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A case study of “Parivarthana”- towards zero waste

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Centre for Social Action (CSA), Christ University, India has been implementing a community based solid waste management initiative called ‘Parivarthana Project’, with the support of Global Communities. The project was initiated to undertake decentralized solid waste management which includes collection, sorting and sale of recyclables, composting and paper recycling. This project employs women from slum communities and involves around 2200 households were serviced in Rajendra Nagar and Ambedkar Nagar. Two sorting and composting centres have been established in collaboration with BBMP. In addition, occupational health, safety & saving insights through SHGs trainings are provided to BBMP waste collectors in 5 wards. Various initiatives are undertaken to educate, orient & create awareness along with improving the socio economic conditions of pourakarmikas. The major aspect in this project is community participation, involving students of Christ University, residents of slums, their children and others.

This paper presents a description of this project which has been successful in making Christ University a zero waste campus.

Keywords: Waste management, society participation, CSA, Christ University, Parivarthana.

I. INTRODUCTION

With the increase in population and usage of other items like plastic, electronic articles, health-care wastes etc., disposal of waste, waste management, an important civic issue is no longer just a natural process of disposal which is meant to clear out garbage and unwanted articles. Due to the unavailability of land to dispose these kind of wastes and the fact that many of them are hazardous to humans and animals, a proper handling of waste and its related issues becomes imperative. Waste, if segregated properly can be used for economic purposes like generating electricity, as an alternative sources of fuel, making useful products and most importantly, in keeping a city clean and hygienic.

Waste management is not only collecting waste but also deals with the transportation, processing of collected and segregated waste, recycling whatever can be recycled, disposal of those which cannot be recycled in a proper manner as well as monitoring of waste materials, while taking into consideration factors like environmental, economic, technical, legislation, institutional and political issues. There is a need for proper planning to segregate, collect and dispose waste. If there is a pre-set amount at which bins are emptied, ugly pile ups can be avoided. As far as possible, local parks and other places should take care of composting etc. Recycling units should be encouraged in each area and this will reduce the cost of transportation to a large extent.

India now holds the dubious distinction of being among the top 10 waste-generating nations in the world. A 2012 report by “Worldwatch Institute “ placed the United States of America at first place and China at second, with daily municipal solid waste generation of 621,000 tons and 521,000 tons, respectively. At number 6, India’s daily municipal solid waste generation is estimated at 110,000 tons. According to estimates, only 25% of the world’s waste is either being recycled or composted (if organic) and 75% is being incinerated or sent to landfills. The term “Zero-waste “ means that efforts should be made to recycle things as much as we can and to compost the entire organic fraction of the waste produced.

In low and middle income countries, management of solid waste management occupies a big place in the budget for cities. In our country, it is very essential that there is an effective waste management and University campuses can contribute through their own zero-waste programs.

Keeping the above factors in mind, local participation in waste management becomes crucial in the success of any program. Initiated in the year 2008, the Centre for Social Action (CSA) which is the corporate face and development wing of Christ University initiated Parivarthana – a decentralized Solid Waste Management practices in the campus. Since the campus is huge with a large number of students and staff, the volume of waste generated is also high and varied. Parivarthana, a compressive, scientific and environment-friendly approach to handling waste is a shining example of tackling waste at the local level. It aims to be an economically viable enterprise by generating revenue by collection, sale of recyclables, compost, recyclable paper and paper products. This has resulted in Christ University becoming a zero-waste campus. Amritha University, University of Oregon, Arizona state university, American University are some examples which are zero-waste campuses. Many schools and college campuses are working their way towards this end and have achieved about 75% of their target. This project was initiated to undertake

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decentralized solid waste management which includes collection, sorting and sale of recyclables, composting and paper recycling. It employs women from slum communities. The sorting cum composting unit and the handmade recycled paper unit add to the income of the Parivarthana Enterprise to make it a self sustained unit.

II. HOW IT WORKS

In the campus of Christ University, around 1000-1200 kgs of waste is generated everyday, of which about 80% is dry and the remaining is wet waste. different types of waste generated in the campus is managed by using comprehensive, scientific and environment-friendly approaches to decentralized solid waste management practices. Students, staff and other employees sensitized about waste segregation practices, primary and secondary segregation, paper recycling unit, composting unit, bio-gas plant for energy generation from food waste, sewage treatment plant . A number of bins, clearly indicating the type of waste to be disposed, are placed at strategic places all over campus for primary segregation. This practice helps complete 70% of waste segregation by the students. Every one hour wastes are collected and taken to sorting unit, located on the campus where the secondary segregation (30%) takes place. and different types of waste are put into various uses.

All the paper recyclables are processed at paper recycling unit and various types of papers products are made. Tetra packs are sent to Janakiram Layout where SHG members promoted by CSA make artistically designed vanity bags and other products which are being sold to the external markets. This practice helps complete 70% of waste segregation by the students. Every one hour wastes are collected and taken to sorting unit where the secondary segregation (30%) takes place. All the paper recyclables are processed at paper recycling unit and various types of papers products are made. Most importantly the student volunteers of Christ University propagate the message of waste segregation and solid waste management practices in the slums through awareness campaign, rally, street play, door to door community education, formation of eco-clubs etc.

The recycled paper is converted into products like files and folder, carry bags (small & big), writing /scribbling pads, books (small, medium & big), photo frames, photo albums (small & big), gift boxes, greetings/message cards, diary etc. In “ Parivarthana” , recycling paper is done in-house and they the bulky part of recyclables is sold to the large recyclers . The proceeds generated through the recycling of waste are used for supporting the unit and thus promoting sustainable livelihood for marginalized women.

If waste is not disposed safely and simply incinerated, it causes environmental pollution. To prevent this, the Centre for Social Action (CSA) has a partnership with the erstwhile CHF International (now Global Communities) and this partnership-based intervention has gained a momentum as replicable models of solid waste management practices are initiated at Christ University.

A. Paper Recycling Unit

CSA has established Handmade Paper Recycling at Christ University Campus. Once the paper has been separated, it is put into a Hydro Beater Pulper along with fiber cotton and water grinded o form pulp and set in a Univet thus forming a rectangular sheet. The sheet is passed through a machine that presses the sheet and drains out further excess water. Then the sheet is allowed to dry for a day. One batch produces roughly 30 sheets. Finally it goes through a calendaring /polishing machine which thins down and evens the sheet. The recycled paper is now ready to be converted into products like files and folder, carry bags (small & big), writing /scribbling pads, books (small, medium & big), photo frames, photo albums (small & big), gift boxes, greetings/message cards, diary etc.

The following tables give the details of year-wise waste generated and income generated Paper Recycling Unit.

Duration	Quantity in Kg (Cotton)	Price in Rs.	Sale of Paper Products in Rs.	Maintenance in Rs.
April 2011 to March 2012	160	7040	858441	355407
April 2012 to March 2013	165	8040	1004643	341756
Grand Total	325	15080	1863084	697163

B. Generating Energy from food waste

In order to demonstrate generation of energy and ensuring safe disposal, utilization and management of food waste, CSA has renewed the bio-gas plant at Christ University – Dharmaram. The feeding capacity of this bio-gas –plant is 500 kgs of food waste which can generate about 25 kgs of methane gas every day. Additionally live demo water jacket model of Bio-tech and ARTI model Bio-gas plants at Paper Recycle Unit, Christ University are in full functional status. This serves as part of information centre for

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exposure and education to other stakeholders. Many stakeholders, community people are visiting and learning various aspects of bio-gas plant. CSA has organized exposure visit for more than 120 SHG members/ Community and People Paura Karmikas with an objective to promote the bio-gas technology.

C. Composting Unit

The wet waste generated in the campus is used in the composting unit for converting it into manure/compost which in turn is being used for gardening purpose in the university campus. The following tables give the details of year-wise waste generated and income generated at Composting unit.

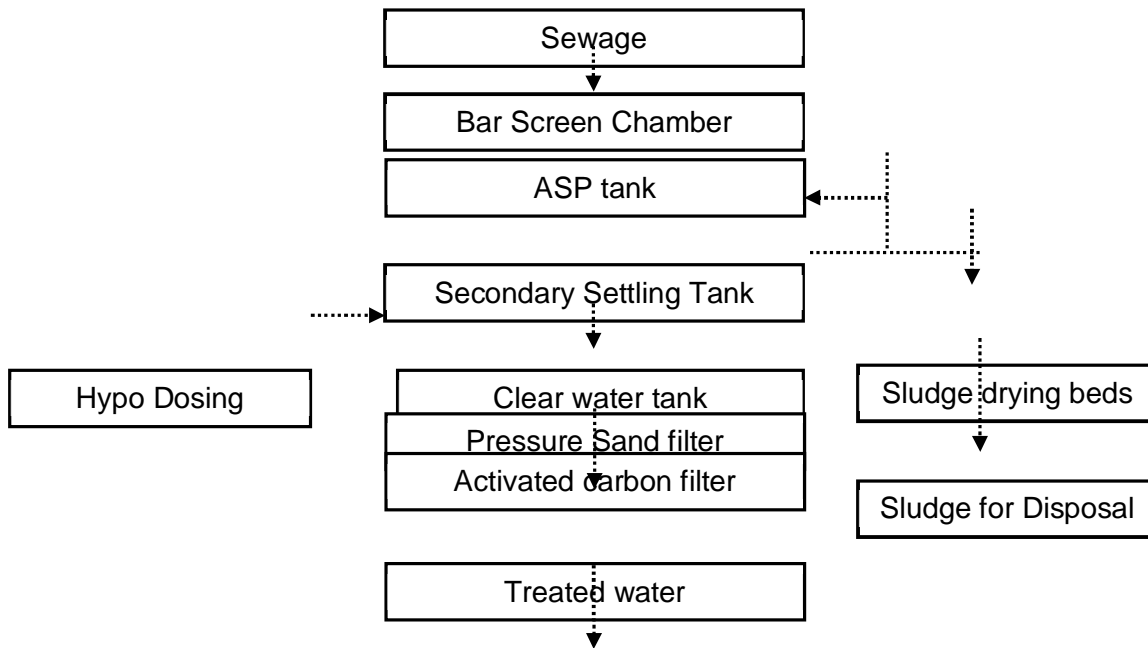
Duration	Quantity of Waste in Kg	Price in Rs.	Tetra packs (Kg)	Tetra pack Income in Rs.	Service Fee in Rs.	Compost in Rs	Compost Sale in Rs.
April 2011 to March 2012	26133	206062	1782	11379	74000	2801	11204
April 2012 to March 2013	29789	254906.1	1651	10604	102600	2522	10329
Grand Total	55922	460968	3433	21983	176600	5323	21533

The wet waste generated in the campus is used in the composting unit for converting into manure/compost which in turn is being used for gardening purpose in the university campus. The food, fruit and vegetable waste are collected in a container chopped into smaller pieces. Dry leaves are placed in the compost tank as first layer, then on top of it is placed the wet waste which is collected from the campus evenly all over the composting tank. Leaves and food waste should be mixed with a spoonful of bio-inoculum in a bucket of water and sprinkled on the compost daily. Leached water gets drained out of the tank on daily basis. When the leached water is added to the tank and the content gets mixed the waste starts composting after 25 days. The compost is then used in a compost shredder to make into fine powder for further use, which is then directly used for the plants and vegetation in Christ University.

- 1) *Biogas Model (Floating Dome ARTI Model)*: CSA has set up one scaled-up version of the ARTI model at paper recycling unit in Christ University Campus for showcasing and educating various stakeholders including the community people on the concept and practice of energy generation from the food waste. Technically ARTI model has revolutionized the biogas world by utilizing only food waste products. This design is utilized to showcase a small household sized model. 2-3 kg/day plant supplies gas to a stove which is being used to make tea for the workers of the unit. The goal of this plant is not only to supply gas to the recycling plant workers, but to showcase a very affordable, thus replicable, working model for various stakeholders. The system can be built by local materials, and the skills required to assemble the materials are minimal.
- 2) *Biotech Model*: CSA has installed Bio-tech - a floating dome style bio-gas plant at Christ University premises. Technically Bio-Tech digester offers many years of implementation research to this project. This plant will showcase a working, replicable model that is supplying significant gas to the campus canteen utilizing 150 kg's of food waste used daily. The dome shaped (floating device) allows for a chamber to collect the biogas produced from the slurry inside. An output tank is designed to capture and allow the new waste to be extracted easily for use as fertilizer. As part of show-casing and disseminating information to various stakeholders on different models management of Christ University to enhance its efficacy. This provides a stark contrast between two different technologies, and two different inputs for various stakeholders.
- 3) *Sewage Treatment Plant (STP)*: The principal objective of waste water treatment at Christ University is generally to allow effluents to be disposed of without danger to human health or unacceptable damage to the natural environment. Irrigation with wastewater is both disposal and utilization and indeed is an effective form of wastewater disposal. And as such waste water is being used at Christ University for vegetation and gardening work. This is one of the major waste water treatment practices being adopted at Christ University. By this process sewage (waste water) is collected through pipelines into a collection sump after screening through bar screen chamber to remove the floating as well as settle-able coarse solids. The collected sewage is homogenized using diffuser in the sewage collection sump. Then the sewage is pumped to an activated sludge process (ASP) system for the reduction of organic pollutants. The air required for the aeration tank will be supplied through air blower connected to grid piping. Then the wastewater sludge mixture is allowed to flow by gravity into a secondary settling tank (tube settler), where the sludge will be settled at the bottom and the clear supernatant would overflow into the clarified water tank. The excess sludge is recirculated to ASP tank through recirculation pumps. Hypochlorite solution will be dosed in the clarified

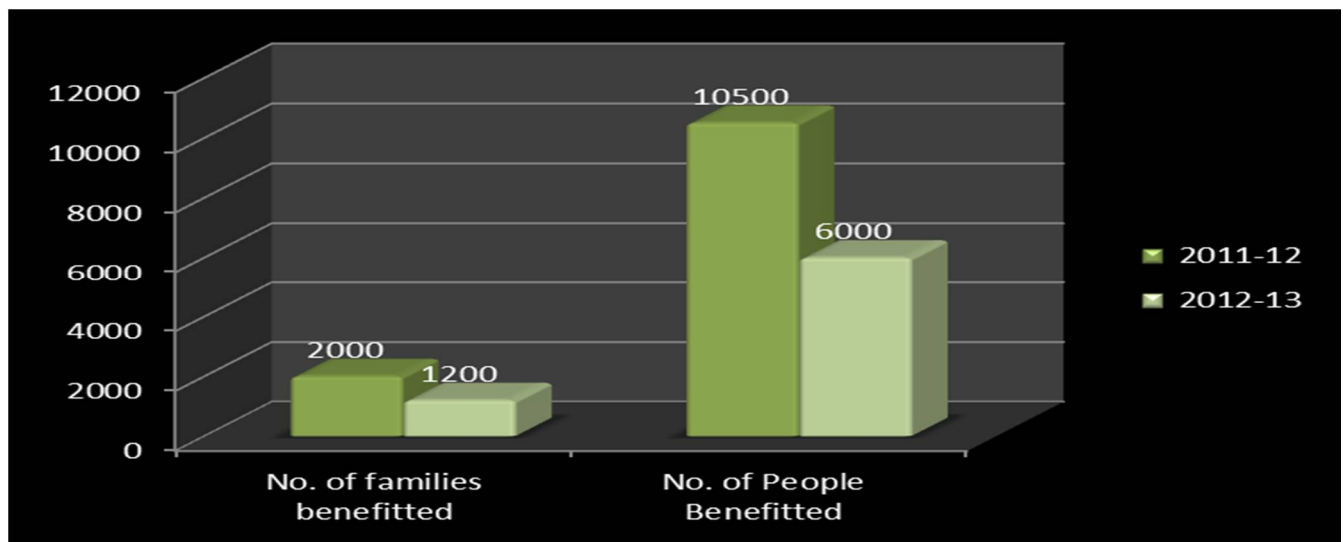
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water tank for disinfection. The secondary treated Sewage is passed through a tertiary treatment plant comprising of pressure sand filter and activated carbon filter for fine polishing. The sludge from the settling tank is sent to sludge drying beds and periodically disposed. Treatment Scheme is as follows:



D. Community Involvement

With a view to facilitate community based dry waste collection and segregation Parivarthana project has established Dry Waste Collection Centres (DWCC) at Rajendra Nagar and Ambedkar Nagar slums with the help of Global Communities. Decentralized community based solid waste management includes waste collection, sorting and sale of recyclables, composting and paper recycling. Parivarthana has employed women from the surrounding slum communities. It generates revenue from sale of recyclables and compost. As part of this programme, around 2200 households were serviced in Rajendra Nagar and Ambedkar Nagar slum communities and two sorting and composting centres have been established. Graph no.1 gives the details of waste generated and income and expenditure status of Decentralized community based solid waste management initiative at Rajendra Nagar and Ambedkar Nagar slums.



Graph 1: No. of Families and people benefitted through Parivarthana Project

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A series of capacity building trainings is carried out to train the women groups and others to orient and educate them on a variety of skills like communication skills, organization building, financial literacy etc. Around 2200 households were serviced in Rajendra Nagar and Ambedkar Nagar. Two sorting and composting centres have been established in collaboration with BBMP. Occupational health, safety & saving insights through SHGs trainings are provided to BBMP waste collectors in 5 wards. Parivarthana team, CSA staff, CSA Sponsored children & Christ University students & volunteers visited 1548 houses and the Paura Karmikas (PKs) living & working in impact slum areas, to educate, orient & create awareness through exposure visits, street plays, hand bills, wall paintings & rallies etc on the need to segregate waste at source. These campaigns resulted in positive response and change among people living along the drains and the households (HHs) at Ambedkar Nagar. A total of 12 eco-clubs were established for the school going children, which are actively functioning in the area. Children from each club could work together to spread awareness on waste management in their respective community and keep their street clean. There was an improved retrieval of recyclables in Ejjipura area. 470 high quality dust bins have been distributed to residents of Ejjipura for segregation of dry and food waste at source in coordination with BBMP and Saahas an NGO working in solid waste management. Regular meetings were conducted, with other like-minded partners like "Saahas NGO & Resident Welfare Association (RWA)" for promoting further the concept of clean & green surroundings through segregation of waste at source and giving waste to the nearby recycling units regularly, through the BBMP vehicle collection system.

E. Strengthening Paura karmikas and self help groups

In order to strengthen socio-economic condition of Paura Karmikas and enhance their access to awareness, health, savings and credit activities, and 6 self-help groups were formed initially, among them one became defunct. These paura karmikas were involved in self help groups so that they can be trained and strengthened to retrieve quality waste, sell them and make extra money. The idea was to enhance their income at least by some percentage and also contribute to reduction of waste dumping in landfills. Several capacity building and linkage support for these initiatives were undertaken.

III. CONCLUSIONS

A good citizen follows good civic practices, among which, knowledge and applications of waste generated is of prime importance. As tomorrow's citizens, it is imperative for the younger generation to manage and reduce carbon footprints. There is no better place than an educational institution to provide this insight. The CSA of Christ university in doing a job of both an educator and instructor in this area as well as sensitising students to not just waste management but also toward being an empathetic and responsible citizen.

IV. ACKNOWLEDGEMENTS

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