THE ENVIRONMENT MANAGEMENT

A Quarterly E- Magazine on Environment and Sustainable Development

SIES Indian Institute of Environment Management
RISE WITH EDUCATION

पर्यावरणो रक्षति रक्षितः

(for private circulation only)

Vol.: IV | January – March 2018 | Issue: 1

Current Issue – Green Jobs for Sustainable Environment Management

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From Director's Desk

In current scenario, two defining challenges are among us: the first is to control environmental pollution, degradation of natural resources and avert the harmful effects of climate change which would seriously have negative impacts on the quality of life of present and future generations. The second challenge is to ensure social development and financial security for all. These two challenges are complimentary to each other and cannot be addressed separately. In past, technologies have been developed to solve many days to day problems but we are still struggling in safeguarding the quality of our resources and providing basic amenities viz. safe drinking water, clean air to breath etc. to people. These challenges need a systematic thinking approach with focus on not only the problem solving but also on the long-term management of resources for social and economic viability. In a sustainable business models emphasis is laid on the practices that are ecologically, socially and economically viable with more concern on having greener operations that contribute to creating jobs for the economic upliftment of the society. Sustainability is the future and in near future the demand of trained professionals with specialized knowledge of environment, technology, management and economics is going to rise in different areas like sustainable industrial operations, pollution management, natural capital assessment, corporate social responsibility and many more. The UNEP, ILO, ITUC and IEO have focused on Green Jobs in 2008 for providing equitable opportunities to people to generate livelihood with in the principles of circular economy. To promote the concept of Green Jobs among students, future leaders and industries its sensitization and broad policy measures are required at global and local levels. The SIES IIEM has nurtured future environmental leaders for last 18 years through its academic programmes and supported industries by providing technological and business solutions. The current issue of institute's quarterly newsletter is focusing on the theme, 'Green Jobs in Sustainable Environment Management' to discuss the pertinent areas wherein opportunities are arising for budding environmental leaders as well as skill sets required to bridge the gaps of academia and industries. We wish you happy reading and sharing of knowledge.

Dr. Seema Mishra

Green Jobs for Sustainable Environment Management

Dr. S.V. Viswanathan
Director & CEO 3VConsultants

Sustainability is a fine balancing act between economy, environment, society & has a far-reaching effect on environment protection & improvement for generation to come. Green is environment friendly action that ensure reduction or no harm upon ecosystems & green jobs are those in all sectors that ensure some of the following:

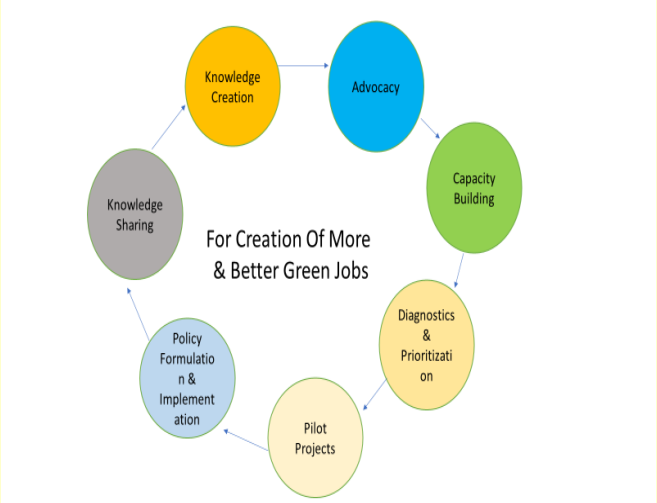
- Environment preservation & protection
- energy efficiency improvement
- better raw materials utilizations
- limit greenhouse emissions
- waste minimization
- pollution prevention
- protect & restoration of ecosystems
- protect & restoration of biodiversity
- support adaption to the effects of climate change
- preserving & restoring environment
- conserve natural resources
- mitigating environmental challenges
- reduce water consumption

Natural resource management manage natural resources such as land, water, soil, plants & animals, with a focus on how it affects the quality of life for both present & future and the green jobs include:

- Biotic resource science – i.e. biological principles & ecosystem that includes landscapes, wildlife, vegetation
- Social science – i.e. human impacts on ecosystem that includes sociology, anthropology, emergency management
- Natural resource economics- administrative, regulatory & policy positions
- Environmental communication – environmental mass media, journalism & public relations
- Pollution control- for managing natural resources for pollution control
- Physical/ earth resource science- centers on physical & chemical aspects of ecosystems viz. soils, geoscience, GIS.

Green jobs encompass renewable energy, energy storage, green construction & transportation, carbon sinks, municipal solid waste management, e-waste management, water management, water conservation, sustainable forestry, biofuels, geothermal energy, environmental remediation, sustainability, energy auditors, recycling, electric vehicles, solar, wind, tidal power, policy laying, controlling & ensuring energy efficiency, pollution prevention, public awareness, education & training.

Innovations, IT revolution, shrinking world, depletion of natural resources & necessity for improvements in costs drives the creation of environmental jobs while increasing labor productivity & energy efficiency helps in decreasing costs. **ILO defines green jobs** as those that preserve & restore environment, be it in traditional or in new & emerging green sectors such as renewable energy, energy efficiency & pollution prevention. They are easily identifiable by the environment friendly processes.



Environmental Science is the link between air, land, water, biology & human society - creating an understanding of our natural environment, improve local, regional & global management actions. Researchers identify causes of environmental issues, develop solutions, policy or strategies for protecting the environment & human health, as well as better managing our natural resources. They focus on shareholder engagement, create synergies & create more green jobs by following the above model.

Green jobs as per **ILO** preserves & restores environment, promotes socially inclusive development & create economies that boosts employment such as:
Agricultural research assistant, atmospheric scientist, energy analyst, eco-tourism consultant & operator, environment & quarantine advisor, environmental assessment officer, environmental liaison officer, environmental auditor, environmental campaign officer, environmental consultant, environmental policy/research/ project officer, green army supervisor, parks & wildlife officer, regional land-care & facilitator/NRM facilitator, science communicator/teacher/ education officer, soil systems analyst, sustainability officer, technical assistant, waste management officer etc.

UNEP, ILO, ITUC, IEO jointly launched the green jobs initiative in 2008 by providing space for workers, employers, & governments, to negotiate on policy effective in providing equitable opportunity to green jobs. Environmental science is a holistic & multidisciplinary field that explores the links between air, land &, water, biology & human society that translates effective management actions to improve local, regional & global sustainability.

Environment careers are skilled at conducting research, problem solving & communicating their findings to both technical & non-technical audiences. They identify causes of environmental issues, develop solutions, policy or strategies for protecting the environment, human health & for better managing natural resources.

Volunteering for environment protection helps in career enhancement of students, conduct research, manage natural resources, advise on policy, manage conservation & wildlife, educate & verify organizations compliances. They are involved in raising environmental awareness & protection within NGO's, mining rehabilitation, sustainability start-ups, consultancy work, & environmental impact assessments.

Careers in Environmental Science categories are air/ water quality protection & management, agriculture, bio-diversity & ecosystem restoration, climate change & protection, ecotourism, education & awareness, forestry, fisheries & wildlife, green/alternative energy, mining, natural resource management, parks management policy formation, research sustainability, urban planning, waste management. India is committed to a low carbon emission and endeavoring to meet all the developmental challenges. INDC is taking forward our **PM Shri Narendra Modiji's** vision of a sustainable lifestyle & climate, justice to protect the poor & vulnerable from adverse impacts of climate change. This centres around its policies & programmes on promotion of clean energy, renewable energy, enhancement of energy efficiency, development of less carbon intensive & resilient urban centres, promotion of waste to wealth, safe, smart & sustainable green transportation network, abatement of pollution & efforts to enhance carbon sink through creation of forest & tree cover. These will ensure creation of many jobs. India had declared its commitment to reduce emissions intensity by 33–35%, over 2005 levels by the year 2030 in Paris COP 21, where several ambitious measures for clean & renewable energy, energy efficiency in various sectors including achieving lower emission intensity in the automobile & transport sector, non-fossil-based electricity generation & building sector based on energy conservation were made. The agreement includes thrust on

renewable energy, promotion of clean energy, enhancing energy efficiency, developing climate resilient urban centres & sustainable green transport network are some of the measures for achieving this goal. Green economy is a compelling way of sustainable living. Green jobs are those that **preserve or restore environment** both in traditional sectors & emerging green sectors such as renewable energy & energy efficiency or services such as audit & rating of green activities.

Greening of enterprises, workplace practices & the labour market create employment opportunities, enhance resource efficiency & build low-carbon sustainable societies through active support of all stake holders.

By achieving a target of 100 gigawatts (GW) of installed solar energy and 60 GW of wind energy capacity by 2022 1.184 **million jobs** will be created in India.

Upcoming Green Jobs in Urban India

Ms. Suprabha Marathe
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(PGDSEM 2017-18 Batch, SIES IIEM, Nerul, Navi Mumbai)

Green jobs or **green-collared jobs** are, according to the United Nations Environment Program, "work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute(s) substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution."

Green jobs, according to the Bureau of Labor Statistics, are classified as, "jobs in business that produce goods or services that benefit the environment or conserve natural resources" or "jobs in which workers' duties involve making their establishment's production processes more environmentally friendly or use fewer natural resources". The Bureau of Labor Statistics categorizes Green Jobs into the following: Water conservation, Sustainable forestry, Biofuels, Geothermal energy, Environmental Remediation, Sustainability, Energy auditors, Recycling, Electric Vehicles, Solar power, and Wind energy.
Green jobs hold the promise that humankind will be able to face up to the following two defining closely linked challenges of the twenty-first century:

1. Averting dangerous and potentially unmanageable climate change and protecting the natural environment which supports life on earth.
2. Providing decent work and thus the prospect of well-being and dignity for all in the face of rapid population growth worldwide and the current exclusion of over a billion people from economic and social development.

Green jobs are key to meeting both simultaneously. The environmental challenges include: Climate-related disasters, Water shortages, Environmental refugees, Displacement by flooding, Food shortages and malnutrition, Pollution, Loss of biodiversity etc. Decent work challenges include: Working poor, Unemployed, Young job seekers, Insecurity, Access to energy, Adequate housing and access to essential facilities such as clean water & sanitation.

The Green Jobs report was funded and commissioned by UNEP under the joint UNEP, ILO, IOE and ITUC Green Jobs Initiative, in order to shed light on the impact that transformation to a green economy will have on work, on enterprise and on the way people earn a living. The report has been produced by the World watch Institute with technical assistance from the Cornell University Global Labor Institute. It is the first study which provides a global overview drawing on available information from around the world.

The report finds that the notion of a green job is thus not absolute, but there are ‘shades’ of green and many jobs which are green in principle are not green in practice because of the environmental damage caused by inappropriate practices. Further, what is considered fuel-efficient today will no longer qualify in ten years’ time The evidence shows that green jobs do not automatically constitute decent work e.g. many current recycling jobs, recover raw material and help to alleviate pressure on natural resources, but apply a process which is often dirty, dangerous and difficult, causing significant damage to the environment and to human health. Millions of green jobs are already in existence: Even though only six economic sectors particularly important in terms of greenhouse-gas emission and use of natural resources for raw material,

as well as their contribution to the economy and as sources of employment and income were studied. : These sectors are energy supply, in particular renewable energy, building and construction, transportation, basic industry, agriculture and forestry.

Grameen Shakti (GS), in Bangladesh has helped rural population by way of a small loans scheme which enables even very poor rural households to buy a PV solar home system without subsidies. The scheme also creates local jobs and income opportunities by training local youngsters and women as certified technicians in the repair and maintenance of PV systems. Many more jobs are created indirectly as solar systems enable local entrepreneurs to start up new businesses such as community TV shops, solar-charged mobile phone centres and electronic repair shops. Kuyasa Low-Income Housing Upgrade in Cape Town, South Africa. Local artisans and unemployed youngsters from the township are trained to insulate the roof to avoid the need for heating in winter, install solar thermal water-heating equipment and replace incandescent light bulbs with energy-efficient ones that improve the quality of housing and of life, yet reduce energy demand and emissions. The scheme contributes additional electricity in a country experiencing severe power shortages and blackouts. A household will save over 600 rand per year on energy. A Community Trust model will offer still better options accountability and sustainability.

Upcoming Green Jobs in Urban India: With MSW handling rules 2016 in force segregation of waste is mandatory. Further bigger societies have to handle their wet waste themselves by setting up biomethenation plants, vermicomposting or other appropriate methods.

Dry waste is supposed to be segregated and handed over to rag pickers. Hazardous waste and E waste is to be separately disposed. Urban India had traditional rag pickers raddiwala, dabbabatliwala, bhangarwala etc. who used to collect specific dry waste may be send it for recycling to some informal set system. The balance food was invariably given to poor or animals and birds.

These practices declined with coming up of isolated complexes who prevented entry of all these recyclers. Time has arrived to once again open doors to all of them who can may be now come forward in more organised and formal manner. Women workers BPL from an NGO Stree Mukti Sanghatana have been working for decades I the sector of segregation.

They have been successfully running bimethanation plant in BARC handling heir canteen waste for may be 15 years. But now the cities need thousands of such workers having police verification, I Card and skill training who will come to their door step collect different type of waste and treat / dispose it in legitimate way.

These jobs will reduce pollution, keep environment clean, handle waste in appropriate manner, generate revenue, recycle articles thus reducing pressure on natural resources and offer descent jobs than traditional rag pickers. NGOs or Government sector can look at this as upcoming service sector which is need of the hour. With some of the NGOs in field of women empowerment I will soon be taking up a pilot project in this subject.

Reference Source: Green Jobs - Towards Decent Work in a Sustainable, Low-Carbon World, UNEP/ILO/IOE/ITUC, September 2008

Job or Entrepreneurship Opportunities in Disposal of Municipal Solid Waste (MSW) in India

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Preamble: Municipal Solid Waste (MSW) handling, management & ultimate disposal have been far from expectations in India. Although specific & formal Rules for the same were promulgated in Sept. 2000, today even after lapse of 18 years, the situation is far from desired target. The Rules were modified & made more stringent in 2016. However even after lapse of 2 years, there is no improvement in the scenario.

Opportunities: As a result, there are several job or business opportunities in this sector. However, before entering this field, it is imperative to know the situation in the same.

Lacunae: The lacunae in the existing situation are Social, Management & Technical.

Social lacunae: They are in terms of basic mindset of our society, our people & their attitude. The attitude of our people is *laissez faire* i.e. attitude of letting things take their own course, without interfering. Moreover, tendency of people is not observing any rules or regulations. If they are enforced, there are varieties of ways of getting by, either through corruption or influence. However, it is not the topic of discussion here.

Management Lacunae: Let us look at Management angle now. Municipal bodies basically manage the MSW by collection, transportation & disposal. The survey indicates that about 70 to 90% of MSW is collected & transported, which is fairly high percentage. Let us give credit for that.

However as regards disposal, the entire MSW gets dumped at a remote place & almost 99% is not conclusively disposed. What is the effect? In every city, town or village in India, MSW produced about few decades ago, is still existing somewhere within the dump, though some of its biodegradable portion has degraded. Now unlike in foreign countries, these dumps are not scientific landfills. The Scientific Landfills are well planned in terms of period, quantity & area of accommodating the MSW for that period. It is BURIED UNDER the ground after finite time is over & covered. The topmost layer is converted into greenery. This avoids the unhygienic conditions now prevailing at dumps in India.

Thus, what is lacking in MSW management in India is its ultimate link to conclusive disposal. MSW is getting collected, transported; but not conclusively disposed. The disposal units are either not installed or wherever installed failed to yield results of conclusive disposal of MSW.

Technical Lacunae: There are several aspects for this, which are explained below.
Although the MSW Rules 2000 or 2016, identify various technologies for ultimate disposal of MSW there is widespread lack of awareness about them in municipal bodies.

Segregation: In spite of 18 years of advertising, education & promotion of idea of segregating waste at source, small percentage of waste is segregated. Now this should not have stopped municipal bodies from setting up mechanical segregation units on their own to ultimately yield biodegradable & non-biodegradable fractions. However every municipal body has neglected the matter.

Technology for Disposal: Before selecting any technology for disposal, every municipal body should verify if it meets following criteria of selection. 1. It should accept un-segregated waste. (2) It must tolerate variation in composition & moisture. (3) It should not demand specific type of waste. (4) It should have capability to separate inert material like

glass & metal. (5) It should be an all-season technology, unaffected by rain or winter. (6) It must operate 24X7, all year around. (7) It should not require huge quantity of land to set up & operate (8) It should have self-revenue model in terms of value added product or by-product, which is easily sellable. (9) Its financial feasibility should not depend on concessions & grants. (10) The technology should not be heavily reliant on imported spares or services. These can be called as Ten Commandments for MSW disposal. If the technology in question, meets all of them, it will be the technology of choice. If the technology in question does not start processing the MSW within 48hrs, it starts smelling & putrefaction of the same gives rise to diseases

Barriers for Project Implementation:

Land: The pressure of development in India, due to burgeoning population, is so high that land prices in & around townships are spiraling. Hence it is difficult to acquire sufficient land to set up MSW disposal projects.

Not in my backyard (NIMBY): People have lost faith in municipal bodies being able to do anything effective in MSW management. Hence there is a huge resistance to project being set up.

Clearances: Setting up a MSW Disposal project requires clearances from scores of government organizations, each with complete different aspects independent of each other & often there is no tendency to facilitate the project in helpful manner.

Lack of responsibilities: Officials or Non-officials do not have any liability, responsibilities or no penal provisions for failure of implementation MSW Rules, especially about MSW Disposal. Thus no one feels any pressure & matter continues unattended. (Failure to implement should result in ban in participating in future elections.)

Parties in Waste Business: The track record of the existing players in this field is not very reliable & many have abandoned projects after usurping funds from government agencies.

Corruption at Municipal Bodies: The rampant corruption demands up-front considerations for project allotment. This has prevented truly successful, experienced & capable companies around the world in coming to India.

Overall these various factors are responsible for poor implementation of MSW disposal projects & non-compliance with MSW Rules 2016. Even if all the other management aspects are well addressed, the Barriers identified above, unless somehow controlled, will never bring about success in ultimate MSW disposal & truthful implementation of Swachh Bharat Abhiyan.

Once these factors are understood & appreciated, the jobs & business opportunities are galore.

SIES Indian Institute of Environment Management
RISE WITH EDUCATION

SIES INDIAN INSTITUTE OF ENVIRONMENT MANAGEMENT

(Recognized by University of Mumbai)

M.Sc. in Sustainable Development and Environment Management (M.Sc. SDEM)

(Affiliated to Garware Institute of Career Education and Development, University of Mumbai)

Academic year 2018 – 19

Admission process starts in May 2018

Sustainability will be the biggest job sector in near future. Professionals with training in sustainable environment management would be required in public/ private sector for environmental planning, environmental status evaluation, environmental legislation with focus on implementation, monitoring and auditing practices.

M. Sc. Sustainable Development and Environment Management (SDEM) is a multidisciplinary job oriented course which addresses these requirements. It equips individuals to solve problems in these fields at source rather than at the end - of - pipe interventions.

Eligibility: B. Sc. / B.E. degree or equivalent
Duration: Two year- Full Time

COURSE HIGHLIGHTS

- Highly experienced faculty and high faculty/ student ratio
- State of the art well equipped laboratory for practicals
- Industry centered curriculum with emphasis to develop sustainability professionals
- Interdisciplinary approach
- Innovative pedagogy
- Focus on innovation through project activities and industrial training
- Linkages with various stakeholders like industry, NGOs, consultancy and government departments
- Focus on improving individual skills
- Specialized library
- Placement assistance provided





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Green Jobs – Prospects and Career Scope

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Green jobs, according to the United Nations Environment Program, "work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute(s) substantially to preserving or restoring environmental quality".

Green jobs are decent jobs that contribute to preserve or restore the environment, be they in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency. From policy changes to the business risks involved, this will be the next big skill requirement in India and other part of the developing world.

In India Green Job Seekers are driven by the growing demand for professionals who understand the business of environmental sustainability. Experts estimate 8,000 to 10,000 green jobs have been opening up each year for the past 10 years. These are not just in purely green businesses such as green buildings, renewable energy, energy efficiency and carbon consultancies, but also in big companies which have launched green initiatives.

While there is a good framework of government policies to encourage environment-friendly operations in industry, however the management expertise is required who understands green business issues.

Many companies in India came forward to support the green initiatives. IndusInd Bank is one of several companies that have been working with Centre for Environmental Research & Education (CERE) to reduce energy consumption by 15% per year. It currently has 100 solar-powered ATMs across India.

Ambuja Cements has an environment management department, which deal with sustainable solutions for industrial waste. The department coordinates with various Ambuja plants on matters related to environment, climate change and sustainability. It also acts as an interface on these issues with the company's management.

Companies such as Apollo Tyres, Cisco and IL&FS have also managed to reduce their energy consumption and increase productivity through green initiatives such as water recycling and construction of green buildings. Even pure green businesses, like the renewable energy space, are looking for talent. Emergent Ventures India (EVI), a climate change and clean energy solutions consultant are hiring talent.

Green Infra, a renewable energy company, is looking to hire fresh MBAs with a background in investment and equity finance. The company has 307 megawatts of operational capacity across its wind, solar, biomass, hydro and energy efficiency verticals. India has a large base for core skills in the renewable energy and energy efficiency businesses.

Government mandates to encourage wind energy and, more recently, solar energy have allowed talent growth in pure green businesses. This has helped emerging segments in the green sector draw talent from related sectors, as professionals in the latter upgrade and adapt to new businesses.

Industry associations are helping the green shift in business by initiating training programs to develop talent for this growing sector. The CII Sohrabji Godrej Green Business Centre (CII-Godrej GBC), funded by the Godrej Group, is working with 20 architectural and

engineering colleges to introduce training programs in the green building segment under its Indian Green Building Council's student chapter. Experts say the design and construction of green buildings hold enormous job potential. Green buildings account for just three per cent of all buildings being constructed in India at present. CII-Godrej GBC is working to increase this figure to a range of 30 to 50 per cent. Among the companies whose offices are green buildings are Wipro, Cisco, Infosys, HSBC and ITC. India's green building footprint is likely to increase to 100 billion square feet by 2030 from 25 billion square feet in 2010.

Fastest Growing Green Jobs

Urban Food Growers: Green roof gardens can deliver locally sourced foods that help protect environment by minimizing use of pesticides, fossil fuels, and other resources to grow and transport from larger farms. It will also improve the urban environment by insulating buildings against energy loss, managing storm water, improving air quality, and providing recreation.

Water Quality Technician:
The reservoir water had concentrations of natural bromide and bacteria-killing chlorine additives, and when exposed to UV rays bromate (carcinogen) is produced. Water quality problems and control is an increasingly important green job around the world.

Clean Automobile Engineers: Transportation is another key green jobs category as auto industry asked to develop vehicles that consume less fossil fuel and produce less pollution. Renewable-energy sector is working to replace dirty fuels with cleaner alternatives such as battery, wind and solar.

Recycle Experts: EPA statistics show that recycling a single ton of paper saves enough power for an American home for half a year, saves 7,000 gallons of water, and reduces greenhouse gas emissions by a metric ton of carbon equivalent. This process creates green jobs—and makes a big impact on the environment.

Natural Scientists: The world's nations try to move towards sustainable lifestyles and greener economies, it's essential that trained professionals monitor and analyze our impacts on the world around us and the natural resources on which we all ultimately depend for both wealth and health.

Solar Cell Technicians: According to the European Commission, production of solar cells and photovoltaic systems has doubled every two years during the past decade, though costs must continue to decrease, and efficiency increase, before PV can become a primary electric supply source. Led by Germany, which has some 40,000 solar workers, Europe produces about 30 percent of the world's photovoltaic power. The requirement of skilled Solar workers is expected to increase exponentially in coming years.

Wave Energy Technicians: The ocean is packed in perpetual motion can be captured it to produce power. The mechanisms are composed of five tube sections linked by joints that flex in two directions. Waves bend the partially submerged tubes at these joints, which house hydraulic cylinders to resist the motion and pump fluid into pressurized accumulators to generate electricity. It is expected that projects like this will signify future growth in the renewable energy sector.

Wind Energy Workers: Proponents of wind power believe that the industry can become a giant part of global electricity production—perhaps producing as much as one-third of the world's total

by 2050—and replace fossil-fuel industry jobs with greener equivalents.

Biofuels Jobs: The US Energy Independence and Security Act (2007) mandates that renewable fuel must increase from 9 billion gallons (34 billion liters) of U.S. motor fuel in 2008 to 36 billion gallons (136 billion liters) by 2022. The policy makes rapid growth in biofuel jobs quite likely, including the construction and operation of ethanol and other biofuel plants, production of feedstock, and creation of delivery infrastructure

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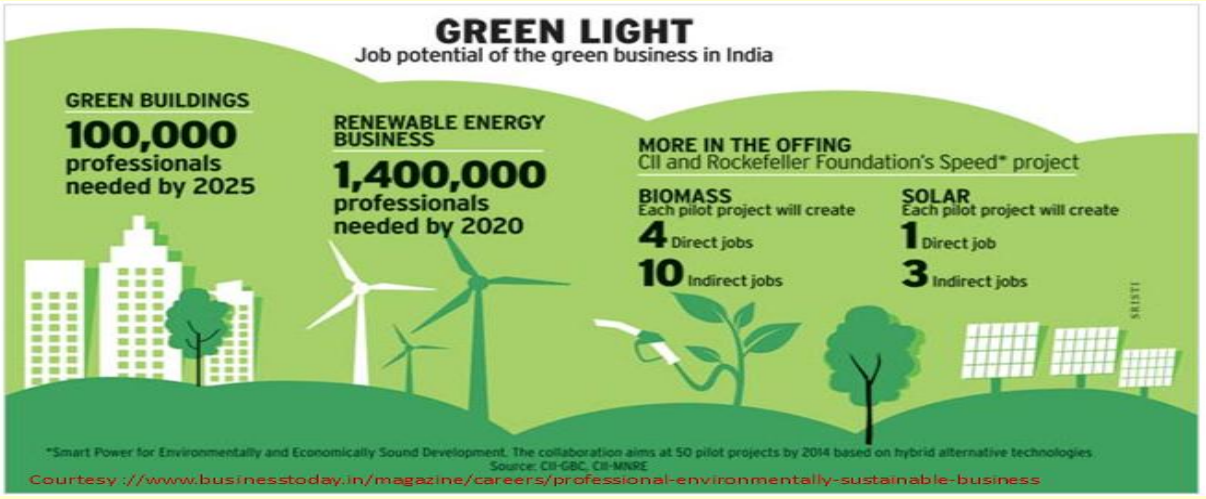

Research Advisory Committee (RAC) Meeting

for the ongoing R & D project in SIES IIEM

1. **BRNS/DAE** sanctioned project on 'Development of Electrochemical oxidation methods for treatment of organic radioactive wastes'. Research Advisory Committee meeting was held on 2nd February 2018 to review the progress of the work. The experts expressed satisfaction with the progress of the work done since May 2017.

2. **NRDMS, DST** sanctioned project on 'Addressing Drinking Water Issues in Slums in Greater Mumbai and its mapping using GIS'. Work progress and findings of the study were discussed in detail during the RAC meeting on 28th Feb 2018. RAC members present during the meeting have found the progress of the project as satisfactory.

Present Market Situation & Bridging the Gap for Green Jobs for Sustainable Environment Management (SEM)

Rohit Kumar
Technical Director, Tesla Innovations Pvt Ltd., SINE – IITB

What are Green Jobs & how policies are instrumental for SEM ?

SEM is the key requirement of every small, medium & large enterprise who is into manufacturing of consumer goods & products for allied industries. Hence, Central Govt. has created policies & departments across each state/UT[1]s for sustainable environment management. As per SPCB/PCCs[2], industries are required to put up pollution control devices for pollution control as per the laid policies across SSI, MSI & LSIs. Slowly, policies are drifting on Zero Liquid Discharge (ZLD) where LSIs & MSIs are asked to reduce water footprint by 50% or in some cases 100%. Due to poor plant operations & non- compliances, new policies are advent for continuous data monitoring & transmission to respective SPCBs/PCCs such that immediate actions can be taken for the defaulters. And if, data is out of order for more number of days industries receives SCN[3] & PDs in which industry shall explain the reason for failures. Industries are closed if the reasons are not acceptable to Boards. This developments in the environment domain has opened up lots of jobs opportunity where industries are searching for in house Environment Managers which can ensure smooth operations & proper reporting. This is what you may understand the role of ***Green Jobs***.

Skills Required in Green Jobs

As per industries, the skills they look for can be classified in the following manner:

- Technological Know-How
  - Waste water treatment
  - Process Water Treatment
  - Air pollution control
  - Hazardous Waste Management
- Operation Experience
- Troubleshooting Experience
- Health & Safety
- Environment Reporting
- Experience in Energy/Water/Environment Audits
- And others.

Present Market Situation & Bridging the Gap

Presently, in India, we are developing only environment engineers with limited practical knowledge which becomes entry barrier in the industries. Therefore, skills required in green jobs is not possible for students to gain in the curriculum. Considering this Gap, our company Tesla Innovations Pvt Ltd started skill development & professional training courses for engineers & under privileged to becomes professionals. We have internalized all the technologies in the field of Wastewater treatment, Process Water Treatment, Air pollution Control Treatment, Solid waste Management under one roof for any student or learning candidate to become highly paid professional. The facility of tesla is known as Tesla Innovation Centre (TIC), it is located in Taloja MIDC. At TIC, all students from India come for training & career advises. We at Tesla also helps industry operators & management to go green with proper R&D set ups.

[1] Union Territories
[2] State Pollution Control Board & Pollution Control Committees
[3] Show Cause Notice & proposed Directions

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

ABOUT SIES IIEM

- SIES IIEM 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.
- IIEM 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.
- IIEM 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 equipments like HPLC, AAS, GC, HVS etc.

CONSULTANCY SERVICES

Drinking Water and Waste Water Quality Parameters

- Physical parameters
- Chemical parameters
- Microbial parameters: Total Coliform Test, *E. coli*, Fecal streptococci Manganese
- Heavy Metals: Lead, Copper, Nickel, Iron, Cadmium, Zinc, Aluminum

Soil Quality Index for Agricultural and Landscape Applications

- Physical parameters
- Chemical parameters
- Major Nutrients
- Minor Nutrient
- Secondary Nutrients

Waste Management

- Training programs
- Characterization of Solid Waste for Composting and Vermicomposting
- Compost Quality Index (Physical, Chemical & microbial parameters and seed quality index)
- Testing, characterization and standardization of bio-fertilizers from
  - N fixers
  - P Solubilizers – PSB, AMF

GIS based Environmental Planning and Management

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

Providing CSR Solutions for Environment and Society

Technical Support in CSR	CSR Services
Support in the development of CSR strategies for industries	Linkages with NGO partners
Implementation of CSR strategies in industries and execution of activities in the areas of environment and societal development	Community engagement and mobilization
Stakeholder engagement	Capacity building
Compliance and regulatory affairs in the areas of environment	Training and outreach activities
Impact Assessment of CSR activities by industries	Volunteering
CSR Communications	Promotions

Sustainability Solutions for Mitigation of Climate Change Vulnerability

Biomass Characterization for Physical, Chemical and Biochemical Parameters

- ❖ Moisture content
- ❖ Nitrogen
- ❖ Phosphorus
- ❖ Potassium
- ❖ Crude protein
- ❖ Lignin
- ❖ Cellulose
- ❖ Hemi-cellulose
- ❖ Fibers

- Antimicrobial and Antioxidant Testing Screening and Evaluation of Bioactivity of Synthetic Chemicals and Natural Compounds

Natural Capital Assessment Services

Implementation of Natural Capital and Ecosystem Services Concept

- Integration of business practices and decision making with natural capital and ecosystem services concept.

Assessment of Natural Capital and Ecosystem Services

- Qualitative and quantitative approaches
- GIS mapping
- Foot printing
- Stakeholder engagement

Land Use and Biodiversity Opportunity Mapping Training and Capacity Building

Areas of Research	Specific Areas
1. Total Water Management	1. Purification of drinking water by using low cost techniques. 2. Management of nitrite contaminated wastewater 3. Textile wastewater management. 4. Phytoremediation. 5. Oil spill management by biosurfactants. 6. Management of brine generated from water purification technologies. 7. Assessment and management of marine pollution
2. Solid Waste Management	1. Management of industrial waste. 2. Management of MSW and other solid wastes. 3. Management of agro- residue.
3. Applied Biotechnology	1. Utilization of biofertilizers and biopesticides in soil fertility management and agriculture. 2. Exploitation of beneficial microorganisms in remediation of heavy metals, oil pollution etc.
3. Management of Natural Resources	1. Pollution monitoring and management 2. Ecorestoration. 3. Studies on Climate Change. 4. Biodiversity Studies. 5. GIS & Remote Sensing

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

Exploring green career opportunities in environmental biotechnology industries and renewable energy sector

Dr. Ketna Atul Matkar
Ph.D., Consultant-Environment Microbiologist

There are various ways of classifying the green jobs, it is generally perceived as some job that deals with the environment preservation or restoration. The most precise definition has been given by the US Dept. of Labour's based on studies and surveys conducted internationally. It states that green jobs can be classified as jobs in the following two categories:

Industry centric

Industries that produce goods or provide services that benefit the environment or conserve natural resources.

The understanding is to be made that not all the jobs in industry would be classified as green even though the products or services are green, there are various verticals which might require a non-green job function.

Occupation centric

Industries where production processes more environmentally friendly or use fewer natural resources.

The occupations which are generally covered in this domain are mainly involving R & D, planning, implementation, monitoring, installation, equipment's or infrastructure changes or modifications, measuring and controlling output of process.

The sectors where green goods and services or occupations can be spread over in an industry may be any of these (Fig. 1).

The universally accepted jobs belong to major categories as cited in the Fig. 2.

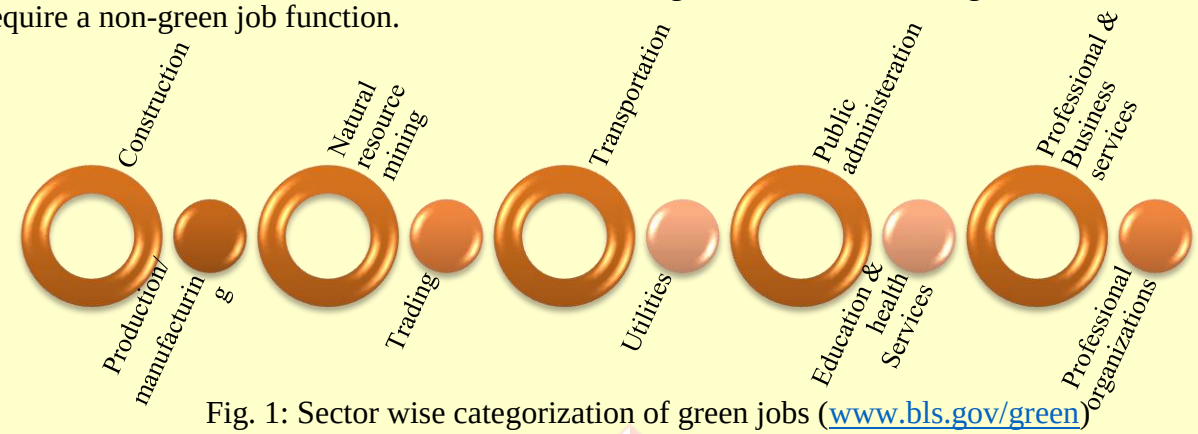

Fig. 1: Sector wise categorization of green jobs (www.bls.gov/green)

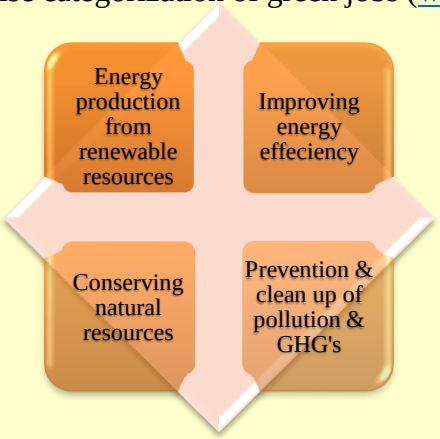

Fig. 2: Universally cited categories for green jobs

The major titles under the green jobs category are as mentioned in the Fig. 3. The salaries range anywhere between INR 15,000/- to 45,000/- per month depending upon the level (Internship, Entry, Middle management and Senior management).

The required educational qualification for these green jobs is mainly one amongst the following:

1. Business and Entrepreneurship
2. Petroleum Engineering
3. Mechanical Engineering
4. Chemical Engineering
5. Architecture
6. Agriculture
7. Environmental Science/ Management
8. Biotechnology

The job functions may require basic skill or high skill, and such add on orientation and certificate training modules can be taken up by aspiring entrants in the green jobs domain. Besides there are certain other important skills which may be directly or indirectly playing an important role in selection for a job (Fig. 4).

Green Jobs for those who have done their graduation/ post-graduation in Biotechnology/ Lifesciences/ Microbiology/ Biochemistry etc. can be further categorized as either of the following: (Fig. 5).

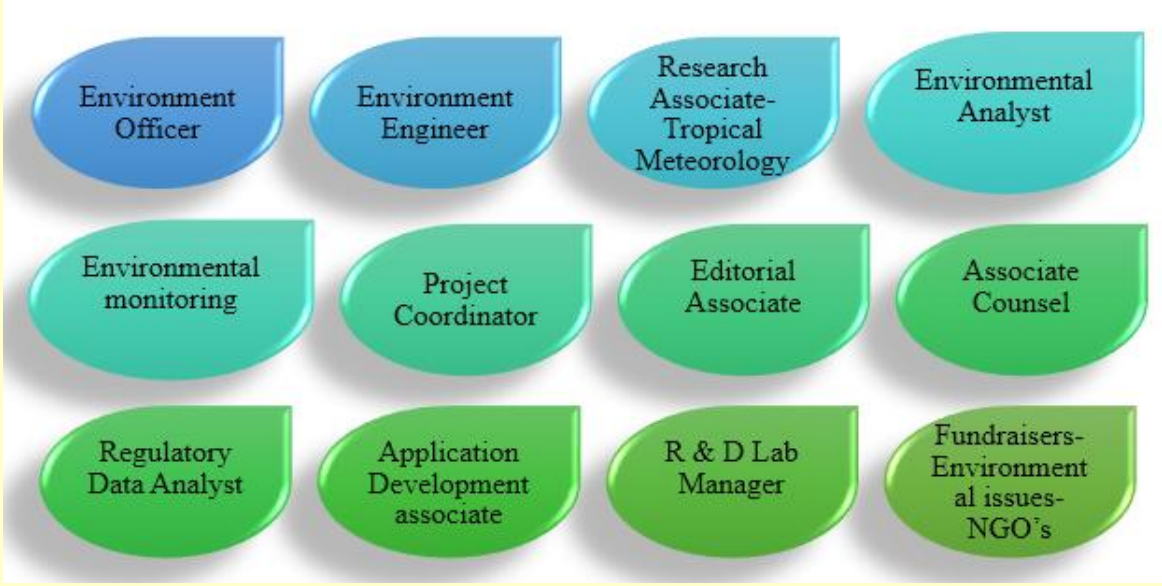

Fig. 3: Green job titles across different industries

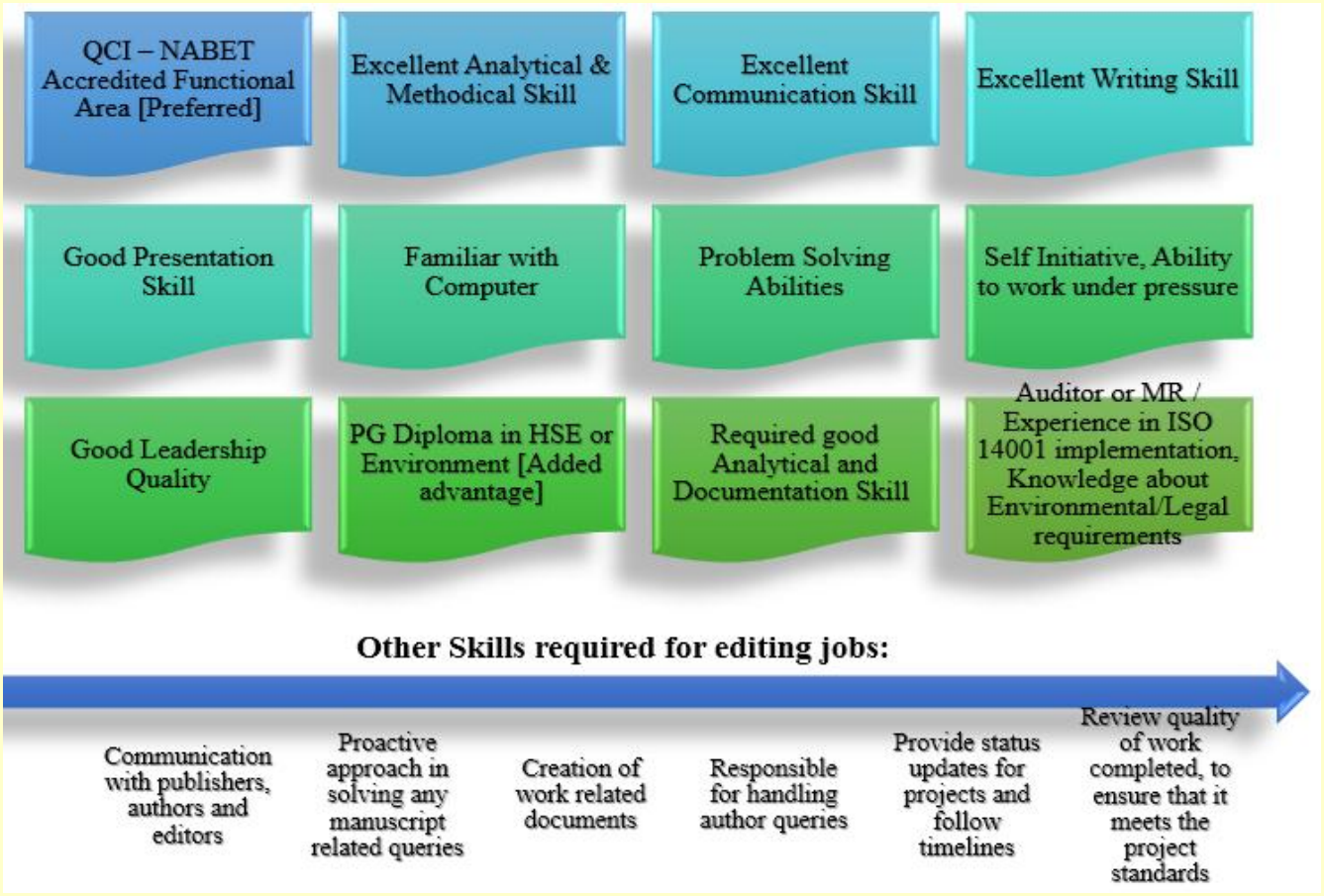

Fig. 4: Skills required for green jobs

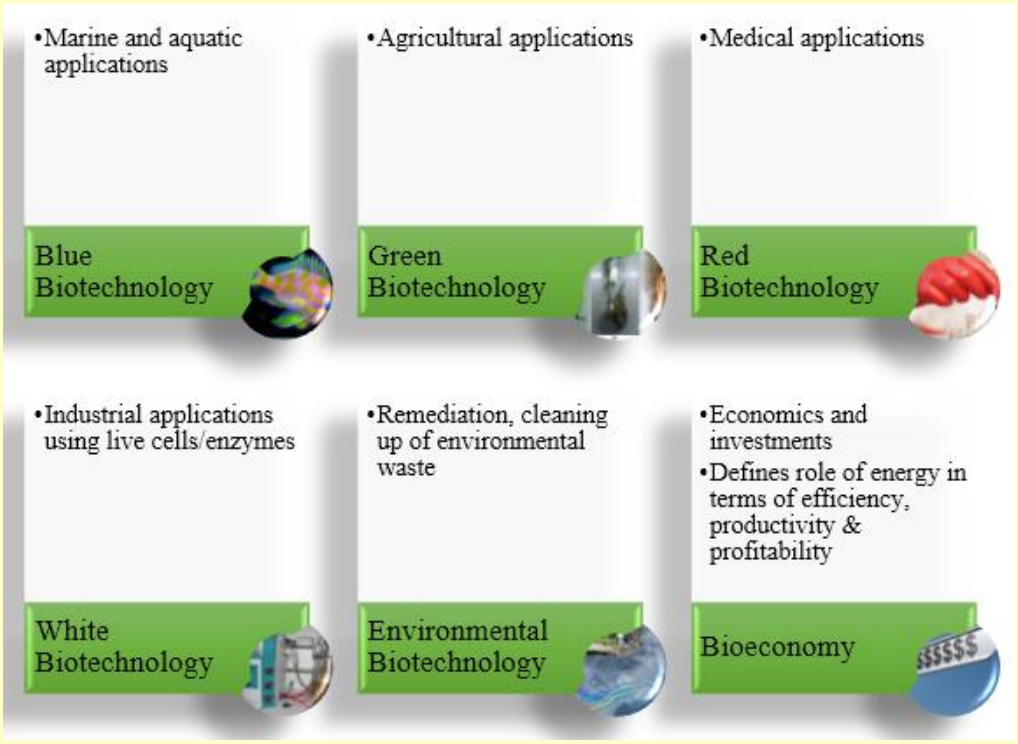

Fig. 5: Biotechnology related green jobs categories

The Industries which are offering attractive posts and salaries for green jobs in biotechnology sector in India are as mentioned in Fig. 6.

An exhaustive list of various websites and twitter handles offering green jobs is given as reference (Table 1a & 1b)

Table 1(a) Websites for green jobs	
1	http://jobs.greenbiz.com/green-biotech-science-jobs/
2	https://www.biotech-careers.org/job-areas/agricultural-biotechnology
3	https://www.greenjobs.co.uk/
4	http://www.sustainablebusiness.com/greendreamjobs/jobs/
5	https://www.goodwork.ca/
6	https://www.simplyhired.com/search?q=environmental+biotech&job=rs1pXiWg-M3HZGiAFW9Ffs2VI6yVXztD3DJEMeqGunKHCFU-NStE9w
7	https://www.greenjobsonline.co.uk/
8	https://www.bls.gov/green/

Table 1(b) The twitter handles for green jobs	
1	@GreenJobFinder
2	@BCGreenJobs
3	@tmj_nyc_green
4	@GreenMasonStory
5	@greendreamjobs
6	@TriplePundit
7	@CleanTechies
8	@GreenJobsOnline
9	@Greenseekers
10	@CanadaGreenJobs
11	@GreenJobsIndia
12	@greenjobs4india
13	@sscgreenjobs

Fig. 6: List of Environment Biotechnology industries offering green jobs in India (https://www.environmental-expert.com/companies/keyword-environmental-biotechnology-2632/location-india)

Way forward…

India, at COP 21 in Paris, declared a voluntary goal of reducing the emissions intensity of its GDP by 33–35%, over 2005 levels by 2030 and to rely more on the renewable energy resources bringing its dependence to 40% along with the creation of carbon sink to compensate the effect of GHG emissions. Considering the Prime Minister's vision of doing justice to the climate & having sustainable development, Government of India has taken up the initiative by launching Skill Council for Green Jobs (SCGJ) in alignment to National Skill Development Mission. SCGJ is a not-for-profit, autonomous, industry lead society which is promoted by the Ministry of New and Renewable Energy (MNRE) and Confederation of Indian Industry (CII).

The aim of SCGJ is to identify skills required by service users as well as manufacturers/ service providers, within Green Businesses sector, and implement nation-wide, Industry led, collaborative skills development & entrepreneur development initiatives that will enable meet India's potential for "Green Businesses".

It is expected that almost 2 Cr. skilled workforce would be required for green jobs by 2030 (renewable energy) out of which 15 lakhs would be required for solar energy needs while 2 lakhs would be required for wind energy sector. Presently India has only 3.5% skilled people as compared to 96% (Korea), 80% (Japan), 74% (Germany), 68% (UK), 54% (The USA) as per the National Sample Survey Organization report. Therefore, GOI has launched the world's biggest skill development mission program that aims to develop trained manpower which would be able to cater the green jobs industry (www.scgj.in).

The renewable energy sector which is presently contributing only 14.87% with a capacity of 47GW is estimated to grow to 175 GW by 2030. The existing scenario in the renewable energy sector is as per Fig. 7.

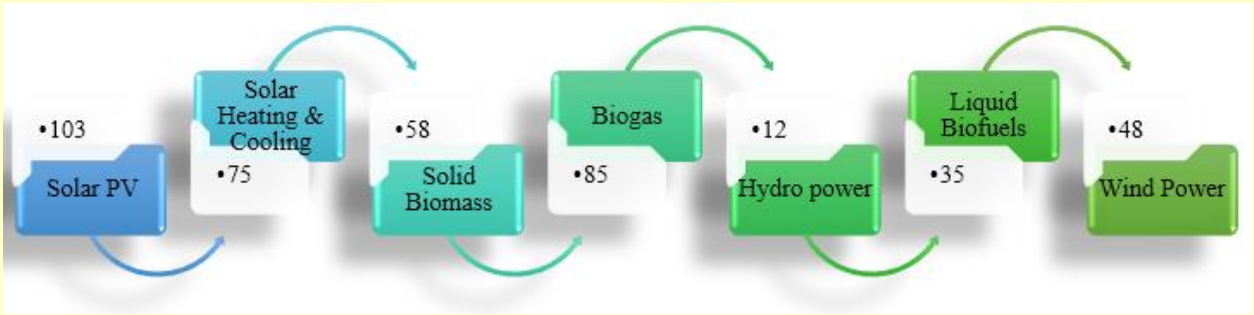

Fig. 7: Jobs in Renewable energy sector in India (IREA-2016), values are in thousands

Green Jobs for green India

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The "green jobs or occupation "existed from the time-immemorial in India. The green jobs help to protect ecosystems by reducing energy, materials, and Water consumption through high efficiency strategies. It also helps de-carbonize the economy and minimize all forms of waste and pollution for sustainable development. Some developed economies have taken leading steps towards green jobs and technology and developing country such as India and China are making efforts to go for green economy. Green jobs include opportunities for managers, scientists and technicians particularly in informal sectors where most: youth, women, farmers, rural populations and slum dwellers may be a major player.

India has large potential of human capital so there is a big scope of green jobs. The phenomenal growth rates achieved by some of the developing countries like India and China has changed the carbon footprint of the world. In this context keeping in mind the importance of sustainable development, these countries will require a radical shift in developing new skills and qualifications which will offer great potential for the creation of green jobs.

India is at a crucial cusp of breaking into the path to the 'being a developed' country. The journey to this path is not going to be smooth as the rapid growth brings in its own set of challenges. One of the biggest challenges is to maintain the environment according to international commitments, bringing down the fossil fuel based consumption and substantially increasing the non-conventional (green) energy consumption. Though India is a signatory to the United Nations Framework Convention on Climate Change (UNFCC), she is not required to contain its GHG (greenhouse gas) emissions. India's policies for sustainable development, by way of promotion of energy efficiency, renewable energy, changing the fuel mix to cleaner sources, energy pricing, pollution abatement, a forestation, mass transport, besides differentially higher growth rates of less energy intensive services sectors as compared to manufacturing, results in a relatively GHG benign growth path**. This would mean creation of millions of "green jobs" in the coming 10 to 15 years.**

The Government of India is supporting and facilitating major research programs to assess various aspects related to climate change. India has a comprehensive scientific climate change Programme (along with the national level employment guarantee scheme and programs to development of skills at various levels of employment) in place that involved over 120 research Institutions and over 220 of the best scientists in the country.

Solar systems have a huge source of energy which is converted into heat through thermal systems. The amount of energy produced varies according to the system's location, the time of year and the weather, although some energy is produced even on cloudy days. Solar energy can be used to heat water, dry crops or cook food and lighting. Indian geographical location is best suited for solar electricity and various success stories are reported in India. The objective of the National Solar Mission is to establish India as a global leader in solar energy which will create huge green jobs.
The greening of occupation is an outcome of implementation of energy efficient green technologies in the energy sector. There is huge opportunity and employment in biomass energy power plant and wind power plant.

Water and sanitation related activities and occupation required. Production of sanitary hardware, Production of water filters and drilling of hand pumps and water testing labs required sample collector, chemist, lab assistant and production engineer and manager.

About 60 per cent of the working population in India are engaged in agriculture and thereby makes it the most employment generating sector. This involves several occupations with different skills and knowledge base. They assist the agriculturists in their work with regard to:

- Plant breeding,
- Animal husbandry,
- Irrigation schemes,
- Soil conservation,
- Agricultural mechanization,
- Efficient use of electronics and electricity,
- Site-specific pesticide application,
- Yield mapping, and variable-rate irrigation,
- Efficient use of water,
- Use of seed and fertiliser etc.

Climate Risk Managers: Such professionals need to be well-versed in the art and science of Climate Risk Management and help to blend traditional wisdom with modern science. They would be trained for mitigation, adaptation and developing drought, flood and good weather codes with a view of being prepared to minimize the adverse impact of aberrant weather and to maximize the benefit of good monsoons Such an initiative will benefit both the resource-poor small farmers, and national food security.

Forestry: No job can possibly be greener than planting a tree. Forestry is an area where large number on green jobs can be generated by undertaking reforestation and afforestation projects. In India through National Rural Employment Guarantee Scheme (NREGS), which has a strong natural resource management component, several afforestation projects have been taken in different states.

Building: The Energy Conservation Building Code (ECBC) was developed by India's Bureau of Energy Efficiency (BEE) and launched in 2007. A green building is one that requires less depletion of natural resources during its construction and operation. It minimizes the use of non-renewable resources and efficiently uses energy, water and natural resources. It maximizes the use of environment friendly construction materials. Construction of green buildings is a new practice in India and offers a whole range of new opportunity.

Manufacturing: The manufacturing sector is one of the major sources of environment pollution. In the absence of clear environmental standards manufacturing units were not interested in using green technologies. The products were also not environment friendly and hazardous chemicals were used in the production process. Introduction of environmental standards and green economic activities would compel these units to use green technologies and produce eco-friendly products. This would require them to look for experts like biochemical engineers who may help them develop or evaluate green technologies.

India is a country with largest youngest population in the world, comprises nearly 24 percent population in the age group 5-14 years as per 2001 population. Most of this population is deprived of schooling and other vocational skill due to lack of proper resources So to meet the future challenges regarding environment protection and adaptable to green jobs related occupations, India needs:

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Report of the Workshop on Environment Management Practices in Industries: Current Trends and Prospects

SIES Indian Institute of Environment Management had organized one-day workshop on "Environment Management Practices in Industries: Current Trends and Future Aspects" on 17th March 2018. Many representatives from industries as well as students from different colleges participated in the workshop. Resource persons for invited talk were from different industries and they shared their thoughts and experience with the participants on industrial perspective in environment management. Eight invited lectures were delivered during the workshop.

The invited lectures were on the following topics:

1. 'CSR in Sustainable Environment Management' by Mr. Prathamesh Raichura, Director, KPMG Climate Change and Sustainability Service in India
2. 'Environment Health and Safety in Industries' by Mr. Naresh Musale, EHS Leader, Owens-Corning(India) Pvt Ltd.
3. 'Environment Risk Assessment in Upstream Gas and Oil Industry' by Mr. Amor Nath Mondal, Superintendent Engineer (Env.), ONGC
4. 'Environment Management Practices in Industries: Current Trends & Future Prospects' by Mr. Amol Mahajan, Manager EMD, TATA Steel.
5. 'Life Cycle Assessment in Industrial Operations' by Mr. Ritesh Agarwal, Thinkstep Sustainability Solutions Pvt Ltd.
6. 'Climate Change Regulations : Current Trends and Future Aspects' by Mr. Pravin Jadhav, Assiciate Vice President, RSM GC Advisory Services Pvt Ltd.
7. 'Key Challenges in Environmental Compliances in Industries & Wayout' by Mr. Rohit Kumar, TESLA
8. 'Environmental Compliance Management' by Mr. Nilesh Potdar, Operations Manager, Building Environment India Pvt Ltd.

Resource persons for the workshop

Participants during the workshop session

Green Career in Geospatial Technology for Environment Management

Dr. Saumya Singh
SIES Indian Institute of Environment Management, Nerul, Navi Mumbai

Ever increasing population and unplanned developmental activities have caused severe deterioration of environmental resources. It is necessary to maintain balance between the capacity of environment and utilization of resources. Today's technology has immense potential to capture large amount of data about earth's resources. To get meaningful information from those data is a big challenge.

Geospatial technology has immense potential to spatially analyse such data and helps in understanding and studying the past and present scenario of environmental resources, its spatial and temporal variations, and predict future scenario. Today, GIS is being used in various government departments as well as in industries for creating and managing data, performing spatial analysis, and making maps. The demand for maps is increasing in government sector as well as in private sector for decision making process. The advantage of GIS is its ability to create separate thematic maps (map layers) for different types of information, and then combine them in any desired way.

The skills required to be a successful GIS professional includes knowledge of cartography, geospatial customization, spatial analysis, database management, web technologies, programming, and knowledge of GIS software. Today GIS is used in various fields and disciplines like academics, research and developments, urban planning, disaster management, geology, forestry, agriculture, environment management, civil engineering, etc. It is very important to know the use of Geospatial technology in different fields and disciplines. Based upon the application of this technology workforce may be required in various government and private sectors.

Use of Geospatial technology in Government sectors:

Ministry of Environment, Forest and Climate Change:

- New technologies like GPS, GIS and remote sensing have been used in the forestry sector for better protection and management of the resource.
- The Government of India has taken a pioneering initiative for conserving its national animal, the tiger, by launching the 'Project Tiger' in 1973. The tiger corridors for gene flow have been mapped in the GIS domain.
- National Natural Resource Management System (NNRMS) promote the use of high technology inputs such as Remote Sensing (RS), Geographical Information System (GIS) and GPS (Global Positioning System) in conjunction with the conventional techniques / methods for national development applications including natural resources management, environmental monitoring and disaster management.
- India State-Level Basic Environmental Information Database (ISBEID) has been developed to help State Government/ UT Centres to collect, compile and disseminate information on a centralised server. The GIS modules is used to (a) provide internet-based GIS application, interactive maps capable of handling operations like zoom in/out, pan, print, measure etc., and (b) enable querying ISBEID interactively on dynamic maps with layers such as rivers, railways lines, roads, location of National Parks, Reserves etc.
- ***ENVIS Centre at Institute for Ocean Management (IOM), Chennai:*** The Centre provided detailed description of the Andaman & Nicobar and Lakshadweep

Islands and created a GIS database of island and land use of selected inhabited islands.

National Centre for Earth Science Studies, Ministry of Earth Sciences, Govt. of India: Coastal zones are ideal laboratories to monitor the impact of climate change due to sea level rise, monsoonal variations or oceanic circulations, wherein the outcomes are mainly visualized as changing shorelines. Remote Sensing and Geographic Information Systems (GIS) are valuable tools for acquiring and collating information for systematic evaluation of shorelines transformation over a period of time.

Ministry of Drinking Water & Sanitation, Government of India

- The Ministry of Drinking Water & Sanitation (MoDWS) signed a Memorandum of Understanding (MoU), with Central Ground Water Board and National Remote Sensing Centre on 21st September 2015 for joint use of Geo-Spatial Technology in Aquifer Mapping and Management.
- The Ministry has completed the preparation of hydro-geo-morphological maps for the entire country. Using these maps, States can identify sites for groundwater sources for water supply systems and locations for constructing recharge structures to improve sustainability of existing water supply sources.
- Ground Water prospect maps will help in identifying correct sites for production wells and sustainability structures for artificial groundwater recharge.

Ministry of Housing and Urban Affairs, Govt. of India:

- Reform of property tax with Geographical Information System (GIS) so as to raise collection.
- Broad spatial plan showing land use pattern, road and other infrastructure network.

Ministry of Statistics and Programme Implementation, Govt. of India: Application of modern IT tools like RS and GIS for generating environmental statistics, irrigation statistics, integrating spatial and attribute data from diverse sources and to synthesise all information in a specific format.

Ministry of Development of North Eastern Region, Govt. of India: DoNER has embarked upon the agenda of using Geo Spatial, Remote Sensing and GIS technologies as decision support systems for planning. The Ministry has taken up the task of mapping the entire North-Eastern Region (NER) with the help of National Centre of Geo Informatics (NCOG), Ministry of Electronics and Information Technology and North Eastern Space Application Centre (NESAC), which is a space application unit of North Eastern Council. The purpose is to aggregate all development related data about NER in one place to strategise, plan, implement and monitor various developmental schemes and projects in the area.

Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare Government of India: Remote Sensing & Geographical Information System (RS &GIS) and Global Positioning System (GPS) are being used to generate site specific soil and land information. It has also established a Remote Sensing Centre (RSC) for leveraging applications of advanced technologies in soil survey programmes.

National Disaster Management Authority, Govt. of India: GIS & Risk and Vulnerability Analysis and vulnerability profile.

National Institute of Rural Development and Panchayati Raj (NIRD&PR), an autonomous organisation under the Ministry of Rural Development: Recognising the importance of the emerging application of

Geo-informatics in various rural sectors, Centre on Geo-Informatic Applications in Rural Development (C-GARD) of the Institute designs specialised programmes for imparting skills and improving knowledge levels in the latest Geomatics technology and tools. Six GIS Facility Centres are established viz., in Assam, Gujarat, Andhra Pradesh, Tamil Nadu, Kerala and Odisha States, for promoting the use of scientific information derived from satellites, GPS and GIS technologies in rural development programmes.

Telangana State Remote Sensing Applications Centre (TRAC), Planning Department, Government of Telangana

- Web GIS services and Mobile GIS services are used to collect, modify, and measure the spatial data in an easy and effective way.

Government of Chhattisgarh through its nodal agency, Chhattisgarh InfoTech & biotech Promotion Society (CHi PS), an autonomous organization under the Department of Information Technology, in consultation with Department of Panchyat and Rural Development (P&RD), and Department of Land Revenue (LRD), has generated Natural Resources Database (NRD), Infrastructure Resource Database and Cadastral Database for the State of Chhattisgarh on various scale from 1:50000 scale for natural resource, 1:4000 for rural cadastral maps to 1:1000 for urban amenities using IRS LISS-III/IV and CARTOSET data made available by NRSA(ISRO).

Use of Geospatial technology in Industry:

Various Geospatial jobs titles in industry includes GIS intern, GIS analyst, Geospatial analysts, cartographer, programmer/ developer, GIS technician, GIS coordinator, GIS manager, GIS executive, Surveyor, Geographer, etc. GIS job demands following responsibilities:

- Conduct geospatial analyses, maintain GIS graphic files and generate reports using GIS software,
- Perform R & D to obtain datasets of unknown locations with the help of known datasets through interpolation,
- Compile spatial and non-spatial data from various sources,
- Data conversion between various formats
- Analyse environmental and geographic data from different sources,
- Digital elevation modelling and contour map generation
- Consulting activities and capacity building in geospatial technology

In this technical field it is important to update the knowledge level and skills by attending training programmes, workshops, conferences and reading GIS based literature. Today, various GIS companies are designing and developing spatial database in a user-friendly way to provide solution to environmental problems.

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Career Options for Environmental Practitioners

Nilesh Potdar
Operations Manager (Building Environment India Pvt. Ltd.

Every business model starts with need of solving some kind of problems. Where the problems are more, business flourishes. since the early days of civilization, human has faced number of problems related to food and shelter and that's how you can see numerous business models which are based on solving these problems. In today's world we are facing a new set of problems. These problems are related to quality of environment in which we live. Although we are technologically very advanced but we still struggle to solve basic problems such as water quality, air quality, waste management and degradation of land. As these problems are increasing day by day, in future we will require more and more business models which can solve these problems. Therefore, the environmental practitioners are the essential parts of our society and there will be more and more demand for them. But having just more number of practitioners is not enough. There has to be a number of knowledgeable environmental practitioners who can solve the real life environmental problems. In this article let's understand different business areas which are there for environmental practitioners.

1. Environmental consultancy

This is very important business area of environmental field. It deals with environmental impact assessment, environmental and social risk assessment, environmental monitoring programs, environmental audits, compliance management and environmental performance assessment. In this business area it is important to understand the various regulatory requirements applicable to the project, identification of potential environmental and social impacts of the project, evaluation of impacts, knowledge of various prevention, control and mitigation measures including the best practices available in the industry as environmental consultant deals with accessing, reporting, monitoring as well as implementation. This is the key area of the environmental field the consultancy provides great opportunity to work in variety of assignments and helps expand the knowledge base.

2. Environmental Manager at an industry

Environmental manager at industry deals with day to day compliance management as well as key business decisions. This position is critical because any wrong decision can have major negative impact on industry's reputation as well as investments. it requires very good understanding of applicable regulatory requirements for the business and also the knowledge of implementation. The environmental manager needs to have good communication skills as he has to regularly communicate with various authorities. Depending on the type of industry, it is important to have the core knowledge of the industry and regulations.

3. Environment Manager at Corporate Level

This is the position where one needs to understand various operations of the group. This is a challenging position as it involves assessment of various scenarios, taking decisions, coordinating with various business units of the company and managing the overall compliance of the company. This position involves communications at various levels from top management, to business unit level, to external stakeholders. This role also involves managing various contractors

and monitoring the implementation of compliance at each business unit. Since the key business decisions are taken at group level, this position is critical.

4. Research Institute

There are many research institutions working in the environmental field. These institutions work on solving challenging issues in the industry and finding cost effective solutions. This area gives great opportunity to work with some of the greatest minds in the industry and to dedicate ourselves for contribution to the future technological innovations.

5. Teaching Profession

Here you need to keep yourself updated with all the basic knowledge as well as latest trends in the field. Your role is of leader who creates other leaders and lead by example. Teachers have the key role of imparting knowledge and helping the new generation deal with future challenges.

6. Government Offices

This profession is one of the most important area in environmental field as it actually drives implementation of environmental controls and regulates the environmental compliance. They are monitoring the day to day environmental performance of the industry and keep the records. They also conduct audits and inspections for reviewing the performance of industries. They set the standards and guidelines to regulate the industrial activities and protect the environment.

7. Business Start-ups

They say future is all about innovative business models. The new business startups are basically the units formed with a unique objective to solve the particular problems currently faced by the industries. The startups work on solving those problems and scale it up to the industrial levels. They do consultancy, design, planning, detailing of the solutions. This is an interesting area where you use your expertise to develop the new business models and help the industry. Again, this takes a great knowledge about your domain as well as the analysis of market.

In the nutshell, you can thrive in any of these areas provided you possess the required knowledge and dedication. It is always recommended to prepare yourself well during your graduation and post-graduation so that you can become the great contributors as you enter the professional life.

SIES IIEM's Participation in Various Events

Republic Day Celebration
26th January 2018

Republic Day Celebration at Anglo Eastern Meritime Academy, Khandpe, Karjat.

Dr. Seema Mishra, Director, SIES IIEM was invited by Anglo Eastern Meritime Academy, Khandpe, Karjat on 26th Januray 2018 for Republic Day Celebration at their Academy. Anglo Eastern Meritime Academy have several working models on Environment management (Waste water treatment plant, biogas plant, drinking water purification system, solar lights, green landscape, rich biodiversity and many more).

Dr. Seema Mishra. Director, SIES IIEM at Anglo Eastern Meritime Academy, Khandpe, Karjat

Capacity Building Programmes on Waste Management Rules
at Nagpur on 12th of March 2018

Capacity Building Programmes on Waste Management Rules are being organized by ULBs / Municipal corporations in 70 cities of India. National Productivity Council (NPC) is the National Programme coordinator for conducting these programmes. Till date, the programmes have been conducted in 15 cities. As a part of this Capacity Building Programme on different Waste Management Rules 2016, Dr. C. Srinivas of our institute gave talk as a resource speaker on 'Bio-Medical Waste Management Rules 2016' at Nagpur on 12th of March, 2018. This programme was jointly organised by NPC and Nagpur Municipal Corporation with participation from different stake holders numbering 350.

Dr. C. Srinivas, resource speaker on 'Bio- Medical Waste Management Rules 2016' at Nagpur on 12th March, 2018

AIR-O2-THON
16th February 2018, Chennai

SIES IIEM supported and participated in Air-O2-Thon, Chennai at IIT Madras. Our Alumni Mr. S. Mahesh attended the conference and represented our Institute during the conference.

Mr. S. Mahesh (PGDSEM 2016-17 Batch, SIES IIEM)

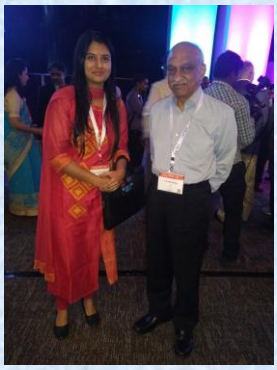
Two Day Skill Development Program by Tesla Innovation Center
23rd to 24th March 2018, Mumbai

SIES IIEM students Namrata P. Kakade and Komal Kamble attended 2-day skill development program by Tesla Innovation Center at CSRE, IIT Bombay on 23rd March and MIDC Taloja on 24th March 2018.

SIES IIEM's Participation in Various Events

Geospatial World Forum 2018 17th – 19th January 2018

Geospatial World Forum (GWF) is the global flagship event produced and organized by Geospatial Media and Communications. The conference has successfully highlighted the true potential of geospatial technology across multiple sectors and industries for over a decade. It is one of the most informative international forums in the geospatial industry. Dr. Saumya Singh of our institute attended and presented technical paper on "Addressing Drinking Water Issues in Slums in Greater Mumbai and its Mapping using GIS" under NRDMS, DST project during the technical session of the conference on 17th Januray 2018 at HICC, Hyderabad, India.



Dr. Saumya Singh with Dr. A. S. Kiran Kumar, Former Chairman, ISRO, India

Dr. Harshvardhan, Minister at Ministry of Science & Technology India,
Dr. Jitendra Singh, Minister of State, Dr. A. S. Kiran Kumar, Former Chairman, ISRO and other Respected Dignitaries releasing the Atlas Book based on activities of National Remote Sensing Centre during the conference

World Water Day Celebration by Pillai College of Engineering and Indian Desalination Association (InDA)

Seminar was organized by Pillai College of Engineering and Indian Desalination Association (InDA) on 24th March 2018 for World Water Day Celebration. SIES IIEM has participated in the conference and presented oral as well as poster presentations during the seminar. SIES IIEM has received best oral and poster presentation awards in the seminar. Oral presentation was on the topic "Geospatial technology for assessing drinking water problems in slums in Greater Mumbai" (NRDMS, DST project) by Dr. Saumya Singh. Poster presentation was given by Ms. Gitika Singh on the topic "Waste water treatment processes" (BRNS Project).

The seminar consisted of scientific sessions that included invited lectures, presentation of contributory papers and posters. The speakers were from industry, academic institutes and those involved in social work.

Dr. Saumya Singh, presenting on the topic "Geospatial technology for assessing drinking water problems in slums in Greater Mumbai"

Ms. Gitika Singh presenting poster on the topic "Waste water treatment processes"

Evolve "Smart Campus" at Training Institutes with Green Initiatives for Resource conservation

Prof. Ajit Seshadri
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Vels University, Chennai 603103

It would be in order to have all academic institutions to aspire and become "Smart Campus" by exerting efforts for conserving usage of natural resources viz. water, wastes, electric- power for energy usage etc. The expenses and efforts afforded are economized and there is more availability of resources at lesser costs and expenses at each institution.

Also, each Institute starts to **train professionals** in house ideally for carrying out this role efficiently. Be it be in Science, Engineering, Management or Architecture, planners are aptly groomed. Their competence and experience are bettered by true projects at campus itself.

Effect of Environmental Impacts:

All institutional campuses are environmental impacts prone with adverse effects experienced by shortages of natural resources viz. water, energy and effects of greens etc. Wastes generated at each campus also are detrimental and even problems on heat islands remain unaddressed. Sustainable initiatives are promoted and efforts are afforded in order that natural resources are conserved and ill-effects of environmental impacts are remedied.

Efforts are afforded for conserving energy, water resources and creating green projects in conserving and turning wastes into resources. These efforts would go a long way in providing better quality of teaching/ learning experiences for staff, faculty and students.

Apt initiatives done before After-shocks :

One by one Environment conscious Institutes, are exerting efforts to become more conservative on energy, water consumption and wastes optimization. Environment friendly measures are practiced so that pollution effects are reduced in the respective sites. Implementing green initiatives enhances the sustainability level of each of the institution. And regular Sustainability Audits are carried out with targeted improvements done year after year.

Need for Green principles and practices:
Functioning of educational institutes are designed for total deliverables to the society for **imparting education and realization of values** to students. Institutes also conduct value added environmental training for all faculty and students to bring value in the communities. All these initiatives are taken forward on a set pattern and overall green principles are evolved at each sections of the campus. Do-able initiatives are listed and budget is made for formal approval.

A team of **Project planners** could be evolved for training students, others under guidance from senior faculty with on-site project training and an Institute can draw benefits from same. In next phases these practices are perfected and a Campus Green Practices Manual is evolved.

Benefits accrued and Action forward:
Even though most Institutes are environmentally conscious and maintained, a bit more efforts when afforded realizes proportionately more benefits from the nature. With a costing of approximately 5 to 10% of annual budget, the gains achieved are estimated to be twice the costs afforded

i.e. nearly 15 to 20% of annual budget value. This leads to a sustainable approach at campus-sites and to carry out environmental practices on main elements viz. water, waste water, management of wastes, greening of campus, optimization of energy and building awareness on festival celebrations etc. Thus, after becoming confident of sustaining the efforts, new projects are added to suit the needs of the Institution. Also, substantial team force of project implementers is evolved among students. Hence upon graduation, these students can easily take up doing these tasks as future employment opportunities. These values gained would enhance their career in this path of sustainability and doing Green-projects etc.

Conclusion:

The creation of green initiatives results in evolving of a Smart- campus holistically with tangible and intangible benefits. In conclusion, a Smart Campus is evolved at the institution to sustain its green initiatives with progressive gains and benefits accrued etc.

This Green project enables an Institute to evolve a work-force of Green job implementers, also that Green Job Seekers can easily source apt work force who can further their Green career at varied sites.

Table 1 :- Details of Green Initiative: Process and Smart Campus Assets - Audit Account

Examples of Process for Conservation of Natural Resources & remediation of wastes:

S.No.	Natural Resource Input	Green Initiative eg Campus Asset Process	Conserved Resource Output
1.	Rain/ storm water	RWH – Rain Water Harvesting	Recharge in well/ pond
2.	Waste water/ sewage	STP- Sewage Treatment Plant	Co-composting / Manure
3.	Waste water/ sullage	STP- Sewage Treatment Plant	Re-use water for Use
4.	Solid waste – bio origin	Composting & Soil Treatment	Co-composting process
5.	Solid waste – non-bio	Recyclers mode & safe -disposal	Revenue realized/ re-use
6.	Air Quality - CO2 / SPM	Campus greens & landscapes	Lawn/ green cover
7.	Festival - celebrations	Eco-conduct eg safe practices	Smart campus evolved
8.	Electricity supplied	Energy audit with conservation	Revenue saved

Heat Islands & others remedied /audited/ assets realized at SMART Campus.

Figure 1: A view of a Maritime Training Institute (Picture used for representation)

Green Shoppe The Path to Green Career

Shreelata Menon
Project Coordinator, Green Shoppe, Enviro Vigil, Thane

NGOs have always flourished on the psychology that humans are inherently helpful in nature. Some help in the form of donations, some in kind form and some through their voluntary services. But the conventional notion that NGOs are only voluntary services has changed over time. Today the youth also pursue challenging and ambitious careers in NGOs which pay them for their services.

My article focuses on social entrepreneurship an area slowly growing in India. The basis of this field is bifold. One is the new mantra (by our present Prime Minister Mr Narendra Modi and his government) of the "Make in India" wherein the emphasis is to discourage imported products viz-a-vi promote local Indian made products and the second is that NGOs too are now looking at becoming self-sufficient and sustainable in terms of their economic requirements.

Enviro Vigil's Green Shoppe is one such activity which promotes both these philosophies. Started as a small activity in 2012 the Green Shoppe has grown to be a major wing of Enviro Vigil. The Green Shoppe is a platform for self-sustaining NGOs manufacturing environment friendly products it started as a one stop for consumers who are on the lookout for environment friendly products. Green Shoppe operates under 5 banners of ecofriendly festivals, eco-friendly living, Green gifts, shop with cloth and publications. Presently the Green Shoppe is networking around 30 NGOs across the country and has more than 100 products to its credit. Our festival banner and the green gifts are the most sorted of the 5 in which we target celebrating festivals in an environment friendly fashion and also gifting to support a cause. The shoppe covers the 4 important festivals of Maharashtra viz Rakshabandhan, Ganapati, Diwali and Holi. The Green Shoppe was the first to popularize Rakhis made from bamboo and by a rural NGO in Melghat. Similarly, a Shadu Mati moorti with natural colours, an ecofriendly makhar, natural aggarbattis, bowls and plates from natural material etc all these are available under the "My Ganesha Green Ganesha". Clenture for Diwali, natural colours for Holi, gifts made from paper mache, waste pine wood, Vetiver have been appreciated by many and prefer to now give only these. In the options for the bags the shoppe offers bags made from upcylced flex, cotton, jute and reused sarees too. Publications in the Green Shoppe are some of the best to help schools and educational institutions to be able to do effective environment education.

The tagline of the shoppe is 'Small purchases big differences' and thus by buying a product one touches a life and also supports a great cause. The main criterion for the group to be associated with the Green Shoppe is how needy it is- the less known and needier, Green Shoppe would add it to its networking list. So, there have been organizations working with rural landless people, groups running schools for the physically and mentally challenged, NGOs working with the women in distress, adivasis, etc. The major part of the money from the purchase of the product goes directly to its NGO and for the empowerment of its people.

To summarize the salient features of the Green Shoppe are

- It is only a marketing platform and thus addresses the biggest challenge faced by the NGOs of "How and where to sell"
- Products made by deserving and remote NGOs are brought to the doorstep of the consumer
- A one stop solution for all those who believe in being green and living green
- Has tremendous potential for scaling up and engaging youth who are aspiring to take up careers in social business

But that's not all, the Green Shoppe is now moving to its second level of being able to sell concepts which will encourage conservation.

Under this level it intends helping groups by providing consultancy services in green living in areas of waste, water and energy. It is working on a comprehensive training module of green audit for schools and colleges (wherein the objective is to train the youth who will then render these services). The third field is tapping social tourism, heritage trails and eco-friendly events and celebrations. Each topic is a career in itself and has immense scope. Thus, through this article I would sincerely request the readers to visit the Green Shoppe to understand its role in sustainable development and promote green careers.

Report on the Training Program
on
Total Solid Waste Management of SIES Nerul Campus

Training Program on 'Total Solid Waste Management of SIES Nerul Campus' was conducted on 6th March 2018 by SIES Indian Institute of Environment Management as a Green initiative for Swachchta Ranking. Training was imparted to SIES Nerul staff from housekeeping, canteen, senior's home pantry, temple, PNS staff, security guards, students and faculties to sensitize on the importance of solid waste management. Total 92 participants participated in the training program. In this training program M.Sc. (SDEM) students actively participated in imparting training to the participants in Marathi as well as English language.

Training Program

Faculty members during the training program

The effect of training on the improvement of knowledge on total solid waste management was assessed through questionnaires before and after the conduction of the training program. Pre- and post-knowledge questionnaires were filled by all the stakeholders. After the training program, participants were taken for site visit to the compost pit of SIES Nerul Campus. They were explained about the importance of waste segregation at source. Locations of dustbins in the entire campus was also shown to them with detailed explanation of dry and wet waste. Overall, the training has been observed to be effective in knowledge improvement and similar awareness programme among all the stakeholders will be conducted on regular basis.

PNS and housekeeping staff filling up the Pre knowledge questionnaire

SIES staff filling up the Post knowledge questionnaire

Student Perspective

Green Jobs

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With the increase in the awareness of sustainability, varieties of job opportunities in the industry are becoming available. The diversity of sustainability makes it flexible, allowing people from various education levels and backgrounds to find different career options here. "Sustainability" and "green" words frequently raise concern for the environment. The three pillars of sustainability are Economic development, Social, Development and Environmental protection.

As this industry requires a heterogeneous workforce ranging from industrial to engineering management, the employment conditions vary from position to position. Because of miscellaneous issues that industry faces regularly, one may work in office while another may work in industry, while yet another may spend their maximum time on site.

With the fourth Industrial revolution in its infancy, the demands of energy and resources for computing system, data centers, networks and the supporting e-infrastructure are growing exponentially. Making IT greener is no simple matter as it involves different disciplines and requires innovative solutions for improved energy efficiency. Following the AAA (Assess, Analyze, Act) paradigm, performing Life cycle Assessment are some of the ways which opens the door to many green jobs in the market. According to the Department of Energy, renewable energy employment is an important piece of legislation for a number of reasons. Firstly, it sets out the Indian government ambition for the deployment of renewable energy to 2030, thus providing the needed signal to renewable energy investors. Secondly, it contributes to our overall aim of reducing harmful greenhouse gas emissions by 40% by 2030, which is pledged under the Paris Agreement. Thirdly, and perhaps most controversially, it sets out the sustainability, government for biofuels and biomass. The best way to get more and more renewables into the system is to allow people to make money from it.

Green careers will continue to become more prevalent. You should look for a career that is of interest, and then seek out a sustainability education that helps you meet that career's requirement. The chances are good that you can find a rewarding, lucrative career that will be beneficial now and for generations to come. Use the following websites to sort through the growing list of career possibilities: - SustainableBusiness.com, Earthworks-Jobs.com, EnvironmentalCareer.com, EcoJobs.com, GreenBiz.com & GreenEnergyJobs.com.

From engineer and analyst to manager and designer, existing and emerging careers in sustainable development cover a broad spectrum. The list of these positions includes: **Construction Project Manager:** A project manager oversees all aspects of a construction project, including budget, design approval, and project plan implementation. The construction project manager makes sure the finished facility meets sustainability requirements. **Sustainability Analyst:** Working in a variety of industries, the sustainability analyst reviews projects, procedures, and policies to see if they meet sustainable

standards. If the standards are not met, the analyst recommends ways to make improvements. **Sustainable Design Professional:** Using architectural and engineering expertise, the sustainable design professional designs and implements blueprints to make a building sustainable. **Energy Efficiency Analyst:** An energy efficiency analyst can be employed by businesses, organizations or individuals to determine the current energy efficiency of a project or building and then recommend ways for improvement. **Operations Manager:** An operations manager instills sustainable practices into their business or industry. They are hired to make operations run more efficiently in both productivity and energy consumption.

These careers are often dedicated to help other organizations and companies increasing their profits by running them more effectively and pleasing the customer base. Therefore, Sustainability and green jobs are much similar to the management jobs with one main difference - In green job, professionals give priority to environmental sustainable solutions at the core of their business strategy.

Therefore, there's growth not only in jobs directly related to sustainability, but in those indirectly affected as well, primarily related to the supply of materials to onsite operations.

Glimpses of Alumni Meet of SIES IIEM

6th January 2018

Alumni Meet was organized by SIES IIEM on 6th January 2018 for networking and developing linkages. Announcement of SIES IIEM Alumni Association Executive Body was made on 6th January 2018 followed by cultural programmes and formal alumni interaction.

Alumni Executive Body

Alumni Interaction

Cultural events during Alumni Meet

Environment in News Headlines

Draft National Forest Policy, 2018

The overall objective and goal of the present policy is to safeguard the ecological and livelihood security of people, of the present and future generations, based on sustainable management of the forests for the flow of ecosystem services. In order to achieve the national goal for eco security, the country should have a minimum of one- third of the total land area under forest and tree cover. In the hills and mountainous regions, the aim will be to maintain two- third of the area under forest and tree in order to prevent soil erosion and land degradation and also to ensure the stability of the fragile eco-systems.

Source: India Environment Portal, March 15, 2018, Ministry of Environment

Fly ash to be given out for free within 100 kilometere of power plants

The Fly Ash Council, chaired by Chief Secretary Sumit Mallick, told Mahagenco to work out the commercials of providing fly ash for free. Almost a year after the Maharashtra government adopted the Fly Ash Utilization Policy, it will now give away fly ash for free to industries within 100 km of the power plant.

Source: The Indian EXPRESS, March 15, 2018

The impact of disasters and crises on agriculture and food security 2017

The Impact of Disasters on Agriculture and Food Security 2015 showed that a staggering 22 percent of total damage and loss from natural disasters in developing countries was absorbed by the agriculture sector alone. Two years on, FAO continues the effort to bridge persisting knowledge gaps and foster a better understanding of how the agriculture sector is affected by disasters..

Source: India Environment Portal, March 15, 2018, FAO

Nature's 'alarming' decline threatens food, water, energy: UN study

According to the study, human activities are causing an alarming decline in the variety of plant and animal life on Earth. Climate change will become a steadily bigger threat to biodiversity by 2050, adding to damage from pollution and forest clearance to make way for agriculture, according to more than 550 experts in a set of reports approved by 129 governments.

Source: The Times of India, March 23, 2018

Forthcoming Events

- **Popular Science Lecture Series 2017-2018,** Organized by **Indian Women Scientists' Association, Vashi, Navi Mumbai Supported by BRNS-DAE** In association with **SIES Indian Institute of Environment Management**

Articles, photos etc. are invited for next issue (April - June 2018) of 'The Environment Management' on the theme 'Beat Plastic Pollution'.

Published by-

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