

# CONTRIBUTION IN ENVIRONMENT AND REVENUE GENERATION BY RECYCLING OF EDUCATIONAL INSTITUTION'S WASTE PAPERS

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**ABSTRACT:** Worldwide, every student uses the product of papers like books, note books, drawing sheets etc. and demand of new papers are continuously increasing. Papers industries are completed the requirement of new papers which are coming from the publishers. For this, industries require wooden pulp. Thus trees are cut to fulfill this requirement of wooden pulp. Thus, paper industries are responsible for the cutting of trees due to which the area of forest is decreasing continuously. The environment and climate are also affected due to the paper industries. These industries are responsible for emission of harmful gasses in environment and responsible for air and other types of pollution. The solution to this problem is the reused of the waste papers after recycling. By this recycling, handmade papers are produced. It can be predicted that after recycling of one-ton used papers, we can save the life of 30 eucalyptus trees, conserve 7000 gallons water, 400kW electric energy, 380 gallons of oil, and 3.3 cubic yards of landfill space and create the jobs of two persons for 450 days. In this manuscript, the calculations in many aspects are made by the waste papers generated by the students annually; the tentative number of students of an educational Institute for three years is taken. The revenue generation is calculated if the waste papers sell directly and sell after recycling with handmade paper products. The other impact of the recycling is on the environment, pollution, protection in climate change, difference in revenue and employment.

**KEYWORDS:** Educational Institute, recycling of papers, Handmade paper products, Environment protection, Pollution control, Revenue generation.

## I. INTRODUCTION

As the ingesting of paper is been growing, it is becoming problematic to obtain raw materials due to which the primary means are being exploited. Recycling of waste papers imperative as the requirement for papers will raise more natural resources will deteriorate. This study targets to the cost-effective and environmental benefits due to the recycling of waste papers. Waste is not waste anymore as recycling of discarded and consequent recovery of constituents, over and done with a procedure of separation, assemblage, and after that procedure of recycling, for clean value-added goods be able to considerably lessen the challenges faced by waste management and be responsible for massive economic prospects[1,7,14]. Procedure of waste recycling comprises of squander assemblage, recycling, and revival of single desecrate constituents such as plastics, paper, glass, and metals to create fresh valued products and materials [2,8,13]. The informal garbage categorization is done by manual labour. The gathering of plastics, used paper, cardboards, metals from different sources like public sectors, domestic and industrial garbage is done by manual labor. They are the most important waste categorization and recapture method [3,4,15]. In garbage of a city, about 35% soild waste papers are present [7, 8]. If the solid waste papers from the garbage are classified and sent it for processing of recycling. It becomes a great help in protection of our natural resources. The municipal corporation of a city should make management cell to organize these things. This management shell will work on the national level. It is also a duty of this cell that

the people will do training of recycling of waste papers under the guidance of experts in this field [9, 10]. In addition, exports of used papers lessen the possible financial profit so recuperating the waste papers within the state. Furthermore, Paper industries are extremely capital rigorous by long remuneration stage and consequently, except unprocessed objects is existing to the business on a logical cost, the paper manufacturing may appearance challenges within the extensive sprint [4-6].

In this study the tentative number of students in a university is estimated plus observation is made that the students undergo many exams annually which involve paper usage like end-term exam, mid-term exam, assignments, lab practical files, practical lab mid-term exam, practical lab end-term exam, plus notebooks. So after the academic session the papers used to write exams can be considered in the category of waste papers. Therefore recycling the waste paper the multiple items like file covers, note pads, soft boards and carry bags can be made out in universities. This can lead to the all-inclusive progress strategy with an intention to build the finest prospect for the country [11, 12, 16]. The goal is to recreate waste paper in accordance to sustain economy and environment based on renewable waste recycling schemes. The aim of this manuscript is to inspire the people for recycling and also aware about the environmental conservation with the economical benefits.

## **II. METHODOLOGY**

A sample amount of the waste paper is discarded every year so here we came up with the solution that how we can reuse those papers. Here we have taken tentative consideration for three years, in which annually waste papers are collected from the university. So this ample amount of waste paper collected is then processed to form the economic product. We have taken data of an University for 2017 year. The number of students in 2017 was 13500, in 2018, number was 14000 and in 2019, it was increased 17000. In a year students give about 10 theories and 8 practical examinations. For all examinations, answer books are required and new papers are used for conducting examinations. Similarly, papers are also used for doing assignments and making notes by the students. All these papers become waste after used the answer books in examinations, doing assignments and making notes by the students. In general, these waste papers are sold directly by the Institutes/Universities. But another method is that we can recycle all waste papers and make different handmade papers products. The calculation has been made in such a way that if the waste papers are sold directly and sold after the recycling of waste paper products. The revenue generation, employment, energy savings, pollutions protection, land fill space, oil consumption and life of trees are compared before and after the process.

For this study, the waste papers are collected at one place and after that the process of recycling has been started. The handmade papers are prepared and products like file covers, note books, certificates of conferences/workshops, visiting cards, carry bags, soft boards etc. are also manufactured.

The waste papers collected from any educational Institute may be the resource for the recycled products. Such waste papers undergo the further step by step process of recycling in which the initial step is pulping. In this section, the water is added to waste papers (Best proportion of pulp which can be taken into consideration is 100gm paper and 4l of water). To prepare the pulp, beater is used which may be hand functioned or electric motor operated mash machine. Pulping is followed by the screening process in which the paper pulp is decanted on the screener as an outcome paper pulp is collected over the screener and the slurry settles down at the bottom of the screener. After this process the pressure is applied on the paper pulp with the help of roller to remove excess of moisture and make it of equal thickness. This process is followed by the drying process in which the recycled paper sheet is dried under the sun for around couple of hours. After this, the calendar machine is used to smoothen the paper surface and the cutting machine is used to cut the sheet of recycled paper. Though, it's not conceivable to absolutely satisfy the necessity for raw material exclusively by recycling. But recycling plays major part in green economy where the key parameters are emerging recycling market plus its monetary and environmental possession. Recycling can condense critically the necessity for resources which economy call for subsequently the compression on resources will become feebler. The recycling of waste papers produces substantial economic profits, when it is properly consumed and used. In this manuscript, the authors determine the economic benefit with environmental and pollution protection by the waste papers found from an educational Institute/University. In this study, the cost of recycling products like file covers, notepads, soft board and carry bags are considered.

## **III. DISCUSSION**

The students who are studying in higher education are passing through about five mid & end term theory examinations and four mid & end term practical examinations in a semester. Students also submit about five assignments and four lab files to his/her teacher in a semester. In this manuscript, the study has been made that how the recycling of used papers of students will help to generate revenue and employment. After undergoing the recycling process, various products were made. Table 4, 5 and 6 show the sustained economic benefits by the products of recycling of waste papers. Estimated economic benefits of handmade paper products are mentioned in table 7. So the study conducted gives the broader aspect to see how the waste papers can be reused in terms of saving the environment and resources used. The waste paper recovery originates the incredible

environmental aids all through the paper lifecycle. As per environments prospects, the advantages of recycled paper are greater than wooden fibers. Table 8 illustrates the saving of life of trees, conservation of electric power, fuel oil and water. The data given in Table 8 represents the environmental contribution due to the used papers of students of any University/Institute.

**IV. RESULTS**

The calculation of generation of revenue and employment, saving of life of trees, electric energy, water and fuel oil are mentioned in below tables. In table 1, the weight of paper used by the single under graduate student is calculated according to the theory and practical examinations undertaken by them and it is observed that a student consumed about 18.550 kg paper in a year in his/her examination pattern in educational Institute/University. The total amount of paper used by the students in last three years (2017, 18 &19) is calculated and shown in table 2. The calculations of table 3 represents that if waste paper is sold directly without doing any process then the cost of waste papers will be 18.59, 19.33, and 23.78 Lakhs in 2017, 18 and 19 respectively in this process two person are getting employment. If these used papers of students are recycled and converted in to handmade paper products, the cost of papers will be increased. If we convert the used papers of 2017 into file covers, note pads, soft boards and carry bags, the revenue generation become 1.842 Crore, 9.981 Crore, 8.868 Crore, & 3.72 Crore respectively (table 4) and four persons are getting employment. Similarly, the used papers of 2018 generate the revenue for above mentioned recycling products are 1.911Cr, 10.35 Cr, 9.197 Cr & 3.85 Cr respectively (table 5) and again four persons are getting employment. For year 2019, the revenue generation is increased 2.32 Cr, 12.57 Cr, 11.17 Cr & 4.694 Cr respectively (table 6) (including the cost of four labors and sales man).

The recycling process not only doing the economic benefit, it saves the life of trees and protect our environment from air, water and land pollution. With economic and employment benefit, the recycling process of used papers in 2017 year can save the life of 7512 trees, 1001700 kW electric energy, 1752975 gallons of water and also save 95162 gallons of oil. By recycling of used papers of 2018 can save the life of 7791 trees, 1038800 kW electric energy, 1752975 gallons of water & 98686 gallons of oil, Similarly the waste papers of 2019 can save the life of 9460 trees, 1261400 kW electric energy, 2207450 gallons of water & 119833 gallons of oil respectively (Table 8). The monetary as well as the environmental benefit of recovered paper are substantial, if properly utilized, and can produce extensive financial profits to the country and produce noteworthy employment opening. Moreover, waste recycling has inordinate environmental worth.

**V. OBSERVATION:**

**Table 1:** Estimated weight of used papers by a UG student annually

	End Term	Mid Term	Lab practical end term	Lab Practical mid term	Assig nment s	Lab practical file	Note books	Total no. of Paper used by a UG student in a year
Number of answer booklets	10	10	8	8	10	8	10	-----
Weight of answer booklets	200gm	100gm	100gm	100gm	100g m	700gm	735gm	-----
Total	2000gm	1000gm	800gm	800gm	1000g m	5600gm	7350g m	18.550kg

**Table 2:** Total waste papers generated in a year by the students annually

	2017	2018	2019
Total no. of student	13500	14000	17000
waste paper (kg)	250425	259700	315350

**Table 3:** Net Revenue generation after recycling of waste papers

	2017	2018	2019
Waste Paper(kg)	250425	259700	315350
Revenue by waste paper (sold 8 rupees per kg)	2003400	2077600	2522800
Collection job salary (2person per annum)	144000	144000	144000
Net Revenue generated by Waste paper	1859400	1933600	2378800

**Table 4:** Total Revenue generation from the recycling products in academic year 2017

Item	Weight of each product	Market value of Each product(rupees)	No. of recycled Products Generated	Revenue generated	sale job (2 person per annum)	Manufactured Job(2 person per annum)	Net revenue Generated by the recycled products
File Covers	200gm	15	1252125	18781875	192000	168000	18421875
Note Pads	50gm	20	5008500	100170000	192000	168000	99810000
Soft board(4'x3')	2.25kg	800	111300	89040000	192000	168000	88680000
Carry Bags	100gm	15	2504250	37563750	192000	168000	37203750

**Table 5:** Total Revenue generation from the recycling products in academic year 2018

Item	Weight of each product	Market value of each product(rupees)	No. of recycled Products Generated	Revenue generated	sale job (2 person per annum)	Manufactured job(2 person per month)	Net revenue Generated by the recycled products
File Covers	200gm	15	1298500	19477500	192000	168000	19117500
Note Pads	50gm	20	5194000	103880000	192000	168000	103520000
Soft board(4'x3')	2.25kg	800	115422	92337600	192000	168000	91977600
Carry Bags	100gm	15	2597000	38955000	192000	168000	38595000

**Table 6:** Total Revenue generation from the recycling products in academic year 2019

Item	Weight of each product	Market value of Each product(rupees)	No. of recycled Products Generated	Revenue generated	sale job (2 person per annum)	Manufactured job (2 person per annum)	Net revenue Generated by the recycled products
File Covers	200gm	15	1576750	23651250	192000	168000	23291250
Note Pads	50gm	20	6307000	126140000	192000	168000	125780000
Soft board(4'x3')	2.25kg	800	140156	112124800	192000	168000	111764800
Carry Bags	100gm	15	3153500	47302500	192000	168000	46942500

**Table 7:** Integrated data of recycled products and revenue generation in last three years

Item	No of Recycled product (file cover)	No of Recycled product (Note Pads)	No. of Recycled product (Soft Board)	No. of recycled Product (Carry Bag)	Net Revenue Generated by (file cover)	Net Revenue Generated by (Note Pads)	Net Revenue Generated by (Soft Board)	Net Revenue Generated by (Carry Bags)
2017	1252125	5008500	111300	2504250	18421875	99810000	88680000	37203750
2018	1298500	5194000	115422	2597000	19117500	103520000	919776000	38595000
2019	1576750	6307000	140156	3153500	23291250	125780000	111764800	46942500
Average	1375792	5503167	122293	2751583	12513125	109703333	373406933	40913750

**Table 8:** Environmental benefit from the recycling of waste papers

Parameter	Saving per 1000 Kilogram	Recycled paper saving for 2017	Recycled paper saving for 2018	Recycled paper saving for 2019
Eucalyptus Trees	30 trees	7512 trees	7791 trees	9460 trees
Energy(kw)	4000	1001700	1038800	1261400
Water(gallons)	7000	1752975	1817900	2207450
Oil(gallons)	380	95162	98686	119833
Landfill volume	3.3 m <sup>3</sup>	826.40m <sup>3</sup>	857.01 m <sup>3</sup>	1040.65 m <sup>3</sup>

**VI. CONCLUSIONS**

From the above analysis, it is concluded that if the used papers of students are sold after recycling than the revenue generation become 10 times if we make file covers, 53 times in case of note pads, 47 times in case of soft boards and 20 times in case of carry bags than sold directly. The making and selling of products of handmade papers also generate employment with the benefit for the environment in terms of saving trees, reducing water used, fuel oil used and air, water land land pollution etc. The emissions of green house gasses will also be decreased due to recycling of waste papers. Thus this study reveals that everybody should reuse the papers after recycling as well as should also inspire to the people for recycling as the resources like forest and limited on earth.

Paper manufacturing, which was anticipated to reduce with the progression of technology, at present is the measure of everyday life for numerous purposes and its usage is been still growing. There is a lot of economic and environmental difference in view of revenue generation if waste papers are sold directly and sold as products like file covers, note pads, carry bags, and soft boards.

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