CHAPTER V:

CONCLUSION

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> "Kathiawar in early times was covered with dense forest. It is now comparatively thinly wooded except the Gir forests in the south and the Barda forests on the west coast. The Gir forest is about sixty miles long by thirty miles at the broadest, but contains no value timber. The portion of the Barda hills belonging to Navanagar is thickly wooded, but in Porbander the hills are being recklessly stripped. Another small forest in the Sihor range in Bhavnagar is carefully looked after, but the timber is small and stunted. The place where forests are most needed, and whence the timber has been most recklessly out, is the central pleatue where all the rivers rise. In time a judicious system of planting would reclothe the hills, improve both the climate and the water supply, and provide a much-needed store of fuel. The hills near Chotila, than, the Bamanbor, though now bare, had till lately cover enough to attract lions. The mangrove abounds along the shores of the gulf of Cutch and Cambay. It is most valuable as fuel and the leaves and berries are largely used as a food for canal and cattle.[1]"

Kathiawar therefore prior to the 17th century was an extremely wooded area, but gradually the region was depleted of its forests and now it is known to be a desert area devoid of any forests. What is significant here to note is that the same kind of axing of forests is taking place in Central and South Gujarat and if the process continues, the time would not be far away, when the Gazetteers of the South and Central Gujarat territories will state that "in earlier times these regions were covered with dense forests". In my thesis I have tried to analysis the ecological history of Central and South Gujarat by presenting an integrated approach of ecological; social; economic; ethical-cultural and biocentric, aspects. :

- Through the Ecological aspect an attempt has been to place value on a bio- diverse and stable nature in a near state of equilibrium.

[1] *Gazetteer of the Bombay Province*, vol.VII, Kathiawar, Govt. of Bombay, 1884, pg.94.

This stability had been unfortunately disturbed by the interventions of the colonial state.

- Economical aspect is generally dealt with by analyzing the policy of the British which made efficiency a virtue to maximize their profits by urging a greater exploitation of natural resources leading to irreversible damages.
- Ethical aspect focuses on the need to preserve the exceptional features of nature not only for humanity but for the nature itself. Whereas the Bio-centric aspect lays stress on developing an attitude which gives an aesthetetic value to the nature surrounding us so that we treat it with respect just as the tribal people had done.
- Social aspect addresses the importance of the social and cultural institutions which strengthened the a sustainable bond between humans and nature while trying to simultaneously analyze how hierarchies of control of natural resources lead to inequalities in the society.

I have also attempted to trace origins of modern environmentalism by interlinking its major issues of forests, land use and water through discussions on the processes of the colonial-administrative ideologies, policies and imperialist demands.

Ecologically speaking, forests play a central and a key role in defining the ecology of the place. First, the roots of the trees keep the ground soft and moist providing a habitat to number of small creatures in soil, as, fertile soil consist of a mixture of living and non living organisms.
Secondly, forests exercise a decisive influence upon the level of rainfall, its effects and its observance by the soil. It is an established fact that areas of forests led to an increase in the rate of precipitation up to 20%.
Thirdly, the new growth of trees, bushes and grasses, as well as herbs contributes substantially to the ground's water storage capacity, the roots

of the trees offering the necessary channels in the forest soil. This process is known as the 'sponge effect'. One other extremely important function of the forests (in the wake of global warming) is that they regulate the temperature. Temperature is minimized by the process of evapo-transpiration (evaporation and transpiration) of trees and the areas which have a layer of plant covering have higher levels of evaporation than the bare soil (which dry gradually as the absence of roots prevents water being driven to the surface). The highest temperature is at the uppermost layer of plant growth and the poor conductivity of plants prevents the heat being passed on downwards. Even a light tree cover; can reduce the amount of direct sunlight falling on to the soil, keeping its temperature down. Finally, all kind of vegetation helps to prevent soil erosion as the former helps in protecting the soil. Deforestation erodes the top soil with all its mineral contents, resulting in a dramatic drop in the crop yield. Wind erosion has more serious consequences. It occurs only in areas of dry soil and scanty vegetation, and can lead to sand and dust storms. Therefore, the depletion of forests and their transformation into heavily worked agricultural land, with an ever-increasing proportion of cash crops may lead to an immeasurable loss of soil fertility.

The English first arrived in India, for the purpose of trade, economic profit being their primary motive. It was to safeguard their economic interests, that they undertook the territorial annexations which not only brought cash crops (cotton, sugarcane and indigo), but also the revenues from agriculture. Once the Company's trade with China came to be locally financed gaining the Company's independence from London's exported silver, their hunger for the land revenues only increased. High revenue assessments and the desire for permanent expansion of more valuable crops, i.e. cash crops, within a few decades led to substantial ecological changes in large parts of British India.

European expansion brought with it a new level of environmental destruction. From the 18th century onwards, colonial commerce was characterized primarily by the export of raw materials. To maintain the low prices of raw materials, the introduction of plantation economy on a large scale could have been possible, but to English it was not easy and expensive. The easiest option was to increase the land revenue and bring more land under cultivation. Railways were introduced to further exploit the interior of the country. Thus railways had become the tool of the British and deforestation was both its cause and result. The British no doubt led to environmental degradation on a large scale. Daniel Defoe's novel, Robinson Crusoe (1719) gave a blueprint for the British colony: nature tamed, the undergrowth cleared or made productive; the natives either faithful servants like Man Friday, or conquered by disciplined soldiers with guns. In America and Australia, this programme was carried out early: many tribes were wiped out and the survivors were subjected to a regime of enforced 'civilization', while their land was taken away from them and was made to yield a maximum immediate profit through cattle ranches, private plot of agricultural land or mining.

India was a jewel in the crown of the British Empire, pre-eminently on the basis of its vast wealth and natural resources. It had large tracts of forests, well established outlets of internal and external trade and ready markets. Further the geographical location provided the country with vast reserves of natural resources and immediate possibilities of harnessing it. Thus began the process of exploiting India's natural resources on a large scale.

The arrival of the British and their subsequent expansion brought new pressures on the forests of India. There is little to suggest that there was an ecological equilibrium in pre-British India. In the Pre British state, it was the pressure for revenue and the agrarian extension which actually influenced the process of denudation. Muhamad Bin Tughlaq (1325-51)

tried to encourage the agrarian expansion by remitting revenues and providing credit to those peasants who cleared new lands for cultivation. Besides, forests also provided shelter to rebels, robbers and peasants who led due to extremely high rate of taxation. This was especially the case in medieval India, where labour was a scarce resource and peasants could simply move away rather than pay high taxes[2]. However, the law of density of population in many parts of the Mughal Empire ensured that peasants could still convert forested lands into arable[3]. The relationship of the Indian State with forest areas was not entirely a negative one. State control was limited to the extraction of certain plant or animal species or to the maintenance of hunting reserves. There were some customary restraints on the use of trees, such as sacred groves protected by the villagers and the tribal people. Such groves were in existence till the late 19th century in Southern India and Gorakhpur in the North[4]. As discussed earlier in this chapter, there are significant differences among the scholars over the question of how the pre colonial situation was distinct from the colonial one. Guha and Gadgil contend that earlier, village communities had control over the management and disposal of forests besides uncultivated lands. Demands by dominant land holders and rulers were limited, which did not approach the scale, as in the subsequent period of the colonial rule[5]. At the other hand Grove stress that deforestation had assumed significant proportions before the advent of colonialism.

To understand the changes brought about by the colonial rulers, it is first necessary to comprehend social and economic changes that were taking place in Britain. Their own military history and Agriculture Revolution made them to take the negative view of the forests. Deforestation in the favor of

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[2] *Cambridge Economic History of India*, vol I, pp.2-4.
[3] Irfan Habib, *The Agrarian System of the Mughal India*, 1556-1707, London, 1963, pg.117.
[4] *NAI*, PWD, Rev. Forests, June 1871, nos. 72-3, pg.3,'Protection of Fine Trees in sacred and temple Groves' ,Memorandum by Acting IGF, G.F. Pearson, 6 Aug. 1869.
[5] 'State Forestry and Social conflict', pg.141

cultivation during the "Agriculture Revolution" was seen as a sign of progress. Forests were considered to be the abode of robbers, poverty stricken, stubborn and uncivil. From around 1750, English landowners planted trees on the privately owned and enclosed lands. Trees were to be grown and cut on a regular basis, like crops. The woods became a managed and controlled landscape rather than untamed forests[6].

The British during the formulative period of their rule in India hoped to consolidate their control by the expansion of cultivation. Besides, the denudation of the countryside helped them to gain a military advantage against their foes. Ecological Warfare, i.e. Devastation of forests for military purposes, was not new in India, but the colonial rulers gave them the sharper edge[7]. Zimmerman has shown that the British believed the jungles to be lands that lapsed into a state of nature because of inadequate care by the man. The jungle was thus seen as the result of the abandonment of cultivation, and was a place of wild and rots vegetation[8]. Thus forests were the landscape to be conquered and tamed. Further the subcontinent had acquired a fresh significance in the wake Anglo French rivalry, as the former was a source of timber, which was scarce in England. Inspite of the fact, the process of denudation was seen as the sign of progress.

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[6] N.D.G. James, *A History of English Forestry*, Oxford University Press, Oxford, 1981, pp. 166-8

[7] C.A. Bayly, *Indian Society and the making of the British Empire*, Orient Longman, Cambridge University Press, Cambridge, New Delhi, 1987, pg.140.

[8] Zimmerman Francis, *The Jungle and the Aroma of Meat: Ecological themes in Hindu Medicines*, Berkeley: University of California Press, 1987, pg.14 and pg.44.

As Thomas Preston stated,

> "The scarcity of timber ought never to be regretted, for it is a certain proof of National Improvement; and for royal Navies, countries yet barbarous are the right and the proper nurseries[9]."

Therefore the British saw forests as commercial assets, calling for strict state control. In the process the practices of tribal people and the small farmers (of shifting cultivation, use of woods) were seen as the obstacles in the path of gaining larger commercial interests. Side by side concerns were also expressed by the colonial administrators, regarding the effects of heavy deforestation. Alexander Gibson and Hugh Clerghorn in the mid 19th century, pointed out to the connection between deforestation and the drought. Protection of forests was now seen as essential for maintaining water supplies and safeguarding agricultural prosperity. Further, it was claimed that denudation of the forests in the catchments areas was leading to the siltation of rivers and of southern ports[10]. The tribals then came under the scanner of the rulers, who were practicing the shifting agriculture. Anxiety about desiccation did play a role in the ban on the kumri cultivation in Coorg in 1848, and its restriction in the Belgaum in 1856 and so in the Dangs, which was a heavy forested area area in Gujarat. The resultant reaction was the revolt of the Dangis, against the colonial laws, which has been discussed in chapter IV. The opening of the railway lines further complicated the problems. The present water scarcity in Gujarat can be traced back to the colonial times, when the water harvesting system began to decay due to the apathy of the British, and encouragement given to boring and electric pumps and tube wells to exploit water. The water table began dropping, as kunds, vavs etc. which acted as aquifers to recharge water table began to be neglected. Therefore we can say that the process of ecological change was initiated

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[9] R.G. Albion, *Forests and sea power, The Timber problem of the Royal Navy, 1652-1852*, Cambridge University Press, Cambridge, 1926, pg.116.
[10] *Forests of India*, vol I, pp. 120, 213 and 215

on a large scale during the British rule, which has reached further new heights in the post colonial period.

A brief historical overview of the development of British colonial forestry under the impact of the continental forestry would help in a greater understanding of the Indian situation which is dealing with the legacies of the British rule.

William Schlich, the former head of the Indian forestry service, wrote in his book, A Manual of Forestry[11],

> Forests are, in the economy of man and nature, of direct and indirect value; the former chiefly through their produce, and the latter through the influence which they exercise upon climate, the regulation of moisture, the stability of the soil, the healthiness of the country and allied subjects.

By the early 19th century scientific environmental tradition had reached to a conclusion that clearing, grazing, torrents and declining water table are inter related to the wider problem of deforestation. With these scientific findings providing a backdrop, Alexander von Humboldt, in the beginning of the 19th century tried to establish a connection between deforestation and the change in climate using the lakes of Central Asia as example. He wrote[12],

> By felling tree which cover the tops and sides of mountains, men in every climate prepare at once two calamities for future generations- the want of fuel and the scarcity of water... Plants exhale fluid from their leaves, in the first place for their own benefit. One of these is maintaining a suitable portion of humidity in the air. Not only do they attract and condense the moisture suspended in the air, and borne by the wind over the earth's surface, which by falling, from their leaves, keep the ground below moist and cool; but they can, by means

[11] W. Schlich, *A Manuel of Forestry*, vol.I, London, 1889, pg.13
[12] A.von Humboldt, *Aspects of Nature in Different Lands and Different Climates: With Scientific Elucidations,* Philadelphia, 1849, pg.232.

> of their roots, pump it up from a very considerable depth, and, raising it into the atmosphere, diffuse it over the face of the country. Trees, by transpiration from their leaves, surround themselves with an atmosphere, constantly cold and moist. They also shelter the soil from the direct action of the sun, and thus prevent evaporation of the water furnished by rains.

At the same time, scientists working in Europe and America also began to derive the same conclusion.

As an economic system, modern forestry originated in 18th century Prussia. It was an attempt to consolidate upon earlier and extant practices of woodland management and to establish a scientific resource use regime. One of the earliest system developed by German foresters, was based on a traditional practice of forest use that involved the setting of annual cutting schedules. Demarcated forests were first partitioned into number f divisions equal to number of years in the growth cycle and then derived annual yields on the assumption that equal areas yield equal amount of wood for harvest each year[13]. This method was later abandoned as it proved insufficient in fulfilling the demand of old and mature timber, which was considered in value equal to any cash crop. By the end of the 18th century, German forestry had developed into a systematic science of determining, predicting and controlling wood mass. It reached a climax in the work Hurrich Cotta, who enunciated a three level approach to the forest management. The first step was a geometric survey, which would supply information about the extant of the forests. The second involved calculations of wood mass of individual trees and finally of the forest as a whole with growth rates calculated for each level of organization. The third step involved linking the forest balance sheet to the monetary budget by

[13] S. Ravi Rajan, *Modernizing Nature, Forestry and Imperial Eco Development 1800-1950,* Orient Longman, Delhi, 2008, pg.37

treating the standing forest as capital, its yield as interest, and then completing a chain of conversions from wood to units of currency[14].

France had a tradition of systematic use of State forestry prior to the introduction of the German methods. In the mid 17th century, J.B. Colbert, an influential minister of the king Louis XIV declared forests of State importance. However the scenario changed after the French Revolution. French foresters trained in Germany promoted German techniques of forestry practices in France which favoured tree plantations- monocultural 'high forests' composed of species suitable for construction and meeting industrial needs[15]. Under their schemes, forests across France were cut and replanted with monocultural stands of species such as pines that were deemed economically important, replacing mixed forests

In India, the early proponents of Forest conservancy were East India Company's employees working either in botanical gardens, medical services or in army. Most of the supporters of the scientific forestry in India had been educated in leading European schools. Many proponents of forestry in India had closely studied the work of scientists concerned with deforestation in Europe and America. Surgeon Edward Balfour, a keen follower of the European scientific literature on deforestation favoured the theory that deforestation leads to desiccation. He compiled the bibliography on the 'international scientific literature on the influence of tress on rainfall and the preservation of moisture' for the benefit of the Madras government in 1840[16]. Hugh Cleghorn, considered by many as the 'father' of forestry in India, actively followed the developments and research on the Continent on the effects of the forest clearance. He was also a principal figure in the designing and supervising forestry training for

[14] ibid, pg. 40

[15] *ibid*, pg. 47

[16] E. Belfour, 'Letter to the Secretary to the Madras Government on the Influence Exercised by trees on Climate', *Madras Journal of literature and Science*, 15/36, 1849.

trainees for the students of Indian forestry. Many of such colonial foresters had expressed their views on the relation between deforestation and the natural resources. One such issue was related to forests and water. For example, in the Bombay Presidency, rivers and creeks of the Malabar Coast where ships once used to ride at anchor had been silted up in the living memory of the people. In the Deccan Highlands and the Eastern Ghats, denudation had resulted in the silting of the major rivers. The story was similar in the Coromandal coast and the rivers Godavari and Krishna[17]. In addition to siltation, deforestation had caused destruction of fertile valleys as a result of erosion and avalanches in many parts of India[18].

Another issue was of water supply. According to the scientific conservationists, local water supplies had dried up in many parts of India and the water level in major rivers had declined. Citing the European work, they argued that forests improved soil and maintained the permanency of the rivers.

The theory that human beings cause deforestation due to ignorance was extended also to Indian context. It was argued that the increasing demands of the forest produce and the commercial exploitation are leading to rapid deforestation. Many colonial scientist conservationists urged the setting up of plantations exclusively for the railway use. They also urged the substitution of timber, with iron, for the railway sleepers[19]. Concerns were also expressed on the wastefulness of private timber extractors and corrupt private contractors. Another reason, which according to them, was leading to deforestation was the practice of shifting cultivation. It was considered responsible to the destruction of frosts and also seen as destructive of soil and thus affecting cultivation of major cash crops like coffee.

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[17] *The Forests of India*, vol.I, pg.213
[18] *Ibid,* pp.210-11
[19] Cleghorn, H, *Forests and Gardens of India*, pg.32

The second half of the 19th century marked important water shed in the history of British colonial forestry. There was a creation of a governmental Forest Service in India modeled along the continental techniques of forest management. Laws restricting resource use were passed, silvicultural systems inaugurated, and new approaches to forest utilization were launched. The success of the Indian Forest Department in supplying the government of its forest products needs led to the establishment of many Forest Departments in colonies based on the Indian model. Between 1870 and 1900, various Forest Departments were formed with the help of the Indian Forest Department in New Zealand, Mauritius, Cyprus, Ceylon, the Cape Colony, Nigeria, Sierra Leone, Gold Coast, Kenya, Uganda, Malaya and Australia.

In Britain, in contrast to the continental forestry, the British landed classes relied heavily upon the management practice called the 'coppice'- with standards that involved partial cutting, regrowth, and subsequent harvests. This traditional system of forest management in Britain catered to the needs of wood ranging from the domestic to the industrial markets including the navy. At the end of the 19th century, retired colonial Indian foresters helped in guiding, training and in co coordinating the activities of the foresters in their mother country. Therefore we fin that one area where the information passed into Britain through the empire is that of forest management. Unlike other scientific fields, where the expertise involved was grown and nurtured from within the British institutions, forestry was an import- a German seed, acclimatized in British India and then transplanted into the United Kingdom[20].

20 Modernising nature, pg. 154

Situating Environmental History and its main concerns

In South Asia, writings on the environmental history had its beginnings in the late 1980's, a series of books and articles, opened channels that lay unexplored in the past. Two of the earliest articles were written by North Americans, Robert K. Winterns, a professional forester, the other, a radical Indianist and a political historian, Richard Tucker.

R. Tucker's pioneering work was his essay on 'The Depletion of India's forests under British imperialist planters: Forests and peasants in Assam and Kerela". In this work he outlined the process in which forests were cut on a large scale in Assam to establish tea plantations, which was largely dominated by the foreigners. Most of the tea plantations were established by clearing natural forests on lands purchased from the government of India. He drew a link between nationalist protest and the colonial forest policy in Western India. With his article, along with the process of politicization of environment with the beginning of the 'Chipko Movement' in Northern India, various researches were made in the field of environmental history beginning with fresh debates in the history of forests. Environmental history in Asia and Africa first derived its strength from the upsurge of the history from below, pioneered by Peter Burke and E.P. Thompson, and from the increasing contributions by the Annals school (scholars like Marc Bloch, Braudel and E.L.R. Ladurie). According to the scholars of the Annal School, the natural environment among other things, was an important consideration in the understanding of the structures of past. Fernand Braudel in his article 'The Mediterranean and the Mediterranean World in the Age of Philip II' underlined a powerful impact of geography and surrounding environment on the humans.

He says[21],

> "The first is an enquiry into a history that is almost changeless, the history of man in relation to his surroundings. It is a history which unfolds slowly and is slow to alter, often repeating itself and working itself out in cycles which are endlessly renewed. I did not wish to overlook this facet of history, which exists almost out of time and tells the story of man's contact with inanimate nor when dealing with it, did I wish to make do with one of these traditional geographical introductions to history, which one finds placed to such little effect at the beginning of so many volumes, with their brief reviews of the mineral deposits, the types of agriculture, and the local flora, none of which is ever frozen in their migrations, and as if the ships did not have to sail on an actual sea, which changes as the season change".

Emmanual Le Roy Ladurie brought to light the point of environment changes in some of his major works. In his essay, 'A Concept: The Unification of the Globe by Disease (14th to 17th centuries)', he underlined how the spread of the diseases like plague, cholera; had changed the demographic pattern of the world. He at one place state,

> "The world wide ecology of the plague ultimately concerns a complex relationship between man and bacillus, a relationship which relies upon the harmonious function of a ménage d quatre (flea, rat, man). The very existence and geographical diffusion of "ménage" of this type inevitably leads in the long term to friction and incompatibility of temperament; the "ecological framework" of this cohabitation- which often ends in the death of three or four partners- is very limited. The flea, for example needs certain strict conditions of temperature and humidity before it can breed[22]".

Marc Bloch, another historian of the Annal School outlined the importance of nature and its resources. In his book 'The Historian

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[21] Braudel, *The Mediterranean and the Mediterranean World in the Age of Philip II'*, translated into English by Sian Renolds, Harper and Row Publishers, USA, 1973, pg. 3

[22] E.L.R. Ladurie, *The Mind and Method of the Historian*, The Harvester Press, Sussex, 1981, pg.31.

Craft', at number of places, the necessity of taking into account, the environmental factors is outlined.

Thus the Annal School served as a great source of inspiration to the environmental historians of the future.

In India, Ramachandra Guha in his path breaking article,' Forestry in British and Post British India', and subsequent books underlined that the actual deforestation on large scale began during the colonial period driven by materialistic interests of the West. To him, there was little or no interference with the customary use of forest and forest dwellers during the pre-colonial period. In opposition to the views propounded by Madhav Gadgil and Guha, Richard Grove argues that colonial conservatism was based on humanist concerns motivated by growing deforestation and drought. To him, dessiccationsts promoted the idea of forest conservancy in the colonies. However Grove remains silent about the ecological imperialism of Europe, particularly its far-reaching impact on the natural, economic and cultural life of the colonies. One can also say that he plays down the importance of imperialist and capitalist greed behind the forest policy.

Ajay Sakaria opines that forest conservation emerged as a result of the desiccationist discourses which was a part of broader 'civilization mission' of imperialism. Further Elizabeth Whitcomb in her pioneering works on the large-scale Indian irrigation during the Raj emphasized on the negative effects of water works. According to her, the construction of large canals caused obstruction to surface drainage, leading to water logging which in turn led to the spread of malaria. She showed that malarial incidence were highest 'in submontain tracts and in water logged areas of the plain'.

The above discussions have enriched the field of environmental history. Though the number of researches conducted in the colonial period is surpassed by huge quantities of work during the colonial period, one fact

which emerges out clearly in the wake of these scholarly debates that colonial period marked a watershed in the ecological history of South Asia. Various arguments are forwarded to support this fact. The first is that in the pre colonial period, there existed a cultural tradition of prudence at the level of community, called 'conservation from below' which was disturbed in various ways during the colonial period. During the Mughal period, the state did encourage the depletion of forests lying away from villages for more income, but this expansion of agriculture was least harmful to ecology, as damage to forests was not connected to any major commercial needs which arose during the colonial times. Industrial Revolution completely changed the statistics of economy. The British in order to control forests just marked it as a 'backward primitive economy' and the forest dwellers as 'barbaric' and then made efforts to put an end to the shifting cultivation.

The shifting cultivators did cut and burn trees, but the damage was temporary as they could afford to wait till the completion of the process of regeneration. Thus the causes of major deforestation in colonial South Asia lay largely outside the tribal society.

One more field where some researches have been conducted has been attached to hunting. To Mahesh Rangrajan, it was largely during the British rule that number of species of animals came to the verge of extinction. Hunting can be taken as the earliest profession of primitive man, which was an important economic activity for them as they lived primarily on a food- gathering-hunting economy. Many primitive or tribal communities in India still depend on hunting to a considerable extent. Hunting animals for self-protection, occupied a greater part of human activities. What seriously created problems were when the animals began to be hunted for pleasure and it became a sport. Animals' killings became a status symbol of the British and the Indian kings. In Kathiawar, a cavalry

officer was reported to have shot as many as 80 lions, while on the other occasion 14 lions were shot in the Gir foretss, within ten days. Their numbers were further depleted by large scale poaching. Ultimately the situation became so alarming that in a report in 1913, from the then District Forest Officer, Junagadh state, stated that there were only six to eight lions, were left in the area of 1,893 sq.kms. A total ban on the lion shooting was then placed[23].

The killing of specie on a large scale can at times seriously disturb the ecological balance. The first British officer who thought of protecting the wild life was Captain Rogers. He was posted at fort Williams in Calcutta in 1870. While touring, he observed that in the villages of Bengal several people were dying of snake bites. He studied the situation and then reported to the government that owing to a greater trade in lizard skin, the destruction of these animals was carried on a large scale[24]. The lizards feed on small snakes and their eggs. The killing of lizards had tended to cause a large increase in the number of deaths from snakebites. As a result in 1931, in Bengal, a decision was taken that there should be complete protection of immature lizards.

There has been a growing awareness among the people regarding the environmental problems been faced by our country today. Most of the environmental problems arise from the fast denudation of the forests and the resultant disturbances of the eco systems. The large scale depletion of forests for commercial use began with the arrival of the English. According to Ramachandran Guha, the building of the railway network was a crucial watershed in the history of Indian forestry[25]. Large forests were cut down to meet the demands of the railway sleepers. In his famous minute of

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[23] Ajay Rawat (ed), *History of forestry in India*, Indus Publishing Co., New Delhi, 1999, Pg.139.
[24] *ibid*, pg. 141.
[25] Forestry in British and post British India, pg.1883

1853, the Governor General of India, Lord Dalhousie, wrote that railway construction was both the means for creating a market for British goods and the outlet for the British capital looking for profitable avenues for investments. Later the Forest Act was passed in 1878 which created the category of the Reserved and the protected forests in India. As a result, the area of forests under the State control steadily increased. In 1878, there were 14,000 sq miles of State forests which by 1890 had increased to 76,000 sq miles and by 1900, there were 81,400 sq miles of reserved forests and 8,300 sq miles of protected forests.

Central and South Gujarat

I have attempted in my study to analyze and situate the ecology of South and Central Gujarat in the all India forest policy and locate the points of similarities and differences.

Ajay Sakaria had researched deep into the Dangis way of life and the systematic passing away of their forests into the hands of the British. He coined the term imperial dessicationism, which stressed for an exclusive control over the forests. Dessicationism is a set of ideology which played a major role in setting up of the Forest Departments in many of the British colonies. However during that process, the maximization of revenues became the chief motive of the Forest Department, and it is from here that a shift was seen from the dessicationist policies to the scientific management of the forests. In contrast to dessicationism imperialism which meant extensive systems of control, the practitioners of scientific forestry preferred intensive system of control over the forests. Working Plans were an important tool of the scientific forestry. The tribal practice of shifting cultivation began to be despised, as it was considered destructive and unscientific. On the other hand the formulation of working plans with the systematic axing of trees in regular cycles was considered to be systematic and scientific.

According to my studies, the Dangs, an important forest territory of South Gujarat shows the case of both imperial dessicationism and scientific forestry. First attempts were made by the British to secure timber leases from the Dangi kings, so as to bring forests under the States control. This shows the principle of dessicationism been applied to the Dang. Later when the extraction of revenues became the prime motive the British, the practice of scientific forestry was introduced. Under it, shifting cultivation was banned, collection of Mahowa flower was restricted and working plans were introduced. Various Working Plans (such as Rajpipla East and West, Dangs North and South, Valsad North and South divisions and Working plan for the and Dharampur forest division) formulated by the government shows a tendency of the western imperialists to commercially exploit the forests under the garb of the scientific management.

Tribal—forest, deforestation, soil erosion, shifting cultivation resistance, politics of environment, subsistence, shikar or hunting and animal worlds are an important elements of tribal and nature co-existence. From ancient times people lived with the forests and their interaction with the forests did not do any harm to the environment. As David Hardiman talks of the Bhils in the Dangs[26]:

> '(they) had a strong affinity with these woods and hill--their home as well as place of refuge—and any destruction which they carried out was on so small a scale as to make very little difference to the environment as a whole'

The people of the land had learnt through experience the wise principle of adjustment and accommodation with nature. Thus the country was gifted with a definite environmental management system, constituted by social and cultural institutions, regulating utilization of natural resources. It was the colonialist British who rejected the Asiatic notion of mutual survival of both trees and humans and their inter-productive existence. They disturbed the natural equilibrium first by encouraging cultivation through

[26] Power in the forest :Dangs1820-1940, subaltern studies, vol viii, p 105

forest clearance for maximizing land revenue and then by introducing organized or scientific forestry for commercial timber production. They also destroy the hold of these institutions by assuming domination over the Indian nature, monopolized the resources of the land with absolute denial of customary and traditional rights over forests ,water and other related resources

There were wide protests by the tribal people against the forest policies of the British. In the 1880's when the Government of Bombay Presidency was demarcating the rich teak forests of the Dang district, a Bhil tribal chief sent a petition stating that[27],

> "We do not wish to let the Dang jungle be demarcated, for thereby we shall lose our rights and we and our poor ryots shall always be under control of the Forest Department and the department will always oppress us.

When the European model of strict State control over forests was practiced in the colonies, the affected communities responded with arson and violence, which had become recurring phenomena in the countries ruled by the British, the Dutch and French. One such territory was Dangs and the Panchmahals, where there were increasing cases of such sort. These conflicts continued when the postcolonial government also followed the authoritarian model of managing forest movements inherited from the colonizers. According to David Hardiman, the revolts by the tribal people in the Dangs and the Panchmahals appear to have been caused by a violation of what E.P. Thompson calls 'the moral economy of the poor'. James C Scott has tried to apply Thompson's concept of the moral economy to the peasants of South East Asia, in a book titled '*The Moral Economy of the poor Peasants*'. According to James Scott, there are two moral principles which could be applied to the peasants. One is the 'the

[27] *Hybrid Histories*, pg 216

norm of reciprocity' and the other is the 'right to subsistence'[28]. First is the moral obligation applied to the peasantry and the dominant classes in which the peasants provide agricultural produce to the dominant classes and the latter reciprocates with its services. 'The right to subsistence' is a belief that everyone in a society has a right to subsistence. Exploitation leaves a peasant hungry which compels him to violate this moral code.

James Scott further argues that the large scale changes brought about in the peasants societies through their alienation from their lands, forests and other resources have violated these moral codes[29]. High colonial land taxes coupled with the deprivation of the peasant's basic rights to use forests and lands forced peasants to rise in revolt. Such risings were defensive movements caused by resentment over the breaking of the moral code rather by starvation. In the Panchmahals, the cause of rising does not appear to have been starvation. What made the Bhils dissatisfied was that the grains were being hoarded by the *sahukars* and it was anticipated by the tribals that if the hoarding continued, they could at any time face the situation of starvation. Therefore they rose in revolt against the *sahukars.* The burning of the forests by the Dangis and by the Bhils of Panchmahals can be termed as the reaction against the British for breaking the 'moral code'. For example the British policy of banning the shifting cultivation and the restriction on the collection of the *mahowa* flowers instigated the tribal people to rise in revolt.

Tribal culture shows an example of synchronization of life with nature. In my research, a detailed study has been made of how the elements of nature have been incorporated in the tribal dances (*Marghi Charo*, where the movements of cock is imitated, *Shikari nritya*- hunt dance, *Aaleni-Haaleni nritya* which welcomes the spring season, *Sherdi Charo*- the sugarcane dance and *Khiskoli charo* in which the voice and movements of squirrel is imitated) songs, paintings, festivals and religion. Nature has

[28] James C. Scott, The *Moral Economy of the poor Peasant: Rebellions and Subsistence in Southeast Asia,* Yale, 1976, pp. 167-86.
[29] *ibid*, pg.4

been deeply embedded in their daily activities and has been their abode since centuries. This is the reason why the discontent had spread amongst them, when the British systematically formulated the plans to alienate them from their abode.

The British control over the forests was coupled with their efforts to control water resources also. Irrigation is an extremely important part of cultivation, which generates revenues for the ruler. The Institutions which control or manage irrigation and their relationship with the general political authority has attracted the attention of the social scientists in the western world. Karl Marx, a great social thinker of his age, said that the peculiarities of the Oriental society can be associated with the technical and organizational compulsions of water control. Marx wrote[30],

> "Climate and territorial conditions made artificial irrigation by canals and waterworks the basis of the Oriental agriculture. And this prime necessity of an economical and common use of water which... drove private enterprise to voluntary association, as in Flanders and Italy, necessitated in the Orient where civilization was too low and the territorial extent too vast to call into life voluntary association, the interference of the centralizing power of the government.

Max Weber, a German sociologist and a political economist, also shared the similar views between the necessity for irrigation and the important role of the bureaucracy in ancient Egypt, West Asia, India and China. He argued[31]:

> "...in the cultural evolution of the Egypt, West Asia, India and China, the question of irrigation was crucial. The water question conditioned the existence of the bureaucracy, the compulsory service of the dependent classes, and the dependence of the

[30] Karl Marx, *The British rule in India*, New York, 1853; Reprinted in Karl Marx and Frederick Engels, *Selected Works*, Progress Publishers, Moscow, vol.I, pg.283.
[31] Max Weber, *General Economic History*, Collier Books, New York, 1927, pg.237

subject classes upon the functioning of the bureaucracy of the king".

This line of argument was further elaborated by the social anthropologist and historian, Karl Wittfogel, into a general theory stating that there is an inherent tendency of hydraulic societies to become centralized despotic states. However his theory evoked some sharp criticisms and stimulated a number of detailed studies of irrigational institutions in different parts of the world. The studies which ensued revealed wide variations in institutional arrangements over the construction and management of the irrigation systems. It was arrived at the conclusion, that there can be no definite correlation between irrigation and political authorities. In the same way it is not necessary for the irrigation societies to be centralized or authoritarian. 'Irrigation' is itself a kind of organizational activities which involves, control of water source, and delivery of water, facility construction, operation and maintenance of water storage system, water allocation and conflict resolution. Hence it may be inappropriate to talk about irrigation organization as a single entity handling all phases and functions. It has to be viewed in terms of arrangement for performing the various functions in each of the phases of irrigation and water control[32].

We find that most studies in the Asian context view water control and management primarily in terms of their relation to general political authority. Though wide variations in the irrigation management are documented, attempts have hardly been made to examine the importance and the reasons behind these variations. In India, even such studies are not available. The researches so far made view irrigation in relation to the kind of climate and agriculture, technology of water control, land tenure etc. In Baroda, various tanks, wells and stepwells were in use for storing water and for irrigation purposes. Several tanks were constructed by the

[32] William Wright Kelly, *Water Control in an Agrarian State: Irrigation Organisation in a Japanese River Basin,* University Ann Arboun, Michigan, pp 14-20

State of Baroda with small distributing channels. Some important tanks in the Baroda district are, Vadhvana, Karachia, Raval, Haripura, Dhanora, Muval and Manopura tank. In the Navsari district, the important tanks were Dasuvada, Chikli and Zankhari.

Many stepwells were also constructed in the State of Baroda. Of these the most notable are the celebrated Navalakhi (meaning nine lakhs) stepwell in the district of Sevasi, Mandala at the Dholka taluka and Sojitra at the Petland taluka of the Baroda district.

Sunita Narain and Anil Agrawal in "Dying Wisdom" have stressed that the Indian water harvesting system was well developed prior to the British rule. Though there are instances of State controlled irrigation in the past, there was also the community management of irrigation. Village communities exercised full control over the means of irrigation. The local bodies had a wide ranging strategy to maintain and repair water reservoirs. For example in medieval South India, a special cess called '*eriyam*' was collected from the ryots according to the specified rates[33]. The tank surplus committee also had the powers to collect the taxes. General water disputes were also settled locally though at times royal officers were invited to arbitrate. According to Sunita Narain and Anil Agrawal, these water managing institutions began to break up, as a result of the exploitative revenue demands of the British. The village communities began to breakdown and consequently the water harvesting structures like, tanks, stepwells, etc. began to decline or went out of use. The British concentrated more on the building of large dams, rather than construction or revising the small water storing structures.

David Hardiman in his pioneering work on 'wells in Gujarat', have stressed that the colonial rule cannot be completely held responsible for the destruction of the traditional hierarchical institution of the village

[33] *Dying Wisdom*, pg.300

communities, but rather strengthened the basis of their power by granting property in land and water[34]. According to him, the decline in the water harvesting system during the early 19th century, caused initially by the political disturbances and warfare which later was reinforced by colonial disinterest and and ruinous rates of land taxes and the knowledge of the earlier techniques of water harvesting was lost. In these traditional systems were multiple forms of water conservation, using check-dams, channels, controlled flooding, reservoirs and wells. But in the colonial period the major emphasis whether in British Gujarat or in the princely states was on wells. In the situation when the colonial state charged an exorbitant high rate of taxation along with the introduction of the concept of private property, the local communities began to loose control over the water resources, as they were deprived of the power to raise taxes for the building and the maintenance of water storage system. This consequently gave rise to the private source of irrigation which could be afforded only by the peasants who are rich. Commodification of water also led to the decline of water harvesting structures. During the pre-colonial period, the customary law regulated the distribution of the water and it was in tune with the requirements of the village communities rather than individual rights over water. The practice of selling titles to land and water resources was not practiced. However under the colonial rule, land and water came to be regarded as a commodity which a wealthy individual could sell ignoring the requirements and the needs of the larger and not so rich community. This means that only those who had the land could own the water resources, and those who did not had colonial land deed were excluded from it. This caused the collapse of social institutions which monitored traditional water management structures and led to the irresponsible use of water for the personal gains[35]. As the greed for a larger quantity of cash crops and land revenue demands increased the

[34] *Well Irrigation in Gujarat,* pg.1533.
[35] Chhatrapati Singh, *Water Rights and Principles of Water Resources Management,* New Delhi, 1991, pp. 55-57.

British began to encourage the use of mechanized pumps to expand irrigation in Gujarat---Kheda and Ahemadabad. There were potential dangers of this new technology as it could lead to extraction of ground water in an unsustainable way, this also puts a question mark on the riparian right as it would lead to a wealthier neighbour who can afford a pump would be able to draw larger quantities of water and the poor neighbour would suffer the depletion of ground water even in normal times-thus creating a drought situation.

Gujarat prior to the British rule had an indigenous water storing structures. Tanks, wells and stepwells could be seen in the entire State which helped in the irrigation of crops when the rains were not available. Those structures were maintained by the village communities. When the State passed into the hands of the British, initially taxes were assessed on the basis of irrigated lands according to the local prevalent cesses. The irrigation taxes were not uniform as in some cases taxes were determined on the basis of crops grown and in other cases according to irrigation carried out. With the tax settlements introduced in Gujarat from the mid nineteenth century, a more uniform system of taxing land on the basis of irrigation status evolved. A dry crop rate was assigned to each field, with the extra charges being levied over and above this amount according to its capacity for irrigation.

These taxes can be termed as a 'rent' paid by the cultivators for using the water resources. In this way, the British appropriated the water resources of India from those who had a customary right of using it. Gradually with the decay in the water harvesting structures and the installations of pumps and tubewells, a crisis situation is now present in Gujarat, with its many cities and villages, facing the severe scarcity of water.

It is now important to discuss in the light of these past situations, the present condition of the Gujarat State which is suffering from various ecological problems.

Ecological Situation of Gujarat in Post Independent India

The state of Gujarat, as discussed in earlier chapters is a state with rich history and varied ecology. It account for six percent of the total geographical area of the country. One of the major factors which had led to the prosperity of Gujarat has been its long coast line which has bestowed it with flourishing internal and external trade in the ancient, medieval and modern times. However its long coastline has been threatened by some environmental problems. One of the major environmental problems, which have become chief concern of the people, is the 'Global Warming'. Global warming due to an accelerated 'Green House Effect' is arguably one of the most alarming ecological concerns facing the world. The Green House effect is the phenomena that keep our planet warm due to heat trapping ability of certain atmospheric pressure gases, viz... carbon dioxide, methane, nitrous oxide and Chlorofluorocarbons (CFC11, CFC12). There are two major consequences of the green house effect, climate change and sea level rise.

It has been estimated that during the last century, the sea level rose by approximately 0.12 to 0.15 meters, which is mainly due to the melting of the glaciers and thermal expansion of the oceans caused by global warming. There is general consensus amongst the experts of the area, that even if the sea level rises by .50 m, it may have serious ecological and socio-economic consequences such as,

- Flooding of low plains and wetlands near coastlines.
- Erosion of coastlines
- Increase in storm tides
- Stalinization of estuaries, deltas and groundwater resources, as well as other adverse effects on the water quality.
- Changes in tidal rise and sedimentation, and

- Decrease in easily accessible groundwater beds

The Gujarat coastline overlooking the Arabian sea extends to a length of 1600km, covering the parts of Valsad, Surat, Bharuch, Baroda, Ahemadabad, Kheda, Bhavnagar, Amreli, Junagadh, Jamnagar, Rajkot and Bhuj districts. Gujarat is one of the most heavily industrialized states in India with major industrial locations running along a belt from Bombay to Ahemadabad. A probable sea rise would have some effects on this belt, disturbing transport, communications and even some industrial establishments on the coast.

Geologists are also seriously concerned with the sea moving into land along the coast from Dahej in Bharuch to Ubhrat in Navsari district is in South Gujarat by roughly five meters in the past year and a half. A team of geologists from M.S. University is in a process of studying Gujarat's coastline-spread over 1,600 kms-and their observations compared with satellite imagery and old maps reveal that in the last 35 years, the sea has eaten away any where between 75 meters and 90 meters on land in and around Dahej. Their preliminary studies in 2005 of coastal area of South Gujarat had shown that sea water had moved in by 10 to 15m from Danti towards Umbergaon. In Danti alone, sea water has moved inland by 80-90 meters which is alarming[36]. Thus the South Gujarat region in near future faces a lot of danger arising alone from global warming.

Gujarat since the pre independence days has been the center of industrial development. It is after independence that, the pace of industrialization has further increased by the development of manufacture industries in the state, which date back to the period of British Raj with the setting up of a large number of textile mills. Then the dye and intermediate dye and stuff industries followed suit. Exploitation of oil and gas led to the

[36] *Times of India*, March 26, 2006.

refining, petrochemicals and downward integration. Abundant limestone deposits led to the setting up of cement industries. A long coastline provided the impetus for the manufacture of marine and various chemicals, which now drives port-based development. In a bid to lead towards rapid industrialization, no attention was paid to save the surrounding environment from pollution emitting industries. According to annual survey of industries for the year 1997-98, the chemical and chemical products, Rubber, plastics, petroleum and coal based industries contributes another 14%, while textiles contribute 85 of the industries. Of 2000 large and medium industries, about 65% are in the polluting sector. Around 45% of the small scale industries are also in the polluting sector[37].

Most of the highly polluting industries in the list, identified by the Central Pollution Control Board (CPCB) can be found in Gujarat. The Labour Commission, Gujarat has identified that there are 116 highly flammable, poisonous, lethally toxic and hazardous chemicals being produced in Gujarat. It is reported that the production of some of these are either banned or agreed to be phased out in the developing countries.

Some massive killers (%) 1993

Diseases	Gujarat	India
Bronchitis and Asthma	8.8	8.2
Heart Attack	8.1	5.7
Tuberculosis of lungs	9.2	5.7
Cancer	4.7	3.1

[37] *State of Environment in Gujarat*, Ecological Commission of Gujarat, Govt. of Gujarat, Vadodara, 2001, pg.7

The above table shows that certain diseases which are caused due to breathing of polluted air and living in the polluted atmosphere were major killers in Gujarat[38].

GOLDEN CORRIDOR

> "Ours is a world of nuclear giants and ethical infants. If we continue to develop our technology without wisdom or prudence, our servants may prove to be our executioner"[39].

Valsad is the southern district of Gujarat. Blessed with the good rainfall, the region has traditionally been the fruit basket of Gujarat. Besides the teak and rice paddies, it was and continues to remain a significant producer of mangoes, guavas, chikoos and coconuts. Given its proximity to the Arabian Sea and the fact that five perennial rivers flow into the sea, the region has been home to tens of thousands of people, most of whom are dependent on marine and riparian resources for a living. However, the industrial boom in the late 1960s has transformed the region from an area of pristine beauty and self-sufficient communities to industrial wastelands. The Vapi industrial Estate was set up in 1907 in the district of Valsad to absorb the industrial investment from neighbouring Mumbai. Today this estate has more than 1,950 industries in 1,117 hectares of land[40]. Vapi has around 1,800 factories of which roughly 450 are categorized as polluting industries- 50 paper mills, 60 dye intermediate producing units, 200 dye industries, 100 pharmaceutical factories, 25 textile dying units and 10 pesticide plants.

In fact, the factories have made it a common practice to discharge their toxic effluent into rivers, creeks, streams and open lands, and dump their hazardous solid wastes on public lands or within the estate. Apart from

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[38] *ibid*, pg.8
[39] *ibid*, pg.9
[40] *Indian Express*, 22 Feb, 2007.

this the sheer magnitude of water used by the industries has robbed other water users of their fundamental right to clean water. According to Central Pollution Control Board, the district has at least 17 medium- and large scale paper and pulp mills. These are highly water intensive, consuming as much as 250-450 cu meters of water per ton of pulp, besides discharging their wastes into the nearby Rivers, Kolak, Damanganga and Par[41].

Sumanbhai Desai, a fruit grower in the Valsad district, states, "The River Par was dammed in the 1950's to provide water for the Atul Complex (a large manufacturer of hazardous chemicals)". The river is diverted, used by Atul and the effluents are released into the water which in turn is consumed by the people for their daily necessities. Part of the river is diverted to augment the water supply to GIDC Vapi, for the drinking purposes. The people living in and around Atul Complex have reported a significant loss in both horticulture and farming. The Golden Corridor traverses the basin of the River Sabarmati, Mahi, Narmada, Tapti and Damanganga, which among them represents 78.1% of the available surface water resources.

The water quality in Sabarmati worsens considerably in the stretch from Vansada, Naroda and other industrial estates. Pollution of the river Narmada begins downstream of Bharuch where it is joined by its tributary Amlakhadi. This tributary carries effluents from Ankleshwar, Jhagodia, and Panoli industrial estates. The River Damanganga receives effluents from chemical industrial complex manufacturing pharmaceuticals, dyestuffs and other chemicals in the Vapi area. It suffers from the waste water discharges of the Vapi industrial estate. The map on the page shows the level of pollution in these rivers.

[41] *State of Environment in Gujarat*, pg.10

Gujarat suffers from the scarcity of drinking water. It depends heavily on groundwater to meet municipal, industrial and irrigational needs. Overall groundwater accounts for over 76% of the irrigated area in the state and is the basic source of supply for many municipal and industrial needs. However scarcity of water is acute in North Gujarat and the region of Saurashtra and Kutch, which receives at times less than 400mm of rainfall. Further the rapid growth in extraction has led to over development of groundwater resources in many parts of North Gujarat and along coastal areas. It has been concluded by Bela Bhatia, in her excellent article, 'Lush fields and parched throats' that during some worst famines in Gujarat in the years 1731, 1741, 1812, 1899, 1901, no corresponding account of hardship caused by groundwater scarcity was found[42]. The groundwater was available in abundance even in the drought years of pre independence period. However the over extraction of water by the installation of boring pumps and tubewells had begun in the beginning of the twentieth century under the British rule. Acute water scarcity was noted during the drought of 1960-61 and also during the subsequent droughts of 1963-63 to 1968-69 (when drought occurred year after year in one part of the state or another).

Broadly two causes of this accelerating depletion of groundwater can be seen as one aspect of a broader ecological crisis, involving particularly the disruption of the hydrological cycle. Second, there are important economic forces, especially the indiscriminate expansion of modern water extraction devices and of water intensive crops in the areas of groundwater scarcity.

The 'Hydrological Cycle' refers to the continuous circulation of the earth's moisture through evaporation and precipitation. It is this cycle, which makes water a renewable resource. The excessive pumping of water not in proportion to the recharge rate can disrupt this cycle and lead to the

[42]Bela Bhatia, Lush Fields and parched Throats, Political Economy of Ground water in Gujarat, *Economic and Political Weekly*, Dec. 19-26, 1992, pg. A-142.

depletion of water resources. The rate of percolation depends chiefly on the characteristics of the soil. Coarse sandy soils permit fast percolation, while fine clayey soil permits slow percolation. In Gujarat, denudation also has played a major role in accelerating run off and reducing groundwater recharge.

Just as denudation is a cause of increase water scarcity, the disruption of the hydrological cycle itself contributes to the disappearance of forests. The National Forest Policy (1952) has described that, of the total land area, 33% should be covered by forests. Official statistics of Gujarat shows that the state falls short of the prescribed criteria and in 1981, forests formed only 10.4% of the area. (See map VA).

The experience of desertification has found deep expression in oral histories and local folklore. Umashankar Joshi, a celebrated poet, talks about his native village in Bhiloda taluka of the Sabarkantha district as the most beautiful spot on the earth with its dense forests, rich foliage and fresh water rivers and streams. But today, the hills are at the edge of the Aravalli range are completely barren of vegetation[43].

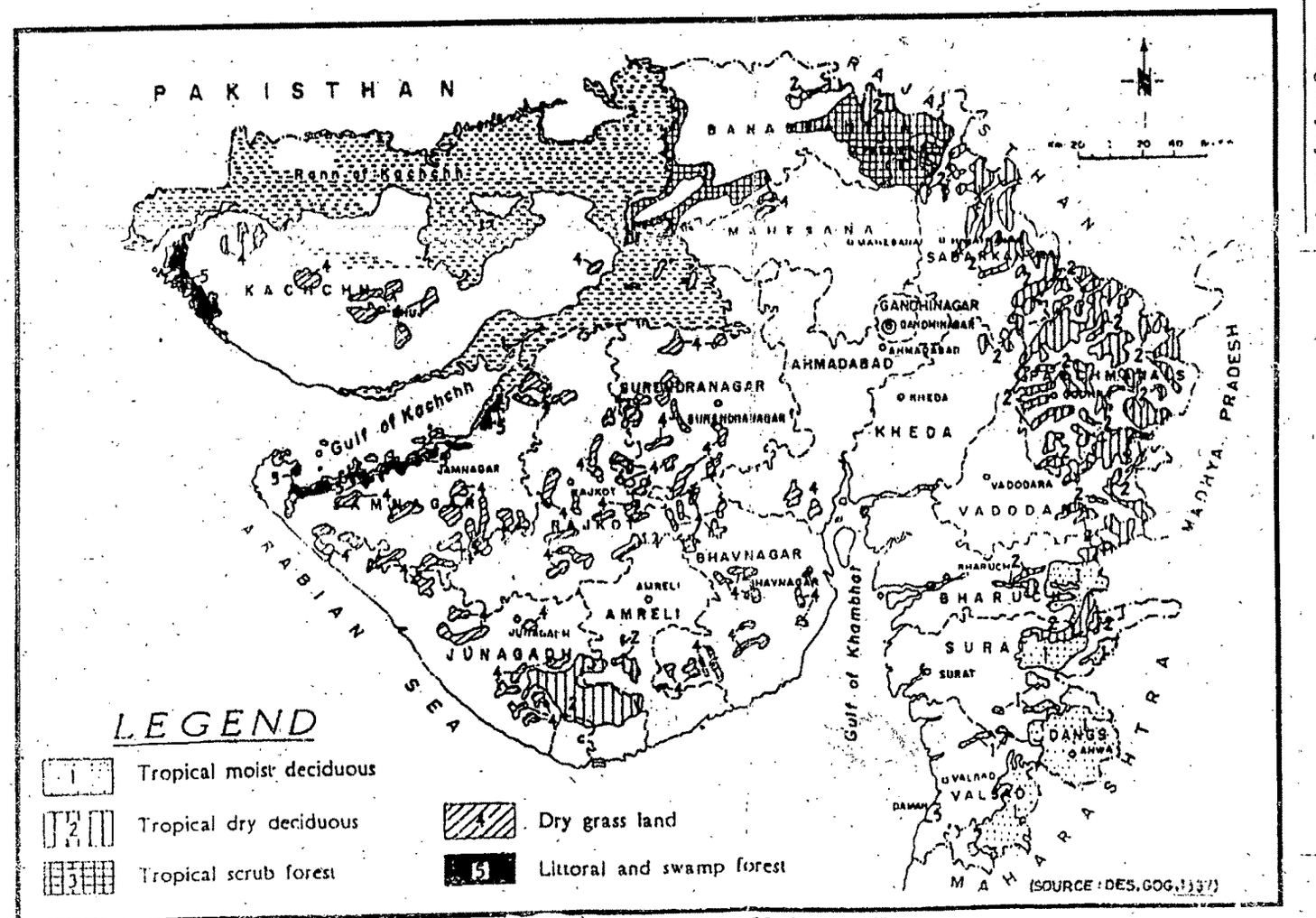
The real consequence of the loss of forests is borne by poor villagers and adivasis, whose survival is depended on these wooded resources. Women not only have to walk longer distances for water, but also have to spend on an average five to six hours every two or three days on firewood collection. It is the growing scarcity of such precious resources like wood or water, which is becoming the most alarming aspects of the environmental crises.

The exploitation of the forest resources on the name of industrial development is the other major reason for its depletion. The poor farmers

[43] *Ibid*, pg. A-148

Map V A

The Forest Cover of Gujarat



FOREST MAP OF GUJARAT

Ecoregions of Gujarat

Source: State of Environment in Gujarat, Ecological Commission of Gujarat, Govt. of Gujarat, Vadodara, 2001

and tribal people in absence of any gainful employment, in the North and South Gujarat are forced to trade a head load of wood for a small amount of cash, or in exchange for a pitcher full of buttermilk on which the family survives for three to four days. Through this widely prevalent practice, the higher caste rich farmers manage to maintain load of feulwood inspite of the general scarcity. Meanwhile, the poor become helpless victims of this vicious circle of economic destitution and environmental degradation.

The development of the modern sources of for the extraction of water has increased many folds in Gujarat. The initiative was taken by the British to increase the revenue, which further was accelerated by post independence Indian government. Today the wells continue to be the single largest source of irrigation, a change in the category of 'wells' has taken a place. Earlier irrigation was done through the use of bullocks or manually, today, however well irrigation generally involves energized pumps. Thus the dug well or the open well of the 60's have given a way to the tube wells of the 70's and 80's. This has inevitably led to the expansion of the irrigated fields which is due to the rapid expansion of modern extraction systems. The following table shows the increase in the percentage of energized tube wells and pump sets in Gujarat compared to dug wells[44].

[44] *Ibid*, pg, A-152

Table V A

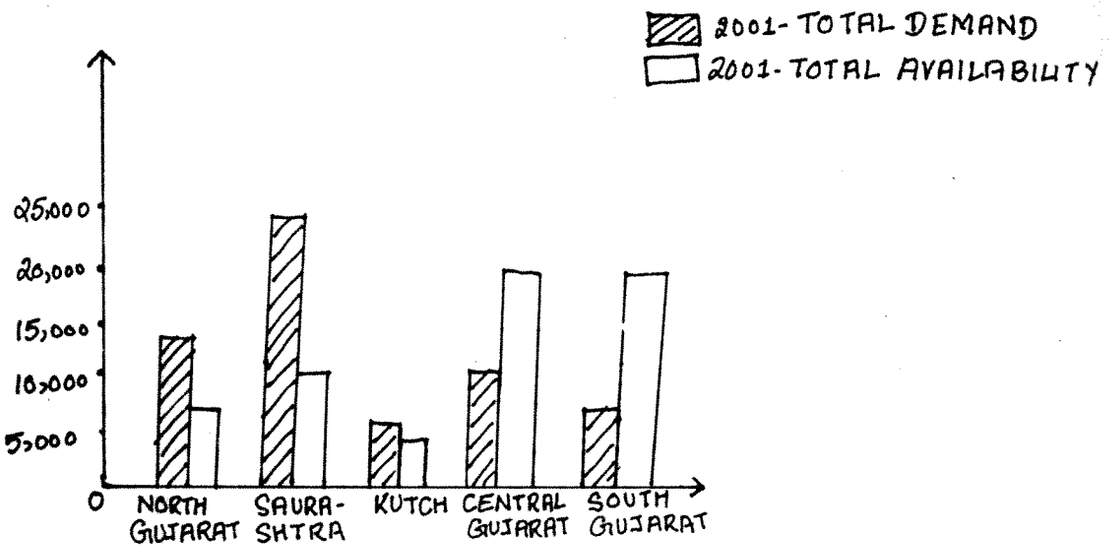
Comparative Table of Wells in Gujarat-1980-1985

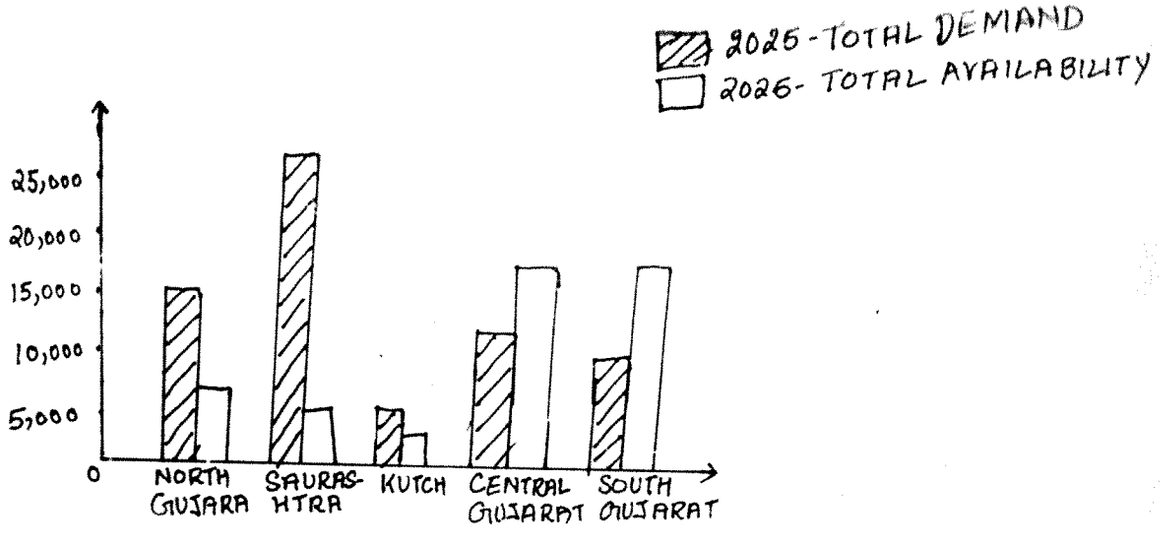
Figures in thousands

Groundwater extraction structures	Number of structures in 1980	Number of structures in 1985	Percentage increase over last 5 years
Dug Wells	654.0	672.9	3
Private shallow tubewells	2.5	4.5	80
Public tubewells	2.2	3.9	77
Electric Pumpsets	202.9	294.1	45
Diesel Pumpsets	565.5	732.5	30

These mechanized technologies have thus been playing a major role in the lowering of the water table. In the past, droughts caused major famines while water scarcity was a relatively minor problem, but at present, the groundwater scarcity in Gujarat is no longer confined to drought years. The most alarming signs of the water crises are the decline of water tables, the spreading of salinity and the increase of fluoride levels in groundwater. If this trend continues at a current rate, large parts of the state will soon be converted to deserts. The depletion of groundwater means that even the traditional wells would dry up.

Following are the details of the mismatch between total water demand and its availability for water deficit regions and water surplus regions[45].





[45] *State of Environment in Gujarat*, pg. 29

With annual average rainfall varying from about 300mm in Kutch, 700mm in Saurashtra and North Gujarat and about 2000mm. In South Gujarat, the distribution of water resources is highly skewed in the state. The state can be broadly divided into two regions from the point of view of water availability. The areas north of the River Mahi comprising north Gujarat, Saurashtra and Kutch are water scarce while the areas south of the River Mahi, comprising south and central Gujarat are water surplus. But from the table, it can be noticed that by 2025, the percentage of total available water will reduce in these regions. If the destruction of forests and the extraction of water through mechanized technologies continue on the same scale, these two regions may in future become water scarce regions.

Broadly speaking, three types of intervention can be identified to prevent the over exploitation of ground water resources.

The first type, which has received most attention, includes state regulation of the private sector. In this case, the government attempts to introduce a set of rules or incentives that influence the behaviour of the private sector in the direction of the control of water. Within this category, one can make a further distinction between 'direct' and 'indirect' regulation of water. The former seeks to impose direct control over the use of groundwater, while the latter may include electricity rates, crop prices and credit policies.

The second form of intervention concerns the positive involvement of the public sector in a rational use of water resources. Some of them can be:

- The implementation of water shed programmes and the construction of tanks in order to encourage greater use of surface water.
- The revival of forms of traditional and ecologically sound system of collective ground water use and conservation.

- The channeling of groundwater resources through public tubewells.

The third approach is management of groundwater conservation by the village communities. Here the aim is to enable the village communities to make use of the information and control it possesses on the local resources and individual behavior in order to prevent the excessive depletion of the groundwater.

Soil erosion is the other environmental issue, which has become severe in Gujarat. Soils are important as they give life to the plants. It is the top layer of the soil, which contains all the necessary minerals and nutrients, providing vital growth of plants. Cause of soil erosion could be attributed to the depletion of the forests, as their roots firmly hold the soil. Once the trees are cut, and land becomes bare, the top soil-which contains essential minerals and nutrients, get washed away.

It was estimated in 1994, that 170 of the 184 talukas (into which the state was divided at that time) were affected by water erosion of soils in varying degrees. Of the total geographical area of the state, 33.5% was found to be affected. The problem is severe in the Dangs, Bharuch, Valsad, Panchmahals and Sabarkantha. South Gujarat is the region of high rainfall and heavy rainfall over a short duration along with the fast denudation has resulted in the erosion of soil. See map

Therefore we find that removing of the tree cover leads to multiplicity of environment degradation. Gujarat actual forest area of 1256 sq kms (1907) constitutes only 6.4% of its geographical area, which is well below the prescribed national level. The per capita forest area fell from 0.06 hectares in 1980 to 0.04 hectares in 1996. Between 1951 and 1975, about 2.5 million hectares of forests were cleared to make land available for

agriculture. In later years, further 519, 13.3 hectares were denuded to make room for development projects.

The word 'development' itself contains many contradictions. Developments in pre independence and post independence period have often confronted with nature. Humans have tried to tame, restrict and even order nature so as to provide room for various development projects. The clearing of trees for construction of buildings, for building highways, for making large dams, all leads to the disastrous impact on the environment. State environmentalism is meant only for development with the declared objective of scientific conservatism whereas the people at the bottom prefer to side with the ethical or non-materialist idea of survival of the community. This leads to growing binarity between the authoritarian centre and the subaltern periphery over the use of nature.

The environmental disputes which ensue are not only between eco-systems and eco-system people but also between social classes as the fight s politicized between the 'we-state' and the 'they-citizens'. In fact it is also a struggle between the powerful 'centre' and the powerless 'periphery'[46]. The Chipko Movement and the Narmada Bachao Andolan are the best examples of people's environmentalism in the India periphery as against that of the Indian centre.

The River Narmada originates in the hills of Amarkantak in the Shahdol district of M.P. and then travels its way through forests, fields and gorges till it joins the Arabian Sea. All along the route, 41 tributaries add to its water. Twenty million people inhabit the basin, including tribals like the Bhils, the Gonds and the Baigas. A great variety of agricultural systems and crops are encountered all along the river banks. Since the river passes through three states, it was inevitable that Narmada project should

[46] Alok Kumar Ghosh, State Versus People: The Indian Experience of Environmentalism in Ranjan Chakrabarti,(ed) *Situating Environmental History,* Manohar, 2007,pg.66.

become the subject of an interstate dispute. To resolve the issue, the Central government finally set up the Narmada Water Dispute Tribunal in 1969. Engineers and bureaucrats from the rural states of Madhya Pradesh and Gujarat kept inflating the numbers of dams and their sizes in order to convince the tribunal that 'their state has best plans to utilize the water of the river. Eventually, the number of projects (major, medium and minor) reached an astronomical figure of some 3200 dams. Two of the most important major dams were Narmada Sagar and the Sardar Sarovar Dams.

Sardar Sarovar Dam on the Narmada River is viewed as an illustration of India's economic development. It is constructed near Badgam in Bharuch district of Gujarat is expected to irrigate 1,500,000 hectares and generate 300MW electricity[47]. It would submerge historic temples, at least 250 villages and would force 70,000 people to become ecological refugees[48]. However the costs of some of the dam environmentally have proved and will prove costly on many fronts. Such a big dam, in a country in which the forest area is already markedly below the prescribed norms, the Narmada Sagar will submerge and destroy another 40,332 hectares of the forest area. This forest will be clear felled prior to inundation[49]. This figure does not include extra 1,500 hectares required for staff colonies, canals and related works. The Sardar Sarover will inundate an additional 13,744 hectares of rich deciduous forest. With the forests, there will also the disappearance of hundred of species of flora and fauna, which will further make our eco system fragile. Further, the large dams often face the problem of siltation where the silt is deposited within the reservoirs of large dams; it drastically reduces their storage capacity and their useful life. In

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[47] Claude Alvares and Ramesh Billorey, Damning the Narmada: The Politics behind the Destruction , *The Ecologist*,vol. 17, No.2/3, March/June, 1987, pg. 63

[48] State Versus People: The Indian Experience of Environmentalism, *Situating Environmental History*, pp. 70-71.

[49] Damning the Narmada: The Politics behind the Destruction , *The Ecologist*, pg. 64.

1976, the National Commission on agriculture noted that the rate of siltation of some of India's major reservoirs has been alarmingly high.

Another problem attached with big dams is the problem of water logging and salinity. Water logging is usually associated with large-scale irrigation schemes, which lack effective drainage to enable surplus waters to be flushed away. Where such drainage is not in a proper working condition, surplus water accumulates, leading to a rise in the water table, with ground water eventually making their way to the surface where they evaporate leaving behind salts. It is being grudgingly admitted today that the rich alluvial plains of Punjab and Haryana suffer seriously from desertification through water logging and salinisation, induced by excessive irrigation. Expanding water availability becomes a heavy but undisclosed price to pay for the Green Revolution. Is the same happening to Gujarat too?

Construction of dam, also leads to the large-scale displacement of people. According to the Institute of urban affairs, New Delhi, the entire Narmada Valley Project will lead to the eventual displacement of over one million people. Thus, as even the World Bank (WB) admits will be,"the largest river basin population resettlement to date." This displaced population will face total economic, social and cultural disruption. A large population belongs to the tribal communities. Although these tribal people have been traditionally cultivating forest lands for decades, they do not have legal title to the land: and hence will not get any compensation. Equally traumatic will be the uprooting of the tribal people from their forests and river habitats and their forced dispersal in far flung, areas which are already degraded environmentally. Besides causing serious economic deprivations, the displacement will affect their culture and the basis of their livelihood- their beliefs, myths and rituals, their festivals, songs and

dances, all closely associated with hills, woods and streams and may lead to an identity crisis of a given race of the people.

According to Kalpvriksha, an N.G.O. working on the rehabilitation of the displaced people, the buildings at Kevadia Colony in Gujarat, which has already housed 5,000 staff members working on a Sardar Sarovar dam site, have cost Rs. 230 million including air conditioned rest houses and circuit bunglows. If one adds to the cost of building roads supplying electricity and setting of the communications network, the figure comes to Rs. 330 million, which is more than has been allotted for the permanent settlement of the 67,000 people displaced by the same dam[50].

Since the early years of independence, big dams were promoted as temples of modern India, but the track record of these large projects has been largely dismal.

Rajiv Gandhi, the late Prime Minister of India while addressing the state irrigation minister's conference in July 1986, bemoaned the situation. He said,

> "Since 1951, 246 big surface irrigation projects have been initiated. Only 65 out of these have been completed. Some 181 are still under construction. This is not a happy state of affairs. We need some definite thrusts from the projects that we have started after 1970. Perhaps we can safely say that almost no benefit has come to people from these projects. For 16 years, we have poured money out. The people have not got anything back, no irrigation, no water, and no increase in production and no help in daily lives[51]".

Big dams have always been politician, administration and contractor friendly. The alternative is to build small check dams and revive the traditional water harvesting system. An example of such an effort has been the district of Alwar, in Rajasthan. In early 1970s the Rajasthan

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[50] *ibid*, pg. 64
[51] *Dying Wisdom*, pg.315.

government had declared Alwar a 'dark zone', due to its dangerously depleting ground water resources. However in 1984, a voluntary agency the Taran Bhagat Singh (TBS) after 'learning' from the local community that the roots cause of all the problems was the unsustainable management of water resources. TBS then mobilized the villagers to revive traditional water harvesting structures, such as *johads* (check dams), *anicut*, *talavs* and *Bandhs* without any government help. The idea was not to let a single drop of rain water go off as runoff: arrest the rainwater where it falls. Simultaneously, villagers took to the afforestation drive. The slogan was: *jal, jungle aur jeevan* (water, forests and livlihood). In this way wells were recharged with water, and the people who moved to towns, began coming home, to their traditional economic activities. It was also noticed that animals and birds that had migrated to other areas due to scarcity of rainfall, and depletion of green cover had started to come back after the trees were planted and check dams were built. Thus the ecological balance was on its way to restoration.

The same kind of drive could be initiated in the drought prone areas of Kutch and Saurashtra in Gujarat, north Gujarat and in some parts of central Gujarat where, the rainfall is less and consequently the area suffers from acute water shortage.

Therefore we can conclude that the state of Gujarat is not environmentally safe. The lower water tables, deforestation, floods which visit the state on yearly basis have been the results of the activities of humans that have been in progress since many years. It cannot be denied that, British rule played a major part in uprooting forests, snatching the rights of the adivasis and in the introduction of major technology, which only further degraded the environment. However the situation became worse in the post independence period. In a bid to develop too fast, the reckless destruction of forests on a much rapid pace began to take place. The

Green Revolution was heralded, whose negative impacts can now be felt. New technology was introduced to extract water. Big dams were considered as the temples of modern India, and the role of *talavs*, lakes, and check dams was ignored. No attention was paid to the concept of 'sustainable development'. It is the human greed, which is destroying the nature.

However, whenever there has been a natural disaster, there has been a disaster coping mechanism in each culture. When transformations are taking place in climate at a greater intensity, the urban human culture will also have to transform its coping mechanism. Thus what is important is the transformation of earlier knowledge into a more practical system for dealing with the disaster to make the globe an environmentally safe place to live.

There are many over lappings between environmental and social history. In most cases environmental history plays an umbrella-type role which incorporates the role of specific human societies and their relationship with nature, environmental policy and politics. South Asian environmental history clearly emphasizes the negative impact of the interventionist role of the colonial and post colonial states in the degration of human ecologies; for example, in India the ideology of state managed conservation is facing a crisis today. Smugglers and poachers, supported by political and business interests and sheltered by local communities, raid the protected forests for valuable exports such as elephant tusks and tiger skins. Scientific forestry has alienated the indigenous populations settled near the forests. And forest officers like the colonialists depriving them of their right to the use the forests.

In simple terms environmental history is the history of mutual relations between human beings and the rest of nature. Environmental historians are concerned with the mistakes of the past and they have respect for the physical sciences and unbound optimism for the capability of man.

In conclusion I can state from my experience of four years of intellectual connection with the subject of ecology of South and Central Gujarat that nature has been one of the spaces where we observe the most intense form of class struggle and power politics. The focus of environmentalism is and should not only be with movements for nature, but also be a fight for people, their survival, and rights to mutual interaction with nature. I am drawn towards the idea of Mahatma Gandhi who combined a[52]-

> '...moral critique with a simple lifestyle, living gently on the earth while deploring the multiplication of wants that the modern civilization had brought'.

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[52] Ramchandran Guha, Environmentalism-A Global History, New Delhi, 2000, pp 10-24