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Sustainability Through a Green Event

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The London summer Olympics and Paralympics 2012 set the first mark in history to become unique and hold the critical strands of sustainability events. This paper discusses a sustainable event held by Cleanfix-Schevaran Systems Private Limited at Nanjangud taluk, Mysuru district, Karnataka elaborating the pre-event planning, monitoring during event, and post-event data analyses. Net zero Objective was achieved through Zero energy skylight (40 numbers) and 40 turbo vent fans, 25KW solar and the carbon laid from travel made by participants from all over the world was taken to neutrality through carbon sequestration (~39.97T) with bio-mass of ~14.69 T planned at the site, which is beyond existing plantation accounting to ~17T. 62 species of plants belonging to 32 families are potential carbon neutralizers. Others points were use of eco-friendly VOC's-free prints of ecosolvent, digital displays, single-use bottles replaced with reusable glass bottles, ceramic plates, and local catering with native food, factory has been designed water positive, with ponds conserving rainwater and a sewage treatment plant. Overall, the event gives an insightful way forward for government agencies, industries, institutions, event management agencies and communities that engage in several occasions and events annually.

Keywords: Carbon footprint, Carbon sequestration, Eco-friendly celebration, Energy conservation, Sustainable event, Water positive

1 Introduction

Sustainable event thought has given Cleanfix-Schevaran Systems Private Limited at Adakanahalli Industrial Area, Nanjangud taluk, Mysuru, Karnataka innovative opportunity to make it carbon neutral, water positive and use eco-friendly materials as much as possible. The consciousness of going sustainable enabled setting a example to industry, institution and society for several events held annually. The event started with meticulous planning pre-event, during the event and post-event. Venue, Power, Water, Waste Management, Material use for Event marketing and printing, carbon sequestration for travel carbon footprint and Catering are the aspects considered.

2 Materials and Method

Study location: The study area, Cleanfix-Schevaran Systems Private Limited Company, is located in Adakanahalli Industrial Area, Nanjangud taluk, Mysuru district, Karnataka state. The company spreads over 198156 sq. ft. (4.55 Acres) of which 90112 sq. ft. area is a built-up area, the green space is 81705 sq. ft., and other areas account for 26338 sq. ft. ISO 20121:2012 International standard for Sustainable event was referred to, and subsequent objectives were finalized to make it more sustainable. Table 1 gives an understanding on how pre-event objectives were set to understand how the event could be made more sustainable and those objectives were monitored closely during the event to make sure if the specified objectives were being adopted, following which the post event evaluation of objectives were done to understand the amount of scope achieved.

2.1 Plant diversity analysis for carbon sequestration

The plant diversity analyses study was carried out during June-July 2022. A systematic sampling method was used for tree sampling and all the tree and shrub species enumerated at breast height (GBH – Girth at Breast height) (1.37m).

The number of plants in the industry premises was recorded, and the relative abundance of tree species was calculated by dividing the number of individual species by the total number of all the species in all sample plots multiplied by 100. The height and girth of the trees were measured using an American Forests

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method and measuring tape method, respectively. Data of individual trees were used to estimate the volume of the trees. The volume of each species was calculated using the species-specific volumetric equation method developed by the Forest Survey of India (FSI, 1996).

2.2 1 Aboveground, Below-ground biomass (AGB and BGB) and Carbon content

To obtain the Carbon stock, only the tree species present on the premises are considered and other plants are documented.

To calculate the carbon stock, the relevant data and equations mentioned below are used.

Aboveground biomass (AGB) was estimated as follows:

The specific gravity/wood density (SG) of most tree species was obtained from Reyes et al. (1992) and Mani and Parthsarathy (2007).

$AGB\ (t) = 0.25\ D2\ H$---1 (for trees width <11 inches) …(1)

$AGB\ (t) = 0.15\ D2\ H$---2 (for trees width >11 inches) …(2)

$Where\ D\ is\ Diameter\ and\ H\ is\ Height$

Further, the below-ground biomass (BGB) was estimated by multiplying the AGB by 26%

$BGB = AGB\ x\ 0.26$ …(3)

The total biomass was taken as the sum of the trees' ABG and BGB. In this study, the carbon and CO_2 stocks of the trees were estimated considering the total biomass of the trees. Carbon stocks were estimated by multiplying the total dry biomass by the default carbon fraction (0.475), which represents the average carbon content of the biomass:

$C\ (t) = Biomass\ (t)\ x\ 0.475$ …(4)

The carbon storage in individual tree species in the company premises plantations was calculated by adding the carbon stock values of particular species in all study plots. The estimated carbon stock was converted into CO_2 stock by multiplying the carbon stock by 3.663 to determine the CO_2 assimilation by tree biomass (Chandra et.al. 2018; Kanime N et al., 2013).

3 Results and Discussion

The event had a success in execution as a sustainable event the following data proves the results achieved due to careful planning. All the seven elements considered for execution prevent, during event and after event is described below

3.1 Venue

The selection of venue was both indoor and outdoor to make the best use of natural resources, it helped reduce air-conditioning load by more than 50%. The program gathering was organized indoor for the main function and the food was organized outdoor. The decoration for the event used recyclable materials to the most such as flowers than use of single use plastics. The decoration materials used such as flowers were later decomposed in the venue's garden area at a designated place.

3.2 Energy

The event was planned to run partly on renewable and with the initial set up of solar energy power it was observed that the amount of solar energy consumed was 8.02 KW and the DG energy consumed was 40KW as there was no electricity supply that was provided from the Electricity Board at the time of Event. The factory by design has adopted unique features such as having a renewable source of energy of 25 KW off grid solar power plant so that the factory can operate with green power and excess can be supplied to Grid. 252 Light fixtures in plant are operated with motion-based sensors and timer based sensors and 40 number of sky lights are present in the factory which uses natural sunlight as source of energy, 40 turbo vent fans are present that operate and facilitate the air exchanges 24 Hrs without using any energy source.

3.3 Water

Water demand on the event day was mapped for domestic use. The amount of drinking water used during the event was 305 ltr. Glass bottles used for the event eliminated use of single use plastic during the event and enabled its usage in the conference planned after the event. Use of reusable bottles minimised the use of water and generation of water wastage. Utensils were not washed at the facility; water used for the sanitary purpose couldn't not be measures as separate meters were not affixed for monitoring. The amount of wastewater generated during the event form hand washing activity from approximately 250 people was 100 ltr. washrooms were connected to the soak pit as the STP installation was in process. Apart from the event day, there are many initiatives taken by the factory to make it water positive by demand,

Table 1 — Conceptualization of Sustainable event through aspects considered pre, during and post event

Elements	Pre event Planning	During event Implmentation	Post event Analysis
1. Venue	Selection of site for indoor and outdoor to reduce energy to avoid air-conditioning	Opening of the program on keynote on sustainability to create awareness on all points, Nomination of Event In charge to monitor the activities	Participation in publication of the event about the approach to promote sustainable event
2. Power	Estimation of energy consumed, Diesel-travel, Diesel Generator, LPG for cooking, Solar	Use of Solar energy, Motion sensors, Sky light, Zero energy turbo vent fans, Energy efficient lighting, reduced diesel consumption and LPG	Estimation of energy consumption, calculation of carbon footprint
3. Water	Study factory water scenario, review Pond, STP, rainwater harvesting facilities	Use of Glass bottles avoiding single use plastics. Routing handwash water to garden, The sanitary waste was routed to Sewage treatment plant.	Estimation of water consumed its sources and wastewater
4. Waste management	Reduction of plastic waste, decoration with natural material, plan to achieve zero waste to landfill	Elimination of carpet for whole area Use of recyclable material Segregation and storage of waste and disposal to planned vendors	Reuse of glass bottles in other events
5. Catering	Local cuisines, Avoid processed food	Minimization of waste generation Use of reusable plates and cutleries Hand wash sink routed to garden Veg and Nonveg Separate counters	Extra food – donated and waste was sent to piggeries
6. Material Use	Digital display, ecofriendly printing, Digital Invitation, Choice of standees that can be reused	Use of flowers for decoration, instead of ribbon flower mala was used for inauguration. Display of material in cloth than flex and its explanation to the attendees for creating awareness	Continuation on education of water positive, biodiversity and carbon neutral event
7. Carbon Foot print	Enumeration of carbon footprint before event using myclimate[1] and using GHG protocol[9] Planning for the type of trees, engaging wit Biologists for estimation from type of plantation for sequestration to neutralize travel	Use of train, bus and public transport Combining events to reduce footprint Tree plantation during event by guests	Enumeration of carbon footprint after event and sequestration using the plantation drive

few of the initiatives are: seven recharge pits installed within the premises for rainwater harvesting a tank of about 50000ltr was made to store rainwater to store and route it to the Fire tank overflow of the same was connected to raw water supply tank. By this the supply water could be reduced. Two ponds of three lakhs and five lakh ltr capacity each which can cater to garden watering needs also reduces the need of fresh water.

3.4 Waste management

The waste segregation process was achieved using the Guidelines under Waste Management Rules by Karnataka State Pollution Control Board. Waste was identified and segregation bins were placed around the premises and disposal of waste was organised through local municipality. Use of 150 ceramic / reusable plates eliminated the generation of waste, paper cups were used for water, Excess food was donated and it was possible to achieve zero to landfill due to efficient segregation of waste and excess food being donated for the needful and waste food was sent to piggeries.

3.5 Catering

Most of the utensils used for the event were recyclable and there was no single use plastic involved. The food was prepared from caterers and only heating and appam (delicacy of south India like dosa) was only made onsite this used about 2 LPG cylinders were used..

3.6 Material use

The event was paperless in terms of no printed invitations, banners were made of cloth, two reusable standees, and printing was with Eco solvent which is VOC free. The standees were used for spreading awareness about the event even after the event. All decoration was done using flowers & no single use plastics used.

3.7 Carbon foot print

Carbon emissions were calculated for the factors such as travel, electricity, fuel and cooking. The Travel included enumeration of carbon emissions from the travel of joint owners and ambassador of Spain, their local from Bangalore airport, travel of employees and guests to location . Electricity

consumed was zero as there was no connection of the location electricity board, Diesel used for generating electricity. The total emissions generated from event amounted to 29.857 Tonnes. These emissions were sequestered by the Plant diversity around the factory and with use of renewable energy sources.

The figure 1 below indicates the carbon footprint inventory and the carbon sequestration established in the plant.

3.7.1 Plant diversity analysis for carbon sequestration

The plant diversity at different plots was documented and the list with botanical name, common name, and family was enumerated. The study showed that a total of 1724 individuals belonging to 62 different species were present on the industry premises. 44 tree species, six shrub species, three bamboo and nine herb species were recorded. Further, the 22 families of the tree represent the highest number i.e., 43 individuals belonging to different age groups. The highest number of tree species recorded was *Mangifera indica* (38 Nos.) followed by *Lagerstromeia speciosa* (32 Nos.), *Tabebuia rosea* (30 Nos.) and *Moringa oleifera* (25 Nos.). In the case of shrubs, a total of 247 individuals belonging to the five families were recorded and the *Nerium oleander* (120 Nos.) represents the highest number followed by *Lawsonia inermis* (27 Nos.). Herbs represented seven families with 1086 individuals. The area spread of the grasses was 69,965 sq. ft on the premises.

3.7.2 Age group classification

The age of the plant plays a crucial role in determining carbon sequestration. Hence, the age of all plant species was recorded. Trees are major in number and their age ranges from 3 years to 40 years. 25 years old trees are more in number (24 species- 119 Nos.) followed by 30 years (12 species- 112 Nos.).

3.7.3 Girth and height data

For biomass, carbon storage, and CO_2 sequestration of trees, basic data of count, GBH (and Height was documented.

3.7.4 Biomass, carbon, and CO_2 sequestration

The industrial premises accommodated 43 tree species, seven shrub species, three bamboo and nine herb species belonging to 32 different families, with accumulated biomass of 14.69 T, 5.7 T of carbon stock, and assimilated 39.9 T of CO_2 . Along with the tree data, the biomass, carbon, and CO_2 sequestration data of shrubs, herbs, and grasses are calculated employing a standard set of data. Lawn grass had the largest amounts of species-specific biomass and CO_2 stock assimilation, followed by *Lagerstromia speciosa, Tabebuia rosea, Mangifera indica* and *Moringa oleifera*. Also, these four species had the highest numbers and relative abundances. The result shows that carbon stock was highest at the location West and lowest at location North, although the highest tree density was observed at location East and lowest at location North. The average carbon stock of the study area was recorded as 0.6466 T C/ha. The lawn grass sequestered more than 67% of the CO_2, while the four tree species that sequestered 11% of the CO_2, in order of highest to lowest sequestration, *Lagerstromia speciosa, Tabebuia rosea, Mangifera indica* and *Moringa oleifera*. Further, Bignoniaceae, Poaceae and Fabaceae trees were the most common. Trees of these families grow fast and these trees can survive harsh conditions, such as nutrient-deficient soil, due to the nitrogen-fixation efficiency of associated Rhizobacteria (Ahemad and Kibret, 2013). These results agree with those of Abd Rahman et al., (2014) who showed that Fabaceae species were used for massive afforestation initiatives across Southeast Asia. Tree species had different carbon and CO_2 stocks because of their varying growth rate, biomass accumulation patterns, and tree population in different plots. Generally, 45–51% of carbon can be absorbed by a tree during its wood formation stage (Maiti et al., 2015). Therefore, a larger/taller tree will accumulate more biomass and carbon stocks than smaller trees do. Earlier reports show a significant upsurge in tree diameter and volume in different tree species with a low number of trees per

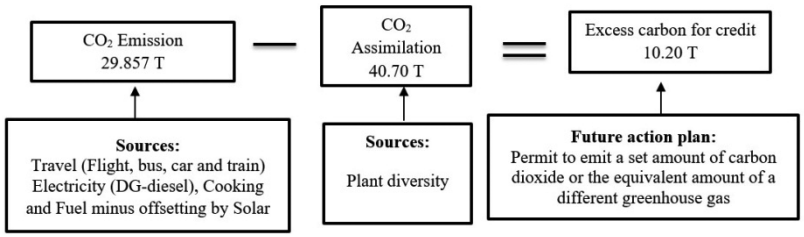

Fig. 1 — Carbon Foot print enumeration and sequestration.

hectare (Baldwin et al., 2000; Hebert et al., 2016; Zhang et al., 2013; Akers et al., 2013). Shrestha et al., (2016) reported a similar variation in carbon stocks of tree species planted at different sites. The results of Luyssaert et al., (2008) and Sharma et al. (2014) support the present findings that taller, older trees with larger girths store larger amounts of carbon. Carbon storage in trees also varied because of uneven spacing that resulted in varying growth. Wider spacing in plantations supports higher growth (Baldwin et al., 2000; Hebert et al., 2016) and greater carbon and CO_2 stocks, compared with narrower spacing.

The Cleanfix-Schevaran Laboratories Private Limited company has taken the initiative to maintain 69.54% of the premises exclusively dedicated to conscious maintenance in the green approach. Further, 95% of the garden is maintained with soil cover, which is armoured by in approach with air, water, and soil conservation. The company has also brought in avian incorporation of Goose to maintain a sustainable eco-system. All the passages including walkways are paved with interlocking tiles with an approach to check groundwater recharge and mitigate surface runoff. This study found species-specific variation in tree biomass and carbon stocks across plots in different plots. Biomass and carbon stocks decreased with narrower spacing compared with that in more widely spaced plantations due to greater intraspecific competition. The tree species with the highest CO_2 sequestration capability were Lawn *grass, Lagerstromia speciosa, Tabebuia rosea, Mangifera indica* and *Moringa oleifera*.

4 Conclusion

The event was an effort towards making it Sustainable from an environmental perspective, enumerating opportunities for carbon neutrality and beyond through biodiversity; several factors, such as the green design of the factory, had a contributing role, and most of all, the cooperation and the vision of the Leadership. Our event focused on highlighting goals for environmental sustainability, which could create an awareness impact on the participants and promote a positive thought to the fellow community.

After evaluating the post-event objective, the gap assessment created many opportunities for further studies. More research is needed on the cumulative effects of trees, soils, and their management in urban and industrial areas. However, carbon estimates for urban ecosystems are improving as new data become available. Monitoring urban, industrial, and other non-forest areas will help improve carbon estimates in urban and other traditionally non-forested landscapes.

The present study shows that the carbon sequestration potential in industrial sites is considerably good due to the presence of an adequate number of trees in the study area. Although with the incorporation of more plant species, carbon sequestration potential can be further enhanced. The selection of species for plantation in the industrial area must be considered while developing management policies to enhance carbon sequestration. A better understanding and accounting of urban ecosystems can be used to develop management plans and national policies that can significantly improve the nation's environmental quality and human health.

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