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APPENDIX III

OUTTURN OF INDUSTRIAL AND FUEL WOOD IN CUBIC FEET PER THOUSAND INHABITANTS

Year	Industrial wood		Fuel wood		Total	
	Quantity (c. ft.)	Value* (Rs.)	Quantity (c. ft.)	Value* (Rs.)	Quantity (c. ft.)	Value* (Rs.)
1951-52	439.19	420.22	984.47	122.04	564.39	540.01
1952-53	331.34	369.28	881.65	103.77	436.37	486.33
1953-54	309.14	377.46	853.42	66.25	414.16	505.69
1954-55	526.17	491.71	813.77	96.04	722.47	675.18
1955-56	518.83	671.11	838.87	99.01	745.15	960.12
1956-57	463.30	525.19	836.43	129.17	675.99	766.28
1957-58	475.69	539.63	887.61	118.10	700.60	798.00
1958-59	476.05	772.73	946.33	132.52	730.72	1,186.11
1959-60	515.77	864.93	923.22	160.24	814.28	1,365.52
1960-61	457.73	747.55	925.11	162.27	743.92	1,214.95
1961-62	465.73	759.69	825.39	145.62	768.34	1,253.28

* Value of the outturn was deflated by the general price index of all commodities.
Source: Indian Forest Statistics, *op. cit.*

THE ROLE OF FIREWOOD IN THE INDIAN ECONOMY*

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The purpose of this paper is to assess the role of firewood in meeting the energy needs of the Indian economy. Some implications of this study for the development of forestry in the country are also examined.

Firewood is a major produce of the Indian forests. Excluding minor forest products, wood is the primary forest produce in India. Fuel wood, as distinguished from industrial wood or timber, constitutes 70 per cent of the total wood outturn of the Indian forests, though the value of this timber is almost five times that of the fuel wood.

* This paper is part of a larger study entitled "Demand for Firewood in India," being prepared by the authors at the Institute of Economic Growth, Delhi.

Distances give rise to the problem of transportation if the goods to be transported are not produced everywhere. Since India is a country of very large distances, let us look into (*a*) the extent of concentration of fuel resources on the one hand and (*b*) the extent of transport facilities on the other. For studying concentration and its implications for transportation, we can usefully employ the Weberian framework[1] in which the disposition of material deposits influences location of industries. Weber classifies materials into "ubiquities" and "localized materials," depending upon the nature of their deposits. "Ubiquities," as the connotation suggests, are available everywhere, whereas "localized materials" are available only in geographically well-defined localities.[2]

Wood grows in India almost everywhere. Firewood is, thus, a highly ubiquitous fuel for the Indian economy. In the first instance, forests are not found to be concentrated in any one part of this country. Taking into account the population factor, we find that inter-regional disparities in the per capita availability of forests are not very pronounced. For instance, Bihar, Gujarat, Kerala, Madras, Punjab and Uttar Pradesh all have about 0.2 acre of forest land per head of population. The corresponding figures for other States are : about 0.5 acre for Andhra Pradesh, Maharashtra and Mysore; 0.8 acre for Rajasthan; 1.3 acres for Assam; 1.7 acres for Madhya Pradesh and Jammu and Kashmir; 2.4 to 2.6 acres for the Union Territories of Tripura, Himachal Pradesh and Manipur.[3]

Forests are, however, not the only source of firewood. Orchard lands are another source of firewood. So are the trees growing on the embankments of fields, roads, etc. Thus, for the population centres, situated either near the forests or in the rural areas, firewood partakes the character of a ubiquity or ubiquitous material. It is only for the urban centres situated away from the forests or the rural areas that it is not a ubiquitous material.

In sharp contrast to the overall ubiquitous character of firewood, coal is a highly localized fuel for the Indian economy. "The coal-fields are in the main clustered round the area of Bihar, West Bengal, Orissa and Eastern Madhya Pradesh."[4] Natural occurrence apart, what really matters is the actual disposition of the exploited coal-fields. "The first coal resources to be exploited were the mines of Bihar and West Bengal, which in the past have provided four-fifths of the nation's coal production and the whole of the coking coal. These mines are some 1450 kilometres from Bombay, over 1500 kilometres from Madras and nearly 1000 kilometres from Delhi."[5] In fact, the principal coal mines of Bengal and Bihar, *viz.*, the Jhari-Raniganj mines shrink almost to a point in a corner in relation to the vast geographical configuration of the country. This is particularly true of coke, which can be manufactured only from coals having the coking property.

1. Alfred Weber : Theory of the Location of Industries, translated by Carl J. Friedrich, The University of Chicago Press, U.S.A., 1929.
2. For further details about this Weberian dichotomy of materials, see pp. 50-52 and footnote 32 in the Editor's Introduction to the work mentioned in footnote 1 above.
3. The source of these statistics is Table II, p. 226 of 100 Years of Indian Forestry 1861-1961, Vol. II, published by the Forest Research Institute, Dehra Dun, 1961.
4. Report of the Energy Survey of India Committee, Government of India, New Delhi, 1965, para 264, p. 109.
5. *ibid.*, p. 5.

Apart from coal and firewood, we may briefly spell out the disposition of two other sources of energy, namely, electricity and petroleum. Electricity is mainly used for motive and lighting purposes. As a source of heat, it is not found to be an economical proposition in relation to coal and firewood, unless it is available at very low prices. In India, it is a localized fuel to the extent it has to be generated from the localized deposits of coal. It is only hydel electricity that cannot be considered a localized energy for the country as a whole, for water is not a localized resource for this country. However, hydro generation is feasible at a few selected points on the water courses. Thus, hydel electricity is a localized source of energy for each State, though not for the country as a whole.

Petroleum, from which the two fuels, kerosene and furnace oil are obtained, is a highly localized material. The indigenous supplies of petroleum almost wholly came from Assam till recently (the production of oil has now commenced in Gujarat). Imported oil is no doubt available at almost the same landed price in the coastal parts of the country, provided we import finished oil rather than crude oil. Since we import bulk of the imported oil in the form of crude petroleum, it is the disposition of the oil refineries that determines the extent of localization of oil for the country. Till the commencement of the Barauni refinery in Bihar, the refining capacity was concentrated mainly in Bombay city.

The localized character of modern or commercial fuels, notably of coal and oil, implies that transport costs in relation to the pit-head or ex-refinery price tend to become an important element in their landed prices for delivery in most parts of the country. How important these transport costs actually are depends not only on the distances to be traversed but also on the transport facilities and the pricing policy of a transport system.

The principal coal belt of Bengal and Bihar is well-connected by rail to the different regions of India. The same holds good for the oil refineries of the country. But areas producing firewood are not generally connected to the railway network. Thus, firewood has to be generally moved to its consumption centres by road.

Indian railways have accorded, like railways of the other countries, a very favourable treatment to the movement of coal, thereby reducing the importance of transport costs in the landed price of coal in regions located away from the coal mines. "This commodity has all along been treated differently from other general merchandise in the matter of rating. From early years, coal in wagon-loads from the Bihar and West Bengal fields was charged according to a telescopic scale of rates on the through distances when the scale of charges for other general merchandise was on a flat scale."[6] Apart from this very favourable telescopic freight structure for coal,[7] the rating for coal compared to other goods is very low.[8]

6. Report of the Railway Freight Structure Enquiry Committee, 1955-57, Vol. I (Part I), Ministry of Railways, Government of India, para 188, p. 60.

7. The rates taper off precipitously after a distance of 200 miles. For instance, freight per wagon of coal was (from 15th October, 1956) about Rs. 10.31 for a distance of 200 miles, Rs. 13.12 for 400 miles, Rs. 17.69 for 800 miles, Rs. 21.94 for 1200 miles and Rs. 24.88 for 1500 miles. (*Source ibid.*, Table on p. 63).

8. Even in the upwardly revised classification of goods, the Railway Freight Committee recommended that coal be charged 25 per cent of the standard freight rate, which is probably the lowest for any commodity moved by the railways. For instance, the above Committee recommended that even foodgrains should pay 32.5 per cent of the standard freight rate.

Freight rate for oil is, unlike coal, very high.[9] This makes the transport costs of oil very high even for short distances. Consequently, the localized character of the product on the one hand and the high freight rate on the other make oil expensive at places located away from the oil refineries.

To sum up, firewood has a definite role to play in the energy economy of India. In the first instance, it happens to be a highly ubiquitous source of energy whereas coal, though abundantly made available by Nature, happens to be a highly localized material for a country of large distances like ours. The deliberate policy of the railways to charge very low freight rate for coal has undoubtedly tended to reduce the transport costs for areas remotely situated from the coal-fields. However, the benefit of this favourable transport policy can accrue to those places which lie on the railway network. Since transportation of coal by road is much more costly than by rail, places not served by rail are disadvantageously placed in respect of coal. Broadly speaking, Indian railways do not reach the rural areas. Thus, firewood has a very important role to play in meeting the energy needs of the rural areas for which it is almost a ubiquitous fuel in contrast to the highly localized coal requiring transport by the costly mode of transport, *viz.*, by road. In short, most rural areas cannot look forward to soft coke as a domestic fuel for cooking purposes. On the other hand, for most urban areas in India which happen to be well-served by the railways, both coal and firewood are highly localized materials, with the notable difference that coal is mainly localized in one locality of the country whereas firewood is localized in several localities spread over all regions of the country. In other words, firewood is a regionally localized fuel while coal is a nationally localized fuel. It is because of the very low railway freight rate for coal that firewood can be effectively displaced as a household as well as an industrial fuel by coal even in the urban centres remotely situated from the coal-fields.

Petroleum oil, like coal, is not only a highly localized fuel but also bears a heavy freight rate in its transport even by the railways. Also, it is largely an imported fuel,[10] thereby drawing on scarce foreign exchange resources. Thus, it cannot be expected to play a significant role in meeting the fuel needs of the areas remote from oil refineries. Therefore, rural areas at least cannot look forward to kerosene as a domestic fuel for cooking purposes.

What are the implications of the above analysis for the development of forestry in India ? Notwithstanding the desirability of replacing firewood by soft coke—as suggested by the Energy Survey of India Committee and the National Council of Applied Economic Research—the rural areas of India have per force to rely mainly on firewood in meeting their energy needs. It is, therefore, very essential that the supply of firewood in these areas should be increased. This implies that the programmes of afforestation need to be implemented effectively and quickly.

At present no more than one-fourth of the land area of this country is under forests. The Forest Policy of 1952 has emphasized the need for raising this pro-

9. In the classification of goods prevailing prior to the appointment of the Railway Freight Committee, petroleum oils were charged at 120 per cent of the standard rate. The Committee recommended that it be raised to 130 per cent of the standard rate.

10. India imported about 5.78 million tons of crude oil and about 1.82 million tons of finished oil in 1960-61, whereas the indigenous sources contributed just 0.46 million tons of crude oil in the same year.

portion to at least one-third. Such an increase in forested area can make the forests not only more efficient than at present in discharging their primary function of protection, but also make a positive contribution towards meeting the growing energy needs of the rural households. If necessary funds for increasing the forest area are not made available, the rising rural demand[11] for firewood will result in great pressure on the existing forests. The consequent increase in illicit and indiscriminate fellings from forests—what the Inspector-General of Forests, V.S. Rao, aptly discribes as "operation of a robber economy by neighbouring population"[12] — may further impair the protective role of the forests on the one hand and a further reduction in tree population on the other.

Non-availability of firewood in requisite quantity can have a deleterious effect on agriculture in a direct way as well. Presently, the rural households meet about 15 per cent of their energy needs from animal dung. This significant dependence on animal dung in the rural domestic energy pattern is symptomatic of the fact that fuelwood is in short supply, with the result that the rural people are being forced to use animal dung more as a fuel than as a fertilizer. "Today about two-thirds of the total cattle dung produced in India is burnt as fuel because there is a shortage of other fuel in most villages."[13] If this hiatus between demand and supply tends to widen further in the years to come, the rural people will be forced to use more of animal dung for fuel purposes, thereby depriving the already depleted soils from an important source of organic nutrient.

NATIONAL FOREST POLICY AND FORESTRY DEVELOPMENT IN INDIA

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Land utilization data show that the area under forests formed only 22.48 per cent of the total geographical area in 1950-51 and this percentage further fell to 21.10 per cent in 1960-61. This decline may be attributed to a number of factors, such as, the submergence of large areas of forests in river valley projects; settlement of landless agriculturists; settlement of displaced persons in forest areas by clearing the forests; unauthorised clearance and occupation of wood lands; exercise of ruinous rights by tribals and others living in areas adjacent to forests; practice of shifting cultivation; and excessive grazing of cattle.

11. According to the National Council of Applied Economic Research's study Domestic Fuels in Rural India, 1965, the rural demand for firewood is anticipated to rise from about 86 million tons in 1962 to about 112 million tons in 1975-76. Again, the Energy Survey of India Committee estimated that the household demand for firewood would rise from 95 million tons of coal equivalent in 1960-61 to 122 million tons of coal equivalent in 1970-71 and 155 million tons of coal equivalent in 1980-81.

12. 100 Years of Indian Forestry, *op. cit.*, p. vii.

13. S. R. Sen, "Forestry and Agriculture in India : Competition or Coexistence," The Strategy for Agricultural Development, Asia Publishing House, Bombay, 1962, p. 43.