



Paper Mills, environment and biodiversity conservation

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Abstract

This communication deals with the requirement of forest based raw materials for Paper mills and consequent impact on biodiversity and pollution of environment. Some major issues regarding Paper Mills, environment and biodiversity conservation are also discussed.

Keywords : Paper mills, environment, biodiversity, conservation issues.

1. Introduction

The paper mills play very important role in economic and industrial growth of India. There are about 215 Paper mills in India comprising 179 small paper mills with installing capacity of 7,12,340 tons per annum (TPA) and 36 large paper mills with installing capacity of 13,29,160 TPA. The total installed capacity is 2.4 million TPA, to cater the domestic requirement of the country. The small paper mills contribute about 35% and large paper mills contribute about 65% of the total production of paper in the country. Most of the paper mills, particularly large Paper mills are dependent on forest based raw materials like bamboo and forest wood for manufacture of paper.

Paper Mills have direct influence on ecology and biodiversity due to large scale consumption of forest products and simultaneous release of huge amount of toxic liquid, solid and gaseous waste in to the environment. The following shows the volume of consumption of natural raw materials and chemicals to produce one ton of writing paper by a Paper mill. 1. Bamboo (moisture free)– 2.2 metric ton. 2. Caustic soda/salt cake – 150 Kg. 3. Chlorine – 120 Kg. 4. Talcum powder – 200 Kg. 5. Alum – 50 Kg. 6. Rosin -10 Kg. 7. Dyes – 50 gm. 8. Power – 1800 KW. 9. Coal – 2 tons. 10. Furnace oil – 40 litres. 11. Water – 250 cubic meter. (Baruah et al. 1996 a)

1.1 Raw materials : The raw materials of large

Paper mills are primarily bamboo (in some mills mixed with forest wood) which are found in abundance in hills as well as plains in most parts of India. Bamboo growth is facilitated by alluvial sandy and clay soil with acidic pH , balanced NPK, silica etc. and high amount of rainfall pattern. Reports suggested that there are about 500 species of bamboo mostly found in South America and Asia. In India, there are about 165 species of bamboo of which about 65 species are found in North Eastern region alone. The North Eastern region of India covers about 2.7 million hectares of bamboo growing area in both hills and plains, and in total accounts for 66 % bamboo production in the country (Dutta 2001).

It has been estimated that in well grown areas such as hills of Assam one hectare of bamboo plantation produces about 16 – 20 metric tons of bamboo. The yield is variable depending upon the bamboo species. The common variety of bamboo species used in paper production in the paper mills of Assam are – *Bambusa tulda*, *B. balcooa*, *B. vulgaris*, *B. dullooa*, *B. pallida*, *B arondinacea*, *Dendrocalamus hamiltoni*, *D. giganteus*, *Malconia baccifera* and *Oxylenthus servifolia*.

The bamboo plant has very high socio economic importance. Traditionally every part of bamboo plant is valuable and required for daily use. The leaves are fodder for domestic animals, the rhizome is a good food item, the stem is used in house building and making of wall , fishing gears, material

for agricultural purposes, preparation of food items, carrying water, ornamental and decorative materials and variety of household items.

1.2 Bamboo culm niche : The bamboo culm in forest provides several niche or microhabitat such as burrows in roots and rhizomes, tender shoots, stem cavities and leaves. These niche are used as shelter by diverse animal groups, such as small mammals, reptiles, amphibians, birds and number of invertebrates and insects. Besides, the role of bamboo plant in prevention of soil erosion and maintenance of pollution free environment is well established. Thus the bamboo plants immensely contribute to the conservation of ecology and biodiversity of an area.

1.3 Quantum of bamboo need by Paper mills : As mentioned above Paper mills consume about 2.2 MT moisture free bamboo for production of good quality writing paper. A large Paper mill with 300 TPD production capacity requires about 600 tons of bamboo per day and proportionately other materials for production of paper. Reports indicate that one hectare of bamboo plantation yields 15 – 20 MT of bamboo, by this calculation daily requirement of bamboo will affect about 60 hectare area resulting huge loss of bamboo cover in hills and plains. This not only reduces forest cover but also destroys the habitat of hundreds of other animal species. This is a common scenario in bamboo grown areas of hills and plains in the country including North Eastern States.

1.4 Policy on pricing of bamboo: Being State subject, the forest covers are exclusively under State Government jurisdiction and cared by State Forest Department. The policy on bamboo extraction from the forest generally fixed by State Government of concerned Paper mills. For example- In Assam the State Government has fixed a royalty of certain amount of money per ton bamboo extracted from the forest and the amount goes to State treasury. In addition, the mills have to pay certain amount of money per ton of bamboo extracted from the forest and private farmers. This amount is paid to private parties or contractors to meet the cost of cutting, collection, transport and stacking of bamboo in the mill premises. The contractors usually employ the local villagers on daily wage basis with stipulated target for extraction. The locals are very much interested in this job because there is no other avenues to earn money in these remote areas. Reportedly, in Assam, a single Paper mill pay about Rs. 1 crore as royalty to State Government and pay about Rs. 2.5 crores for the purpose of extraction and transportation of raw materials in a year.

1.5 Precautions in extraction of bamboo and management : Bamboo felling is selective cutting and

under joint monitoring of State Forest Department and Mill authority. The felling is done in a particular place on four yearly rotation basis. The cutting of bamboo plant is carried out 1- 2 feet above the base of each bamboo plant for maintaining proper growth of a new bamboo in future. Normally the resources of forest are exclusively managed by State Forest Department. Since forest is a renewable resource, and with reference to increase in bamboo production, the Paper mills in Assam have undertaken a plan called Farm Forestry Scheme to involve the local villagers to cultivate bamboo with a promise to collect the grown bamboo by the mills in future at prevailing market price. A successful implementation of the scheme will perhaps contribute to manage the bamboo resources on sustained basis.

1.6 Paper mill pollution : Water pollution by Paper mills is a major concern in recent days. Paper mill uses about 7000 gallons of water to manufacture one ton of good quality paper and in turn generates huge amount of effluent which pollutes the receiving wetlands and soil. It has been estimated that a Paper mill with a capacity of 300 TPD releases about 2100 cubic meter of effluent per hour. Study revealed that the released effluent contains numerous organic and inorganic chemicals which are extremely harmful (Baruah *et al.* 1996a). The enormous amount of effluent severely degrade the water quality of receiving wetland (Baruah *et al.* 1996 b) thereby jeopardizing the diversity and abundance of aquatic biota. In the receiving wetland the alteration of water quality immediately affect the diversity of plankton population, the vary basis of food chain (Baruah and Das 1997 a) and fish population (Baruah and Das 1997 b) including some endangered species. Experiments indicated that Paper mill effluent has the ability to induce alteration in morphological, haematological, histological and biochemical profile of fishes leading to their morbidity and death (Devi 2008).

Study further revealed that water pollution caused by the discharged Paper mill effluent can affect the economy of people residing in the vicinity of polluted wetland which includes decreased agricultural yield, diseases in poultry, livestock and human population, low demand of the fish collected from polluted water and affecting durability of the fishing gear (Baruah and Das 2000). The effluent has the potential to pollute the soil by altering the physico chemical characteristics as well as nutrient status (Baruah and Das 1998 a) affecting agricultural yield (Baruah and Das 1998 b). Paper mill also cause air pollution due to release of gaseous pollutants from its digesters and boilers. The gaseous emission includes dust, sulphides, disulphides, mercaptan, fly ash etc., and these have adverse effect on both man and wildlife. Paper mills produce sizable amount of solid

waste comprising wood dust and sand, lime mud, coal ash and sludge (Choudhury 1993).

2. Issues relating to Paper mills and Biodiversity Conservation: Some major issues regarding Paper mill and biodiversity conservation includes:

2.1). Management of forest and resource sustenance : It is necessary to have enough forest resources for continuation of Paper mill operation. In this context, there is a need to form a body comprising officials of State Forest Department and Paper Mills, environmental experts or NGOs working in the field, to suitably design and vigorously comply the appropriate management of forest resources including regeneration, prevention of overexploitation, training of bamboo extracting personnel etc. There is a need for Research and development establishments for the Mills itself or the Forest Departments, to look exclusively for resource development both qualitatively and quantitatively for resource sustenance to carry out uninterrupted Paper production. The unused forest land are required to make available on lease basis for bamboo plantation by the Mill or private parties along with necessary support. This will help employment generation, discourage encroachment of forest land and encourage growth of flora and fauna associated with bamboo plants and help in biodiversity conservation.

2.2). Monitoring of resource extraction and Mill operation : Resource extraction is a fundamental and delicate process for the Paper mill operation. A bamboo plant requires four years to attain maturity and usable for paper manufacture. It is imperative to strictly follow the extraction guidelines, that is to cut the matured one only under joint supervision of Forest Department and Paper Mill personnel. The workers employed should able to select the matured one for sustenance of resource in forest. Periodic monitoring of the forest by environmental experts or NGO would certainly help in proper extraction of bamboo resource. Regarding operational status, the Mills need to take precautions in functioning of effluent treatment mechanism to optimize the reduction of toxicity of released effluent as well as waste water from mill premises. Periodic removal of sludge from effluent treatment plant is one of the primary jobs in this regard. The aeration system in the effluent treatment plant should be kept fully functional. If the properly treated effluent is used in irrigation purposes for crop generation, it is necessary to see that appropriate amount of nutrients are added to the treated effluent.

2.3). Promotion of agro based resource/ waste utilization alternative : The agro based resources/waste such as – rice straw, wheat straw, gunny or jute cuttings, bagasse, different types of grasses etc. and

waste paper constitute some raw materials for the manufacture of some normal grade paper and paper boards. Reports revealed that India produces about 150 million tons of rice straw, 17 million tons of bagasse and 1.4 million tons of raw jute and partial amount of these resources are used by the small paper mills with production range of 3 – 30 TPD spread all over the country. The small Paper mills using agro based resources have been able to save valuable natural resources and encourage regional development. There is a requirement on the part of Government to encourage the growth of such Paper mills by providing infrastructural facilities and concessions for more growth of similar raw material based industries across the length and breadth of the country. Besides providing facilities Government needs to ensure protection of their interest keeping in mind their role in saving the natural wealth. To develop such industry, a comprehensive study is required to assess the quantum of raw materials produced throughout the country and to evaluate the feasibility of establishment of such agro based mills in different parts of country. The paper produced by small Paper mills are dependant on the raw materials used and qualitatively inferior than the paper made from bamboo, but their growth is necessary for vast agriculture dependant countries like India. The small Paper mills create more environmental problems because treatment of the waste become uneconomical. This is another area needs immediate attention for development of better low cost technology to combat environmental pollution in their operating areas.

2.4). Monitoring of waste receiving ecosystem and environmental impact : The quality of released effluent and waste water from the Paper mills needs periodic examination to assess the quantity of organic and inorganic constituents responsible for pollution load in the effluent. The sampling for analysis should be done at the point of release or at the inlet and outlet of effluent treatment plant of concerned mill. This will provide on operational efficiency of the mill and help to take corrective measures at appropriate time. Similarly, air quality of the mill area needs periodic examination to assess the load of air pollutants. In this regard the Paper mills, State Pollution Control Boards and Central Pollution Control Board have greater role to play in respect of periodic assessment of air, effluent and waste water quality, quality of water of receiving wetland and soil of nearby areas. Drinking water contamination, soil fertility reduction, cattle and human diseases are some common problems associated with polluted environment and need immediate measures to mitigate the sufferings of the affected people for maintenance of healthy environmental scenario in and around Paper mills.

2.5). Community participation : There is a need to

organize and educate the local villagers regarding growth and conservation of bamboo species. It has been estimated that one ton of bamboo production will yield gainful employment for forty man days. It is necessary to supply good quality of bamboo rhizome by the Mills to the local communities of hills and plains at subsidized rate with a guarantee to buy later at usual market price. The people involved in extraction of bamboo required to train in respect of different bamboo species and procedure for cutting which would ensure sustained supply of resources and conservation and growth of bamboo plants.

In hills, the Jhum cultivation or shifting cultivation is regularly carried out by hill communities which involves large scale felling of all types of plants including bamboo in large areas in the hill slopes to prepare ground for crop farming. This is a very common practice traditionally adopted by hill people of North Eastern States for cultivation of paddy, maize, millets, vegetables, ginger etc. In fact, the Jhum cultivation causes total degradation of forest ecosystem at an annual rate of about 3,87,000 hectares of land in North Eastern States of which about 70,000 hectares of land in Assam alone. (Chouhan 2000). In this context, initiation of an action

plan is required, with active participation of respective Governments, NGOs and local communities to protect forest resources including bamboo resources from the menace of Jhum cultivation and contribute forest resource generation, environment protection and optimization of biodiversity conservation.

3. Conclusion : Developing countries like India need more production of paper to cater the various demands of her huge population. The forest based resources are being exploited without proper planning which occasionally results in overexploitation, destruction and environmental degradation. Because of this, the present scenario of sustained resource supply for paper production is extremely grim. The present situation needs a serious work plan to maintain a balance between demand of forest based resource, its regeneration, maintenance of environment and biodiversity conservation. More emphasis is necessary in utilization of alternate resources instead of forest based resources for manufacture of paper. Simultaneously, there is a great need for upgrading the existing technologies employed in different industries including the Paper mills to effectively combat pollution of environmental components.

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