ISBN 978-81-933230-0-7

EXECUTIVE SUMMARY AND IDENTIFICATION OF 'GREEN INDICATORS'

The Green Audit Committee 2014-15 of our college Yashwantrao Chavan Warana Mahavidyahalaya , Warananagar has conducted a "Green Audit" in the academic year 2014-15. 'Green audit' is one of such potential tool which can be used effectively by any educational institution for resource usage identification and optimization. If green audit properly deployed with all indicators, it will increase the sustainability of the institutions and reduce their resource consumption, which will benefit the institutions and the nation in many ways. 'Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable'. The main objective to carry out green audit is to check green practices followed by the college and to conduct a well formulated audit report to understand where we stand on a scale of environmental soundness. (This is the first attempt to conduct green audit of our college campus, there was no baseline data). For Green Auditing questionnaires prepared based on the guidelines , rules, acts and formats set by Govt. of India, Ministry of Environment and Forest, New Delhi and Central Pollution Control Board, New Delhi. For preparation of questionnaires and in conducting 'Green Audit' guidelines and help is taken from Dr. Raut ,The HOD of Department of Environmental Science, Shivaji University, Kolhpaur and alumni of our college Dr. Prashant Banne who is exisistingly working asDirector, SAITECH, Research and Development OrganizationIn Kolhapur. Questionnaires were prepared for solid waste, energy, water, hazardous waste and e-waste. For audit purpose and suitability of analysis of data the study area i.e. our campus is grouped as Science Departments (includes Jr. and Sr. wing), Arts Departments (includes Arts Jr. wing ,HSVC wing and Language, Social sciences departments at Sr. wing), Commerce Department(includes Jr. and Sr. wing), Office(include Administrative Office, Principal chamber, meeting hall. Non-residential hall, store, strong room etc), Computer/ I/T. Lab. Gymkhana (includes gymnasium hall, gymkhana office, Shivneri ground, Medical officer room etc) , Exterior (includes Botanical Garden, Garden in front, in back of new building, Roads in Campus and area in near etc) and Common facility centers (includes Library and MPSC Staff quarters, Canteen, Boys hostel , Ladies hostel etc). The environmental audit was carried for solid waste, electricity and energy, water, hazardous waste, noise and air quality. The 'Green Audit' also give a 'Environmental Management Plan' and propose an 'Green Policy' to increase the green practices in campus.

1. Solid Waste: This indicator addresses waste production and disposal: paper waste, food waste, plastic, biodegradable waste, construction waste, glass waste, dust etc and recycling. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Solid waste generation and management is a burning issue. Unscientific handling of solid waste can create threats to everyone. The solid waste audit focused on volume, type and current management practice of solid waste generated in YCM campus. The solid waste collected was paper waste, plastic, biodegradable waste, construction waste, glass waste and other miscellaneous waste. The total solid waste collected in the campus is 7816 kg/month. Paper waste is a major solid waste generated

by all the departments. Single sided used papers reused for writing and printing in all departments. Important and confidential reports/ papers are sent for pulping and recycling after completion of their preservation period. Very less plastic waste is generated by some departments, office, garden etc but it is neither categorized at point source nor sent for recycling. Metal waste and wooden waste is stored and given to authorized Scrap agents (Siddhanath Paper Waste and Scrape Merchant, Kodoli, Dist-Kolhapur & Salunkhe raddi and scrap traders, Kodoli, Dist-Kolhapur) for further processing. Few glass bottles are reused in the laboratories. Small paper piece waste, classroom waste, biodegradable waste is not used for composting but burn on site. Food waste, dinning waste etc. of common canteen is thrown at site. Some paper dishes, plastic use throw dishes, packages of food are burned nearer the canteen. The food waste from main canteen and mess is not used or sent for vermin-composting plants.

2. Electricity and energy audit: This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances ,natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. However, many may not realize how much influence the higher education sector has in the larger energy market. Energy sources utilized by all the departments and common facility centers include electricity, liquid petroleum and LPG.

Major use of energy is in Science Department, office, canteen, hostel and laboratories for lighting, transportation, cooking and laboratory work. Energy consumption by major energy consuming Equipments in College laboratory is 2663.28 KW / Month, Energy consumption by less energy consuming Equipments in College is 4089.13 KW / Month and Energy consumption by Lightning Equipments in College is 4806.62 KW / Month . Thus total Electric energy consumption in college is 11559 KW / Month. No any department and common facility centers were using CFL lamps except department of chemistry and HSVC. All the departments with common facility centers are using a incandescent lamp where increasing consumption of electricity observed. The street lights in front of main gate of campus are HID type and other street lights in campus are of sodium vapour lamp also increasing major consumption of electricity for lighting purpose. In group of study area more electricity is consumed in administrative office, Computer laboratory, Science departments, library and MPSC center on the other hand, it consumed very less at arts and commerce departments. Due to lack of adequate ventilation and natural light at some part of infrastructure more consumption of electricity at air and light appliances in the college is increased. Hence ,survey of adequate ventilation and natural light of infrastructure is essential. In science laboratory at some places exhausts fans are used at proper locations but their use has to be monitored in summer duration. Also high consumption of electricity is observed at office in duration of admission and examination. Some water coolers (nearer to Chemistry lab and nearer to 15 B) are seen overflowing frequently, It wastes electricity as well as water. For this monitoring responsibility was given to peon in near labs. Major electricity is required for water fetching, irrigating purpose although sprinkler, drip irrigation is used for watering the gardens in campus. In science department like Physics, Chemistry, Mathematics, Botany and Zoology electricity was shut downed after occupancy time is one of greening practices for energy conservation.

Audit shows major teaching as well as non-teaching staff is in campus and nearer to campus for resident and mass number of students are come from nearby villages of Warananagar hence consumption in fuel is less. As our college is situated in rural area very less number of students are using vehicles, only 13.48 % of staff using four wheelers is less number. Study shows about 27.76 % students come to the college by walking, 10% student are using bicycle and, 48% are using state transportation vehicles and no any student make use of private transportation like Vadap. Staff members who lived out campus are using the vehicles in sharing for daily transportation. Also effect of bicycle bank scheme for female student was functioning in well manner and private transportation vehicles are restricted in YCM campus from gate. The college follows 'No Vehicle Day' on 13th December on occasion of death anniversary of Late. Tatyasaheb Kore was minimizes the fuel consumption for a day, which is a one of green practices followed by the college. Study tours, collection tours, visits, treks, save fort and clean forts abhiyan are followed by college which gives the message of importance of walking. which is very good green practice. Consumption of LPG for education or practical purpose is very less but high consumption is observed at common facility center like canteen, mess and staff quarters. The LPG connection in name of the college and LPG is handled by departments of Physics, Chemistry, HSVC. For heating purpose at the time of practical, no leakages and off mode regulators are seen at time of verification. Number of two wheelers is 597 , it consumes 6958 liter/month and number of four wheelers is 48, it consumes 1838 liter/month, i.e. total consumption of fuel in YCM campus is 8796 Liters/Month.

3. A)Water and waste water audit: This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. A water audit is an on-site survey and assessment to determine and improve efficiency water use. In survey water used at bathrooms, toilets, laboratory, kitchen, garden, shower and of as well as leakages and over flow of water from overhead tanks is also been evaluated.

The data collected from all the departments is examined and verified. For monitoring of water use number of times of filling of tanks per day, time for overflowing, rate of flow, water wasted in liters per day due to overflowing is periodically is supervised by water management and water harvesting committee members. Data submitted by the departments it examined according to leakages, rate of flow of leakages, use for washing, use of water for cleaning etc by committee.

On an average the total use of water in the college is 17,20,180 Liters/Month and 2,06,42,147 Liter/Year.. Major loss of water is through overflow of tanks and it is observed about 5,56,108 Liters /Month and water loss due to leakages is 17,436 Liters/Month. The major use of water is in common staffroom , science building, canteen, Staff quarters, hostels, canteen and at exteriors.. There is also water filtration plant for filtration of water in the botanical garden which supplies filter water for drinking purpose. Roof top rain water harvesting is also been practiced in some extent by the department of Chemistry with storing rain water and using it as distilled water and distributing to other department for practical purpose. In the Chemistry laboratory the water harvesting system is in working order during rainy season. Roof water is collected in big syntax tank and used as distilled water. This is used by all laboratories throughout the year . Water harvesting is also practiced by digging two wells in

campus at such geographical place where rain water and peculated water easily trapped in it. The collected drain water, rain water from roofs of building, rain water from paved area in the campus is send toward the wells. Although our campus has canopy of trees (grand total - 5021), huge botanical garden, garden and lawn in front of new building, garden in back of new building for this requirement of irrigating water is major and it is sufficiently filled by the wells but new design of water harvesting system and watering the garden is necessary. Gardens are watered by using drip/sprinkler irrigation system to save water. The sprinklers are used for irrigating gardens, different lawns in campus is one of the steps toward greening practices. Less number of leakages are observed while conduction of verification and site inspection of infrastructure still plumbing survey of water supply line is necessary to stop water supply after occupancy time and to use pressure valves / sensor valves to make control on overflow is necessary. Need of monitoring, controlling overflow is essential and periodically supervision drills should be arranged. In campus small scale / medium scale/ large scale reuse and recycle of water system is necessary.

4. Hazardous waste audit:

A. Chemical waste: This indicator addresses hazardous waste, laboratories, medical waste, art supplies, colors, dies and chemicals used in campus maintenance. Hazardous materials represent significant risks to human health and ecological integrity. They often persist in the environment leaving a legacy of land and water contamination for generations. Many accumulate in the tissues of organisms and become concentrated within food chains, leading to cancer, endocrine disruption, birth defects, and other tragedies. The minimization, safe handling, and ultimate elimination of these materials are essential to the long-term health of the planet. Only in the department of Chemistry, Botany and Zoology the laboratories generate the chemical waste. Survey and data collection shows that chemical waste generated on the campus through Science laboratories is very less and majorly generated by the department of Chemistry. At time of site inspection it is observed that in the department of Chemistry hazardous chemicals are handled for practical purpose and these hazardous chemical wastes are drain out with basin water directly to the botanical garden and producing negative impact on environment. In some extent it produces an air, soil, water pollution. Hence for environmental sustainability the drainage of chemical laboratory should be collected in air tight cement chamber and frequently the chemical waste from chamber is sent for recycle or for scientifically destroy process. Although the laboratories of Zoology and Botany generating an less chemical waste and it is of category III, is also directly drained in lawn near the departments. It has to stored in cement chamber and it is frequently recycled or destroyed scientifically. In chemistry, Botany, Zoology different chemical bottles are labeled properly, tight with unbroken caps .The study as well as collected data reveals that solid hazardous waste 4.320 Kg and liquid hazardous waste 11.5 liters are generated, it drained with making 100 times dilution. Usually there is a practice in the laboratories to store these hazardous chemicals in the containers and cans for safe disposal. The stoppers of all the bottles are regularly checked. The exhaust fans are not provided in some laboratory to expel gaseous waste. In laboratory provide a separate dust bin for wet solid waste.

B) Water **Environment:** Waste water sample form the Chemistry, Botany and Zoology was examined for Physico-Chemical parameters in order to assess the characteristics of the laboratory waste. From the analysis report of laboratory waste it is observed the Chemical Oxygen Demand (COD) is higher.COD of waste water sample is 840 mg/L hence waste water is not suitable for irrigating purpose. It can be decreased and make suitable for irrigating by adding coagulants like $FeCl_3$ and $Fe_2(So_4)$ and then passing the sample through the filter made up of sands, charcoal, activated carbon.

B. E-waste: E-waste can be described as consumer and business electronic equipment that is near or at the end of its useful life. E-waste makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury, and Polychlorinated biphenyls (PCBs) that can damage human health and the environment. E-waste generated in our college is of schedule III and is generated is very less in the in institute is handled, treated and disposed in scientific way.

In the year 2012-13 our college purchase committee sold an about 52 peripherals (CRT monitor, P III computers , CPUS, UPS, Multi media system etc.) which are not in use. Computers, Printers and other ICT equipments which cannot be used are sold to vendors who do the recycling. Now our institute has some e-waste like chips, bulbs, circuit boards, mother boards, computers, batteries, relays, and switches with garbage.

The college is not using paperless office work administration due to which in campus there is carbon emission in printers, carbon copy of bills, filing of cartridge inside the office and several departments is observed. The non-working computer spare parts and other non-working electrical equipments are dumped in different department at several places. Buy back policy is not available. The cartridges of laser printers are not refilled outside the college campus. College has to conduct the awareness programmes regarding -E-waste Management with the help of Department of Physics and department of Electronics & Telecommunication of sister concerned TKIET, Warananagar. E-waste handled is 143.5 kg per year and by record this total E-waste treated and disposed. E-waste generated within college will be stored separately and disposed off through authorized vendors .

5. Air quality audit:

Air quality in the academic institute is very important for health of the students, faculty and staff of the institute. The air pollution sources in the college campus are wind storm, pollen grains, natural dust, vehicular emissions, generators, fires and laboratory fumes etc. All the pollutants are measured by the Dr. Prashsnt Banne and his technical team. Six locations are selected for the ambient air quality monitoring , selection of stations is based on the Meteorological conditions of the area.

The air pollutants monitored on regular basis are Sulphur dioxide (SO2), Oxides of Nitrogen as NO2, Suspended Particulate Matter (SPM) and Repairable Suspended Particulate Matter (RSPM) etc. The chief sources of air pollution in the study area are mainly due to existing sugar factory unit of Shree Tatyasaheb Kore Warana Sugar factory, Warananagar, vehicular activities and domestic firewood burning, fuel burning etc. The major pollutants released in the atmosphere will be PM_{10}, $PM_{2.5}$, SO_2 NO_x and CO etc. All the air quality parameters are within standard limits of CPCB, New Delhi, suggesting ambient air quality at YCM campus. College has green campus of 27 acres,

efforts have been made on to bring part of land under cultivation of medicinal plants as well as other productive plants through NSS . NCC students .Seniors students . teaching and nonteaching staff in college. In campus total 5021 tree of 152 varieties are present in which 3087are trees, 1424 are shrubs, 473 are herbs and 37 are climbers.

We created a green zone in our campus. The college has planted different types of large number of trees in the campus, hence the greenery around the institute helps to neutralize whatever carbon and its byproducts generated.

6.0 Noise Environment

The noise levels measurements were carried out using precision noise level meter. The noise level survey was carried out at six locations, at outside as well inside the study area campus. The major source of noise identified in the study area has been predominantly the vehicular movement, and the transportation activities.

Environmental Management Plan:

Environmental Management Plan gives the strength, weaknesses and suggestions on the environmental issues of YCWM campus. It also suggests about which area is to be given priority. The green audit of college campus reveals that the administration should take care of glass waste, waste water, chemical waste and e-waste management on high priority as the ignorance to these will deteriorate the environment on the campus. The entire exercise of green audit concluded that the college administration is keen on all the environmental issues. College have lot to gain by following links to work towards making a green campus and more environmental friendly campus. Students, staff, faculty and administration working together will produce the best results raising awareness and helping to push the environmental friendly agenda in front of campus.