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Indian Cement Sector

Where Sustainability Means More Profit

By *Benedict Paramanand*

Goans, and people who love Goa, rejoiced when Vasavadatta Cement announced recently that it would be using plastic waste from the state to fuel its cement manufacturing in Karnataka.

In fact, the Indian cement industry is eager to save Indian cities from mounting waste using its incinerators. Pre-treatment, regular supply and hassle-free transport system could make Indian cities clean and green with little effort. The Madhya Pradesh government has pioneered it. There's no reason why other states, which have cement plants nearby, cannot do it?

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Inside

Indian Cement & Sustainability Special

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Purpose : To excite Indian businesses, SMEs, executives and students about the immense business opportunity in not only adopting Sustainability as Strategy in their companies but also inspire them to the possibilities of a big market for innovative sustainability products and services.

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Information in this publication is drawn from a variety of sources, including published reports, interviews with practicing managers, academia and consultants. While doing so utmost importance is given to authenticity.

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India has emerged as the second largest producer of cement in the world after China. With investment in infrastructure set to zoom following aggressive policies of the current government, the negative impact of cement and construction sector is bound to become a daunting issue. The heavy price China is paying for unbridled growth in the last decade is no secret.

The Indian cement sector has emerged as one of the most progressive among all other manufacturing sectors in meeting tough sustainability standards. With infrastructure and housing expected to grow at a brisk pace, it is bracing itself up to face stiffer demands. But to have a more significant impact, its sustainability practices have to go beyond manufacturing and become more inclusive by including construction, supply chain, health and welfare of the people.

It's apparent that sustainability is high on the agenda of Indian cement companies mainly for its immense cost benefits. Greater focus on energy saving and use of waste as raw material is making Indian cement companies one of the most competitive in the world. Three Indian companies - Aditya Birla's Ultra Tech Cement, Dalmia Cement and Shree Cement - and seven subsidiaries of multinational cement companies operating in India - are members of the Cement Sustainability Initiative, an initiative of the World Business Council for Sustainable Development. The Cement Manufacturers' Association (CMA) has partnered with CSI with the aim of promoting sustainability best practices across the sector.

The Indian cement sector's seriousness about sustainability was evident for the first time in 2009 when several companies showed interest in becoming part of the Global Cement Technology Roadmap developed by CSI and International Energy Agency (IEA). The next big initiative was when nine CSI members became part of the 'Low carbon Technology

The Indian cement industry leads other countries in minimizing its negative impact and is gaining in efficiency and cost at the same time. This is a mature industry and there is a limit on how far it can go. Incrementalism is not enough, radical new approaches are required especially when the economy is expected to grow at a brisk pace. Sustainable mining continues to be its bug bear

Roadmap for Indian Cement Industry'. This initiative was supported by International Finance Corporation. The India roadmap, launched in February 2013, outlines a low-carbon growth pathway for the Indian cement industry that could lead to carbon intensity reductions of 45% by 2050.

The Indian CSI members in the roadmap project, which together represent about 60% of the country's cement production, are: ACC Ltd, Ambuja Cements, Heidelberg Cement India Ltd, Lafarge India Private Ltd, My Home Industries Ltd / CRH, Shree Cement, Shree Digvijay Cement Co Ltd – Cimpor Group, UltraTech Cement and Zuari Cement. Since the roadmap started, Dalmia Bharat Cement Ltd and Jaypee Cement Ltd have also joined the CSI.

India also announced a voluntary 20-25% emissions intensity reduction by 2020 compared to the 2005 levels and the National Mission for Enhanced Energy Efficiency (NMEEE) has rolled out the Perform-Achieve-Trade (PAT) Mechanism which requires 478 energy intensive industrial plants to reduce their energy intensity by an average of about 4.7% between 2012 and 2015. (Pl see page 15)

The good news is that the energy intensity of cement production in India has declined steadily from 3.9 GJ/t in 1995 to about 3.2 GJ/t in 2011 as a result of several cost saving innovative measures taken by the industry. Some of the plants in India are said to be comparable to the world's best in terms of energy efficiency.

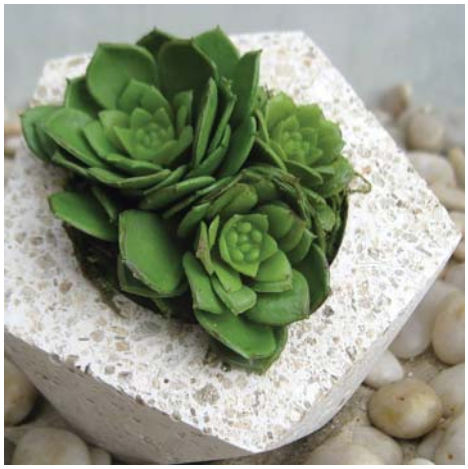
Blend more

Much of the cement produced in India at present is blended cement. Clinker can be mixed with fly ash (a waste from burning coal in power plants) to produce PPC (Portland Pozzolana Cement), and blast furnace granulated slag (a waste from Iron and Steel plants) to produce BFSC (Blast Furnace Slag Cement). These blended cements contribute to the sustainability of cement production since they utilize industrial waste and avoid being dumped in pits or landfills. They also reduce the amount of clinker that is used in cement production and thereby significantly reduce the energy intensity of cement.

Greater support from the new government through progressive policies and tax incentives are likely to give greater push to this trend. What the cement sector also needs is alignment of laws between state governments for procurement of industrial and municipal waste.

An exploration into the cement sector's connect with sustainability should go much beyond its primary role as a binding force in the construction industry.

K N RAO, Director in ACC Ltd, says we should talk about what goes into the entire construction industry, the sand, and water, the complete supply chain. “It doesn’t end there. It also includes the procurement practices – how the entire cement industry buys equipment and materials. We don’t know if the supplier has sustainable mining practices. I may be using it efficiently but we should look at responsible sourcing, so that our entire



value chain is using sustainable practices.”

Despite rapid progress in energy efficiency technologies and uses of alternative raw materials, there will be a limit to which the eco-system can bear the brunt of runaway expansion and growth. Only a radical change in consumption and living styles, imaginative redesign of work places and invention of nearly zero polluting construction material could result in sustainable development in the foreseeable future.

What happened to Novacem?

The invention of Novacem Cement at the Imperial College London by **Dr. Nikolaos Vlasopoulos** in 2010, made the world upbeat about a wonder material. It showed the potential to put the Portland cement industry out of business in a few years. The World Economic Forum named Novacem as one of its Technology Pioneers for 2011.

Unlike traditional Portland cement, in use since the 18th century, which uses calcium carbonate (limestone), magnesium silicate-based **Novacem cement absorbs nearly three times as much atmospheric carbon dioxide as limestone cement during the setting process.**

A post in the Imperial College site states: “Novacem’s carbon-negative technology has the potential to transform the construction sector’s environmental impact from a net emitter of CO2 to a net absorber: Novacem cement minimizes CO2 emissions during its manufacture, use in construction and its disposal (as well).”

Novacem cement had proved that it is stronger than Portland cement but its acceptance for construction could be slow since its durability is yet to be proven. Nobody wants to build a bridge or a dam using Novacem yet.

Novacem had roped in big cement players to pump money into research and production. Laing O’Rourke and Lafarge, in Paris, the world’s biggest producer of building materials, and Rio Tinto, a London-based global mining company was eager to help Novacem dig up magnesium silicates.

Surprisingly, Novacem wound up operations end of 2012 and there is no information in public domain about it. Dr. Vlasopoulos, the founder, now works for Lafarge. This mystery is worth unravelling

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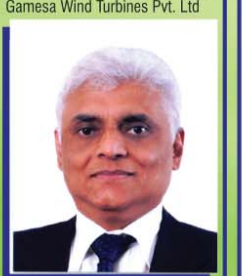

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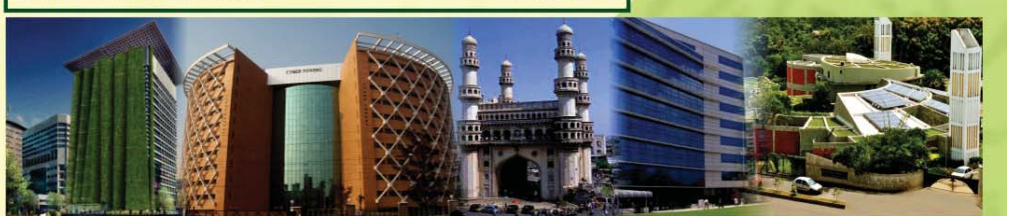

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Indian Cement Industry CEOs are Highly Committed to Sustainability

Philippe Fonta is a global force of the sustainability movement across sectors such as cement, tyre and energy efficiency. In a candid chat with **Benedict Paramanand at the CementTech, organized by the CII Sohrabji Godrej Green Business Center,** in Hyderabad recently, he said he is happy with the commitment of Indian cement sector CEOs to sustainability. But he wants India to get aggressive on using alternate fuels such as municipal waste to cut cost

Philippe Fonta

Managing Director Cement (CSI), Buildings (EEB) and Tires (TIP) projects World Business Council for Sustainable Development (WBCSD).

Philippe Fonta joined the WBCSD in March 2011 to lead the Cement Sustainability Initiative (CSI) project. Initially launched in the early 2000's, when ten leading cement producers agreed to work within the WBCSD for a more sustainable cement industry, the CSI is now gathering 24 member companies, expanding in countries like India, China & Latin America. Fonta also leads the project on Energy Efficiency in Buildings (EEB) since January 2012. Before joining the WBCSD, Fonta was Head of Sustainable Development for Airbus.

What has been your experience working with Indian cement industry?

Indian cement companies, who are members of Cement Sustainability Initiative (CSI), represent 65% of the cement production in India. Typically, it is a CEO-led initiative. The CEO has to be involved; it means that the management has to be involved. Once a year we do a global CEO meeting at the world wide level for which all CEOs are invited to participate. All the Indian CEOs participate. The CEOs of the cement companies in India meet twice a year to do a more in-depth analysis.

Ten companies in India are members. The three Indian member companies are Shree Cement, Ultra Tech and Dalmia Cements. CSI member list includes 10 companies – three independent India- based companies and seven who are subsidiaries of major global groups.

I find that, the CEOs and their companies are highly committed. What is sure that on certain aspects like energy efficiencies India has advanced because the technology which is installed is very modern.

When they join CSI they have three years to become compliant with the charter. They cannot do it all at once. Safety and climate change are the two priorities. India knows what to do for climate change and safety, but that doesn't mean much. They have to think about biodiversity - think about water because in some areas of India there is water scarcity.

What are the sustainability challenges unique to Indian companies?

Unique to India is probably the low level of **alternative fuels usage.** Right now it is less than one percent. We have a road map to increase this number. There is a huge potential there. The potential is the same as the global one that is, by 2050, 25 percent of fuel could come from alternative sources. In some developed countries this figure is already more than 50 percent.

To what extent will that make a difference to the cost?

It's not only the cost. It's the usage of all available resources. If you use waste you need less coal, less lime stone. All that is an indirect cost saving.

Why do you think India has not utilized this potential?

It's a combination of several reasons. First conventional fuel is available, rather cheaply. Waste management happens at the regional or the state level and here the role of law comes into picture. The law is different in different regions. If you have a plant in one state, the provision for collecting fuels in another state, if the law is not the same you cannot transport the waste from one plant to another. **There are plenty of reasons why India is late in using alternate fuels but the potential is still there. That's why it is important to have this collaboration between companies, regulators, civil society.**

Can we say that Indian municipal waste and industrial waste problem can be taken care of if they simply align with the cement industry?

Before using waste in the kilns it needs pre-treatment. Municipal solid waste has to be pre treated to be put in the kilns to get efficiency. We have to set up a framework between polluters, transporters, users, regulators etc. If this is in place there is huge potential.

In most parts of the world there is a tendency for municipalities to build their own incinerators even though cement companies have kilns everywhere. They are much more efficient because they don't leave any residue. Clear and continuous discussion with authorities is important to make this happen.

In the next 5 years what will really drive the sustainability movement in cement?

I think the sector is already managing quite well. All the sustainability aspects that need to be treated have been identified. The driver in the first year depends very much on the governments. There could be some progress at the conference in 2015 where the States will meet to reach an agreement to follow up on the Kyoto Protocol.

In addition, we need help on market-based mechanisms. I think the drivers will be there but I think the main subject of focus will remain climate change.

Green is profitable

Cement is the most polluting industry in the world. About 7% of the man-made CO2 in India is being generated by the cement industry. That is very bad news and our GDP contribution may be less than 1%. **But at the same time we should be happy that our cement industry is the most efficient in the world.**

We have to have very clear thinking that financial good performance is the real reason why we are in the business. **I firmly believe Green and Clean is profitable also.** We have seen that many times, even when it feels that it won't be profitable.

In Shree Cement, when we were putting the scrubber on our power plant for recovering sulphur, I said in the board that I want to do it even if it is not viable. Our board said it's highly viable but it's not profitable. **So viable and profitable are two different words.** We have to always think very clearly.

We went ahead with the scrubber. This is the only scrubber in the cement industry where we mix low quality lime stone with sulphurous water to get gypsum. The gypsum quality doesn't matter, but it's better than the mined gypsum. Since it is for self consumption there is no transport cost. We also make gypsum by purchasing waste sulphuric acid. Here also cost is low and the unit is profitable.

Shree cement was recognized by the World Sustainability Forum as the only company that is the best in all sectors in the world. It was recognized because of the lowest power consumption and better utilization of water. In Rajasthan our growth is limited not because of other resources but because of scarcity of water. Social needs will always precede industry demand.

Investment in R&D poor

It's easy to innovate continuously but the biggest problem in innovation is budget. **I am unhappy to say that the cement industry has not put in even 1% of the turnover on research and development. Till we put money into R&D, budget for it, innovations cannot take place.** Apart from money is fear of failure, if a professional attempts 10 times and fails 7 times, his career will be in danger. To me, 9 failures are tolerable as even 1 success is worth it.

H.M. Bangur

Bangur Mantra for Success

- **Treats employees as entrepreneurs**
- **Likes to be the first to test a new idea or a product**
- **Belief that great leadership and vision at the organizational level needs to be invested to achieve great results**
- **High tolerance for failure**
- **Viable and profitable are two different words.**
- **Complete operational freedom to his executives**

If somebody has ideas please write to Shree Cement and we will be very happy to look at it. Ideas can come from everywhere, people feel frustrated when their ideas are not implemented because of the bureaucracy. **We monitor how many times you are failing, if you are not failing enough, you are not trying enough.** So this has to be your approach to innovation.

How Waste is Fuelling Cement Sector in a Big Way

Excerpts from K N Rao's talk at a conference on 'Responsible Growth: A Business Imperative' organized by CII Western region in Mumbai recently. Mr. Rao is a Director (EECC) at ACC Ltd.

K N Rao

The Indian cement industry is one of the best in the world.

Recent data shows that we have **outsmarted Japan** in terms of resource intensity. We were the first to get into a low carbon road map and what we would like to do in the next 50 years.

The Indian cement industry, under the guidance of World Business for Sustainable Development, came out with a 50-year road map. The carbon emissions have also been reduced significantly. A few years back, one ton of CO2 was released for producing one ton of cement. In recent years the industry has reached 630 kgs of CO2. The industry as a whole would like to reach 350 kgs of CO2/ton of cement by 2015. Innovations are continuously on to reduce use of limestone, water and energy.

Bringing in large amounts of recycled contents into the manufacturing process will reduce the use of virgin materials. In the last 60-70 years of cement manufacturing, the process innovation moved from an absolutely wet process into a totally dry process. In those days, to produce one ton of cement 1400 liters of water was used. Now, it's reduced to 75 liters. In terms of energy requirement, 1400 kilo calories was used to produce one ton of cement, today we use 700 kilo cal/ton.

For one ton of cement, limestone consumption has come down to less than half. Recycled materials like fly ash from the power industry, slack from the steel industry – are good substitutes and save natural raw material. Today, the process consumes 1/3rd of our natural resources of limestone. Instead of 60 years, we can sustain it for 180 years.

Cement kiln is a green incinerator

How are we going to execute this big jump for the values that we are aspiring? Can we substitute coal? India produces 70 million tons of urban waste, 8 million tons of hazardous waste. **Cement kilns are becoming green incinerators** which operates at a higher temperature and can dispose waste without any side effects. With technology most of the gas can be neutralized.

Not only can we reduce emissions but can we help in solving waste management problems.

The cement industry is working towards this process. By bringing in waste in the process in a controlled manner we can substitute some part of coal which is being imported.

Currently, the cement industry's objective is to substitute 35% of coal by 2015. The cement industry is working on innovations. We are trying to use Industrial waste, municipal waste, and plastic waste and biomass which

can substitute coal and avoid imports.

In terms of energy, **by moving 50% of our energy requirements towards green energy, we can reduce carbon footprint in a big way.** Green energy has got grid parity, it is viable, initial costs could be more but we found that it is more economically attractive if we implement a mix of solar, hydel or wind. From our process waste we are able to generate 50% of our power requirements. Generating from our wastage and the balance from green power will reduce carbon footprint.

New Products are the Key

We are moving into product development to **reduce content of cement in binders and cement content in concrete. Can we use more recycled materials in concrete?** Today, we use sand, we are also thinking of using power plant fly ash instead of using natural resources. Pushing towards innovation will help in reducing manufacturing costs. Natural materials increase cost very rapidly but recycling materials will have a better advantage.

We are also looking at **when buildings are demolished to recycle waste material.** We are working with IIT, Bombay for recycling the demolished material. How the resources can be segregated and used. So the whole approach is nothing should be left and to minimize consumption of virgin material as much as possible.

Any innovation related to reducing carbon footprint or energy footprint is a possibility. Sustainability means reducing resources but there is another element to it, **can I enhance the structural life of a building?** A building might be designed to last 60 years but if we develop materials which enhance the structural lifecycle of the building we can increase its lifespan to 200 years. We are working on innovating new products to create long term structural lifecycle.

Achievements

- **Cut in water usage from 1400 liters per ton to 75 liters**
- **Limestone requirement down by 50%**
- **Specific emission has declined from about 1.14 tCO2 to 0.78 tCO2 during 1995-2011**
- **By using waste increasingly as energy source, substitutes coal import**
- **Blended cement that uses waste like fly ash as an ingredient**

Innovations in the Offing

- **Enhance structural life of buildings to 200 years**
- **Recycle material from building demolition**
- **Reduce use of cement by using recycled material as binders**
- **Use recycled material instead of sand**
- **Switch to renewable energy as major sources for power**
- **Use municipal waste as source of energy**

ACC kilns burn HUL's waste

Indian cement companies are extending co-processing services for sustainable management of waste to customers in various sectors. For example, Hindustan Unlilever Limited has partnered with ACC to co-process damaged/expired/rejected stocks. Co-processing is a preferred method as it ensures no product is re-circulated in the black market and protects their brand image.

This initiative was started from Kymore Cement Works in the year 2006 to demonstrate the soundness of co-processing technology which steadily gained momentum and was rolled out to all other ACC plants in India. By offering an extensive range of services on a pan India basis, ACC expanded the service portfolio to also include wastes from manufacturing process and packaging (plastics and laminates) wastes.

Concrete vs. Bitumen Roads

Mumbai's Marine Drive Has the Answer

Mumbai's Marine Drive, built with ACC cement in 1939, is an enduring example of the stength of concrete roads

Investing in a good road network is a prerequisite of economic development, a major part of which involves selecting an appropriate surface between the options of flexible pavements (using bitumen) or rigid pavements (using concrete). Bitumen hogs the lion's share of India's road network though it is derived from imports, while concrete has a meager share despite meeting the requirements of good road building material and being indigenously available from India's cement industry which is the world's second largest.

Experts agree that concrete roads

are largely superior to conventional bitumen ones both operationally and financially. Global practices suggest there is room for both. While our decision-makers are aware of the advantages of concrete, there is a need to address lingering misgivings, particularly those concerning its higher initial outlay and its inflexibility to accommodate laying of new utilities, cables and drainage in city roads.

India has the world's second largest road network connecting an area of 3.3 million square kilometers. Roads are our lifeline, transporting 85 per cent of passenger traffic and 70 per cent of cargo. While at first glance, road density appears to be adequate, it is in the quality of roads where we do not fare well. More than half the nation's roads are classified as being paved, but in reality the quality of a significant extent of surfaced roads is dubious. With bitumen accounting for over 95 per cent of our road length, champions for concrete would say the fault lies with the choice of road surfacing material.

Roads in India have to put up with stresses from over-loaded vehicles, animal-driven carts and handcarts with abrasive wheels. City roads suffer added abuse from heavy undisciplined traffic, garbage and spills – not to forget frequent unplanned digging to accommodate cables, drains and other utilities beneath their surface. The ideal road building material for India must also withstand the region's extreme climate conditions, rain and oxidation from scorching sunlight. Over and above, our roads must allow speedy and cost effective maintenance.

Bitumen – sticky facts

Bitumen has been India's preferred road-laying material for many decades, notwithstanding its inherent limitations. Bitumen surfaces require high maintenance, cannot withstand abrasion from heavy axle loads and harsh metal wheels or the corrosion from petrol, oil and other spills. They deteriorate rapidly in harsh climates. Constructing with bitumen is messy and not at all eco-friendly. Bitumen hot mix plants have high emissions. Besides it is derived from imports and its supply and prices fluctuate.

Cement concrete meets all the characteristics of an ideal road pavement material and are superior to bituminous ones in both operational and financial terms. They are durable and maintenance-free over 20-30 years; their useful life can even stretch to 50 years and beyond. Concrete roads are abrasion-resistant and impermeable. They allow speedy traffic and better skid resistance. A smoother ride lowers wear and tear on vehicles. **Concrete roads have demonstrated economies of 15-25% in fuel consumption and 10-15% savings in vehicle running costs. As compared to bitumen, concrete has a lower carbon footprint.**

Concrete conundrum

Considering that cement is the most widely used commodity on earth after water and that the Indian cement industry is the world's second largest, it is inexplicable why cement has failed to penetrate India's sizeable road market. Concrete roads are not new to India and there are numerous old examples of such roads.

Two arguments stand out as the main deterrents against concrete. The first cited most often is the higher initial outlay as compared to bitumen roads. Longer road lengths can be laid with bitumen with the same sum of money. Arguments of this disadvantage being neutralized by lower life cycle costs are not admitted in the face of resource and liquidity constraints. Especially when the life cycle used in the justification is as long as 20-25 years. **An expert once candidly admitted that because a politician's term in office is limited to 5 years, they are not motivated by longer commitments. Hence life cycle analyses**

hold little influence with them. Even national plans span this period.

Another argument is the inflexibility of concrete roads. Bitumen roads can be built and repaired in patches, which is particularly useful in the context of repairs or digging city roads to lay utilities like sewers, drains and cables. By definition concrete roads are rigid pavements laid over elaborately prepared surfaces. Building concrete roads demands advance planning, including the location of utilities.

True cost comparisons

Roads are national assets; investment in them must be made primarily considering their useful life and not just on initial cost. Life cycle comparisons factor in maintenance and repairs. **Any life cycle comparison will show the advantage tilt decisively in favor of concrete roads particularly after 10 -15 years.** Bitumen roads need major facelifts every five years. The experience of concrete roads built in recent years suggests there may now be no significant difference in initial costs between concrete and bitumen.

Many concrete roads continue to be serviceable well beyond their declared useful life. Take Mumbai's iconic Marine Drive – it is over 70 years old but still endures. Resurfacing of some sections is only now afoot. Before this, local residents scarcely recall the promenade being shut for repairs unlike newer roads. Surely this masterpiece must have paid back its costs decades ago.

The road ahead

Our planners need no lessons in proving that cement is durable, cost-effective, indigenously and environment-friendly. Things are changing with the advent of new technologies that facilitate the building of world class concrete roads at competitive costs.

Unveiling his blueprint, the new Union minister for Road Transport and Highways recently expressed his preference for concrete highways. While it is impractical to expect a rapid switchover, the debate of bitumen versus concrete will persist. Nevertheless the country is impatient to see that the overall service quality of our roads accelerates to keep pace with India's development agenda.

By R. Nand Kumar
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Vice President – Corporate Communications, ACC Limited

PAT Energy Efficiency Policy Working Well

There are several national policies which provide a framework for the sustainability roadmap of the cement industry. India announced a voluntary 20-25% emissions intensity reduction by 2020 compared to the 2005 levels and the National Mission for Enhanced Energy Efficiency (NMEEE) has rolled out the Perform-Achieve-Trade (PAT) Mechanism which requires 478 energy intensive industrial plants to reduce their energy intensity by an average of about 5% between 2012 and 2015.

The ongoing PAT national energy policy mechanism aims to improve energy efficiency of cement plants by about 4.8% by 2014-15, compared to a 2007-10 baseline. National policies need to be strengthened continually to enable the sector to continue on a sustainable roadmap

PAT is a market-based mechanism to incentivise improvements in energy efficiency in large energy-intensive industries.

According to this scheme, industrial units are identified as Designated Consumers (DCs) if they consume more than a specified amount of energy in a year. Energy Saving Certificates (ESCs) are given to DCs who are able to reduce their specific energy consumption (SEC) beyond the specified norms. The mechanism is being implemented in compliance with the Energy Conservation Act 2001, situational analyses of DCs, and India's national energy saving goals.

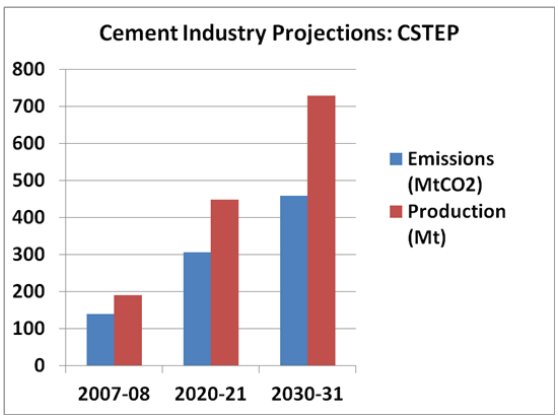

Figure 1: The Indian Cement Industry's Projected CO2 Emissions and Production

ESCs earned by one DC can be traded on platforms with other DCs. DCs who find it difficult to comply with the whole or a part of their targets can purchase these ESCs. The PAT methodology involves setting up a baseline SEC for a DC, and providing a norm or target for reducing it over a three year time period. It also includes processes for data collection, data verification, and to verify the SEC of each DC in the baseline year and target year. In the target year, ESCs will be issued to eligible DCs.

Approximately 85 plants have participated in the PAT mechanism in the first cycle which is due for assessment in 2014-15. The annual energy savings is estimated at about 0.8 Mtoe (Million tonnes of oil equivalent) and represents a 4.793% improvement in energy efficiency of the participating units.

There are global efforts in research and development pipelines to produce cement-like products with alternative materials and processes. Given the ubiquitous nature of cement and its use for the development of infrastructure and buildings, the Indian cement industry is projected to continue its leadership role in contributing to the twin challenges of economic growth and environmental protection. National policies such as PAT need to be strengthened periodically to enable the sector to continue on a sustainable roadmap.

By S.S. Krishnan
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Cement companies are spending more than IT firms on CSR

Professor Sourav Mukherji, associate professor at IIM Bangalore ruffled the features of the IT honchos at a recent NASSCOM Workshop on CSR, when he said steel, retail and cement sectors were spending much more than the stipulated two percent on CSR than the IT sector which averaged between 0.3 to 1.5.

He based his claim on a study that evaluated various annual reports of the companies. They found that the IT and Communication sector recorded the lowest CSR spending because "they neither employ the under-privileged nor have a clear notification on CSR spends from the Government".

IT companies, it appears, are unaware of the tax treatment on CSR spends. Talking about CSR policy adopted by companies, he observed: "Strategic CSR Model is where sourcing happens in the industry with no extra work done and this is where the Cement companies are striking the right chord. The same cannot be adapted to IT domain, so there is a need for these companies, which file net profit of say Rs. 5 crore or more, to constitute a committee with three or more directors."

Explaining the need for CSR committees, Abhishek Hunbad, Co-Founder, NextGen PMS Pvt Ltd, said: "The committees will set up mechanisms to monitor the activities and govern the money-flow, project-flow and work-flow, look to deploy the CSR capital as a venture capitalist and not as philanthropy." He urged the companies to decide the areas of intervention (education/ health care/ sanitation) and then work together with NASSCOM-directed NGOs to make a difference in the society.

The first Anti Retroviral Treatment (ART) Centre was set up in Wadi in Karnataka where ACC's largest cement plant is located.

"Incubation centers are also an intervention approved by Government. NextGen PMS was incubated at IIMB in 2009 and is now a billion dollar company," he said. It's the responsibility of each company to utilize 2% of its assets in CSR activities as there is no certified governing authority and NASSCOM road shows are a great way to educate industry on amendments to Schedule VII (CSR Rules) in the Companies Act 2013.

There are about 16,800 companies with over $2 billion under CSR funds. To diversify spends NASSCOM has earmarked initiatives that socially create an impact and also increase the company's brand value.

Dr. Ganesh Natarajan, Chair, NASSCOM Foundation, and Vice Chairman and CEO, Zensar Technologies urged the heads of companies not to cut 'fat cheques for NGOs', but to work alongside NASSCOM to create and engage employees in making the country a 'digitally empowered community'.

Greener fly-ash cement market to double to $47 billion in 2018

Fly-ash-based cement will more than double to a $47 billion market by 2018, driven by the industry's sustainability goals – use of fly ash is the simplest and most cost-effective option to reduce carbon emissions from cement-making. However, without new innovations, overall emissions from the cement industry could still rise by 31 per cent in five years due to increased global production.

"Cement accounts for 6 per cent of human carbon emissions, and the industry is growing rapidly. Fly ash can help, but cement makers will need to make greater use of natural gas and concentrated solar power, as well as other material substitutions, to keep the absolute emissions at the same level over the next five years," said Aditya Ranade, Lux Research Senior Analyst.

Thermo-chemically treated fly ash has potential. Standard fly ash has an upper limit of 50 per cent without compromising on mechanical properties and durability, but newer thermo-chemically treated fly ash from companies like Ash Improvement Technology (AIT) and Ceratech can completely displace conventional ordinary Portland cement (OPC) in a mix.

Ecocem, Ceratech and AIT are some of the most promising companies among start-ups, developing technologies that enable low-carbon cement/ concrete products and have gained significant market traction

http://www.eco-business.com/press-releases/greener-fly-ash-cement-market-to-double-to-47-billion-in-2018/

Fortum's solar power transforms students' lives in Rajasthan

Fortum, a global leader in sustainable energy, is set to transform the lives of 1,200 students in Bhilwara, through its solar capability. In February 2014, the company equipped three schools with solar-enabled infrastructure.

Amidst the heat wave in Rajasthan, where mercury goes beyond 45 degree Celsius, Fortum's effort has brought relief to the lives of 1200 students. Today, they can study in a friendly atmosphere and without any interruption. The attendance rate in these schools during summers has improved significantly in comparison to the previous years.

Ms. Charu Verma, Principal - Shishu Sadan, Bhilwara said the attendance in summer went up to 95 % after this installation.

ACC first to release G4 report

ACC Limited has launched India's first externally assured Sustainable Development report that is prepared and published in accordance with the latest G4 guidelines of the Global Reporting Initiative (GRI). ACC's Sustainability Development Report for the year 2013, gives an overview of the company's efforts and achievements in promoting sustainable development.

In addition to conforming to the new reporting guidelines its materiality matrix, the exercise helped the company to prioritize key concerns of stakeholders in respect of sustainability. It has also enabled the company to develop a more meaningful road map for the near term.

Key Achievements

- On the environment excellence journey, the company's overall carbon intensity has been cut by 32% since 1990. Despite an increase in demand for more 'carbon-intensive' products like Ordinary Portland Cement (OPC), ACC reduced its overall specific CO2 emissions to 528 kg CO2 /tonne of cement through various CO2 reduction initiatives. It also reduced specific kiln dust emissions by as much as 18%.
- ACC's commissioned its first waste heat recovery power generation unit of 7.5 MW this year. It has the potential to reduce approximately 44,180 tonnes of CO2 per year while providing 7.5% green energy for the plants. The set up will soon be replicated in other ACC plants across the country.
- In 2013, ACC realized 94,459 Certified Emission Reductions (CERs) from their Clean Development Mechanism (CDM) projects registered with United Nations Framework Convention on Climate Change (UNFCCC) and submitted verification reports recommending for issuance of 846,313 CERs.
- As part of ACC's Alternative Fuel and Raw materials (AFR) program implemented under Holcim's Geocycle banner, the company was able to raise the thermal substitution rate (TSR) to 4.36% during the year. This resulted in **usage of more than 5 Lakh tonnes of alternative raw materials and fuels in the cement manufacturing process.**

Ramesh Agrawal wins Green Nobel

Environmental activist Ramesh Agrawal, who helped villagers stop a massive coal mining project, is among six people around the world to be awarded the prestigious Goldman Environment Prize.

The annual prize honors outstanding grassroots environmentalists for their sustained and significant efforts to protect and enhance the natural environment, often at great personal risk. The individual cash prize of $175,000 makes it the largest award of its kind.

"With a small internet cafe as his headquarters, Ramesh Agrawal organized villagers to demand their right to information about industrial development projects and succeeded in shutting down one of the largest proposed coal mines in Chhattisgarh," a statement from the Goldman Environment Prize said.

The prize was established in 1989 by San Francisco philanthropists Richard and Rhoda Goldman and winners are selected by an international jury.

Solar plant to power Chennai airport

Solar power could soon drive Chennai airport. Airports Authority of India is planning a solar plant that will meet the airport's requirements and the surplus power supplied to the grid. The move is part of a plan to install solar power plants at 30 airports across India. AAI and Solar Energy Corporation of India signed an MOU in May this year to generate 50 MW in the first phase.

AAI wants to install solar panels on the buildings or in the space between the runways at the airport that is spread over more than 3,000 acres. The airport now spends a lot of money to keep the land clear of grass and bushes and it is felt this is a better way to use the land.

Chandigarh to use TERI's GIS tool to generate solar power on rooftops

Chandigarh has become the first city to offer rooftop mapping facility through web-GIS; (geographic information system), a tool launched by The Energy and Resource Institute (TERI). Chandigarh has total 1.10 lakh rooftops, where 400 megawatt capacity solar plants could be installed.

The GIS mapping of rooftops has added a new feather in the city's cap. Details of each rooftop and space required for installing solar plants are available. Chandigarh is the first city to have this facility. Chandigarh has installed solar plants on government buildings.

Green energy to power over 50% homes in big cities

The Modi-led government has started work on a plan to ensure half of all homes in major cities receive some power from solar or wind energy sources by 2019.

The plan includes fresh incentives to encourage companies and individuals to invest in renewable energy sources and setting up giant solar plants in states such as Gujarat. New plans for renewable energy are also in the pipeline for the Delhi. The Delhi government is looking at additional incentives to citizens for installing roof-top solar systems with grid connectivity.

If people will have an option to sell the excess power to the electricity grid for which a policy initiative is being revived, some income every month will be an additional incentive for switching to green energy.

Gujarat implemented the Jyotigram Yojana that provided 24/7 power to each household. The scheme depended on solar, wind, biomass and waste as energy sources to generate about 25,000 MW annually. Gujarat initiated work on building the world's biggest solar park of 4,000 MW spread over 20,000 hectares of salt land in Kutch.

The state also installed solar panels over a water canal to ensure both power generation

and saving water lost to evaporation. Previous governments have tried to popularize renewable energy with a subsidy scheme for installing solar installations including roof-top power standalone generation systems. But the schemes didn't have desired impact as the required political push was absent.

Grid-connected rooftop solar system to come up in Kolkata

The UK government and the West Bengal department of power and Kolkata Municipal Corporation are working on developing a grid-connected rooftop solar system. "Over the next few months, we will be working with the West Bengal government and supporting Ashden India Renewable Energy Collective to help develop an affordable rooftop solar scheme through which they will be able to reduce their power bills and greenhouse gas emission of the city," Scott Furssedonn-Wood, British Deputy High Commissioner to Eastern India said.

Under this initiative, there will be a major emphasis on capacity building programmes for key stakeholders to implement such schemes in the state, he said.

http://panchabuta.com/2014/06/24/grid-connected-rooftop-solar-system-to-come-up-in-

Oberoi Mall achieves GOLD rating

Mumbai's Oberoi Mall in Goregaon has become the first mall in India to achieve USGBC* LEED** Existing Building GOLD Rating, scoring 60 points under Operation & Maintenance Category.

Godrej Green Building Consultancy Services (GBCS) provided a comprehensive green solution which included Facilitation, Retro-Commissioning, Energy Audit and Waste Stream Audit. The mall's green initiative has been rewarded with a host of benefits.

Through the Existing Building (EB) rating, the Oberoi Mall demonstrated that water and energy consumption of malls too can be brought within internationally acceptable standards.

Water Management: Retro-fitting of plumbing fixtures with aerators enabled a 30-40% water use reduction. The complete landscaping water needs are now met by the STP.

Energy Management: With software tools like the Energy Star Portfolio Manager, a structured approach was developed to map the energy performance of the mall year-on-year. This also helped to map the current levels of CO_2 emissions with respect to energy consumption. Some of the implemented measures include lux level sensors for lighting, occupancy sensors to control lighting and group control for elevators.

Retro-commissioning: GBCS introduced the concept of the retro-commissioning to the mall operators for the first time. The goal was to evaluate the current performance of the building systems and identify measures to enhance the energy efficiency.

O&M practices: The mall already had regular and planned O&M practices. Additionally, GBCS documented a System Description and Building Operation Plan for the mall operators. A preliminary walkthrough audit was conducted to ensure that the mandatory requirements are met. Regular O&M documents like the checklist, operational plan etc. were also aligned with international standards.

Housekeeping and Waste Management: Green Seal Housekeeping chemicals, with minimal impact on human health, and sustainable cleaning equipment are now employed by the mall staff. A Waste Stream Audit was conducted and a procedure was set up to track waste collection and disposal.

A Sustainable Purchasing Policy which provides guidelines for purchase of eco-friendly materials with recycled content, low mercury lamps, local materials from within 500 miles, FSC certified materials etc.

Bangalore's greenest Sewage Treatment Plant

St. Martha's Hospital in the heart of Bangalore has been treating patients for over 128 years now, and sees traffic of two and a half lakh outpatients and 21,000 in-patients a year. As a hospital, it is no real surprise that they release a daily volume of waste water of about 300 KLD (kilolitres per day). Taking care of this can be an ordeal, as apart from the sheer scale of the operation required, also considering that the nature of the waste released by hospitals (wet, dry and bio-medical) is more complex than a regular bulk generator.

When St. Martha's Hospital opted to use an STP in 2009, they had a couple of options: a conventional STP based on aerobic bacteria which would operate as a perpetual motor requiring fuel, or based on anaerobic bacteria, which while not being a very popular option at the time, would prove to be the better long term economical choice as well as one that would enhance their reputation as a sustainable hospital.

Anaerobic versus Aerobic

Water recycling can prove to be economical in two ways – firstly, the cost of running an anaerobic STP is roughly one-twelfth of the cost borne in the running of a regular aerobic treatment plant. Secondly, there are major savings to be made in water usage as a result of the reusable water that the STP provides you with. In the case of St. Martha's hospital, the water supply bill was brought down from five lakhs to two and a half lakhs, which is a 50% decrease. The installation of anaerobic STPs in particular can be even more economical as it decreases the costs involved in heavy motors and mostly involves civil installation works.

Nagaland activates India's first solar powered water treatment plant

A solar-powered water treatment plant - a first by a state in India was inaugurated at Tsiesema village, near Kohima, recently.Two similar projects had been installed in two villages of Meriema and Kijumetouma in Kohima district. The two villages along with Tsiesma are facing an acute water scarcity in the whole district.

The solar powered Advanced Membrane Filtration system has been developed by Mumbai-based Aditya Corporation and is designed to produce pure drinking water. 99.99% bacteria will be removed from the water by the system without hampering other elements or the taste.

kolkata/?utm_content=buffer79c09&utm_medium=social&utm_source=linkedin.com&utm_campaign=buffer

India's renewable energy constitutes 13% of capacity

India's total installed capacity of renewable energy has touched 32,269.6 MW as of March 2014, which is 12.95% of the potential available in the country. With this, renewable energy, including large hydro electric projects, constitutes 28.8 per cent of the overall installed capacity in India.

According to the India Renewable Energy Status Report 2014 the total renewable energy potential from various sources in India is 249,188 Mw. The untapped market potential is 216,918.39 MW, a huge growth potential for renewable energy in India.

The Ministry of New & Renewable Energy has set a target of overall renewable energy installed capacity of 41,400 Mw by 2017. This creates an opportunity worth $10.51 billion for the renewable energy market in India till 2017. India has the world's fifth-largest electricity generation capacity, which presently stands at 243 GW.

Is it time to make eco-labeling compulsory in India?

Vivek Gilani, an Ashoka Fellow and founder cBalance Solutions Hub, rues the failure of ECOMARK and has come up with an alternative along with IIM Ahmedabad. The buy-in has been slow but is expected to catch up with greater consumer awareness. Excerpts of his chat with **Benedict Paramanand,** Editor of SustainabilityNext

How's the eco-labeling concept you pioneered picking up?

I set up Green Signal along with IIM Ahmadabad in 2011. The Green Signal program is not government-funded or supported. Because of this there's a lack of visibility for this symbol. It hasn't percolated into the mindset of consumers, SME enterprises or even large enterprises to get themselves eco-labeled so that they could differentiate themselves. Through corporate communications activities we are trying to change that.

India still lacks a formal backing for Green Signal eco label or any other eco label. That has been a hurdle. We are currently looking at restructuring Green Signal to expand the support base.

The second obstacle is the cost of eco-labeling. Currently, the licensing of eco-labeling doesn't cost much because it is run through a couple of NGOs. Entrepreneurs perceive this as cost which doesn't guarantee commercial benefit in the short term. They also feel that they need to be very conservative when it comes to how much they pay consultants to measure their sustainability matrix. I admit that requirements for certification are currently a little cumbersome.

We feel that most SME entrepreneurs who are doing excellent work in creating sustainable products and services do not have the technical capability to measure sustainability. They are domain experts and it is difficult for them to know their own impact on the eco-system. So they have to rely on external consultants. What we want to do in Green Signal is reduce the importance of the

Vivek Gilani

gatekeepers/consultants through more open-sourced mechanisms.

With Green Signal, we are able to rapidly enhance the rate of certification while reducing cost for the enterprise.

Once the label demonstrates itself as a true device for differentiation then

I think it actually deserves to be supported by the SMEs themselves by paying for the cost of auditing.

What's the rough cost, just to get an idea?

Currently, the two-year licensing cost of Green Signal for an organization that has a turnover greater than 5 crores is Rs. One lakh. This is very low. However auditing carbon footprint, direct and indirect emissions, measuring sustainability matrix could cost between Rs. 4-5 lakhs.

The Green People of India TGPI, a consortium of about 50 to 70 sustainable product manufacturers and service providers, want to aggregate demand and they want to leverage scale. They want to come across as a common front or a platform for entrepreneurs so that they can make use of common services such as eco-labeling certification. Cluster eco-labeling approach of 5-6 companies with similar operational parameters reduces cost.

Are you pushing the government to make it mandatory?

No, we are not working at the advocacy level; our approach is bottom up. We feel that if we show sufficient examples of organizations who have come ahead and done this and provide case studies, it should work.

We have demonstrated this to the pollution control boards. For example, the Gujarat Pollution Control Board understood how it is far more sophisticated and progressive than the ECOMARK which was India's first eco label.

How different is Green Label from ECOMARK?

ECOMARK is essentially an eco label which is a yes and no certification. Either you get it or you don't get it. It's primarily based on just pollution parameters around local air pollutants during the manufacturing phase of the product. This can inherently preclude or exclude materials. A service might not have high pollution impact but have a high climate change impact because the embodied carbons being higher. Secondly, it also excludes services. For example, a developer can't get their building eco labeled or a hotel can't get eco labeled because the nature of the service has got to do with the entire life-cycle of operations as well. **It was relevant in the 90s but it hasn't moved on.**

Is ECOMARK compulsory?

Even that is not mandatory, it's completely voluntary, and it's been a remarkable failure. In its 21 year history, only two or three organizations have been labeled, nobody knows what to make of it when they see it on a product.

Green Signal was a reaction to the fact that India's only attempt at eco label had failed.

Whenever we eco label organizations I hope that drives other entrepreneurs who say even I want to get differentiated for my best practices that I am following in my organization.

You have created a range of tools and solutions. Are they mature and how can people access them?

We have two tools right now. One is called the **Foot Print Reporter** - a product we have created for enterprises to be able to map the carbon hot spots and this can be extended to other hot spots as well. Through this tool we are able to give organizations a way to source the mapping of their emission hot spots as well as do scenario modeling of various low impact areas in a very rapid manner. This helps organizations with a decision support tool for making transformations in terms of technology, operational standards, operational practices, among others. The free demo version of the tool is available at cBalance (http://cbalance.in/).

The India specific and the more rigorous version which is needed for a commercial enterprise with embedded emission factors, this tool is available through a licensing fee model – an annual licensing model where we are charging organizations, depending on the size of the organization, depending on how many projects they need to do on this platform. On the carbon ERP platform, we charge differently. This is called the **cBalance Footprint Reporter which is India's only India-specific**

Carbon ERP system

The second tool that we have created is primarily geared towards research institutions and academic institutions which are teaching sustainability, energy efficiency or carbon finance. This tool is called **Emission Factor Database** which is fully searchable carbon emission database. It has about 19,000 emission factors to India. This tool is far more cost effective in terms of being able to make it available to organizations with a very limited capacity because it has been completely developed in-house for our own research. All the research is validated is in alignment with global GHG emissions methodologies.

It runs on the SAS model. This product has been built in association with a partner organization in UK called **The Best Foot Forward.** We are the India associates with respect to this tool and we have created the India specific version of this.

Indian Companies Corner Zayed Energy's 2014 Awards

Clean start-up technology companies popularly called clean-tech are coming into their own and are competing in international competitions. Two such India-based examples are **AbellonCleanEnergy** and **Orb Energy,** both were awarded funding by the world's largest annual prize purse in renewable energy and sustainability, the **Zayed Future Energy Prize.**

KSV School student from Dharward receiving the award

Abellon received US$1.5 million in 2014 for winning the Prize's Small Medium Enterprise (SME) category. Founded in 2008 by Aditya Handa, Abellon manufactures and sells biomass pellets made from agricultural and sawmill residues sourced from local farmers in partnership with Poornakumbha, an NGO established by Abellon. The role of Poornakumbha is to help farmers create value from waste – where 'waste' refers to not just agricultural residue but also under-utilized land and other natural resources.

The company uses an integrated approach to establish supply chains in rural areas in India and Ghana. These range from decentralized biomass collection to power production and power trading. Abellon has been driving economic growth, improvement in crop yields and support for rural farmers in its home state of Gujarat. While its main operations are in India, Abellon is also expanding to other developing and developed nations around the world.

Orb Energy

The recipient of US$ 1 million for finishing as SME runner-up in the 2012 Zayed Future Energy Prize, Orb Energy is India's leading provider of solar electricity and hot-water systems. **One of its key innovations is managing a direct branch infrastructure dedicated to solar energy.** Orb has established 159 direct-run branches, from which its personnel sell, install and service solar systems. It has established financing tie-ups with nearly 20 local banks, and sold and installed nearly 30,000 solar energy systems, benefitting approximately 150,000 customers in rural and semi-urban India. About 45% of Orb's sales are from solar photovoltaic systems while 50% of their sales are from solar water-heating systems.

IDEI

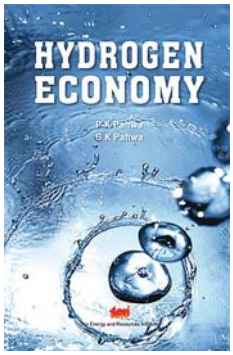
Two more India-based organizations to benefit from the prize are **IDEI** – a social enterprise dedicated to providing long-term solutions to poverty, malnutrition, and hunger – and **Kalkeri Sangeet Vidyalaya (KSV),** a school that caters to disadvantaged students in the Dharwad district of Karnakata.

IDEI provides small holder farmers with low-cost irrigation technologies that drastically improve production and save over 500 million liters of diesel fuel, decreasing their carbon footprint by 1.8 million tones of CO2.

Aditya Handa of Abellon

Meanwhile, KSV was awarded a grant of US$ 100,000 for winning in the Global High Schools (Asia) category in 2014 for the school's student-led project incorporating energy efficiency, solar lighting and bio-gas, a 'green' amphitheatre and a Light Scholarship program to electrify the homes of deserving underprivileged students.

The $4 million Zayed Future Energy Prize, launched in 2008 by the government of the United Arab Emirates to recognize those who have made a significant contribution to sustainability and renewable energy, acts as a catalyst for clean-tech innovation, encouraging enterprises to push their research further. While market forces are traditionally the key drivers for finding solutions to global challenges, such as energy access and climate change, additional catalysts, like the Zayed Future Energy Prize, can incentivize innovation where the market leaves a gap.



Hydrogen Economy

By P K Pahwa and G K Pahwa

The Energy and Resources Institute, TERI, April 2014

As the dependence on the depleting fossils fuels continues and global warming increases, we need to find an energy system that is renewable and sustainable, efficient and cost-effective, convenient and safe. Hydrogen has been proposed as the perfect fuel to sustain the energy system. The availability of a reliable and cost-effective supply, safe and efficient storage, and convenient end use of hydrogen will be essential for a transition to a hydrogen economy. Research is being conducted throughout the world for the development of safe, cost-effective hydrogen production, storage, and end-use technologies that support and foster this transition.

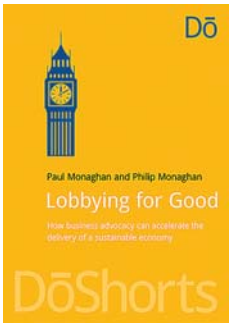
Hydrogen Economy discusses the strategies and roadmaps of introducing hydrogen as the alternate source of fuel for sustainable development. The book examines the link between development and energy, prospects of sustainable development, significance of hydrogen energy economy. It provides an authoritative and up-to-date scientific account of hydrogen generation, storage, transportation, and safety.

Creating Employee Champions: How to Drive Business Success through Sustainability Engagement Training

By Joanna M Sullivan

Do Sustainability, June 2014

Disengaged employees cost companies billions in lost productivity and high turnover rates. Integrating sustainability into the soul of your business can unleash an 'upward spiral' of engagement, and turn your employees into sustainability champions. Making business sustainability part of the job description drives employees towards collaboration, community and commitment. It transforms employees into authentic brand ambassadors and companies into movements. In addition, companies that embed sustainability are better positioned to anticipate and adapt to changing market conditions. Creating Employee Champions offers a three-step method for sustainability engagement training and a paradigm shift in employee engagement and business sustainability. Use it transplant NGO DNA into business DNA, so you can inspire hearts and minds, engage employees, foster dynamic commitment to meet sustainability goals and equip employees to engage with external stakeholders.



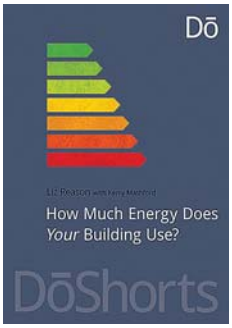
Lobbying for Good: How business advocacy can accelerate the delivery of a sustainable economy

By Paul Monaghan, Philip E Monaghan

Do Sustainability, June 2014

The business case for sustainability or corporate responsibility will never be strong enough to support an isolated business in its competition against the unscrupulous. The progressive vanguard reaches a point where it can advance no further without rendering itself uncompetitive. That is, unless advocacy and public policy intervention change the rules and shift the bar for the allowable lowest common denominator. With the base reset, so is the bar of aspiration. New rules enable new behaviors', with players competing on a fairer, more sustainable footing.

This ground-breaking book, describes how far-sighted businesses are rebooting the game, throwing off cultural inhibitions and sticking their head above the parapet to advocate progressive legislative change. The authors describe a strategic opportunity to get on board the next wave of CSR – the most radical and impactful yet -- and explain how finely-tuned and well-delivered Lobbying for Good can be an extremely cost-effective brand-enhancement tool. Against a backdrop of general mistrust in business lobbying, learn how leaders are making it work and Lobbying for Good.



How Much Energy Does Your Building Use?

By Liz Reason, Kerry Mashford

Do Sustainability, April 2014

Why do award-winning 'green' buildings so often have higher energy bills than ordinary buildings? Why do expensive refurbishments deliver outcomes that are far from the promises of improved sustainability? Why does your building have high running costs and still the occupants complain about being too cold or too hot and are otherwise dissatisfied?

The failure of many countries to produce buildings that are comfortable with excellent energy performance is a scandal. Achieving low energy buildings does not involve learning rocket science: just some basic building physics, a clear language for talking meaningfully about energy-efficient outcomes with all those in the buildings cycle, and an outlook that casts a new low energy perspective on old problems.

This book provides that common language. It outlines a path towards understanding what makes for a good quality low energy building, the stakeholders that need to be engaged, and encourages new ways of thinking about how to reduce energy use and costs.

Green Power
17 & 18 July 2014, Chennai
www.cii.in

Green Sugar Summit
23 & 24 July 2014, Hyderabad
www.cii.in

Power Plant Summit
31July & 1 August 2014, New Delhi
www.cii.in

5th World Renewable Energy Congress
Aug 21 - Aug 23, New Delhi
http://www.wretc.in/#sthash.ACj9hTz8.dpuf

Advanced Training Programme on Green Buildings
Sep 2 - Sep 3, 2014, Hyderabad

Workshop on Energy Simulation in Buildings
Sep 2 - Sep 3, 2014, Hyderabad

Renewable Energy India Expo
Sep 3 - Sep 5, Greater Noida
http://www.renewableenergyindiaexpo.com/#sthash.E5NqODEw.dpuf

International Conference on Green Buildings
Sep 4 - Sep 5, 2014, Hyderabad

Green Building Congress 2014
Sep 4 - Sep 6, Hyderabad

Exhibition on Green Building Materials & Technologies
Sep 4 - Sep 6, 2014, Hyderabad

Green Building Congress
2 – 6 September 2014, Hyderabad
www.cii.in

Conference on Green Homes
Sep 6, 2014, Hyderabad

Conference on Existing Buildings
Sep 6, 2014, Hyderabad

Conference on Green Schools
Sep 6, 2014, Hyderabad

Common Criteria: Meeting the Technology Challenges"
9-11 September, 2014
Hotel Lalit, New Delhi
www.cii.in

Watertech India 2014
Sep 10 - Sep 12, New Delhi
http://www.watertechindia.com/#sthash.G6XqlcHb.dpuf

4th India Smart Utilities Week
Sep 16 - Sep 18, New Delhi
http://www.wsgcindiaweek.com/

Light India
Sep 18 - Sep 21, New Delhi
http://www.messefrankfurt.com.hk/other/country_list.aspx?country_id=12

Energy Efficiency Summit
29 October – 1 November 2014, Hyderabad
www.cii.in

Greenco Best Practices Award and Waste Management Summit 2014
20-22 November 2014, Pune
www.cii.in

Solar Energy Course
https://www.edx.org/course/delftx/delftx-et-3034tu-solar-energy-1996#.U61J7LHNk69

Science and Management for Sustainable Living
www.bhoomicollege.org

Post Graduate Diploma Course in Sustainable Development (PGDM-SD)
http://bimtech.ac.in/

M.Sc. in Sustainable Development - Distance learning Course + information
The Global Open University
http://nagaland.net.in/

Post-Graduate Certificate in Sustainable Enterprise
Indian Institute for Sustainable Enterprise
http://theiise.net/pgcertinse.html

Postgraduate in Sustainability Management
Silver Bright Institute of Management
http://www.htcampus.com/college/silver-bright-institute-management-sbim

Post Graduate Diploma in Sustainability (Distance learning)
Chhattisgarh University
http://www.cguniversity.com/

Post Graduate Diploma
IGNOU- Indira Gandhi National Open University
http://www.ignou.ac.in/

Master of Architecture (Sustainable Architecture)
Bharati Vidyapeeth Deemed University
http://www.bharatividyapeeth.edu/Campuses/Pune/default.aspx

MBA and MA in Sustainability Management
TERI University
http://www.teriuniversity.ac.in/

M Tech, MSc Environmental Science
Thapar University
http://www.thapar.edu/

PG Diploma
Entrepreneurship Development Institute of India
http://www.ediindia.org/

M Tech in Environmental Engineering
The National Institute Of Technology, Tiruchirappalli
http://www.nitt.edu/home/

Advanced Diploma in Bio Degradable & Solid Waste
Vellalar College for Women
http://www.vellalar.com/Arts/carrer-oriented-programmes.php

PhD in Environmental Science
Gauhati University
http://www.gauhati.ac.in/

MSc in Environmental Science
Dr Babasaheb Ambedkar Marathawada University
http://www.bamu.net/dept/environment/

Advanced Diploma in Energy
Vidya Prasarak Mandals Polytechnic
http://www.vpmthane.org/polywebnew/courses.html

BSc in Environmental Science
University of Calicut
http://www.universityofcalicut.info/

PhD in Environmental Science
Punjab University
http://puchd.ac.in/

MSc in Environmental Science
Bharathiar University
http://www.b-u.ac.in/

MBA in Environmental Science
School of Management & Infrastructure & Development Studies
http://www.minds-india.org/

MA in Environmental Economics (Distance Learning Course)
Annamalai University
http://www.annamalaiuniversity.ac.in/

PhD in Environmental Bio-Technology & Solid Waste Management
School of Environmental Sciences, Jawaharlal Nehru University
http://www.jnu.ac.in/main.asp?sendval=SchoolOfEnvironmentalSciences

MBA in Energy & Environmental Science
Symbiosis Institute of International Business
http://www.siib.ac.in/programmes.aspx