
Environment and Social Sustainability Approaches in Policy and Practice: A Case Study of Symbiosis International University, Pune, India

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Abstract

Environmental issues, development concerns and sustainability have become a major interest area for society as critical issues for economic growth and societal development. The recent Rio+20 summit in 2012 has strengthened the need for building sustainable development as an integral part of educational institutions through integrated learning and use of innovative pedagogical methods including the internationalization of educational systems. The present chapter seeks to focus on sustainability as a core vision and its concepts in policy and practices by implementing a unique standardized curriculum integrating various levels of sustainable development by building curriculum in key disciplines like energy, environment, infrastructure, climate change, global governance and corporate sustainability at the Symbiosis International University. The case study also discusses a preliminary assessment of the sustainability operations of the University through quantification of its energy, water consumption patterns and other initiatives. The study uses pilot student driven projects to describe sustainable development in practice. The study addresses some of the key issues and challenges in building environmental aspects as a part higher education policy and as a sustainable practice across constituent institutions of the University.

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Sustainability · Symbiosis · Infrastructure · Curriculum · Policy · Practice

1 Introduction: Concept of Sustainability in Higher Education

Over the past few years, there has been a growing realisation on the need to see sustainability as the centre piece of all anthropogenic activities leading to rational use of environmental resources and their conservation. The concept of sustainability emerged from the Brundtland Commission Report as product of the World Commission on Environment and Development (WCED) in 1987 and Agenda 21 from the Earth Summit of the United Nations Conference on Environment and Development (UNCED) in 1992 (NCSE 2003; Scheunpflug and Asbrand 2006; Springett 2005). The central question has been “to what extent is the use of natural resources and environment possible, if our economy is to exist on at least the present level in the very long run”? (Malovics et al. 2008). In recent times, apart from incorporating sustainability related curriculum in educational institutions, it has also been suggested that the institutions of higher learning should also measure their sustainability quotient in terms of tracking various energy and ecological foot prints and impacts (Leal Filho 2012). A sustainable business management practice has to acknowledge the “embeddedness in social, environmental and economic systems, and focuses on management and relationships to meet the environmental, social, and economic requirements of many different stakeholders in its networks” (Van Kleef and Roome 2007).

Sustainability itself, however, is a complex term that has been open to a variety of interpretations (Bonnett 2002). In the past, although the concept of sustainability tended to be centred squarely on environmental issues, as in the framing of a balance between economic growth and ecological carrying capacity, more recent understanding of the term have come to include socio-cultural aspects as well (Dempsey et al. 2009). Approaches to sustainability-related issues are diverse and situations are uniquely different between nations and cultures (Enderle 1997; Matten and Moon 2004). The most frequently seen factors used in performance measurement are: economic, environmental and social.

The university courses are the economic front where the courses duration, faculty and the fees structure plays a greater role to define economic viability of the course (Velazquez et al. 2009). The social aspect of the university not only encompasses the faculty and staff but it also involve the student and community in large. India being an emerging economy, in the post liberalization era, most of Indian Business Schools and Universities have started programmes focusing on sustainable development, energy and environment aspects in their curriculum; and waste management systems is one of the integral parts of such programmes (Rao et al. 2013).

From an educational perspective there have been several advances in the field of sustainability through the development of policy and operational aspects. University systems around the world have developed several approaches and models to promote sustainability policies as well as carry out implementation of activities leading to sustainable development (Leal Filho 2011). The UNCED in 1972 sowed the seeds for creating importance around key issues related to environmental conservation, biodiversity protection and environmental awareness. This was further reiterated through the Tbilisi Declaration of 1977 where a framework for environmental education activities was developed to be considered at local, regional, national and international levels through a set of fundamental principles. In 1987, sustainable development was formally adopted as a term by the Brundtland Commission (WCED 1987). Subsequently, several other agreements and declarations have been set in motion for integrating sustainable development across institutions of higher learning. Some of these include the Copernicus Universities Charter for Sustainable Development (1994), the Luneburg Declaration on Higher Education for Sustainable Development (2001) and more recently the 2010 G8 University summit—statement of action (Leal Filho 2011).

One of the major decisions of the Rio summit of 1992 was to promote Agenda 21—as a series of recommendations aimed at promoting sustainable development across various dimensions. These included education, training and awareness generation amongst institutions, civil society, business and industry and other relevant bodies and agencies. As such the key focus of this activity was to help develop capacity in educational institutions through explaining the various processes related to physical and biological environment along with inter linkages to socio-economic environment and human development. In doing so, it was envisaged that university programs in individual countries would create a system of training young graduates to inculcate sustainable aspects for society and development as in the case of Fluminense Federal University (UFF), Brazil (Romero 1995). Campus related initiatives have further been strengthened by the development of an integrated decision making process wherein all aspect of sustainability ranging from policy, teaching, research and practice have been created through tools using pressure state exposure effect framework and a multi bottom line approach (Waheed et al. 2011). Haigh (2010) in a treatise aptly points that curriculum greening is the only solution to infuse sustainable development activities across institutions of higher education and suggests that our educational enterprises must be fully geared to meet the needs of the future instead of relying on destructive and disruptive characteristics of the current economic era.

Academic institutions have in recent years apart from focusing on sustainable development based curriculum are also considering the prospect of incorporating some of the emerging disciplines into their own sustainability models. Sterling (2001) points out that development of sustainable education framework requires in depth visioning, design, and implementation at levels for achieving environmentally sustainable lifestyles. Several other authors (Madeira et al. 2011; Mitchell 2011; Speller 1992; Stubbs and Cockling 2008) have also highlighted the need for incorporating sustainable development into the framework of University institutions.

The desire to achieve sustainable development often has its fair share of challenges. Often educational institutions are seen to have certain misconceptions of sustainability and its implications for society. While most would agree that environment and conservation activities are seen as a positive sign of societal development, serious challenges remain in implementation of such actions. Some of the barriers to such actions include resource availability, lack of relevant human resource capacity, motivation among institutional staff about environment issues, management support, etc. (Leal Filho 2000, 2011).

2 Educational Institutions and Sustainability Institutions in India

Sustainable development at Universities and academic institutions in India has been mainly seen from the point of introducing curriculum which is related to various aspects of sustainability and environmental conservation (Rao 2011). Since the introduction of environment as a subject across post graduate education institutions in India in 1985, many Indian universities have introduced environment related curriculum as compared to niche based Universities which have emerged only recently. Traditional science based colleges and engineering institutions have at some stage incorporated energy efficiency, power sector related courses as a part of their electrical engineering discipline.

Since the initiation of economic reforms process in India from 1991, several institutions have started to consider the importance of environment as a compulsory element of education curriculum at primary and secondary level as well as at higher education institutions.

From the operational perspective there are very few examples of how sustainable development practices are implemented at Universities and other educational institutions (Roy et al. 2008; Spranger 2011). While some use fulltime residential courses and curricula on energy and environment (Rao 2011) as an attempt to promote sustainability, others follow a paradigm of undertaking short courses aimed at niche based target groups.

In India, practices are either restricted to niche based strategies or through institutions like the Indian Institute of Science, Bangalore, which has been collaborating on reducing its carbon emissions through various in-house related research and development activities. On the other hand there has been extensive research carried out at national and city levels to determine the environmental (Living Planet 2012) impacts and carbon footprint of cities and regions (ICLEI 2009). The key aspect of environmental sustainability of the institution itself has not been studied in detail barring a few studies at the International level (Leal Filho 2012).

As Higher Education Institutions (HEI) embark on adopting sustainability led curriculum and operational practices in their overall institutional framework, the use of several tools like GASU (Lozano 2006). Auditing Instrument for sustainable higher education (Roorda 2001) and STAUNCH (Lozano 2010) become very

relevant. Sustainability planning and action has led to other forms of policy related initiatives e.g. the Association for the Advancement of Sustainability in Higher Education (AASHE) which helps promote and coordinate the sustainability activities across Universities (AASHE 2012).

Also, in the past two decades, especially after post liberalisation era in 1991, curriculum development in India in the broad area of environmental science and management got restricted or confined to a particular niche area because of lack of suitable human resource and unavailability of necessary teaching resource. Depending upon the available expertise the curriculum over the period of time got conversant with either biology or chemistry or geology or geography. Focus on the management aspects was completely lacking. Moreover, the entire curriculum completely lacked the integration with other disciplines like social sciences, economics, etc. This practice in the past generated human resource that lacked the holistic (sustainable) approach to resolve environmental problems. Secondly, although the energy and environmental related programmes and courses are being taught in large number of universities across India, there are very few instances in which the acquired knowledge is being put into practiced for developing sustainable/green campuses due to one or other reasons, mainly being the financial constraints. These have been a matter of concern and the issues of resource use and conservation needs to be addressed immediately as the situation gets more vulnerable.

In the light of above, the authors narrate the case study of Symbiosis International University, Pune, India concerning the development of curriculum and initiatives (policy) related to sustainability and pilot assessment of operational aspects (practice) of sustainability.

3 Methodology

The present chapter deals with the initiatives taken at the Symbiosis International University, Pune, India, which is spread across six different campuses in Pune. In adopting a methodology, the study focused on the curriculum (policy) related to sustainable development coupled with the preliminary assessment of the operational aspects (practices) of sustainability at the University. In 2013, a curriculum development exercise was initiated at Symbiosis International University to evolve and standardize a uniform curriculum across its constituent colleges in the field of sustainability studies and infrastructure management. In order to study the policy perspective the methodology took into account the process of developing an integrated approach to curriculum development at the Symbiosis International University as well as considered the various sustainability related courses being imparted at undergraduate and post graduate levels.

For the operational aspects of sustainability the study focused on undertaking preliminary assessments of environmental sustainability through indicators like water, energy, landscape, waste, resource utilisation, etc. from May to October 2013 across six different campuses of Symbiosis International University viz. Senapati Bapat Road, Atur Centre, Vimannagar, Khadki, Lavale, and Hinjewadi.

4 Sustainability Education in Symbiosis International University: A Policy View

The genesis and origin of the Symbiosis International University (SIU) established in 2002 lies in the foundation of the ‘Symbiosis Society’ by Padma Bhushan Dr. S.B. Mujumdar, a renowned educationist in the year 1971 with a motto ‘*Vasudhaiva Kutumbakam*’ which effectively means “world as one family”. As a deemed University SIU is recognised by the University Grants Commission (UGC) and accredited by NAAC with A grade in 2009. Symbiosis scientifically means living together for mutual benefit and the University is today a true representation with 43 institutes imparting education in diverse disciplines at under graduate, post graduate and doctoral levels. SIU is known to be a multicultural, multi lingual and multi-national institution with academic democracy and nurturing innovation, passion and compassion along with Internationalisation (www.siu.edu.in). At SIU, sustainability lies at the core and the entire team works together through many initiatives at all levels of organizations. The education at SIU has pedagogy which has both policy and practices in its curriculum.

4.1 Sustainability Curriculum Visioning at SIU

As a part of the growing need for convergence and integration, the SIU conducted a curriculum development and review exercise aimed at standardising inter disciplinary courses in sustainability and other relevant disciplines into a uniform set of courses across its constituent institutions and colleges. This also meant avoiding repetitive courses and overlaps across Symbiosis Institutions (Cayuela et al. 2013).

The exercise was initiated at the university level where an expert committee was involved in review, design and modification of course offerings and evaluation criteria as per the level of understanding of the participants (Bloom’s Taxonomy). The exercise involved subject matter experts, faculties and practitioners. The curriculum development exercise was held in two phases with phase one essentially a gap analysis and brain storming session, while phase two being the actual designing of the courses with syllabi. As a part of the exercise the authors reviewed existing courses on sustainability with faculty members and through a process of deliberations and brainstorming, courses were standardized including developing module specific syllabi. Initially at the start of the exercise 90 courses were available for under graduate and post graduate students as part of sustainability studies. Based on the various reviews of existing courses, a total of 77 courses were finalised which meant that 13 courses were not included for reasons like, being an overlap course, too theoretical, not industry relevant, etc. From a University point of view, courses in sustainability were heavily biased toward post graduate studies (65) as compared to under graduate studies (12). The exercise also revealed a few courses (11) which were common to various symbiosis constituent Institutions as a critical component of their curriculum on sustainability (Table 1).

Table 1 Common courses in sustainability and infrastructure at Symbiosis International University

Sr. No.	Common courses on sustainability across Symbiosis International University	UG/PG
1.	Concepts and applications in sustainability	PG
2.	Environment impact assessment	UG/PG
3.	Oil and gas economics	PG
4.	Project management software	PG
5.	Public private partnerships	PG
6.	Field/Research project	UG/PG
7.	Governance and corporate sustainability	PG
8.	Project management	PG
9.	Transmission and distribution management	PG
10.	Urban and industrial waste management	PG
11.	Renewable energy sources	PG

4.2 Sustainability Discipline as Stand Alone Courses at Symbiosis International University

In 2009, the Symbiosis International University conceptualised a unique post graduate course which was aimed at integrating energy development and environment concerns and equipping aspiring global managers with managerial, economic, and technical competence. Core focus areas include sectors like sustainable energy development, conventional energy (coal, oil/gas), renewable energy, energy economics, carbon markets and trading, corporate environmental sustainability, energy management, environmental assessments, natural resources management etc. Subsequently post graduate programmes were also introduced related to Infrastructure management in the context of increasing focus on infrastructure development and economic growth in India.

While most educational institutions develop niche based courses with specific focus on creating a particular domain knowledge for students, these stand alone courses at SIU were conceived with a view to integrate some of the critical issues linking the energy, environment and infrastructure sectors with issues of social development and equity were therefore in a way trend setting courses. Some of these integrated approaches are detailed below:

Power sector: The recent power sector reforms in the country following the Electricity Act, 2003 mandated the development of a transparent, fair and equitable process in the generation, transmission and distribution of electricity across the country. This has led to several private sector entities trying to capture a market share of the power sector generation. As a consequence, several environmental concerns like mining, and rights acquisition, loss of ecologically rich ecosystems, wetland reclamation, forest cover loss, etc. have been often neglected in the desire to set up new and ultra-modern power plants (Areendran et al. 2013). The post graduate programmes have tried to include these issues as part of a rigorous curriculum which

will also sensitise future managers through curriculum focused on project management, environmental impact assessments rules and regulations, wastewater management, sustainable energy development, infrastructure project development, etc.

Corporate sustainability: The current initiatives in Indian industry to build responsible business as a sustainability activity as an integral part of core business is limited and seems all the more a difficult choice to make given the current economic growth conditions around the world. However with the adoption of the recent Companies Bill of 2013, it is hoped that businesses will develop frameworks to create an integrated approach to addressing responsible business activities through the adoption of the triple bottom concept of environmental, social and economic performance. The post graduate programmes at the University have incorporated various sections in the curriculum to inculcate the business case of sustainability for clarity and thinking on the balance between infrastructure growth and sustainable development through use of methodologies and tools for developing sustainability standards and guidelines.

Water energy nexus: In today's market and growth centred economy, resource consumption and utilisation are often seen as key to the sustainable development of society and its stakeholders. In this context the linkages between water and energy use has been studied by many scientists and is now being seen as a crucial aspect of economic growth. Moreover, organisations like the World Business Council on Sustainable Development (WBCSD), UNEP have emphasised the importance of water and energy as directly relevant to sustainable business operations. The curriculum at Symbiosis has attempted to integrate these two disciplines in an effort to provide a holistic approach to the water energy nexus. The new focus of the curriculum seeks to study the linkages between water—energy use through adoption of demand side management options, optimizing efficiency of existing systems e.g. steam engineering and water savings, recycling of waste water, alternate energy use including their application across different infrastructure sectors.

Climate change and development: According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), climate change is likely have tremendous impacts on biodiversity, natural resources, abundant freshwater resources, local livelihoods and many other sectors. Serious societal challenges are seen as many industries rely on natural resources for production and operations. The role of business schools in creating leadership to tackle sustainability challenges has been a key factor (Adams et al. 2011) in driving the development of curriculum aimed to creation of sustainable or low carbon universities. At Symbiosis, the under graduate and post graduate programmes have developed targeted courses which address the impact of climate change not only for business risks but also its implications to society and for policy makers. The curriculum focuses on the direct linkages between climate change impacts and energy development and also on recent market mechanisms (Renewable energy certificates, Perform Achieve and Trade) and emerging policy mandates like NAMAs. Such mechanisms offer vast scope for various business and industry players including small and medium enterprises (SMEs) (Saini et al. 2012). The courses related to renewable energy have been conceived from undergraduate level itself in the light of the growing

focus by policy makers in increasing the overall share of renewable energy in the energy mix of India.

Public private partnership: The Symbiosis Integrated programme curriculum has also introduced innovative course modules which seek to conceptualise the governance model of public private partnerships as a solution to rapid economic growth. Ever since the PPP process has evolved globally for the past two decades, there has been mixed results on its efficiency, performance monitoring and viability across different growth sectors. At the same time, it is of interest to note that several PPP led initiatives have been taken up in the water and sanitation, transport, power sector to promote sustainable infrastructure growth. At Symbiosis, courses at the post graduate level have been developed on the PPP led governance model with a focus on sustainable development for management education.

Industrial ecology: Since industrial development has rapidly grown in developing countries, particularly Asian countries and given the constraints as mentioned previously, it is a pressing need to accelerate the need for economic development with simultaneous protection of environmental resources. The present programme curriculum at Symbiosis decided to introduce a new integrated industrial planning and management mechanism in its curriculum on the discipline of Industrial Ecology and springs from interests in integrating notions of sustainability into environmental and economic systems (Ehrenfeld and Gertler 1997). Thus, model of industrial symbiosis in developing and underdeveloped countries would have an opportunity to manage their waste to become resource without many investments in technology of waste management (Bhat et al. 2012; Itankar et al. 2013; Patil 2012). It will also (a) help industries to improve their environmental performance, strategic planning and will become more competitive; (b) help local communities develop and maintain a sound industrial base and infrastructure without sacrificing the quality of their environments; and (c) help local, regional and national government to formulate policies and regulations in order to improve environmental protection with simultaneous building of business competitiveness.

Courses have been designed related to Life Cycle Assessment (LCA) as a method to assess environmental impacts associated with all the stages of a product's life from cradle-to-grave (Finnveden et al. 2009). LCA completely avoids the restricted viewpoint towards environmental concerns by way of: (a) accounting an inventory of relevant energy and material inputs and environmental releases; (b) evaluates the potential impacts associated with identified inputs and releases; and (c) interpreting the results to help make a more informed decision (Scott 2010).

5 Sustainability at Symbiosis International University: A Practical View

The Symbiosis International University has six campuses in Pune city, India catering to the education requirements of several thousand students in India and overseas. Many students stay on campus 24/7. The sustainability practices presented here by the authors are an initial assessment of the practices in the areas of

education (policy) and energy, water and food waste (operations) which was primarily driven by students. The various initiatives were started as a pilot project at the Symbiosis Infotech Campus (SIC) at Hinjewadi initially and were then taken up at the other campuses.

5.1 Promoting Campus Wide Energy, Water and Food Conservation Through Assessments

The students of Symbiosis Institute of International Business held an observatory survey in the SIC campus hostel which is a residence to more than 1,000 students. This initiative aimed to understand the use of various electrical appliances, tube lights, fans and plug points during the period when the students were not in the rooms for a period of 11 (eleven) days. This was followed by posters which were put to spread awareness among students towards energy conservation due to disregard towards energy saving. The data was collected and the analysis in terms of the cost incurred is shown in Fig. 1.

Food waste management: Food wastage has always been an important concern in India, and a lot of food gets wasted on a day-to-day basis. The maximum amount of food wastage comes from hotels and restaurants. However, lately it has been noticed that there is a considerable amount of food wastage generated in residential colleges as well because of food served in the hostels. The food wastage was noted down for a period of one month for breakfast, lunch and dinner on all the days and the data collected is presented in Fig. 2. In order to manage and reduce the quantum of waste generated from food SIU has initiated the process of setting up bio gas plants at two of its locations in Pune.

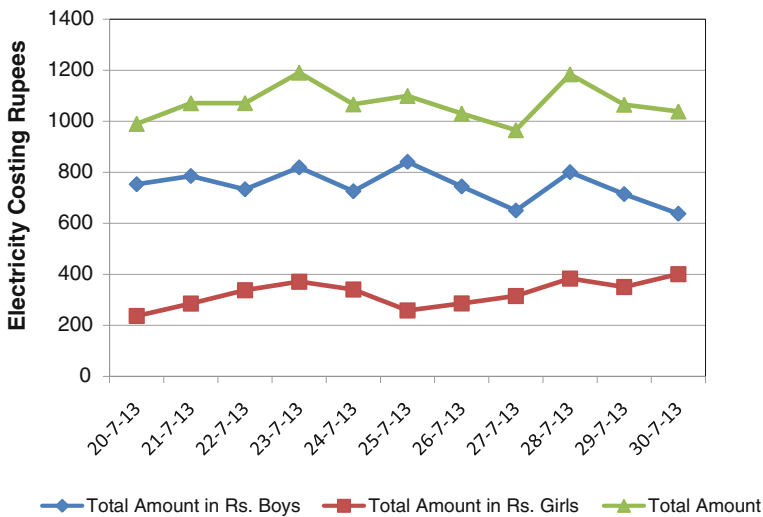


Fig. 1 Total cost incurred for different unused electrical appliances on different dates

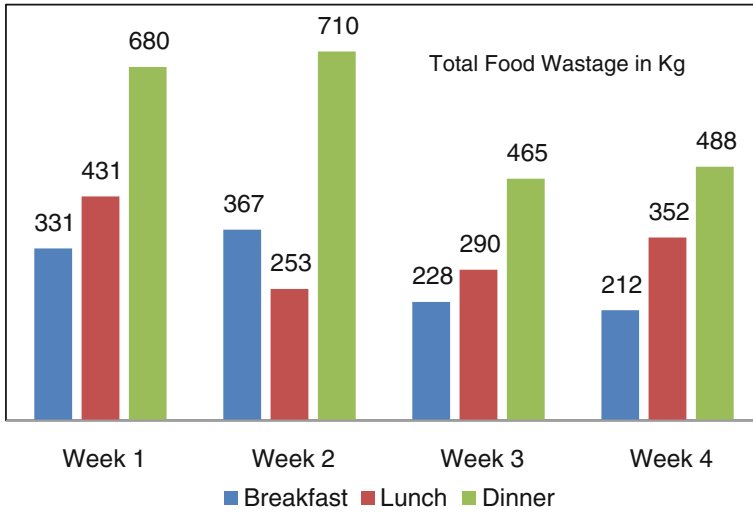


Fig. 2 Food wastage (in kg) at SIC Campus (August 2013)

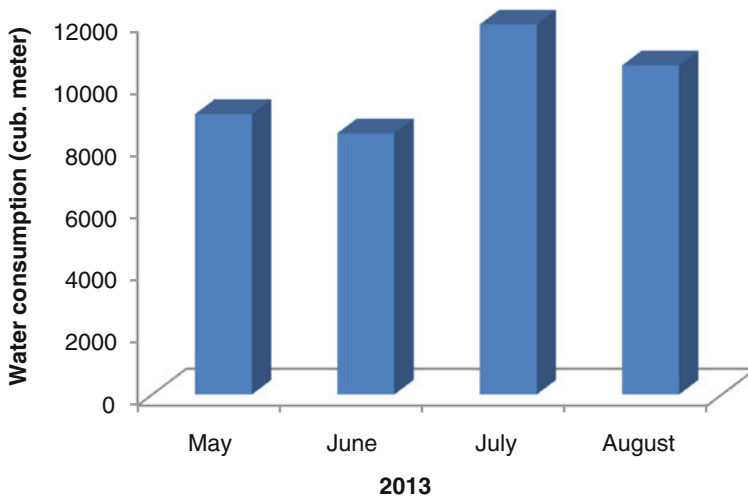


Fig. 3 Month-wise total water consumption at SIC Campus

Water consumption: Water is one of the most precious commodities and its demand, availability, consumption and use, wastewater generation and its treatment, recycling and disposal are crucial aspects for a developing and emerging economy like India. The data related to water consumption was collected for the period of 4 months to understand the usage of water in SIC campus (Fig. 3). It was

Table 2 A comparative data of resource consumption and food wastage at various campuses

Campus location	Avg. electricity consumption (Units)	Avg. water consumption (l)	Avg. food wastage (Kg)
SIC	104,103	2,150	45
SIU	290,116	6,504	50
SIMS	51,202	3,776	28
S.B. Road	33,491	6,133	30
Viman Nagar	67,270	2,055	376

Note All the values mentioned are the average of 6 months (May–October 2013)

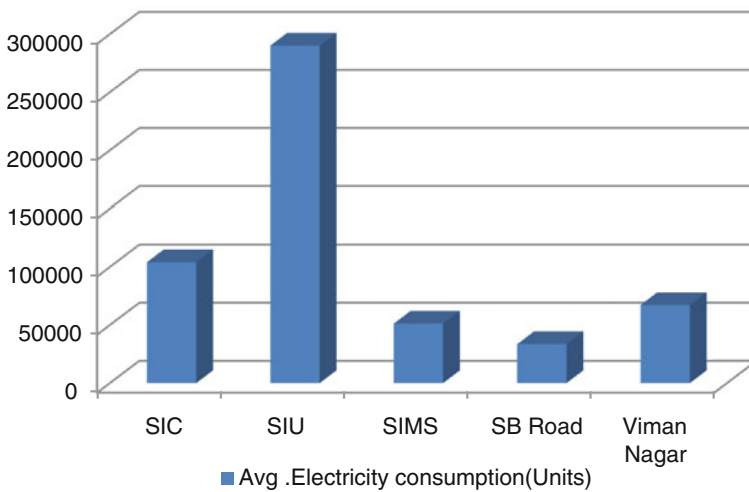


Fig. 4 Average electricity consumption (in units) across Symbiosis Campuses in Pune

found that the new initiatives include the construction of rain water harvesting system at hill top Lavale campus of SIU and three earthen dams at the hill base having storage capacity of 50 million litres of water. Sewage water generated at Lavale campus is being treated using biological treatment method like Reed Bed Technology. Further, the treated wastewater is used for the gardening purpose.

Assessment of food, water, electricity in the SIU Campuses in Pune city: Data related to food, water and electricity were collected for a period of 6 months between May and October 2013 and a comparative analysis is depicted in Table 2 and Figs. 4, 5 and 6. Based on the comparison of data at individual campuses various measures are being initiated to reduce and rationalise consumption practices across the campuses.

Environmental observatory display program: This initiative was to spread awareness about significant parameters which affect environment. The local parameters displayed included maximum and minimum temperature and humidity,

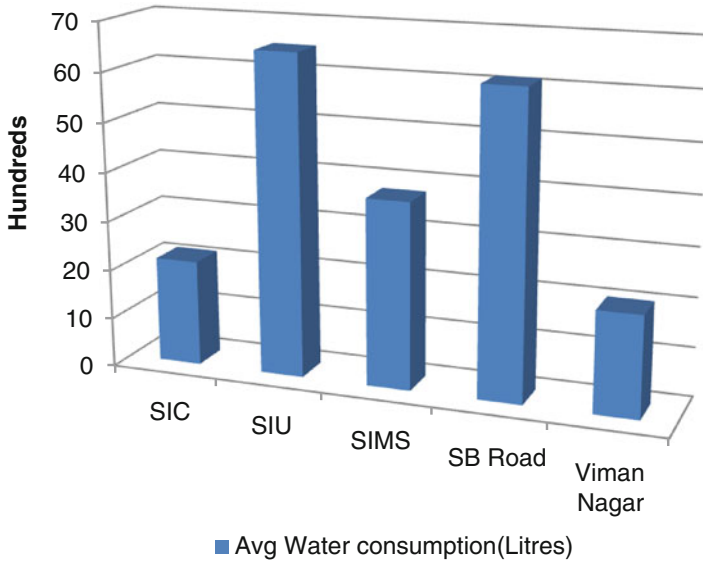


Fig. 5 Average water consumption (in litres) across Symbiosis Campuses in Pune

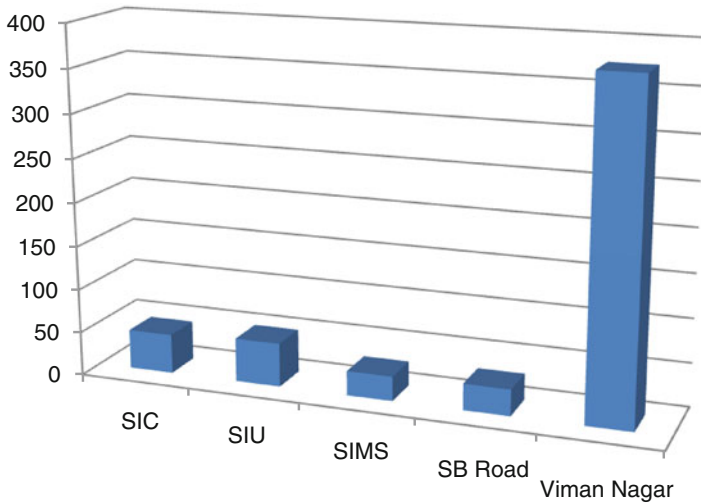


Fig. 6 Average food wastage (in Kg) across Symbiosis Campuses in Pune

while the global parameters on display monitored emissions of CO₂, CO, NO₂, SO₂, O₃, CH₄, N₂O, CFC-12. A database of these parameters is being maintained for the last 4 months since November 2013 and will be used to create awareness about climate change in the long run.

Computer energy savings program: The individual institutes under SIU have various policies to conserve ambient energy during computer usage. At the SIIB campus, asleep mode policy is implemented which switches off the monitor when not in use. In a class of 2 h duration if the faculty gives an offline assignment or quiz with a break of 10 min, the students generally leave the computer switched on. Due to the sleep mode policy the monitors go to the sleep mode and saves almost 2 paise in their electricity bill per computer. The SIIB laboratory houses 75 computers which results in a saving of 75×2 paise = 150 paise (1 INR = 100 paise) of electricity bill for duration of 2 h. There are totally 100 computers in each campus and if the same policy is applied everywhere on an average Rs. 2 is saved in the electricity bill for the duration of 2 h.

Transportation Policy: In an effort to reduce greenhouse gas emissions from students, faculty, and university vehicles, all the SIU campuses are declared as Green zones where no student vehicles are allowed. There are shuttle buses for the students to commute from the hostel and also to the city. The faculty and staff use the shuttle buses to travel from city to the campuses. There are two electric vehicles in the university premises used for commuting within the university campus. Pool of bicycles is kept at the university premises for student usage. Faculty who stay nearby use carpools to reduce vehicle fuel usage and help in reduction of greenhouse gas emissions.

Sustainability Practices through CSR activities: The World Business Council for Sustainable Development defines CSR as '*the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce and their families as well as of the local community and society at large*'. Sharing these views and working in the lines of Symbiosis's vision the university students put in consistent efforts for holistic development of Society. Since the year 2004, SIIB students contribute to the curriculum development, study plan for the students of VIIIth class depending and implement the study plan by visiting twice a week to delivering lectures in Computer, English and Mathematics. The contribution is just not limited to teaching; students celebrate Teacher's Day, Christmas, New Year, Children's Day, thus sharing a symbiotic relationship.

In the year 2008, an innovative way of tutoring 11 children of SIC Staff was started. The children ranging from Nursery to XIIth Std were tutored by a group of 23 students in the subjects the parents claim they are weak in. The performance of 11 students with whom the initiative took was monitored and has shown considerable improvement in their learning capacities.

6 Conclusion: Sustainability as a Foundation for Change at SIU

The importance of environmental sustainability as the future direction for societal action is perhaps the need of the hour. This is particularly relevant in the context of some of the most challenging and complex global environmental issues the world is

facing. Our current understanding of some of the key issues of impact of climate change (Pachauri and Reisinger 2007) only seems to suggest that there is very little time for the world at taking action in mitigating the effects of greenhouse gas emissions which are like to increase in an exponential way in a business as usual scenario (Meinhausen et al. 2009). The rising demand for energy and its consumption in order to achieve higher economic growth is cited as a key driver of higher GHG emission rates. The increasing urbanisation rate and local environmental stresses from over population, industrial development, migration, etc. (Mukhopadhyay and Revi 2009) are an indicator of some of the imbalances humans are likely to face. This could mean strategic involvement of not only country governments but also business and industry, academic institutions and civil society in alliance that will help to build a sustainable and low carbon economy.

The example of Symbiosis International University recounts the initiatives focussed on development of UG and PG curriculum (policy) related to sustainable development and pilot scale assessment of the operational aspects (practices) of sustainability in the various campuses. Taking forward the motto of '*Vasudhaiva Kutumbakam*' (world as one family), the University as its first step through the exercise of curriculum development tried to integrate all the constituent institutes that otherwise are imparting education in diverse courses and disciplines. The faculty members along with other academicians and subject experts, practitioners after a long process of deliberations and brainstorming reviewed, modified, standardized and optimized the sustainability related courses. This exercise helped in removing the redundant elements thereby enhancing the quality and need based substance. The sustainability related courses introduced at SIU are stand alone courses and were envisaged to integrate critical issues linking energy, environment and infrastructure sectors with social development and equity. However, the question remains whether such stand alone courses can make a difference to sustainability education across a large University like Symbiosis. At the present moment only a handful of student community take these sustainability course offerings each year as this is not seen as a main stream in the larger scheme of things. According to Hegarty et al. (2011) such stand-alone courses can lead the way for developing sustainability action model across campuses. Future directions must include as series of faculty development programmes which can target non mainstream disciplines towards the realisation of sustainability as a key and integral aspect of education.

On the operations front (practices), pilot assessments of the resources used and wasted were examined on various campuses of the university. For this project, students were involved in large number which sensitized and provided them with the requisite first hand practical experience. In the era of climate change, it is imperative for all the organisations, companies, educational institutes and universities to measure the efficacy of the resource use in terms of water use and recycling, food wastage and energy use and conservation. While there are no shortages of these resources on any of the campuses of the University at this moment, the authors believe that with the increase in population, urbanisation, industrial development, and other human activities, it is certain that there will be huge

resource crunch of these basic resources in an emerging economy like India in the years to come. In order to tackle these problems and prepare for the future, the authors suggest that HEI like Symbiosis International University will certainly need to take a “Leadership Role” by imparting and practicing sustainability education that will integrate the three dimensions viz. environment, economic and social in a true sense. The example of Symbiosis International University of visioning campus greening curriculum as well as implementing operational aspects of sustainability at various campuses requires in depth imagination and an ability to imbibe market based changes since sustainability policies are seen as very dynamic and linked clearly to societal needs and pressures.

The importance of environment as a compulsory element of primary and secondary school curriculum has already been implemented by the University Grants Commission, Government of India. It is imperative to build and strengthen interdisciplinary sustainability based curriculum across HEI. The authors suggest that this can be achieved through a clear vision and developing education frameworks and policy guidelines across the academic institutions and inclusion of new governance approaches.

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