

**GEOPOLITICS OF RAIN FOREST DEVASTATION :
THE CASE OF BRAZIL'S AMAZON REGION**

*Dissertation submitted to the Jawaharlal Nehru University in partial
fulfilment of the requirements for the award of the degree of*

MASTER OF PHILOSOPHY

RANJANA BAJPAI

POLITICAL GEOGRAPHY DIVISION
CENTRE FOR INTERNATIONAL POLITICS,
ORGANISATION AND DISARMAMENT,
SCHOOL OF INTERNATIONAL STUDIES,
JAWAHARLAL NEHRU UNIVERSITY,
NEW DELHI - 110067

2000

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TO
MUMMY AND DADDY*



CENTRE FOR INTERNATIONAL POLITICS, ORGANIZATION & DISARMAMENT
SCHOOL OF INTERNATIONAL STUDIES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI - 110 067

Gram : JAYENU
Phone : 6107676, 6167557
Extn.: 2349
Fax : 91-11-6165886

Political Geography Division
Centre For International Politics,
Organisation and Disarmament,
School of International Studies.

21 July, 2000

CERTIFICATE

This is to certify that the dissertation entitled "**Geopolitics of Rain Forest Devastation : The Case of Brazil's Amazon Region**", submitted by **Ranjana Bajpai**, in partial fulfillment of the award of the degree of **Master of Philosophy of Jawaharlal Nehru University**, is her own work and may be placed before the examiner for evaluation. This dissertation has not been previously submitted for the award of any other degree of this or any other university.

Dr. Amitabh Mattoo
(Chairperson)

Dr. S.S. Deora
(Supervisor)

Chairperson
Centre for International Politics,
Organization and Disarmament
School of International Studies,
Jawaharlal Nehru University
New Delhi - 110 067

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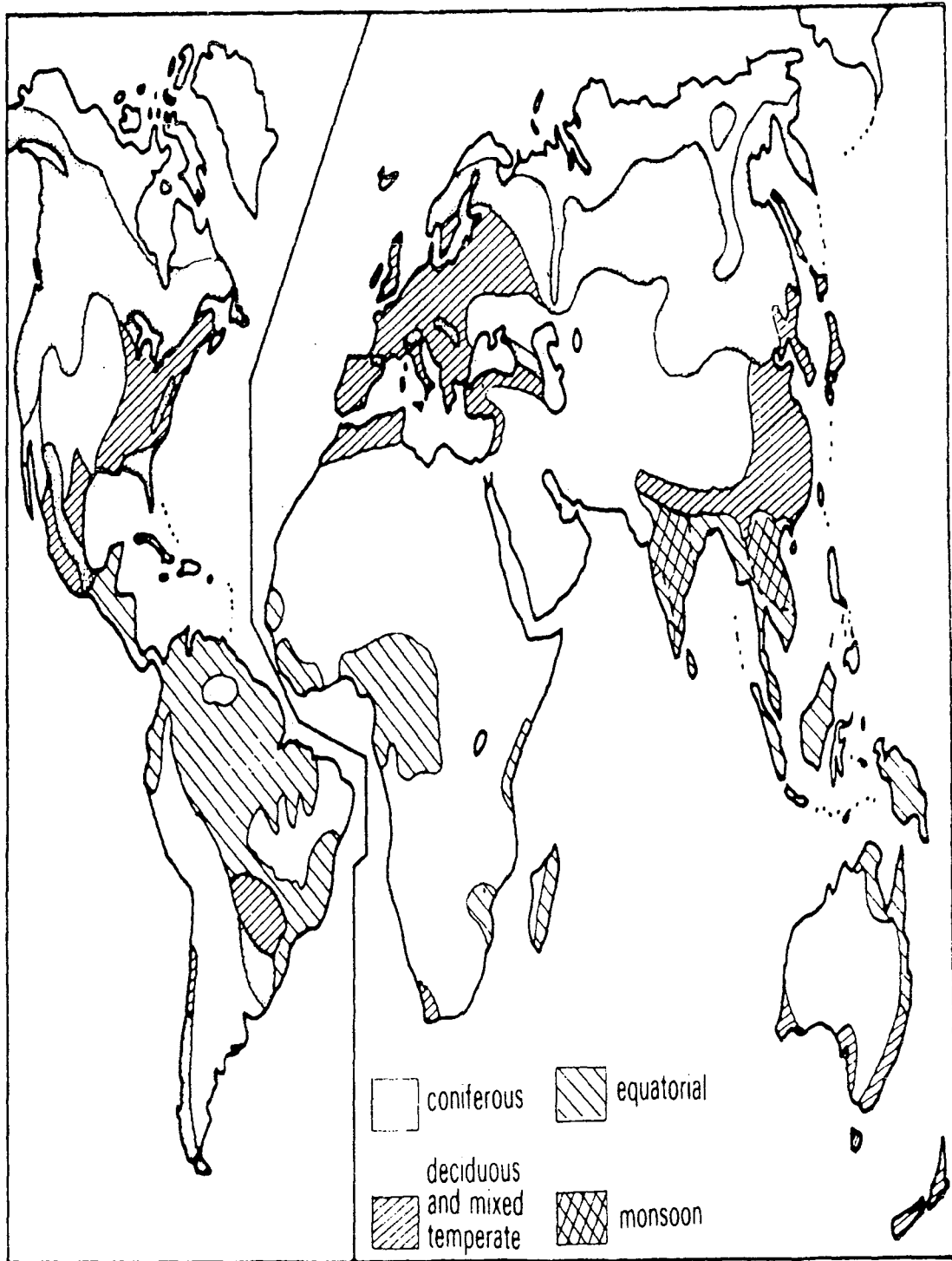
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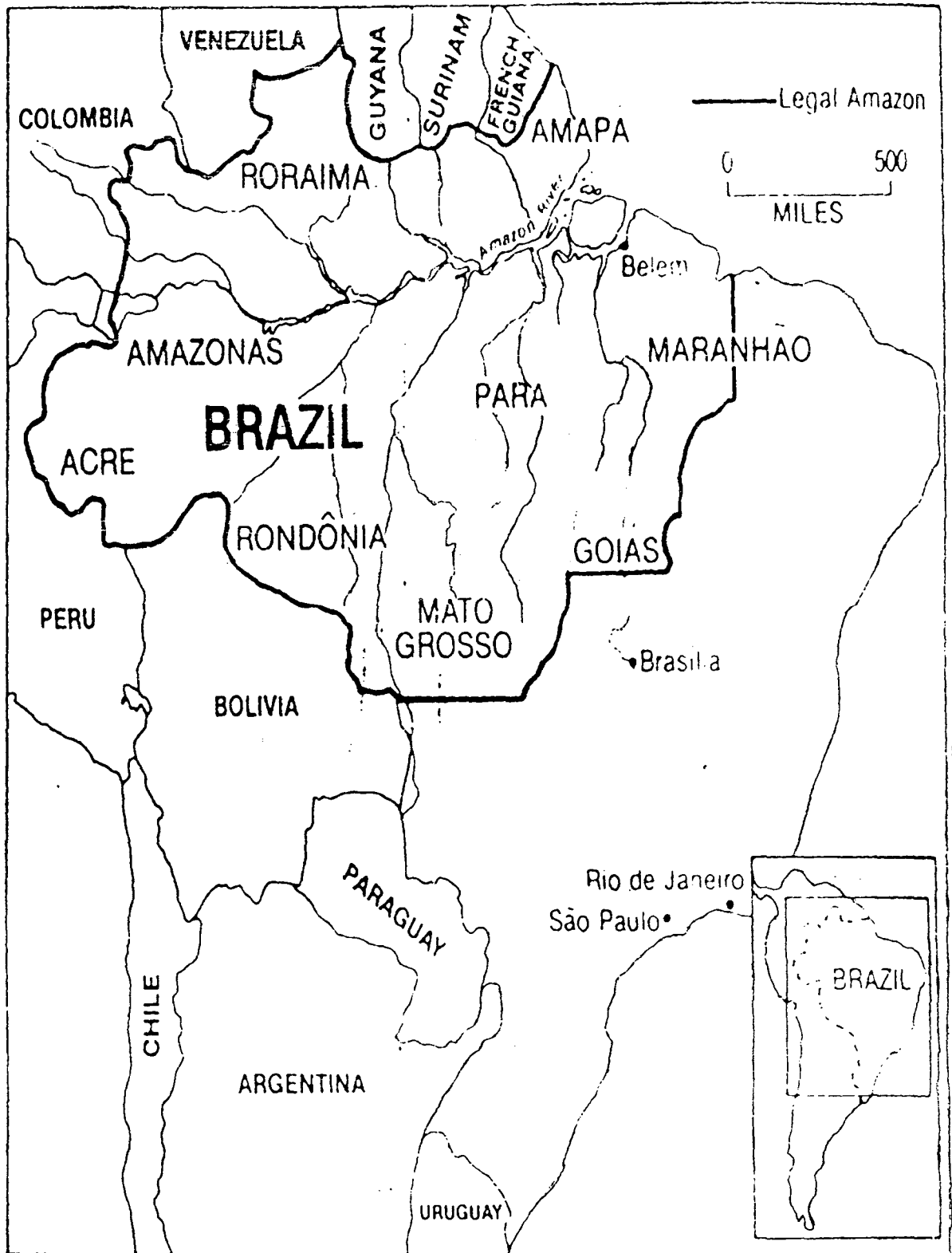
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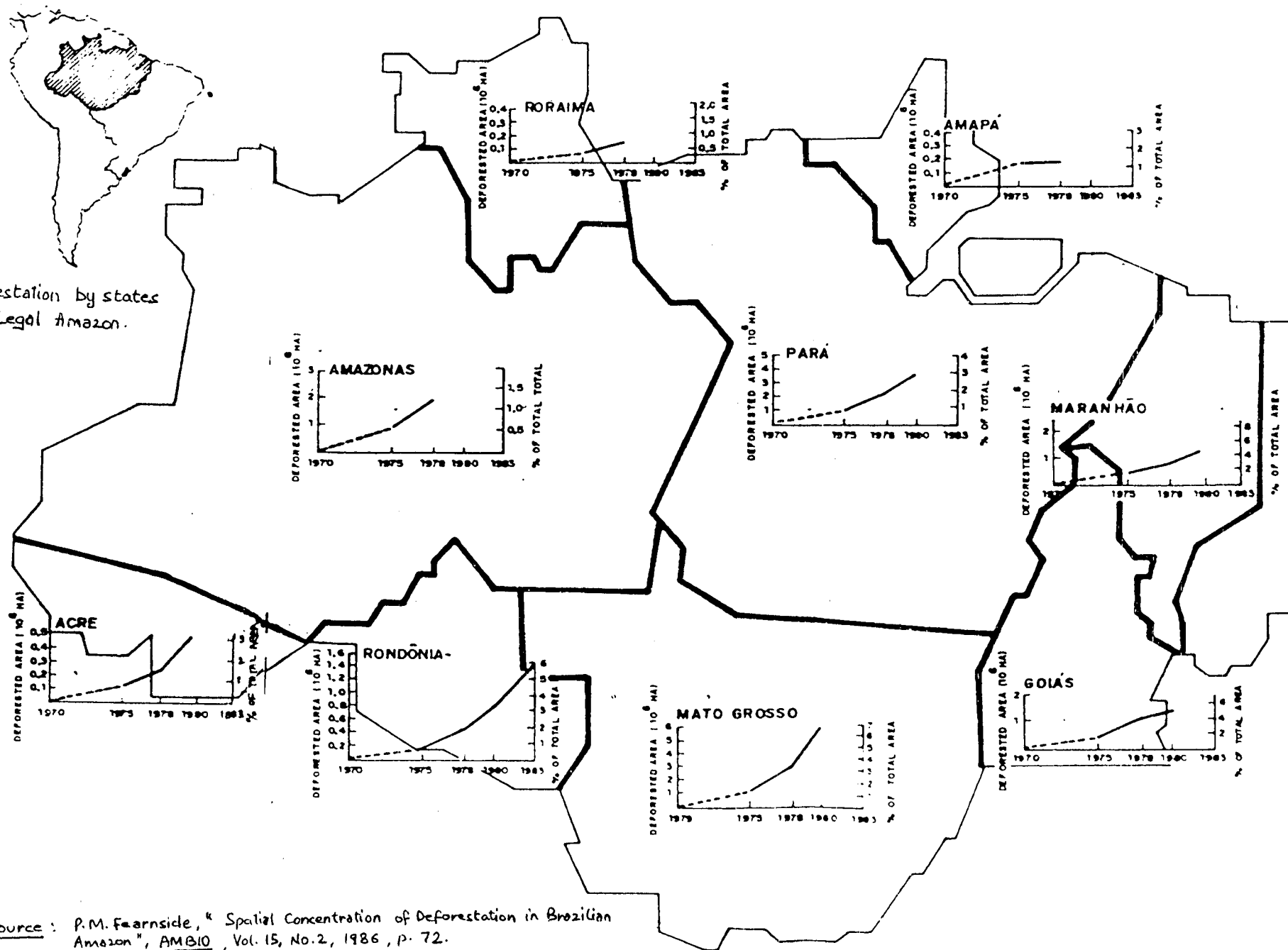
Source : Goh Cheng Leong and Gillian C. Morgan, *Human and Economic Geography*, Oxford University Press, Oxford, 1988, p. 340.



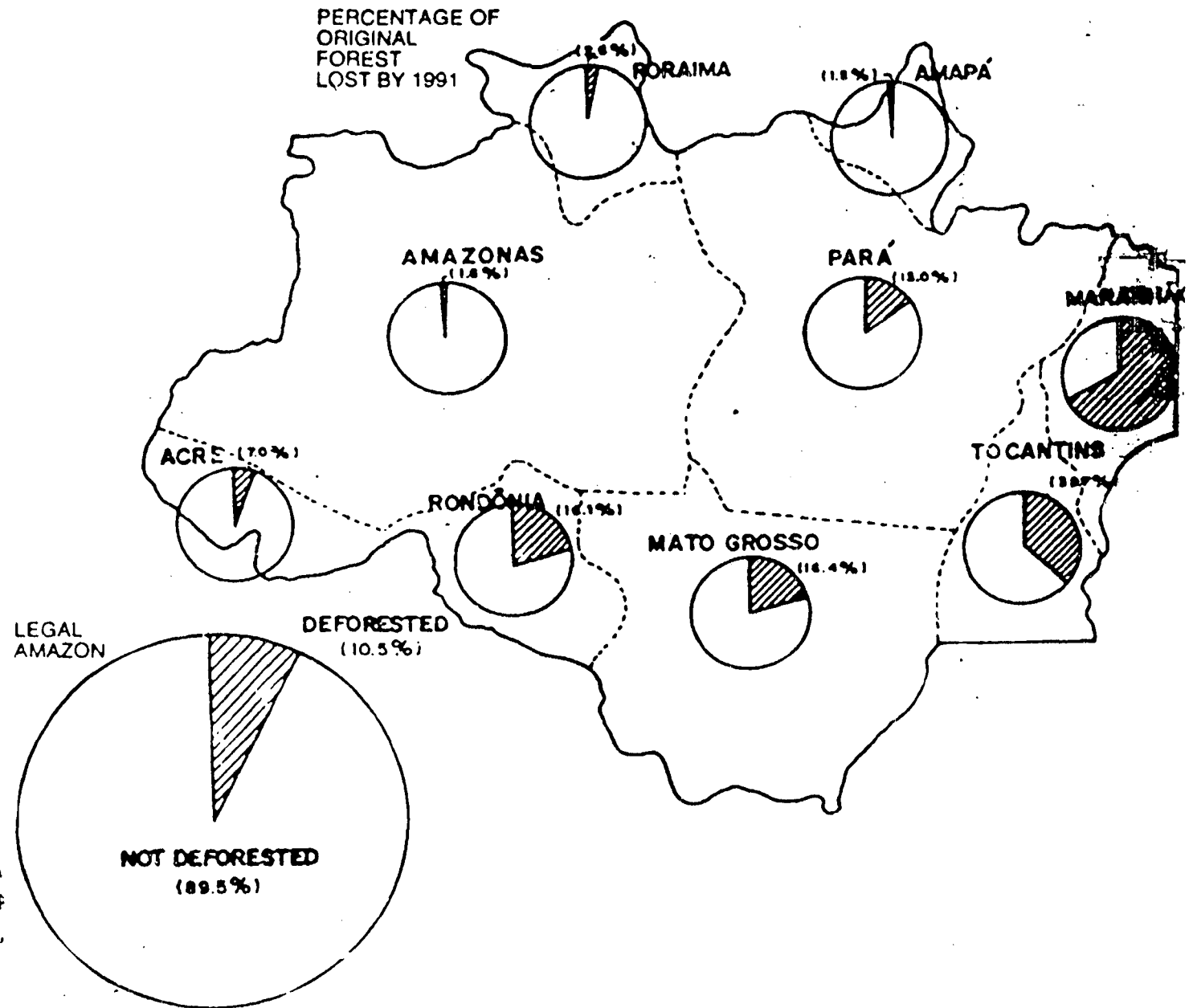
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Source: John O. Browder, "Public Policy and Deforestation in the Brazilian Amazon" in Robert Repetto and Malcolm Gillis (eds.), *Public Policies and the Misuse of Forest Resources*, Cambridge University Press, Cambridge, p. 248.

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Source: P.M. Fearnside, "Spatial Concentration of Deforestation in Brazilian Amazon", *AMBIO*, Vol. 15, No. 2, 1986, p. 72.



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Source: P. M. Fearnside, "Deforestation in Brazilian Amazonia: The Effect of Population and Land Tenure", *AMBIO*, Vol. 22, No. 8, Dec. 1993, p. 540.

Chapter - 1

INTRODUCTION : TROPICAL DEFORESTATION

CHAPTER I

INTRODUCTION :TROPICAL DEFORESTATION

The late 1980's witnessed the issues of natural resource management and environment gaining a wide acceptance at a global level. The mass media of late has been covering almost daily, the information about some sort of short and long term threat to environment. A lot of public debate among the academic specialists and the policy-makers concerns the ways to ward-off the impending disasters. Various important issues have contributed to this sea change in public opinion and political response: global climatic change, desertification, food and water quality, marine and atmospheric pollution, etc. According to the experts, "one of the most resonant issues, however, which is capable of detonating substantial expressions of pre-occupation and bewilderment has been the fate fo the world's tropical forests".¹

So far as the tropical forests are concerned, their destruction has come into world wide focus because of their unique role in evolution and ecology, their diversity and the increasing threat to their existence. Covering some 7 percent of the earth's surface, tropical forests have millions of people including numerous indigenous groups, contain 50 percent of the all species and make up the richest biodiversity. It is estimated that the tropical forests probably contain more than 5 million plant and animal species. According E.O. Wilson, about 1.7 million species have been classified and mentioned, including those in the major groups, about 75,000 insects, 47,000 vertebrates and about 2,50,000 plant varieties.² Some specialists estimate the total number of species at 30 million (e.g., Erwin, T.C., as noted in New

¹ Anthony Gross, "Amazonia in the Nineties: Sustainable Development or Another Decade of Destruction", Third World Quarterly, Vol.12, No.3, July 1990, p.1.

² For details , see E.O. Wilson, New and Comment, Science,No.234 , 1986, pp. 14 -15.

and Comments, *Science*, 1986, No.234, pp.14-15).³ This bio-diversity is used directly for education and scientific research and other similar purposes. The tropical forests are the sources of timber and a whole range of other products such as fruits, oils, nuts, latex, medicines, building materials, meat and many other products which comprise basis needs of forest dwellers. Products from tropical forests are also an important commodity in local and international trade.

In addition, the tropical forests perform important ecological and environmental functions which comprise watershed and regulation of climate. Also "tropical forests have the highest net primary production of carbon per unit area ($16.8 \times 10^{5g} \text{ yr}^{-1}$ or 30% of the terrestrial total) and account for 40% of the total terrestrial plant bio-mass (344.10^{15g})"⁴, in this context.

Location wise, the tropical forests are found in the wide equatorial zone of some 1,200 million hectares, which is equivalent to about 50% of their original extent, the world over. The increased and unabated process of deforestation and degradation of tropical forests endangers the very existence of these wide tracts the world over. Here one has to bear in mind the basic and fundamental difference in the use of terms like deforestation and degradation, because "deforestation refers to a change of land use with the depletion of tree crown cover to less than 10 percent. Changes within the forest class (from closed to open forest), which negatively effect the site or stand, and in particular, lower the production capacity are termed degradation".⁵

³ T.C.Erwin, News and Comment, *Science*, No.234, 1986, pp.14-15.

⁴ G.M.Woodwell, "The Carbon Dioxide Question ", *Scientific American*, , 1978, Vol .238, p.36.

⁵ David Pearce and Katrina Brown, "Saving the World's Tropical Forests" in Katrina Brown and David Pearce (eds.), *The Causes of Tropical Deforestation* , Research Press, New Delhi, 1995, p.9

As far as the original extent of tropical forests in undisturbed form is concerned, Whittaker and Likens put the estimate of 24.5 million km² (including moist evergreen and seasonal forest)⁶, which has been reduced to 10.0 million km². Norman Myers cites bio-climatic data to conclude that tropical forests in primary (undisturbed) form cover some 8.6 million km², all that remain of 15-16 million km², that may have once existed.

The ever increasing rate of deforestation of tropical forests threatens the spatial extent of this biome. "The lack of systematic and quantitative data on the rates and extent of the process has prevented formation of a general scientific consensus on the magnitude of what could be a serious global problem".⁷ However, it is widely accepted by the experts that every year around 76,000 to 1,00,000 km² are deforested and that at least 10,000 km² are degraded every year. Considering the fact that these rates of depletion are based on a data base of the late 1970 and the rates have increased since then, the picture is even more alarming. Or, in other words, 1% of the tropical forest biome is being deforested each year, and more than 1% of it is being degraded. It is believed that by the end of 20th century and shortly thereafter, tropical forests in undisturbed form would be confined only to Zaire basin and the western half of Brazilian Amazon and some areas in Guyana Highlands and in New Guinea. All this would have global implications for bio-diversity. The global assessment of impacts of deforestation is itself faced with uncertainties which are partially a function of uncertainty in determining the rates and extent of deforestation and which

⁶ For details, see R.H. Whittaker and G.E. Likens, "Primary Production: The Biosphere and Man", Human Ecology, Vol.1, 1973, pp. 357-369.

⁷ M.A.Mares, "Conservation in South America: Problems, Consequences and Solutions", Science, No.233, 1986, p.734.

are debatable. Following table prepared by Grainger shows the range in magnitude of rates of deforestation in the humid tropics (million ha per annum):⁸

Source	Date	Period	Total
Somer ^a	1976	1970	11-15
Myers ^b	1980	1970	7-5-20
Grainger ^c	1983	1976-1980	6.1
Myers	1989	Late 1980	14.2
FAO ^d	1990	1981-1990	16.8
FAO ^e	1992	1981-1990	12.2
FAO ^f	1993	1981-1990	15.4

Notes: a) 15 commonly quoted ; b) .5 a later revision;
 c) cf.7.3 for all tropics; interim estimate;
 d) revised interim estimate presented to UNCED
 e) 1990 Tropical Forest Assessment as reported by Singh
 f) (1993): figures of all tropics.

Source: David Pearce and Katrina Brown, "Saving the World's Tropical Forests" in Katrina Brown and David Pearce (eds.) The Causes of Tropical Deforestation , Research Press, New Delhi, 1995,p.8.

It is not clear whether these estimates refer to the same thing, as they use different definitions of deforestation- it clearance, selective logging, or degradation- and also different types and categories of forest. Second, methodologies and techniques of measurement differ and remote sensing has done little to provide more accurate data. Calculating deforestation rates would mean having estimates of deforested area at two points of time. Both the estimates should use the same criteria

⁸ David Pearce and Katrina Brown, op.cit., p.13

in defining the area considered or the vegetation within that area that is classified as 'forest' and the deforestation.

Problems and inconsistencies in the measurement of deforested areas have been discussed in the subsequent chapter. But so far as remote sensing techniques are concerned, these offer conflicting estimates depending on resolution and sampling coverage. For example, two estimates of deforestation in Brazilian Amazonia using remote sensing provide very different figures. One estimate by a group in the Brazilian National Space Agency (INPE) estimated rate of deforestation at 1.7 million ha/yr during 1978-88, whereas another group at the same agency estimated 8.1 million ha/yr for 187. The different figures were the result of using different resolutions, and the second measured smoke from fires as an indicator of deforestation. In light of these methodological difficulties in assessing the rate and extent of tropical deforestation, there is a strong need for an improved assessment and a close monitoring of the rapid changes in tropical forest cover.

Though severity of impact of the exploitation of tropical forests is debated, it is believed that "neither the rate of clearing nor its causes are uniform throughout the tropics".⁹ Some regions such as West Africa, Madagascar, Central America, Thailand and the Philippines show heavily depleted forests, while the Zaire Basin and the other in western half of Brazilian Amazonia and some outlier areas in Guyana highlands and in New Guinea may remain relatively unexploited, though even these may not last beyond the middle of the next century.

As the scale and damaging effects of tropical deforestation have become more evident, the debate about its causes has intensified. It begins with the point that policy makers and planners should have a clear understanding of causes of tropical

⁹ Robert.J.Buschbacher, "Natural Forest Management in the Humid Tropics: Ecological, Social and Economic Considerations", AMBIO, Vol.19 , No.5, August 1990, p.253.

deforestation in order to design an effective set of counter measures. "The many case studies of deforestation do not provide a clear picture of its causes. They seem to vary from place to place in almost idiosyncratic fashion. The international timber trade has played a major role in Southeast Asia. But only a minor role in Latin America (Poore, 1989). Growth in the size and number of cattle ranches has caused much deforestation in Latin America and it little deforestation anywhere else(Shane 1986)".¹⁰

Jerome K.Vanclay, in one of his studies points out that often the attempts to alleviate the problems are misdirected because of tendency to identify symptoms of deforestation as caused. Thus, he differentiates between causes and symptoms which, he says are, interrelated and also suggests solutions to the problem of deforestation.

Symptoms	Causes	Solutions
Erosion, flooding and landslides, extinction, destructive logging, shifting cultivation, migrants and squatters, industrial monocultures	Poverty and overpopulation, corruption and greed, imperialism, ignorance and carelessness, international trade policy	Education, training and information, cooperation, social security, land tenure, boost agricultural production, rehabilitate land, economic stability, broad outlook

Source: Jerome K. Vanclay, "Saving the Tropical Forest: Needs and Prognosis", AMBIO, Vol. 22, No.4, June 1993.p. 227.

The above Table clearly differentiates between the symptoms and the causes of deforestation. While the symptoms can be seen as resulting from clearing of forests, it is the causes of deforestation that need to be focussed upon. A direct attack on these root problems of the society can lead us to solution that Vanclay has suggested. Addressing the basic problems itself would mean a sea change in policy decisions by the decision makers. The causes of deforestation, as suggested by

¹⁰ Tom Rudel and Jill Roper, "The Paths to Rainforest Destruction: Crossational Patterns of Tropical Deforestation, 1975-90", World Development , Vol.25, No.1, 1997, p.53.

Vanclay, reflect an important fact that these are common to almost all developing nations. This leads then to one common platform on which they can cooperate to find some reach to some solutions to the problem of deforestation. But developing countries have little incentive to conserve the rainforests, which are seen as a resource not for their rich bio-diversity but a sources of fuel, timber etc. Vanclay in the same study points out that the bio-diversity, which in much talked about by developed countries in various debates and discussions to preserve the tropical forests of the world, is of little attraction to local population of the developing would and thus low initiative to conserve the same. He says, "few species, often from secondary forest satisfy most needs of the local communities. Some species attract tourists, but diversity itself is rarely an attraction. Plant-based pharmaceuticals from 90 plants may account for 25% of prescription drugs and USD 40 billion in sales each year, but the statistics do not indicate the potential value of the other 2,50,000 plant species. Bio-diversity offers a potential for enhancing the productivity of domestic plants and animals and for new pharmaceuticals, but who will benefit and when? How great is the potential: pharmaceutical firms do not own much rainforest. The current custodians of the forest have more pressing problems than the possibilities for curing cancer and AIDS, and history suggests that the industrialized nations will be the major beneficiaries. Equitable ways fo sharing the costs and benefits of this unrealized potential need to be found. Until they are, developing countries will have little incentive for conserving rainforests for their bio-diversity." ¹¹ The problem highlighted by Vanclay in his article needs to be realized by the western developed would, because most of the tropical forests are under the developing countries and a coordination between two is essential to conserve tropical forests.

¹¹ Vanclay, Jerome K., "Saving the Tropical Forest: Needs and Prognosis", AMBIO Vol.22., No.4, June 1993 p.226.

David Pearce and Katrina Brown agree with causes suggested by Jerome K. Vanclay in his study and add that misdirected past policies by bilateral and multilateral aid agencies, corruption, the indifference of much big business to environmental problems, the results of international indebtedness and poverty itself are the proximate causes of tropical deforestation. According to them, clearing of land for other uses such as agriculture and unsustainable logging are important factors contributing to deforestation but it is equally desirable to explore the compulsions under which policy makers take uneconomic and environmentally destructive decisions. It is here, they say, that specific causes such as population pressure, indebtedness or the structure of the world timber trade can be identified. Thus it is possible to identify the fundamental forces giving rise to deforestation which arise from two factors:

- (a) High population growth of developing countries, resulting from the competition between humans and non-humans for the remaining ecological niches on land and in coastal regions.
- (b) International and national economic systems have failed to reflect the true value of environmental system in the working of the economy. Many of the functions of tropical forests are ignored by policymakers because they are not marketed. Instead, their decisions to convert tropical forests into pastures and other land uses, are themselves encouraged by fiscal and other incentives for different reasons.

John Roper and Ralph W. Roberts in their paper "Forestry Issues" emphasise that it is important to distinguish between the agents of deforestation and its causes. The "agents" are those individual corporations, governments enterprises and development policies or projects that clear the forests in opposition to the forces that

motivate them. They say that most of the literature fails to distinguish between "agents" and "causes". This leads to assigning blame to people who are taking rational decisions given their socio-economic and political framework. According to them causes of tropical deforestation are:

(1) Indirect causes

- Fiscal and Development policies
- Land Access and Land Tenure
- Market Pressure
- Undervaluation of Natural Forests
- Weak government institutions and
- Social factors

(2) Direct Causes

- Slash-and-Burn Farming
- Commercial Agriculture
- Cattle Ranching and livestock grazing
- Mining and petroleum exploration
- Infrastructure development

As far as agents of deforestation are concerned, in all geographic areas, slash-and-burn farmers are ranked high as the most important agents of deforestation. They occupy forest land to clear trees and cultivate food crops. Other major agents of deforestation in agricultural sector are ranchers, who clear the forest to grow pasture for livestock grazing and the commercial farmers who establish estate crops like oil palm and rubber. Loggers, commercial tree planters, firewood collectors, mining and

petroleum industrialists and infrastructure developers are the secondary agents of deforestation.

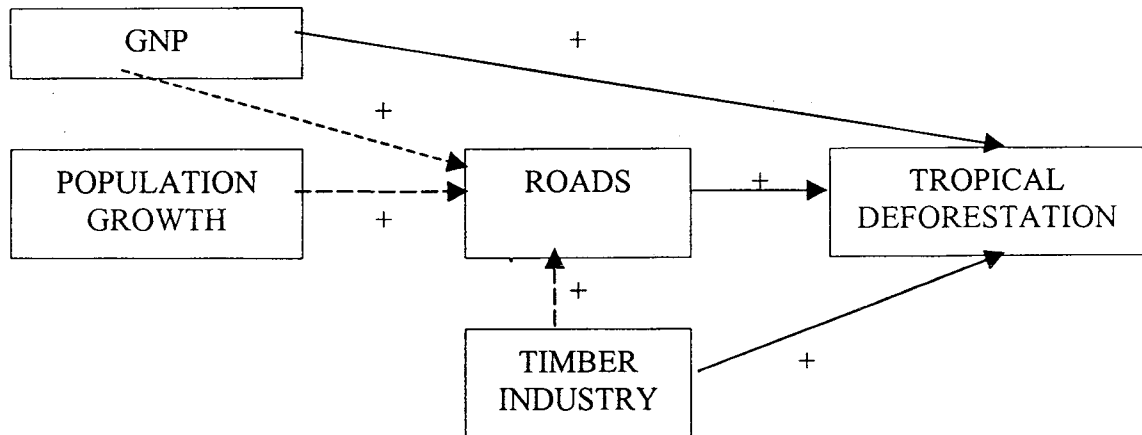
Further, there is a considerable variation region to region and country to country regarding the groups that are the most important agents of deforestation. Since there is a lack of a definitive, quantified list of the main agents of deforestation by geographic region, it is therefore difficult to conclude as to how much deforestation occurs as a result of the activities of the various agents involved. They gather information from various sources and attempt to rank by geographic region the important agents of deforestation.

In Africa slash-and-burn farmers are the main agents of deforestation followed by commercial farmers, loggers, livestock herders and refugees from civil disturbances. In Asia-Oceania, the main agents of deforestation are commercial farmers followed by slash-and-burn farmers, commercial tree planters and Infrastructure developers. Slash-and-burn farmers followed by cattle ranchers, commercial farmers, loggers and infrastructure developers are the main agents of deforestation in Latin America and Caribbean.

Tom Rudel and Jill Roper in a study based on cross-national data on tropical deforestation to assess the major explanations for tropical deforestation during 1975-1990, have come out with two sets of explanations.

- (1) **Frontier theory** - This idea believes that entrepreneurs, companies and small farmers are the main agents of deforestation. They are organized, use private capital and state assistance to build roads, open up regions for exploitation, settlement and deforestation. Companies and farmers rapidly clear land, as workers build penetration roads, because in the

beginning of process of opening up regions, there are no property rights to resource that can be enforced. Deforestation occurs as part of an effort by timber companies to open up rain-forest regions, therefore it is called "frontier" model of deforestation. Capital is one of the driving forces as every fresh infusion of capital accelerates the process of deforestation.

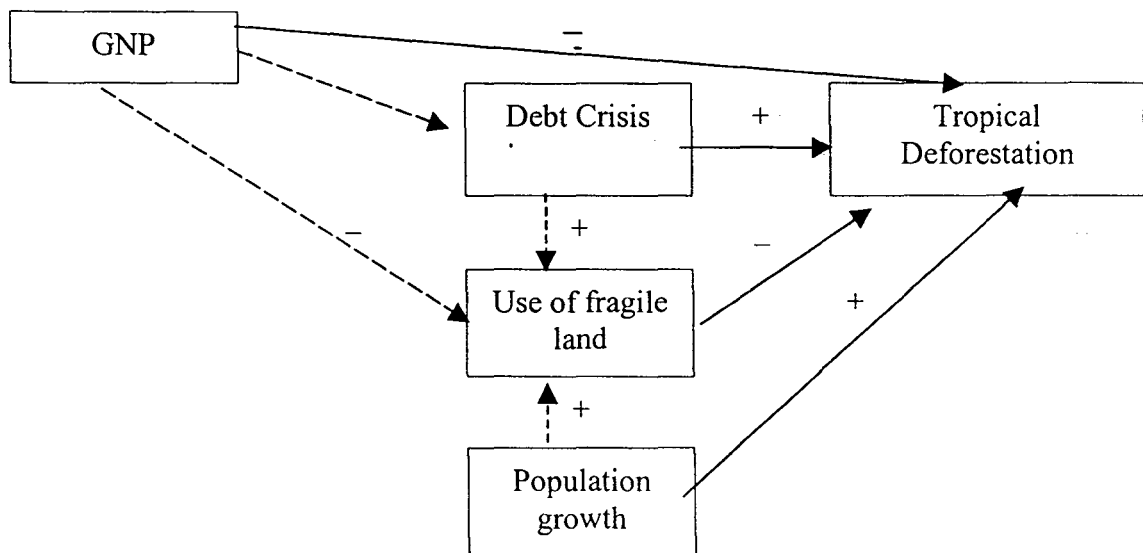


The Frontier Model: entrepreneurs, companies and small farmers. Adopted from Tom Rudel and Jill Roper , " The Paths to Rain Forest Destruction: Crossnational Patterns of Tropical Deforestation, 1975-90." World Development, Vol.25, No.1, 1997, p. 55.

This figure shows the main relationships in the frontier model. Timber industry builds road and harvests timber at unsustainable rates. These roads are utilised by the growing population to acquire and clear land in the rain forest. The role of capital is represented by GNP- deforestation arrow. An increase of incomes in a country makes more capital available for investment in rainforest regions, thus increasing pressures for land clearing in forested areas. This model does not take into cognizance the capital which comes from outside the country.

- (2) The second set of explanations focuses on growing population of peasants and shifting cultivators who create small farms in tropical forest. Poor national

economies fail to integrate poor with the economy, thus leaving few other means of living. This coupled with large foreign debts prevent the creation of non-farm jobs that otherwise might attract people to cities and relieve the human pressure on forests. Thus poor people are compelled to open up marginal lands for cultivation, clearing steep hillsides in formerly forested, mountainous terrain. They cite an instance where "this type of deforestation occurred in the 1980s in the Philippines when a decline in the urban economy prompted an increase in migration to the highlands by peasants who wanted to start or expand small farms".¹² Because this model presupposes a population of poor peasants with few economic alternatives, it is called, immiserization model.



Immiserization model : Peasants and shifting cultivation Adopted from: Tom Rudel and Jill Roper , " The Paths to Rain Forest Destruction: Crossnational Patterns of Tropical Deforestation, 1975-90." World Development, Vol.25, No.1, 1997, p. 55.

The figure shows that low levels of GNP results in economic stagnation, leaving peasants with few economic alternatives to land clearing. An increase in GNP

¹² Tom Rudel and Jill Roper, op.cit., p.56.

levels leads to wider economic alternatives. This releases some pressure from land, so the GNP - deforestation relationship should be negative. A heavy burden of international debt increases the deforestation. Governments encourage the expansion of export crop production at the costs of forests because they need revenue and foreign exchange to repay debts. Rural population growth creates pressures to bring additional land into production. Under these circumstances, small farmers often clear marginal lands which do not recover well when left fallow and remain deforested for decades after farmers have abandoned them.

Other theories about the causes of tropical deforestation relate to explaining environmental degradation in the third world in general. One of these is Malthusian theory which stresses upon the pressure exerted by increasing population which forces migration into undisturbed forest zones and practicing unsustainable and destructive agriculture on land.

"Tragedy of the Commons", first suggested by **Hardin** in 1968, explains environmental degradation occurring due to lack of incentive among the individuals to preserve common land. Exploiting common resources not only generates profits to the individuals but also environmental costs are shared with rest of the public. The process of exploitation increases if the land is open to access by all.

- (3) In the environmental 'externalities' idea, environmental costs are not considered economic costs, thus overlooked in planning process. This further leads to environmental degradation. As **Redclift** put it, "since we do not possess a tangible means of weighing the environmental costs., the negative aspects of these process can be easily ignored."¹³

¹³ M.Redclift,, Development and Environmental Crisis, London: Methuen. , 1984

Development literature often refers to the concept of 'dependency'. It explains "environmental degradation resulting from international intervention either through market forces encouraging growth of inappropriate crops or reckless harvesting of forests and mineral resources or through transfer by trade or foreign aid of technologies ill-suited to preservation of tropical environments."¹⁴ According to this view, the developed countries force developing countries to switch over to environmentally destructive land uses for the benefit of the former which can avail certain products resulting from these land uses at cheaper rates and on their part, the developing countries need to repay their debts forces them to new land uses ill-suited to their environments.

While there is no dispute over these forces behind deforestation. (poverty, over population, large development projects, commercial logging, cattle ranching and international market forces), in addition, "**government policies** have significantly added to and exacerbated intensified other pressures leading to wasteful use of natural forest resources, including those owned by governments themselves"¹⁵ Therefore, policy dimension should be emphasised because changes in policy can substantially reduce resource wastage. According to them these policies will also take care of economic waste have also undermined conservation efforts, regional development strategies and other socio economic goals like health and hygiene, employment, etc.

It is very difficult to separate the effect of government policies from those of other causes because both interact together on forests: "forests opened by loggers encouraged by liberal concession terms are more accessible to shifting cultivators, government-sponsored settlements also attract spontaneous migrants; development policies that worsen rural poverty lead to more rapid encroachment on forest lands.

¹⁴ Jacob Bendix and Carol M.Liebler. " Environmental Degradation in Brazilian Amazon: Perspectives in US New Media", The Professional Geographer, , Vol. 43, No.4, November 1991 p.478.

¹⁵ Malcom Gillis and Robert Repetto in Simon, Rietzberger (ed.)"Public Policies and the Misuse of Forest Resources " in Tropical Forestry, Earthscan Publications, London, 1993, p.69

The indirect effects of government policies are complex and substantial¹⁶ The policies include not only government's forest policies but non-forestry policies as well. "Forestry policies include those pertaining to the terms of timber harvest concession, such as their duration, permissible animal harvests and harvest methods, levels and structures of royalties, and fees, policies affecting utilization of no-wood forest products, and policies towards reforestation."¹⁷

Non-forestry policies responsible for forest destruction are forest clearing for plantation crops such as rubber, palm oil and cacao, for perennial crops and even for fishing. Also included are investments in dams, road construction, mining and other large infrastructure projects. Economically unviable, these are the result of political decisions leading to irreparable losses to forests.

In addition, government's tax credit and pricing policies, land tenure policies, indirect tenurial policies, pricing policies and investment priorities biased against the agricultural sector, further make conditions worse for tropical forests.

Thus , it becomes clear that government policies have been specially hostile to the rational utilisation of valuable forest resources. And as David Pearce and Katrina Brown suggest, going into underlying reasons for taking such decisions is important to understand the depth of the problem. Enquiring into the reasons for this attitude brings into light the fact that in many countries the policies have been framed in a manner as to reward special interest groups allied with or otherwise favoured by those in power. However, in many other cases despite will intentioned development objectives, governments have failed in understanding and execution of the same. It was mainly because policy makers and general public undervalued the benefits of

¹⁶ Ibid. p.68.

¹⁷ Ibid. p.69

undisturbed primary forests and overvalued the net benefits from forest exploitation and conversion, while the environmental costs have been ignored, as pointed out by Redclift in his theory of environmental externalities . Development planners went ahead with development policies without adequate knowledge of tropical forests, be it potential or limitations and also the consequences of their policies, which testifies the fact put by Pearce and Brown that there is a lack of understanding of role tropical forests play in the working of an economy. Tropical forest resources have been drawn upon to overcome fiscal, economic, social and political problems existing in some other part of the society.

In sum, an increasing rate of deforestation is depleting the world's tropical forest cover. The situation seems even more alarming when we realize that the methods of estimation of original forest cover and how much of it has been cleared are not fool proof. Different experts employ various definitions for forest cover and also various criteria to define deforestation. As far as causes of tropical deforestation are concerned, these range from poverty and population pressure to misdirected government policies to international trade and related issues and many other factors such as corruption, indebtedness, etc. Various experts have a broad consensus on these factors, but even among these the fact that which factor would dominate where or in which region of the world depends on the domestic conditions of a particular country and its interaction with outside world in terms of trade and outside interests in that country.

Chapter - 2

BRAZILIAN AMAZON : UNDER THREAT FROM DEFORESTATION

Chapter II

BRAZILIAN AMAZON : UNDER THREAT FROM DEFORESTATION

Natural vegetation in some form of forest is found in most parts of the earth, except the areas which experience extreme climates (too cold or too dry), and therefore cannot support forests. Two such areas are the polar regions which are characterized by a short growing season, frozen or snow covered ground and a very low rainfall (about 10 inches) and the deserts where rainfall is too low (below 10 inches) soils are thin, sandy or saline. Higher mountain slopes too, are often too cold or lacking in soil to support trees.

The temperate and tropical grasslands also support few trees due to dryness or seasonal rhythm of the climate. However, human role in altering the vegetation of many grasslands can not be denied and it is thought that as a result of human interference forest cover has been reduced or eliminated. For instance, forests covering patches of savanna vegetation or even tropical forests having patches of dry scrub savanna may have degenerated from forests as a result of burning by shifting cultivators over many years.

More humid temperate and tropical areas of the world support mainly three kinds of forests which are differentiated by the climatic factors, dominant trees and the types of wood they yield. The main forest types are (see map1):

Temperate Deciduous Hardwood Forests : These forests are found in temperate regions of moderate temperature and rainfall like central and western Europe, north eastern USA, southern Soviet Union, Central America, Eastern Asia, that is, Korea, Japan and China, etc. The seasonality of climate is not as extreme as in

the coniferous forest belt. Trees of these forests are mostly deciduous, shedding their leaves in autumn and remaining leafless throughout the winter. These forests, like the tropical rainforests, have trees of different species mixed together, including many shrubs and small plants, but its undergrowth and thick canopy does not match those of tropical forests. The hardwood yielded by these forests is quite strong and durable and, easier to work on too, unlike the hardwood yielded by tropical rainforests. Main trees are oak, birch, maple, chestnut, walnut and elm. These forests provide valuable wood which is used as building material and for the ship building industry. As a result, the temperate hardwood forests have suffered greater commercial exploitation at the hands of man than any other forests. A favourable climate and rapid expansion of population in these areas have led to extensive clearing of these forests both for industry and agriculture. The total area under these forests has reduced rapidly and constantly, and the area of forest which remain, represent only a fraction of the original cover.

Temperate Coniferous Softwood Forests or Taiga : Most of the coniferous forests are confined to northern latitudes between 50°N and 70°N in both North America and Eurasia. They are found in an extensive belt in the northern hemisphere running through Canada, Norway, Sweden, Finland, Baltic region of former USSR and central and eastern Siberia. They are also found on uplands and mountains between altitudes of 1500 and 2000 metres. For instance, forests on the slopes of the Alps and the Himalayas. Coniferous trees are tall, straight, evergreen trees with narrow, needle like leaves. Only a few coniferous trees such as larch, are deciduous. The needle like leaves limit loss of water by transpiration and help conifers to grow in drier areas. Tree growth begins just after the long winter and grow in a relatively short growing period after that. Most conifers are softwood and light, making them easier to cut and transport. Trees occur in pure stands consisting of one particular

species and are therefore commercially valuable. A wide variety of species in the spruce, pine, fir and larch families are found.

Tropical Hardwood Forests : These forests include both the evergreen rainforests of equatorial latitudes and the tropical monsoon forests. These are found in the regions of high temperature and high rainfall. Natural vegetation of these two regions differs due to the differences in the rainfall and temperature characteristics. Therefore, the tropical hardwood forests are divided into two types - equatorial rainforests and monsoon forests.

Equatorial rainforests : These forests extend between 5⁰ north and 5⁰ south of the equator. These are found in the Zaire basin of Africa, the Amazon basin of South America and with certain modifications in Malaysia and Indonesia (because of the modifying influence of the sea). The tropical forests in the Amazon basin are also called as Selvas. High temperature and rainfall throughout the year results in a thick luxuriant growth of trees. A thick canopy of trees in these forests leads trees to compete with each other for sunlight. Thus they grow taller and taller. Trees have a layered structure in these forests. Many creepers like lianas and epiphytes growing on trees are a common sight in these forests. Trees of these forests shed their leaves at different times, therefore appear to be green. A high temperature and humidity result in different kinds of diseases. These forests are also infested with poisonous insects, flies and snakes. Economic exploitation of the trees in these forests is a major problem because trees of one specie are scattered over a wide area. Important trees which are economically valuable are mahogany, rosewood and ebony.

Monsoon forests : These forests are confined to central and north-east India, Myanmar, Vietnam, Thailand, Laos, Cambodia and north-east Australia. Trees of these forests are characterized by a climate where rainy season is limited and as

duration and amount of rainfall affect the density of forests, monsoon forests are comparatively less dense than equatorial forests. Monsoon forests are characterised by a thick undergrowth of shrubs and small trees and by dense thickets of bamboo. Coastal areas in the tropics often have swampy mangrove forests. Sal, teak and sisam are important trees of the monsoon forests. Areas of high rainfall also have bamboo's, rubber, cinchona and mahogany etc. Being less dense, the economic exploitation of these forests is easier. Due to a very high density of population in the monsoon region, demand for wood is also high. Many parts of monsoon forests have experienced over-exploitation, adversely affecting the cover of these forests.

In recent years, tropical forests have been cleared at a very fast rate. According to recent estimates, during 1989, tropical moist forests lost 142,200 square kilometers of their expanse. Although tropical forests exist and suffer similar processes of degradation in Africa, Asia, Australia and Latin America, public opinion has largely been mobilized around Amazonia, especially the **Brazilian Amazon**, as its major concern. The reasons for such concern is obvious. The Amazon region is by far the largest remaining tropical forest on the planet and the major part is located within Brazil. Of the total current of around 23.8 million km², 2.2 million km² is in Brazil. This combined with the relatively open society of Brazil and the flow of information between Egos, grass root networks and environmental activists in Brazil and their associates in the North have resulted in an increased media coverage of Brazilian Amazon affairs and people's familiarity with the apparent crisis in Amazon, at least with its symptoms, if not with the causes.

The degradation of the tropical rainforests of this region has brought the country in the international lime light of ecological concerns – the destruction implies a loss of bio-diversity – already substantial losses of fauna and flora can be

observed. The burning of tropical forests, it is argued, is a major contributing factor to global warming, implying increased levels of risks to the well being of human beings.

The deforestation encouraging policy decisions of the Brazilian government, the activities of environmental organizations in Brazil as well as abroad, the discussions of the slash and burn, clearing of large tracts of land in the Amazon rainforests and the ways and means of putting a necessary stop to this destructive process and the supra regional to global climatic consequences that accompany it, have created an international controversy at a high political level. It is this concern that makes it imperative to go deep into the problems of this fragile belt of forests which is renowned for its bio-diversity. This study therefore confines itself to Brazilian Amazon.

Brazil's Amazon Region : Covering an area of 7.9 million square kilometers, the Amazon is the world's largest contiguous tropical moist forest. Of all the South American States (Bolivia, Brazil, Columbia, Ecuador, Guyana, Peru, Surinam, Venezuela) which have a share in the Amazon region, Brazil (within its total territory of about 8.4 million km²) occupies the largest part in the Amazon, covering 3.6 million square kilometers or 69 percent of its total area (see map2). In this regard two real definitions need to be distinguished:

- The Amazon area which is ecologically defined as a forest area of about 3.6 million km², equivalent to about 69% of Brazil's total area, and
- The area which is referred to as "Amazonia Legal" in development policies, extending over a total area of about 5 million km² includes non forest vegetation such as corode (dry scrub savanna of central Brazil), panatela (Mato Grosso humid savanna) and larva (Roraima humid savanna) besides the forest areas; it is

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the equivalent of about two thirds of the Brazil's total surface area (about 85% of the legal Amazon had forest as its original vegetation).

"Amazonia Legal" includes the federal states of Acre, Amapa, Amazonas, Para, Rondonia, Roraima, as well as parts of the federal states of Goiters, Mato Grosso and Maranhao (Map 2).

Physical Setting and Ecology of the Amazon Region: According to Winfred Blum, "the Geology of the region presents a wide variety of rocks ranging from central sedimentary basin (about 2.6 million km²) with its Cretaceous to Recent sediments to the adjacent pre-Cambrian formations of granites and gneisses, similar to the African basement complex in the north, where they are part of the Guyana Shield, and in the South, where they belong to the Brazilian uplands; during the Jurassic and even later they were affected by intrusions of acidic to basic basalt's. This region thus demonstrates an immense geological variety, from sedimentary rocks to metamorphoses and magmatites of very different ages and different kinds of origin"¹This is shared view of the most geologists writing on the Amazon region.

Morphological units of Amazon region are as follows:

- (a) **The Amazon lowland** with average height of about 20-200 metres above sea-level covers sedimentary basin of the central Amazon. It comprises terrace formation, dating back to the periods from the Cretaceous to the Holocene. As a result of the normal annual fluctuation of 10-14 metres in Amazon water level, terrace formation continues.

¹ Winfred E.H., Blum, "Land Use in the Humid Tropics, Exemplified by the Amazon Region of Brazil", Applied Geography and Development, Vol. 24, 1984 – 86, pp. 71-87.

(b) **Adjacent crystalline elevations** in the north and south have characteristic mountain ranges of the "series" and the Pico de Neblina which is the highest mountain peak (3,104m) in Brazil situated in Roraima State.

(c) **The coastal lowland** is the Brazil's largest lowland region with a maximum height of 20 metres.

Thus, the main distinction made by the regional population is that between river's floodplain (versa) and the terra firme, the terrain above the inundation level.

Climate: The Brazilian Amazon region has two distinct seasons: (i) a dry season which lasts for about 3-5 months and (ii) rainy season. Average rainfall is between 80-120 inches (200-300 cm) in most of the areas. Daytime temperatures are above 80 or 90°F and night time temperatures are above 70° or 80°F. September to November are the warmest months at the end of the dry season and just before the rainy season.

During the dry season which is from May to September, cold waves resulting from a northward movement of an Antarctic polar air mass, sometimes affect the western Amazon basin. On the one hand, they lower temperature for 3 to 4 days by as much as 18° to 27°F (9-14°C), on the other, damage crops, kill fish in shallow pools, when get further aggravated by the region's consistently high relative humidity of around 85%.

Eastern parts of the Amazon basin experience winds from the east and southeast. Inland areas have variable light winds. December to April is the rainy season, coinciding with the latitudinal migration of moist air, known as ITCZ, toward the equator and the areas where the sun's rays strike the earth's surface vertically.

Soils: The Brazilian Amazon region has a wide variety of soils - which extends from the "tropical human podzols, latosols, Acrisols, hydromorphic soils of very different character, terraes rossae over magmatic eruptives, heavy water logged soils and the saline soils of the coastal region to the virgin soils in places where the geographically most recent phases of erosion have washed away the older soils formations"².

Soils underlying the forest are of poor quality. The luxuriant forests canopy and the life contained within it bear little relation to the soils below. Most of the region has soils that range from indifferent to extremely impoverished. This is because of a humid climate in which all soluble substances are removed from the soil by weather processes and washed out.

Vegetation: Mainly four types of vegetation characterize the region:

- (a) The dense tropical forests, or "hylea" found mainly in northern Amazon states (Amazonas, Amapa, Roraima, Para and Maranhao) covers 48.8% of the region. It is the equatorial variant of the tropical rainforest and is typical of continental areas that have high rainfall and a uniformly warm and excessively humid climate.
- (b) The less exuberant, shorter but still continuous "transition forest" in the central Amazon (Acre, Rondonia, northern Mato Grosso and Goias and western Maranhao) covering 27% of the region.
- (c) Savannah Shrublands, campo cerrado cover 17.2% of the region mainly in Goias and southern Mato Grosso.

² Ibid, p.75.

(d) Savannah grasslands, campos naturais, occurs mainly in varzea floodplains, along the Atlantic coast in Amapa and Marajo Islands and in northern Roraima covering only 6.9% of the "Legal Amazon" region.

The forest of the flood plain has greater botanical diversity than that of higher ground or terra-firme. The quantity and variety of the seeds carried by the annual floodwaters and deposited on the rich soils of the floodplain are very great. The dry land forest on the unflooded terra-firme, however, has a great variety of useful hardwoods. The so called "white" or soft woods like the rubber tree and the kapok tree predominate on the flood plains.

The high density woods of the terra-firme include mahogany and other fine cabinet woods and the Brazil nut tree, which provides good building timber. There are many oil yielding palms in the forest and the familiar profusion of ropelike lianas and epiphytes. These parasite plants compete for sunlight and reach about 160 feet above the ground along with the trees. Some fairly large areas of Savanna grassland are also found.

Other important vegetation forms that extend over large areas are the coastal forests, some of which grow in brackish water zones, the oil palm and Brazil nut groves, as well as a great variety of other closed forest tree savanna and grassland formations of specific character.

As far as total bio-diversity is concerned, Brazilian Amazon region alone contains some 6,000 different tree species, many of them endemic to specific areas. The region has varied insect, reptile and bird populations, but there are few large mammals. Much of the wild game in the more populated areas has been killed by hunters or driven away when forest land has been cleared for crops or pasture. It

contains one in five of every known bird species and at least two thousand species of fish. There are perhaps thirty million animal species, most of them insects. Only 1 per cent of the probable 86,000 plant species in the Amazon have been intensively tested for their medicinal properties. Besides, its rich bio-diversity, Amazonian forests are known for the fact that despite the infertility of Amazonian soil, a luxurious forests stands on them. A hot and humid climate of Amazonia ensures a rapid re-absorption from the forest litter and from the dropping remains of animals. The root system of the trees is thick but does not extend beyond 20-30 cm below the surface. A shallow root system means that there is no temporary retention of nutrients in dead matter on top of this soil from which they might be easily leached by high rainfall. The forest ecosystem of Amazonia has a very closed cycling of nutrients that is restricted within the living mass and it ensures the reduction of loss of nutrients to a minimum by leaks from the cycle. The dense mat roots of the forest trees acts as a highly effective filter retaining all dissolved substances from the canopy water and the stem runoff and immediately recycles them back into the living trees without losing any into the groundwater, creeks and rivers which would finally carry them into the ocean to be lost forever from the forest ecosystem.

The canopy water and the stem run-off are very rich in dissolved matter including nutrients. It is the result of leaching effect of rainwater on the leaves and epiphytic and epiphytic plants of the forest trees. Also the greatest part of Amazon forest fauna lives in or on the canopies of the trees. They feed and defecate there leaving their 'manure' is washed down by the rains. The fauna is thus perfectly integrated into the general nutrient recycling process within the life of the forest.

Since most of the nutrients are stored in the biomass and cycling of nutrients takes place via litter fall and root uptake, a continual removal of this biomass which is

presently occurring over increasing areas of the moist tropics effectively depletes essential nutrients from the ecosystem while promoting erosion, soil compaction and weed infestation. An over intensive use of deforested sites in this zone could lead to permanent degradation of regional ecosystems.

Deforestation in Brazilian Amazon :

A tremendous controversy revolves around the estimation of rates and extent of deforestation in Brazilian Amazon. This is largely because of various criteria applied for defining deforestation and at times even classifying forest area in the region ; methodological difficulties in interpretation of data and; tampering with facts by the authorities in order to show low rates of deforestation .

First problem is with regard to criteria that is used in defining forests in an area and the types of changes to be marked or identified as deforestation. While delimiting Amazonia, inconsistencies relate to the “inclusion or exclusion of the cerrado (dry scrub savanna) , consideration of secondary forests as ‘forest’ or ‘deforested’ and the counting of re-clearing secondary forests and of flooding by hydroelectric dams as ‘deforestation’³.

Differences in estimates of deforestation result from differences in methods or of errors in data interpretation. The problem in interpreting a satellite imagery is how to distinguish between slash-and-burn clearance which may also involve the areas of dry scrub savanna occurring in the Amazon region and areas of destroyed forest. satellite remote sensing is still considered as the only means for resolving discrepancies in the data and providing updated and objective estimates of the actual

³ Philip M. Fearnside “Deforestation in Brazilian Amazonia : The Effect of Population and Land Tenure”, AMBIO, Vol. 22, No. 8, Dec 1993, p. 537.

rates and total extent of deforestation. Talking of satellite remote sensing, various means such as Landsat, metrological satellite, space shuttle and geostationary satellite data are used to study tropical deforestation. In this respect, "while Landsat multispectral scanner (MSS) and thematic mapper (TM) data can identify areas 80 and 30 metres in size, respectively, these data are collected only once every 16 days. This frequency of observation, coupled with the high probability of cloud and the frequent presence of smoke from forest clearing fires often results in useful data being collected only every two to four years for the areas of interest. Consequently, Landsat data are not always suitable for providing up-to-date estimates of tropical deforestation."⁴ Yet Landsat data can be a reliable source for the estimation of deforestation, if their quantity is sufficient enough to compensate for high cloud-cover conditions. But such a detailed and exhaustive survey is difficult and expensive to carry out.

Another problem related to inconsistencies in data regarding deforestation is that of adjusting data according to the requirements of the authorities. In Brazil's case, a World Bank study of June 1988 carried out by Maher, estimated that by 1988 the amount of forest which had been felled accounted for 12% of the total area of the planning region of Amazonia Legal. Anthony B. Anderson, reveals that the details of political influence on deforestation as "Brazil's Institute of Space Research (INPE) published in updated report on forest clearing in Amazonia (INPE 1989) that differs considerably from the World Bank estimates (Maher 1988). According to INPE Report, total forest clearing for the region through 1988 was approximately 250,000 km² or a mere 5.1 percent of the total area of Legal Amazonia. This report, however, has been received with considerable scepticism within Brazil (Antonio 1989). For example

⁴ R. Nelson and B.N. Holben "Identifying Deforestation in Brazil Using Multi-Resolution Satellite Data", International Journal of Remote Sensing, Vol. 7, 1986, pp. 29-44.

prominent members of the national scientific community charge that the figures were underestimated to still international criticism of Brazil's environmental policies in the Amazon. Likewise, technicians at INPE complain that the report was prepared too hastily (less than one month), and that the scientific staff was excluded from the final data analysis and synthesis. Finally, 'old' clearings made before 1970 were excluded from the estimates, including approximately 87,000 km² in the states of Para and Maranhao alone (INPE 1989; Marcos Pereira, personal communication)".⁵ The problem of tempering with data is highlighted by other experts as well, particularly Philip M. Fearnside, who has devoted numerous works to the tropical deforestation. Fearnside in one of his papers, gives an instance to explain how data can be tampered with to reach the required figures - "In January 1989, then Brazilian president Jose Sarney announced that only 5% of the Legal Amazon had been cleared through 1988, and reaffirmed this figure in an interview published in the 20th Feb 1989 issue of the Time. Only in following month, in March 1989, did the Brazilian Institute for Space Research receive the enlargements of the LANDSAT images that were later interpreted to give the same result of 5% deforestation"⁶.

It is because of these problems that we get various estimates on deforestation in Brazilian Amazon, that have been used in several publications on deforestation and its impacts. The World Resources Institute (WRI) Report for 1990-1991 put the rate of deforestation at 80000 km² yr⁻¹ as annual rate for the 1980s. Norman Myers placed the rate at 50,000 km² yr⁻¹ of 1988. The Intergovernmental Panel on Climate Change (IPCC) later used this value as the basis for green house emissions calculations. Both estimates are based on data provided by US National

⁵ Anthony B. Anderson, "Deforestation in Amazonia : Dynamics, Causes and Alternatives" in Anthony B. Anderson (ed.), Alternatives to Deforestation : Steps Toward Sustainable Use of the Amazon Rain Forest , Columbia University Press, New York, 1990, p. 180.

⁶ Philip M. Fearnside, op.cit., p. 538.

Oceanographic and Atmospheric Administration meteorological satellite on number of fires. Fearnside argues that WRI estimates were calculated for the year 1987 which had much more deforestation and burning than other years due to combination of dry weather, while results arrived at by Myers suffer from severe methodological problems for estimating areas burned and in correlating burning information into estimates of deforestation. And, if Brazilian government's forest cover monitoring program (Programa de Monitoriament da Cobertura Florestal do Brasil) is to be believed, 14.8million hectares of Amazon forests of all types had been altered as of 1983. This comes to slightly less than 3% of the legal Amazon region. Many scientists differ in their estimates and believe that the actual damage has been more extensive between 5% to 15% of the Amazon.

Philip E. Fearnside, who has drawn attention to the extremely high rates of increase in deforestation in a number of studies on this topic, in one of his papers titled "Deforestation in Brazilian Amazonia : The Effect of Population and Land Tenure", says that the variation in the estimates of deforestation results from the difference in methods of estimation and errors in interpretation of data. He gives three reasons for believing that Landsat-based estimates of deforested areas are low.

- (1) 1983-1987 data for three of the nine federal states of the Legal Amazon (Amapa, Roraima and Amazonia) totaling nearly 40% of the region's area were not included in the 1983 estimates).
- (2) Landsat technology is not equipped with distinguishing primary forest from secondary growth.
- (3) Landsat can not detect small forest clearing.

Explaining these, he says that until 1988, Landsat images had included clearing in the dry scrub savanna of central Brazil along with that in the forest. This creates a lot of confusion as it has been much more quickly cleared than forest and can almost double the estimates for clearing if included. In addition, the reclearing of older secondary forest had originally not been separated from primary forest clearing for the 1978 data. This was later separated to make it consistent with the later data sets of 1988 and 1989. In spite of various legitimate criticisms, most researchers, including Fearnside use the Landsat information as the only available standard, regularly updated measure of deforestation in the Brazilian Amazon.

The estimates for 1988-89 interval were thus corrected using many techniques. The number of images from Landsat for 1988 and 1989 was increased to overcome the problems of incomplete coverage. Areas covered by clouds were given a better treatment to improve the reliability of the estimates. As a result of these improvements, estimates of deforestation rate for the 1988-89 interval decreased from 33000 km² yr⁻¹ to 26000 km² yr⁻¹ to 19000 km² yr⁻¹.

Fearnside calculates percentages of original forest lost by 1991. It is based on forest area estimates for each 1:250000 LANDSAT image done by the Brazilian Institute for Space Research that measured the clearings. The total forest area was estimated to be 4.0 million km², resulting in a best current estimate of 10.5 for original forest cleared by 1991. While this estimate may seem insignificant, what is important is that almost all of this forest has been destroyed in the last few years. The percentage deforested increased from approximately 24% at the time of the launching of the Transamazon Highway in 1970 to 3.8% in 1978 to 10.5% in 1991.

As far as the rate of deforestation is concerned, Landsat data for 1978, 1988, 1989, 1990 and 1991 indicate that by 1991 the area of forest cleared had reached 4,20,000km² (10.5% of the 4 million km² Legal Amazon Region) over the 1978-1988 period, forest was lost at a rate of 22000 km² yr⁻¹ (including hydroelectric flooding) while the rate was 19000 km² yr⁻¹ for 1988-1989, 14000 km² yr⁻¹ for 1989-1990 and 11000 km² yr⁻¹ for 1990-1991.

The decline in deforestation rates from 1987 through 1991 is mainly explained by Brazil's deepening economic recession over this period. A severe lack of funds for more clearing for ranches, continuing building highways and establishing settlement projects. This means that deforestation rates can be expected to increase again once Brazil's economy recovers, unless checked by government.

State of the World's Forests 1999, reports that the largest areas of forests were burned in Brazil and Indonesia. Low rainfall in much of the Amazon attributed to the El Nino Weather pattern contributed to a prolonged fire season and an unusually high number of fires. In 1997, over 2 million hectares of rainforest in Brazil were burned. Analysis of satellite data from the US National Oceanic and Atmospheric Administration showed an increase of over 50% in the number of fires from July to November 1997. Most of the fires occurred in Mato Grosso and Para states.

Some Brazilian forests of particular ecological or cultural significance were affected. In march 1998, fires burned over 600,000 hectares of rainforest in Roraima, including parts of the Yanomani Indian reserve, near the border with Venezuela. In late September 1998, fires destroyed a large area of Brasilia National Park - a sanctuary for rare species from Central Savannah region killing wild life. Earlier in

the month, fire in state of Mato Grosso threatened to move into Xingu National Park, home to 17 indigenous groups, until rains extinguished the fire.

Spatial Concentration of Deforestation in the Brazil Amazon - Main threat of spreading deforestation can be analysed from its spatial distribution. At the level of individual states or territories, great differences can be seen in both the rate and the trend of deforestation Data for 1975-1980 (In 1980 no data were available for three states namely Amazonas Roraima and Amapa)for six states shows two groups of states (Map 3).

1. States of Rondonia, Acre and Mato Grosso with a strong exponential pattern in deforestation.
2. Para, Maranhao and Goias show an approximately linear increase in deforested areas. Of these both Para and Maranhao showed increase in clearing a little faster than linear, while only Goias showed sign of a slight rate decrease.
3. In all but one of the six states for which 1980 data are available therefore, clearing has accelerated over this five year period.

Percentage of original forest lost by 1991 shows 65.8% deforestation in the state of Maranhao followed by Tocantins (32.7%), Mato Grosso and Rondonia. Amazonas is one of the least deforested among the nine states of "Amazonia Legal" (Map 4).

Although most of the clearing is concentrated along the southern and eastern edges of the forest, a smaller but more threatening area is spread out along highways that now penetrate much of the region. This proliferation increases the danger that deforestation can spread quickly into relatively untouched areas. Plans for future

highway construction would open up much wider areas including the vast areas now only accessible by river in the western part of the state of Amazonas.

Rate of deforestation in states shows that there was a decrease in deforestation rates in Para, Maranhao, Tocantins, Rondonia, Amazonas and Acre while deforestation rates increased in Roraima and Amapa. This has been maintained consistently since 1988. The regional total of $10,500 \text{ km}^2 \text{ yr}^{-1}$ is dominated by the states along the eastern and southern fringes of legal Amazonia.

THE EFFECTS OF DEFORESTATION:

Thus an analysis of estimates of total area and rates of deforestation reveals that there is no agreement over any figures related to these and irrespective of the methodological difficulties in determining the rates of deforestation and political pressure to influence these rates, it is still true to say that deforestation is occurring at exponential rates atleast in some parts of the region. Therefore "reliable estimates are needed because of deforestation's contribution to global concerns such as greenhouse warming and loss of bio-diversity as well as its destruction of a potentially valuable resource for maintaining Amazonia's human population"⁷

Such a rising concern is mainly due to consequences of forest clearing on Amazonian ecosystem. Main effects of deforestation (these are some of the consequences to be predicted when current development projects are undertaken) are as follows:

⁷ Philip M. Fearnside, opcit, p537.

Circulation and reserve of nutrients: Tightly intertwined nutrient cycling is interrupted as a result of deforestation. A large scale burning of the felled forest reduces the nutrient content of the biomass, which is then contained in ashes. Most of these are then washed out from the surface when it rains. Surface run off and ground water seepage removes it from the environment. Experts like Harald Sioli mentions that cattle ranches established for the purposes of beef export, have devastated a vast area under forest and transformed them into artificial steppe. He further says that "The result of such activity is impoverished soils, deprived of the stock of nutrients contained in the former living biomass. Carrying capacity of artificial pastures in a former hylaeen section of the Belem-Brasilia highways decreased from 0.9 - 1 head of cattle on young pastures to only 0.3 head after some six years (H. OR. Sternberg, verbal communication). Nutrients are one basis of constant biological productivity. Their irreplaceable loss reduces and limits not only harvests but also biological production."⁸

Surface erosion and soil compaction: The dense forest canopy provides protection to the soils and surface layers. Felling trees deprives these soils of this kind of protection. Soils get exposed to the direct impact of heavy rains which easily eroded the soils sediments and thick weathering layers of the Amazon terra firme. When forests are substituted by short cycle crops or by planted grasses, even then the soils are deprived of the protection. Pasture grasses dry up during the dry seasons and the parts of ground are even more exposed, strongly heated, killing the microflora. "There is a danger that region may develop into a new 'dust bowl' – dust, formerly unknown in Amazonia is already common on the new roads during the dry season"⁹.

⁸ Harald Sioli, "The Effects of Deforestation in Amazonia", The Geographical Journal, Vol. 151, No. 2, July 1985, p. 199.

⁹ Ibid, p.200.

Also, formerly porous forest soil is compacted by deforestation through general and especially slope clearing, deforestation increases surface run off.

Sandification: Another effect of forest clearing is sandification on the bare surface layer of the soil. Direct impact of heavy raindrops causes 'selective erosion' washing away the finer clay particles, leaving behind coarser and heavier sand. If small areas are left without protective vegetation for a longer time, sandification proceeds deeper into the soil, thus reducing its water retaining capacity. This condition is especially harmful to young seedlings of forest trees and the regrowth of a forest is prevented.

Climate Change: It is one of the most serious effects of large scale deforestation. It effects the generally high evapotranspiration of the whole forest. With the reduction of rain water re-evaporating from the original forest, the rate of its recycling will also diminish. Steppe evapotranspiration is estimated to be only a third of evergreen forest and in the same proportion availability of water for evapotranspiring steppe plants is reduced. The consequence will be a reduction in total annual rainfall after a certain percentage of Amazon forest has been destroyed, and a pronounced seasonality of rainfall.

Longer and more severe dry seasons will interrupt the supply of rainwater to shallow root systems of the forest trees for longer periods. Since the groundwater level of Amazon terra firme is usually very deep and is not reached by the roots of most trees, these are not used to long periods without rain.

Rivers: The obvious effects of soil erosion and an intense surface run off on the sediment load and sedimentation processes of the rivers are - sudden and higher floods, lower water levels during the dry season, greater turbidity and increased

sediment load and partial silting of the river beds. Destruction of forests along streams and some river banks surely affects water quality and flow on a local scale. But the vast scale of Amazonia's forests appears to be masking the impact of deforestation on small watersheds. Bayley argues that landscape changes are not currently radical enough to affect Amazon hydrology on a large scale.

Global Consequences: These relate to increase of CO₂ in the atmosphere, resulting in greenhouse warming. A study done by Klinge in 1976 for biomass determination in a subregion of Amazonia has revealed that "the dry vegetable matter amounts to about 500 tons per hectare which corresponds to about 250 metric tons of carbon fixed in a steady state equilibrium"¹⁰. Extrapolated for the whole Amazonian hylea of nearly 5×10^6 km², which means that about 115×10^9 tons of carbon are retained in the forest matter (or 20% of the carbon of the entire atmosphere's CO₂).

"Removal of that forest biomass and replacement with artificial steppe(pasture) or short cycle crops means that at most 20% of the carbon content of former forest biomass will be fixed in the new vegetation. The rest will be oxidized, by burning or by rotting, etc. and will enter the atmosphere as CO₂. Experience during recent decades indicates that about half of additional output of CO₂ into the atmosphere will disappear into the sink of the oceans. There would be thus a net increase of about 8% in the CO₂ content of the global atmosphere if the entire Amazon forest were replaced by a much less voluminous, manmade vegetation. Together with the increase of about 16% of carbon dioxide in the atmosphere already observed since the last century, that new addition would contribute to the greenhouse effect of the CO₂ in the atmosphere"¹¹

¹⁰ H. Klinge "Rootmass Estimation in Lowland Tropical Rainforests of Central Amazonia: Brazil", Tropical Ecology, Vol. 14, 1973, p29-38.

¹¹ Harald Sioli, op cit, p.201.

Environmental impact of smoke: Smoke from forest cut for agriculture and ranching may have local, regional and global impacts. Methyl chloride, a component of biomass burning, attacks ozone and deforestation in Amazonia has been held partly responsible for holes in the ozone layer over Antarctica, by some experts. In spite of this, industrial world is far more responsible for more ozone depleting aerosols into the atmosphere, than do farmers and the ranchers in the tropics.

Excessive smoke may result temporary disruptions in climate. Some incoming solar radiation is reflected back into the atmosphere. A reduction in incoming solar radiation reaching the earth's surface may lower conventional activity and rainfall in some areas.

Shutting down of airports because of smoke is not uncommon in Amazonia, but the past two decades have witnessed the problem aggravating in airfields in parts of Rondonia and Acre.

Habitat destruction and the loss of bio-diversity:

Loss of bio-diversity as a result of development and deforestation has emerged as a global concern. Debates on bio-diversity loss often put forward tropical deforestation at the forefront. According to Myers, at least 27,000 species are thought to be lost from such widespread destruction every year. Deforestation can adversely affect bio-diversity in two ways:

Habitat destruction and ecological changes along the contact zone of remaining forest stands. Between 1978-88 period, some 98000 km² of forest are said to have been degraded. Outright deforestation in itself is not capable of a change in bio-diversity. The contact effect of disturbance which can be in the form of

microclimatic changes or pasture fires, can alter plant and animal species as much as 1 km into the forest.

Dispute/Controversy Regarding Climatic Change due to Deforestation in Brazilian Amazon.

Whenever a discussion on environmental change in Amazonia comes up, utmost attention is drawn towards the impact of deforestation on regional and global climate. Tropical deforestation is often blamed to be a major culprit contributing to global warming trends and largest cover of tropical forest in Amazonia means its increasing role on the future of the world's climate.

Global warming: Scientific experts and media reports suggest that human activities such as burning forests and fossil fuels are leading to global warming. However, it is argued (Byrne 1988; Flavin 1989; Schneider (1989) that the idea that global warming has already begun may be premature tropical deforestation accounts for less than 20% of the greenhouse gas emissions and thus are only partly at fault.

Experts from developing countries have argued that CO₂ from the fossil fuel burning which occurs mostly in temperate countries is the largest component of greenhouse gases. Only seven industrialized countries produce 40 percent of carbon dioxide emissions worldwide. Industrial countries are responsible for about 85% of CO₂ accumulation in the atmosphere.

The idea that countries which have a share of Amazon rainforests should control forest clearing to protect the world's climate has faced a sharp reaction from Amazonian countries who say that the developed countries should reduce their own carbon dioxide emissions if they want third world countries to tackle the issue. Some

scientists also distinguish "survival emissions", such as slash and burn agriculture practised by resource poor farmers from "luxury emissions" from cars and natural gas burning. In light of these controversies, "a cautious approach to formulating environmental and economic policy to address global warming has been adopted by several governments. Three main factors account for this wait-and-see attitude. First, climate change predictions are too uncertain, particularly at the regional level. Second, current systems are thought to be capable of absorbing climate change without major disruption, at least for the next few decades. Third technologies can be deployed to mitigate or compensate for some of the changes wrought by global climate change"¹².

Desertification: In addition to temperature changes, rainfall regimes may be adversely affected by the deforestation. Evapotranspiration is thought to be contributing to half of the rain that falls in Amazonia. Thus it is assumed that continued deforestation might lead to a dry regime. Some theories predict a sharp fall in rains if large scale deforestation continues in Amazonia, thus increasing the spectre of dust-bowls and desertification.

But according to some experts in this field, "It is highly unlikely that substantial areas of Amazonia will be converted to asphalt or a desert. Second growth soon begins the regeneration path to forest in all but the sandiest soils"¹³

There is no evidence to suggest that deforestation in Amazonia has led to a fall in rainfall. After two particularly heavy burning seasons in Amazonia in 1987 and

¹² Smith, Nigel J.H., Emmanuel Adilson, S. Serrao, Paub T. Alwin and I.C. Falesi "Amazonia: Resiliency and Dynamism of the Land and its People", UN University Press, New York, 1995, p.17.

¹³ *ibid*, p.20.

1988, 1989 was a very wet year. Eastern Amazonian 1989 got so much rain fall that the dry season actually disappeared.

"Rainfall patterns are highly variable in Amazonia. In 1774, a drought assailed the Rio Negro watershed when deforestation rates were much lower than at present (Hemming 1987). River levels in Amazonia were unusually low in 1860 owing to poor rainfall (Chandless 1866). In 1958, 64 days passed without any rain in the Bragantine Zone east of Belem (Penteado 1968: 138). The Amazon River was particularly low again in 1963. The big "push" to develop and open up the Amazon started only in the late 1960s"¹⁴

In the view of these controversial opinions on effects of deforestation in Brazilian Amazon, all that can be said is that more information is needed about various aspects concerning deforestation and the required assistance will come only from further research.

¹⁴ *ibid*, p.21.

Chapter - 3

CAUSES OF DEFORESTATION IN BRAZILIAN AMAZON : A CRITICAL ANALYSIS

CHAPTER III

CAUSES OF DEFORESTATION IN BRAZILIAN AMAZON: A CRITICAL ANALYSIS

An analysis of the causes of rainforest devastation in the Brazilian Amazon recognizes a critical survey of the findings of the various of the studies undertaken by the leading experts in the field and then assessing them on the basis of the documentary evidence and the parameters of the critical analyses of the discernible trends in this regard.

Roberto O. Guimaraes holds the view that any relationship of human beings with nature reveals internal social relations among them. He attempts a historical analysis of environmental management in the context of Brazil's political development. In his paper, a detailed study of the bureaucratic politics of public policies concerning the environment, reveals also how environment is conceptualized in development planning and how environmental management reflects the main features of the political system and of the social formation of Brazil. The developmentalist ideology was so effectively ingrained in Brazilian politics that the military regime, which assumed power in 1964, justified the transformation of Brazil into a 'world power' even at the social and environmental costs. In fact, techno-bureaucrats were major players in Brazilian politics. To put it in his words, "the civilian-military regime installed in Brazil after 1964 can be expressed in simple terms. It represented the alliance of the financial and industrial bourgeoisie with multinational interests. ... What has made this alliance possible was the existence of a well trained, specialized and willing technocracy, both civilian and military".¹ This

¹ Roberto P. Guimaraes, "Bureaucracy and Ecopolitics in the Third World : Environmental Policy Formation in Brazil", International Sociology, Vol. 6, No.1, March 1991, p. 77.

military regime implemented the developmentalist ideology in the form of large developmental projects aimed at creating infrastructure and integrating the Amazonian frontiers with the national economy.

Sussana B. Hecht says that Amazonian integration has often been described as an essential national development project and the only means of alleviating poverty in Brazil, both in terms of its potential economic and social effects. This kind of literature while does not deny the ecological impacts, but the benefits of development are thought to over reign the irreversible costs of species lost and Indian extinction. This view holds that with development things deteriorate but with growth technical solutions eventually diminish the deleterious environmental effects.

Hecht talks about three generally prevailing models of environmental degradation.

- Malthusian model of increasing demographic pressure resulting in overuse of land and use of marginal land resulting in soil nutrient decline or erosion, with resultant destruction of agricultural base.
- Tragedy of commons and
- Dependency perspectives.

According to her, none of these models, explains the situation in Brazilian Amazon. She proposes two explanations, which are specific to Brazilian Amazon. One of these pertains to internal/government policies such as tax subsidies for cattle ranches. "These policies are responses to political concerns within Brazil and to the traditional national concern with ensuring the territorial claim to Amazonia through its occupation and use"². The other is simply put as "land speculation".³ Combined

² Hecht, Sussana B., "Environment and Development and Politics: Capital Accumulation and Livestock Sector in Eastern Amazonia " , World Development, June 1985, p.663.

³ Ibid, p.663.

policy factors and unintended economic fluctuations result in skyrocketing prices of land in the Brazilian Amazon. The speculative returns on land can actually surpass the productive return from the land's use. This inhibits initiative on the part of land speculator to conserve the productive potential of the land and he clears the land to strengthen ownership claims.

Anthony B. Anderson believes that the proximate causes of deforestation are not easy to identify. He calls over population as a cause of deforestation a myth which may indeed lead to deforestation in certain areas of Asia and Africa, but the ultimate cause is unequal land distribution. Around 81% of the Brazil's farmland is held by 4.5% of Brazil's land owners, while 70% of rural households are landless. Thus rural poor are continuously forced to move towards new frontiers where they can clear the land covered by forests for shifting cultivation.

Government incentives, according to him, have played an important part in encouraging deforestation in the region, often for economically and ecologically inviable land uses like conversion of over 10 million hectares of Amazon rainforest to cattle pastures as a result of government policies. But recently Amazonian development "has moved increasingly beyond the control of the public sectorwhether spontaneous or planned ,colonisation in the Amazon Basin is now largely under private initiative ,and settlements are spreading along the southern flank of the region and where ever new roads are built .The influx of the new settlers often overwhelms the capacity of frontier communities to absorb them . The convergence of these factors is producing a marked increase in the rate and scale of deforestation in the Amazon".⁴

⁴ Anthony B. Anderson, " Deforestation in Amazonia: Dynamics, Causes and Alternatives" , in Anthony B. Anderson (ed) , Alternatives to Deforestation: Steps towards Sustainable Use of the Amazon Rainforest , Columbia University Press, New York 1990.

He agrees with Hecht on contribution of land speculation to deforestation. Once large area of land have been converted to pasture, it is easy to establish claims on such lands.

Gerd Kohlhepp in his various papers on development of Brazilian Amazon, says that the present situation in the Amazonian rainforests of Brazil came as a result of the decision taken by the Brazilian government in the mid 1960s when it decided to initiate controlled development of Amazonian lowlands thus including it in overall development programme. The tropical lowlands of the Amazon Basin were also seen as a safety valve to relieve acute social problems in rural areas. A rapidly growing population which had been marginalised by the lack of agrarian reforms, had to be provided with an alternative in the form of land allocations in the Amazonian region.

Besides economic aspirations and social compulsions, "geopolitical motives, questions of internal security and in strongly nationalistic circles-- the debate on counter strategies to control or eliminate foreign and particularly American influence, also played some part especially towards the end of the 1960s, since the Amazon frontiers with neighbouring states extend for more than 11,000 km."⁵

Jacob Bendix and Carol M. Liebler in one of their papers titled "Environmental Degradation in Brazilian Amazon : Perspectives in US News Media", find that there is no consensus on the existing causes among those observing environmental degradation in Amazonia. These causes fall under seven explanatory frameworks:

- (1) Malthusian theory of population pressure
- (2) Tragedy of the commons (by Hardin, 1968)

⁵ Gerd Kohlhepp, " Analysis of state and Private Regional Development Projects in the Brazilian Amazon Basin" , Applied Geography an Development , Vol.16, 1980-81, p.55.

- (3) Theory of environmental externalities
- (4) Dependency theories
- (5) Inappropriate technologies
- (6) Government policies (Sussana B. Hecht)
- (7) Land speculation (Sussana B. Hecht)

According to them, any coverage in media on the causes of Amazonian deforestation relates to one of these explanations. The period of their study is 1988-1989 and the newspapers chosen for analysis were Los Angeles Times, the New York Times and the Washington Post. "Most of the news stories analysed (80.2%), included at least one of the theoretical explanations for environmental degradation in Brazilian Amazonia, and 23.3% provided more than one. Although the theories varied in frequency of occurrence, only externalities failed to appear more than once. The most common explanations provided was Brazilian internal policy, cited in 38.4% of the stories. Other explanations appearing frequently were the Malthusian model and the dependency theory"⁶. Both internal policy and dependency theories had implied (explicit) criticism of the Brazilian government and the international economic relationship respectively. The internal policy was discussed in 55.6% of the entries from the op-ed pages, while dependency was covered only in 11.1%, compared to 22.1% of the news stories.

⁶ Jacob Bendix and Carol M. Liebler, "Environmental Degradation in Brazilian Amazon : Perspectives in US News Media", Professional Geographer, Vol.43, No.4, 1991, p.479 .

Number and percent of stories that included each theoretical model

Model	Total stories		News ^a		Op-ed ^b	
	#	% ^c	#	% ^c	#	% ^c
Malthusian	17	19.8	11	16.2	6	33.3
Tragedy of the commons	10	11.6	9	13.2	1	5.6
Externalities	1	1.2	1	1.5	0	0.0
Dependency	17	19.8	15	22.1	2	11.1
Inappropriate technology	7	8.1	6	8.8	1	5.6
Internal policy	33	38.4	23	33.8	10	55.6
Land speculation	7	8.1	6	8.8	1	5.6
No model included	17	19.8	13	19.1	4	22.2

^a Total of 68 news stories ^b Total of 18 op-ed stories

^c Percentages do not total 100 because more than one model could appear in a given story or op-ed.

Source: Jacob Bendix and Carol M. Liebler, "Environmental Degradation in Brazilian Amazon : Perspectives in US News Media", Professional Geographer, Vol.43, No.4, 1991, p.480 .

P.M. Fearnside is of the opinion that politicians in Brazilian Amazonia promote the notion that clearing by the poor people for survival encourages deforestation. This is done to justify their claims that anyone talking against deforestation is against people. Further, the government uses baseless argument that clearing by large ranchers has been controlled by suspending incentives, so that the remaining clearing is done by the small farmers, blaming the poor for clearing. Subsistence agriculture accounts for relatively little deforestation compared to

established cattle ranching projects, which continue to receive government incentives. Ranching dominates the region because of the attraction of fiscal incentives and especially because it is the cheapest way to secure land claims for speculative purposes. Fearnside agrees with Hecht that along with government policies, land speculation too is responsible to a large extent for rainforest devastation in Brazilian Amazon. He says "land speculation provides ample motive for replacing forest with pasture even little or no beef is produced. The value of Amazonian ranchland has consistently risen at rates exceeding inflation (Mahar 1979; Hecht 1985), motivating speculators to plant pasture so that the land will not be taken by squatters or by other ranchers".⁷

Furtado argues that the government policies have induced both the capital and labour to behave as they do and to move to the frontier. This is guaranteed by Brazil's economic and social system. government policies have only strengthened the concentration of land ownership and income, excluding the poor majority from the benefits of economic growth, channeling it to better off social classes or groups. Thus, the destruction of Amazon rain forest has deep social roots.

Bruce Albert draws upon the ideas of Arrunda and Silva to suggest that a geopolitical strategy of regional integration, conceived in the 1950s and early 1960s, was responsible for an aggressive policy of demographic occupation and economic development of Brazilian Amazon. "In the 1970s and 1980s the policy of develop Amazonia under the national security doctrine (Comblin, 1980) was carried out through a series of plans such as Operacao Amazonia, Plano de Integracao Nacional

⁷ Philip M. Fearnside " Predominant Land uses in Brazilian Amazonia" in Anthony B. Anderson (ed.) Alternatives to Deforestation: Steps Towards Sustainable the of the Amazon Rainforest, Columbia University Press, New York 1990 p.235 .

and Polamazonia."⁸ Foreign debt played an important part in deforestation as Amazon was seen as a source of raw materials for export and as a site for large-scale development projects designed to attract international loans.

Elizabeth Allen in her paper "Calha Norte: Military Development in Brazilian Amazon" emphasizes that military had an important role to play in integrating the Amazon area into the national economy at least during the military-led governments from 1964 to 1985. This paper shows that even under the New Republic which has a civilian president, the developmentalist military concern for Amazonia continues. This development has been the result of government projects for road building, hydroelectric power development, colonization, and cattle ranching (encouraged by tax incentives). These plans were never conceived keeping in mind the inhabitants of the region. To emphasise her point she says "one feature of this throughout Brazil's modern history and particularly since 1964 under the military backed regime, has been that plan and projects for Amazonia were elaborated and determined not in the region, but by the planners, politicians and often by military strategists in Brasilia and Centre-South."⁹

Anthony Gross looks at the planning presumptions in the context of economic growth and political culture in Brazil as a whole. Amazon development was planned as a part of regional development policy that was determined by civilian and military planners keeping in mind national security considerations. "This mentality comprises three theses - that public participation and scrutiny are messy, inefficient and potentially subversive mechanisms; that modernity implies

⁸ Albert Bruce, "Indian Lands, Environmental Policy and Military Geopolitics in the Development of the Brazilian Amazon: The Case of the Yanomami", Development and Change, Vol.23, 1992, pp.35-36.

⁹ Elizabeth Allen, "Calha Norte: Military Development in Brazilian Amazonia", Development and Change, Vol.23, 1992, p.72.

reproducing the production techniques and consumption patterns of developed economies; and that Amazonia is virtually an empty space".¹⁰

During the second World War, Brazil formed an alliance with USA under which it received economic aid and military training from the latter. Growth of US postwar economy and the popular doctrine of national security during that period formed the platform on which a programme of rapid state directed economic growth be launched. Military coup of 1964 helped in implementing this ideology. 1985 constitutional reforms led to first direct presidential elections since 1960 in 1989. Despite a formal withdrawal of military from power, important areas of government policy were de facto controlled by military, especially over policy concerning Amazon region. The policies of Brazilian governments have resulted in social and environmental crisis in Amazon region. This situation is one of the "planned intervention"¹¹ which has resulted in conflicting situations in Amazon region.

Dennis J. Mahar lists following as the proximate causes of deforestation - small scale agriculture, cattle ranching, logging, road building, hydro electric development, mining and urban growth. The relative contribution of each of these activities can not be determined with any degree of precision. It, however, becomes clear that rapid expansion of the agricultural frontier over the past two decades has been the most important single factor. Farmland in Amazonia increased from 3,13,000 sq.km in 1970 to more than 9,00,000 km² in 1985 in all of the region's states and territories.

He identifies cattle ranching as the main threat to Amazon rainforests. Because pasture has clearly been the predominant form the agricultural land use in

¹⁰ Anthony Gross, "Amazonia in the Nineties : Sustainable Development or Another Decade of Destruction?" Third World Quarterly, Vol. 12, July 1990, p. 7.

¹¹ Ibid, p.11

the region, cattle ranching would appear to be the leading proximate cause of deforestation. "Logging is also dominant factor and wood production within the region has increased considerably but it is difficult to establish the contribution of logging to deforestation as much timber extraction is a by-product the land clearing for agricultural purposes. The vast majority of the trees have little or no commercial value outside the region and all burned before the planting of crops".¹² He says Operation Amazonia, the Trans Amazon highway system, livestock development, the Program of National Integration, Polonoroeste, Polamazonia and Grande Carajas are all government schemes which have helped facilitate and accelerate deforestation. These have provided little improvement in the living standards of the poor, while displacing many indigenous groups and doing little to protect the environment.

John O. Browder joins Dennis Mahar in pointing out cattle ranching as the most important contributor to forest conversion in Brazilian Amazon. He says, "given the Landsat monitoring program's 1980 estimates of vegetation cover attraction (12,364,681 hectares), pasture formation would account for more than 72% of the total deforested area"¹³. Second most important cause of forest destruction since 1970 has been the small farmer settlement. Landless farmers have migrated into the region due to unequal land tenure system, increasing mechanization of agriculture and recurrent droughts. Pull factors have been the government colonization and land settlements programs. The influx has also been caused by massive government investments in the social overhead capital. Other government infrastructure investments have resulted in additional destruction.

¹² Dennis J. Mahar, "Government Policies and Deforestation in Brazil's Amazon Region", World Bank Washington D.C., 1989, p.22.

¹³ Browder, John O., "Public Policy and Deforestation in the Brzilian Amazon" in Robert Repetto and Malcolm Gillis (eds), Public Policies and the Misuse of Forest Resources, Cambridge, 1988, p. 251.

He lists other factors such as population growth, inflation, displacement of small farmers, government social overhead investment, cultural attitudes, international economics, political legitimization of the former military regime also as important factors contributing to deforestation in the region.

This discussion reveals that while population growth, is considered a serious threat by some scholars, others regard it a myth. Various development projects of the Brazilian government especially after 1964 military coup till 1985 and government incentives like subsidized credits to projects in Amazonia receive attention from almost all scholars. Others particularly point out the national security concerns of government and integration of Amazonia to the national economy as serious threats to rainforests. That the development of Amazon has picked up at an unprecedented rate after the military coup of 1964, is agreed upon by all.

Amazonian development, specially after military take over of the government is a reflection of ideology prevailing at that time. It was that of national security, the large size of Amazonia (more than 50% of the Brazilian territory) with its sparse population and porous borders with 8 other countries with which it shared a history of annexation and border conflict. All these concerns along with the region being "single richest region of the tropical biome",¹⁴ and "one of the world's richest sources of economically valuable minerals, tempting both government and individuals to get rich quickly"¹⁵ gave it a geopolitical importance. Thus the military government was more assertive with regard to its plans towards the Amazon. Thus it becomes important to throw some light on government policies and development projects after 1964, that have brought Amazonia to present level of threat. But before that it would

¹⁴Norman Myers, "Tropical Forests: The Main Deforestation Fronts", Environmental Conservation, Vol.20, No.1. 1993. p.9.

¹⁵ Elizabeth Allen, op.cit., p.72.

not be out of scope of this study to give a brief description of development in Brazil before 1964.

A Brief History of Development in Brazil :

The South American continent for the first time was explored by Spaniards and Portuguese during the early 16th century whose sole aim was to locate gold and silver rich areas and Indians who could be enslaved. These early expeditions explored vast area, though only few permanent settlements came into reality. The region owes its name "Amazon" to these explorers who on their accounts of the interior of the continent, talked about 'tall women warriors'. "The explorers named them Amazons, after the female warriors in Greek mythology, and their name was given to that area of the continent. These "warriors" were probably Indian men who were mistaken for women because of their peculiar dress."¹⁶

The influence of Spaniards spread to Central America and northwest South America, whereas the Portuguese occupied the Amazon. This period was based on extraction of resource in tune with international tendencies and also with the ecological cycles in terms of resource exhaustion. Thus, first it was Brazilwood and the red dye, which was produced from it, followed by Brazilnuts, cocoa and rubber. Rubber extraction lasted till 1910, finally collapsing in 1913 when it faced a tough competition from Malaya. Mining started with gold discovery in 1695 and diamonds a little later and continued till the end of 1700s. Agriculture was characterised by land concentration in the form of large rural properties. It resulted in irrational use of the land through shift cultivation and slash-and-burn, thus abandoning the land after two-three years of cultivation. Land concentration brought monoculture which resulted in soil degradation, desertification and economic overspecialization.

¹⁶ Kemton E. Webb, "Amazon", Encyclopedia Britannica Vol.1 p.660

(1822-1889) In this period the character of economy did not change and only perpetuated land concentration and monoculture. This period saw strengthening of the landed oligarchy; growth and expansion of a bureaucracy that was already a burden on the country's economy; abolition of slavery in 1888, increasing costs and slave labour after 1850, its inefficiency and the larger internal market required by industrial classes and; as a result large immigration of Europeans to substitute for slave labour and beginnings of manufacturing by the Europeans who invested their capital in industrial activities. The environmental concerns that began during this period were largely the public health issues.

(1889-1930) The period which saw establishment of Republic in Brazil in 1889, brought a new phase in Brazilian politics and economy. This period was characterized by a dominant role assumed by national elite, the agrarian followed by the industrial who were concerned with export oriented commerce and the presence of the military in politics. This was in contrast to the majority of the population that comprised rural workers. This change in economy and society brought incipient growth of the cities and the deterioration of sanitary conditions in the cities.

(1930-1964) This period saw the emergence of a new alliance in society - industrial elite, agrarian elites whose concerns were the internal markets, organized urban workers and the new middle classes which emerged from the growth of bureaucracy as well as from state directed industrialization. This alliance replaced former oligarchy which had export oriented commercial interests.

Brazil's economy reached its boom during these three decades. This was also a period in which major efforts were made to integrate the national territory, especially through construction of highways. One of the other important features was intervention of state. Natural resources were to come under priority and there was a move towards nationalization. Heavy exploitation of resources was carried out by

public agencies. This was also accompanied by litigation's concerning natural resources.

Government Policies and Development Projects from 1964 onwards:

Military government's Amazonian policy was in response to the question of its legitimacy. Diverse political factions supported the coup, but certain groups obviously benefited from it - the agro industrial and industrial entrepreneurial elite . Therefore, a variety of changes were brought in Brazil's economic scene to favour these corporate giants. Amazonian development was based on “an economic model geared to fast industrialisation”¹⁷, where state- of-art technology was to be employed for laying down basic infrastructure like roads, bridges, telecommunication etc. for development. Agriculture was based cash crops basically monocultures directed towards industry and the export market .

Basic political issues which required to be addressed in 1964 were to legitimise the right of military to govern and answer the growing economic constraints that had hampered capital accumulation by elites. It also needed to solve the social and political problems of rural areas as reflected in stagnant agricultural production, low investment rates and rural out- migration. The solution was sought in increased international borrowing, transnational participation in the economy and other monetary and fiscal policies.

The regime took credit for rapid economic growth in Brazil during 1964-73, which only helped in the institutionalization of various military regimes that followed the 1964 coup. The series of programmes started under the military led regime are -

¹⁷ Jose A . Lutzenberger , "Who is Destroying the Amazon Rain forest ?", The Ecologist, Vol .17, No .4 /5, 1987, p.155.

Operation Amazonia: This programme was established during the administration of (General) President Castello Branco at the end of 1966. Under this programme, Brazil's first regional planning body, the SPVEA (Superintendency of the Plan for Economic Expansion of Amazonia), set up in 1953 was replaced by SUDAM (Superintendency for the Development of Amazonia). A series of legislative acts and decrees were enacted in 1966 and 1967. The new government intended to develop the region through its occupation as well as eventual integration of Amazonia with rest of Brazil. It included road building, agricultural colonization schemes and fiscal incentives to attract new industrial and agricultural enterprises.

Military government was keen to lay its claim on vast Amazonian frontiers considering its wide base of natural resources. Therefore, "the motives behind Operation Amazonia were largely geopolitical. Several neighbouring countries (especially Peru and Venezuela) had already initiated programmes to occupy and develop their respective regions. Brazil's military leaders were anxious to ensure national sovereignty by establishing self-sustaining settlement in frontier areas"¹⁸.

The programme emphasized a greater efficiency in planning and an enhanced role of private enterprise in regional development. Government was to provide all infrastructure and funding, while the regional occupation was to be carried out by the entrepreneurs. Government provided 50 percent of taxes owed for 12 years to enterprises already established in 1966 and exemption upto 100% for projects implemented before 1972. Import of machinery, and equipment was made duty free for qualifying firms. These firms were exempted from export duties for regional products (for e.g., timber). Firms also got incentives and inducements from states of the region as well as from Inter American Development Bank. Firms were provided special agricultural development credit to be mobilized for Amazonia. As a result of

¹⁸ Dennis J .Mahar ,op.cit., p. 26

these and other various incentives, “75% of the investment capital required for enterprises was to be supplied by the federal government.”¹⁹

Fiscal incentives and other credit facilities led to an explosion of ranching in Amazonia. Between 1967-1972, 368 new projects had been approved by SUDAM. Throughout the 1960s, livestock production was publicized as the most promising investment to be made in Amazonia. According to Mr. Hans Binswanger²⁰, an economist at the World Bank, Brazil’s laws and tax incentives have made deforestation and ranching in the Amazon, a profitable business “Brazil’s implicit fiscal for livestock ranches between 1975 and 1986 has been estimated at over \$1billion. This represents the biggest known subsidy in history for ecological destruction unrelieved by economic gain”²¹. By the late 1960s, livestock expansion policy was shrouded with controversies for social and ecological reasons. Therefore in 1970 President Medici started a new policy for the Amazon.

National Integration Programme (1970-74) : Established in 1970, this programme was to be financed through a 30% share of fiscal incentive fund. This programme intended to construct a road network of 15,000 kms. including an east-west (Trans-Amazon) highway(between 1970 and 1975 the PIN was responsible for a considerable expansion of the federal road network).A 20 km strip of land was to be reserved on either side of these highways for agricultural settlement projects which included small farmer settlements. In addition, it was to finance the irrigation of 40,000 hectares in the northeast which was wrecked by drought. The east-west highway was a short-term solution for the displaced northeast families by creating jobs for them.

¹⁹ Sussana B.Hecht, op.cit p..672.

²⁰ for details, see Hans Binswanger Fiscal and Legal Incentives with Environmental Effects on the Brazilian Amazon”, Discussion Paper 69, World Bank.

²¹ _____ How Brazil Subsidises the Destruction of the Amazon , The Economist March 18, 1989

In long term, the government-sponsored settlements along the Trans-Amazon highway were expected to alleviate population and social and social pressures in the northeast and facilitates effective occupation of Amazonia. In other words, "Policies under this programme thus reiterated the themes of the agricultural frontiers as the escape valve for surplus population, the importance of national security and the necessity of national integration"²².

An analysis of the programme shows the failure of agricultural activities along the Trans-Amazon highway due to a lack of understanding of the ecological situation. As far as establishing settlements is concerned, the ambitious plan had projected the settlement of 1,00,000 families on 100-hectare lots by 1976. However, not more than 1,2800 families could be settled, including families with temporary land occupancy permits. Further , the very conception of the programme was faulty. Meant for establishing smallfarmer settlements, these were conceived "precisely in order not have to face agrarian reform in other regions. The settlers come from the north east where landlords have always prevented a healthy peasant culture from developing and from the south where soyabean monoculture drives thousands of people off their lands."²³ Maintenance of the Trans-Amazon highway has been neglected and is a continuous problem. Ambiguous policies and procedures accompanied by bad planning resulted in the failure of the programme.

This failure resulted in a major policy shift away from small farmer settlement toward a renewed emphasis on large-scale land development and led to the Polamazonia Programme in 1974.

²² Sussana B. Hecht, op.cit. p.674.

²³ Jose A. Lutzenberger, op.cit.p.157.

Polamazonia - Launched in 1974, this programme increased the role of private entrepreneurs in economy. Governments economic development strategy took anew turn during the oil crisis that occurred almost simultaneously when PIN failed. Government had to widen its scope while allowing private business because "it was forced to cut back on its investments as a result of the first oil price rise crisis which had serious financial consequences for Brazil."²⁴ Very large tax reductions and other benefits attracted capital investors to Amazonia. Polamazonia was a typical project to establish large cattle farms. This meant clearing large tracts of the forestland for grazing. Cattle farming which has come under severe criticism on economic, social, ecological and regional planning grounds has accounts for the largest amount of destruction of rainforests. This sector clearly stands out as an important beneficiary of the government policies. SUDAM funding of livestock project has contributed more to deforestation in the Amazon than any other government sponsored programme. This project has accounted for "30% of the forest conversion as suggested by Landsite findings in Legal Amazonia between 1973 and 1983, according to estimates derived from an 8.5% sample of such projects."²⁵

The Polamazonia programme was actually a refinement of Operation Amazonia idea of development polices for stimulating region's growth, determining fifteen new integrated growth poles. Some of these comprise grand projects of which **Grand Carajas** (Programma Grande Carajas or henceforth PGC) is one developed from 1980 onwards. This regional development project is based on the exploitation of substantial mineral reserves accompanied by the laying down of the necessary infrastructure (railway and port facilities), mineral transformation (aluminium smelters in Belem and Saolins, pig iron smelters along the railway), the Tucuru

²⁴ Gerd Kohlhepp, "The Destruction of the Tropical Rainforests in the Amazon Region of Brazil-An Analysis of the Causes and the Current Situation", Applied Geography and Development, Vol.38, 1991, p.89.

²⁵ John O. Browder ,op.cit., p.2 48.

hydroelectric dam and related tax holiday schemes for agro-industrial investments. Sixty nine percent of the programme region was originally covered by tropical rainforests. All these projects have created a massive influx of people.

Since its conception, the PGC has been linked to the Iron Ore project. But the two project a striking constrast with regard to environmental conservation. As far as Iron Ore project is concerned, within its premises, an 80 metre wide strip along the railroad and a 2,221 hectare port - natural resources have either been conserved or are actively being restored.

Outside of these confines, however, deforestation is encouraged by uncontrolled settlement, gold mining, logging, shifting cultivation and pasture conversion. The impact of these activities can be gathered from the fact that within a 300-km wide strip along the railroad, 48 percent of originally forested land was cleared by the end of 1985 and another 14.0 per cent had been selectively logged. The rapid clearing of forests is leading to wide spread soil erosion, compaction, flooding and threat to indigenous population.

However, even Iron Ore project is not free from loopholes as far as environmental conservation is concerned. Production of charcoal used in the manufacture of pig iron has started a new wave of rainforests devastation. Producing pig iron in electric furnaces would have been economically unprofitable and due to lack of funds coal based coke could not be imported. Therefore, the production of charcoal ultimately formed the basis for the iron smelters. Large areas of rainforests were cleared to meet the charcoal requirements of the pig iron industries. According to an estimate, around 1,000 to 2,200 km² of area would be cleared in order to meet the PGC production target of 2.7 million tonnes of pig iron.

Polonoroeste - This programme in Rondonia and in north western Mato Grosso was a programme of agrarian colonization by the small scale farmers. It aimed at integrated development of rural areas for lower classes, attending their basic needs and encouraging participation. Supported by the World Bank, it settled 44,000 families by the middle of 1985. This programme was also founded on massive investments in highway improvement. Road link between Cuiba and Porto Velho was asphalted to facilitate migration of rural population into the region from southern and south -eastern Brazil where their conditions were deteriorating. This migration was not only large in numbers but was also characterized by uncontrolled settlement in areas of little agricultural carrying capacity. Consequently large areas of forest were cleared. As land speculation and cattle farmers displaced small-scale settlers, even more forest was cut down.

The Energy Related "Plano 2010" - This programme aims at expansion of hydroelectric power generation by using the natural hydropower potential of the Amazonia. Misplanning in the HEP generation programmes is revealed by the fact that large areas of forest are cleared only to be flooded later for the creation of reservoir. Amazonia is relatively flat, so dam building along major rivers leads to the drowning of substantial tracts of flood plain and upland forest.

Electrobras, the Brazilian organization of the national electricity industry has planned 79 reservoirs in the planning region of Amazon Legal to support an installed generating capacity of 86,000 megawatt. All but one (Upper Araguaia Tocantins System) are located in tropical rainforest. Besides, simply destroying the rainforest and threatening species and gene pools, it will result in serious ecological consequences.

Calha Norte Project - This is the most recent military project in Brazilian Amazonia. "It aims to incorporate the whole of the region to the north of Amazon

river into the national economy and to defend the area from guerillas, drug traffickers and other perceived threats from neighbouring countries"²⁶.

This project was launched in lines of Venezuelan activities in Amazonian frontiers in the form of two development programmes - 'Development of frontier area' and 'conquest of the south' which concentrated on colonization, development plan by private and state-run enterprises and the exploitation of mineral wealth. Part of this development was also a road from Caracas to the Brazilian frontier. All this was seen as a threat to Brazil's sovereignty. One of the other concerns was internationalization of the Amazon region.

It was also emphasized that the territorial integrity and security of Brazilian Amazonia calls for reorganization of its military activities. This policy initiative led to the emergence of this ambitious project.

ENVIRONMENT POLICY OF BRAZIL

All these projects reflect some loopholes somewhere in Brazil's policy to Amazonia in particular and its environmental policy in general. Environmental policies of Brazil go back to 1930s when several codes were started: Water, Mining and Forestry codes in 1934; the Fishing Code in 1938 and the Hunting Code in 1943. As far as conservation is concerned, 1934 was the year when a breakthrough was achieved in first Brazilian conference for the Protection of Nature took place in Rio de Janeiro.

1988 Constitution of Brazil introduced a set of legal principles focussed on environmental protection and preservation, making a solid foundation for a consistent environmental policy. This policy is mostly broad ranging. "Article 225, Paragraph 4

²⁶ Allen, Elizabeth, op.cit., p.71.

of the new constitution ,which comes into force on 5 October 1998, states that the Amazonian rain forests are “patrimônio nacional”, i.e. they are protected by law and their use is governed by the legal regulations aimed at preserving the environment.”²⁷

Environmental policy of Brazil covers:

- Norms and standards for environmental control
- Licensing system of environment polluting activities and
- Conservation of renewable natural resources which has 3 main objectives -
 - (a) maintain the essential ecological processes and life systems
 - (b) preserve genetic diversity
 - (c) permit perennial utilization of species in specific ecosystems²⁸

Forestry code has been formulated to regulate and discipline land occupation, aiming at protecting forests. The forestry code encourages the establishment of national, state and municipal public natural units (parks, reserves and forests), though they don't stipulate that such areas be created in all states of the Federation, nor do they define quantitative requirements.

“The financial incentives provided for in the code to stimulate forest activities such as special funds, interest rates and terms have not been institutionalized; tax exemption for planted forest products was revoked; exemption from territorial taxes on forest areas indicated by law was also vetoed and dealt with according to agricultural interests; tax exemption on income derived from cultivated forests was retooled and never became low; and the full deduction from income tax of sums invested in the formation of forests was substantially changed. Tax incentives for reforestation remained for a long time.”²⁹

²⁷ Gerd Kohlhepp, op.cit.p.101.

²⁸ The Challenge of Sustainable Development: The Brazilian Report for the UNCED, Press Secretariat of the Presidency of Republic, Brasilia, March 1992, p .68.

²⁹ Ibid,p.69.

In all, Brazil has 1.8% of its territory protected by conservation units where resources are indirectly used (national parks, biological reserves and ecological stations) which are the most important for preserving biodiversity. The total percentage of protected area is 3.7% of the country's surface. Comparing the new action programme with official statements from the early 1970s, we find that a great progress has been made in the government's awareness of the environmental needs in Brazil. There are many reasons for this. It is now generally realized that there has been a dramatic increase in the destruction of the rainforests and its known consequences. Public pressure has come from national and international levels in all discussions and the foreign lenders have imposed tougher environmental conditions.

But environment agencies and legislations are now guarantee to implementation of actual concerns. A large size of Legal Amazon is itself an obstacle in implementation of governmental framework of law and order. It is a continuous problem to monitor the necessary measures and their effects.

The new environmental programme for this region can not be isolated from the ongoing development projects and those which are still in the planning stage in the region. In fact, the government agencies in 1988 and 1989 overreacted and referred to all the criticisms of the deforestation process as 'attempts to internationalize Amazonia'.

Though the Collor government since March 1990 abolished once and for all, the tax incentives to invest in projects which destroy the rainforests, the new constitution still regards clear cutting as proof of economic exploitation. In fact destruction of rainforests fuels speculation leading to an increase in land values.

Individual and interest groups along with loopholes in organisation have prevented a general breakthrough in the protection of the Amazon basin rainforests in Brazil, despite the commitment of environmental authorities, citizens and scientists action groups and media coverage of the problem

In sum, Amazonian integration with the national economy combined with

government policies and incentives especially after 1964 to encourage road building, hydroelectric projects mining and other developmental projects is to a large extent responsible for the destruction of Amazonian rainforests. At the same time this developmental mentality of the military government which took over in 1964 reflects its ideology concerning national security and making Brazil a big economic power in the region. Amazon was a large frontier with sparse population and had porous borders with 8 countries with which Brazil had a history of border conflict. All this gave region a unique geopolitical importance and henceforth an assertion of its policies by the military government.

Pressures within the country and outside concerns regarding increasing rates of deforestation in Amazon region led the new civilian government adopt a new constitution in 1989, which mentioned special codes for environmental protection. But the close reality still revolves around military's tendency to view the Amazon region from a geopolitical perspective and the implementation of forestry codes and other measures have not been very effective.

Chapter - 4

INTERNATIONAL ROLE, CONCERNS AND POLICIES

Chapter IV

THE INTERNATIONAL ROLE, CONCERNS AND POLICIES

Environment in the International Context

The tropical forest problem has to be viewed within the broader context of the environment and ecology. It is not out of context to say that the current debate over the environmental problems in developing countries has led to severe problems in North-South dialogue regarding trade versus aid, state versus market and development versus conservation. Since the scale and devastating effects of tropical deforestation have become more evident, hence the debate about its causes at the international level has intensified and at the same time, become controversial at the political level. Developing countries have become strongly opposed to what they call 'internationalisation' of the problem. They have become apprehensive of the developed world, which after having utilised its natural resources is now forcing the developing world to conserve and safeguard its own natural resources and biodiversity and thus interfering in the internal matters of developing nations and arresting their development efforts.

Simultaneously and interestingly, however, "the environment has also turned out to be a potential source of power as well, a vehicle for bringing demands for the restructuring of international economic relations into the negotiations."¹ During the 1992 United Nations Conference on Environment and Development (UNCED), the developing countries from the world over adopted a firm bargaining position by seeking environmental concessions in exchange for Northern commitment for technology transfer and resources to increase access to Northern markets, to reduce their debt burden and to regulate multinational corporations in the areas of safety and the environment. As the inherent conflict between North-South regarding environmental issues went on - South not succumbing to pressures from North and North not yielding

¹ Ans Kolk, "From Conflict to Cooperation: International Policies to Protect the Brazilian Amazon", World Development, Vol. 26, No.8, 1998, p.1481.

any significant concessions to the South, some programmes were chalked out to address the environmental problems as a result of combined efforts of world community, represented by some organisations, NGOs and the national governments of the countries where programmes were to be implemented. This process was not a smooth one, especially so far as the tropical deforestation problem is concerned. This chapter takes the Brazilian Amazon case where international role in and concerns with deforestation are highlighted. At the same time, the steps towards corrective measures in the form of some policies to preserve the rainforests have also been discussed in this chapter.

Global Interdependence

Having assessed the nature of development policies of the Brazilian government in the previous chapter, it should be brought to the notice that the policies are often stimulated or constrained by the factors that are lying beyond the national borders. The Amazon region has been tied to the world economy since the 16th century. The extraction activities related to the forests, especially the natural latex in the late 19th and 20th centuries cannot be dissociated from the demand for commodities in other parts of the world. These extractive systems were not sustainable. "In most cases, per unit costs tend to rise as the scale of extraction increases, since commodities must be sought in more distant and difficult locations. Rising costs mean that sources elsewhere are substituted, leading to economic decline."² Thus a long-term development that is compatible with the regional environment, fails to sustain itself. It is more so in the tropical climate forests.

The whole development of Amazon began in the 1950's and 1960's, when the extensive road building schemes were started and this transport facility construction ended the isolation of Amazon. This development was linked to the role Brazil's economy was to have in world economic system in terms of export of forest products. The pronounced and explicit government's economic policies in the 1960's shifted the capital earned in south to the Amazon area, in expectation that the investment would

²Stephen G.Bunker, "Under developing the Amazon", Urbana, University of Illinois Press,.1985,p.2.

generate additional export earnings. This Amazon project was viewed as a prospective provider of cheap and abundant food, as a safety valve for the ever increasing population, or a resource frontier for future export.

The foreign debt burden in the 1980's brought a severe crisis in economic planning of Brazil. In these circumstances, the Amazon region was viewed as a potential source of export commodities (including timber, gold, iron ore and other minerals) to be exploited as quickly as possible and as the site of vast development projects (such as Carajas and Polonoroeste) which could draw large foreign loans, as well as investments, under various programmes and mutual agreements signed with the foreign governments, institutions and agencies.

Role of Developed World and the International Lending Agencies in Deforestation:

As is axiomatic that “the developed world plays a major role in tropical deforestation. Through our consumer practices, our own hand is on the chainsaw. This is principally apparent in the international trade in tropical timber and the overexploitation of forests by commercial loggers. The excessive harvest is stimulated in major measure by developed world demand for tropical hardwoods. Of course, developing countries consume much of the hardwood; but developed world consumption has increased 15 times since 1950, whereas producer region consumption has increased only three times until each is now responsible for about half the total”.³ It could be well further elaborated by citing the Japanese case. Japan meets its three-quarters of export requirements from the region undergoing the most rapid deforestation, Southeast Asia. Every year Japan increases its cover of protected hardwood forests, as it avails 'cheap' supplies of hardwoods from the humid tropics. This is a typical case of self-interest protection through the exploitation of others' precious resources. “A further role of developed world consumerism is seen in the ‘hamburger connection’: demand for cheap beef from North American consumers fosters the spread of cattle ranches in Central

³ N.Myers , “The Future of Environment” in Laurie Friday and Ronald Laskey(eds.), The Fragile Environment, Cambridge University Press, Cambridge, 1989. p.p 25-26.

America, at the cost of forest cover”⁴. This is also true of deforestation in Brazilian Amazon where large-scale cattle ranching is being practised. International factors have played an important role in the emergence of ranching as the main development strategy for the Amazon in the 1960’s. During the mid 1960’s, the global demand for beef expanded, reflecting a change of production system in United States and an increase in purchases by Europe and Middle East. According to Feder, an increase in lending for the livestock sector by international agencies was related to changes in beef production system in the United States which had a tremendous impact on other fellow beef producing countries.

In the 1950's, the United States adopted the feedlot system in order to increase the production of high quality beef. This change also meant absorption of the surplus wheat and corn produced in US, a serious issue in the late 1950's and early 1960's. Large quantities of high quality beef could be obtained by grain fattening of cattle. This system was not a total success specially when demand for lower quality utility beef used in fast foods and sausages increased. Utility beef is costly if produced by the feedlot system and suppliers turned to international sources for beef. The rise in US demand and that of meat consumption and demand in Europe, the Eastern Bloc and Japan occurred simultaneously. Since South American beef has traditionally been oriented to European markets, the expanded purchasing powers of these countries in the mid 1960s was a major stimulus to demand for beef-from South American countries.

“The general international perspective for the expansion of Brazilian Beef in summarised by FAO/ECLA’s (1964) study called ‘Livestock in Latin America’. The FAO document indicated that although Brazil’s existing productive capacity was rather low, it had great potential for expansion through the incorporation of new land and the rationalisation of production. The FAO argued that overcoming certain bottlenecks, primarily related to sizeable market share. This document concluded that global beef markets, were buoyant and would continue to expand as national and international demand increased, a tendency that was particularly strong in early 60’s.

⁴ Ibid,p.26.

Finally, Brazil was seen as an appropriate area for the transference of the Australian pasture technologies. If the conditions of long term credit and better grass varieties were met, FAO pointed out that Brazil could become one of the premier beef exporters. This influential document frequently underlay the great push toward ranching throughout Latin America in the early 1960's the precise period when the policy for the Amazon was being developed".⁵ On the basis of this report, international agencies, such as the World Bank, advocated for development of livestock sector in Brazilian Amazon and gave huge funds for the development of this sector. It is evident from these above cited sources that livestock projects received substantial fund in the 1960's, as a result of support from various international agencies such as the World Bank.

The World Bank and other international organisations actually funded the deforestation through cattle ranching, which is evident from the fact that "the total direct livestock support given by the World Bank and the IADB in the late 1960's and 1970's not including general infrastructure loans, was about \$1.3 billion. Indirect and counterpart funds provided an additional \$5-\$7 billion. To estimate private-foreign and domestic investments in the beef cattle system is virtually impossible but at least a billion dollars have been invested in SUDAM Amazonian projects alone."⁶ In the years 1974-80, the Bank approved 70 loan projects of about \$1.4 million, out of which 63 percent was meant for Latin America.

The vast areas of tropical forests in the eastern Amazon region are of critical importance from the point of view of resources, development and environmental protection. There are some ongoing projects/programmes for the utilisation of the resources of this region. The Grande Carajas Programme utilises the wood from these forests for industrial purposes, i.e. to be used for charcoal to smelt pig iron. Attractive economic incentives have been granted to the smelters for this purpose and the first of these smelters began operation in January 1988. The entire project has become the focus

⁵ Sussana B. Hecht, "Environment, Development and Politics: Capital Accumulation and the Livestock Sector in Eastern Amazonia", World Development, June 1985, p.675.

⁶ Ibid, p.681.

of intense criticism, as the pig iron scheme is made possible by the carajas mine and railway that were financed by the World Bank. •

Obviously the World Bank loans played an important role in assuring and attracting other international lenders, in a period in which the Brazilian government struggled with huge foreign debt and balance of payment difficulties. After the Carajas Project got funds from the World Bank, other donors, including the European Community (now European Union) and Japan too joined them.

International attention focussed on this specific region and with special emphasis on the role of the Brazilian government and the World Bank which funded huge development projects in the region. International environment activists campaigns and the local Brazilian NGOs raised concern over the deforestation in the region. One of the criticisms leveled against the World Bank by Brazil was that it (the World Bank) was one of the major international agencies that financed the development projects and even justified them as and when required, matching the convenience of the developed industrialized world which has a considerable influence over these agencies and later on these very agencies carried out campaigns against generating funds for development. However, the experts from the developed countries assert that support from Brazil for policy changes was needed mainly because the causes of deforestation were primarily national in character--- a result of the development model which it adopted in the 1960's.

Concerns of the International Community

Much international concern was caused by the 1987 fires in Brazilian Amazon. The unprecedented destruction of the forests in this year is evident from the fact that "on 24 August of that year, INPE detected 6800 fires just in the states of Mato Grosso and a small portion of southern Para and eastern Rondonia (Silveira & Nestlehner 1987). It was the largest burn recorded in the history of the region. Smoke from Amazon fires

lasted until December and resulted in the closure of most regional airports.”⁷ This caused a grave concern and stirred a number of controversies in the context of environmental protection. International public opinion was also mobilized by the image of burning rainforests and their impact projected by the literature on this topic. Elizabeth Allen in one of her reviews of literature on Brazilian amazon mentioned that “new discoveries of mineral wealth, such as bauxite, copper, gold, tin lead, iron, manganese, nickel and silver and the development of oil, gas and hydroelectric potential, all threaten the region and its future. So, too, do pressures stemming from the international economic system and from national politics. This threat is so severe that people now talk of regional deserts in the future rather than rainforests.”⁸ The Brazilian tropical deforestation case was seen as the destruction of the largest remnant rainforest covering approximately one third of the total rainforest area in their management. The International community seriously perceived Brazil’s rainforest depletion on the ground and therefore, viewed its destruction as seriously affecting the quality of life through a massive soil erosion, sedimentation, floods, desertification and the release of carbondioxide into the atmosphere. Deforestation would also affect the availability and supply of essential items available in the form of fuel foodstuff, natural fibres, medicines and other forests products. Moreover, it deprives species of their natural habitat and causes extinction.

International concern was also caused about the inhabitants of the Amazon forest and the fact that knowledge increased about what difficult situation the Indians were in and how the rubber tappers carried their struggle against deforestation. This reinforced the international concerns. Environmental NGOs, especially those from North those from North America started an international campaign in 1983 against the Multilateral Development Banks (MDBs). Media brought into the light the negative environmental and social effects of MDB project lending, thus increasing public awareness and suspicion in such projects. Two projects- Polonoeste (a large construction and

⁷ A.B.Anderson, "Deforestation in Amazonia : Dynamics, Causes and Alternatives", in Anthony B.Anderson (ed.), Alternatives to Deforestation : Steps Towards Sustainable Use of the Amazon Rainforest, Columbia University Press, New York, 1990,p.170.

⁸ Elizabeth Allen, "Amazonia in Nineties : The Burning Question", Third World Quaterly, Vol2, No-4, 1990, p.230.

infrastructural project) and the Grande Carriages(a project aimed at constructing transport infrastructure and mining facilities to exploit large mineral reserves in the South Eastern Amazon), in particular came in for severe criticism by the local NGK's and the external agencies as well, because both these projects could not be planned in a manner that would not harm the environment. Both "Polonoroeste and Carajas had a significant share in new Bank lending to Brazil in the years in which they approved: respectively 48%and 21%."9

International campaign generated an acute controversy involving the role and objectives of the World Bank. It is evident from the fact that "International environmental groups have publicly placed pressure on the US government to intervene through its participation in the World Bank, in funding of development projects in Amazonia. In response to public pressure, the World Bank and Inter American Development Bank (IDB) have done environmental impact studies for every client country. With each loan proposal submitted, environmental problems associated with a proposed project are examined. In the recent past, such institutions have stopped payment on loans to Brazil on the ground that the Brazilian government was not complying with, or would not meet conservation and social stipulations"10. It sharpened the debate and controversy.

Brazilian Amazon by then had already come into international focus, especially after the successful campaign against the World Bank and IADB. The deforestation process and figures, an alarming picture of burning forests and the subsequent murder of Chico Mendes (a rubber tapper who symbolised the struggle against deforestation) in December 1988, only added fuel to the controversy and international campaigns. The last incident specially stimulated and necessitated various kinds of international actions in this regard. The world community asked the Brazilain government to assume its responsibility vis-à-vis international community. The world environment concerned

⁹ The World Bank and The Environment in Brazil : A Review of Selected Projects, World Bank, Operations Evaluation Department ,Washington D.C.,Feb19,1991a,p.17.

¹⁰ Rachael M .McCleary,"The International Community's Claim to Rights in Brazilian Amazonia", Political Studies ,1991,Vol.36,p.691.

community pleaded with the Brazilian authorities that effects of environmental catastrophe knew transcended state boundaries and since the destruction of rainforests of Amazon would have global consequences, Brazil ought to own up the responsibility to protect them as they (the rainforests) are under the sovereign control of Brazil. The world community specially the industrialized nations insisted that since the tropical rainforests do not come under their sovereign control and their (tropical rainforests) deforestation has global consequences, it (the world community) has a right to conserve the rainforests. This also means Brazil has a duty to do something on behalf of the international community to conserve the rainforests, since the former has a sovereign control over these rainforests. The purpose of international community in asserting a right to conserve the rainforests is to discourage further degradation of Brazilian rainforests. The world community is also pressurizing Brazil to preserve the Amazon rainforests by withdrawing the funds through the World Bank and other international lending agencies.

The Internationalisation of Amazon:

The international concern and the debate/controversy over the extent and increasing rates of deforestation in Brazilian Amazon, has been termed as 'internationalisation' of the Amazon, by the Brazilians. The international debate on the fate of depleting rainforests immediately brings two issues on the forefront – Brazil's sovereign right over the resources of the Amazon rainforests and the claims of international community of their own rights (thanks to ecological awareness), emphasising the point that deforestation in Brazil contributes to the green house effect which heats up the whole planet and not just the Brazilian bit of it. "To these critics, Brazil has one standard reply: Amazon is under sovereign control of Brazil and it is the right of Brazil alone to decide what to do with it."¹¹ World community specially environmental organisation and developed nations have pleaded for stronger

¹¹-----A Murder in the Forest, The Economist, January 7, 1989, p.36.

conservation measures from Brazilian side to protect the rainforests from further devastation.

Emergence of a Brazilian Perspective

Any outside intervention in the fate of the Amazon has met with a staunch reaction from Brazilian nationalist forces. The outside concern was called as a hypocritical attack on sovereignty of Brazil and those expressing that concern as stooges of Northern economic interests.

The rejection of outside interference was centred on the role of the industrialised countries and their agents (such as multinational cooperations, international organisations and environmental groups). Brazil demanded major concessions in the fields like transfer of technology without any costs, if Amazonia has to be protected. Developed world was accused of hypocrisy, since it ignored the environmental problem it had caused. It accused them of adopting double standards. It said that the developed world is still engaged in degrading and depleting its natural resources. "On the international level, Brazil continually singles out the US for its lack of 'political will' to cooperate with other nations in reducing dependence on chemical substances"¹² Brazil expressed its concerns regarding western pressure on developing countries to pressure their natural resources and latter's failure to recognise the problems of developing countries.

Brazil viewed the international concern as undue interference in its internal matters. "To press the point, President Jose Sarney refused to participate in the international environment conference held at the Hague in March 1989, claiming that discussion of Amazonia by representatives of other nations was a violation of Brazil's

¹² A Brazilian member of the delegation is quoted from an article by Philip Shabecoff. US was assailed Geneva talks for backing out of ozone plan. New York Times, 10 May 1990.

sovereignty. He said of the issue: 'We are the masters of our destiny and will not permit any interference in our territory.'¹³

Brazilian viewpoint was that the international protests or campaigns against the alarming rates of deforestation were based on misinformation. Brazil's officials stated that the deforestation rates were actually much lower than reported and also there was no scientific evidence to prove the global consequences of deforestation. A congressional commission of enquiry was specifically established to look into the 'rumours' about the extent of deforestation. Its results gave a much lower figure than suggested by the World Bank estimates (A point already discussed in chapter II).

Finally, the internationalisation was seen as a threat to Brazilian sovereignty and it was emphasized by the Brazilian authorities that the legitimate right to use and manage the Amazon rests with Brazil. They also feared the exploitation of the large mineral resources in the Amazon by international forces under the pretext of preserving the environment. Brazilian leaders took a harsh stand against any talk of Amazon at the international level. "Most of Brazil's leaders are absolutely sure that that dark forces lie behind international protests over the destruction of the Amazon's rain forests. They believe that their resource rich nation is destined to rise to become a big economic power and that everything done "against" Brazil - including the campaign to protect the forests is intended to hold back its development".¹⁴

Perspective of the International Community

The international community believed that the above views reflect the ideas of Brazilian military and strong nationalistic forces which expressed this view most prominently. A strong alliance with the United States in the 1960's and equally strong anti-communist ideology prevailing at that time served to legitimize the Brazil military's intervention in the Amazon in the form of its integration into the national economy. The

¹³Rachael M. .McCleary, op.cit ., p.692.

¹⁴_____ It's Our Forest to Burn if We Want to ,The Economist , March 11,1989,p.62.

issue of environment was not new in Brazilian policies, though it emerged for the first time during constitution process in 1987 and 1988. "Already in the 1960's, during the dictatorship (1964-85), the military and other nationalist groups warned for the supposed attempts to internationalize the Brazilian Amazon. Protection of the region against foreign intrusion, be it from neighbouring countries or one of the superpowers, occupied a central place in a special study by the superior war college."¹⁵

The developmental economic model adopted under the military rule was responsible for the entry of the foreign capital. The doctrine of national security and development stressed that economic growth was the need of the hour and that Brazil had the potential of attaining the status of economic power and therefore any opposition should be fought against. It stressed that the national security can not be separated from industrialisation and the non-developed regions posed threat to the defence of the borders, therefore need to be developed. This whole ideology was the motivating force behind the integration of Amazonia into the nation's economy.

The international opinion was that the strategy of industrialisation itself was based on an alliance between the state, multinational and national companies. This kind of development based on capital led to rapid economic growth, especially in durable consumer goods and capital goods sectors of the economy, which relied heavily on the technical, financial and organisational knowledge of MNCs. The State played an important role in guiding and attracting funds from MNCs and in investing in basic economic sectors like petrochemicals, mining, iron and steel and telecommunications.

The development model justified a large- scale colonization of the Amazon much at the cost of its ecological consequences. It was thought that the occupation of the Amazon would help in ensuring national security and territorial integrity. A large- scale infrastructure development programme, comprising highway construction and electrification was started after 1964. Regional development programmes tried to attract foreign and national investors and the plundering of the land and resources of the

¹⁵ Ans Kolk, op.cit., p.1484.

rainforest was encouraged. Various agricultural and economic policies, tax concessions, tax holidays and other incentives to develop the Amazon, reflect the general tendency to use the resources of Amazon for national development. While these criticisms are based on ground realities in Brazil, the world community perhaps did not give serious consideration to the fact that to a considerable extent, this model was supported by the foreign capital and international development projects.

The attempts to occupy Amazon were characterised by short-term gains where environmental concerns were not ranked high, rather there was a predominance of the powerful economic forces. Even the local and regional state agencies and politicians were unwilling or unable to confront them. By the time the effects became known, the World Bank had already invested a lot of funds in the road construction.

While Brazil accused the international community of an undue interference in its internal matters, the State itself in alliance with the multinational companies was involved in the mining sector. Thus, the internationalisation of Amazon, which could be seen as major multinational investments and ownership positions, began under the military dictatorship. This process gave an opportunity to the nationalists to accuse the international forces. These accusations, according to the world community, do not fall in line with the actual situation in the Amazon and did not reflect international developments.

Two different perspectives on international debate on the fate of Amazon forests show self-defence and mutual accusations which have resulted in conflict at the international scenario. "With only mild caricature, we can say that both concerned outsiders and national decision makers in different ways and for different ends, have tended to assume a stereotyped homogeneity, ecological and social with regard to the Amazon. This has served to justify, on the one hand, environmentally and socially pernicious public policy and on the other, has run the risk of channeling genuine concern

into comfortable but unhelpful mindsets.”¹⁶ At this juncture, this realisation came on the part of the international organisations and other countries that since Brazil's sovereignty over the Amazon cannot be denied because of geographical realities, threatening to invade the country or placing economic sanctions against Brazil in order to preserve Amazonia can neither be implemented in reality, nor is feasible in long term. Therefore, a criticism by the international community may be an appropriate form of sanction and so may be a boycott of tropical hardwood products. Further, end of military dictatorship in 1985, forming of a new constitution in 1989 and a new environment policy of Brazilian government, were the developments in political scenario in Brazil that led international organisations plead for cooperation, rather than using any threat or interventions in other forms to protect the Amazon.

From the Brazilian side, a close interdependence of the national economies of various countries was being recognised. This led to the popular belief that economic sanctions would be difficult to manage, for Brazil depended a great deal on funds from international agencies, like the World Bank and other countries for its development. Secondly, a boycott of its products from Amazon by the world community would further lower its economic growth. Further, “the environmental issue started to become a barrier to Brazilian successes in other international negotiations and undermined its position, emerging time and again in bi-lateral and multi-lateral discussions. Loans from the World Bank and IDB were suspended or became subject to stricter conditions, signs that unwillingness to respond to environmental concerns caused difficulties.”¹⁷ Therefore, good report showing positive signs towards protecting the environment also meant getting additional funds in the form of debt-for-nature. Internal pressure from NGOs and environmental groups was building up. These events led both the sides meet and work for the acceptance of the need to preserve Amazonia.

¹⁶ Anthony Gross, "Amazonia in the Nineties: Sustainable Development or another Decade of Destruction", *Third World Quarterly*, Vol.12, No.3 July 1990, p.3.

¹⁷ Ans Kolk, op.cit., p.1485.

Towards Cooperation

From 1989 onwards when the new constitution was formed, the political dominance of hard-line nationalists had started diminishing. An interaction between international and national environmental organisations was obvious in the light of continuous focus on the Amazon at the international level. Since the early days of change to democracy, the popular organisations working for the environment gained importance and with the public and financial support of other international organisation, their cause gained even more strength. The devastation of the Amazon rainforest and its implications for the global environment and the difficult situation of the Indians, rubber tappers and the landless too gave them ample support. The Amazonian Alliance of the Peoples of the Forest was one of the organisations formed between the union of indigeneous nations and National Council of Rubber Tappers, to defend Amazonia. It demanded an immediate cessation of World Bank lending to the development projects in the region and demarcation of Indian reserves.

All this put pressure on the government of Brazil and international organisations to work for the preservation of the rainforests. At the same time, a heavily internationalized economy of Brazil and the role of multi-national capital in its development, compelled Brazil to rethink on its environment policy.

To improve country's environmental image, government's environmental plan for the Amazon in April 1989 abolished some subsidies and regulations which encouraged deforestation and also suspended some large projects. In addition, the Brazilian Ministry of Foreign Affairs decided to organize UNCED in 1992.

These changes in Brazilian environmental policy were welcomed by international organisations, Western governments and the NGOs. Also, Brazil's rejection of foreign interference and international hypocrisy contributed for the creation of a positive environment to tackle deforestation problem. It was against this background that the Pilot Programme for the Protection of Brazilian Tropical Forests, was launched by the

Group of Seven Nations, based on a German proposal during the Houston Economic Summit in July, 1990. It was named as PP-G7. After the proposal, the Brazilian government, with the support of the World Bank and the Commission of the former European Community, submitted the first version of the project at the London G-7 Summit in June 1991. The Brazilian government's proposal was approved at that meeting and it was agreed to support the first phase. Thus, at the first meeting of the participants held in Geneva, the programme was approved.

The Pilot Programme got support from developments in other parts of the world as well. The fate of the rainforest in general and the Amazon in particular led to debates, actions and programmes in various European countries. For e.g, a large number of various environmental organisations expressed their concern in a 1989 rainforests memorandum signed by more than a hundred NGOs, only to be actively discussed in and investigated by the parliament in Germany. Germany was a major participant and benefactor from the Carajas project. The fact that the European community had given loans for Carajas, raised many questions in European Parliament too and consequently, the World Bank was asked to reexamine its policies regarding funding development projects. This led to an idea that if industrialized countries attached so much importance to the conservation of the Brazilian rainforest, funds given to Brazil should be on favourable conditions.

The Pilot Programme was intended to achieve results before UNCED. This would have meant a sincere intention on the part of G-7, Commission of European Communities and the Brazilian government to deal with the environment issues.

To an extent, the Pilot Programme shows changing attitude of the World Bank. Under pressure from the NGOs and industrialized countries, the Bank became more cautious while lending for big projects, adopted stringent environmental conditions for projects and started implementing environmental projects. The new policy also included coordinating international environmental programmes and more intensive cooperation with local organisations.

In sum, PP-G7 can be cited as an exemplary programme where interesting parties - International Organizations and Brazilian government cooperated in the field of environment in spite of certain doubts and apprehensions regarding the other party's intentions. Both the sides recognized and accepted that the deforestation problem in Brazil's Amazon region is of grave concern and to a certain extent, both are responsible for the present state of affairs. Moreover, before coming to a common platform, both, the world community represented by international organisations (including environmental organisations) and the Brazilian authorities realised that mutual accusations would only heat up the already strained relations so far as the field of environment is concerned. Thus, cooperation to save the world's largest extent of rainforests was the best alternative. There are many projects for implementation under the pilot programme. "The main projects in the process of implementation are the indigenous peoples and the natural resources in their areas; the natural resources policy project, meant to strengthen environmental management entities in the states of the Brazilian Amazon; support for extractive reserves, for scientific centres and the management of forest resources"¹⁸.

Problems in the Cooperation

The cooperation or joint working in formulating any programme is actually difficult, specially when the two parties perceive the problem in their own perspective and this applies to PP-G7 case as well. Formulating a proposal with active involvement of the government of Brazil was important, considering its sensitivities regarding outside interference. During the negotiations for the Pilot Programme, accusations of internationalization of Amazon came up from hard-liners in Brazil. They accused developed nations of adopting double standards while dealing with developing nations, especially in the field of environmental conservation. Those who were opposed to any deal cooperation with the developed world and international agencies in protecting the Amazon rainforests, alleged that the developed nations had propagated their own kind of consumerism at the cost of their own environment and now interfering in the internal matters of Brazil. The then President of Brazil Mr. Jose Sarney's foreign ministry

¹⁸ Ibid ,p.1489.

pointed out that the average American consumed 15 times more energy than the average Brazilian. The Brazilian army scoffed at any suggestion of international monitoring of the region. Any proposals for debt-for-nature swaps to help finance Brazilian environmental organisations were dismissed as foreign meddling. In addition, “the 1990 publication of the 'green house index ranking' by the World Resources Institute in which Brazil occupied the third position after the United States and the USSR, also gave rise to a large controversy. The contribution of deforestation to global warming was calculated on the basis of the 1967 figures, the exponential nature of which was already known at that time”¹⁹. Besides the institute was accused of “environmental colonialism”²⁰ as its method tended to exaggerate the share of Southern countries in the emission of green house gases. There were other grievances of Brazilian NGOs and environmental organisations against the World Resource Institute’s earlier programmes to protect the Amazon by. It’s Call for Action Programme mentioned that “tragically it is the rural poor themselves who are the major agents of destruction”²¹. The plan included fuel wood and Agro-forestry (US \$ 400 million), Forest Management for industrial uses (US \$ 325 million) and US \$ 50 million for the conservation of tropical forest ecosystems. It did not address the roots of the problem: the transnational corporations and powerful national groups who exploit the forests and destructive development projects co-financed by the international aid agencies, carried out in collaboration with the Brazilian government.

The Pilot Programme progressed continuously until mid 1992, in spite of various obstructions and opposition from different quarters within Brazil. It was possible only because of a favourable political climate, where the Collor government did not want to offend the international community and a smooth passage for the programme within the country meant generation of substantial international funds for the country . These funds could be used for various development projects in Brazil.

¹⁹ Ans Kolk, op.cit., p.1487.

²⁰ A. Agarwal and S Narain, Global Warming in an Unequal World., A Case of Environmental Colonialism ,CSE., New Delhi 1991.

²¹ Renner, Magda, "A Critical Review of Tropical Forests : A Call for Action", The Ecologist, Vol. 17, No. 4/5, 1987, p. 150.

As mentioned already, there were some conservative hard-liners in Brazil who were opposed to any cooperation with outside governments in the field of environment and dubbed it as opening issues of national importance to outside interference. These forces comprised those who were engaged in profitable activities in the Amazon, the proponents of Brazilian sovereignty and those who were sceptical about international aid programmes. The opponents included the military, mining, construction, and agricultural and industrial giants and often supported by ministries of Foreign Affairs, Economic Affairs and Secretariat of Strategic Affairs. All these groups had formed a big coalition within the country to oppose the programmes under the Pilot Project. By mid 1992, the political atmosphere of Brazil was changing. The UNCED had been held and environmental issues were not as popular as before. Collor was accused of corruption and misappropriation of funds. In order to survive in the office, the Collor government joined hands with the conservative forces (though it failed in its efforts and had to resign). But the whole process brought the conservative forces in the forefront and the forces gained political importance for sometime. They used their pressure to oppose the programmes. International organisations and their experts have insisted that the changing political scenario and vested personal interests have delayed the proper implementation of any project to save the rain forests in the sensitive Amazon region of Brazil. However, the situation has improved since 1995 with the election of Fernando Henrique Cardoso and his government has taken positive steps towards the implementation of projects under the programme.

The Present Situation

In spite of being loaded with controversies, the Pilot Programme G-7 can be cited as an example where two conflicting views on deforestation in Amazonia and its consequences have come together to save its fragile environment. The strength of programme lies in active support from local NGOs and the population. The Pilot Programme is the largest environmental programme for any one country, which runs itself from grants and not loans. Presently, international payments are being utilized for protecting biodiversity and preventing the emission of the greenhouse gases.

As far as Brazil's own efforts are concerned, many measures have been taken against deforestation in response to international concerns. In July 1996, for instance, the 'Amazon package' was declared by the Cardoso government. This package brings a two-year moratorium on the logging of two rare timber species - mahogany and virola. The environmental impact of current logging contracts is being reviewed. More restrictions have been enforced on deforestation in agricultural areas. Deforestation figures show more transparency. In 1990-91, the INPE reported the lowest rates while new published deforestation figures for mid 1992 - mid 1994 reveals that annual deforestation was 34.6% higher than in 1990-91.

From another angle, the picture looks less encouraging. The political influence of ranchers, mining companies and other economic forces who have vested interests in perpetuating the status quo is far greater than that of forest peoples, notwithstanding their international networks. The military continues to view the region through a geopolitical prism. The 1995 integrated policy plan for the Legal Amazon aims at the further integration of the region, both nationally and internationally. A new Trans-Amazon highway connecting the western province of Acre to Pucallpa in Peru and thence over the Andes to Lima has been planned. The highway has been planned to gain an opening to the Pacific. The plan has come under a severe criticism from the various quarters. The World Bank and the Inter-American Development Bank both refused to pay for the Acre to Peru road, under their new policy of not helping projects that damage the rainforest. The environmentalists say a new road from Rio Branco (the state capital of Acre) to Pucallpa in Peru would expose a vast new region to destruction. For Brazil the highway construction would mean finding an opening to the Pacific. Its exports of timber, rubber and Brazil nuts would travel less compared to its ports. Freight costs for soyabean exports to Japan from Mato Grosso State would be slashed by direct shipment through Peru, squeezing American competitors. Apart from this, new hydroelectricity projects are also being planned. The Brazilian government argues that Brazil is forced to import oil and discouraged from developing its struggling nuclear programme. It has therefore, no option but to tap cheap and plentiful hydroelectric resources in the

Amazon. It intends the Amazon region to provide a third of country's energy by the year 2010.

The Western experts believe that the pilot programme has enabled the international community to exert influence on Brazilian policies. It was possible only because Brazilians sensitivities to the infringement of its sovereignty was considered by the international community. Contrary to this, any mindset which aims at pressurizing a country by various means will not create any positive environment for cooperation. Doubts and suspicions in developing countries regarding western dominance in the issues related to environment the cause of developed world's rigid attitudes to the matters like transfer of technology etc. At present strong national economies dictate the terms of negotiations in trade, environment or any such field. While the international concern over the fast rate of depletion of tropical rainforests is understood and the efforts of international organisations to save the rainforest from deforestation are appreciated, the intentions to do so should also be transparent. Any fear or suspicion in the minds of the country who is at the receiving end will jeopardise the efforts of cooperation for the welfare of humanity.

Developing countries, as already mentioned in the beginning of this chapter, want commitments from the North to transfer technology and resources to preserve and manage their natural resources. This is one field where the international cooperation is immediately required because developing countries have environment related problems that are specific to the developing world arising due to underdevelopment. Developing countries insist that development is the only alternative to their ecological problems. Also, they lack adequate capital which could be devoted to any research or innovation to obtain suitable technology to combat their under development related problems. Therefore, as pioneers of technologies and new innovations, developed countries should cooperate with the developing world to transfer adequate technology suited to their environments. Developed countries have at every step failed to comply on the issue of transfer of technology, due to fear of losing control over the international matters.

Brazil should also own some responsibility to safeguard its own resources and preserve its precious forest resources because only Brazil has a sovereign control over them. Sovereignty does not always mean utilising resources in a way the country feels it has maximum benefit, it also carries an obligation to preserve the natural wealth. Merely protesting against internationalisation of the issue and accusing the developed world of hypocrisy would not end the problems within Brazil due to large scale deforestation in Amazonia.

To conclude, “The ‘internationalisation’ Brazil’s rainforest raises political and philosophical questions about the nature of rights and duties to preserve natural resources. The international community, particularly the United States is arguing that it has a right to the preservation of the rainforest. As a corresponding duty, Brazil is being held uniquely responsible for the preservation of its Amazonian rainforest. Until the means (and burden which attend them) can be equitably distributed among nations, it is unjust to obligate Brazil alone to preserve the rainforest while other countries, particularly the industrialized ones, hold the rights to enforce preservation.”²² Therefore, any international claim that the environmental degradation in a particular country has consequences all over the world, should be accompanied by policies which address the causes and consider the domestic feelings too. International concern over destruction of Brazilian Amazon is not without accusations of hypocrisy, infringement of sovereignty and obstructing development. Any inherent conflict can be changed into cooperation by effective policies by addressing the domestic needs of a particular country.

²² Rachael M. Mc Clearly, *op. cit* p.691.

CONCLUSIONS

CONCLUSIONS

Tropical forests have come into worldwide focus because of their diverse functions and increasing threat to their existence due to large-scale deforestation. A lot of controversy revolves around the original extent of these forests and also the rate and extent of devastation these have undergone. Reliable estimates on these aspects are required because deforestation contributes to global warming, loss of bio-diversity and destruction of valuable resources. Proximate causes of tropical deforestation are poverty, over population, misdirected government policies and international trade. These are the underlying reasons which drive agents of deforestation such as small farmers, shifting cultivators, commercial loggers, cattle ranchers, industrial, agricultural and construction giants to clear forest land for environmentally destructive decisions and their respective activities. Of all these forces behind deforestation, government policies of the respective countries have come in for great deal of criticism from the international community.

International community's concerns are even more serious with regard to fate of Brazil's Amazon basin rainforests. These forests are the world's largest tropical moist forest region. They are home to at least one tenth of the world's 5 million to 10 million plant and animal species. Brazilian Amazon forest alone may contain one third of the world's tropical broadleafed timbers. Yet, inspite of their enormous economic value and essential environmental functions, the rain forests of Brazilian Amazon are being destroyed at accelerating rates in some areas. But accurate and reliable estimates on the actual forest area cleared and at what rate are far from available. Many recent attempts to arrive at the estimates of destruction of the rainforests not only to have an overview of the present status but also to forecast the future course of events the action required to combat the problem of deforestation,

give various figures. Conflicting figures on deforestation rates (Fearnside-19,000 sq. km./yr. in 1988-89; Myers - 50,000sq.km/yr. in 1988; World Resources Institute. 80,000 km/yr. in 1990-91) result from definitional problems relating to forest area and changes in it to be considered as deforestation and methodological errors in interpreting satellite imageries. As far as percentage of actual cover of forest devastated is concerned, Fearnside says by 1991, 10 per cent of the original forest was cleared whereas Mahar, in a World Bank study concludes that 12% of the total area of the planning region original cover had been devastated by 1988. Yet another finding by Forest Cover Monitoring Program of Brazil government based on Landsat information suggests that slightly less than three percent of the Legal Amazon was threatened by 1983. Such sensitive is the issue of devastation of Brazilian Amazon to the Brazilians and equally controversial as well, that a political dimension is added to the deforestation. Brazilian Space Research Institute INPE's scientific data (forest loss 9.3% referring to forested area) were corrected in an official presentation of the INPE to 5.12% referring to the planning region. Spatial concentration of deforestation in Brazilian Amazon shows that eastern and southern fringes of Legal Amazonia are most severely affected with annual rate of clearing of about $10,500 \text{ km}^2\text{yr}^{-1}$. Even more alarming is the situation where new areas being cleared. But, regardless of methodological difficulties in interpreting satellite imageries and the attempts to exert political influence on the data published, it is still true to say that the rate at which the forested areas are being cleared, is increasing at a fast rate and this accounts for the grave concern of the environmental NGOs both within Brazil and outside it and the international community as well.

Much international concern was built up around the consequences of such a large scale deforestation in the Brazilian Amazon, which the developed world said, were global in nature such as green house effect leading to global warming and

climate change as a result of long dry spells between various rainfall regimes in the rainforest. Other experts on ecology, specially from Brazil and other Amazonian countries have a different viewpoint regarding the consequences of rainforest devastation in Amazonia. According to them, Amazonian rainforests have not been converted or destroyed to such an extent so as to affect global climate or even lead to global warming. They say the rich bio-diversity and the whole ecosystem of the region is resilient to small changes. The Amazonian countries alleged that the largest component of green house gases comes from temperate countries, accounting for about 40% of CO₂ emissions world wide and therefore the developed world should reduce its own emissions from cars and natural gas burning.

This kind of a controversy and debate holds true for the causes of deforestation in Brazilian Amazon too. As both the Brazilian authorities, the international community and its various lending agencies as well as environmental organizations have raised allegations and counter allegations upon each other regarding the causes of deforestation, both are fairly responsible for the present status of rainforests of Brazilian Amazon, no matter what the rate or extent of deforestation are.

Brazilian Amazon represents a case where deforestation has deep socio-economic and even deeper political roots. Brazilian society is marked by gross inequalities with a rapidly growing population which is marginalised by the lack of agrarian reforms, leading to social unrest. This results in a forceful migration of the poor to forested areas for subsistence. This is further facilitated by the government which provides them with an alternative in the form of land allocations in the Amazonian region.

Brazilian economy represents a strong coalition of industrial, agricultural and financial giants who had multinational interests supported by an efficient and willing technocracy. The support of this coalition was important in the formation of any government and this coalition was actively involved in major policy decisions of the government.

Brazilian politics from the very beginning was dominated by developmental ideology largely reflecting multinational interests of individuals and corporations. This ideology, aimed at making Brazil a regional power on the basis of a strong economy, took up large development projects in Amazonia, justifying its decision even at social and environmental costs. Brazilian alliance with USA during the Second World War strengthened its economy and military. The popular post war doctrine of national security gave Brazil a platform on which a rapid state led programme of economic growth was initiated. Brazil's military had a tendency to view the Amazon region with a geopolitical perspective. Its dominant influence in politics and its strategy of integration of Amazon region into the national economy was conceived in early 1950s. A military coup of 1964 helped in implementing this ideology. This was responsible for an aggressive policy of demographic occupation and economic development of Brazilian Amazon.

Thus socio-economic compulsions, geopolitical aspirations and matters of internal security in view of Brazil's history of border conflicts with its neighbouring states with whom it shared more than 11000 kms of Amazonian frontier were the factors that led Brazilian military government of 1964 carry out development projects in Amazon region. Cattle ranching projects which largely expanded through government's fiscal incentives, are alone responsible for 30 percent of the forest conversion in the region. Cattle ranching as alternative land use in Amazonia had

been rejected by the experts on ecological as well as economic grounds. Yet during its bureaucratic authoritarian regime (1964-1985) the Brazilian government actively pursued development of livestock sector in the region. During this period government had to ensure its legitimacy by seeking support of powerful corporate interest groups. This was done by providing large government subsidies to corporate groups who had claimed large holdings in Amazon region for cattle ranching project. Thus since the military government was established, Brazilian government's policies to develop the Amazon region have rarely been planned and carried out with due regard for resulting environmental problems. A large-scale deforestation in Amazonia has neither benefited the regional population (except for better-off classes) nor the Amazonian ecology as a whole. Despite decades of various development works in Amazonia, the region still accounts for only an insignificant 3 percent of national income of Brazil. If present policies remain unaltered, the rapid deforestation will continue specially when much damage has already been done where easy access to Amazonian lands already exists.

In spite of all legitimate criticisms of Brazilian government for devastation of rainforests within its Amazon region, it would be wrong to put all blame on it. Deforestation problem in Brazil has an international dimension too. A worldwide criticism of Brazilian government's development policies in Amazon region in international conferences was not limited to debate and discussions and media reports. It took the form of protests and campaigns by the national and international environmental agencies; suspension of loans by the international lending agencies such as the World Bank, Inter American Development Bank, European Union, etc. and; boycott of forest products from Amazonia in the international markets. Some western countries even talked of international 'monitoring' of the development projects and their impacts on Amazonian ecosystem. These forms of protest cannot be

wholly justified, if the role of international lending agencies in encouraging Amazonian development itself is examined. Various international organizations, for instance, UN's FAO, published reports on economic viability of livestock sector in Brazil in view of expanding global beef markets. World Bank and IADB financed much of the cattle ranching projects in Amazonia during late 1960s and early 1970s. Then, various aspects of international trade till recent years have lured Brazilian government of trading benefits of an intensive road network that would provide Brazil an easy access to the Pacific. It is a well known fact that despite its intensive lobbying for environmental cause, the developed world has its own economic interests in Brazilian Amazon, like that of cheap availability of forest products, pharmaceutical drugs which can be obtained from a rich variety of plant species in the region and further research on its biodiversity. However, it does not mean that rainforests of Brazilian Amazon should be left to themselves specially when these are under threat from devastation. Drawing attention to the developed world's role in degrading the rainforests, is only aimed at making them realize of their responsibility in helping Brazilian government in the form of technology transfer and research for alternate land uses in Amazon which are economically viable and sustainable in ecological terms. Any cooperation between the two is possible and is exemplified by Pilot program which was formulated (in a positive political atmosphere in Brazil) at G-7 meet at Houston in 1991. This program has various projects under implementation, to preserve the richest biodiversity and enormous wealth of Brazilian Amazon. All this would not have been possible without a positive political atmosphere that was prevailing then.

Presently under Cardoso government, deforestation rates have come down which could be because of economic recession Brazil faced a few years ago which considerably reduced large funds that could have been generated for development

projects in Amazonia. State of the World's Forests, 1999, a report published by UN every year, suggests that recent devastation was a result of large number of fires which were due to natural phenomena of low rainfall attributed to El Nino weather pattern. This means human activity has not contributed much to the occurrence of these fires.

Having seen that environmental problems in Amazonia mainly result from socio-economic and political reasons, their solutions can also be found here. Given the political will, the destruction of the rainforest can be slowed down in coming years, if cannot be brought to an end. There can be no choice between environment and development. They go together and strict preservation measures are not feasible. This means Amazonia can be protected while still benefiting Brazilian and larger humanity from its resources.

Both capital and population moved to the Amazon region induced by a particular developmental model and policies. Policies in Amazon can be reformulated so as to have a balance between development and the preservation of the Amazon. Certain measures may be taken within the region to decelerate deforestation and also carry out alternate land uses that are sustainable.

Stopping government incentives: All government incentives and subsidies that fund precarious land uses such as cattle ranching and timber activities in Amazonia should be cut. New highways penetrating unexplored areas should not be constructed. No new settlement projects should be undertaken in far flung areas of the Amazon frontier. Government should provide incentives to encourage economically viable and ecologically sustainable land uses. This should make sure that those who carry out such activities actually yield some productive results rather than appropriate all incentives.

Better living conditions by the means of agrarian reforms, urban reforms, health and welfare and other policies should be ensured to make benefits of development reach equally to small farmers and rural workers so that their dependence on the rainforests for sustenance is reduced. This would release pressure from Amazon rainforest.

Government should make some efforts to consolidate the settlements, which are already there. Initially, it may involve some depletion of forests by agriculture (traditional and perennial crops) in the areas already, partially for laying down infrastructure, mainly already existing roads and strengthening the urban network and practising ecologically sustainable agriculture. But all this would mean less deforestation on the far lying frontier areas where there is no infrastructure, no previous occupation and where agriculture is less sustainable.

Alternate land uses in Amazonia can be practised like agro-forestry, tree crops, gathering of forest products, etc. that have been suggested by the experts already. Further research should be done to find out how already degraded land in Amazonia can be reclaimed and put to sustainable land uses. Land use research can benefit a lot from rural inhabitants of Amazonia who have a lot practical knowledge.

Lastly, it should be realized that developed countries woke up to their environmental problems when it was too late to preserve what had already been lost. In Brazil this should not happen. Before it reaches similar levels of development and environmental degradation, effective environmental laws should be enforced. Besides, it is important to spread awareness about environment within the region. These measures can to a large extent help in bringing down the rates of rainforest devastation and may also favour its preservation in future.

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

- Agarwal, A. and S. Narain (eds.), "Global Warming in an Unequal World. A Case of Environmental Colonialism", Centre for Science and Environment, New Delhi, 1991.
- Anderson, Anthony B.(ed.), "Alternatives to Deforestation : Steps Toward Sustainable Use of the Amazon Rain Forest", Columbia University Press, New York, 1990.
- Asthana, Vandana, "The Politics of Environment : A Profile", Ashish Publishing House, New Delhi, 1992.
- Brown, Katrina and David W. Pearce,(eds.), "The Causes of Tropical Deforestation – The Economic and Statistical Analysis of Factors Giving Rise to the Loss of the Tropical Forests", Research Press, New Delhi, 1995.
- Bunker, Stephen G., "Underdeveloping the Amazon", Urbana, University of Illinois Press, Illinois, 1985.
- Downing, Theodore E., Susanna B. Hecht, Henry A. Pearson and Carmen Garcia Downing (eds.), "Development or Destruction : The Conversion of Tropical Forests to Pasture in Latin America", Westview, U.S., Man and the Biosphere Program, Oxford, 1992.
- Eden, Michae J., "Ecology and Land Management in Amazonia", Belhaven Press, London and New York, 1990.

- Friday, Laurie and Ronald Laskey (eds.), "The Fragile Environment", Cambridge University Press, Cambridge, 1989.
- Jordan, C.F., (ed.), "An Amazonian Rainforest", Man and the Biosphere Series, The Parthenon Publishing Group, UNESCO, 1989.
- Little, Peter D. and Michael M. Harowitz, with Endre A. Nyerges (eds.), "Lands at Risk in Third World : Local Level Perspectives", IDA Monographs in Development Anthropology, Westview Press, London, 1987.
- Myers, N., "The Primary Source : Tropical Forests and Our Future", New York : Norton, 1984.
- Pompa, Gomez A., T.C. Whitmore and M. Hadley (eds.), "Rainforest Regeneration and Management", Man and Biosphere Series, UNESCO, Paris and the Parthenon Publishing Group, International Publishers in Science, Technology and Education, 1991.
- Prance, G.T. and , T.E. Lovejoy (eds.), "Amazonia", Pergamon Press, Oxford, 1985.
- Prance, Ghilean T. (ed.), "Tropical Rain Forests and The World Atmosphere", International Book Distributors, Dehradun, 1988.
- Repetto, Robert and Malcolm Gillis (eds.), "Public Policies and the Misuse of Forest Resources", Cambridge University Press, Cambridge, 1988.
- Rietbergen, Simon (ed.), "Tropical Forestry", Earthscan Publications Ltd., London, 1993.
- Sharma, Narendra P. (ed.), "Managing the World Forests : Looking for Balance Between Conservation and Development", International Bank for Reconstruction and Development, 1992.

Tulchin, Joseph C. and Andrew Rudman (eds.), "Economic Development and Environmental Protection in Latin America", Lynne Rienner Publishers, Boulder, 1991.

Weinberg, Bill, "War on the Land : Ecology and Politics in Central America", Zed Books, London, 1991.

Wolfgang, Sachs (ed.), "Global Ecology : A New Arena of Political Conflict", Zed Books, London, 1993.

Whitmore, T.C. and, J.A. Sayer (eds.), "Tropical Deforestation and Species Extinction", Chapman and Hall, London, New York, Tokyo, Melbourne, Madras, 1992.

Articles in Journals and Papers

A Backdoor into the Amazon, The Economist, February 11, 1989.

A Murder in the Forest, The Economist, January 7, 1989.

Albert, Bruce, "Indian Lands, Environmental Policy and Military Geopolitics in the Development of the Brazilian Amazon : The Case of the Yanomami", Development and Change, Vol. 23, 1992, pp. 35-70.

Allen, Elizabeth, "Amazonia in the Nineties : The Burning Question", Third World Quarterly, Vol. XII, No. 1, Jan 1990, pp. 123-42.

_____ "Calha Norte : Military Development in Brazilian Amazonia", Development and Change, Vol. 23, 1992, pp. 71-99.

Almedia, Oriana Trindade De and Christopher Uhl , "Developing a Quantitative Framework for Sustainable Resource Use Planning in the Brazilian Amazon", World Development, Vol. 23, No. 10, 1995, pp. 1745-1764.

Anderson, Anthony, "Smokestacks in the Rainforests :Industrial Development and Deforestation in the Amazon Basin", World Development, Vol. 18, No. 9, 1990, pp. 1191-1205.

Bendix, Jacob and Carol M. Liebler , "Environmental Degradation in Brazilian Amazon : Perspectives in US News Media", Professional Geographer, Vol. 43, No. 4, 1991, pp. 474-485.

Binswanger, Hans P., "Brazilian Policies that Encourage Deforestation in the Amazon", The World Bank Policy, Planning and Research Staff, Environment Department, April, 1989.

Blum, Winfried E.H., "Land Use in the Humid Tropics Exemplified by the Amazon Region of Brazil", Applied Geography and Development, Vol. 24-26, 1984-86, pp. 71-87.

Bryant, Raymond L., "Political Ecology : an Emerging Research Agenda in Third World Studies", Political Geography, Vol. II, No. 1, Jan 1992, pp. 12-36,.

Bunyard, Peter "Brazil – The Way to Dusty Death", The Ecologist, Vol. 4, No. 3, March-April, 1974, pp. 89-93.

_____ "The Significance of the Amazon Basin for Global Climate Equilibrium", The Ecologist, Vol. 17, No. 4-5, 1987, pp. 139-141.

Buschbacher, Robert J., "Natural Forest Management in the Humid Tropics : Ecological, Social and Economic Consideration", AMBIO, Vol. 19, No. 5, August 1990, pp. 253-258.

Cleary, David, "After the Frontier : Problems with Political Economy in the Modern Brazilian Amazon", Journal of Latin American Studies, Vol. 25, 1993, pp. 331.

Coomes, Oliver T. and Bradford L Barham., "Rainforest Extraction and Conservation in Amazonia", Geographical Journal, Vol. 163, No. 2, July 1997, pp. 180-188.

Dalby, Simon, "Ecological Discourse : Environmental Security and Political Geography", Progress in Human Geography, Vol. 16, No. 4, 1992, pp. 503-522.

Delson, Roberta M. and John P. Dickinson , "Perspectives on Landscape Change in Brazil", Journal of Latin American Studies, Vol.. 16, 1983, pp. 101-125.

Dickinson, John ,“Too Many Trees : Not Enough Wood”, A Review of Recent Literature on Brazilian Amazonia”, Journal of Latin American Studies, Vol. 18, 1986,pp. 409-23.

Fearnside, Philip M., “Rate and Extent of Deforestation in Brazilian Amazon”, Environmental Conservation, Vol. 10, No. 141, 1983,pp.78-97.

_____“The Charcoal of Carajas : A Threat to the Forests of Brazil’s Eastern Amazon Region”, AMBIO, Vol. 18, No. 2, 1989,pp.141-43.

_____“Deforestation in Brazilian Amazonia : The Effect of Population and Land Tenure”, AMBIO, Vol. 22, No. 8, December 1993, pp. 537-545.

_____“Spatial Concentration of Deforestation in the Brazilian Amazon”, AMBIO, Vol. 15, No. 2, 1986, pp. 74-81.

Forsberg, M.C Silva, Rider B. Forsberg, and V. K.Zeidemann, “Mercury Contamination in Humans Linked to River Chemistry in the Amazon Basin”, AMBIO, Vol. 28, No. 6, Sept .1999, pp. 519-521.

Pompa A., Gomez, Vasquez C. Yanes. and S. Guevara, “The Tropical Rainforests : A Non-renewable Resource”, Science, Vol. 165, 1972, pp. 131-137.

Grainger, Alan, “An Evaluation of the FAO’s Tropical Forest Resource Assessment,1990”,Geographical Journal, Vol.162, March 1996, pp. 73-79.

Gross, Anthony, “Amazonia in the Nineties : Sustainable Development or Another Decade of Deforestation”, Third World Quarterly, Vol. XII, Nos. 3 and 4, Winter 1990-91, p. 3-27.

Guimaraes, J.R.D. and others, "Mercury in Human and Environmental Samples from Two Lakes in Amapa, Brazilian Amazon", AMBIO, Vol. 28, NO. 4, June 1999, pp. 296-301.

Guimaraes, Roberto P., "Bureaucracy and Ecopolitics in the Third World : Environmental Policy Formation in Brazil", International Sociology, Vol. 6, No. 1, 1972, pp. 73-96.

_____ "The Ecopolitics of Development in Brazil", Cepal Review, No. 38, August 1989, pp. 89-104.

Hageman, Helmut "The Development of Environmental Policies in Brazil", The Institute for European Environmental Policy, Bonn, 1990.

Hecht, Sussana B., "Environment, Development and Politics : Capital Accumulation and Livestock Sector in Eastern Amazonia", World Development, June 1985, pp. 662-84.

How Brazil Subsidises the Destruction of the Amazon, The Economist, March 18, 1989.

Hyman, Eria L., "Opportunities and Constraints for Organisations to Help Sustain Tropical Forest Resources", Environmental Management, Vol. 10, No. 1, January 1986, pp. 11-20.

Iltis, Hugh H., "Tropical Forests : What Will Be Their Fate", Environment Vol. 25, NO. 10, 1985, pp. 55-60.

Imbernon, J., "A Comparison of the Driving Forces Behind Deforestation in the Peruvian and the Brazilian Amazon", AMBIO, Vol. 28, No. 6, September 1999, pp. 509-513.

Its Our Forest to Burn if We Want to, The Economist, March 11, 1989.

Johns, A.D., "Economic Development and Wildlife Conservation in Brazilian Amazonia", AMBIO, Vol. 17, NO. 5, 1988, pp.302-6.

Kohlhepp, Gerd, "Analysis of State and Private Regional Development Projects in the Brazilian Amazon Basin", Applied Geography and Development, Vol. 16, 1980-91, pp. 53-79.

_____ "A Challenge to Science and Regional Development Policy : Reflections of the Future Development of Amazonia", Applied Geography and Development, Vol. 33, 1989, pp. 52-67.

_____ "Destruction of the Tropical Rainforests in the Amazon Region of Brazil : An Analysis of the Causes and the Current Situation", Applied Geography and Development, Vol. 38, 1991, pp. 87-109.

_____ "The Spatial Impact of State Activity in Latin America with Reference to Successive State Regional Policies in Brazil Until 1992", Applied Geography and Development, Vol. 45-48, 1995-96, pp.74-86.

Kolk, Ans, "From Conflict to Cooperation : International Policies to Protect the Brazilian Amazon", World Development, Vol. 26, NO. 8, 1998, pp. 1481-93.

Lutzenberger, Jose A., "Brazil's Amazonian Alliance", The Ecologist, Vol. 17, No. 4/5, 1987, pp. 190-1.

_____ "Who is Destroying the Amazon Rainforest", The Ecologist, Vol. 17, No. 4/5, 1987, pp. 155-60.

Mahar, Dennis J., "Government Policies and Deforestation in Brazil's Amazon Region", World Bank Publication, Washington D.C., 1989.

- Malingreau, Jean Paul and Comton J.Tucker, "Large-scale Deforestation in the South Eastern Amazon Basin of Brazil", AMBIO, Vol. 17, No. 1-6, 1988, pp. 49-55.
- Mares, M.A., "Conservation in South America : Problems, Consequences and Solutions", Science, No. 233, 1986, pp. 734-748.
- Marlinelli, Luiz A. and others, "Mercury Contamination in the Amazon : A Gold Rush Consequence", AMBIO, Vol. 17, No. 1-6, 1988, pp. 252-4.
- McCleary, Rachael M., "International Community's Claim to Rights in Brazilian Amazonia", Political Studies, Vol. 39, No. 4, Dec 1991, pp. 691-707.
- Myers, N. "Tropical Forests : The Main Deforestation Fronts", Environmental Conservation, Vol. 20, No. 1, 1993, pp. 9-16.
- Nepstad, Daniel C., Christopher Uhl and S. Serrao, "Recuperation of a Degraded Amazonian Landscape : Forest Recovery and Agricultural Restoration", AMBIO, Vol. 20, No. 6, September 1991, pp. 248-55.
- Nobre, S.S. "Atlantic Rainforest in Brazilian Cocoa Region", Applied Geography and Development, Vol.. 52, 1998, pp. 41-51.
- Plumwood, Val and Richard Routley , "World Rainforest Destruction – The Social Factors", The Ecologist, Vol. 12, No. 1, Jan – Feb 1982, p. 4-22.
- Price, Marie, "Ecopolitics and Environmental NGOs in Latin America", Geographical Review, Vol.. 54, No. 1, Jan 1994, pp. 42-58.
- Renner, Magda, "A Critical Review of Tropical Forests : A Call for Action", The Ecologist, Vol. 17, Jan 1994, No. 4/5.

- Repetto, Robert, "Creating Incentives for Sustainable Forest Development", AMBIO, Vol. 16, No. 2-3, 1987, pp. 23-38.
- Rudel, Tom and Jill Roper, "The Paths to Rain Forest Destruction : Crossnational Patterns of Tropical Deforestation, 1975-90", World Development, Vol. 25, No. 1, 1997, pp. 53-65.
- Setzer, Alberto W. and Marcos C. Pereira, "Amazonia Biomass Burnings in 1987 and an Estimate of their Tropospheric Emissions", AMBIO, Vol. 20, No. 1, Feb 1991, pp. 19-22.
- Sioli, Harald, "Effects of Deforestation in Amazonia", Geographical Journal, July 1985, Vol. 151, pp. 197-203.
- Skillings, Robert F., "Economic Development of Brazilian Amazon : Opportunities and Constraints", Geographical Journal, March 1984, pp. 48-54.
- Steinberg, Philip E., "Political Geography and the Environment", Journal of Geography, Vol. 96, No. 2, March – April, 97, pp. 113-18.
- Vanclay, Jerome K. "Saving the Tropical Forests : Needs and Prognosis", AMBIO, Vol. 22, No. 4, June 1993, pp. 225-231.
- Walker, R., "Land use Transition and Deforestation in Developing Countries", Geographical Analysis, Vol. 19, No. 1, 1987, pp. 18-30.
- Whitesell, Edward A., "Local Struggles Over Rainforest Conservation in Alaska and Amazonia", Geographical Review, Vol. 86, No. 3, July, 1996, pp. 414-36.
- Webb, Kempton E., "Amazon", Encyclopedia Britannica, Vol. 1, 1991, p. 660.

Reports

Agenda 21 for Amazonia : Basis for Discussion, Ministry of the Environment, Water Resources and the Legal Amazonia, Secretariat for the Coordination of Amazonian Affairs, Brasilia, March 1997.

Browder, John O., "Subsidies, Deforestation and the Forest Sector in the Brazilian Amazon", Report to the World Resources Institute, Washington D.C., 1985.

Smeraldi, Roberto, "Coherent Public Policies for a Sustainable Amazon : The Challenge of Innovation and the Pilot Program, Friends of the Earth, International Amazon Program. NGO Amazon Working Group, CLN Brasilia, Brazil.

Smith, J.H. and Others, "Environmental Threats in Amazonia : Resiliency and Dynamism of the Land and its People", UN University Studies on Critical Environmental Region, UN University Press, New York, 1995.

Sound Public Policies for the Amazon Region : Harmonizing Public Policies with the Objectives of the Pilot Program for the Brazilian Rainforests. Friends of the Earth. International, Sao Paulo, Graphic Design and Printer, Brazil, 1994.

State of the World's Forests, 1999, UN Publication, New York, 1999.

The Challenge of Sustainable Development, The Brazilian Report for the UNCED Press Secretariat of the Presidency of the Republic, Brasilia, March, 1992.

World Environment Handbook : A Director of Government, Natural Resource Management Agencies and Non-Governmental Environment Organisations in 145 countries.

The World Bank and the Environment in Brazil : A Review of Selected Projects. World Bank, Operation Evaluation Department, Washington D.C., Feb 19, 1991a.