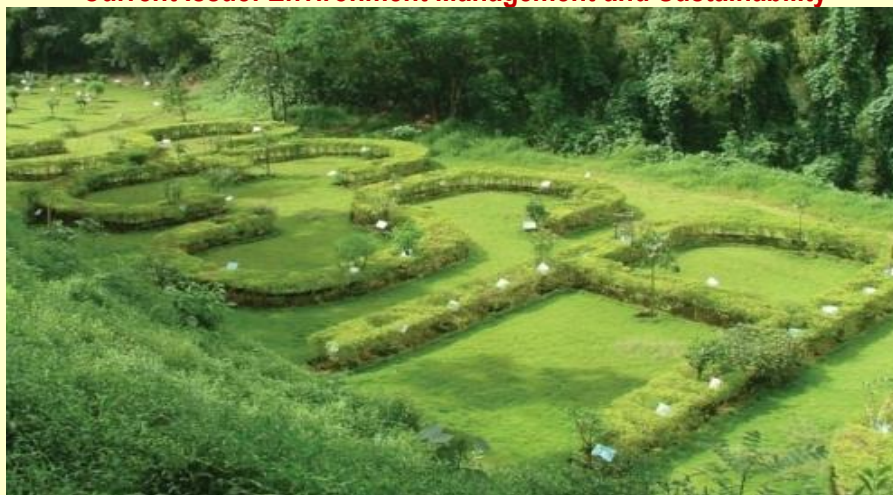


## Current Issue: Environment Management and Sustainability



Charak vatika developed on reclaimed Sesa iron ore mine, Vedanta Ltd. Goa (Source: Article-3)

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### From Director's Desk



I am extremely happy to share with you all that 'The Environment Management', the quarterly newsletter from SIES IEM has successfully completed one year of its journey. The four issues released during the last one year focused on pertinent areas of sustainable environment management. The current issue is commemorating theme of the International Conference on 'Environment Management and Sustainability' which is being organized from 4<sup>th</sup> to 6<sup>th</sup> January 2017 with sponsorship from SERB, Ministry of Science and Technology, GOI, MPCB and co- sponsorship from DRDO, CSIR and JNPT.

The UN Climate Change Conference in Marrakech (COP 22) held in November 2016 further emphasized to reduce the emission of greenhouse gases by adopting good practices viz. reuse, reduce, recycle and maximum utilization of locally available resources. In this regard, it is imperative to identify and exploit ecosystem services for supporting resource generation; regulating the effects of climate change and environmental pollution and provisioning natural resources for therapeutic, economic, cultural and holistic development. Industry plays profound role in improving the quality of human life. They may also showcase their concern for environment by adopting eco- efficient technologies and practices. The current issue of newsletter focuses on exploring ecosystem services for environment management, eco restoration of mining affected land, eco efficient technologies and waste management.

Dr. Seema Mishra



## Indian Business Response to Climate Change - Summary of Actions from Sustainability Reports



**Pravin Jadhav, Dr. Ram Babu**  
RSM GC Advisory Services, Navi Mumbai

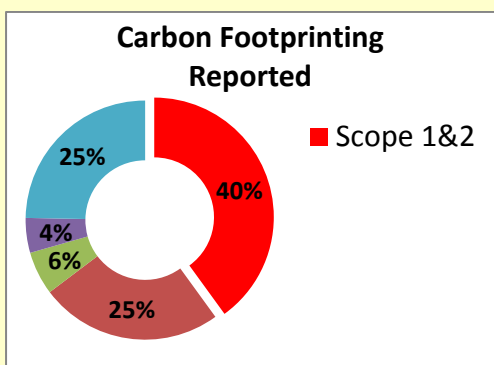
This summary is based on a documents review conducted at RSM GC involving analysis of about 100 sustainability reports (FY 2014-15) and other related public disclosures from Indian companies. The response of companies to climate change is further distributed into (A) extent of carbon footprint disclosure (B) voluntary targets taken to reduce the GHG emissions (mitigation) and (C) company's response to the climate change impacts (adaptation).

### (A) Extent of carbon footprint disclosure

Companies cite one or more of the following business goals as reasons for compiling GHG inventory

- Managing GHG issues and identifying mitigation opportunities
- Public reporting – Voluntary or mandatory
- Participation in GHG Markets

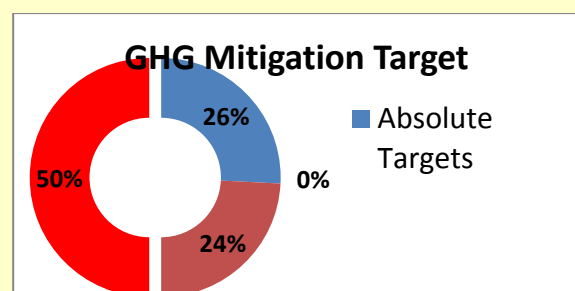
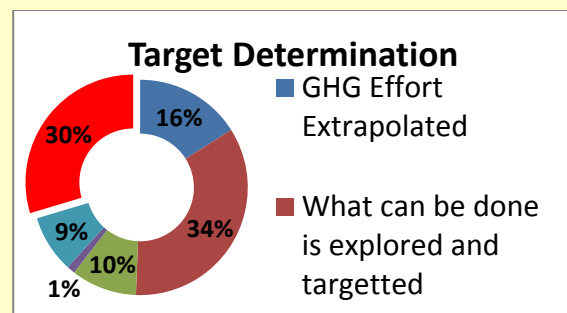
Result of the review - 40% of entities restrict their carbon footprint disclosures to scopes 1&2, another 25% go ahead and include scope 3 emissions from logistics and business travel. It is interesting that about 10% of the businesses are reporting scope 3 emissions that either include embedded carbon or emissions from products in use.



(B) Voluntary targets taken to reduce the GHG emissions

Nearly 30% of Indian Businesses have not disclosed any targets for GHG emission mitigation, while reporting their footprint and actions/ projects to reduce emissions. Businesses in India largely (about 50%) adopted Business-as-Usual approach to target setting. Diligent exploration of what and how much GHG mitigation be achieved, was done by 34% businesses surveyed. In contrast, 16% of businesses in India, extrapolated their GHG emission reduction into next few years and set these as the targets. Out of the remaining 20%, half of the businesses adopted sectoral approach and set good or best practices as their targets.

For the remaining 10%, GHG emission reduction targets were derived out of country commitments or science based targets. While target setting methodology by these pioneers, can further be improved, the approach and attempt is quite commendable.



**(C) Company’s response to the climate change impacts**

Majority (57%) of surveyed businesses in India, have not undertaken Climate Mitigation risk assessment and accordingly have not put in any risk management plan/program in place.

Out of the remaining 43%, a significant 20% restrict risk identification to upcoming climate mitigation regulatory landscape. In contrast, 17% identify and manage risks due to climate mitigation impacts on macro economy e.g., increase in energy prices etc., and 6% extend this and focus on risks along the value chain. Most common response (79%) is to mitigate GHG emissions is to continue business-as-usual or identify and undertake GHG emission reduction projects. Up to 11% of Indian businesses extend mitigation effort to value chain- most work with suppliers to improve energy efficiency and some work for product innovation to reduce GHG emissions. However, none use internal carbon price or internal carbon markets to achieve set targets.

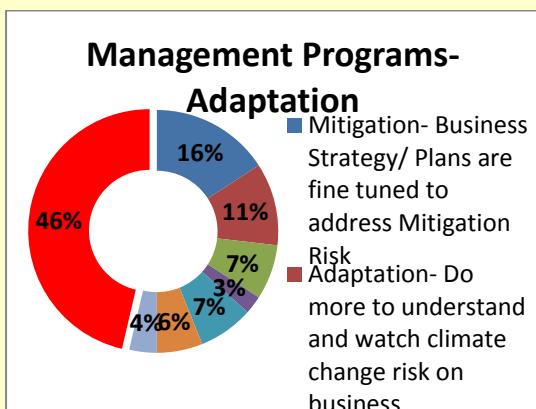
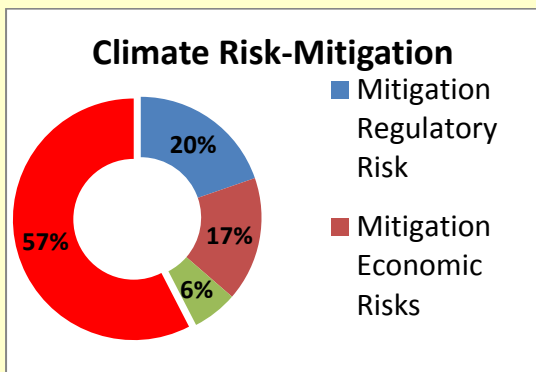
**Summary and recommendations:**

It is imperative that businesses in India address the challenge of GHG mitigation. For many businesses, the GHG footprint along the value chain can be significantly larger than in direct operations. Setting GHG mitigation targets in operations and along the value chain in line with country commitment or following SBT approach is recommended. The methods of achieving GHG mitigation targets could be innovative and use market based instrument or reward mechanisms.

Business in India has not yet assessed the risks to its assets and value due to physical climatic changes. Doing this is prudent financial practice and can aid future proofing of business.

(Please read our full review report at link below –

<https://rsmgcblog.files.wordpress.com/2016/06/climate-changes-rsm-gc-15-jun-2016.pdf>)





# Ecosystem Services for the Mitigation of Effects of Climate Change

**SIES Indian Institute of Environment Management  
Plot No. 1E, Sector- V, Nerul, Navi Mumbai 400 706**

Ecosystem is a dynamic community of living organisms that exists in synergy with the non-living components of their environment interacting as a system. The biotic and abiotic components ensure smooth cycling of nutrients, flow of energy and their interactions to maintain the efficiency of system. Humankind benefits in multitude of ways from ecosystem. They maintain biodiversity and the production of ecosystem goods, such as food, forage timber, biomass fuels, natural fiber, and many pharmaceuticals, industrial products, and their precursors. Collectively these benefits are known as ecosystem services. Ecosystem services are the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life. Although, ecosystem is a subject of research for long time, the concept of Ecosystem Services was popularized by Millennium Ecosystem Assessment (MA) in early 2000s. As per this concept ecosystem services can be grouped in four broader categories:

## **1. Provisioning Services**

These are the products obtained from ecosystems eg. food, fiber, fuel wood, fresh water, genetic resources etc.

## **2. Regulating Services**

The benefits obtained from the regulations of ecosystem processes viz. climate regulation, flood regulation, disease regulation, water purification etc. are the services which supports the functioning of ecosystem directly as well as indirectly.

## **3. Cultural Services**

The non-material benefits obtained from ecosystem have immense benefits for human kind, The services include aesthetic, spiritual, educational and recreation benefits.

## **4. Supporting Services**

Services necessary for the maintenance of all other ecosystem services comes under supporting services. The examples of supporting services are

biomass production, nutrient recycling and soil formation.

The first three services directly affect humankind and have short term impacts. However, supporting services have indirect effect on human being with long term impacts. The diversity in ecosystem positively supports ecosystem services as it directly affect supporting services such as primary productivity, soil formation, and nutrient cycling, which in turn influence provisioning services such as genetic resources and production of food, timber, fuel, and fiber. Ecosystems can serve as natural buffers from extreme events such as wildfires, flooding, and drought.

## **Climate Change and Ecosystem Services**

Currently, there is a rapid increase in human population size. Both because of this growth and changing patterns of consumption, humans are altering ecosystems on a global scale. Further, changing climate affects ecosystems in a variety of ways. For instance, warming may force species to migrate to higher latitudes or higher elevations where temperatures are more conducive to their survival. Similarly, as sea level rises, saltwater intrusion into a freshwater system may force some key species to relocate or die, thus removing predators or prey that are critical in the existing food chain. Local and regional ecosystem services may also be affected by climate change, such as water regulation or timber production, with direct implications for dependent societies. Climate change and human modification may restrict ecosystems' ability to temper the impacts of extreme conditions, and thus may increase vulnerability to damage. The anthropogenic and climate change impacts on natural as well as managed ecosystems, and the large role living

organisms play in ecosystem processes such as nutrient cycling, has resulted in increased interest in the connection between ecosystem services climate change.

### **Ecosystem Services in Climate Change Management**

Ecosystem services plays pivotal role in the mitigation and adaptation of effects of climate change. Well-managed ecosystems can help societies to adapt to current climate hazards and future climate change by providing a range of ecosystem services. Ecosystem-based approaches to climate change should recognize the multiple links between ecosystem services and climate change: management can enhance the contribution of ecosystem services to adaptation and mitigation ('ecosystem-based adaptation and mitigation') and, as climate change will affect ecosystems and their services, adaptation measures are needed to reduce negative impacts and maintain ecosystem functions. Some of the key attributes of environmental services in climate change mitigation and adaptation are listed below:

- Ecosystems contribute to mitigation because of their capacity to remove carbon from the atmosphere and to store it. Terrestrial ecosystems absorb around 3 billion tons of atmospheric carbon per year (Pg/yr) through net growth, which accounts for 30% of anthropogenic CO<sub>2</sub> emissions.
- Forest ecosystems play a crucial role in carbon sequestration, particularly tropical forests, but tropical deforestation causes carbon emissions, estimated between 0.8 to 2.8 Pg/yr (2012), equivalent to 6–17% of global anthropogenic CO<sub>2</sub> emissions to the atmosphere.
- Afforestation (converting long-time non-forested land to forest) and reforestation (converting recently nonforested land to forest), for example, increase carbon in the vegetation, whereas forest conservation contributes to reducing carbon emissions from deforestation.

- Agricultural management can also enhance carbon sequestration through soil conservation and the introduction of trees in agroforestry systems. Trees around agricultural fields regulate the vulnerability of crops to climate variations.
- In urban areas trees regulate temperatures (through shade and evaporative cooling) and water (through rain interception and infiltration), they play a role in urban adaptation to climate variability and change. Because of their impermeable surfaces, cities are vulnerable to flooding, but urban parks or trees can reduce runoff through infiltration. The urban heat island effects, which increase the health impacts of heat waves, are moderated by green cover.
- Coastal forests improve adaptation of coastal communities to the effects of sea water intrusion and erosion.
- Ecosystem support rainfall interception, evapotranspiration, water infiltration, and groundwater recharge. This reduces the impact of climate variability in downstream population.
- Timber and non timber forest products helps in the livelihood diversification during drought or floods.

The place of ecosystem-based approaches is still in nascent stage in climate change adaptation and mitigation, but some initiatives have been developed at national and local scales. Many projects and programs are contributing to effective mitigation and adaptation strategies through the conservation of biodiversity and ecosystem services. To ensure that ecosystems mitigate climate change and help people adapt, it is important to reduce current threats to ecosystem services viz. anthropogenic stresses to ecosystems as a first step. It should also address future threats by developing adaptation measures. Moreover, strengthening of climate change policies in ecosystem domain is required at all the levels for better management of resources.



## **Ecorestoration of Sanquelim Group of Iron Ore Mines of Sesa Goa Ltd. Iron Ore Business of Vedanta Ltd.**



**Krishna V. Kulkarni, Jagdish R. Desai**  
Sesa Iron Ore, Vedanta Ltd.  
Panaji (Goa) - 403 001

### **Introduction**

Minerals and metals are present everywhere in our daily lives: from the components of our cell phones, to our vehicles and the structure of buildings and bridges. Mining is an essential activity for modern society and contributes significantly to the income of many countries. As populations increase and living standards rise, the demand for mining products will continue to grow. Most of the mines are in remote locations, where infrastructure and governance are often lacking. To meet this challenge mining companies translates the full potential of minerals mined to positively benefit the economies, improve the lives of people, and respect the environment of the mining belts in which they operate. They also have to take care of the environmental degradation, unproductive and disruptive social and economic impacts and combat other negative perceptions that are generally associated with the mining community. This calls for mining companies to adhere and follow sustainable environmental practices to mine in a responsible way in order not to harm the planet, the environs and the communities around. Not all countries have a robust Sustainability Development Framework or legislation to oversee the operations of a miner and this generally leads to irresponsible mining operations by a few who are not wary of the harm they cause to the environment and the people.

### **Responsible Mine Closure**

Mining is a temporary activity, with the operating life of a mine lasting from a few years to several decades. Mine closure occurs once the mineral resource at a working mine is exhausted, or operations are no longer profitable. Mine closure plans are required by most regulatory agencies worldwide before a mining permit is granted, and must demonstrate that the site will not pose a threat to the health of the environment or society in the future.

Mine closure is the process of shutting down mining operations on a temporary or permanent basis. Mines have a limited lifetime which is determined by the size and quality of the mineral deposit being extracted. It typically takes two to ten years to shut down a mine, but it can take longer too. Once production stops the mining company decides to close operations. Reclamation typically involves a number of activities such as removing any hazardous materials, reshaping the land, restoring topsoil, and planting native grasses, trees, or ground cover. A classic case is the Sanquelim Group of Mines which has been reclaimed in a phased manner by Vedanta, making sure a mine is closed responsibly. The Company has led by example well in advance before legislation or regulation was even thought of for responsible closure of mines in India.

The Sanquelim Group of Mines of Vedanta - Sesa Goa Iron Ore is located in Mauliguem village of Bicholim taluka of North Goa district. The said mine was the second mine of Sesa Goa Iron Ore

with an area of 203 hectares. Large-scale mining operations ceased in the late eighties and post that started the large scale reclamation efforts. Reclamation measures at Sanquelim Mine are one of its kind and considered to be a model reclaimed mine project.

### Sanquelim Mine Reclamation Concept

Most of the areas were covered by planting fast growing plants like *Acacia auriculiformis* and *Casurina equisetifolia*. The former species was at that point of time advocated and supplied by the



**A view of vegetation on reclaimed mine**

Forest Department. The reason being the species is fast growing, leguminous, and can grow on dumps without any aftercare and irrigation. These species were basically planted as nurse crop so as to prevent erosion on dumps and to stabilize the dumps. The Company also tried growing cashew plants based on their past experience at Orasso Dongor mine, which is one of the Company's oldest mine operated during 1960's and exhausted in 1974. The Company has prepared a Sanquelim mine biodiversity management plan and the same is approved by the state Forest Department. The objective of the plan being, to cut the mature trees (mostly monoculture plantation of *Acacia*) and undertake plantation of native species, thus improving the biodiversity of the area. Various projects like medicinal gardens, bamboo pavilion, bamboo setum, butterfly Park have already been developed under the management plan initiative. This has totally changed the landscape in the area making abundant with flora and fauna all well deserving to be an ecotourism destination. The medicinal gardens were developed on one of the dump benches based on two concepts:

**Nakshatra Devata Udyan:** It is based on the 27 constellations (Nakshatras). The garden consists of two sacred trees to each of the 27 Nakshatras. There are also sacred plants for zodiac signs and planets.



**Butterfly Garden**

**Charak Devata Udyan:** It is based on ancient science of Ayurveda. The plants are classified into nine different classes and further sub divided according to functions into 81 sub classes.



**Medicinal garden on dump benches**

Biodiversity plantations were taken up in various systems of plantations like horti- silviculture. The fruits produced from the area like pineapples, mangoes, guava, and banana are as of now not commercially exploited but distributed to our students from the Football Academy and Technical School and some of the fruits are retained on the trees for attracting birds and insects for pollination. All these plantations are irrigated with rainwater harvested in the exhausted mining pit. Rubber plantations are also carried out in some areas. Green cover species *Plureria* - leguminous creeper is planted on these waste dump surfaces, which helps to enrich the soil by fixing nitrogen and also increasing the organic matter in the soil.

**Pisciculture project** was taken up in collaboration with National Institute of Oceanography in the year 1990. One of the worked out pits (Lisboa)

was terraced with loose soil to facilitate afforestation, and the pit is used for Pisciculture. The pit receives fresh water from rains and a good volume of the water remains throughout the year. The fingerlings of **Rahu, Mrugal & Carp** (around 15000) were released in the open pit and were fed daily with soaked groundnut cakes.



**Water sports in mine pit**



**Harvest of fish from pisciculture pond**



**Back filling of exhausted pits**

### **Systematic Mining**

Mining activities were restarted in one of the mining pits so as to stabilize the unstable portions of the exhausted mining pit and dumps. This was possible only due to the demand for low grade iron ore which was preserved during earlier operations. Due permissions were taken from legal agencies before starting the sustainable mining activities. Modern day software like SURPAC and DATAMINE are used for mine planning and optimum utilization of resources. Annual Pit Design Plan is prepared for the financial year based on the sales programme in accordance with the approved mining plan/ mining scheme. Bench layout is along the strike; bench height and width are maintained at 7 meters each with an overall pit slope angle of 30 degrees. However, for clay benches the width of benches is more than the height of benches. Pit survey and geological mapping are carried out every fortnight, to monitor the implementation of the planned scheme of working. A monthly cutting plan is prepared to check if there is any deviation from the mining plan. Annual Pit design is thus checked on a monthly basis.

### **Environment Monitoring**

The monitoring of environment parameters like air, water, soil, noise etc. are carried out by government recognised in-house environment laboratory located at Codli. For maintaining the environmental sustainability following activities were conducted regularly-

#### **Waste dump management**

Our waste dumps are within mining lease as per the approved Mining Scheme / Plan. The disposal of waste is carried out in the form of backfilling of exhausted mining pits. After finalizing such areas proper afforestation with native species will be carried out and the areas will be reclaimed.

#### **Water management**

The entire water is channelized into exhausted or working pit thus preventing any water pollution to the outside environs. There is no discharge of water in the rainy season.





**Water channelized in mine pits**

**Other erosion control measures:**

Settling ponds are constructed at the toe of the dump to contain the dump run off. Series of such settling ponds are constructed at the toe of our old dumps. Garland drains/ trenches are constructed all along the toe of the dump to channelize the dump runoff to settling ponds.

**Dust Suppression arrangements:**

Most of the ore and waste handled are below the water table. The moisture content in the ore and waste is high and thus the air borne dust is under control.

**Measures taken to reduce air borne dust on haulage roads:**

Water tankers are used to spray water within the mine on haul roads. The Company has deployed a ruck mounted road sweeping machine to clean the dust generated on the roads. The road sweeping and washing is carried out during the night.

The trucks carrying ore are covered with tarpaulin to prevent dust dissemination during transportation. The flaps have been provided on the tails gates of the tippers.

**Scientific studies carried out in the mine**

Water levels are monitored periodically in and around the mines. Hydro geological studies are conducted for the mines. Slope stability studies have been carried out for the mine through a recognized Institute, National Geographic Research Institute - Hyderabad. All the

structures have also been tested for structural stability to ensure safety of operations.

**Social Initiative**

As part of its Corporate Social Responsibility objective, the company established The *Sesa Community Development Foundation*. Under this foundation the Company runs the *Sesa Technical School and the Sesa Football Academy*.

**Sesa Technical School:** It was established in the year 1994 on the same reclaimed mine. The premises of the earlier mining workshop and office were utilized for the running this technical residential school affiliated to the National Council of Vocational training. The courses are designed on the market requirements. There are five courses namely Fitter, Machinist, Instrument mechanic, Multi trade (mechanical) and Multi trade (electrical). Annually 70 students are admitted based on merit. Students from the mining area/ belt are given preference. The school has got a 100% track record and many multinational companies absorb these boys through campus interviews conducted.

**Sesa Football Academy:** The Sesa Football Academy was established in the year 1999. The prime objective was to nurture the football talent in Goa and to make a positive contribution to our society by producing football players and professionals of the sport. The course is fully sponsored by the company. It is a residential course of four years. The boys are admitted in the age group of 13 to 15. The trainees in the morning attend the local school for academics and in the afternoon go are profession ally trained for the game. All facilities like a nutritious diet, health care, gymnasium, playground, etc. are provided to the students.

**Reader's Corner**

Thank you for your mail. I found your newsletter quite informative and wish you all the best for future issues. I shall try to keep contributing in future as well.

Dr A K Agnihotri,  
Ex-GM (Chem.), CHSE,  
ONGC, Delhi



## Wasteless and Save Earth

Anthony Raivellur

**SIES Indian Institute of Environment Management  
Plot No. 1E, Sector- V, Nerul, Navi Mumbai 400 706**

Each year, 1.3 billion tons or 33% of the food produced globally goes to waste during agricultural production, transportation, storage in industrial facilities, grocery stores/food markets and in our households causing economic losses of \$750 billion and significant damage to the environment.

Often times, food fails to reach the household because of strict sell-by or use before dates and the demand for visually perfect food. Wasted food frequently ends up in a landfill releasing the greenhouse gas Methane which is up to 25 times more harmful to the environment than carbon dioxide emissions.

### Some facts on Global food production:

1. Uses 25% of all habitable land.
2. Is responsible for 70% of fresh water consumption, 80% of deforestation, and 30% of greenhouse gas emission.
3. Over 550 billion cubic meters (m<sup>3</sup>) of water is wasted globally raising crops and animals that never reach the consumer.

Apart from food waste, food packaging which includes billions of plastic bags, utensils and napkins end up in the landfill as well. It is estimated that as much as 32% of household waste is comprised of food packaging. In addition, 100 million plastic bottles are used worldwide each day. Roughly over 3% are recycled and most end up in

landfill where it will take years to biodegrade. As the population grows, pressure on the environment increases and conserving resources to produce food requires action from each of us.

How you can make a difference:

### Reduce

- Choose items that have less packaging or are sustainably packaged.
- Purchase only what you need.
- Store food properly so it stays fresh longer
- Skip plastic bags for fresh fruits and vegetables – carry a cloth bag every time you shop.
- Pre plan meals and portion sizes save and eat leftovers.
- Let retailers know there is a market for food that is less visually appealing.

### Reuse

- Use a refillable drinking bottle.
- Use containers and utensils that can be reused.
- Use cloth napkins

### Recycle

- Recycle all items that can be recycled.
- Compost food scraps to avoid the landfill

Reference:

<http://www.fao.org/docrep/018/i3347e/i3347e.pdf>

### Disclaimer:

**Editors have taken utmost care to provide quality in this compilation. However, they are not responsible for the representation of facts, adaptation of material, and the personal views of the authors with respect to their compilation.**

## Graduation Ceremony for Post Graduate Diploma in Sustainable Environment Management (PGDSEM 2015-16)

Graduation ceremony of Post Graduate Diploma in Sustainable Environment Management (PGDSEM) Course (2015-16) was held in the forenoon of 16-10-2016 in the SIES-IIEM Conference room. Dr. V.Ramachandhran, Ex-Associate Director, SIES-IIEM was the Guest of Honour. Shri S.V.Viswanathan, Joint Honourary Secretary of SIES Management graced the occasion.



## Training Programmes on Plastic Waste Management

Training programme on plastic waste management was conducted in selected schools of Mumbai and Navi Mumbai to aware students and teachers on the management of plastic materials and waste with support of Indian Centre for Plastics in Environment (ICPE) during September- December 2016. The training was imparted by arranging lectures, discussions/ debates and screening of movies. Total 350 students and teachers were sensitized in selected schools.



Interaction with students on the objectives of training programme



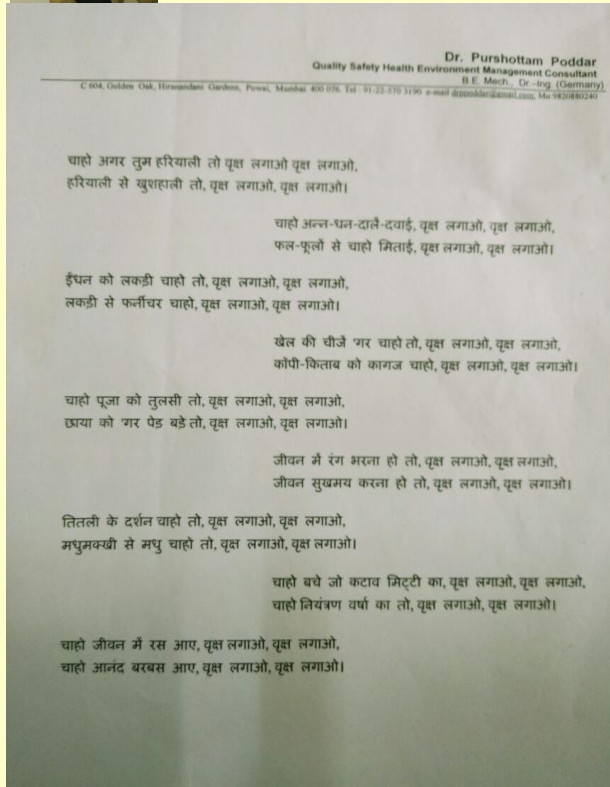
Lecture on the 'plastic boon or bane'



Post knowledge assessment of students on plastic waste management



Group discussion with students



## SIES IEM DEDICATED TO ENVIRONMENT MANAGEMENT THROUGH R & D AND OUTREACH ACTIVITIES

### ABOUT SIES IEM

- SIES IEM was established in 1999. It has been contributing in the fields of R&D activities and Academics in the areas of Environment Management and Biotechnology.
- IEM is recognized by Department of Scientific and Industrial Research for research activities and has successfully completed various research projects with funding from DST, BRNS, DBT, ICMR, MOEFCC, MMREIS and several other agencies.
- IEM also conducts consultancy services, organizing seminars, workshop and providing community service through research and creating awareness.



### INFRASTRUCTURE AND FACILITIES

State of Art Facilities to conduct R & D and consultancy in the areas of Environmental Science and Management. Laboratories are equipped with the advanced equipments (HPLC, AAS, GC, HVS etc.)

## CONSULTANCY SERVICES

### GREEN MANAGEMENT

#### Environmental Monitoring and Analysis

- Water, Soil, Air, Waste
- Eco-toxicity studies

#### Conservation of Resources and Biodiversity

- Eco restoration of Resources
- Biodiversity mapping and indexing

#### Waste Management

- Wastewater management for zero discharge
- Solid waste management
- Industrial sludge management
- E- waste management

#### Expertise in:

- Advanced oxidation processes
- Aerobic and anaerobic processes
- Bio- and phyto- remediation

#### EIA and Sustainability Solutions for Mitigation of Climate Change Vulnerability

#### GIS based Environmental Planning and Management

- Natural resource mapping
- Groundwater recharge study
- Site selection
- Database management

### GREEN COMMUNICATION

#### Providing CSR Solutions for Environment and Society

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Environmental Education</li> <li>• Training and Awareness programme</li> <li>• Water audit and energy audit</li> <li>• Carbon footprint mapping</li> </ul> | <ul style="list-style-type: none"> <li>• Capacity building</li> <li>• R&amp;D proposals and report writing</li> <li>• Events – workshops, seminars and conferences</li> </ul> |
|---|---|

Areas of Research	Specific Areas
1. Total Water Management	<ol style="list-style-type: none"> <li>1. Purification of drinking water by using low cost techniques.</li> <li>2. Management of nitrite contaminated wastewater</li> <li>3. Textile wastewater management.</li> <li>4. Phytoremediation.</li> <li>5. Oil spill management by biosurfactants.</li> <li>6. Management of brine generated from water purification technologies.</li> <li>7. Assessment and management of marine pollution</li> </ol>
2. Solid Waste Management	<ol style="list-style-type: none"> <li>1. Management of industrial waste.</li> <li>2. Management of MSW and other solid wastes.</li> <li>3. Management of agro- residue.</li> </ol>
3. Applied Biotechnology	<ol style="list-style-type: none"> <li>1. Utilization of biofertilizers and biopesticides in soil fertility management and agriculture.</li> <li>2. Exploitation of beneficial microorganisms in remediation of heavy metals, oil pollution etc.</li> </ol>
3. Management of Natural Resources	<ol style="list-style-type: none"> <li>1. Pollution monitoring and management</li> <li>2. Ecorestoration.</li> <li>3. Studies on Climate Change.</li> <li>4. Biodiversity Studies.</li> <li>5. GIS &amp; Remote Sensing</li> </ol>

### MAJOR FUNDING AGENCIES

- Ministry of Environment Forest and Climate Change
- Department of Science and Technology
- Department of Biotechnology
- Board of Research in Nuclear Sciences
- Indian Council of Medical Research
- Mumbai- Metropolitan Region- Environment Improvement Society

### OUTREACH ACTIVITIES



All previous issues of 'The Environment Management' can be viewed at: [http:// www.siesiem.net](http://www.siesiem.net)

## Report on the Seminar on Energy Conservation and Management: Current Trends and Future Opportunities organized on 20<sup>th</sup> December 2016

Energy conservation week was celebrated in SIES at Nerul Campus with a half day seminar on 'Energy Conservation and Management: Current Trends and Future Opportunities' organized jointly by SIES Indian Institute of Environment Management, SIES Central Purchase Department and SIES (Nerul) Institute of Comprehensive Education on 20<sup>th</sup> December, 2016 in the SIES-SOP Auditorium. Mr. S.V.Viswanathan, Joint Honorary Secretary, SIES was the Chief Guest of the function. Shri Shirish Deshpande of Maharashtra Energy Development Agency, Mr. Gautam Handa of Fourth Partner Energy, Dr. Yogesh Shinde of Code Greenn was the guests of honour. The seminar was sponsored by MEDA, Code Greenn and Fourth Partner Energy.

Mr. S. V. Viswanathan in his lecture emphasized the role of resource conservation and environment management for sustainable development. A lecture on the efforts of SIES group in energy conservation and implementation of renewable energy was delivered by Mr. C. V. Goplakrishnan, Director, Central Purchase Department. Mr. Shirish Deshpande in his presentation lamented that there is growth in building construction in our country with no adequate consideration for energy conservation. He said that by improving building design and efficiency of appliances, the energy consumption can be substantially reduced without compromising on thermal comfort of the inhabitants. Mr. Gautam Handa talked on the theme 'Harnessing energy through Renewable Energy Sources'. He talked about roof top solar panels and their role as an important renewable energy source. He said that with the encouragement given by present government and technology improvement, the solar panel costs are continually decreasing for the last 3-4 years. Dr. Yogesh Shinde gave a presentation on 'Introduction to Energy Efficient Devices'. He chose to talk on the subject of energy optimization in cooking and heating devices. He said that the current cooking devices like pressure cooker operate only at 20% energy efficiency. He explained the reasons for the low efficiency by way of basic heat transfer concepts, viz., conductive, convective and radiative mechanisms.

Dr. Vidhya Satish, Director SIES Institute of Comprehensive Education briefed about the activities of her institute before a skit on energy conservation and management presented by the students of SIES (Nerul) Institute of Comprehensive Education. Mr. S. Gopalkrishnan, Chief Manager, Central Purchase Department, SIES delivered vote of thanks.



Inauguration of Seminar



Welcome address by Dr. Seema Mishra, Director, SIES IEM



Lecture by Dr. Shirish Deshpande on Energy Auditing



Audience during the seminar

## Environment in News Headlines

### A permanent increase in CO<sub>2</sub> threshold levels

Earth has crossed its threshold CO<sub>2</sub> levels of 400 ppm permanently. In spite of the fact that there is a dip in CO<sub>2</sub> level globally in the month of September, this year the levels did not come down. The impact is a result of carbon pollution resulting from industrial revolution. The high CO<sub>2</sub> levels lead to the global temperature rise by 1.5°C. If the major steps to reduce emissions are not taken then there can be further rise in the temperature exceeding 2°C, causing serious repercussions like: heat waves, drought, coastal flooding's and extinction of coral reefs.

*Source: Scientific American, Sept. 27<sup>th</sup> 2016.*

### Australian continent making shift

Earth's centre of mass is changing and hence there is a shift occurring in the Australian continent. Australia has moved 1.5 m northwards in past 22 yrs. due to tectonic shifts. Although the shift is a subtle one, but plays a significant role in tracking of things like GPS measurement.

*Source: Science Alert, Nov. 11<sup>th</sup> 2016.*

### Great barrier reef: Die off

Great barrier reef spread over around 1400 mile is listed as the natural world heritage site by UN. High temperatures of Pacific Ocean, El Nino and global warming have done great damage to the reef by bleaching. A little relief has been brought by cyclone Winston, which brought down the temperatures bringing down the intensity of damage. The bad news is that the reef has been damaged severely in the northern part with a mortality rate of 67%, but the good news is that the mortality in the central and southern part is 6% and 1% respectively. While this mass bleaching due to global warming has occurred 3rd time in last 18 yrs., the current incidence had a very high impact. Extensive measures if taken, can limit the damage allowing the reef to bounce back.

*Source: Vox, Nov. 29<sup>th</sup> 2016.*

### Diamond batteries: Nuclear waste converted to batteries by diamonds

A team of physicists and chemists from university of Bristol has come up with a new technology providing solution to mitigate the problems of nuclear waste and providing a clean energy source with a never before longevity. It would be possible to have sustainable batteries using hazardous nuclear waste. These batteries can be generated by encapsulating short range radioactive materials in a man-made diamond using carbon isotopes from graphite blocks obtained from power plants. These batteries can have utility in pacemakers, space crafts and high altitude drones. It would sure give desired longevity and sustainability with an estimated capacity to generate 50% power till 5,730 yrs. A prototype using Ni-63 has been successfully prepared and the process is to be worked out using C-14.

*Source: University of Bristol, Nov. 25<sup>th</sup> 2016*

Compiled by: Dr. Ketna Matkar, Student- PGDSEM, SIES IEM

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## Forthcoming Events

Workshop on Plastic Waste  
Management for  
Sustainable Environment  
Management on 10<sup>th</sup>  
January 2017.

Articles, photos etc. are  
invited for next issue  
(January - March, 2017)  
of the Newsletter on the  
theme 'Wetlands:  
Conservation and  
Management'