



ANDHRA UNIVERSITY

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**Resource Recovery and Reuse (RRR) Program of
Andhra University**

By
Center for Environment, Sustainable Development and Climate Change
(CESCC)
Andhra University Visakhapatnam, Andhra Pradesh

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Resource Recovery and Reuse (RRR) Program of the Andhra University

The Andhra University, constituted in the year 1926, is one of the oldest academic institutions of India. It is located in the coastal city of Visakhapatnam, Andhra Pradesh (AP). Since early 1900s, the university strives for its excellence through teaching, research, and outreach activities not only for educating, training, and preparing students to be the future leaders in their respective disciplines but also for serving the communities through practical and innovative means. As part of it, the university established 'Center for Environment, Sustainable Development and Climate Change (CESCC)' on 5th June, 2020. One of the objectives of it is to make the Andhra University a leading environmental friendly institute through implementations of various sustainable development policies and initiatives including the resource recovery programs. The sustainable development practices in the campus help in promoting holistic vision and sets bench mark in on campus operations, conservation of natural resources and the natural ecosystems. It may bring a healthy change in traditions, culture and learning of the educational institutions. Therefore, Andhra University, being the oldest university of the Andhra Pradesh, committed to have a profile towards resource recovery program and generating wealth from the existing idle inventory and conventional termed waste on its campus in various departments, centers and other facilities. The university already took several steps in harnessing the solar energy for power generation, rainwater for groundwater recharge as part of sustainable development goals.

The materials available in the university that are conventionally considered as waste may be reused or recycled and placed back into the system. Such initiative will help in enhances the optimum utilization of the natural resources and set a bench mark for other institutes as well. Therefore, the Andhra University took an imitative to design and implement the Resource Recovery and Reuse (RRR) aims at developing and/or improving techniques and processes for material reuse or recycling. The waste resources may be converted into useful forms of various products to be used in the campus or make it a showcase to the citizens that may lead to development of new solutions or opportunities in the society. It ultimately reduces the impact on the environment and economy benefitting the society. The campus idle inventory needs to be assessed department or facility wise. It should be classified based on its characteristics for segregation. The necessary methods and processes are to be identified to put the material back into the systems with the available limited resources. The entire campus RRR program should be developed as a self sustaining program thus attracting initial minimum financial resources from the university. The CESCC will take the lead in designing and implementing the RRR program in the university.

Aims and Objectives

- Develop the RRR program as a reference and resource hub integrating knowledge and expertise in the specialty of resource management.

- Showcasing Wealth from Waste processes for better understanding of the university fraternity and the society.
- Developing nodal agency for the skill development in the field of resource recovery or wealth from waste considering the conventional waste as resource.
- Set a model to other educational institutions across the country.
- Dissemination of knowledge to the society through community development programs for the transformation of lives and livelihoods towards sustainable development.
- Support the university and the government in its efforts in to conserve the resources.
- Promoting partnership with various stakeholders' like students, institutions, industry, governments, business organizations, Non-government Organizations, and local communities.

Outcome of the University's Resource Recovery and Reuse Program

An effective RRR program with suitable implementation practices is essential for Andhra University. Such program will have direct and indirect benefits to the institution and the society. Some of the expected outcomes or benefits of the program are

Environment protection: Sustainable resources management aims at environmental protection through reduction of impacts due to disposal of various resources that are conventionally treated as waste.

Conservation of natural resource: The entire program is to implement various waste management options promoting **reduce, reuse, and recycling**. Hence, it helps in reduction of fresh natural resource utilization as the **reclaimed** resources are derived from the generated waste **that is being treated** as wealth.

Saving money: The proposed management protocols involve various processes to reuse the material erstwhile labeled as waste or useless. It eliminates some of the new procurements or supplies and also generates money through goods or material transaction. It may eventually save educational institution's money.

Utilizing waste dump building space: Since several years the material got piled up in various buildings occupying the useful building space. The left over equipment remains there for months or years without any function. Removing them and processing them from the present place may free the space that can be utilized for various purposes. It may sometimes provide an opportunity to avoid creating new building spaces.

Setting benchmark: The RR program will facilitate the university to set a bench mark in creating wealth from waste. Properly documented methods or activities will help other institutions to take up them.

University standing: The Andhra University may be at the forefront creating a distinction and making institutions little better in waste (resource) management. Further it may set a model of innovation and leadership in these areas.

Colleges and universities can make the implementation of the RR program easier through partnerships with the local industry, NGOs, and other environmental management organizations. It helps in roping up experienced professionals in this field of wealth from waste.

Resource Recycling and Reuse Program (RRR)

The material available in the university which are conventionally categorized as waste/scrap/solid waste consists of furniture made up of wood (natural or engineered) or metal, obsolete laboratory material, construction and demolition waste, waste paper, e-waste, leftover solid chemicals, glass bottles, plastic or fiber materials, woody biomass or garden trimmings, food waste, etc. These will be in different forms like broken, outdated, unserviceable, unused for long time, etc.

The university activities are diversified one with teaching learning facility, research and development, on campus residential facility for both students and the staff, landscaping, and so on. Hence, there will be variety of discarded material to be handled as part of the RR program. Some of the wastes commonly generated on university campuses are

- a) Recyclable Paper, Cardboard, Books etc.
- b) Plastic, Glass, Cans or metal containers and stationery
- c) Student Clothes and House wares
- d) Laboratory equipment and Chemical Waste
- e) Wooden and metal furniture
- f) Electronics and electrical (e-waste) and accessories
- g) Construction and demolition waste
- h) Food and other organic waste
- i) Garden waste and Miscellaneous

Biomedical or clinical waste will not be part of this resource recovery program. The above wastes, except biomedical waste, will be handled in phased manner developing a reliable and environmentally friendly manner as far as possible with in the university campus. Local waste management organizations may be roped in for an effective management of wasted resources of the campus.

The university campuses generate waste from various departments or facilities and significant volumes will be generated from student's residential facilities at the end of each semester and staff periodically. Each generation site or point i.e. academic or non academic departments and residential complexes should maintain proper places or locations for onsite storage of source segregated waste. These need to be properly tapped for reuse or processing. The respective generator should properly mark the areas for onsite waste handling and make it ready for collection and further transfer.

The RRR program guide need to be developed with all necessary information and it will be made available to the university people. University campuses are often eager to reduce waste for

many reasons viz. to save money, streamline operations, and appeal to university fraternity do something good for the environment either directly or indirectly. The following are the 7 basic steps of the proposed RR program of the university.

- ✚ **Organize a Team or Committee:** The team or committee is one of the important steps to make things happen. A team consists of representatives from each of the academic wings or colleges with a convener helps in effective implementation of the RRR program. The active persons from each of the department should know about the RRR program. The University RRR team gathers data, analyze current practices and make recommendations for improvements and implementation. The RRR team comprises of a Coordinator, one or two faculty as members and one non teaching or administrative staff as associate from each constituent colleges. The team may comprise of the following.

Coordinator	: Director (CESCC)
Members	
College of Engineering	: Two faculty members
College of Science and Technology	: Two faculty members
College of Engineering (Women)	: One faculty member
College of Pharmaceutical Sciences	: One faculty member
College of Arts and Commerce	: One faculty member
College of Law	: One faculty member

Staff, students, teachers, custodial staff, administrative representatives and other stakeholders need to be roped into the activity. Each department viz. administrative or academic, or non-academic must designate at least one Resource Recovery and Reuse coordinator who will be assigned the duties of identifying and tracking the department's solid waste. The committee constituted for the RRR program will further classify and send it for development of techniques or methods to convert these for a suitable end use. It helps in developing an overall university waste inventory.

- ✚ **Regular Inventory Audits:** The inventory audits along with the status improve the utilization of various equipments in the university. It's a beginning to implement waste management strategies which reduces the generation of waste. Proper planning and little investments can help colleges and universities develop useful waste management processes and lower their waste production. At present the inventories of the university department or facilities are not periodically updated. Hence, it is recommended to maintain proper inventory of each of the department or office or other units of waste generation to periodically update the items or equipment or material available under their jurisdiction.
- ✚ **Waste Audit:** A waste audit will give a clear picture and understanding providing the volume; composition, origin points, and possible management strategies. An audit is also useful to determine what materials being used that could be substituted with recyclable materials. It may help in identifying the potential options for reusing, recycling and reducing waste.
- ✚ **Characterization of the (waste) Resource:** Waste characterization will be useful to determine one of the waste management options such as reduce, reuse and recycle. The material characterization should be made at the generation point as per the type of the waste

classification stated earlier thereby the MRF can have a better opportunity in designing the process. It helps in collection and conveyance process of the waste.

- ✚ **Incentivize the needy:** New ideas or solutions are to be complemented with suitable recognitions or rewards that encourage the community to participate actively with commitment. The university will provide a certificate of appreciation. In addition, based on the availability of the funds and the innovativeness of the idea or solution, appropriate prize money will be accompanied with a certificate.
- ✚ **Marketing the reusable or recyclables:** A RRR program is useful only if reliable facilities are available to accept the resources generated from the identified waste. Suitable marketing procedure within and outside the university campus or community need to be identified and assessed beforehand. The resources available will be placed on the web in addition to the display at prominent places in the university campus.
- ✚ **Sensitize and Educate:** The entire university community should know the details of the program and the possible direct or indirect benefits. A dedicated web link through the official university web site will help in disseminating information regularly frequent updates which may keep them motivated and recognize their contributions.

The 3 Rs viz. Reduce, Reuse and Recycle principle will be the initial guiding principle which can be extended further with time. Reducing the waste at source is the basic principle in the RR program strategy. Reduction of waste involves procurement of items with longer life and options of reutilization at the end of life. Reduce the consumption of paper and printing through digitalization may be another option to reduce the waste. Such measures will be encouraged as part of the program. It aims at optimizing the resource utilization thereby reducing the consumption of fresh resources and conversion of resources into waste. Reuse and recycling are the second and third principles of the RR program. Now a day's suppliers take back option is on rise while providing the goods or equipment. Hence, this will also be looked at while getting the items to the university.

Resource Recovery and Reuse Program process should be well documented for dissemination of experience and probable future up gradation. The entire program aims at bench marking the processes for an educational institute or university. An effective RRR program lowers raw material consumption by providing recycled materials for reuse. The reuse process reduces the demand for new resources and the recycling process generally provides raw material to various processing facilities that saves the virgin materials extraction from the earth.

It is suggested to setup a Material Recovery Facility (MRF) as a central facility for resource recovery. Initially, it reduces the central space requirements and facilitates easy handling at the MRF. The students are encouraged to deposit their leftovers in the MRF of the CESCC. The items that reach the MRF will be properly managed based on their respective composition, characteristics, volume and potential option for reusability, recycling or elimination or disposal. The list of items available with the MRF should be made available through an official web link. The processed items will be made available on a first-come-first-served basis to the university usage. Then the items will be made available to the university community and subsequently to the general public for a predetermined price.

Material Recovery Facility (MRF)

A Material Recovery Facility (MRF) of the CESCC will be the central facility that converts the discarded material into useful ones through the development of appropriate designs or methods or processes. The human resources will be identified and employed as and when necessary.

The university facilities viz. academic, non-academic, administrative and residential facilities should identify the material available with them. Each of the material or item should be properly tagged or labeled. There should be item specific information of the identified material and these should be listed properly before handing over them to the MRF, CESCC, Andhra University. Modalities will be developed to collect the identified material in a phased manner depending upon the reusability or recyclability. The material received will be further classified and processed for possible options with reference to reuse or recycling.

The MRF will have a receiving unit, segregation and storage area, processing area and the product area. The present scrap storage area will be converted as MRF and the layout within it will be properly altered to accommodate the above said unit of the MRF. The collection, conveyance and processing require financial and human resources. The availability of these resources will influence the outcome of the program.

Financial Resources

The seed money necessary for the program may be earned through sale of the salable resources. In addition to these financial resources, it is necessary to tap the additional sources such as resources from industrial and corporate organization through their corporate environmental responsibility funds. Direct participation of the NGOs and organization in the program or future projects will be added advantages for the success of the RRR program. Subsequently, in due course of time, it is necessary to develop a sustainable model for continuous activities of the RRR program.

Human Resources

The implementation of the RRR program along with the MRF activities needs human resources including skilled workforce. The arrangements will be made to cater the needs from within the university community and from outside agencies as per the norms of the university. The personal engaged or the services extended by the skilled people will be suitably rewarded as per the university norms.

Participatory Approach

University's fraternity should contribute actively practicing the RRR program guidelines and policies of the university. The resource management program success depends on the involvement of all the stakeholders across the university and its associates. Hence, the constructive inputs from the stakeholders will be added advantage for the success of the program. It ultimately leads to creation of healthy environment and change in the perception of the stakeholders on defining a resource as waste.

The faculty and students will be encouraged to participate actively and become part of the entire program. The RRR program success depends on the support and approval from top level administration, involvement of all employees, students and residents or visitors of the campus. Another step in the participatory approach is to share the facilities of the laboratories and equipment across the departments in a college or across colleges in the university. It reduces not only duplicate and multiple procurements but also saves capital cost, operation and maintenance cost and thus the ultimate waste generation.

Epilogue

The higher educational institution's solid waste management strategy need to be developed treating the conventional termed waste as a resource. It should incorporate reduce, reuse and recycle strategy to use the resources effectively with little effort. The Andhra University took the lead in initiating the RRR program in its campus. The RRR program aims at doing its bit of effort to conserve natural resources and protect the environment. It may provide an opportunity in developing and implementing an RRR program as a reference and resource hub integrating knowledge and experience in the specialty of university resource management. It will enhance the resource utilization and reduces the waste fraction. The program may provide a direction to develop management strategies or technologies in the field of wealth from waste which may be useful to the small and medium scale industrial units. The implementation of it will be a show case in campus circular economy and a sustainable campus of higher education institutions.