding transportation of Indian coal with high ash content over long distances. The coal resources in India are largely concentrated in the eastern region and so is the per capita availability of water, making the region idealistic to meet the projected growth in thermal power capacity.

◆ Appropriate cooling technology

In Indian context, around 80% of the consumed water, i.e. around 65% of the total water withdrawn in a typical coal fired power plant is used in its cooling system, followed by ash handling activities. Considering three key methods of cooling, namely, 'once through system', 'Wet Cooling' and 'Dry Cooling', it has been demonstrated that unlike wet cooling system, dry cooling system use air instead of water to cool the steam exiting a turbine, decreasing total water requirements by up to 80% (Bhattacharya and Mitra 2013).

◆ Demand-side Management

Indian agriculture is overwhelmingly dependent on ground water, establishing a unique Water-Energy Nexus. Lack of modern energy efficient pump set technologies,

absence of rural electrification system and dearth of monetary incentives led to further substantial energy losses. Managing the overall demand of ground water is one widely acknowledged challenge facing this sector. The demand side management is possible through farm level technical interventions such as shifts in the cropping pattern, attempts to incentivise farmers to move away from water intensive paddy crops through diversification, better on-farm water management practices such as mulching, zero tillage, laser leveling etc (FAO 2013). The interventions need careful evaluation in the specific local circumstances to assess their respective water-saving potential.

b) Energy to Water:

Managing the energy requirements for extracting water resources is achievable through four technological interventions - reducing the run off (FAO 2013), pricing water resource (OECD 2010) and rain water harvesting (Shiferaw, Okello and Reddy 2009) and enhancing the ground water seepage.

◆ Managing the run off

The run-off is one of the noticeable issues for the rainfed crop lands not only because it leads to loss of potential water resource but also cause damaging soil erosion. The run-off management techniques include practices that improve infiltration capacity and control water movement through mulch farming, alley cropping, no tillage farming, contour farming and terrace farming (FAO 2013).

◆ Pricing Mechanism

The introduction of highly subsidised tariff on electricity generation for agricultural purposes in some states of India such as Punjab, Karnataka, Andhra Pradesh, etc. has led to high levels of power consumption for pumping ground water, further resulting into overexploitation of ground water resources (Mukherji, Shah and Giordano 2012). Given the present scenario, an appropriate pricing mechanism in terms of power tariff or water pricing is



imperative to signal the scarcity of resources, avoid any overconsumption of resource, help cover financial costs of irrigation systems and improve water use efficiency in situations of water paucity (OECD 2010).

◆ **Rain Water Harvesting**

The rain water harvesting upstream of check dams and dug-wells down-stream can provide irrigation at critical stage or during intermittent long breaks in monsoon and ensure sustained productivity (National Rainfed Area Authority, Ministry of Agriculture and Farmer's Welfare 2014). This restricts the over usage of electric pumps for extracting ground water, thereby reducing the overall consumption of energy and managing the Water-Energy Nexus.

• **Conclusion**

India is one of the fastest growing economies in the world, and thus a reliable supply of energy and water resource is the most important issue that the country faces. The existing issues and the projected resource scarcity can be resolved through the proposed options including supply-side and demand-side management of the resources:

◆ **Understanding of costs and benefits of alternative cooling technology in thermal power generation**

The choice of options heavily depends on the required investment cost. The suggested technologies such as dry cooling are comparatively costlier (around 20% more) compared to the conventional cooling technologies and also it causes loss in power plant system efficiency between 1.5 to 2%. As a result, dry cooling system is expensive compared to conventional wet cooling system. However, for sites where adequate quantity of water is just not available, dry cooling systems can still be an economical option in the context of hedging the risks of power plant shutdown due to non-availability of water. A recent case in NTPC power plant in shut down due to water crisis is a prominent example for need of this alternative option of cooling (NDTV 2016).

◆ **Water use efficiency enhancement through technological intervention**

The water-saving augmenting irrigation technologies such as energy efficient water pump sets are promising in not only reducing the consumptive use of water but also enhancing agricultural yield substantially.

◆ **Resource use efficiency through market determined pricing**

Market mechanism with proper pricing of water resources is imperative for ensuring sustainable usage and long term availability of the water resource. An efficient allocation of both the resources, water and energy, can be reached at the point where the market price balances supply against demand.

◆ **Transforming economic characteristics of water resources from common to private goods**

The common goods face pertinent issue of over-exploitation as each user withdraws as per their requirements without taking into consideration the negative impact on the resource availability for other consumers. Water, if considered as a private good, perhaps is managed like an "asset" by the user, ensuring economically rational consumption and future availability of the resource.

◆ **Full scale introduction of water harvesting by regulation, technology intervention and investment**

Adoption and adaptation of cost effective water management practices can be ensured through careful consideration of market, policy and institutional factors that condition and shape beneficiary's conservation decisions. Apposite policies and institutional mechanisms can be a useful driving force towards sustainable management of water resources. Access to investment credit at affordable rates and other benefits like livelihood opportunities can also help deciphering some of the long-standing constraints.

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- DISCLAIMER: The views expressed here are solely those of the authors in their private capacity and do not in any way represent the views of the Ernst and Young.**



Biodiversity Value for SMEs



Wijnand Broer
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Mr Wijnand Broer is Deputy Director at CREM BV, an Amsterdam based consultancy. He has been working in the area of Corporate Social Responsibility for almost 25 years, with special emphasis on international supply chains and market opportunities. He has been involved in projects in India since 2008, focusing on the business opportunities of CSR and the work of the India Business & Biodiversity Initiative. Mr Broer has been working in the field of Business & Biodiversity and Natural Capital for over 15 years, focusing on the assessment and management of impacts, dependencies and opportunities. He is currently involved in the work of the Dutch Business Help desk on Natural Capital and the development of a publication on Natural Capital and the Circular Economy.

Many companies tend to see biodiversity as a luxury good: beautiful and a source of inspiration, but not directly relevant to everyday business. Biodiversity is however much more than that. Biodiversity is essential to a healthy environment and to the delivery of natural resources like food, clean water, clean air, wood, fish and a variety of services that nature provides, like pollination and water purification (we call these ecosystem services) not just in the countryside, but also in cities. Because of the continuing loss of biodiversity, costs of raw materials are increasing and services previously provided by nature (for free) need to be replaced by technical solutions (at a cost). This is already affecting economic sectors and this is being recognised by governments and businesses globally.

All companies, big or small, depend on biodiversity in one way or another. Also, all companies impact on

biodiversity through the use of resources, emissions of hazardous substances and the production of waste. A loss of biodiversity and a loss of ecosystem services may affect operational costs, market access and a company's license to operate. Managing these dependencies and impacts on biodiversity is therefore significant from a risk management point of view, but also from the viewpoint of business strategy. Multinationals that integrate a focus on biodiversity in their supplier requirements are looking for suppliers that can meet these requirements. Banks that include biodiversity in their investment policy will only invest in companies that can comply with this policy. And last but not least: where there is a problem, there is money to be made in providing the solution! New markets are emerging for innovative companies that succeed in providing the solution. This is not just true for multinationals, but also for SMEs.

Three trends influencing the role of SMEs

In the last 2-3 years, in Europe and in other countries around the world, the perception of the role of companies (including SMEs) in the field of biodiversity is changing as a result of three important & interrelated trends:

1. A shift in the perception of biodiversity: from species towards the value for society

In the last decade a shift has taken place in the perception of biodiversity from (1) a focus on species, to (2) the (societal and monetary) value of ecosystem services provided and supported by biodiversity, to (3) biodiversity as an essential part of 'our' 'Natural Capital'. This concept of Natural Capital comprises not just biodiversity, but all of earth's natural assets, including soil, air, water, flora and fauna and geological resources (like metals, minerals and oil). Many of the services our natural capital provides (see figure 1) can only be provided by healthy ecosystems. Since biodiversity is an important precondition for healthy ecosystems, the conservation of biodiversity is not just important from the viewpoint of intrinsic value (the value in itself or ethical value), but also from an economic perspective.

2. A shift from sectors to landscapes

The realisation that different stakeholders in one area depend on the same pool of natural assets, is slowly resulting in a shift from looking at individual companies and sectors to a focus on landscapes: a 'landscape approach'. The question whether an area is used or exploited in a sustainable or 'future proof' way depends on the natural capital the area has to offer and the actions of all stakeholders interacting with this area. This includes SMEs, which in many urban and rural areas are key stakeholders. Not just from the viewpoint of resource use and the production of emissions and waste ('footprint'), but also from the viewpoint of positive contributions ('handprint').

3. A shift from a linear economy towards a circular economy

The growing scarcity of resources is slowly inducing a shift from a 'linear economy' based on take-make-waste to a 'circular economy' where abiotic and biotic loops are closed. This trend towards a circular economy focuses on:

- closing resource loops by means of re-use and recycling;
- shifting from product ownership to the use of services, reducing the need for resources;
- replacing non renewable resources (abiotic resources like fossil based resources, metals and minerals) by renewable resources (the biobased economy);
- creating 'nature based solutions': using nature (including newly created nature) to provide the services we otherwise need to produce in an artificial way (using scarce resources).

Key to the circular economy is 'system thinking': realising that there may be trade-offs when optimising one service over another. For example, optimising the conditions for agricultural production in a specific area may lead to the loss of other services in that area, like water retention or carbon sequestration. This system thinking is of course closely linked to the concept of the landscape approach.

Figure 1 shows the services that natural capital can provide to different stakeholders in an area, including SMEs. It also illustrates the need for a landscape approach when creating a 'future proof area' where natural capital is used in a sustainable way.

So how does this relate to SMEs and the value of managing biodiversity?

The value of focusing on biodiversity as part of an SME's responsible business operation will differ depending on the type of company we are talking about. In general one could distinguish between four different types of SMEs:

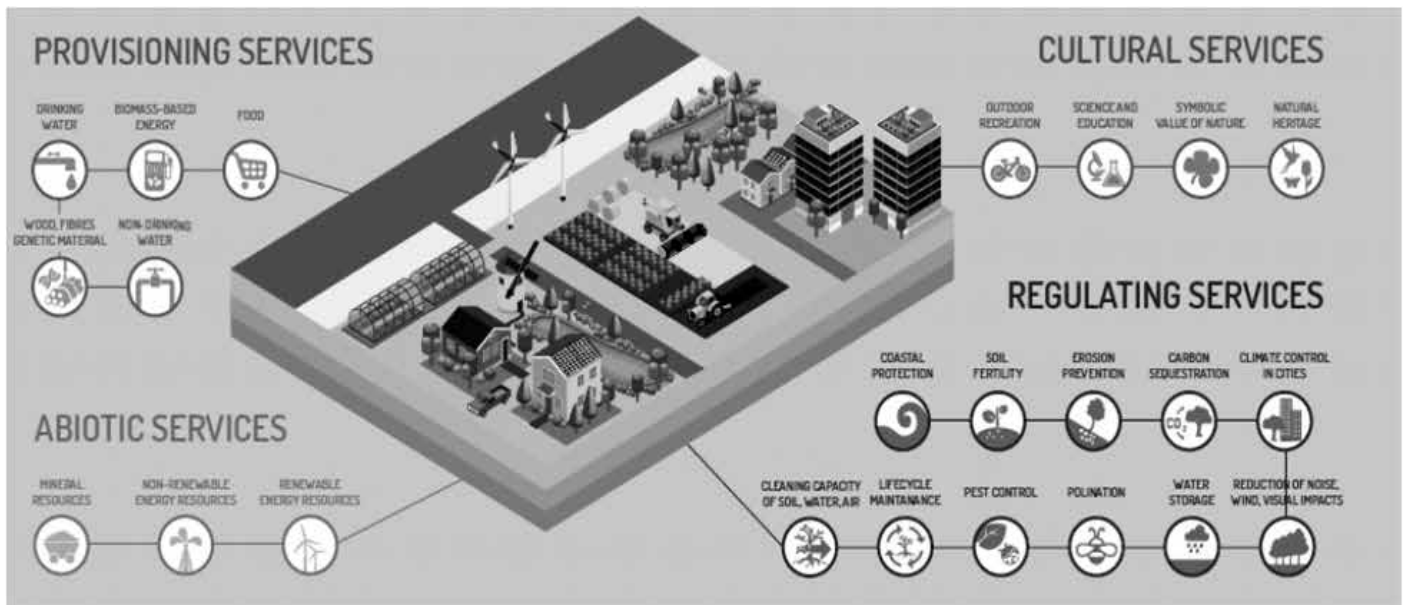


Figure 1: Natural Capital and the services (adapted from PBL, RIVM, WUR, CICES, 2014)

- The *'future proof entrepreneur'*: the business that understands that taking sustainability and biodiversity and ecosystem services into account is necessary to stay in business. Be it because of a dependency on services which are locally provided by nature (like pollination or water purification), or because the company impacts on services which are used by other stakeholders in the area (e.g. when water use by the company is resulting in water scarcity, harming the company's license to operate). Or because the company sees that the market is changing, for example when clients or investors start asking for a sound track record on biodiversity related topics. This is the SME that wants to be future proof.
- The *'eco-innovation entrepreneur'*: the business that thinks out of the box and sees the opportunities for innovation and new markets in the area of biodiversity and ecosystem services. "Where there is a problem, there is money to be made with a solution". These are the companies that build on the challenges related to biodiversity, natural capital and the circular economy. By developing new technologies (like nature based solutions, e.g. green roofs for insulation and water catchment), new materials (like biobased materials for packaging solutions) and new services (like product service systems, replacing product ownership; e.g. selling light instead of lamps). SMEs tend to play an important role in this kind of innovative thinking. Moreover, an increasing number of SMEs is being created around such innovations (start-ups and social enterprises), focusing on 'shared value' (value to society and value to the company) as a key part of their mission.
- The *'green entrepreneur'*: the business that uses biodiversity as part of the product it sells, thereby also creating value for existing biodiversity and facilitating its conservation. Examples are eco tourism companies that sell a 'nature experience' or companies that manage nature areas in a sustainable way and sell products from the area (e.g. sustainably harvested medicinal plants and other non timber forest products, like honey). These kind of products are also called 'pro-biodiversity' products (products of which the production contributes to the conservation of biodiversity).

- The *'knowledge partner'* the service sector that provides the knowledge and tools the companies need. These knowledge partners can be consultants, universities, sector associations and industry organisations. A good example is the Confederation of Indian Industry which, through the India Business & Biodiversity Initiative (IBBI), is able to support businesses and government in the conservation and sustainable use of biodiversity in India.

The role of SMEs as a knowledge partner and as an eco-innovation entrepreneur is of course of key interest to the focus of the 'Global Conference on Environmental Services for Sustainable Development', organised by the CII and its Centre of Excellence for Sustainable Development. This is where the opportunities are for the services sector in India. Not just as a service provider to SMEs, but also as a knowledge partner for large companies (sourcing from SMEs), sector associations (having SMEs as their members), local governments and national government (interested in the conservation of natural capital through a landscape approach, involving SMEs).

So what can SMEs do in practice?

The four categories of SMEs shows that there is a potential business case in managing biodiversity for many SMEs. Either as a user of natural capital in an area/landscape or as a business looking for a position as a preferred supplier in a supply chain or for new markets.

Figure 2 provides an overview of some of the action perspectives a company has when focusing on biodiversity as part of its sustainability policy or its ambition to be a responsible business. This includes:

- Greening of the production site, e.g. creating green patches or corridors for migrating animals
- Managing the production process to reduce the company's footprint on biodiversity and ecosystem services, e.g. by cooperating with local ecologists

- Taking biodiversity into account in procurement decisions, e.g. by sourcing products and materials with a sustainability certificate
- Creating innovative solutions to conserve or strengthen biodiversity, like water saving techniques
- Local sourcing of sustainable resources, e.g. in cooperation with local producers
- Sharing knowledge and cooperating with other companies, e.g. in business parks
- Joining (local) projects that benefit biodiversity, like anti litter initiatives

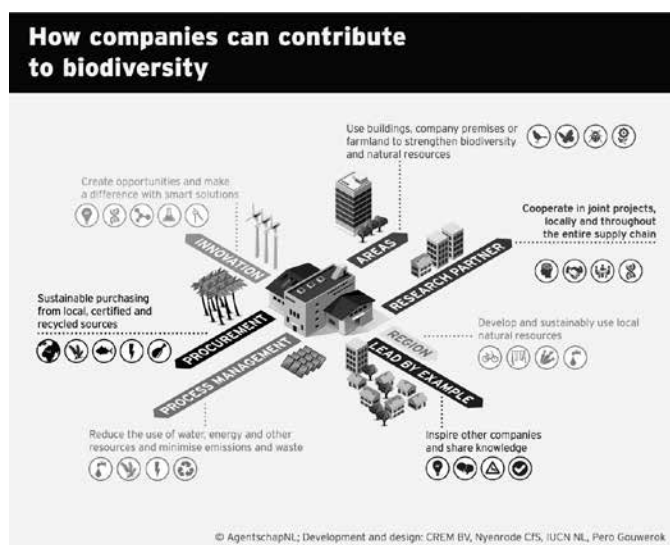


Figure 2: A company's action perspectives to contribute to the conservation and sustainable use of biodiversity

The way forward for SMEs: a step by step approach

A first step for every SME will be to assess show the company and the company's key stakeholders (like local communities) benefit from (local) biodiversity and the services nature provides. Is there a common interest? Are the services the company and others use being paid for or are they (still) for free?

A second step would be to discuss why it could be of interest to the company to take action on this topic: Are



clients asking questions? Can the company pro-actively position itself as a responsible supplier? Does local legislation require action? Do local stakeholders use the same resources? Is there an opportunity to enter new markets?

If the company decides that it is beneficial to the company to take action, it will need to look into the action perspectives and the options for cooperation with others, like local service providers and other stakeholders in the area. Can the company integrate biodiversity and ecosystem services into an already existing ISO14001 system? Is local knowledge available about the state of biodiversity in the area? Are there local initiatives benefiting the biodiversity and ecosystem services the company depends on? Is local government participating with companies on local sustainability challenges?

After deciding on the actions the company will implement it will need to think about the need for communication and marketing to realise the intended benefits. Who needs to be informed/engaged to enhance the company's license to operate? How can clients be informed about the company's performance? To what extent would a partnership with a local NGO be beneficial?

By taking such a step by step approach, SMEs will be able to assess what value biodiversity holds for them and how they can preserve this value and capitalise on this value. Looking at the trends around natural capital, the landscape approach and the circular economy, involvement of SMEs is not a matter of 'if', but a matter of 'when' they will be involved.

Sustainable Mining



Laxman Singh Shekhawat
Chief Operating Officer-
Mines
Hindustan Zinc Limited

Mr L S Shekhawat started his career with Hindustan Zinc Limited at Rampura Agucha Mine during the year 1990 as a Mining Engineer and has worked his way up to become the Chief Operating Officer of HZL Mines in the year 2014. During a career span of 25 years, Mr Shekhawat has been involved with various projects across HZL and Vedanta in different roles and responsibilities. He has been behind the remarkable journey- towards growth, of Rampura Agucha Mine and HZL. Besides this, he has actively participated in many of Vedanta's key M&As since the year 2005. He has widely travelled across the globe to various mining operations and carries a very rich experience in various facets of mining business.

Mr L S Shekhawat has an engineering degree in mining from the MBM College of Engineering Jodhpur and also holds a first class Mine Manager's Certificate of Competency. He has a keen interest towards playing volleyball and cricket and has been a national player of Kho-Kho.

(The author would like to thank the co-authors Mr CSR Mehta, Mr V. Jayaraman, Ms Shama Jain for their help in preparing the article.)

In this new era of paradigm shift, sustainable development has emerged as an important concern for all industries to address related environmental and social issues and to maximize their contribution to the global economy. Mining in this scenario has attracted special attention as more than any other industrial activity as it tends to leave a strong negative impact on environment and society.

Minerals and metals have played a crucial role in the development and continuation of human civilization. Mining or mineral development comprising exploration of the nature's mineral reserves, their extraction from below the earth's crust in solid, gaseous and liquid forms and subsequent processing and recovery of derivative-products for industrial and commercial purposes have been an important human and business activity over the ages. Mining activities can bring benefits to the local communities through creation of jobs, encouragement to

business and infrastructure development. In continuation of all these benefits sustainable mining strategy provides an opportunity to bring a balance between economic, social and environmental well-being now and for the future. Hindustan Zinc has significant contribution towards promoting the fact of sustainable mining in India. We are

- Operating the world's largest zinc mine – Rampura Agucha Mine
- India's only and world's second largest zinc miner
- Fourth largest zinc metal producer in the world
- Unique, with fully integrated operations and mine life of over 25 years

HZL is integrated zinc manufacturer and owns captive



zinc mines which meet complete requirement of zinc and lead concentrate for its smelters. HZL operates open cast (Rampura Agucha Mine) as well as underground mines (Rampura Agucha, Rajpura Dariba, Sindesar Khurd, Zawar Mines and Kayad Mines) all in Rajasthan with state of the art technology. Rampura Agucha mine is one of the most cost-efficient zinc mine in the world. In addition, the Company also has a rock-phosphate mine in Maton near Udaipur.

Hindustan Zinc's overall ore production capacity today stands at 10.25 MTPA and the overall metal production capacity over 1 million tonne of zinc-lead. With reserves and resources of 375 million tonnes, company's exploration programme is integral to its growth and future expansions. Successful exploration and subsequent development of mineral assets underlines the mission and business strategy of the company.

Approach to Sustainable Mining

The sustainability of the mining industry stands on three pillars: economic, environmental and social. Striving for sustainable development involves balancing the inevitable conflicts in these three areas. It is also clear that encompassing all these is the issue of governance which is required to provide and maintain legal and regulatory framework in order to further support the sustainability of the minerals industry.



Techno Economic Sustenance: Use mineral resources optimally, and contributing towards global economic growth.

Resource Sustenance: Implying proper management of natural resources and long term view of development that goes beyond the life of the mine.

Social Sustenance: Mining operations that have a broad based social licence to operate- creating lasting social and economic wealth which will outlast the life of the mine.

Sustainability Framework at Hindustan Zinc

Our business strategy is about ensuring that growth is maximised in a way that is both sustainable and responsive. Our sustainability framework provides robust structure for driving our future growth, supporting four pillars - Responsible Stewardship, Building Strong Relationships, Adding & Sharing Value and Strategic Communication and supported by its sustainability policies.

Sustainability Framework at Hindustan Zinc is:

- A stakeholder driven process.
- Aligned with international standards and industry best practices.
- Integrating social and environmental aspects for sustaining business.
- Zero harm to people, host communities & environment

Responsible Stewardship: It is the foundation on which we build our business – the way in which we respond to and manage our business. This includes: employees' health and safety management, land management, environmental impact and our supporting business processes.

Building Strong Relationships: We work hard to engage with our stakeholders to understand their key concerns

and expectations of our business and practices. Proactive engagement also enables us to identify opportunities and mitigate risks by understanding and responding to issues rather than reacting to them.

Adding and Sharing Value: We seek to add and share value through everything that we do. As a business we make a considerable economic impact: through employment, the payment of taxes, royalties and other contributions to local, state and national governments. We also build local infrastructure that benefits local communities in the form of roads, anicuts, classrooms, water tanks, etc.

Strategic communications: The fourth pillar interlocks with the other three pillars of our model, and is the guiding principle which enables the organisation to engage with our stakeholders in a transparent dialogue. This pillar is the vital element of sustainable development, in implementing and strengthening our 'license to operate' efforts.

Inclusion of Sustainability Practices in Mine Life Cycle:

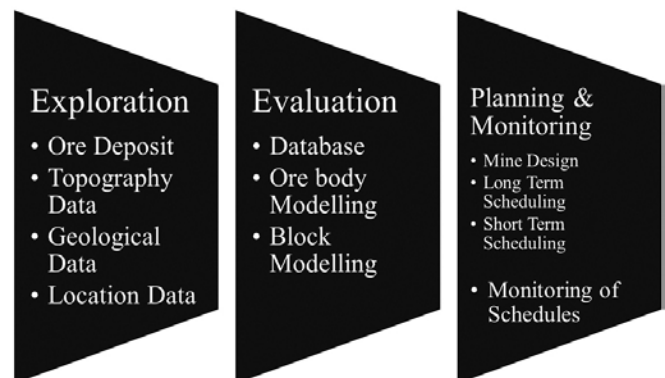
A mining project normally has the following phases of mine life cycle:

- **Exploration**
- **Mine planning**
- **Mine development**
- **Mineral extraction**
- **Mine closure**
- **Reclamation and rehabilitation (post-closure scenario)**

Inclusion of sustainability practices with all these stages is the key to get social licence to operate resulted from the reactions and expectations of the local community of the area where the mining project is established or proposed to be established.

Scientific Mining & Technological Advancement:

Scientific mining is essential for the conservation of a non-renewable resource and its optimum and efficient utilization and thus constitutes the first step for sustainability in mining. It involves adoption and continuous development of technology reflected in the advances in equipment and management practices. Scientific mining ensures resource efficiency, both in the management and extraction of minerals.

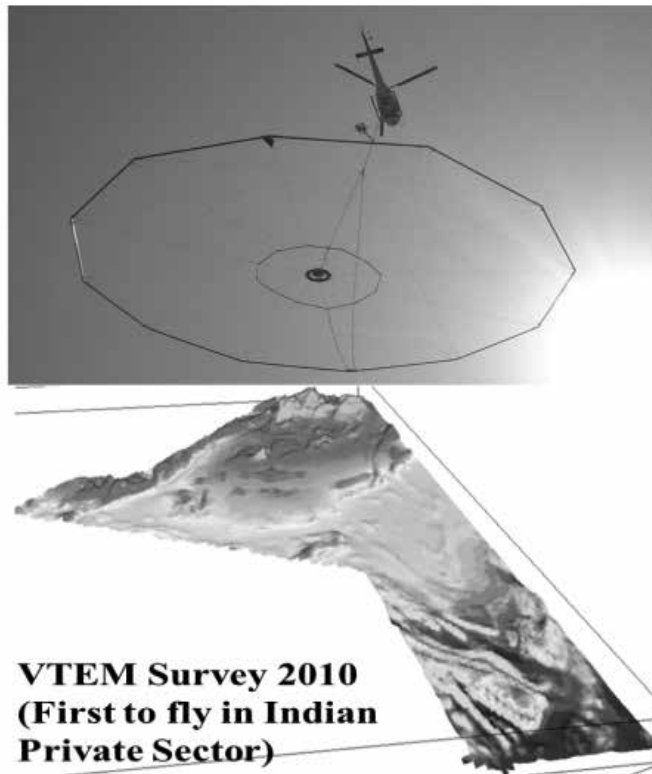


Example: At Hindustan Zinc we are pioneers in Scientific Mineral Exploration in India. Adoption of latest technology and software in mine planning and design & blasting for improving resource efficiency are key to our mining business.

Most technological advances in recent years have taken place as a result of the application of information technologies (IT) and computers to mining methods at different stages of mining operations. The interpretation of various types of data helps to prepare models of mineral occurrences and to orient drilling operations, thereby reducing environmental damage and reducing waste. Significant advances in geochemistry and geophysics (including airborne geophysical and geochemical analysis) have increased the accuracy and range of data for interpreting geophysical environment. Other innovations in mineral exploration include satellite, remote sensing technology, 3D modelling, the use of global positions system (GPS) and low-impact



seismic methods that minimize environmental damage and increase productivity.



Vtem heliborne survey- High Sensitivity Magnetic & Time Domain EM survey over 1500 sqkm area (~8700 line km) in Sawar-Jobner RP.

Titan Deep Earth Imaging Survey- This Survey (Quantec Geoscience Inc., Canada) DC Resistivity, Induced Polarisation & Magnetotellurics at Zawar (Sonaria – Ruparia hills), Pur Dariba prospect, Rampura Agucha (South & Kothian), Pipela prospect (Deri-Pindwara RP)

Few of the technologies that we are using (specifically in Open Cast Mines) are:

- Crawler Mounted
- Truck Mounted KLR Rig
- Conventional VOL 300 drill Rig

- Percussion Drill Rig
- Core Logs from Exploratory drilling
- Long association with world reputed mining consultants in the fields of Mine Planning, Geo-tech, Blasting and Benchmarking Studies like AMC Australia, SRK UK, JKMRC, CIMFR, NIRM, IISC Bangalore etc.
- Adoption of latest technology and software in mine planning and design, Geotech, Blasting and HEMM maintenance like Datamine, JK Simblast, SLOPE/W, SLIDE, DIPS, FLAC 3D etc.
- Culture of continuous Improvement by carrying out scientific studies at various stages of the mine.
- Induction & Successful operation of 34 m3 excavator (Caterpillar, RH -340 B): Biggest hydraulic excavator in India
- 221 MT dumpers (Komatsu, 830 E): Diesel electric technology, 1st of this class in India.
- Simulator for providing continuous training to HEMM operators.
- Truck Dispatch System for HEMM fleet management.
- Chemical treatment on haul roads to reduce dust generation and water consumption.
- Benchmarking of operational efficiencies of HEMM.





Open cast Mining

Best practices of underground mines

- Highly mechanized vertical development through raise borer machine.
 - Continuous monitoring system for online monitoring of mine gases (CO, NOx, O2,) and temperature.
 - Voice communication, and real time tracking of persons and equipment through leaky feeder system.
 - Refuge chambers in underground mine to meet emergency conditions.
 - Light weight LED cap lamps for underground persons.
 - Self-rescuers are mandatory for all underground persons.
 - Introduction of bulk emulsion explosive in underground mine.
 - Introduction of paste fill system for Backfilling.
 - Modern technology man basket on Volvo loaders.
 - Application of shotcrete machine for ground support.
 - Introduction of personnel carriers for carrying persons.
- Introduction of 3D Faro Scanner for calculating voids volume.
 - Using challenge (mono) pump for face dewatering that will reduce cycle time of development blasts.
 - Rapid development crew inducted to demonstrate world's best practices in mine development and safety.

Health & Safety Management at Hindustan Zinc:

Health and Safety are the key material issues for the company and in company safety of our employees and contract employees is of prime concern. Our Vision and Mission for Safety demonstrate the approach towards safety and wellbeing of our employees. We are committed to provide safe working conditions and have effective management systems in place to ensure the well-being of all our employees and others who may be affected by our operations. Most of our operations are certified to the international health and safety standard, OHSAS 18001 and we are committed to be a business without fatalities, serious injuries or occupational illness; and firmly believe that every unsafe situation is preventable. "Zero Harm to People" is our paramount health and safety goal.

With a vision to provide a safe and injury-free working environment to all our employees & contract employees; and to reduce the incident rate we give paramount importance to building a robust, effective and efficient safety culture. We know that we will only achieve our vision of Zero harm if we have a positive safety culture in which every employee, wherever they work in the organisation, takes responsibility for their own safety, and that of those around employees: colleagues, superiors, contractors and visitors. With that objective in mind, we've launched our Journey 'Aarohan' with DuPont for taking one step ahead in building positive safety culture.

We aim to eliminate occupational illness by providing a workplace that is free from occupational health risk and hygiene hazard. We proactively work with employees and contract employees to contribute towards healthier



lifestyles. This enables us to increase productivity, reduce absenteeism and enhance retention.

We have occupational health centre at all major mines, manned with experts for regular health examination of employees and contract employees.

Due to the nature of our operations, there can be associated health risks and we are committed to understanding, managing and mitigating these. Care for our people resolute in our aim of eliminating occupational illness and diseases. From the beginning of an employee's career with us, we have processes in place to manage and monitor health risks. This includes a pre-employment medical check-up followed by periodical medical check-ups with on-site medical professionals to monitor the occupational exposure limits.

Constant efforts are being made for providing a workplace free from occupational health risks and hygiene hazards. Such efforts translate into reduced absenteeism, higher productivity and good health for our employees.

Infrastructure for Employee Health Management:

- Well-equipped occupational health centres for regular health examination of employees including contract employees.
- Regular monitoring of ambient air at workplace. Air parameters are maintained below the permissible limits.
- Training for first aid and occupational health awareness to employees as well as contract employees.
- Pre-placement and periodic medical examination to assess the health status.
- Specific examinations like blood lead level, audiometric, spirometry, ophthalmic and chest x-rays.
- Special campaigns for stress management, bone

density tests, hypertension for employees and dependents.

- Toxic elements profile test of blood for toxic elements like Arsenic, Cadmium, Mercury, Cobalt, Lead, Chromium etc.
- Bag filters in place, to prevent fugitive emissions.
- Covering of all conveyors.
- Separate raw material handling storage with water sprinkling system.
- Preventive maintenance system to arrest the dust and fumes leakages.
- Use of good quality personal protective equipment and protective clothing.
- Wash house facilities.

We invest in technologically advanced processes that reduce possible exposure levels, including pollution control equipments, effluent treatment, sewage treatment and the proper storage of hazardous chemicals.

Community Health Management:

As a responsible corporate we aim to enhance the quality of life and economic wellbeing of communities around our operations. For improving the health of communities we facilitate them with various medical camps and campaigns for all age group.

We monthly organize routine health check-ups in which test like blood Sugar, high blood pressure, thyroid etc. is being done. Apart from these special camps focusing on specific issues such as dental camps, eye camps, blood donation camps, bone-mineral density camps etc. were organized for the benefit of surrounding communities. Some camps targeting specific group of people were organized such as family planning camp, prevention on Swine Flu, HIV/ AIDs camp etc.

Minimizing Environmental Impacts:

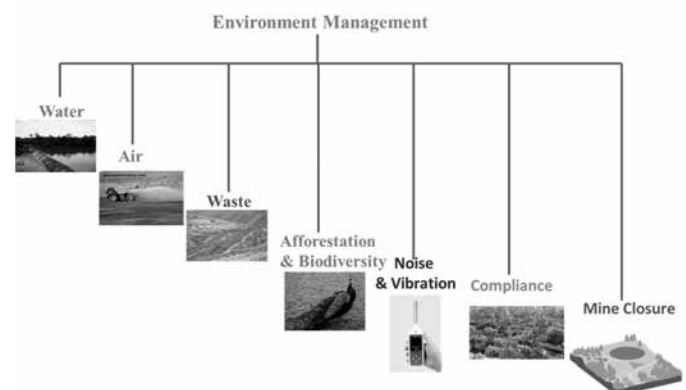
In order to contribute to sustainable development, a mine must minimize environmental impacts throughout the mining life cycle from exploration, through construction and extraction to closure and reclamation. This is achieved through the adoption of effective environmental management which includes the following elements:

- Environment and Social Impact Assessment (ESIA) and preparation of Environment and Social Management Plan (EMP) during mine planning
- Biodiversity management - mitigating the effects on flora and fauna
- Pollution control in respect of airborne contaminants, noise and vibration
- Management of hazardous substances
- Tailings management
- Management of water including that generated during mining operations, mineral
- Handling and processes
- Mine closure

Environment and Social Impact Assessment (ESIA):

Hindustan Zinc is conducting ESIA's to International Standards for all its new projects. We carry out Environmental and Social Impact Assessments (ESIA) for all new projects, to help us ensure projects are properly derisked, and successfully obtain and sustain their license to operate. As part of the ESIA process, we identify potentially affected community very early in the project development stage and engage with them to identify, assess and manage Environmental and Social risks. Our approach of social impact mitigation is founded on disclosure of relevant information, consultation and participation of all affected communities, and arriving at mutually acceptable solutions addressing matters of

material concern to stakeholders, including affected communities. The ESIA includes an Environmental and Social Management Plan (ESMP) setting out the mitigation and management measures to be implemented over the lifecycle of the Project and additional topic-specific management plans where relevant.



Water Management:

We recognize the social, economic and environmental value of water and the increasing global and local concern of water scarcity.

Water is a key resource and needs to be used responsibly, balancing the needs of many different users. We apply a zero discharge philosophy through application of best available techniques like replacement of water by compressed air in filter press, resulted significant reduction in fresh water consumption, increased recycling of water from Tailing Dam, Utilization of mine water in process, plantation and spraying, adoption of Best Technology for Tailing Thickening and higher recovery of water -Deep Cone thickener in Rampura Agucha Mine and through participating in local or regional water catchment planning activities to secure sustainable water resources.

Air Quality Management:

We have a strong environment monitoring mechanism and have deployed the best technologies for eco-friendly mining. Extensive activities have been done to achieve



world class standards by proper air quality management, noise and vibration management, over burden management, plantation, water quality management, tailing management etc. The various initiatives we do on the ground to ensure the air emissions are under check are:

- Track mounted DTH drills with wet drilling system.
- Water sprinklers for haul road dust suppression. Use of chemical dust suppressant along with water spray.
- Water spray nozzles and venturi scrubbers at crusher for dust collection.
- Cleaning of Industrial roads by Mechanical Road Sweeper.
- Covered conveyor belts to prevent dust losses into atmosphere.
- The concentrate carrying trucks are covered with tarpaulin to prevent any possibility of spillages.
- Truck tyre washing system installed to wash out the concentrates attached to wheels of the truck.

Waste and Tailing Management:

Waste Management:

We undertake continuous improvement project to optimize our waste efficiency by reducing waste generation and maximizing waste recycling. The Company has adopted the 4R waste strategy and its eco-friendly disposal. It has clearly defined waste segregation practices for recycling hazardous and non-hazardous waste. The company is exploring opportunities for gainful utilization of waste in eco-friendly manner to achieve its target of zero waste.

Gainful Utilisation of Waste rock generated from Kayad Underground mine. The waste left over after utilisation of quantity in back filling, it was identified that the rocks were suitable for laying the tracks on the tracks

of Dedicated Freight Railways double line works. The utilisation was approved by Ministry of Railways for formation in embankment and ballast section of railway line.

Waste dump management:

- The waste rocks generated in the mining activity are systematically stacked at earmarked place.
- Overall slope of 27° with intermediate benches has been maintained to give proper stability and safety.
- Construction and regular maintenance of Garland drains around the waste dump to ensure collection of run-off water hence conserving water.
- Regular water sprays with dust suppression chemicals.
- Geotextile application over the OB slopes for stabilization and minimization of fugitive emissions.
- Progressive plantation on the inactive benches and slopes by adopting use of jute bags for rehabilitation and improving biodiversity.
- 2.5ha football stadium developed in valley of rocks at Zawar Mines and 7.5ha Rock Garden developed using waste rocks.

Tailing Management:

Tailings are the materials left over after the process of separating the valuable fraction from uneconomic fraction of the ore.

- Tailing generated is disposed in a safe manner in tailing dam.
- All tailings (with 40% solids) from the plant are put in the tailing dam.
- It's a Rock filled with LDPE lining.
- Designed by experts from Central Water Commission

and Indian Institute of Science, Bangalore.

- Regular groundwater monitoring.
- Concurrent recycling of water is done for plant use.
- Reduced evaporation losses by using evaporation retardant chemicals.

Tailing dam Rehabilitation:

- Rehabilitation of old tailing dam by bio-technological approach.
- A collaborative project undertaken jointly by HZL, Dept. of Bio-technology (Govt. of India) NEERI, Nagpur & Swedish International Development Agency (SIDA).
- Area -38 hectares Plantation done- 1, 55,000 nos.

Paste Fill Plant:

The use of underground paste backfill provides ground support to the pillars and walls, but also helps prevent caving and roof falls, and enhances pillar recovery, which enhances productivity. Cemented Paste backfill came into existence because of this. Use of Mine tailings in Paste fill helps in gainful utilisation of the waste. Paste fill plant technology is radically changing the way tailing are disposed off on surface. It utilizes mill tailing generated during mineral processing, which are mixed with cement. The backfill material is then placed into previously mined stopes.

Successful commissioning of Paste fill Plant (unique in India) at Sindesar Khurd Mine and Rampura Agucha mine of HZL. Its multifold benefits ranging from improvement of ground stability and safety to environmental protection and higher mine extraction productivity, the system surpasses the earlier practise of low density hydraulic filling, ensuring wider sustainance of mining operations.



Biodiversity Conservation:

The Company has separate policy on Biodiversity and stay committed to prevent risk on biodiversity throughout its business by conserving rare and endangered species and high priority conservation areas.

In order to promote a best practice management approach to biodiversity, we have reviewed all operations through the mapping tool Integrated Biodiversity Assessment Tool (IBAT) to identify which of our sites are operating within close proximity of protected International Union for Conservation of Nature (IUCN) areas, important bird areas and key biodiversity hot spots. The results of the biodiversity risk screening programme have led us to prioritise the subsequent biodiversity management processes. All our Sites have biodiversity management plans (BMP) in place. Few of the initiatives taken in Mines are:

- Nursery of Endangered Species at Rampura Agucha Mine and Kayad Mine
- Peacock Conservation at Kayad Mine
- Massive Plantation



Nursery of Endangered Species

Noise and Vibration Management:

Noise Reduction at Source:

- Steel Liners of ball mill replaced with rubber liners.
- Eliminating secondary blasting by use of rock breakers.
- Periodic preventive maintenance by OEM's.
- Special condition imposed on suppliers for Noise level inside the Komatsu 240 Ton Dumpers below 85dBA.
- Development of green belt for attenuation of noise.

Vibration Management

- Electronic Delay Detonators are extensively being used to keep the maximum charge per delay within limits.
- Stemming of blast holes with gravel.
- Pre-splitting in top benches. The crack of pre-splitting reduces vibrations.
- Periodic monitoring by reputed institutions like CMFRI and CWPRS are carried out and suggested measures are implemented to achieve continuous improvements.

Sustainable Mine Closure

The final stages of the mining cycle, namely mine closure and associated reclamation and rehabilitation of lands earlier utilized for mineral extraction have perhaps the most important significance for sustainable development in the mineral sector.

Environmentally, a mine closure plan must ensure that:

- The mine infrastructure (roads, buildings, spoil heaps, tailings and waste rock areas etc.) is evaluated and those posing safety risks are removed from the site.
- Hazardous substances are identified and disposed of in a controlled manner according to hazardous waste management regulations.
- Post abandonment risks are minimized.
- A healthy environment is made available for the future.
- Adequate (surface and ground) water supplies, clean air and productive land are made available for future operations.
- Progressive rehabilitation and vegetation of land takes place along with appropriate landscaping for any future land use activities planned for the area.
- Opportunities for beneficial uses of land exist for future landowners and other users of land.

We have mainstreamed the agenda of mine closure in our mining activities. Following the Key Drivers which ensures our time to time progress for towards achieving a required mine closure-

- Sustainable life of mine planning;
- Compliance with corporate requirements;
- Compliance with regulatory requirements;

- Development of an exit strategy

Main Activities for ensuring the required mine closure that HZL follow:

- Preparing and complying to Progressive Mine Closure Plan
- Detailed exploration of deposit area for assessing correct life of mine.
- Planned development of mine for easy and safe closure.

Stakeholder Engagement and Community Development:

Stakeholder engagement that includes effective consultation with local communities is an inclusive process which encompasses all interested parties and should occur throughout all the phases of the mine life cycle: exploration, evaluation, construction, operation and post-operation.

Hindustan Zinc is committed to dealing with our stakeholders proactively, accountably and with integrity. We strongly believe that attainment of business objectives should be strictly consistent with the needs and welfare of stakeholders. We have Structured Stakeholder Identification and engagement process in place at all locations. "Stakeholder Identification" is the process of identifying the individuals or groups that are likely to affect or be affected by our operations, and prioritizing them according to their impact on operation and the impact the operation will have on them. This information is then used to assess the manner in which the interests of the stakeholders should be addressed in the plan, policy, program, or other actions.

Meaningful engagement is ensured so as to understand and address stakeholder issues, concerns and know how these may impact on our business. In short, it ensures our 'social licence to operate', which is one of the key enablers of our business strategy.

Community engagement is closely linked to community development which, besides interactions with the community, implies "the process of increasing the strength and effectiveness of communities, improving people's quality of life, and enabling people to achieve greater long-term control over their lives".

As a socially responsible corporate, Hindustan Zinc is making sustainable efforts in uplifting the socio – economic condition of the rural community. Providing nutrition and education to more than 2 lacs children on daily basis, through adoption of state run Anganwadi Centres, Govt. Schools and engaging with schools for supporting in imparting quality education to the under privileged children. We also focus on bringing women empowerment through formation of self-help groups and skill building (SAKHI initiative); training of rural youths in vocational trades; health and medical camps; agriculture & livestock development; and model village development; to name a few. These programs are bringing significant changes in the lives of rural people in Rajasthan. Hindustan Zinc is targeting to reach out to around 5, 00,000 people in Rajasthan, particularly tribal and rural population, towards their sustainable development.

Way Forward for Sustainable Mining:

- Promote and foster responsible mining.
- Regulatory Assistance for mining companies to incorporate principles of sustainable mining into their business practices.
- Create positive public perception towards mining.
- Provide platform for sharing of best practices, training and capacity building towards Sustainable mining
- Interact with all the stakeholders for creating enabling climate for sustainable mining to thrive.
- Network with organizations and institutions worldwide and disseminate information on sustainable mining.



Ambuja's Tryst with Corporate Sustainability



Sandeep Shrivastava
Head-Environment & Sustainability
Ambuja Cements Ltd.

Mr Sandeep Shrivastava has over 26 years of rich experience working with government & industry on several subject areas on Environment, Health & Safety, Energy, Climate Change & Corporate Sustainability. Currently, he is working with Ambuja Cements Limited as "Head- Environment & Sustainability". Mr Shrivastava is responsible for Sustainability Initiatives as well as Annual Sustainability Report of the company. He is also the Convener of Corporate Sustainability Committee of the company. He has attended the accredited lead certification course on ISO 14001 and OHAS 18001 and possess 125 days of audit experience and 250 days of training experience on these management systems. He is also a recipient of 'Fulbright Fellowship' under Indo-American Environment Leadership Award for study in US. Also traveled to many other counties on various official assignments. A member of: CHD 34 of Bureau of Indian Standard (BIS), National Council on Climate Change of CII, CII Committees on Environment, Advisory Committee on Business and Biodiversity, Water Mission-FICCI. Earlier he has worked with a government regulatory body- Central Pollution Control Board (CPCB), the industry association-Confederation of Indian Industry (CII) as well as a leading power company. He has experience working with industry in a variety of sectors including power, chemicals, automobiles, cement etc.

Ambuja Cements Limited (ACL) is India's leading cement company. It commenced cement production in 1986. Ambuja Cement is a premier cement brand in India for Ordinary Portland Cement (OPC) and Pozzolana Portland Cement (PPC), with significant footprints across Western, Eastern and Northern markets of India. Our customers range from individuals house builders (IHB) to governments to global construction firms. For 2015, the total cement capacity is 29.65 MTPA with its production 21.54 MTPA cement. Ambuja has taken several steps in the recent past to remain one of the most Sustainable Corporations in the country. A gist of few of these initiatives are provided as follows:

Business Risk Management (BRM): Sustainability measures often are preceded by a methodical BRM process for identification of key issues covering business, social & environmental topics. Risk assessment and management policy support the sustainable business module for increased profitability. Our risk management approach incorporates sustainability and provides management with useful data for identifying emerging issues and developing new and better products and processes that help protect corporate reputation and improve shareholder value. The first step towards implementation is risk/opportunities assessment, where all the possible risks/opportunities are identified and then mapped in a matrix design to illustrate sustainable

development issues with importance or significance to stakeholders and the Company. Next step is prioritizing the risks/opportunities and formulation of action plans which then take form of projects.

Corporate Governance: Good Corporate Governance has been an integral part of Ambuja business since inception. We have been implementing sound management practices and compliance with the laws adhering to the highest standards of transparency and business ethics. The Company has laid high emphasis on values such as empowerment, integrity and safety of employees & communities surrounding our plants, transparency in decision making process, fair & ethical dealings with all, clean environment and accountability to all the stakeholders.

Promoting Green Construction: Ambuja Cement's regional office at Gurgaon has been awarded GOLD rating of India Green Building Council (**IGBC**) **LEED** INDIA, which reiterates the vision to be the most sustainable company.

Energy Efficiency: Depleting coal linkages and volatility in the Indian rupee is escalating concerns regarding coal. To mitigate risk associated with the dynamic fuel market, the Company has developed abilities to switch to the most economical fuel mix. ACL is constantly working on energy efficiency improvement measures by plugging heat loss at every possible stage of coal consumption, looking at cost-effective fuel mixes and also increasing the usage of alternative fuels (AFR). 'Geo 20' is a major initiative for the usage of cost efficient and sustainable green fuel by processing mostly industrial waste materials. An increased usage of green fuel has helped reduce energy costs and carbon footprint. As a long term solution to energy security, the Company has invested in construction of new state of art storage and pre-processing platforms at our integrated plants to increase the usage of the AFR. Use of AFR, Waste Heat Recovery (WHR) that improves fuel utilization, and use of renewable energy like biomass are our top priorities. The international standard ISO 50001:2011 is implemented in 3 integrated and 6 grinding plants to further strengthen

our energy management system. New AFR facilities helped us to achieve AFR consumption of about 2.6 lac tons which is 45% higher from the previous year thus substituting 5.71 % of total thermal energy which would have otherwise been provided by the conventional fossil fuels. Moreover, we co-processed as much as 60545 tons of plastic waste in our kilns amounting to 1.82 times of total plastic used in packing bags for our cement thus also making us plastic positive. We also generated 4.6% of our energy consumption from Renewable Energy sources such as wind, biomass and solar.

Water Conservation: Water conservation and augmentation occupies a special status as far as our community developed programmes near around our sites are concerned. The problem of water scarcity affects a large number of different stakeholders and it is also identified as a risk for business. In the spirit 'to give back more than we take', our CSR arm Ambuja Cement Foundation (ACF) has worked extensively in the Company's neighborhood to manage precious water resources and promote water conservation. In the cyclic drought prone region of Kodinar (Gujarat), ACF has worked for more than two decades to mitigate the threat of salinity on the livelihoods of surrounding community. A multidimensional approach was undertaken which included water harvesting, enhancement of water sources and distribution system for potable water by undertaking activities like percolation wells, check dams, roof rain water harvesting structures (RRWHS), adoption of low water intensive crop farming etc. Additionally, in dry arid territories of Rajasthan, hilly regions of Darlaghat and the water scarce state of Andhra Pradesh, technologies like renovation of traditional water reservoirs, pond deepening, RRWHS, Reverse Osmosis plants, have reached out to more than 4 lakh people across locations. In culmination of all these efforts, in 2014 Ambuja overall was certified to be 4.03 times water positive by a third party. However, this is not the end of our efforts and we strive to scale new heights.

Carbon Mitigation: We are keeping focus on the four levers in our operations to address the challenges of



climate change, namely, Reduction in Clinker factor by utilizing appropriate materials like flyash, Improving thermal energy efficiency & process technology, Waste Heat Recovery and Optimizing fuel composition, including the use of wastes as alternative fuels. **For the year 2015, the reduction in carbon intensity of our product has been higher than previous years. Specific Net CO₂ per tonne of cementitious product** has reduced to 545 kg. There is a reduction of 29.4 % from 1990 levels as compared to a figure of 28.3 % for the year 2014. Total Scope-1 Direct Absolute Gross (including CO₂ from onsite power generation) CO₂ emissions also reduced by 2.9 % as compared to 2014 figures. This could not have been possible without the multi-pronged initiatives taken up by the Company as above.

Biodiversity Conservation: At ACL integrated cement plants and mining sites several measures are implemented so that biodiversity of the area is not disturbed. Protecting local biodiversity is the goal. A part of this measure is water positive program around mining sites to minimize water requirement from natural resources which directly supports biodiversity and ecosystem services. Another example of enhancing biodiversity and thereby creating ecosystem services is plantation of trees on the mines overburden and at the mine lease boundary which helps biodiversity. Green belt in and around the plant and mines area achieved after years of hard work has transformed the land around our sites to greener habitats. The increased availability of water in the water scarce regions of Gujarat, and Rajasthan enables local people to grow multiple crops during a longer period of the year increasing their livelihood. This also helps in the proliferation of biodiversity and ecosystem around the area. The company is using local agricultural fodder as a biomass for power generation which helps in minimizing Green House Gas emission and providing additional income to farmers from biomass sell to ACL. In Gujarat, ACL has undertaken mangrove plantation in about 150 ha. Ambuja has signed India Business and Biodiversity Initiative (IBBI) declaration of Confederation of Indian Industry (CII) and has been active in Leader for Nature (Lfn) initiative of International Union for Conservation

of Nature (IUCN). The Company is contributing in IBBI activities in India regarding policy development, biodiversity assessment and reporting guidelines.

Community Development: The Ambuja Cement Foundation (ACF) is the Corporate Social Responsibility (CSR) arm of Ambuja Cements Ltd. which formally registered in 1993. ACF works with the rural communities surrounding Ambuja's existing and proposed manufacturing locations. Today ACF is functional across 12 states covering 22 locations in India with structured community development programmes in water conservation, education, health, agriculture, women empowerment, livelihood etc and spends for many years well over 2% of net profit that is mandated by the new Companies' Act.

Health & Safety: Health & Safety is a top most priority item at Ambuja. The Company is committed to ensure safety of all its employees, contractors and everyone associated with it. It firmly believes in the policy of "Zero Harm". Our onsite performance has gradually improved since last few years. The "We Care" - our Health & Safety Excellence initiative launched across the Company in 2014 has also remarkably helped in changing the mindset of our people and strengthening the safety culture in the Company.

Stakeholder Engagement: Ambuja's mission is to create value for all its stakeholders. The Company strives its best towards achieving these objectives. In over three decades of our existence we have engaged with a varied group of stakeholders at different levels to understand their expectations and to make them partners in our journey towards sustainable development. We believe that our stakeholders are our strong pillars of support at all times. Appreciating the importance of our stakeholders, we have created dedicated engagement vehicles for some of our stakeholder groups.

Summary: Sustainability efforts in Ambuja have evolved over a period of time to become more organised, efficient and structured and has achieved substantial improvements in its overall performance on several

sustainability parameters some of them enlisted above. Innovation, increased use of blended cement, increased energy efficiency, advanced technology and use of alternative fuels have on one hand played an important role in protecting the environment and have helped the nation preserve its rich natural resources; need based community development programmes at all our operating sites and renewed vigour on health & safety are on the other hand are manifestation of our social commitment.



The Need for Carbon Pricing



Damandeep Singh
Director, CDP India

Mr Damandeep Singh is the Director of CDP India. He has spent over two decades writing and researching on environment and development issues in India. He worked as an independent researcher and journalist primarily on environment and climate change issues, executing projects for ERM UK, Worldwatch Institute, The Climate Group, Bureau of Energy Efficiency and Suzlon. Prior to consultancy work, Mr Singh was heading Research and Mission Programme Division of the National Geographic Channel in India for five years. He started his career as a journalist and has worked with *The Times of India*, *The Pioneer*, *Business Standard* and *The Indian Express*.

(The author wishes to acknowledge Gargi Sharma and Sara Silver for contributing to the article.)

Carbon pricing is key to preparing for the new low-carbon economy, because it offers a powerful and flexible financial tool to prepare for the new, low-carbon economy. It aids governments in cutting emissions, mitigating climate impacts, and building resilient communities. Carbon pricing helps companies allocate resources and capital to prepare for the low-carbon future. And for investors, it clarifies the portfolio opportunities and risks -- including stranded assets -- they are trying to assess in a fast-changing landscape.

Already, 20 nations and 40 regions and cities are using carbon pricing. With policies coming into effect among G20 nations, countries that represent 90% of the global economy will have some form of carbon pricing by 2019. On the corporate side, more than 1,000 companies are implementing carbon pricing by 2017 as part of their action on climate change, according to disclosures to CDP, formerly known as the Carbon Disclosure Project. CDP is working with companies and investors to catalyse a

global economic system that operates within sustainable environmental boundaries and prevents dangerous climate change.

The momentum on carbon pricing

To see how fast carbon pricing is spreading, one need look no further than the Paris Agreement, action plans, and national commitments. The final agreement recognized carbon pricing's importance as a powerful incentive to cut emissions by companies, and regional, state, and local governments. The tone of Paris Agreement is amplified by the powerful contributions from ambitious national plans submitted to UNFCCC, and major initiatives by businesses, investors, cities and regions.

Already 2016 has become a major year for implementing the Paris Agreement across many sectors, markets and regions. Many of those initiatives involve carbon pricing, a key policy to implement pledges and achieve quantifiable climate action.

China and Chile are instituting national systems and France plans to increase its domestic fossil-fuel tax, to €22 per metric ton next year and to €100 per metric ton in 2030. Domestically, India has already showcased how serious it is on climate action by doubling the National Clean Energy Cess on coal from INR 200 to INR 400.

How carbon pricing helps business

Using a carbon price gives managers and executives a bottom-line incentive to drive energy and operational efficiencies and clean energy strategies. Proactive companies that take up carbon pricing before it is mandated are better able to navigate future regulations and sourcing requirements in varied jurisdictions. Internal carbon prices give managers a bottom-line incentive to move away from fossil fuels, to direct resources to clean energy projects and to avoid investments that could become stranded with tighter regulation of fossil fuels.

Companies using carbon pricing can better predict and control the future state of their business, both in operational terms and in capital planning. Internal pricing is a tool to drive carbon and energy efficiency throughout business. It steers managers away from carbon waste and spurs innovation so companies can set trends rather than adapt to them. Companies that move ahead of regulation to impose an internal price on carbon are better able to navigate mandatory emissions limits, emissions trading systems and carbon taxes.

Companies that supply, sell our source internationally are increasingly finding their carbon being priced. Major purchasers with more than \$2 trillion in annual spending power including Walmart, Microsoft, Ford, Royal Phillips, and L'Oreal are already asking their suppliers to report their emissions to CDP, focusing on the hotspots in their supply chain.

Carbon pricing is still in voluntary stage and thus, companies adopting it now are deemed to have an upper-hand in their future. Companies adopting their own carbon pricing have the flexibility to determine price, a runway to make allowances, and a powerful financial

tool that can be integrated into decision-making, and to show carbon's direct impact on investments and profits. Carbon pricing will prove as a powerful tool for scenario planning, resource allocation, investments channelization and reward determination for energy efficient divisions/sectors/groups. Investors also are paying attention to such companies planning for the low-carbon economy, and channeling increasing investments towards them.

The investor case for carbon pricing

Investors representing \$24 trillion in assets have called for carbon pricing, which is one factor demonstrating a company's leadership on climate. Using an internal carbon price shows investors that companies are recognizing and addressing climate risks and opportunities. Leading companies on climate and other sustainability issues see lower interest costs and easier financing. While active investors have long tried to spot companies leading on climate, passive investors -- who represent 40% of all professionally managed investment -- are paying attention to such companies and channeling increasing investments toward them.

Companies that lead on the environmental, social and governance factors material to their industries outperform their peers in long-term profits and returns, according to a wave of studies from CDP, Harvard Business School and research firms. Quantitative finance has used this insight to design funds that lower the carbon emissions of index-based portfolios, while matching the historic risks and returns of the benchmark. While the first wave of funds simply excluded energy and utilities companies, they diverged from market returns. This new wave of funds invests in all sectors of the economy, but includes more shares of the carbon-efficient companies and fewer shares of carbon-intensive firms. Underpinning these new low-carbon products is a wave of studies from Harvard Business School and other financial firms showing that the companies that lead on climate and other environmental, social and governance factors material to their industries produce the best long-term profits and returns.



Challenges to carbon pricing

There are roadblocks and challenges to reaping the benefits of carbon pricing. Some of the most common are the lack of: a common method in setting a carbon price; guidance in how to do so; long-term certainty over climate policies and clarity of policies. Companies need to arrive at the “right price”, one that isn’t so high it becomes disruptive or hinders competitiveness, nor too low to shift investment decisions.

World leaders on carbon pricing

World leaders across the globe are considering and promoting carbon pricing. World Bank President Jim Yong Kim calls carbon pricing ‘a dream come true’. He believes carbon pricing to be the most direct and certain path to zero carbon emissions and the goal should be to gradually set a sufficiently higher price around the world to encourage better behavior.

According to German Chancellor Angela Merkel, “Carbon pricing makes investments in low-carbon or carbon-free technologies attractive and ensures that fossil fuels are used efficiently”.

French President Hollande notes that while carbon pricing is inevitable, nations do not need the same carbon price or pricing mechanism to cut their emissions.

Carbon pricing has become a top priority of the We Mean Business coalition, which amplifies the business voice on climate, catalysing bold action, and promoting smart policy frameworks. It is comprised of Business for Social Responsibility, CDP, Ceres, The B Team, The Climate Group, The Prince of Wales’s Corporate Leaders Group, and WBCSD. It encourages companies and investors to commit to put a price on their carbon, among other initiatives.

India’s experience with carbon pricing

Governments around the world are under pressure to limit their GHG emissions and many countries have already started working towards reducing them. The

preferred way of doing this is to reduce the dependence on fossil fuels and effective planning of land use.

In order to achieve the long-term goal to combat climate change, the GOI is in the process of creating various policies and action plans. This is reflected in India’s INDC submission to the UNFCCC in Oct 2015. India intends to reduce the GHG emissions intensity of its GDP by 33-35% by 2030 from the 2005 level, and aims to achieve about 40% cumulative electric power installed capacity from non-fossil fuels in the same time frame. In January, GOI also submitted its first Biennial Update Report wherein it highlighted that India has cut its carbon intensity by 12% in the last 5 years.

The government set a target to increase renewable energy capacity from 30% today to 40% by 2030. The plan also calls for installing 175 gigawatts of renewable energy capacity by 2022 — an ambitious goal considering the world’s total installed solar power capacity was 181 gigawatts in 2014. The government estimates that \$2.5 trillion in investment will be needed to achieve its comprehensive plan by 2030.

For India, there is a clear opportunity here, says Tom Kerr, lead Climate Policy Officer, IFC. Major Indian companies including Dalmia Cement, Mahindra Group and Tata Group have stepped up to become sustainability champions by taking action to support carbon pricing. These and other Indian companies are partners of the Carbon Pricing Leadership Coalition, a new initiative designed to support successful carbon pricing across the globe. Anand Mahindra has joined the leadership panel along with a select galaxy of international business leaders.

However, carbon pricing is not always an easy policy to implement, cautions Kerr. Each jurisdiction and company faces its own challenges, with fears that a carbon price will affect competitiveness or raise energy costs.

The experience through years of study, testing and trial and error shows carbon pricing can work, bringing both reduced emissions and economic growth. We know that because of leaders like California, the European

Union, Korea, China and Mexico that are successfully running carbon pricing programs today. They have navigated concerns about competitiveness, fairness and supporting training and job transition through stakeholder engagement, smart policy design and regular reassessments of progress—building a set of principles for good practice that India can borrow from as it tries to unlock the private investment needed to transform its economy.

In the 2016 budget, Finance Minister Mr Arun Jaitley doubled the carbon cess [tax] on coal, lignite and peat to Rs 400. India's other current carbon taxes are: excise duties on fossil fuels; derived impacts from PAT; REC/RPO and other schemes. PAT is playing a major role, as companies use the estimated PAT savings in their assessment of energy efficiency projects. For example, one cement company used the PAT mechanism as a way to price its carbon. In the private sector, 21 Indian corporate and industrial giants are anticipating introducing internal carbon price in next two years. Others, such as Dalmia Cement and Essar Oil, already have carbon pricing mechanisms. Multinationals operating in India such as Akzo Nobel, Colgate-Palmolive, General Electric, General Motors, Microsoft, and Saint-Gobain all have internal prices on carbon.

An exciting new field that offers huge opportunities to the leaders showcasing their attempts to solve global climate change. It is imperative that business leaders in the world's fastest growing economy, that is, India, contribute and help in shaping the future.



Energy Efficiency and the Role of Renewable Energy



Niranjan Khatri
Ex-General Manager
Environment Initiatives
ITC hotels

Mr Niranjan Khatri is the ex-General Manager, Environment Initiatives, ITC hotels. He is a principal consultant and the founder of iSambhav. He pioneered the concept of eco designing in ITC Bay Island in Port Blair. Mr Khatri headed the Confederation of Indian Industry's (CII) Renewable Energy Cell for a year during the period 1996 to 1997; developed the eco-rating for schools for the Delhi Government; conducted sessions for many PSU's, private sector, Karnataka Pollution Control Board, Power Finance Corporation, IIT's, MDI, SP Jain, CII, FICCI, PHD, FHRAI. He is the ex-Faculty of the Railway Staff College, Baroda; ex-member of the CII National Water Committee and Waste Management Committee; past Convener of the CII Delhi State Environment Committee; founding committee member of ESOI (Ecotourism Society of India); ex Chairperson of the Sustainable Development Committee of the Federation of Hotels and Restaurants Association of India-Western Region; member of expert committee of IICA- Indian Institute of Corporate Affairs; founder and ex-President of Andaman & Nicobar tourism guild 1990 to 1992. Mr Khatri has been awarded with the Helen Keller Award in 2006 & in 2011; Karamveer Puraskar in 2009; Green Hotelier award in 2010 and Parivartan Sustainability Leadership Award in 2012.

"The difference between what we are doing and what we are capable of doing would solve most of the world's problems".

Mahatama Gandhi

Introduction to solar concentrators

For thousands of years, wood was the only source of energy for human beings. The 17th century brought with it the advent of the discovery of coal in different parts of the world. This became the primary source of energy and continues to be so even today. In the 18th century, the discovery of oil, led to a reduction in the use of coal. Over the last 50-60 years, due to the quantum increase in vehicular population and the comfort needs in offices and homes, there was a steep rise in the use of oil.

Today, on account of climatic changes, there is

considerable pressure on the world community to reduce consumption of coal and oil. According to some experts, we have reached the "peaking oil syndrome". This essentially means that maximum production of oil has been achieved and production is now on a decline, as new oil findings have become difficult to come by.

In view of the above scenario, for economic and environmental reasons, the focus is now shifting to renewable energy. Energy efficiency is easy to implement, provided we are prepared to develop the required mind set, and modify our attitude, to the way we currently use energy.

Genesis

I bumped into solar concentrators in a very rudimentary manner in 1998 when one of my friend showed me how to make a solar cooker with card board box and aluminum foil, which cooks for 4 people at a temperature of 75°C to 80°C depending on the agro climatic condition.

I cooked with this technology for four years on weekends. During this period I met a German who introduced me to a solar parabolic concentrator which we installed in our HQ in the year 2000 for cooking for 15 persons at a temperature of 150°C. In 2009, a large concentrator was installed in ITC Maurya for steam generation through a company called Clique. The latter company had installed large system in Latur for dairy farm application. This is example of the proverb "From the little acorn a mighty oak grows". The message for the hotel industry is to conduct small pilot project with many new green technologies so that we disrupt the old ways of conducting our business which are unsustainable and reduce operating margins.



Energy has been unanimously acknowledged as one of the most important building blocks for economic growth and human development of a nation. Energy security and accessibility has become a major issue globally; especially in developing countries. Internationally, efforts have been made by respective governments and international

aid agencies to improve the conditions through devoted programmes, schemes and financial aids. Yet, nearly 2.7 billion people all over the world are dependent on traditional biomass energy sources (wood, straw, charcoal, dung) for satisfying their energy needs. India's case is not too different. Nearly 81 million (32.8 per cent) households do not have access to electricity (Census of India, 2011). Around 74 million rural households lack access to modern lighting services (TERI, 2013) and a larger proportion of the population (around 840 million) continue to be dependent on traditional biomass energy sources (IEA, 2011).

The risk of climate change impacts due to increasing atmospheric GHG concentrations further compounds the issue. Thus, there is an urgent demand for nations to move towards low carbon development. This transition is bound to have a significant influence on the energy planning of the country. While the current policies and activities are focusing on power generation through renewables; there is a need to look at potential applications of renewable energy beyond electricity generation. The potential of renewables, particularly for heating, cooling, cooking and mechanical applications would greatly enhance the acceptance of renewables amongst the masses. There is substantial scope for use of renewables in providing energy to people both on a small-scale as well as on a larger scale.

Commercial energy landscape

Commercial and industrial sectors in India form a major part of energy consumption responsible for 52% of total energy demand followed by transportation and residential sectors. Primarily, the energy required for heating from low to high temperatures (7°C chilled water in air conditioning to 250°C heat generated by LPG for cooking or frying in kitchens) form a major part of energy usage. Currently, most of this demand is met by electricity by driving chillers and LPG for cooking and heating. India, a country blessed with good solar energy potential of 5-7 kWh/m²/day has a tremendous opportunity for adopting Concentrated Solar Thermal (CST) technologies



and systems to displace significant usage of electricity and LPG. CST are commercial technologies with a large installation base worldwide. Typical applications vary from cooking, space heating and cooling, process heating, food processing etc. with a wide temperature range upto 400°C. To put this opportunity in perspective, out of 115Mtoe of total industrial energy consumption, 25% is met by electricity, 20% by imported oil, 30% by coal, 25% by biomass and more than 5% by gas.

In the commercial sector, conventional energy used for building heating and cooling loads followed by institutional and mass cooking is a major opportunity waiting to be unleashed. In 2010, I visited the Energy Centre of Ministry of New and Renewable Energy (MNRE) on the Gurgaon-Faridabad road and I saw the demo system of a company called Megawatt Solutions Private Limited. According to the company, they are India's leaders in providing turnkey solutions based on high-efficiency and economically-effective Concentrated Solar Thermal technology. The company's solutions are based on a proprietary solar thermal-fossil hybrid configuration that allow continuous supply of energy while prioritizing solar energy. MWS follows an integrated and holistic approach towards solar energy integration by undertaking consulting, design, engineering, manufacturing, supply, installation and O&M services.

Breakthrough in Solar Energy Solutions

The MWS Solar Field™- a 100% indigenously-developed solution (Make in India) specifically customized and configured to address the above challenges outlined faced by commercial and industrial establishments. The Solar Field comprises of a collection of proprietary solar dish concentrators each generating energy to feed to an end-application. The company's breakthrough CST technology is based on Paraboloid dish concentrator with fully automated 2-axis sun tracking to maximize the energy yield along with backup heating solutions based on conventional fuels. The dish concentrator focuses

Model M90 Paraboloid Dish Concentrator: Rating 40,000 kcal/hr at 750 W/m² DNI



Thermic Fluid Heating System Waghodia, Vadodara, Gujarat



the incoming solar energy by using outdoor-rated high reflectivity mirrors onto a thermal energy receiver to generate heat in various forms of working fluids such as hot water, thermic oil, steam, hot air etc. across a wide temperature range of 40-400°C. The dish tracks the sun in two axes fully automated and occupies minimal ground or rooftop area for installation. Additionally, process integration, automation and controls are integrated to provide seamless operations without requiring any significant human intervention. Various such concentrators are integrated in series/parallel configuration to provide the required energy yields.

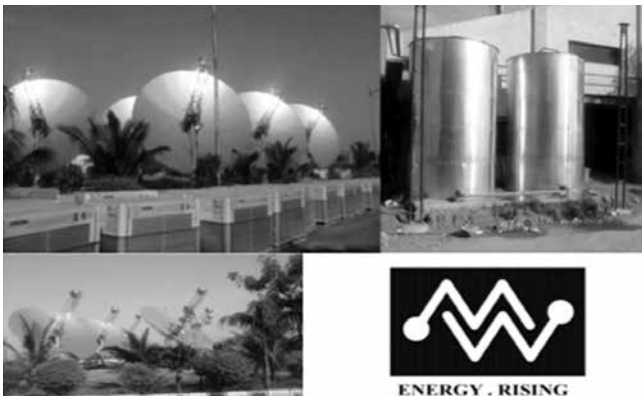
Given below are few case studies of Solar Field™ implemented

- Solar thermal + Biomass for Thermic oil heating for molding rubber
- Solar thermal + Diesel for Thermic oil heating for Cooking
- Solar thermal + LPG for Thermic oil heating for Cooking
- Solar thermal + Furnace Oil for boiler feed-water pre-heating
- Solar thermal for waste water (RO Reject/Brine) enhanced evaporation

Thermic fluid heating system, Pashmylaram, Telengana
Configuration: 4 nos of M90 dishes integrated to provide 2 lac kcal/hr at 250degC of operating temperature



Thermic fluid heating system, Turkapally, Telengana
Configuration: 6 nos of M90 dishes integrated to provide 2.5 lac kcal/hr of energy in form of thermic fluid at 250degC for indirect boiler feedwater heating and steam generation



- Solar thermal for enhanced drying of sludge

Smart kitchen: In hotels, a lot of work has been done in different areas for greening the operating systems, however the kitchen for some peculiar reasons has been left out. There are opportunities to smarten up the kitchen not only to reduce energy consumption but to enhance thermal comfort for the production staff. Nearly 43 % of the heat is wasted due to open flame. This is where this company has brought innovative ideas to address the unintentional waste of gas.

LPG Saving Solutions for Cooking: Considering the rising LPG consumption in industries and hotels for cooking (canteens, mess, community kitchens etc.) and rather inefficient combustion of LPG with open burners in the kitchen, MWS has combined strengths of breakthrough CST technology with LPG, and commercialized a revolutionary cooking solution – The Smart Kitchen, to realize upto 40% LPG savings, create safe working conditions and bring down electrical loads.

Given below are the salient features of the solution:

- Multi-fuel Hybridized Solution for continuous cooking to eliminate intermittency of solar energy
- Thermal Storage- for utilizing solar energy even when the sun is not shining
- No burner, no flame in kitchen to provide safe and comfortable working conditions
- Jacketed vessels to minimize energy losses and increase LPG savings
- No water required for system to eliminate all risks related to poor water quality, scaling, poor heat transfer, IBR
- Edible-grade working fluid for heat transfer
- Wide operating temperature range for all cooking needs from boiling, baking, roasting, drying, frying, flat plate cooking etc



- Centralized heating, distributed consumption to provide full flexibility for future integration of new energy sources
- Automated operations with digital indicators to ensure maximum efficiency and controlled combustion unlike open-flame conventional burners

The company has provided various Smart Kitchens in hotels, ashrams, messes, canteens, etc. and saved tons of LPG for bottom line savings and operational profitability of customer operations. With a payback of 3-4 years for investment into MWS Smart Kitchen™ and life time of 20 years, the value proposition is very strong for customers with very attractive return on investments. In addition there are central government subsidies and depreciation benefits for customer investments.

Similarly the company has supplied various space heating and cooling solutions for eco-resorts, hotels, hospitals, etc. which ensure an optimized utilization of solar energy. A landmark installation includes a drive-way snow melting solution for a resort near China border by solar thermal whereby cold climates pose risk of vehicle accidents & customer inconvenience due to snow accumulation. Solar thermal heated pipes are embedded in the floor to melt the snow. Whenever the system is not used for snow (summers etc.), the solar system can be used either for cooking, hot water generation, steam for sauna etc. Hence a multi-purpose MWS Solar Field™.

Solar Enhanced Evaporator: With practically free heat generated by Solar Field, it lends itself very well to substantial enhancement of waste-water evaporation and sludge drying, a pain point in industries today. There exists a substantial mismatch between rate of generation of waste water and its evaporation through solar ponds. Alternate solutions such as MEVs etc. have tremendous operating costs, maintenance and require a dedicated team for its operations. Whereas evaporation is performed vide open evaporation ponds, there is a dire need in the industry to substantially enhance this rate of evaporation without incurring much operating costs. MWS Solar Field™ address this issue by providing a

zero-operating cost solution. This solution is scalable and applicable to both sludge and waste water and scales across commercial and industrial establishments.

The world faces a huge sustainability crises today due to over reliance and consumption of fossil fuels. Solutions such as above exemplify the power of indigenous engineering infrastructure, indigenous innovation, state-of-the-art technology development and made in India at competitive economics, to address this crises without reliance on any imports. Healthy living and nurturing of mother earth and our very own future generations critically hinges upon involvement by user community of industries and commercial establishments to set a leadership path for the world to follow, by adopting such solutions, reduce fossil consumption, reduce carbon footprint and above all, unleash the power of indigenous Indian innovation for the world to see.

Currently there are very few players in the solar concentrator field but one can safely predict that there will be proliferation of manufacturers in this segment. The 10 months of sunshine in India must be converted into our national strength thereby improving the air in our metro cities. Delhi should launch aggressive programme to clean its air and set the tone for the rest of cities in the country.

In the near future with declining forest cover, cremation processes will be conducted by hybrid solar concentrator coupled with bio gas to address the day and night needs for cremation. Work on this front is being tried in a neighboring area of Baroda.

With more than 55 million hectares of waste land ready for planned biomass plantations and more than abundant solar energy, it is thrilling to witness a transitional & transformational stage we find ourselves in; to a future where clean solar and bio energy resources combined together will gradually phase out carbon-emitting fossil fuels by providing a techno-commercially viable and real energy alternative.

Water Wise India



Santosh K Deshmukh
Institutional and
Corporates Sales, Micro
Irrigation Systems, Jain
Irrigation Systems Ltd.

Dr Santosh K Deshmukh is a Ph.D in Water Science and Technology from Indian Agriculture Research Institute, New Delhi.

He has expert knowledge on water irrigation, natural infrastructure, water stewardship, water and carbon footprint, carbon and water credits, ecosystems and biodiversity, life cycle assessment, sustainability reporting and sustainability management. He was a co-chair for the India Water Tool Version 2. His research work includes topics like energy-water-food nexus, global climate change, geochemistry and water quality, wastewater irrigation.

He is the recipient of Jawaharlal Nehru Award for outstanding PhD Thesis.

Clean drinking water and sanitation in rural India is still a problem as the efforts are spreading with snail's pace with available obsolete technologies. The situation in arid and semi-arid zones of India is an unsolved mystery and for many, the affordability is far away. People in rural areas respond by either adapting to the situation or migrating to neighboring areas and overcoming the challenges and finding solution to support life.

Water management in rural areas: Since 1980, the use of submersible electrical pumps and spread of electricity in rural area has increased the food production and brought millions hectares of land under irrigation by use of groundwater. On other hand it led to groundwater depletion which was not augmented back again by the monsoon rains over the years. Many areas in India are marked as dark zones due to depletion of ground water.

To revive such areas, many organizations are working on water harvesting in different corners of India. The private sectors are investing through the CSR funds through NGO's for water conservation and harvesting. This will create value not only for the farmers but restore the ecosystem. Various water conservation initiatives are taken by the Government of Gujarat, Madhya Pradesh and Maharashtra like the '**Jal-yukt Shivar Abhiyan**'.

The unsustainable use of energy and water has led to the use of solar pumps and drip irrigation, which has been a great boon in peninsular India. Rural India understands the importance of energy and water use efficiency in agriculture but the adoption rate is very low. The impact of climate change and rise in temperature is major issue that we will face in future. The crop canopy and soil which is prone to get heated under harsh temperatures



will reduce the yield due to crop water stress. Hence, instead of irrigation; crop cooling and soil cooling in northern part of India and reduction in the heat stress during the dry spells of monsoon will definitely increase the yield to world class level. Syndrome of 'low yield in tropical climate' can be reduced by introduction of micro climate in the field by using the modern irrigation and climate control technologies. These methods are boon to the farmers for crop and soil cooling leading to enhanced yield. Water is available in all three forms of matter and its thermodynamics plays important role to modify the micro climate and hence we can cool or warm the micro climate according to the weather situation. This will save the crop and prevent related economical loss to farmers.

Water management in urban areas: Many more aspects can be discussed about the importance of water management in agriculture, but there are pressing issues to be addressed in urban areas as well. If we look at the urban water management, the water demand and supply for urban cities is mismatched and the drainage systems are not well designed taking into consideration the future growth. There are many solutions for city water supplies efficiency, reduction of the wastage and for increase in the revenue from water supply and utilities for cities. The private sector is proving to be a great boon by bringing in more transparency and professionalism in this field. Many global players are now interested in the Indian market after the declaration of Smart Cities Mission by Government of India. This will bring the world leaders to the Indian market for water management in urban areas. Also, there are many experienced Indian players in the field of water management who will bring in further innovation.

Another critical issue is the waste water emanated from urban areas. This problem becomes grave when the cities are surrounded by industrial areas. In this situation, the effluent and city waste- water treatment becomes a complex issue and the effluent is discharged into the rivers making them nothing more than mega drains. The situation is changing with central government's initiative for 'Ganga rejuvenation'. Similar scheme will possibly

come up for other rivers in peninsular regions.

One of the ways in which this effluent can be used is in irrigation. The effluent which has undergone primary and secondary treatment can be used for irrigating peri-urban areas downstream of the urban or industrial areas. This treated wastewater also contains certain nutrients that can be taken up by the crops. Wastewater reuse in agriculture is an old practice and recent studies and practices have shown it can be efficiently done using drip irrigation with no impact on health.

Finally, I would like to say that water is the elixir of life and we should treat it as precious resource.

Sustainable Agriculture



PPS Pangli

President of Borlaug
Farmers Association for
South Asia,
President Emeritus of
PAU Kisan Club

Mr PPS Pangli is the President of Borlaug Farmers Association for South Asia and President Emeritus of PAU Kisan Club. He has been working for the progress of farmer community through policy changes and innovation in agriculture for the last 25 years. He has received special training on modern technology and agronomic practices of vegetables and training on plant protection and pest management from Mashav Centre for International Cooperation, Israel. Mr Pangli is also trained in Greenhouse Management at International Horticultural and Innovation and Training Center of Practical Training Center, The Netherlands and DCM Shri Ram Ltd. & Raj Hans, Jaipur. He is an esteemed member of different associations and clubs like Punjab Kisan Club, Ludhiana, Agro Chemicals and Fertilizers (Sub Committee) - FICCI, BIS (Bureau of Indian Standards) – Food & Agricultural Division, Confederation of Indian Farmers Association (CIFA) etc. He has been honored at the 4th & 5th National Conference on Agro-Chemicals by FICCI, New Delhi, by ASSOCHAM for best presentation in 7th Global Knowledge Millennium Summit on “Green Revolution 2nd” titled ‘What farmers want’. He has been the winner of Innovative farmer award more than once.

New global food policy reports say how we feed the world is unsustainable. The reports provide an in-depth look at the major food policy developments in the last year and examines the challenges and opportunities for the future. The most promising technological option for increasing global food, feed and fiber production is to combine the best of the old and new by integrating conventional technology and modern technology. Presently 1.2 billion of Indian population is expected to reach 1.6 billion by 2050, with these growing numbers country will not only have to raise agriculture production but also have to bear the challenges of climate change.

Food for all and nutritional security with specific reference to source and self sufficiency is an increased emphasis by both national programs and donors. During the cotton season 2015-16, a severe epidemic of white

fly incidence has been noticed in north cotton growing zone of India during August when insect population was above economic threshold surveyed in Punjab, Haryana and Rajasthan. Declining arable land area and soil health, stagnation in the crop productivity, decreasing farm size and diminishing margins are major threats along with climate changes in South Asia.

It has become important that agricultural systems and practices for the productive and high-quality yields should not adversely affect the environment and natural resources. The goals of sustainable agriculture, food security, risk management as well as growth of agricultural trade depend critically on improved R&D processes in the sector. In this regard, the contribution from research communities through innovative solutions is of importance for achieving environmentally friendly



practices and economic profitability of crop productions and sharing knowledge and technology in the area of sustainable agriculture will help to promote the productivity and economic viability.

Breakthroughs in basic and other modern sciences offer voluminous opportunities for developing transformative technologies for agriculture. However, this has not been effectively happening in the country for a variety of reasons. Public sector institutions comprising state agricultural universities and a large network of IARI institutes known as National Agricultural Research System (NARS) dominate India's agricultural research system. NARS had played an important role in ushering in the Green Revolution and subsequent attainment of food security in the country. It has helped place Indian agriculture on a stronger footing. However, future challenges in agriculture are much more formidable. Addressing these challenges require a vibrant, responsive, market oriented, globally competitive research systems equipped with state of the art knowledge and scientific manpower of high calibre equipped with adequate resources. An important concern in this respect is that the proliferation of institutions has not only thinly distributed the financial capital but also human capital. This has undermined the ability of the scientists to optimally exploit the synergies for transformational research. If we are to move from incremental to transformational research, the proliferation of agricultural institutions must be arrested in favour of greater focus.

While public sector research institutes have important strengths, they also face serious challenges in meeting future needs of Indian agriculture. Resources have been thinly spread on proliferating agricultural universities around the country with the leading research institutes simultaneously facing severe resource crunch. Most of the scientific energy is spent on routine type of research on the same issues at multiple institutions in the name of location specificity. Lab to land connect has been weakening. Problem oriented research is not showing desired results. There is need to seriously rethink the allocation of financial resources spent on agricultural education and research to generate larger bang for the buck. The institute in turn also need to arrest

the deterioration in work culture, lack of discipline, bureaucratic centralisation of decision making, demoralisation of scientists, improve collaboration with global research institutes and connect better with farmers. The public sector research shows symptom of decline there are serious apprehensions about the role of private sector, particularly relating to pricing and protection of technologies.

The policy makers must intervene into this matter and guide the concerned ministries to redress the real issues of cotton farmers of the country. Early policy reformation in tactical areas like upward revision of MSP in cotton and APMC regulation, crop insurance, technology intervention for productivity enhancement will help the farmers rather than offering them with piece-meal sops.

Regulatory measures for quality seed production have to be tightened so as to discourage the sales of spurious seeds to farmers. The seed companies should be made responsible for poor performance of seed supplied by them. The details of seed traits should be displayed on seed packages and agency website. The seed companies should provide adequate compensation package for farmers in case of general failure of their seeds. Our research institutions must develop rapid testing kits for seed hybridity to allow quick seed testing, thus, enabling the detection of spurious seeds at the time of sale.

'More crop per drop' slogan of hon'ble Prime Minister Mr Narendra Modi will strengthen the judicious use of water in horticulture, vegetables and high value crops throughout the country. Doordarshan initiative of DD Kisan channel is the major milestone of the present government for sustainable agriculture and biodiversity in the coming decade.

Need for GHG Emission Inventory



Naresh Badhwar
Senior Counsellor
CII-ITC Centre of
Excellence for Sustainable
Development

Mr Naresh Badhwar is B.Tech from IIT Bombay, M.S. from Michigan Technological University, USA and M.B.A. from FMS, Delhi. Mr Badhwar has more than 18 years of experience in areas such as Environmental Management, Climate Change Mitigation, Sustainability, CSR etc. He has worked in various fields such as GHG emission inventory Development, Renewable Energy, Energy Efficiency, Evaluation of Sustainable Development projects, Solid Waste Management, Air Quality Management, Hazardous Waste Management, Environmental Impact Assessment etc. He has worked in a regulatory organization, environmental consultancy and UNFCCC accredited DOEs. He is a BEE Certified Energy auditor and he has validated and carried out technical reviews of more than 100 CDM/VCS projects. He has more than 50 registrations/issuances in UNFCCC as technical reviewer.

Introduction

Climate change is recognized as a significant manmade environmental challenge and it will continue to influence our world for generations to come. However, companies are making efforts to address their GHG opportunities and risks in order to ensure long-term success in a competitive business environment. The motto is “If you can’t measure, you can’t manage”. Many companies have multiple objectives for GHG reporting, including emissions trading and voluntary reporting. These objectives are as follows:

- To provide management with information that can be used to build an effective strategy to manage and reduce GHG emissions.
- To demonstrate industry commitment to public for

transparent performance for GHG accounting and reporting.

- To encourage and facilitate stakeholder engagement and dialogue processes towards mitigation of GHGs.
- To use this information to improve business processes strategies and actions.

Most of the developed world already has regulations which put limit on the GHG emissions such as EU-ETS. These regulations impact the trade of the goods and services with these countries. Some of the world’s leading organizations have started asking companies in their supply chain to disclose their GHG emissions. Carbon emissions information is playing crucial role in business deals and collaboration decisions. These are challenges and opportunities, and winners in the long



run would be the organizations which can capitalize on these opportunities and mitigate any risks.

Risk and Opportunity in GHG accounting

Companies are beginning to address their GHG related risk and take advantage of the opportunities so as to gain sustainable long term competitive advantage. There can be a GHG related regulatory risk such as binding emission reduction target thus businesses that start early are already well prepared and can have an early movers' advantage. There can also be physical risks due to changes in precipitation and cyclones etc. in coastal areas due to climate change. Companies that are already prepared for such risks can minimize the impact on their businesses. Companies that voluntarily declare their GHG emissions can increase their reputation in the market and get intangible benefits such as international acceptance. Voluntarily disclosing GHG emissions enhances reputation amongst stakeholders and builds trust. It increases brand value and results in better market position so as to ensure competitiveness.

GHG Accounting as per ISO 14064:2006

ISO 14064 consists of several parts such as ISO 14064-1 which details the principles and requirements for preparing organization level GHG inventories. ISO 14064-2 provides details regarding GHG projects or project based activities specifically designed to reduce GHG emissions. ISO 14064-3 provides requirements and guidance for those conducting validation and verifications of GHG assertions. ISO 14065:2013 specifies accreditation requirements for organizations that validate or verify GHG emission assertions or claims. ISO 14066:2011 provides competency requirements for GHG validation and verification teams.

Use of ISO 14064 enhances the credibility and transparency of GHG quantification and also GHG project emission reductions. It assist organizations in managing GHG-related opportunities and risks. Use of the standard facilitate the development of organization level management strategies to manage GHG emissions and also develop and implement GHG emission reduction projects thereby contributing to climate change mitigation efforts. It also facilitate crediting and

trade of GHG emission reductions as projects developed using ISO 14064 can generate carbon credits in affiliation with using another carbon offset program. Also, many companies also report their GHG inventory using GHG protocol.

Way Forward

Companies need to manage GHG emissions along the value chain and also address GHG management opportunities throughout the product lifecycle. This would require various companies along the supply chain to calculate and disseminate GHG emission data for which capacity building in terms of trained manpower and appropriate tools is required. Once the GHG data becomes available, it is essential for companies to move from GHG reporting to GHG management. GHG accounting and reporting must become integral part of Corporate business strategies and companies should follow the path of low carbon growth. However, many companies do not see an urgent need to disseminate GHG related information in developing countries. Disseminating case studies linking GHG reporting to long terms business advantage would encourage more companies to come forward in reporting their GHG emissions. Reporting GHG emissions would help businesses to understand their carbon emissions. It would help them to increase their reputation and eliminate long term business risks. Companies in the long run should move towards becoming carbon neutral following international standards such as PAS 2060:2014- Specifications for the demonstration of Carbon Neutrality. This standard details requirements for achieving and demonstrating carbon neutrality and use of this standard enhances credibility and transparency in reported information. Companies by reporting and managing their GHG emissions and becoming carbon neutral can play a significant role in climate change mitigation efforts which would help the nation in achieving its international commitment towards GHG emission reductions.

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Speakers



Deep Kapuria

Past Chairman, CII National MSME Council and
Chairman, Hi-Tech Gears Limited

Mr Deep Kapuria is the Chairman of The Hi-Tech Group of Companies comprising The Hi-Tech Gears, The Hi-Tech Engineering Systems, The Hi-Tech e-Soft and The Hi-Tech Robotic Systemz. The group spans a wide spectrum of products and services that include manufacturing of world class Auto Components.

Mr Kapuria was schooled at Mayo College, Ajmer and graduated in Engineering from BITS, Pillani. He is an alumnus of the Harvard Business School, USA.

For last two decades, Mr Kapuria has been actively engaged in Indian business leadership by virtue of eminent positions he held in Industry and Government bodies and associations. He has played an important role in many Confederation of Indian Industry (CII) initiatives, such as the World Trade/Multilateral talks.

A Past President for two terms in 2002-03 & 2004-05, Mr Kapuria has been one of the key leadership of Auto Component Manufacturers Association (ACMA). He has led various overseas CII/ACMA delegations including the Mini PBD (2011) to Canada. He regularly represents Indian Industry at the Indian Government/ Ministerial Business Delegation across the globe.

Industry engagements:

- Chairman, CII Trade Fairs Council, 2015-2016
- Chairman, CII Regional Committee on Central Europe since 2012-13
- Chairman, CII – National MSME Council for 2012-13 and 2013-14, Co-Chairman JETCO and various Councils/ Committees of CII in last few years
- Director, Global Innovation & Technical Alliance, a joint venture between CII & Govt of India
- Chairman, Globalization Committee, ACMA, since 2013
- Non government member on various Govt committees including Make in India, Skill Council & is a member of the PM fellowship Appex Council

**Indra Guha**

Executive Director

Climate Change & Sustainability Services

Ernst & Young LLP – Delhi

Mr Indra Guha is a Civil Engineer from BE College, Sibpur with Master's from IIT Kharagpur. Later on, he went on to do management from IIM Kolkata. He has been with the Advisory Services of EY for 12 years now, and specializes in Climate Change & Sustainability Strategy, Reporting and Assurance, Due Diligence, Climate Change Advisory. His experience spans over more than 18 years with projects across various industry sectors.

Mr Guha has been leading teams on projects in the Steel, Cement, Fertilizer, Paper, Sugar, Renewable Energy (Wind, hydro, biomass), Oil and Gas sector. His expertise is in assisting Corporates in their public reporting initiatives on non-financial performance. He led several sustainability strategy engagements with companies both in India and outside. Mr Guha also assists organisations in assessing their compliance and framing of governance structures, benchmarking the performances in environmental and social parameters against best practices.



Kamal Meattle

CEO

Paharpur Business Centre (PBC)

Mr Kamal Meattle, CEO - Paharpur Business Centre (PBC) and GreenSpaces™, is an environmentalist and an entrepreneur with more than twenty-five years of real estate experience and several awards to his credit. He created a model of Health and Wellness at Work, “Paharpur Business Centre”(PBC) in 1990, an mSME in the services and real estate sector widely recognized for providing office and conference solutions in mountain fresh ambience.

More than Business Centre, Mr Meattle created an Experience Centre for corporate- “PBC”.

- First USGBC LEED Platinum EB Certified Indian retrofit office building
- BEE 5 star rated, with current AAhEPI of <20 Wh /hr/sqm
- ISO 9001, 14001, 22000; 50001; SA 8000; OHSAS 18001 and FSSAI
- NABERS certified (First building outside Australia) for Indoor Environment Quality
- Signatory to UNGC and WEP
- Our USP - Excellent Indoor Air Quality (IAQ) conforming to ASHRAE & WHO standards

IAQ system, a combination of Air-Purifying Plants and Mechanical System, is Mr Meattle’s brainchild, which offers purified and oxygenated indoor air. A study (by Harvard T.H. Chan School of Public Health’s Center for Health, in association with some institutions) has revealed that, “Cognitive performance of those working in green environments was 101 percent higher.” PBC offers indoor environment with low PM 1, 2.5 & 10; VOCs; CO₂; SO_x; NO_x and Ozone levels. Results: Reduced sick days, higher productivity (up to 20%) and well-being. PBC is now heading for Delos WELL Building certification (first protocol for Wellness in built environment). Mr Meattle discovered that three common houseplants can help growing fresh air, and reduce indoor air pollution. He implemented this innovative bio-technology, ‘Indoor Air Quality’ in PBC to create mountain-fresh ambience that conforms to ASHRAE and WHO standards.

He spoke about, “How to grow fresh air” at TED Talk held in the Long Beach, USA which has been since viewed by over two and a half million people. He was also featured in the ‘MIT Technology Review’ as “The Mad Hatter of Nehru Place Greens.”

Mr Kamal Meattle has founded various NGOs like Save the Tree Organization and has also led a public campaign to make ambient air better. He has filed PIL on environmental issues in the Hon’ able Supreme Court of India. He is a trustee of “The Climate Reality Project” (TCRP) founded by Nobel Laureate, Al Gore. Kamal has been personally groomed by Mr. Gore as a climate change leader. He has been honoured for his initiatives and good work by different awards like PHD Chamber’s, “Ethics is Good Business Award,” Lifetime Achievement award and MIT’s Distinguished Alumni Award.



Lou Leonard

Vice President for Climate Policy and Climate Goal Lead
WWF-US

As Vice President for Climate Change, Mr Lou Leonard is the organization's strategic leader on WWF's work to fight climate change, leading a cross-cutting team with members embedded across all parts of WWF's conservation program. Mr Leonard previously served as WWF's director of U.S. climate policy, leading WWF's work to advance government action on climate and clean energy, while building WWF's program on forests and climate change. A lawyer by training, he began his career as special counsel to the Secretary of the Interior specializing in water, Native American and endangered species law. From there, he worked as a senior associate for the law firm of Latham & Watkins, LLP, where he specialized in California natural resources and energy law. He left Latham to accept a Fulbright Senior Scholarship teaching law at the University of Dar es Salaam in Tanzania, where he lived and worked from 2006-2007. While in Tanzania, Mr Lou also supported local communities and civil society groups on forest conservation. He has emerged as a leading voice at the intersection of climate action and the growing mindfulness movement. He is a regular contributor to The Huffington Post, where he blogs about climate change.



Malai Chomphuka

Executive Director

Quality Advantage Co. Ltd.

Ms Malai Chomphuka has more than 2-3 decades of experiences in business while almost 15 years with PREMA. She is involved in various kinds of business, public organizations and NGOs on introducing as well as applying multiple PREMA®(Profitable Resource Efficiency Management)tools available for various kinds and sectors of business and industry. PREMA is an approach that any kind of organizations can employ to realize Triple-win++. Besides, experiences in engineering, sales & marketing of products and systems/projects in international business environment are beneficial for her to take parts in training cum coaching for many individual enterprises and organizations. It is her endeavor and ambition to share her experiences with the societies through her facilitating and coaching the enterprises to apply PREMA®approach and the various tools to achieve the Triple-win++, economical efficiency, environmental friendly and organizational learning cultures, including improving workplace safety, healthiness and happiness. The plus (+) is reducing emissions of greenhouse gas (GHG) there in contributing to lower impacts on ecosystems.

The enterprises of any sizes (SMEs) and kinds who do understand PREMA®process-oriented and participatory approach and implement with committed leadership will assure improvement of sustainable use and consumption of the resources - Triple-win++. To name some industries in records of success are crafts and communities, tourism industry, food, agriculture and agriculture-processing, automotive and auto parts industries, etc.

**Meenakshi Lekhi**

Member of Parliament
Lok Sabha

Mrs Meenakshi Lekhi is an elected Member of Parliament of the Lok Sabha from New Delhi constituency. A politician by passion and a barrister by profession, Mrs Lekhi completed her B.Sc at the prestigious Hindu College and pursued her LLB degree at the University of Delhi. Mrs Lekhi has an illustrious career that spans over 25 years where she has practiced at the Indian Supreme Court and various High Courts and District Courts across the country. She has successfully argued on a wide range of subjects such as the Prevention of Corruption Act to Official Secrets Act to matters relating to domestic violence and family disputes.

She serves as the National Spokeswoman of the Bhartiya Janta Party (BJP) and has actively participated in various national and international press conferences strongly voicing her party's policies and programmes.

Mrs Lekhi is currently the Presiding officer of the New Delhi Municipal Council and has been nominated as a member of the Standing Committees on Commerce & Industry, Urban Development and the Privileges in the Parliament of India. She is the ex-officio Chairwoman of the Commonwealth Women Parliamentarians (CWP) and has also been the member of the National Commission for Women's Special Committee. She has been widely lauded for her contributions as the Chairperson of Special Task Force on Women Empowerment, Vice Chairwoman of JPM, Blind School in New Delhi and Joint Secretary of the Blind Relief Association.

As a social activist, Mrs Lekhi has been closely associated with the National Commission for Women, National Institute of Public Cooperation and Child Development, All India Women's Conference, SAKSHI, WTI, Sampurna and CSR, working on pressing issues relating to rights of children and women. She has given various lectures at the National Human Rights Commission and conducted gender equality training programmes with various Ministries.

In the recent past, she argued and won the case of Permanent Commission of Lady Officers in the Indian Naval Forces and previously advocated the issue of permanent commission of lady officers in the Indian Armed Forces and successfully represented their cause even in the Supreme Court. She was a member of the Drafting Committee of Bills such as the Sexual Harassment of Women at Workplace, which now stands as the law of land, and Women's Reservation Bill.

She is widely known as a 'policy wonk' and a prolific writer. She is a strong, outspoken leader who commands the respect of her peers in legal, political and social circles. She is known for her sharp intelligence, eye for detail and an inimitable presence of mind. She combines this with her dogged determination in championing the causes that she believes in and has proven to be an aggressive fighter who savours the thrust and parry of political campaigning.



Narendra Kumar Jain

AVP, Corporate Environment
Jubilant Life Sciences Limited

Mr Narendra Kumar Jain has more than 20 years of work experience in different areas like operation, project management, environment and sustainability. He is AVP, Corporate Environment with Jubilant Life Sciences Limited, Noida which is an integrated chemical company including distillery, API and crop sciences chemicals company.

Before working with Jubilant Life Sciences Ltd., he has worked for 10 years in alumina refinery in process control, operations and project with Indian Aluminium Company Limited (Now HINDALCO), Belgaum, Karnataka; 6 years in environment and sustainability department in HINDALCO Industries Limited, Mumbai; 2.5 years as GM- Head of Corporate Environment with Hindustan Zinc Limited, Udaipur.

His educational qualifications are BE Chemical, from NIT Surathkal, 1994. His specific areas of work are resource optimization, especially water and energy conservation; waste minimization through Reduce, Reuse and Recycling and Root Cause Analysis and source elimination.

**M Goutham Reddy**

Managing Director & CEO
Ramky Group

Mr M Goutham Reddy is a US returned Environmental Engineer and has been working with Ramky Group since August 2001, with active participation in the Real Estate, Waste Management, Civil infrastructure development and associated businesses. Mr Reddy has vast experience in property development and brings in environmental attributes to the real estate sector. Mr Reddy has the credit and distinction of being a part of establishing and operating India's first integrated hazardous waste and medical waste management facilities. He has grown within the group and currently working as group level resource in strategic planning and growth. Currently, he is working as Managing Director and CEO for Ramky Enviro Engineers Limited.

Earlier, he has worked as Scientist at Environment Protection Training and Research Institute and has been associated with various environmental projects with specific focus on solid waste management.



Sandeep Shrivastava

Head- Environment & Sustainability
Ambuja Cements Ltd

Mr Sandeep Shrivastava has over 26 years of rich experience working with government & industry on several subject areas on environment, Health & Safety, Energy, Climate Change & Corporate Sustainability. Currently, he is working with Ambuja Cements Limited as “Head- Environment & Sustainability”. Mr Shrivastava is responsible for Sustainability Initiatives as well as Annual Sustainability Report of the company. He is also the Convener of Corporate Sustainability Committee of the company. He has attended the accredited lead certification course on ISO 14001 and OHAS 18001 and possess 125 days of audit experience and 250 days of training experience on these management systems. He is also a recipient of ‘Fulbright Fellowship’ under Indo-American Environment Leadership Award for study in US. He has travelled to many other countries on various official assignments. A member of: CHD 34 of Bureau of Indian Standard (BIS), National Council on Climate Change of CII, CII Committees on Environment, Advisory Committee on Business and Biodiversity, Water Mission-FICCI. Earlier he has worked with a government regulatory body- Central Pollution Control Board (CPCB), the industry association-Confederation of Indian Industry (CII) as well as a leading power company. He has experience working with industry in a variety of sectors including power, chemicals, automobiles, cement etc.

**Shikhar Jain**

Principal Counsellor

CII-ITC Centre of Excellence for Sustainable Development

Mr Jain, has over 21 years of experience as business sustainability expert & operational management with variety of industries, where he designed, implemented and integrated Quality, Environmental, Health & Safety and Social programs/management systems in over 100 individual facilities and for corporate-wide operations. Mr Jain has developed and implemented best practices for several top Indian & global firms, including on areas of improved operational efficiency, good EHS practices and enhanced compliance management.

Mr Jain is lead trainer & faculty for various accredited training courses for IRCA (UK), IEMA (UK), SAI (US), GRI (EU) and has conducted over 500 trainings (open & in-company), helping around 10000 professionals for raising awareness & competence on GRI, Sustainability, Stakeholder engagement, environment, occupational health & safety, social accountability, legal issues etc.

Within CII-ITC Centre of Excellence for Sustainable Development (CESD), Mr Jain's responsibilities includes training, advisory and consulting on a wide spectrum including leadership & strategy on sustainability, sustainability assurance, management systems, sustainability reporting & sustainability management framework. Mr. Jain represents the Confederation of Indian Industry (CII) in various committees and working groups of the Bureau of Indian Standards, Account Ability, UK, and Global reporting Initiative and has been involved with development of international standards ISO 26000; Guidance on Social Responsibility, GRI G4 Guidelines & AA 1000 SES on Stakeholder Engagement. Have been nominated as CII representative on the Board of Governors of NSC, Mumbai.



Seema Arora

Executive Director

CII-ITC Centre of Excellence for Sustainable Development

Ms Seema Arora pioneered the creation of services on Environment and Sustainable Development within CII. Her journey with CII began with engaging Indian Industry towards the run up to the Earth Summit in 1992.

Ms Seema Arora works on designing innovative products and frameworks to build the business case for industry to invest in Sustainability. She has created several initiatives including the World's first Corporate Sustainability Label from the Centre. As the head of the Centre she networks with Industry, Government and Community based organisations to develop policy instruments and innovative voluntary approaches to Sustainable Development. She is also providing inputs to defining Sustainable development Action plans at State level. Ms Arora provides training and counseling to Industry for evolving a Sustainability Vision and a portfolio of Sustainability Strategies for building a Sustainable Business Organisation.

Her main areas of interest include environmental policy, management systems, corporate sustainability, institutional strengthening and capacity building.

Ms Arora has a bachelor's degree in Engineering from Delhi University. She is a member of the Stakeholder Council of the Global Reporting Initiative (GRI). She is a member of World Economic Forum Global Agenda Council on Governance for Sustainability. She is a member of the external review panel for Sustainability Reporting for several global companies. Ms Arora is a member of the Polaris Committee of FBN International.

She has twenty five years of experience in the field of Environmental Management and Sustainable Development.

**Suhas T Buddhe**

Chairman & Managing Director
Biocare India Private Limited

Dr Suhas T Buddhe is the Chairman & Managing Director of Biocare India Private Limited since 1996. He is also the Founder Member of Centre for Sustainable Development, Chairman Entrepreneurship Forum, Vidarbha Industries Association (VIA), Founder Director of Biocare Direct Pvt. Ltd. and Founder Director of Peacock leisure Pvt. Ltd.

Dr Buddhe has achieved “The Award for Business Excellence” from Indo Thai Chamber of Commerce. He was also awarded as Golden Peacock for “Eco- Innovations-2012; “3rd Innovation Excellence Gold Award-2014” in ‘Business Development Category’ from ASSOCHAM; ‘Maharashtra State Best Entrepreneur Award 2013’ from Government of Maharashtra and his company is awarded as ‘Top 26 most Innovative Companies in India’ by CII Industrial Innovation Awards 2014. He has also published a research paper in the American Journal of Engineering Research (AJER).



Wijnand Broer

Deputy Director
CREM BV

Mr Wijnand Broer is Deputy Director at CREM BV. He has been working in the area of Corporate Social Responsibility for almost 25 years, with special emphasis on international supply chains and market opportunities. He has been involved in projects in India since 2008, focusing on the business opportunities of CSR and the work of the India Business & Biodiversity Initiative.

Mr Broer has been working in the field of Business & Biodiversity and Natural Capital for over 15 years, focusing on the assessment and management of impacts, dependencies and opportunities. He is currently involved in the work of the Dutch Business Help desk on Natural Capital and the development of a publication on Natural Capital and the Circular Economy.

**Wolfgang Leidig**

Programme Director
GIZ India

Mr Wolfgang Leidig is the Programme Director for Private Sector development at GIZ India, with projects on Innovation and Modernization in SME, Skilling in SME as well as on Responsible Enterprise Financing for SME. He has worked within the German administration as well as in international cooperation. As Secretary of the Ministry of Finance and Economics of the German State of Baden - Wuerttemberg, SME were his focus. As a mayor he balanced economic development, ecological sustainability and urban development. In the German Federal Ministry of Research and Technology he has worked on different issues of technology policy, among others on ecological research programmes.





Ramky Enviro Engineers Limited is India's largest Environment and Waste Management Company currently managing over 6 million tonnes of wastes spread across 50 waste management facilities in the country. Ramky has the credit and distinction of having established India's first Industrial/ Hazardous Waste management facility and Medical Waste Management Facility. Currently, the company is catering to over 10,000 Industries and managing over 10,00,000 TPA of Hazardous Wastes with over 15 years of operations and our Medical Waste facilities cater to over 300,000 beds of in-patient medical services to over 20,000 Health Care Establishments. Ramky also serves numerous municipal corporations including North Delhi Municipal Corporation, Greater Hyderabad Municipal Corporation, Corporation of Chennai, Brihat Bangalore Municipal Corporation, Kolkatta Metropolitan Development Area and multiple other corporations and municipalities over 10,000 tonnes of waste per day. Ramky provides a wide range of environmental services including waste management, environmental consulting, water and sewage management, effluent treatment plants and integrated environmental services and is a leader in the field of environment in the country. Ramky Enviro Engineers Limited is operating 12 TSDFs spread over ten states in India. In addition we also offer Renewable Energy, Consultancy and Integrated Environment Services. All our facilities are ISO 9001, ISO 14001, ISO 17025 and OHSAS 18001 certified, and REEL also have a state of Art Laboratories with NABL and MoEF Accreditations for Environmental Services.



WWF-India is the largest conservation organisation in the country dealing with nature conservation, environment protection and development-related issues. Established as the Charitable Trust in 1969, it has an experience of over four decades in the field. Its mission is to stop the degradation of the planet's natural environment, which it addresses through its work in biodiversity conservation and reduction of humanity's ecological footprint.

WWF-India works across different geographical regions in the country to implement focused conservation strategies on issues like conservation of key wildlife species, protection of habitats, management of rivers, wetlands and their ecosystem, climate change mitigation, enhancing energy access, sustainable livelihood alternatives for local communities, water and carbon footprint reduction in industries, and combating illegal wildlife trade. WWF-India is actively engaged in promoting renewable energy uptake, enabling energy access, demonstrating renewable energy projects in critical landscapes, and overall promoting clean energy solutions.

The Climate Change and Energy Programme of WWF-India is working towards climate resilient future for people, places and species that support pathways for sustainable and equitable economic growth. Low carbon development and renewable energy at scale are the thrust areas of Climate Change and Energy Programme.



India Business & Biodiversity Initiative (IBBI) was launched on 22nd May 2014 by CII-ITC Centre of Excellence for Sustainable Development (CESD) on invitation by Ministry of Environment, Forests and Climate Change (MoEFCC) and with support of German Development Cooperation through GIZ. IBBI serves as a national platform for business and its stakeholders for dialogue, sharing and learning, ultimately leading to mainstreaming sustainable management of biological diversity into business decisions, policies and operations. The IBBI signatories has reached at 25 number with representations from all major sectors as well as from SME.



Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering industry, Government, and civil society, through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organization, playing a proactive role in India's development process. Founded in 1895, India's premier business association has over 8000 members, from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 200,000 enterprises from around 240 national and regional sectoral industry bodies.

CII charts change by working closely with Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness and business opportunities for industry through a range of specialized services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes. Partnerships with civil society organizations carry forward corporate initiatives for integrated and inclusive development across diverse domains including affirmative action, healthcare, education, livelihood, diversity management, skill development, empowerment of women, and water, to name a few.

The CII theme for 2016-17, Building National Competitiveness, emphasizes Industry's role in partnering Government to accelerate competitiveness across sectors, with sustained global competitiveness as the goal. The focus is on six key enablers: Human Development; Corporate Integrity and Good Citizenship; Ease of Doing Business; Innovation and Technical Capability; Sustainability; and Integration with the World.

With 66 offices, including 9 Centres of Excellence, in India, and 9 overseas offices in Australia, Bahrain, China, Egypt, France, Germany, Singapore, UK, and USA, as well as institutional partnerships with 320 counterpart organizations in 106 countries, CII serves as a reference point for Indian industry and the international business community.

Confederation of Indian Industry

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**CII-ITC Centre of Excellence
for Sustainable Development**

Our world is entering an age of unprecedented risks and opportunities. There is immense pressure on our natural resources, carbon emissions are alarmingly high, and inequalities are increasing. The environment is suffering as are the people. In light of this, sustainability has become a major concern for businesses. It pressurizes them to adapt accordingly so that their practices meet the need of the changing environment.

That's where we come in. We nurture our clients to compete, expand opportunity and excel in today's dynamic business environments. The Centre works to create and sustain an environment conducive to the growth of business, partnering business and government alike through training, advisory and consultative services. These services comprise capacity building and training programmes and workshops related to environment policies, management systems, management frameworks, performance assessment, sustainability reporting, stakeholder engagement, sustainability assurance, climate change, sustainable business portfolios and business model innovation to name a few.

Today, India faces multiple challenges. The major challenges are economic, social and environmental in nature. In the last two decades, India has seen tremendous growth. However, the beneficiaries of this growth are but a small section of the country's population. There is an ever-widening gap between the haves and the have nots. The majority of the population remains at the periphery of development, while the rest lean towards the other extreme, that of immense wealth. There are disparities amongst regions, states, sectors and communities. This exclusion from the benefits of economic growth development has rendered people steeped in poverty with very low standards of living.

The environmental challenges that the world and India, especially as a developing economy, faces are depleting natural resources, environmental degradation, sky rocketing GHG emissions and consequently, climate change. The combination of these economic, social and environmental challenges could prove to be detrimental to the future growth of India as a country and as a sustainable economy. The Centre works to mitigate these problems and engender a transformation in the way business is conducted.

In order to do so and achieve sustainable, equitable and inclusive growth, the Centre seeks to bring transformation through a complete programme of policy advocacy, knowledge creation, knowledge dissemination and 'on-ground' model projects. The Centre works with businesses and the government to bring about this transformation and address the various issues of sustainability, environmental degradation, climate change, inclusion etc. The training and consulting services we provide facilitate companies in their sustainability efforts.

CII-ITC Centre of Excellence for Sustainable Development

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