CHAPTER – VI

SOCIO- ECONOMIC- ECOLOGICAL AFFAIRS OF WATER IN KERALA: CASE STUDIES IN POINT

The phrase 'God's own country' is often used as a slogan to attract visitors to Kerala; the expression is a way to declare that Kerala is very special than other Indian states in terms of climate, ecology, culture, modernization and human well-being. Surprisingly, with its industrial deadlocks, this agrarian State has managed world attention by increased standards of living. In Physical Quality Life of Index, Kerala ranks number one, is the first Indian State to achieve total literacy and the first to implement land reforms. It has the highest life expectancy in India and also has the lowest birth rate and the lowest infant mortality. It is the only Indian state with hospital facility in every village and its communication infrastructure is most highly developed (www.kerala.govt.in). The paradox is that while the social indicators show a remarkable level, the economic development indicators show very a dismal level. The "human well-being deception" obscures the entire socio-economic-ecological imbalances and increased struggles for land, water and healthy environment has emerged as regular feature in Kerala society.

The commencement of New Economic Policies (LPG) gravitate these struggles and impede the socio-economic and ecological well-being of the resource-endowed areas of Kerala. The people's movement for land at Muthanga, Chengara; struggle for water at Plachimada, Kanchigode; movements to save the rivers Periyar, Chalakkudy and Chaliyar from industrial pollution; to protect the water and wild life of Silent valley, Pooyamkutty and Athirappally; national agitation to save water and fish for the livelihood of fishermen folk of India etc. are some examples in this regard. While, some prospective actions towards socio-economic-ecological well being can also be find out from Kerala. AHADS is one of the notable examples in this regard.

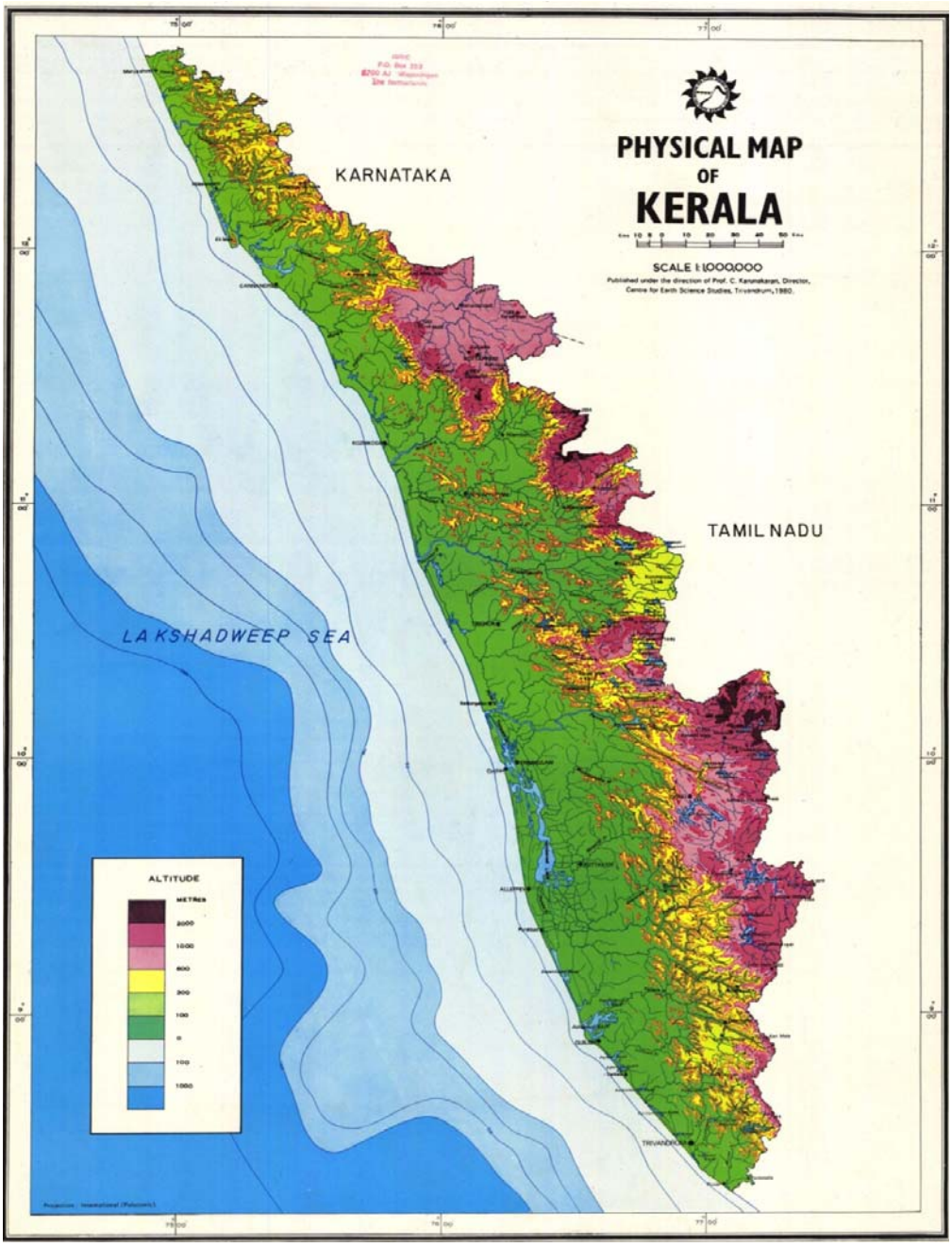

Fig. 6.1 Topography of Kerala

6.1 TOPOGRAPHY OF KERALA

The State of Kerala lays in the south-west corner of the Indian peninsular between $8^{0}18'$ and $12^{0}84'$ North latitude. The State is bounded by Western Ghats in the East, the Arabian Sea in the West, Tamil Nadu in the South and Karnataka in the North. Total land area is 38,863 sq. km covering only 1.3% of the total

area of the country. Total population of over 29 million and the population density at 747 per sq. km, is much higher than the national average of 267 per sq. km, as per the Census Report 2001.

Geographically, Kerala can be divided into three distinct natural divisions- viz., Sandy Coastal Region (<7.6 m above Mean Sea Level (MSL)), Midland region (7.5 - 75 m above MSL) and the Western Ghats (> 75m above MSL) (See Table 6.1, Figure 6.1 and 6.2) (Kerala Development Report, Govt. of India 2008).

Table 6.1 Kerala-Physiographic Units, Altitude and Area

Unit	Altitude (m)	Area (Km^2)	Area in Percent
Low Land	0 – 7.5	3979.3	10.24
Mid Land	7.5 – 75	16231.2	41.76
High Land	>75 m	18653.5	48.00
Source: *Kerala Development Report 2008*			

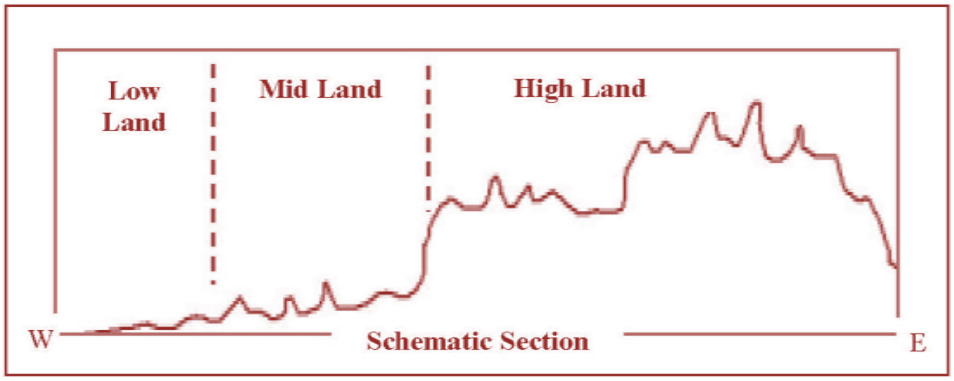

Fig. 6.2 Schematic Section of Kerala

Source: *KSCSTE 2007*

6.2 WATER OF KERALA

Kerala has a distinct water profile and is widely known as a water rich place with 3000 mm average annual rainfall (see Table 6.2), which is about 2.8 times more than national average, with 44 rivers that constitute 850 sq.km water acreage and a 77,900 million cubic meter water capacity.

Table 6.2 District-wise Rainfall Data (Yearly Average in mm) from 1997 to 2008

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Thiruvananthapuram	1860	2080	1882	1530	2102	1505	1567	1911	2133	2322	2051	1932
Kollam	2671	2523	2851	2288	2432	2104	2025	2447	2428	2859	2751	2207
Pathanamthitta	3136	3128	3296	2667	2907	2400	2575	2932	3349	3043	3251	2658
Alappuzha	3189	3108	3104	2634	2748	2478	2324	2797	2599	3021	3107	2585
Kottayam	3122	3371	2957	2423	3078	2574	2780	2913	3386	3755	3468	2534
Idukki	3885	4247	3823	3302	3685	3361	3152	3834	5707	4015	4453	3031
Eranakulam	3490	3317	3053	2858	3587	3018	2593	3204	3402	3858	4046	2874
Thrissur	3082	3315	2748	2199	2761	2569	2248	2928	2857	3577	3954	2310
Palakkad	2405	2407	2173	1862	1970	1833	1728	2225	2648	2659	3270	1884
Malappuram	3453	3019	2852	2109	2508	2200	2206	2626	2632	3408	3544	2145
Kozhikode	4062	3392	2795	2623	2646	2845	2274	3348	2347	3659	4701	3328
Wynadu	2921	2438	2219	2350	1980	2098	1915	2633	3212	2586	3093	2142
Kannur	3961	3484	3037	3033	2944	3087	2865	3423	2643	3426	4092	2823
Kasaragod	3744	3778	3233	3332	3854	3174	3064	3047	2521	3445	3856	3320
State	3213	3115	2859	2515	2800	2518	2380	2876	2990	3260	3546	2555

Source: *Indian Meterology Department, Government of India. 2009*

There are 34 fresh water lakes and several ponds (see Table 6.3) that comprise 330 sq.km of surface water in Kerala and constitute about 9 percent of total land area.

Table 6.3 Kerala Water Scenario

Surface water resources	Ground water resources
Average annual Rainfall – 3000 mm Rivers – 44(hold 70,300 Mm3 of water/year) Lakes – 34 Backwaters – 53 Springs – 236 Ponds- 995	Open well density 200 wells / sq. km in the coastal region 150 wells / sq. km in midland 70 wells / sq. km highland Estimated ground water available - 5,590Mm3 Ground water withdrawal – 980 Mm3 Ground water recharge – 8,134 Mm3
Source: *ENVIS -Kerala Status of Environment and the Related Issues, Quarterly Newsletter Vol. 1 No. 1. January – March 2007*	

Dug wells, 6.5 million in number (see Table 6.4), perhaps the highest density in the World, are the major sources of ground water in Kerala adding 7900 million cubic meters (MCM) of water to the fresh water prosperity. Besides, bore wells are spread all over the state during last two decades. Thus the water table in several districts has drastically fallen to 200-250 metres (Alex 2004). Ponds and lakes too recharge well-water and provide water for domestic uses and irrigation that ensure ground water conservation. The State has 995 reported ponds, which have 10000 cubic metre water collecting capacity. But the lack of reliable ecological/environmental policy options undermines the survival of small water bodies in Kerala.

Table 6.4 District wise Distribution of households Depending on Wells as Source of Drinking Water, Kerala, 2001

District	Total Households	Households Depending on Wells			
		Rural	Urban	Total	%
Kasargod	220293	140676	29259	169935	77.14
Kannur	444547	201765	188872	390637	87.87
Wayanad	164039	116988	3828	120816	73.65
Kozhikode	555360	319182	143748	462930	83.35
Malappuram	598031	477922	40863	518785	86.745
Palakkad	522258	308986	28662	337648	64.65
Thrissur	625382	332142	117082	449224	71.83
Ernakulam	666753	244907	87128	332035	49.79
Idukki	266462	109208	6253	115461	43.333
Kottayam	426527	290871	36177	327048	76.67
Alappuzha	478523	215788	64115	279903	58.49
Pathanamthitta	290848	216373	18176	234549	80.64
Kollam	585616	413888	67929	481817	82.27
Thiruvananthapuram	750567	425548	92618	518166	69.03
State Total	6595206	3814244	924710	4738954	72.18
Source: *Census of India, 2001*					

"Kerala has an estimated 77.35 BMC of fresh water, but nearly 40 percent of water resources are lost in run off. This loss means only 42 BMC of water is available though the state needs 49.70 BMC for irrigation, domestic use, industrial and other purposes annually and this shortage leads to people exploiting ground water" (Jayan 2004).

6.3 SOILS OF KERALA

In general, the soils of Kerala are acidic, kaolintic and gravelly with low CEC, low water-holding capacity and high phosphate-fixing capacity. Spatial distribution

and physic-chemical properties of the soils are mostly consistent with the lithological diversities of rocks as well as physiographic and vegetation distribution pattern. Subsequently the state's soils can be classified into red loam, laterite, coastal alluvium, riverine alluvium, onattukara alluvium, brown hydromorphic, saline hydromorphic, kuttanad alluvium, black soil and forest loam (www.kissankerala.net). The soils of Kerala have limitations for sustained use under irrigation; only 37 percent of land is suitable for irrigation with certain limitations (KSCSTE 2007). Besides, the land environment of Kerala is confronting many other threats like erosion, mining, quality deterioration, land slide, floods, use of chemical fertilizers and land use changes. Bulk density (BD)[1], is essential for interpreting nutrient budgets and calculating soil porosity. BD of the Kerala soils varies from 0.9 to 1.7 Mgm^3 depending on the locations. Heavy soils (above 1.8 Mgm^3) pose a threat to cultivation, making root penetration difficult. Water Holding Capacity (WHC) which directly reflects the water storage and drainage capacity also shows wide variation ranging from 21.5 % to 50 % (see Table 6.5).

Table 6.5 Bulk Density and Water Holding Capacity of Different Types of Soils

Soil Type	BD(Mgm^3)	WHC (%)
Laterite	1.27 - 1.35	29.7 - 50.1
Forest	1.07 - 1.24	31.5 - 51.8
Red loam	1.17 - 1.71	21.5 - 47.5
Coastal sandy	1.59 - 1.62	18.2 - 20.5
Kuttanad(Acid saline)	0.94 - 1.35	35.4 - 61.3
Hydromorphic saline Pokkali and Kaipad	1.26 - 1.30	49.5 - 51.0
Kole	0.86 - 1.41	41.1 - 86.1
Black	1.20 - 1.79	60.3 - 71.2
Greyish Onattukara	1.43 - 1.64	19.6 - 21.2
Riverine alluvium	1.35 - 1.42	40.6 - 44.6
Brown hydromorphic	1.25 - 1.45	42.5 - 45.3
Source: *State of Environment Report 2007*		

The lesser soil volume because of high gravel content in the laterite soils leads to lesser available water holding capacity and hydraulic properties which leads to rapid movement of water (KSCSTE 2007). The above values indicate that these properties have to be modified favourably by suitable soil conservation methods for improving the air-water relations in soils which ensure good agriculture productivity.

6.4 DROUGHT IN DRIZZLE: REVEALING A MYTH

Kerala is an exquisite geographical region with yearlong rains by two predominant rainy seasons viz. South-West monsoon (June-August) and North-East monsoon (September-December) as well as frequent summer showers (April–June). The former contributes 60-65 percent of water to the total water availability of the State, 25 percent by the North-East monsoon and the rest is covered by the summer rains. However the State goes to drought at the very end of monsoon. The water scarcity in summer, identified as droughts, is mainly reflected in dry rivers and lowering of water table. This adversely affects the drinking water sector. During the drought years, 15 - 20% of the homestead open wells dry up, affecting about 3 million people. Most of the larger water supply schemes depend on surface water sources. When these sources either dry up or do not yield sufficient water to meet the requirements, most of the drinking water supply schemes fail. In addition, it has impact on agriculture and to some extent on hydroelectric power generation. Not only rice crop but also plantation and spice crops of Kerala get affected during the dry years and in some cases, perennial crops totally perish (KSCSTE 2005).

Kerala has 44 monsoons-fed rivers with a minimum length of 15 kms. “In fact Kerala does not have a single river that can be called a “Major River”. The annual discharge of all the rivers of Kerala is estimated to be 78041 MCM which is about 30 percent less than that of a single river like Godavari” (Kerala Development Report-Govt. of India, 2008). However, given the terrain conditions, run-off is also

quite high. A study showed that of the total run-off of 77,900Mm^3, 70,200 Mm^3 is from Kerala catchment areas alone (Asian Development Bank's website). Thus, it is an irony of sorts that a green, verdant state like Kerala has a lesser than average per capita availability of potable water, even lesser than that of Rajasthan. The per capita water availability for India is about 15600 litres per capita per day (LPCD) while for Kerala it is 12500 LPCD and for Rajasthan 16000 LPCD.

The state experiences severe summer from January to May when the rainfall is least and faces acute water stress. A deficit of 7142 MCM is experienced during the summer months. Tables, 6.6 and 6.7 show the total seasonal water availability and demand in Kerala.

Table 6.6 Seasonal Water availability in Kerala

Item	Water availability in Million Cubic Meters	
	Monsoon	Summer
Surface Water	24600	3690
Ground Water	5135	5135
Hoard up Surface Water	5500	5500
Total	35235	14325
Source: *"Jelam Jeevamrithum" Planning Board, Govt. of Kerala, 2004*		

Table 6.7 Seasonal Water Demand in Kerala

Item	Water Demand in Million Cubic Meters	
	Monsoon	Summer
House hold Consumption	1226	809
Animals and Birds	438	293
Industry	6400	3200
Irrigation	13665	13665
Land Conservation	5000	3500
Total	26,729	21,467
Source: *"Jelam Jeevamrithum" Planning Board, Govt. Of Kerala, 2004*		

Table 6.8 Ground Water Resources of Kerala as on 31.03.2004 (GEC-1997 Methodology)

1	2	3	4	5	6	7	8	9	10	11
1	Thiruvananthapuram	308.51	30.48	278.03	84.20	94.59	185.77	111.58	82.25	66.82
2	Kollam	495.61	47.36	448.25	114.03	88.75	205.40	111.94	222.28	45.82
3	Pathanamthitta	347.00	30.44	316.55	49.66	42.03	100.50	58.05	208.84	31.75
4	Alappuzha	466.08	46.62	419.46	61.06	67.46	128.64	92.37	266.03	30.67
5	Kottayam	521.06	50.20	470.83	62.89	67.43	133.60	92.52	315.42	28.37
6	Idukki	269.04	22.72	246.32	41.77	41.64	92.32	57.08	147.47	37.18
7	Ernakulam	618.43	50.59	567.83	197.59	86.44	293.80	112.21	258.03	51.74
8	Thrissur	774.93	72.18	702.75	228.27	101.36	326.44	130.24	344.24	46.45
9	Palakkkad	823.92	73.55	750.33	140.47	159.85	327.75	191.81	418.05	43.67
10	Malappuram	557.29	49.66	507.64	165.45	115.23	307.85	156.50	185.69	60.65
11	Kozhikod	366.41	21.60	344.81	104.86	86.80	213.38	112.63	127.32	61.88
12	Wayanad	325.03	32.44	292.59	34.40	28.67	71.93	40.40	217.79	24.58
13	Kannur	591.89	51.27	540.62	107.29	76.52	261.18	101.38	331.95	48.31
14	Kasargod	376.18	32.64	343.53	204.08	40.59	271.64	43.08	96.37	79.07
	TOTAL	**6841.33**	**611.75**	**6229.54**	**1596.02**	**1097.36**	**2920.20**	**1411.79**	**3221.73**	**46.88**

Source: *Central Ground Water Board 2004*

1-Sl. No, 2-District, 3-Total Annual Ground Water Recharge, 4- Natural Discharge during Non-Monsoon Season, 5- Net Annual Ground Water Availability, 6- Gross Ground Water draft for Irrigation, 7- Gross Ground Water for Domestic and Industrial uses, 8- Gross Ground Water draft for all uses, 9- Allocation for domestic and industrial water supply for next 25 years, 10- Net Ground Water Availability for future irrigation development, 11- Stage of Ground Water Development (%).

Figures are in Million Cubic Meter

Since 1983, drought has become a wide spread phenomenon in the State. The ground water potential of Kerala is very low as compared to that of many other States in the country. The State has a rechargeable groundwater resource of 6841 million cubic meters with net groundwater availability of 6229 MCM. It is estimated that the gross groundwater draft is 2920 MCM and the net groundwater available for future use is 3221 MCM (Economic Review Govt. of Kerala, 2007). The ground water extraction in the State is growing at alarming rates and water levels have drastically declined which causes saline water intrusion in the coastal belt of Kerala. The overall stage of ground water development in the State is 47% which is greater than the national level. Table 6.8 shows the district-wise ground water resources of Kerala.

As per the latest groundwater estimation carried out by the Central Groundwater Board, Government of India and Groundwater Department, Government of Kerala based on Groundwater Estimation Committee norms, 15 blocks of the State fall under overexploited, critical and semi-critical categories and 33 blocks show more than 70% development. Blocks were categorized based on the stage of development[2] and long term trend of groundwater levels during pre- and post-Monsoon seasons.

6.5 SOCIO-ECONOMIC-ECOLOGICAL PROFILE OF PALAGHAT

The study puts a special focus on Palakkad District (Palaghat) due to its geographical peculiarities, topographical and meteorological features and socio-economic conditions. The story of Palakkad is an example of what is happening to the once water-rich Kerala. The unethical natural resource extraction and exploitation has been threatening the very survival of the agrarian society of Palakkad. Among the districts of Kerala, Palakkad shows subdued socio-economic characteristics and is considered as a backward region of Kerala. The district has diverse socio-cultural and religious features derived from Tamil cultural link that have caused a setback in the economic development of Palakkad. Even though the

district is a pre-dominant agrarian settlement, the governments of Kerala have given timely support to set up an industrial belt in Malampuzha Block.

Demographic Pattern of Palakkad

The demographic features of the district shows a cultural diversity; Tamil settlers in Chittoor and Attappady blocks; Scheduled Castes (SCs) in Alathur block; Mannarghat block with migrated Central Travancore Christians and other higher castes and the central part of Palakkad is dominated by Other Backward Castes (OBCs) like Ezhavas and Muslims. Population of Scheduled Tribes (STs) and SCs are high in Palakkad with a Scheduled Tribal Settlement block -Attappady. Even though the district once had abundant natural and human resources it remains an "under-developed" district of the State. Its tribal belt has one of the worst life indices in the State. Agriculture is the main vocation of the people. Forestry and fishing and allied sectors are also important. But infrastructure development and quality of life has not improved much over the years and the traditional sectors have not improved their performance (Mohan 2004).

Soil and Agriculture Pattern of Palakkad

Palakkad district is called the “Granary of Kerala” since a major portion of the cultivable area is used for food crops. About 80 percent of the rural population of this district are agriculturists or agricultural labourers. The total paddy cropped area comes to 107467 hectares (total of three seasons). Palakkad is the only district in the state where cotton and groundnut are cultivated. Area under fibre cotton cultivation is 10999 hectare and groundnut is 7019 hectares. Coconut and other oil seeds occupy a prominent position among the crops covering 53302 hectares. Paddy, cereals and millets are cultivated over 112922 hectares and is the major agricultural activity of the district. Rice cultivation in the district is 28 percent of the total area of the State. The climate in the district is suitable for cultivation of horticultural crops such as mango. Jack fruit, pappaya etc. and the area under cultivation of fresh fruits is 24440 hectares. Plantation crops such as rubber, tea,

coffee etc. are planted extensively in midland and highland regions. The area under plantation crops is 98370 hectares in which rubber occupies more than 70 percent (www.palakkad.nic.in).

The district lies between 10'21 and 11'14 North latitude and 76'02 and 76'54 East longitude. The total geographical area of the district is 4480 sq. km representing 11.53 per cent of the State's geographical area. Of this the area under forest is 1363 sq. kms; nearly 31 per cent of the total land area is under forest cover. Based on the physical features, the district is divided into two natural divisions - midland and highland. The midland region consists of valleys and plains. It leads up to the highland which consists of high mountain peaks, long spurs, extensive ravines, dense forests and tangled jungles. Midland is thick with coconut, areca nut, cashew, pepper, rubber and paddy cultivation. The soil is laterite in the hills and midland regions. The elevation of the land forms varies from 20 meter to 2386 meter average mean sea level (see Table 6.9).

Table 6.9 Terrain Units in Palakkad District Area in Percentage

Low lying Terrain including flood plain and terrace	27
Moderately undulating mid land terrain with flood plain	26
Highly Undulating terrain	12
Hilly area including scrap slope	35
Source: *CGWB, Govt. of India*	

The Sahya Ranges (Western Ghats) bordering the region and the 32 to 40 km.-long gap in the mountains exert a dominant influence on the climate of the region. This gap is known as the 'Palakkad Gap' (District Handbooks of Kerala-Palakkad, Govt. of Kerala).The road and rail links between Kerala and Tamil Nadu pass through the Palakkad gap and thus the area is commonly called the “Gate Way of Kerala”.

There are four major type of soils observed in Palakkad; (1) Laterite soil seen in Ottappalam, Alathur, Chittur and Palakkad taluks (2) Virgin forest soil of Mannarkkad Taluk (3) Black soil in Chittur and Attappady Valley which is used for the cultivation of Cotton and (4) Alluvial soil found along the banks of Bharathapuzha and its tributaries (CGWB 2007).

Water of Palakkad

Palakkad receives around 2,400 mm of rain in a year (see Table 6.2) and both the North East and South West monsoons are important to the district. Palakkad district is blessed with many rivulets and a big river Bharathapuzha, the longest river of the state having 6,186 sq. km of catchment area in the district with 14 tributaries draining different parts of the district. It has a good water potential than other districts of Kerala. There are 12 reservoirs in Palakkad, of which seven are major ones. There are nearly 10,000 ponds and nearly 2,000 perennial streams. Parambikulam, Thunakadavu, Peruvarippallom, Mangalam, Pothundy, Malampuzha, Moolathara, Meenkara, Chulliar, Walayar, Kanjirapuzha are the major reservoirs constructed along the course of rivers of Palakkad for irrigation. At present an area of about 7535 sq. km is secured with surface irrigation through two major and 6 medium and a number of minor and lift irrigation projects. Irrigating Kerala is a costly affair due to its physiographic features other than a major portion of Palakkad district which is plain and cost-effective for irrigation with appropriate soil types. A district-wise analysis of ground water resources of Kerala shows that Palakkad has a higher potential for ground water recharge (12%) followed by Thrissur (11%), Ernakulam (9%). Thiruvananthapuram has the lowest (4%) potential for ground water recharge (Kerala Development Report, 2008). However, a study conducted by Central Ground Water Board shows that 12 blocks of Palakkad districts are under water stress (see Table 6.10). The water quality tests of Palakkad district shows excess fluoride, nitrates and electrical conductivity (CWP 2005) in the water of dug wells and bore wells in some areas.

Table 6.10 Water Scarce Areas of Palakkad Districts

Sl No.	Block	Villages/ Areas
1	Palakkad	Mundoor, Keralasseri, Kongad
2	Mannarkkad	Alanallur, Thachampara, Chellathur
3	Attappady	Agali, Puthoor, Sholayoor
4	Alathur	Kannambra
5	Thrithala	Kappur, Anakara, Thrithala
6	Pattambi	Koppam, Vallappuzha
7	Ottapalam	Chathuvatta, Lakkidi, Vaniyamkulam
8	Kollengode	Vadavannur, Elavancheri
9	Chittur	Vadakarapathy, Eruthenpathi, Perumatty, Moolathara
10	Sreekrishnapuram	Pookottukavu, Sreekrishnapuram
11	Nenmara	Ayilur
12	Kuzhalmannam	Kunnathur, Thenkurisi
Source: *CGWB-2007*		

The geomorphologic, metrological and other data of Kerala discussed above concluded as follows, that are the real causes of drought conditions of the State can be.

1. The peculiarity of the rivers flowing across Kerala is their short length and the elevation difference between the high and the low land leading to quick flow of water collected from the river basin and quickly discharged into the Arabian Sea. The State has not been able to utilize the river water sources to a major extent.

2. Soil in Kerala can retain water only for a maximum of three months.

3. Sinking share of marshy lands and wetlands, due to the boom of construction sector in Kerala.

4. Shifting agriculture pattern, from food grains to cash crops like rubber and coconuts.

5. Large scale deforestation practices in the State since seventies (in 1900 the forest coverage was 44.4 percent that came down to 14.7 percent in 1983 and is 9 percent now). As per official claim the forest share is 27 percent of land area including plantations like Rubber, Cardamom etc.

6. Subsequently, inefficient water and land management practices have become the principal causes of desertification in Kerala.

Thus, the exposition of Kerala as a "water-surplus region" has become a well-perpetuated myth.

6.5.1 Rationale of the Selection of the Case Study Areas

Palakkad district of Kerala is the only district that lies in a rain shadow region and accounts for comparatively less rainfall (see Table 6.2). The available metrological, geographical and socio-economic data of Palakkad shows its unique geographical position, water availability, topographical variations, soil peculiarities, cultural and agricultural significance and contribution to the State. These factors have formed the basis for selecting the Palakkad district in conducting this water-related ecological economics study. Particularly, the biggest river of Kerala, Bharathappuzha flows through Palakkad plain and the rivulets of Attappady and Chittoor blocks are contributing much water to this river.

Attappady and Chittoor blocks of Palakkad have been selected as specimen cases for the study due to its contrast in topographical and physiographical features. Socio-economic conditions of both cases are more or less same with a homogeneous cultural pattern. Following are the peculiar features that compelled the selection of Attappady and Chittoor for the study (see Table 6.11).

Table 6.11Chittoor and Attappady Blocks of Palakkad: A Comparison

Features	Chittoor (in Palakkad East)	Attappady (in Palakkad North)
Geographic/ topographic	Plain mid land in Palakkad gap (10° 42' N latitude and 76° 47 E longitude)	Hilly highland sloping towards east on the north of the Palakkad gap (10^0 57 N latitude and 76^0 21 longitude
Historical	Part of Tamil Nadu, Settlement of Tamilians	Forest land, Settlement of Scheduled Tribes
Soil	Black cotton soil; Low in Organic matter, calcareous, moderately alkaline, high in clay content. CEC is high. Medium in P and K content and low in N.	Black cotton soil, laterite and forest soil.
Water	Chitturpuzha River; Moolathara, Venkalakkayam and Meenkara dams Net annual groundwater availability- 66.73 MCM Over exploited Groundwater and sharp decline of water level	Rainfall-1539mm, River Siruvani, Thoothapuzha, Bhavani and their rivulets Net annual groundwater availability- 54.03 MCM Semi critical groundwater
Socio-Cultural	Tamil, Malayalam mixed culture. Tamil migration. STs, SCs population is high	Tamil, Malayalam mixed culture, Tamil migration and migration of agriculturists from Kerala valley. STs population high
Economic	Backward,	Backward, special assistance getting from Govt. of Kerala for development
Agricultural	Intensive farming :Paddy, Coconut and food grains, large scale use of chemical fertilizers, modern techniques of farming	Subsistence agriculture, Coconut, Banana, primitive techniques with organic manures.
New Trends	Shift to cash crops, increasing number of illegal bore wells, large scale water extraction by industries, the dying paddies etc.	Afforestation programmes, peoples participation in eco-restoration projects, rejuvenation of rivulets and rivers, increasing farming, increasing forest thickness etc.

6.6 CASE STUDY I: COCA-COLANIZATION AT PLACHIMADA

This case study assesses the externalities of water commercialization in the rural communities in terms of losses in agricultural production, impact on human health and ecological stability. The cost estimates are based on the detailed primary (household level) data collected from an intensive study of Plachimada, Kerala. The cost estimates reveal that the impact of industrial pollution on rural communities is quite substantial in monetary terms. Further, mere passing of laws and creating institutional structures, though necessary, are not sufficient to address the environmental problems and ecological management and governance. Policies should be implemented in their right perspective. Institutions should be strong enough, with more autonomy and powers, to deal with the problems at hand. Because, contemporary discussion on water resource development in India indicates that rural livelihoods are under stress due to (i) increasing privatization and commercialization of water resources (ii) depletion of ground water (iii) increasing inefficiency in the management of irrigation and public water supply system, and (iv) rising levels of water pollution (Nair et.al. 2008).

This section tries to put forward empirical evidence of the consequences of commercialization of water by Hindustan Coca–Cola Beverages Private Limited (HCBPL) which has driven the Plachimada villagers to water scarcity and de-development. In March 2000, Coca-Cola opened a plant at Plachimada village (Palakkad district, Kerala) intending to produce 1.2m bottles of Coca-Cola, Fanta, Sprite, Limca, Thumps Up, Kinley Soda and Maaza per day. The conditional licence granted by the local panchayat (village council) authorised the use of motorised pumps, but the company drilled more than six wells and illegally installed high-powered electric pumps to extract millions of litres of pure water. The level of water table fell from 45 to 150 metres below the surface. Coca-Cola then polluted what little water it had not stolen from the community. It started by dumping waste outside its premises. During rainy season, this spread into the

paddy fields, canals and wells, causing a serious health hazard. The issues of Plachimada can be analyzed in two ways: 1) Scarcity of water and related issues (vicious circle of poverty and deprivation trap) and 2) as a problem of people's voice on water (rule of water).

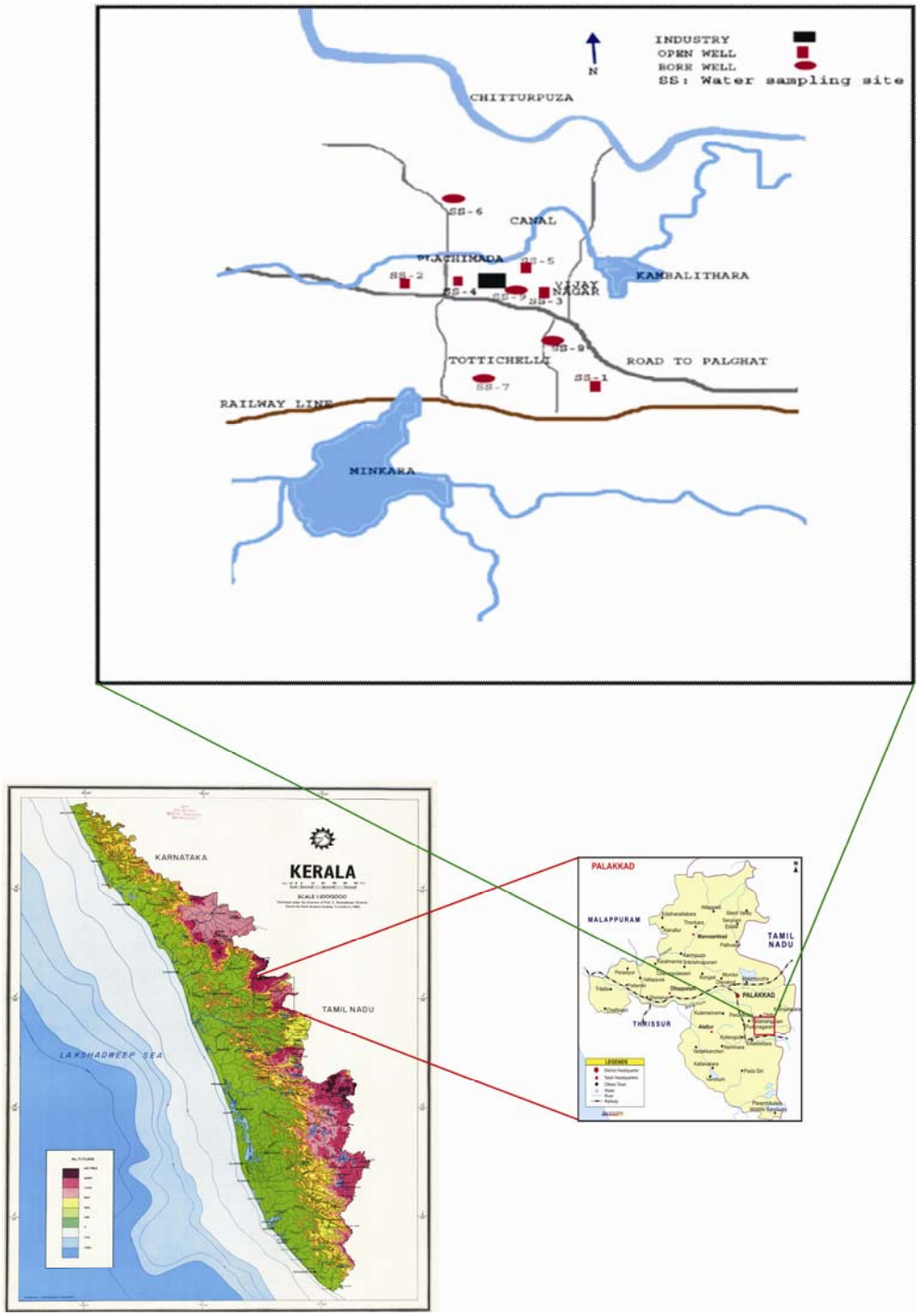

Fig. 6.3 Location Map of Plachimada

6.6.1 The Locality

Plachimada (abode for the schedule castes and schedule tribes) is a little hamlet of Palakkad District, popularly known as the "rice bowl of Kerala". It is a part of the Moolathara Village, which is one among the three villages of Perumatty Grama Panchayat in Chittur Taluk and falls in the Palakkad gap area. It shows undulating topography and is drained by Chitturpuzha, a major tributary of Bharathapuzha River (see Figure 6.3). Satellite pictures and the Govt. of India records mark it as an 'arable land'; The plant site is located besides Palakkad – Meenaskipuram – Pollachi Road and hardly 3 km to the north of the Meenkara dam reservoir and a few hundred metres west of the Kambalathara and Vengalakkayam storage reservoirs. The Moolanthodu main canal coming from Moolathara barrage passes less than 10 metres north of the factory compound and Chittoorpuzha itself is 2 km due north of the plant site. A large area of *Poonthal Padam* (marshy land), a traditional slushy paddy land which dries up in summer with a unique and different eco system, lies in the Perumatty Panchayat, the second largest panchayat in the district (see Table 6.12).

Table 6.12 Plachimada at a Glance (pp. 262-63)

Plachimada	**A hamlet falling in Palakkad gap of Palakkad District in Kerala State**
The MNC	Hindustan Coca–Cola Beverages Private Limited (HCBPL)
Land owned by HCBPL	Forty acres of water–rich fertile agricultural land (in the year 1998)
Production started	2000 March
Products from HCBPL	Coca–Cola, Fanta, Sprite, Limca, Kinley Soda, Maaza, ThumpsUp etc
Number of wells	6 bore wells and 2 dug wells (HCBPL argument)
Working capacity	15 lakh litres of water based products daily

Water consumption by company	5.0 lakh liters of ground water daily (HCBPL argument) 13 to 15 lakh litres from 16 bore wells daily
Nearest water sources	Meenkara dam reservoir (3km away), Kambalathara and Vengalakkayam storage reservoirs (1km away), Moolanthodu main canal (10 metres), chittoorpuzha (2 km away)
Nearest Settlements	Plachimada, Vijayanagaram, Veloor and Madhavan Nair Colonies in the Perumatty Panchayat and the Rajeev Nagar and Thodichipathy colonies in the Pattamchery Panchayat
People	Agriculturalists (Muslim, Ezhava and Tamil middle class & Caste) and Agricultural Labours (SCs/STs)
Crops	Rice, coco-nut, areca nut, ground nuts, vegitables and other high water consuming crops.
Social and economic status	Deprived category/ below poverty line
Strike against factory by affected people	22 April 2002

6.6.2 Socio-Economic Status

The plant site is surrounded by SCs/STs settlements such as Plachimada, Vijayanagaram, Veloor and Madhavan Nair Colonies in the Perumatty Panchayat and the Rajeev Nagar and Thodichipathy colonies in the Pattamchery Panchayat. In these colonies, hundreds of socially and economically deprived families live in extremely crowded conditions. The estimated population of these colonies is around 4000 with a sex ratio of 1084 females per 1000 males (Nair et.al. 2008). More than 1200 households are directly affected by the water scarcity and consequent problems due to the water exploitation of HCBPL and most of them are agricultural labourers. Perumatty Panchayat has 2350 hectare of rice fields out

of which 1500 hectare are in Moolathara Village where the factory is located. Agriculture is the most important occupation for the population in this area and 20% depend on the avocations for their sustenance. The education and health status of the local population are highly vulnerable. Lack of educational facilities, low political participation, low infrastructure facilities in the tribal colonies and lack of social security programmes in the region downgrade the well-being of the people (Alex 2006).

The social composition of the people of Plachimada is rather complex due to their origin, caste-class differences, economic well-being and labour pattern. The villagers, mostly SCs and STs, are predominantly landless agricultural labourers living at the brink of acute poverty (Pillai 2008). The caste-wise composition of the community is significant with comparable deprived socio-economic conditions excluding about 4 percent of population. A sizeable proportion of the population in the Plachimada area is composed of 24 percent STs and 7 percent of SCs. The rest of the people belong to Ezhavas, Goundan, Muthaliyar, Chetti and Muslims.

The educational level of the people leaves much to be desired. 32 percent are illiterate and quite a few number children are not yet enrolled and barely around 5 percent of the population has attained secondary education (see Table 6.13).

The occupational structure and land holding pattern are so appalling that the agricultural labour households dominate with less than 20 cents of land constituting the more than 50 percent of total households. The OBC communities (Ezhava, Muslim and other OBCs) are the most enterprising in Plachimada with diversified portfolio. They account for, apart from 80 percent of non-agricultural labour, around 90 percent of cultivation, 63 percent of trade and business and more than 80 percent of regular salaried jobs (Nair et.al. 2008). Table 6.13 shows the demographical, educational and occupational and land holding patterns of Plachimada.

Table 6.13 Socio-Economic and Demographic Features of Plachimada

Caste	A. Demographic Particulars				B. Educational Status						C. Land Holdings						D. Occupation				
	A1	A2	A3	A4	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D1	D2	D3	D4	D5
SC	7	7	4.49	1070	33.3	9.8	15.0	-	-	13.4	-	100	-	-	-	-	-	50.5	16.5	16.5	16.5
Eravalan ST	20.7	19	4.10	1260	33.3	28.8	15.4	14.6	-	-	11.1	88.9	-	-	-	-	-	100	-	-	-
Other ST	4.6	5	5.05	719	-	10.1	3.3	2.0	-	-	50	50	-	-	-	-	25	75	-	-	-
Ezhava (OBC)	22.2	29	5.98	1051	-	19.7	21.2	35.4	61.9	34.1	5.2	57.6	15.4	16.9	4.9	-	10.5	31.2	36.2	5.8	16.3
Muslim (OBC)	14.7	15	4.67	997	-	11.5	17.6	19.5	10.1	15.7	8.4	72.8	-	-	-	18.4	18.8	39.9	7.9	16.7	16.7
Other OBC	27.2	22	3.70	1138	33.3	19.3	25.9	24.6	21.5	24.0	9.0	33.5	4.3	22.6	18.3	12.4	48.7	24.7	13.3	9.0	4.3
Forward	3.6	3	4.03	1232		0.9	1.7	3.8	6.4	12.9	31.9	33.9	-	34.2	-	-	34.2	-	-	65.8	-
Total			4.56	1084	1.1	32.2	21.6	35.6	4.8	4.8	10.6	61.5	4.5	11.1	6.1	6.1	20.7	47.2	14.0	9.7	8.4
A1- Households in percentage A2- Population in Percentage A3- Average Household Size A4- Sex Ratio					B1-Not enrolled B2-Illiterate B3-Below primary B4-Below secondary B5-Secondary B6-Above secondary *figures in Percentage						C1-Land less C2-Below 10 cents C3-Below 1acre C4-Below 3 acre C5- Below 5 acre C6-5 acre and above *figures in Percentage						D1- Farming D2- Agricultural labour D3- Non-agricultural labour D4- Trade/business/transport D5- Regular salaried employees *figures in Percentage				
Source: *Water Insecurity, Institutions and Livelihood Dynamics- K.N Nair, Antonyto Paul and Vineetha Menon -2008*																					

6.6.3 Present Scenario

Plachimada used to be a water rich region in Palakkad District, where Hindustan Coca–Cola Beverages Private Limited (HCBPL) is an MNC. Forty acre of water-rich fertile agricultural land was taken over in 1998 and factory buildings were erected subsequently. In 2000 March, the Company began its production of Coca–Cola, Fanta, Sprite, Limca, Kinley Soda, Maaza, ThumpsUp and other soft drinks. As per the information given by the Company, the factory pumped out 5.0 lakh liters of ground water daily from 6 bore wells and 2 dug wells. It is learned that the factory had worked on nearly 16 bore wells apart from the two open ponds. The unit has a working capacity of 15 lakh litres of water-based products. 'Around 85 truckloads of beverage products are churned out with each truck carrying around 600 cases of the product. Each case contains 24 bottles of 300 ml' (Jananeethi 2002).

Between 8th and 14th January 2004, Bread for the World and FIAN International conducted an international fact-finding mission to India[3]. It observed that "in Plachimada, Palakkad District, Kerala, the intensive extraction of ground water by Coca Cola has led to depletion of the ground water level. Furthermore the ground water has become severely contaminated, as salinity and hardness of water increased. High levels of calcium and magnesium were found, which make the water unfit for human consumption and irrigation. The Coca Cola Plant also disposed foul smelling slurry waste as fertilizers, which lead to further contamination and health problems (e.g. skin irritation). The health problems reported by local people in Plachimada, Kerala, can mostly be attributed to polluted water. The Indian authorities failed to meet their obligation to protect people's access to suitable water against the style of operation of the factory. Moreover, the operation of the plant seems to have contributed to the depletion of ground water in the area. The State authorities failed to protect the vital irrigation and drinking water demands made by the local people (and protected by the

human right to water) against the excessive water use of the plant in the production of a soft drink (not protected under any human right). This breach of the State's obligation to protect is a violation of the right to water by the Indian authorities".

After the arrival of the company the water level in the wells of the surrounding colonies showed a sharp depletion. The quality of the water–its odour, taste and hardness – got worsened. It became non-potable due to contamination and adversely affected the people especially the women and they were forced to fetch water from a distance of three to five kilometres. Several uncommon diseases broke out. Due to severe shortage of water the farmers around the plant stopped cultivation and lost their meagre daily earnings. They were forced to migrate to faraway lands, seeking work. These villagers are predominantly landless agricultural labourers now living at the brink of acute poverty, hunger, disease, lack of pure drinking water and many other grave ecological hazards. As a last straw, they began a strike against the factory on 22 April 2002 (see Appendix IV). The protesters ask- "If within a period of three years, the plant can cause such extensive damage what would be the situation after ten or fifteen years? And who will answer the sad plight of our children in the coming years, living in a barren land and cursing their parents for giving them birth". Today the people of Plachimada, except a few who work in the plant, have unanimously decided that the plant must be closed down immediately.

6.6.4 Drinking Water Scenario

At Plachimada, the average household size is 6 and the Government of India recommended 40 litres of water per capita per day to enjoy a healthy life in rural areas. So each family needs 240 litres of safe water. "We live here for the last 20 years. Before three years we did not need to go out to fetch water. But today we walk a distance of two and a half kilometres to collect two pots of water" (A resident of Plachimada Colony 2003). At present, in order to acquire this much

water, each family has to spend 14 hrs per day. In the study area the daily wages (for 8 hours) for the unskilled female labourer is Rs.50 and the male is Rs.90. 85% of water is fetched by the women and girl children and remaining by the males. So the total time cost spent by each household is 97.50 Rupees. This is the real cost assumed to be paid by each household for their survival as per Government norms, which means each household has to sacrifice Rs.97.50 in money terms. If they sacrifice Rs.97.50, it means they sacrifice work equal to this amount which may deny food, cloth, education and health facilities for their children (Alex 2006). When a society has no basic infrastructure facilities, drinking water, employment opportunities, is forced to drink bitter water, and also use that for cooking and sanitation, and is engaged in a struggle for water as a daily routine, there is no doubt that the society is in a deprivation trap. This is very true in the case of Plachimada.

At Plachimada, the Coca–Cola factory extensively distributed solid waste containing toxic substances like lead and cadmium as manure for agriculture which contaminated the soil and water (see Table 6.14). A recent study by Greenpeace India observed that the sludge contains inorganic contents like heavy metals and aromatic and non-aromatic organic contents. The sludge has the following contents: lead 1,100 mg/kg, Cadmium 100 mg/kg, Chromium 190 mg/kg, Phosphorous 1,580 mg/kg, Zinc 680 mg/kg, Aluminium 4,000 mg/kg. The Greenpeace findings show that the Coke factory has violated the Kerala Land Utilisation Act, 1967, Water (Prevention and Control of Pollution) Cess Act, 1977, Kerala Pollution Control Act, Central Ground Water Authority Rules, and Environment (Protection) Act.

It is quite evident that the toxic material found in the solid waste has penetrated into the eco system and affected the health condition of the villagers. The following table provides a clear picture about the diseases, which are reported after the operations of the Cola Company (see Table 6.15).

Table 6.14 Water Test Results at Plachimada

Element	Observed data	Units	Permissible limit
Hardness	1340	Mg/litre as CaCo3	75 to 100
Chloride	905	Milligram/litre	250
Manganese	1	Milligram/litre	0.05
pH. value	9	pH units	7 for drinking water
Solid contents	8000	Milligram/litre	500
Sulphide	5.8	Milligram/litre	0.01
Bicarbonate Alkalinity	450	Milligram/litre	250
Cadmium	10	Microgram/litre	10
Lead	65.7	Microgram/litre	3
Chromium	36	Microgram/litre	5
Source: *Compiled from various Studies (BBC/ Green Peace / Univ. Of Exeter etc)*			

Table 6.15 Noticed Health Problems

Disease	Excess in nearby Villages (in No.)	Disease	Excess in nearby Villages (in No.)
Hair falling	1355	Burning eye	677
Cough	677	Vomiting	677
Pain in Limbs	508	Asthma	339
Stomach Ache	217	Diarrhea	203
Fatigue	169	Slain disease	145
Giddiness	131	Fever	72
Source: *Vikas Adhyayan Kendra Report-2004*			

'During the period 2000 – 2003, the birth weight of children near the Cola factory reported a tremendous change against the period of 1996 – 2000. The Vijayanagar (Plachimada) Colony Anganwadi register has details of 118 children (63 boys and 55 girls) born between 1996 and 2003 in Vijayanagar and Plachimada colonies …According to WHO, infants weighing less than 2.5 kgs are considered as Low

Birth Weight (LBW). Birth weight of 73 % of the children is below 3 kgs. The median weight of 2.5 kg is considerably lower than the national average … And those were born during 2001 – 2003 (45 children). The median birth weight of these two groups was 2700 grams and 2500 grams respectively (see Table 6.16). This difference is statistically significant at 0.05 level … The sharp increase in the proportion of underweight children and a 10 % drop in the median birth weight is a serious problem' (Padmanabhan et.al. 2003).

Table 6.16 Birth Weight of Children at Plachimada

Period	Numbers			Percentage		
	- 2.5 kg	+2.5 kg	Total	- 2.5 kg	+2.5 kg	Total
1996 –2000	11	62	73	15.1	84.9	100
2001-2003	14	31	45	31.1	68.9	100
Source: *Padmanabhan 2003*						

The consumption of polluted water causes many health problems (see Appendix V) and with low income they cannot face this severe threat. Ill health leads to an increase in health expenditure that will reduce the expenditure on food items, which leads to the reduction in capacity to work and further health problems. If they spend too much money for maintaining the health and survival of their infants, it leads to other consequences in the consumption of food and traps them in a vicious circle.

6.6.5 Agriculture Scenario

The major income-generating activities of the people of Plachimada are agriculture and agro–based manual labour. The Panchayat has a diverse soil profile including red soil, black cotton soil and clay soil. 90% of the agricultural land in the area is wet and 10% is dry. Although rice, coconut, groundnut are the major crops, vegetables, horse gram, maize, mango, sugarcane and banana are cultivated intermittently.

All farmers who have land within two kilometres from the factory reported paucity of ground waters. Ever since the company started functioning, there is sharp decrease in the production (see Table 6.17). The farmers complained that the organic components in the soil were heavily destroyed due to the depletion of water and the use of sludge, which adversely affected the yield of the land. Paddy production has almost come to a standstill whereas the production of coconut and vegetables decreased below 50 percent.

Table 6.17 Status of Agricultural Production

Item	Before Companies arrival	After Companies Arrival
Paddy	60 Sacs	Nil
Coconut	500 / acre	150/ acre
Vegetable	30 Sacs	10 Sacs
Source: *VAK-2004*		

The irrigation system, which was comfortably managed by the farmers, was also damaged beyond repair due to the depletion of ground water in the area (see Table 6.18).

Table 6.18 Status of Irrigation Water

Scenario	Ownership of the Pump	HP	Time of pumping
Before companies arrival	Self	5 HP	14 hrs
After companies arrival	Self	5 HP	15 minutes to 2 hrs
Source: *VAK-2004*			

Agriculture has a spiralling effect on other sectors of the economy as well. Before the company's arrival villagers got around 100 to 120 working days in a year. They worked on an average 4 to 5 days a week in agricultural seasons. On off-season

days people went for other daily wage jobs in and around the village. After six months since the company started operation the farms got dried up and villagers lost their jobs. Along with this a farmer described the situation in the following way. "Today I don't cultivate anything in the land. I used to cultivate paddy for two seasons per year. The production from one acre in one season would be around 24000 kilogram. Today I stopped cultivating paddy and vegetables due to acute water shortage. Earlier I was able to pump sufficient water for 20 hours using a 5 HP motor from my well, which is only about 24 ft deep. From this well I used to give water to the farm of Ligamuthu Gounder, which is about two and half kilometre away. The coconut production was also at its peak. Normally I got 6000 coconuts from an area of seven acres. But today I don't even get 1500 coconuts" (see Table 6. 17 & 6.18). The plight of agriculture affected all sectors of the economy. It crushed the agro-based industries which in turn increased the rate of unemployment and reduced incomes. Lack of water means reduction in production and income that leads to unemployment and reduction in purchasing power, availability of foodstuffs and poverty.

6.6.6 Ecological Scenario

Bore wells owned by the farmers are now useless due to the exploitation of ground water by the Company. It badly affects the productivity of the land and crops. Now the paddy fields of Plachimada are barren. Production and income of the people are reduced to one-fourth. The over extraction of water from the underground will badly affect the sustainability of the earth plates. Mineral and solids are emitted from the underground by the over extraction of water creating imbalance in the ecology. In short, ecological imbalance questions the integrity of the society and fertility of nature that drives out the local agriculture and agro industries from the market. Deprivation trap begins with ecological degradation and this sterility extends to the social health threatening the survival of the living beings.

6.6.7 Wider Issues

The water exploitation not only denied drinking water, but also denied food, good health, intellect, and social status. The villagers are forced to surrender these fundamentals with each drop of water, which the government 'sold' to the Cola Company. Many small-scale soda producers were pushed out from their livelihood and business by the exploitation of water by HCBPL. They also expelled the water culture that was based on health care products like, Sambharam, Nannari Soda, Jeeraka Soda and Lime juice etc. Before HCBPL entered the market, people got potable water from any shop in Kerala free of cost, but today it is very difficult to get a single cup of lime juice from the shops in city areas. So Coca-Cola trashed out the drinking water culture and habits along with social integrity and health.

6.7 CASE STUDY II: AWCECOP

Once a land of virgin forest which included the world famous bio-diversity hotspot, The Silent Valley is inhabited exclusively by three tribal communities; Irulas, Mudugas and Kurumbas (primitive). By nineties it had turned into a wasteland facing desertification as a result of migration of new settlers from Kerala and Tamil Nadu. The migration process started at the end of 19th century and has continued till date. The scenario transformed the culture and life of the primitive tribal that hooked them on to poverty, ill health and wretchedness of life. In 1962, this 745 sq.km land was declared as a tribal block and efforts were made to pump in money to ameliorate the hardships of the native tribal people. Conversely, the advantages of such efforts have been split up by the migratory settlers and corrupt bureaucrats. New agriculture pattern and illogical deforestation practices collapsed the ecosystem that questioned the integrity of ecology and survival of the people of Attappady. The ecological degradation badly affected the socio-economic and cultural life of the tribes who were closely dependent on forest products.

In this context, Government of Kerala planned a project called Attappady Wasteland Comprehensive Environmental Conservation Programme

(AWCECOP) implemented by an autonomous body named Attappady Hills Area Development Society[4] (AHADS) under Department of Rural Development, Government of Kerala. This project was adjudged by the Ministry of Personnel, Public grievances and Pension, Govt. of India, as the "Best Initiative for Tribal development in India", which is unique in its concepts and mode of implementation.

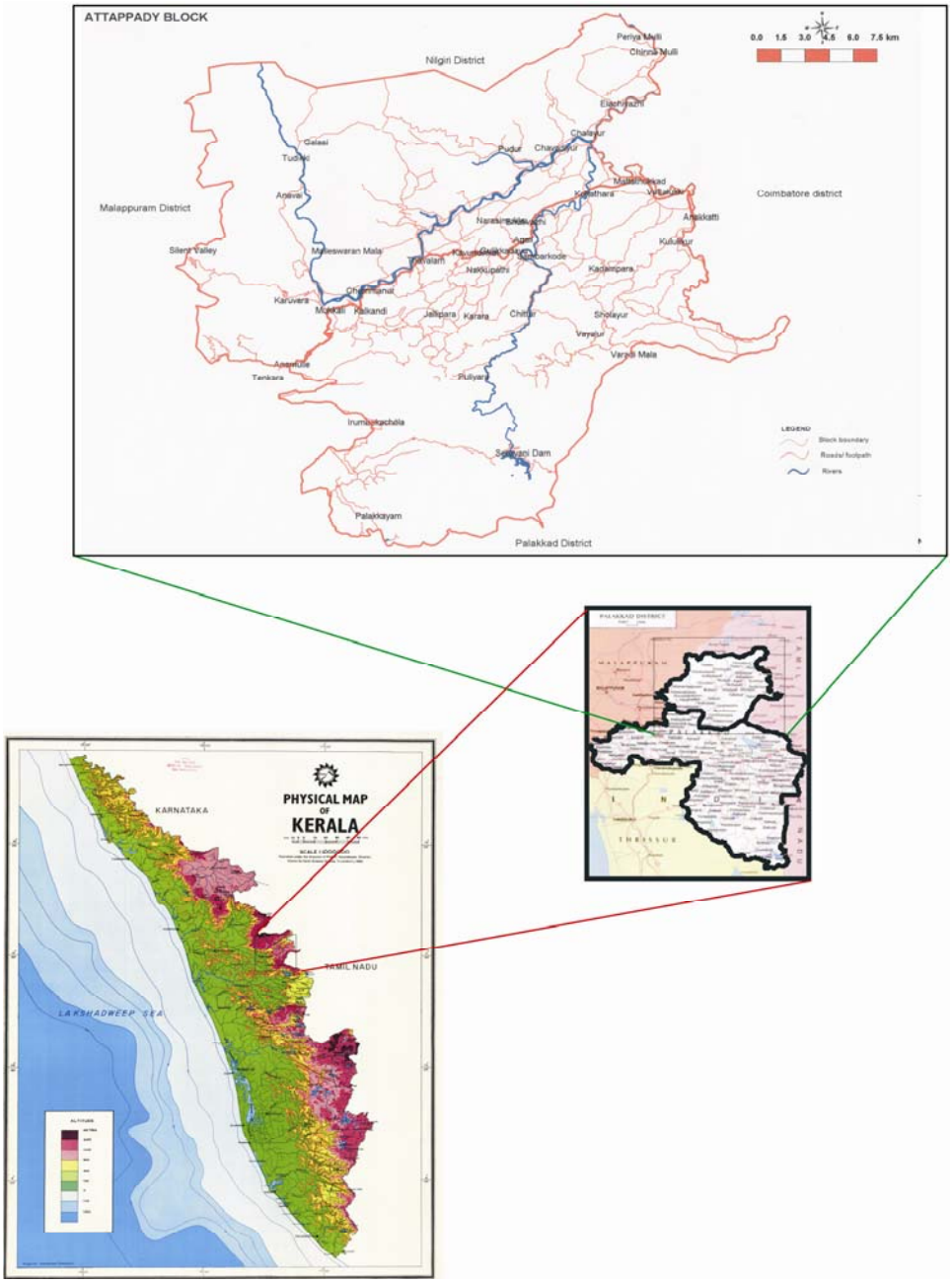

Fig. 6.4 Location Map of Attappady

6.7.1 Location

Attappady in Palghat district, Kerala state (location between 76^0 21' & 76^0 48' East Longitude and 10^0 57'&$11^0$15' North Latitude) is a plateau sloping east on the north of the Palghat gap and the southwest base of Nilgiris in Western Ghats. It is separated from North by Nilgiri District of Tamil Nadu State, East by Coimbatore District of Tamil Nadu State, South by Malampuzha and Mannarghat Block Panchayats of Kerala State and West by hump-like steeply sloping mountain range of Malappuram and Palakkad districts of Kerala (see Figure 6.4).

6.7.2 Objectives of AWCECOP

The AWCECOP project was inaugurated on February 11th, 1996 with a well defined objective – "*ecological restoration of degraded wasteland in Attappady and development of replicable models of participative eco-restoration, so as to prevent further degradation and promote sustainable method of livelihood for the local people (with special emphasis on tribal population) in harmony with resource base".*

This goal has progressed through three project tools viz.

1. Soil and biomass management (land development, afforestation, agronomy and soil conservation).
2. Water resource development and
3. Ecologically compatible income generating schemes.

6.7.3 Funding and Implementation

The AWCECOP aims at eco-restoration and sustainable livelihood using participatory resource management methodology. For this purpose a loan agreement was signed between the Japan Bank for International Cooperation (JBIC) and Government of India (GoI). The loan agreement became effective from 26th March 1996, with the loan disbursement closure on 26th March 2005. Through

subsequent amendments to the loan agreement the loan disbursement closure date has been extended up to 26th March 2010. Of the total project outlay of Rs. 219.31 crore, Rs.176.90 crore is provided by the JBIC as loan whereas the Government of Kerala granted Rs. 42.41 crore for administrative programmes (including Salary, Taxes and Levies). It took nearly four years for AHADS to train the people and society to prepare them for field level implementation of the project.

In nature, AWCECOP is a multidimensional project with social and economic concerns along with cultural and ecological restoration of people and land. AHADS took initiatives for awareness programmes on ecological restoration, health, sanitation, education and other social evils like drugs and alcohol. The society (AHADS) keeps one eye on setting up of a harmonious social life in Attappady through income generating programmes.

AHADS employed AWCECOP with the help of various working groups viz. User Associations (UAs), Local Action Groups (LAGs), Ooru Vikasana Samities (OVSs), Joint Forest Management Committees (JFMCs), Thai Kula Sanghams (TKSs), Eco-Clubs and Income Generation Activity Groups (IGAGs) (see Table 6.19) under five Operation Teams (see Figure 6.5) that divided the entire project area into fifteen Development Units to enable smooth and time-bound implementation of eco-restoration activities.

Table 6.19 AHADS Various Working Groups

Teams	UAs	OVSs	JFMCs	TKSs	IGAs	Eco-club	Total
5	93	166	54	111	219	52	695
Source: *AWCECOP Status Report 2008 and various booklets by AHADS*							

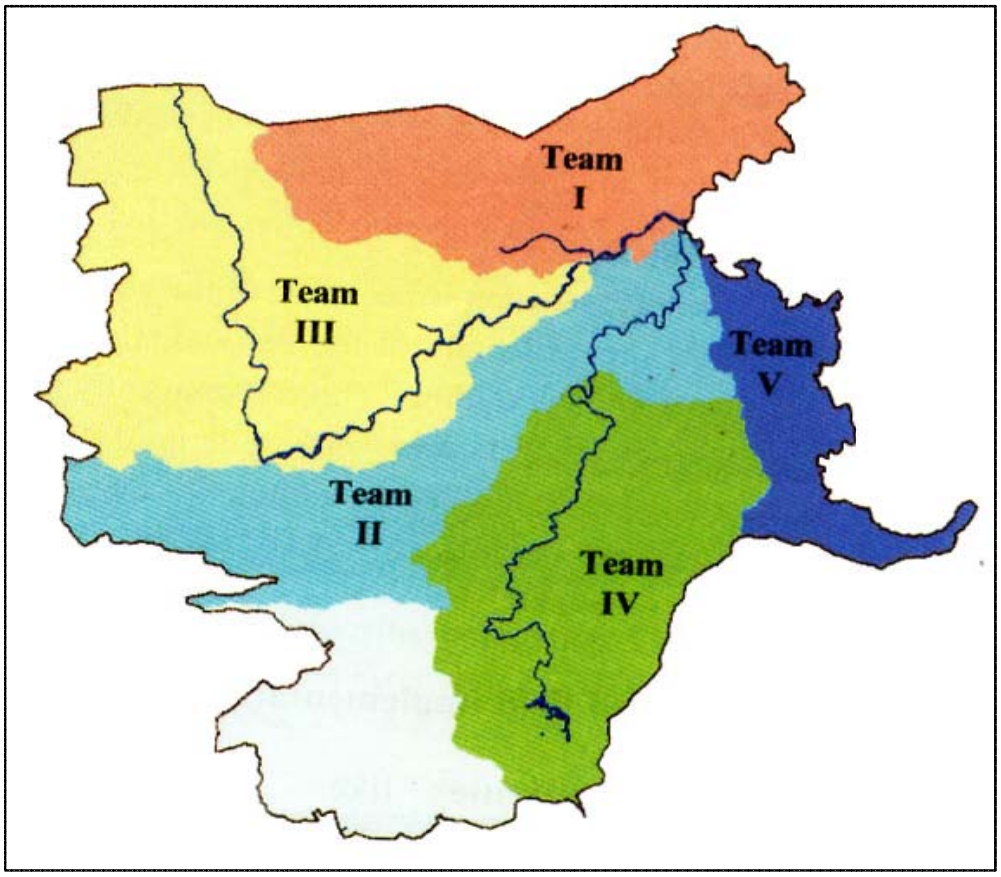

Fig. 6.5 Operational Divisions of AWCECOP

6.7.4 Physiographic Features and Climate

There are two high elevation areas of about 1000 meters (about 19.2% of total area)- one in the north west of the project area with high peak Malleeswaram (1664 meters) at its southern end and the small area around Muthikulam(>1000 meters). Majority of the area is of medium elevation of 600 to 1200 meters, constituting about 60.6% of the total area. The low lying area is 20.2% and extends from the opening to the hills from Mannarghat on the western side and through the two river valleys of Bhavani and Siruvani towards the east. Kodungarapallam, another tributary of Bhavani River, with part of catchment from eastern part of Attappady, flows through the eastern border of Attappady.

The drainage systems in Attappady are:

1. The Western flowing rivulets leading to Thuthapuzha.

2. The northern half of the area forming catchments of Bhavani flowing East and
3. The southern half forming catchments of Siruvani flowing North-East, to join Bhavani at Pudur.

Table 6.20 General Meteorological characteristics of Attappady Block

Place	Average Annual Rain fall (mm)	Average number of Rainy Days	Temperature (^{0}C)	
			Maximum	Minimum
Mully	1044	67	36	21
Chavadiyoor	1062	67	36	21
Narasimukku	827	84	36	21
Pudur	1047	67	36	21
Paloor	1097	68	36	21
Chindakki	2220	140	36	21
Karuvara	3430	165	35	21
Kottathara	1045	70	36	21
Agali	1208	90	36	20
Sholayoor	1936	110	36	21
Anakatty	862	90	36	21
Kallamala	2128	120	38	21
Muthikulam	2108	120	38	21
Mean/Average	**1539**	**97**	**36.2**	**20.9**

Source: *Assessment of land use changes in Attappady, Department of Geology, University of Kerala, July, 2007*

The western part is humid, with humidity decreasing rapidly as one proceeds from west to east. Rainfall varies from 3000 mm (see Table 6.20) along the ridges of Western Ghats to around 900 mm in the eastern boundary. Monsoon clouds enter the plateau from the west. The eastern edge of the plateau has many gaps and the north-eastern monsoon can be high. The eastern border areas receive most of the

rainfall from the northeast monsoon while the western edge from the southwest monsoon (70%). The two east flowing rivers Bhavani and Siruvani have a catchment area of 562 sq.km as well as annual utilizable flow of 1019 million cubic metres and gain from the south west monsoon.

6.7.5 Land Use Pattern

The Northern and Southern part of the project zone is forest. The central portion of the zone has undergone severe land use changes from forest to agro forest, agriculture, monoculture cash crops and arboriculture. The eastern sector is a dry deciduous forest. Migration and deforestation from 1950s to 1980s has thoroughly degraded the ecology of Attappady; consequently 67% of land became waste or fallow (see Table 6.21 & 6.22) that pushed 87% of people into poverty, ill health, malnutrition and many Tamil settlers have been forced to return to their mother land.

Table 6.21 Changing Pattern of Forest Since 1959

Year	Forest Area in Hectare	Area in Percentage	Remarks
1959	60729	82%	Migration started to Attappady
1961	54664	74%	Migration Getting momentum
1971	20949	28%	After 1976 migration losing its momentum and there is no further loss of forest
1976	15108	20%	
Source: *Various booklets published by AHADS*			

It is very clear from the table 6.22 that AWCECOP has made a positive impact in eco-restoration/greening process. *Normally the increase of open deciduous forest is treated as a negative impact, but here it is considered as a positive impact because the earlier scrub lands, permanent fallow lands and the degraded forests lands exhibit an open deciduous look after their treatment*. The increase of total land is a technical issue in that earlier Attappady Block constituted only 754.84

sq.km land; thereafter AWCECOP adopted a few areas from Mannarkkad Block for smooth and full implementation of the project.

Table 6.22 Land Use Pattern at Attappady

Land Use	1996 (sq.km)	2001 (sq.km)	Impact	2005 (sq.km)	Impact
Evergreen Forest	146.16	117.00	Negative	124.73	Positive
Open evergreen Forest	40.38	23.97	Negative	8.87	Negative
Deciduous Forest	125.15	80.85	Positive	85.20	Positive
Open Deciduous Forest	104.79	99.36	Negative	144.23	Positive
Degraded forest	21.55	57.21	Negative	20.07	Positive
Forest Blank	2.24	0.09	Positive	0.27	Negative
Forest Plantation	3.80	8.36	Positive	17.95	Positive
Sub Total	444.07	386.84	-	401.32	-
Single Crop	44.92	33.05	Negative	51.00	Positive
Double Crop	7.02	6.82	Negative	11.10	Positive
Agricultural Plantations	77.73	79.68	Positive	101.94	Positive
Scrub Land	89.44	132.85	Negative	107.73	Positive
Barren Rocky	3.47	0.75	Positive	2.71	Negative
Permanent Fallow	64.70	104.58	Negative	69.08	Positive
Other uses	14.49	14.49	-	14.49	-
Total	**745.84**	**759.06**	**-**	**759.37**	**-**

Source: *Assessment of land use changes in Attappady, Department of Geology, University of Kerala, July, 2007*

6.7.6 Land Development Programmes

Shifting and burn cultivation was the method used by the tribes in the initial stages of their life. This created discontinuity in the forest area. Later, the timber

clearance and new settled agriculture supported by chemical fertilizers became a reason for soil erosion and further degradation of fertile land. The unusual slope of the land has also aggravated this phenomenon. *The major rivers flowing through Attappady have been dammed either outside or at the periphery of Attappady and the stream flow has been diverted to other drainage systems.* The Bhavani River at Upper Bhavani as well as its tributaries, Kundah River and Varagar River have been dammed or diverted. Similarly Siruvani River is also diverted to Coimbatore City by the Tamil Nadu Local Government. The net result of these widespread illogical actions was that nearly 507 sq.km of out of 745 sq.km land area of Attappady became wastelands.

Therefore, to bring back the ecological soundness and reinforce welfare and standard of living among the people of Attappady, AWCECOP primarily focused on various land and water development programmes like afforestation and biomass conservation (see Table 6.23), construction of check dams, earthen dams, trenches, contour bunds, retaining walls and drains etc (see Table 6.24) and agro-forestry plantations (see Table 6.25).

Table 6.23 Afforestation and Biomass Conservation

Year	Biomass Conservation Area (Ha)	Afforestation Area (Ha)	Seedlings Planted (no)
2000-01	-	69.21	72785
2001-02	-	226.50	170874
2002-03	792.20	573.67	425047
2003-04	1347.81	750.89	438705
2004-05	1334.30	703.78	344482
2005-06	941.70	522.26	399500
2006-07	1033.29	501.65	304000
2007-08	1774.36	428.29	272630
Total	**7223.66**	**3776.25**	**2428023**
Source: *AWCECOP Status Report 2008 and various booklets by AHADS*			

Table 6.24 Soil and Water Conservation on Private Lands

Structural Conservation	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	Total
Bench Terrace (in m)	562	10	871	310	361.33	625	0	**2739.33**
Contour Bund (in m)	8599.3	13701	74092	76916.7	135194.6	38699.9	32424	**379627.5**
Check dam (in no.)	327	530	713	755	808	1002	298	**4433**
Drains (in m)	1463	6844	27597.6	9116.6	4113.35	197.5	0	**49332.05**
Fencing (in m)	670.7	0	0	0	0	0	0	**670.7**
Half Moon Terrace (in no.)	0	10571	0	14021	85782	58837	48830	**218041**
Retaining Wall (in m)	5960.2	2218.5	3336.95	1812.5	2554.3	2760.35	1274	**19916.8**
Trenches (in no.)	242061	799685	202248	188469	238619	127191	115536	**1913809**
Earthen dam (in m^3)	0	0	6	2645	7516	19799.1	1400	**31366.1**
Source: *A WCECOP Status Report 2008 and various booklets by AHADS*								

Table 6.25 Private Land Development- Agro forestry Plantations

Year	Treated Area (Ha)	No. of Plants
2001-02	332.84	79384
2002-03	823.42	379132
2003-04	999.09	594000
2004-05	648.30	391748
2005-06	701.23	333560
2006-07	793.49	400895
2007-08	640.90	349941
Total	**4939.27**	**2528660**
Source: *AWCECOP Status Report 2008 and various booklets by AHADS*		

Controlling the ravines and gullies that are prominent features of erstwhile eastern Attappady is the key to rejuvenation of rivulets and wells. Thus*, running water from hilltops is made to walk the valley and percolate beneath arid tracts trough series of gully plugs and percolation ponds* (AWCECOP Status Report 2008) is the prime aim of the land and water development programmes in Attappady.

6.7.7 Population and Culture

Kurumbas, Mudugas and Irulas (the Scheduled Tribes) were the first humans who settled in Attappady (see Table 6.26). In 1950s, in-migration began to Attappady; the landless upper caste people have trespassed into the forest land and have settled there. As per 1951 Census data Attappady was purely a Tribal Block with 95% of Tribes and 5% non Tribes. But, by the end of 2001 the demographic strength of Tribes reduced to 41% (see Table 6.27) and the new Tamil and Kerala upper caste settlers became the major share of population.

Linguistically and culturally, Attappady block is a multilingual and multicultural social stratum which includes primitive and ethnic tribes of Attappady and upper caste Hindus, Muslims, Christians as well as Scheduled castes from Kerala and

Tamil Nadu. Malayam and Tamil are the two instructional languages in the schools and offices of Attappady, even though the Tribes use their ethnic language inside their hamlets for communication.

Table 6.26 Current Demographic Distribution of Tribes and Hamlets

	Irula	Muduga	Kurumba	Total
Hamlets	144	24	19	187
In percentage	84	10	6	100
Source: *AHADS Guide 2007*				

Table 6.27 Changes of Population over time in Attappady 1951-2001

Census	Total	ST	Non ST
1951	11300	10200	1100
1961	21461	12972	8489
1971	39183	16536	22647
1981	62246	20659	41587
1991	62033	24229	37805
2001	66171	27121	39050
Source: *AHADS Guide 2007*			

6.7.8 AWCECOP: An Ecological Economic Analysis

Over the past decades, since 1950s, Attappady Hills experienced exhaustive tree felling and heavy migration from the valleys of Kerala and the planes of Tamil Nadu that caused ecological deterioration, poverty, ill health and socio-cultural anarchy. In this context, AWCECOP of Attappady Hills Area Development Society, since 1996, is a unique experience in poverty eradication, eco-restoration and socio-economic-ecological integrity. Now Attappady Hills have been turning green, fertile and damp with soil and water conservation as well as afforestation programmes.

The above mentioned data and observations (official data and claims) about AWCECOP need an eco-perspective analysis which can be enumerated as follows:

1. Before implementation of AWCECOP forest share declined from 60729 hectares (82% of total land) to 15108 hectares (20% of total land) in Attappady hills. Since 1996 there is no change seen in forest cover.

2. Soil erosion and uncontrolled grazing caused desertification till AWCECOP. Thus, 67% of land area of Attappady is categorized as waste land.

3. Because of ecological deterioration, since 1981 the Attappady block experienced a reverse migration to Tamil Nadu and other parts of Kerala, till 2000. At the same time the population of tribes was sensibly stagnant because of cultural immobility factors. As per census 2001 there is an increase of non-ST population which is an indicator of eco-restoration by AWCECOP. This is very clear from the census data (see Table 6.27).

4. Forest regeneration works have been completed on 10,999.91 hectare of forest land and 782 km fire protection lines are constructed. Earlier, forest fire was daily news in Attappady.
5. For soil and water conservation, AWCECOP completed 6.60 lakhs staggered trenches, 8013 check dams on 4664 hectare of forest land that positively reflected on the rejuvenation of many rivulets which contributed more water to farming in summer also.

6. 5820.48 hectare private wasteland has been treated with soil and conservation works like Bench Terrace, Contour bund, Check dams, Half Moon Terrace, Trenches etc. and 123.45 hectare of farming land is irrigated by pipe irrigation. AWCECOP takes initiatives on agriculture development planting fruits plants in private waste lands and has planned more income generating programmes like sericulture, rabbit farming, diary farming etc.

The new organic farming practices with vermi-cumpost and organic-fertilizers have brought back the fertility of soil increasing the productivity of land and income of the people.

7. The Kodangarapallam River, Varagar, Alamarapallam, Dhaliyarapallam, Uppungarapallam, Puliyappathi streams are genuine examples of river rejuvenation. A study by Kerala University on the changes in land use pattern between 2001 and 2005 in Attappady indicates positive impacts of greening and eco-restoration efforts made by the project (see Table 6.22).

As an Eco-restoration project AWCECOP is a milestone in the field of ecological history of Kerala. It has created environmental literacy among the people of Attappady as well as Kerala. The environmentalists of Kerala were initially apprehensive about the project and beyond its financial hindrance and bureaucratic disputes, AWCECOP eventually got widespread acceptance among the people of Attappady and the primitive scheduled tribes' viz. Irulas, Mudugas and Kurumbas became the backbone as well as the real beneficiaries of this project.

Against this background, it is inevitable to conduct a micro level case study to examine the pro-poor, pro-ecological features of AWCECOP with primary data, interviews and discussions with the beneficiaries of the project beyond its official/ public claims.

6.7.9 Sample Selection

The AWCECOP consists of 15 macro watershed units (DU1 to DU15) and DU 15 is an uninhabited area covered by the forest. Out of these 15 watersheds, DU4 is purposively selected for sample survey since DU4 (Pudur Macro Watershed) is very close to the Nilgiri Hills of Tamil Nadu lying in the northern part of the

project area. This is the place where many rivulets originate and join with tributaries of River Bhavani.

As per the topography, it can be recognized that the South-West to North-East of the project area is more dried and vacant, especially the eastern parts. Similarly, the centre and North-East of the project area shows high population density than other parts of the block. Climatologically, DU4 lies in a moderate climatic region of Attappady block (see Table 6.28 and Figure 6.4).

Table 6.28 Average Climatological data observed in selected Observation Stations

Observation Station	Vattulakky	Chavadiyoor	Mully	Karuavara
Rainfall (mm)	588	948	969	2800
Evaporation (mm)	5.45	5.33	4.85	2.44
Max.Temp.(°C)	32.5	32	31	25
Mini.Temp.(°C)	20	20	19.5	16
Sunshine (Hrs)	6.3	5	5.1	5
Humidity	49	52	55	81
Rain days	35	45	48	87
Position	Extreme East	North-East	Extreme North East	Extreme West
Adapted: *A WCECOP Status Report 2008*				
Note: Development Unit 4 (DU4- Pudur) lying in the extreme north of the Attappady Block, is very close to Chavadiyoor and Mully observation stations. So it has a moderate climate as compared to the East or West of the Block.				

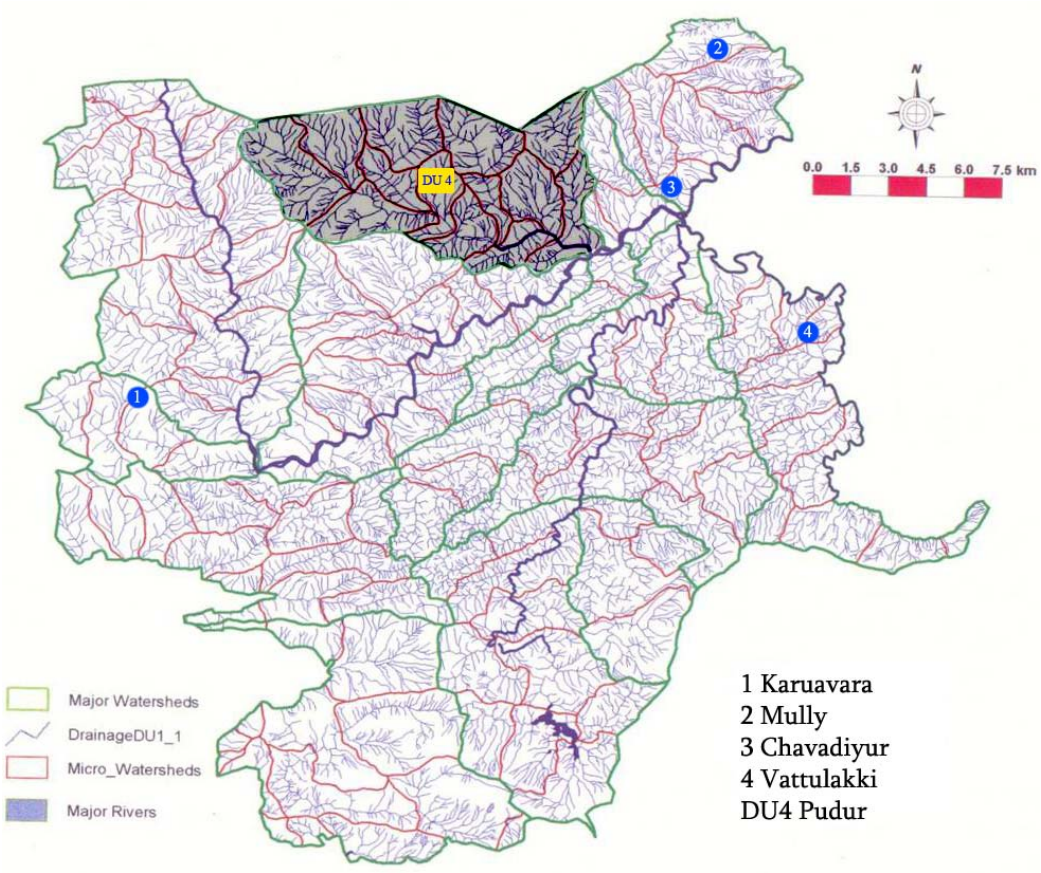

Fig. 6.6 DU4 Pudur-the Climatic Region

To understand the socio-economic and ecological impact of the AWCECOP, the present study carries out a detailed survey at Cheerakkadavu (DU4 Pudur) micro watershed area. Cheerakkadavu is a notable agriculture area that has witnessed the return of farmers since the year 2005 because of the rejuvenation of Cheerakkadavu- Daliyara pallam (small stream). This Micro watershed DU4 is in southern Pudur development unit and contributes water to River Bhavani via Daliyarapallam.

6.7.10 Tools and Techniques

Since the beginning of this study, the researcher was a frequent visitor to this area and keenly observed each macro watershed and selected DU4 for detailed study. To examine the impact of this eco-restoration project, the study employed various participatory research methods like group discussions, discussions with experts,

interviews with office bearers of User Associations, conversations with common people, systematic observations, open as well as close-ended questionnaires, transect walking etc.

6.7.11 Socio-Economic Profile of the Study Area

The tribal economy which was self-reliant and self-sustainable till 1950s and early 1960s, now depends heavily on settler population for livelihood. The tribes who lived in the thick forest of Attappady were content with their environment as it satisfied all their basic needs. Land was a source of livelihood rather than a property to the tribes and they maintained a functional and spiritual relationship with the forest and land (KFRI 1991).

Apart from its geographical position and foregone 'resource encroaches' DU4 also exhibits exclusive socio-economic features. Since 1970s, resource politics has played a decisive role in the socio-economic life of the Scheduled Tribes, who were the real custodians of the land of Attappady. The projects and plans guided by the various government departments to 'characterise the Adivasi (Tribes) as a human being' ruined the culture and their intercultural relations as well as eco-centric life styles. The practices resulted in further encroachment of land and resources by outsiders and these newcomers became the chunk of the region (see Table 21). Accordingly, in early 1990s the fertile land of Attappady turned barren and waste and the tribes became landless[5] wage labourers. The sample survey conducted at DU4-Pudur macro watershed highlights these socio-economic issues and gaps between STs and Non-STs. However, the tribes maintain an integrated way of life, combining the economic, cultural, spiritual and social aspects, which in turn depend on the peripheral economy (settlers and other NGOs like AHADS).

6.7.12 Demography and Education

A sample survey was conducted in 75 households, 38 from non-ST category and 37 from Scheduled Tribes. Sample households were randomly selected from various

micro watersheds of Pudur Development Unit. Here Bhoothayar and Idavani micro watersheds are purely settled and maintained by the Kurumba tribes and the Thoppukadu micro watershed is the farmer's settlement area (see Table 6.29).

Table 6.29 Pudur (DU4): Household distribution

Name of Micro watershed	Scheduled Tribes	Non Scheduled Tribes	Total
Mele Moolakombu	10	3	**13**
Pudur	133	164	**297**
Ummathampady	39	62	**101**
Pattanakkal	23	25	**48**
Thoppukadu	0	8	**8**
Olavankara	50	68	**118**
Swarnagadhaa	40	32	**72**
Aralikkonam	27	2	**29**
Bhoothayar	34	0	**34**
Idavani	20	0	**20**
Total	**376**	**364**	**740**

Source: (*Author's Primary Survey) Interviews and discussion with Presidents and Secretaries of User Association*

The average size of ST families is 3 to 4, whereas it is 4 to 5 in non-ST households. The discussions and interviews with the people of DU4-Pudur has revealed that approximately 9 percent of population are infants below the age of 5, around 20 percent are students and the rest are engaged in economic activities. Table 6.30 gives a clear picture.

In case of education, the sample survey in the DU4 shows that 66 percent of population remains illiterate and 72 percent of them belong to Tribes. 47.2 percent of STs are illiterate and among them the older generation has been completely

excluded from mainstream schooling. At present, the younger generation enjoys opportunities to get good schooling through government schemes. It is observed that the region has Malayam and Tamil medium schools and the settler's children show a higher enrolment rate in these schools. Normally, Tribes prefer government boarding schools outside the region due to the education facilities for Tribes which are 100 percent free with stipends.

Table 6.30 Demographic Pattern of Attappady

	S T Households	Unit	Non S T Households
Normal size of house hold	3 – 5	Number	4 – 6
Children up to age 10	16.3	Percentage	17.2
Age 11 – 15	8.5	-do-	7.3
Full –fledged work force	48.7	-do-	49.2
Supporting work force	23.6	-do-	23.2
Retired or disabled	2.9	-do-	3.1
Illiterates	47.2	-do-	18.7
Primary	24.5	-do-	19.2
Upper Primary	11.7	-do-	38.1
secondary	14.6	-do-	19.4
Technical & higher education	2	-do-	4.6
Source: *Author's Primary Survey and discussions with UAs Secretaries*			

6.7.13 Occupational Pattern and Income

Basically the tribes are nomadic in nature and were accustomed to transitory life till early 1950s. Since the implementation of forest conservation programmes, STs were forced to settle and 'imitate the so called modern life', although they were ignorant of such a life. These strange practices and the exploitation of new settlers from Tamil Nadu and Kerala caused to increase poverty among STs who shifted from landlords to wage labourers. The new settlers then became employers and

land owners in the region. According to the Sample Survey, 53.1 percent of STs are full time wage labourers and 26.2 percent of STs are engaged in part time farming, whereas 69.2 percent non-STs are farmers and hiring wage labourers. 3.9 percent of STs and 5.4 percent of non-STs are also engaged in business (see Table 6.31). But the difference is that the ST shops in size and investment are very small and short-lived and can be called petty shops, whereas, the non-STs own big shops and earn satisfactory income from the business. Very few STs have traditional knowledge on instant remedial treatments with only two old-aged persons practicing the same in the study area.

Table 6.31 Occupation and Income Pattern of Attappady

	S T Households	Unit	Non S T Households
Agriculture	26.2	Percentage	69.2
*Business	3.9	-do-	5.4
Govt. employees	-	-do-	1
Private sector	7.8	-do-	8.2
Wage labour	53.1	-do-	4.6
Self employed	7.5	-do-	8.6
Unemployed	1.5	-do-	3
Normal wage (male)	100 – 120	Rupees	100 – 120
Normal wage (female)	75 – 100	-do-	75 – 100
*Normal monthly income (season)	750 – 1000	-do-	850 – 1200
*Normal monthly income (off Season	400 – 500	-do-	550 – 900
Source: *Author's Primary Survey and discussions with UAs Secretaries*			
Note: *business: In the case of STs it is Petty Shops *normal monthly income: In the case of Non-STs it is the income from Horticulture, Dairy farming, Poultry etc. and apart from the major crops.			

6.7.14 Housing

70 percent of houses in the surveyed area are good, well maintained with satisfactory living conditions, thanks to the public housing schemes of the government. Besides, it is observed that the floor areas of the houses ranged from 200 sq. ft to 1500 sq. ft with 3–4 rooms in the case of STs and 4–5 rooms for non-STs. However, the highest plinth area houses are owned by non-STs and 85 percent of their houses are tiled (see Table 6.32). The more disturbing finding from the region is that only 30 percent households have sanitary/pit toilets and rest of them defecate in the open and also do not have any arrangement for waste water disposal. 28 to 30 percent of houses have favourable living conditions even though they are roofed by grass, asbestos, aluminium sheets etc. Nearly 90 percent of households use bricks for walls and very few use other cheap materials like mud or bamboo poles.

Table 6.32 Housing Pattern of Attappady

	S T Households	Unit	Non S T Households
With good/satisfactory conditions	70	Percentage	72
Liveable conditions	30	-do-	28
Number of Rooms	3 – 4	Number	4 – 5
Kitchen Inside	70	percentage	77
Kitchen Outside	30	-do-	23
Electricity	92	-do-	98
Toilet	30	-do-	65
Source: *Author's Primary Survey and discussions with UAs Secretaries*			

6.7.15 Banking Culture

The sample survey area shows a weak banking culture with 85 percent bank account and less saving habits. These 85 percent accounts are only for some official loans and people are not familiar with banking habits. The money lenders and rich

farmers from Tamil Nadu play a crucial role in the finance matters of the people of Attappady. Table 6.33 shows a clear picture about the banking culture of the people of Pudur.

Table 6.33 Banking Culture of Attappady

	S T Households	Unit	Non S T Households
Bank Account	92	Percentage	80
Cheque book	16	-do-	75
ATM card	-	-do-	15
Saving Deposits	92	-do-	80
Agriculture loan	31	-do-	35
Other loan	5	-do-	26
Chit funds	5	-do-	40
Liabilities (Average)	3500 – 5500	Rupees	5000 – 8000
Source: *Author's Primary Survey and discussions with UAs Secretaries*			

The recently introduced National Rural Employment Guarantee Scheme of the Government of India has influenced the number of bank accounts in this region. Consequently the number of bank accounts increased to 85 percent in this region. The financial and income bottlenecks along with lack of banking culture are the reasons for mortgage out of land by the Tribes. It is also notable that the nearest bank branches are located in Agali - a small township with 3 sq.km area - which is 10 to 18 km away from the sample surveyed area.

6.7.16 Assets

The tribes, the original inhabitants of the Attappady region, have land under their possession (see Table 6.34), though the extent of area has reduced due to alienation by new settlers. The surveyed area showed average 1.6 acres of land with Tribes and average 4.6 acres with others. Comparatively DU4 is a less exploited region by

the outsiders, even though the land of STs declined from average 6 acres to 1.6 in the last decade.

Table 6.34 Physical Assets of ST and Non ST Households of Attappady

	S T Households	Unit	Non S T Households
Average land holdings (Average)	1.6	Acre	4.6
*Other physical assets (Average)	4000 - 6000	Rupees	10000 – 12500
Source: *Author's Primary Survey and discussions with UAs Secretaries*			

Apart from land, the survey has tried to account for other physical assets like television, radio, refrigerators, watch, mobile phones, and motor vehicles etc. The reason is that nowadays GOI and many state governments have deemed these assets to fix the poverty line. Many of the tribes do not have such modern items. However they have Rs.4000 to Rs.6000 worth assets and these are not luxuries. The survey has accounted four motor vehicles and eleven motor bikes from the region owned by the rich settlers. Subsequently the non-ST households have an average of Rs. 1000 to Rs.12500 worth assets other than the above mentioned exceptional cases.

6.7.17 Health and Human Capital

Starvation deaths were reported from Attappady before the year 2000. However, no such incidents are reported now, which is attributed to the availability of year-long employment for the local people. Diseases related to malnutrition were prevalent in Attappady in the past; anaemia was a common problem among tribal children. With the emergence of widespread health facilities over Kerala, the Attappady region was also served with one super speciality government hospital, 3 government hospitals, one mission hospital, 4 private Homeopathic dispensaries and 3 private Ayurvedic dispensaries.

Education facilities in Attappady are very poor, even though 47 schools serve the basic educational needs of the people; there are no higher education centres or technical education institutes under private or government sectors. The dropout rate of children from different schools of Attappady has come down when compared with the previous years (see Table 6.35 & 6.36).

Table 6.35 Education Infrastructure at Attappady

	Government	Co-operative	Aided	Un-aided	Total
L. P Schools	14	-	5	5	24
U. P Schools	4	-	4	-	8
High Schools	4	1	4	-	9
Plus Two Schools	3	-	1	-	4
V.H.S.S	2	-	-	-	2
Total	27	1	14	5	47
Source: *AHADS Guide 2007*					

Table 6.36 School Dropout Cases at Attappady

Schools	1999-2000	2000-2004	2004-2008
Primary schools	174	120	100
Upper Primary Schools	107	65	45
High Schools	83	70	55
Adapted: *AHADS Status Report 2008 and discussions with teachers from various schools*			

The decrease in school dropouts is attributed to the better socio-economic conditions emerging in the tribal hamlets as a result of AWCECOP. Child labour has drastically come down due to the reduction in dropout rate, as more and more children are being sent to school.

6.7.18 Labour Conditions

Wage labourers of Attappady were earlier exploited across the region with fewer wages and more working hours; AHADS has established and ensured minimum wage as Rs. 75 for female labourer and Rs. 100 for male which has now increased to 125 for both men and women instead of Rs.30 and 50 in the late 1990s. Before AHADS intervention it was the tendency of people of Attappady, mainly Tribes, to migrate to Kerala and Tamil Nadu plains in search of employment and higher wages. At present, growing employment opportunities and lack of labour force (demand-supply gap of labour market) combined with eco-restoration activities as well as AHADS social interventions, have increased the wage rates across the region.

END NOTES

[1] BD-defined as the weight of soil per unit volume is a fundamental soil property which is used as an important site characterization parameter since it changes for a given soil.

[2] The stage of ground water development is ratio of Annual Ground Water Draft and Net Annual Ground Water Availability in percentage. Present stage of ground water development of India is 58%.

[3] Bread for the World is the development organization under the auspices of the Protestant Churches in Germany. FIAN International (Food first Information & Action Network) is an international human rights organization working for the right to food of those threatened by hunger and malnutrition.

[4] AHADS is an independent governmental organization registered under the Charitable Societies Registration Act-1860, on October 31, 1995.

[5] Contextually the term landless does not mean no land; here the meaning of landless is less land (less than 2 acre) which remains practically waste and unproductive.

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