INTEGRATED WATERSHED MANAGEMENT PROGRAMME (IWMP)

DEATAILED PROJECT REPORT (DPR)

IWMP II/2012-13

PULIKKEEZHU
BLOCK PANCHAYAT

Technical Support Organisation

CSES
Centre for Socio-economic
& Environmental Studies
Kochi- 682 024

Integrated Watershed Management Programme (IWMP)

Detailed Project Report (DPR)

IWMP II/2012-13

Pulikkeezh Block Panchayat

Technical Support Organization

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ABBREVIATIONS

APL	Above Poverty Line
AAP	Annual Action Plan
BLCC	Block Level Co-ordination Committee
BPL	Below Poverty Line
BRGF	Backward Regions Grant Fund
CEO	Chief Executive Officer
CSES	Centre for Socio-economic and Environmental Studies
DLCC	District Level Co-ordination Committee
DPC	District Planning Committee
DPR	Detailed Project Report
EPA	Entry Point Activities
FGD	Focus Group Discussion
GIS	Geographic Information System
GP	Grama Panchayat
GW	Ground Water
IEC	Information, Education and Communication
IT	Information Technology
IWMP	Integrated Watershed Management Programme
LFA	Logical Framework Analysis
LSGD	Local Self Government Department
LSGI	Local Self Government Institutions
LSS	Livelihood Support System
MCM	Million Cubic Meters
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MLA LAD	Member of Legislative Assembly Local Area Development scheme
MoU	Memorandum of Understanding

MPLAD	Member of Parliament Local Area Development
MSL	Mean Sea Level
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-Governmental Organization
NRAA	National Rainfed Areas Authority
NRHM	National Rural Health Mission
NRM	Natural Resource Management
OBC	Other Backward Caste
PIA	Project Implementing Agency
PRA	Participatory Rural Appraisal
PRIs	Panchayati Raj Institutions
PS&M	Production System and Microenterprises
SC	Scheduled Caste
SHG	Self Help Group
SLNA	State Level Nodal Agency
SPSP	State Perspective and Strategic Plan
ST	Scheduled Tribe
TSO	Technical Support Organisation
UG	User Group
VEO	Village Extension Officer
WC	Watershed Committee
WCC	Watershed Co-ordination Committee
WCDC	Watershed Cell cum Data Centre
WDT	Watershed Development Team
WW	Women Welfare

CHAPTER I

INTRODUCTION

The Integrated Watershed Management Programme (IWMP), initiated by the Ministry of Rural Development (MoRD), Government of India, is a unique watershed programme calling for multidisciplinary approach to natural resource management for ensuring continuous benefit on a sustainable basis. Watershed Management brings about the best possible balance between natural resources on the one side and human beings on the other. IWMP not only helps in land, water and biomass management of degraded areas but also in the conservation of the protected areas so that biodiversity and genetic resources are available for future generations. The programme is implemented through Panchayati Raj Institutions thereby ensuring people's participation in different stages such as planning, implementation, monitoring, evaluation and post project activities.

1.1 Project Background

IWMP II/2012-13 Pulikeezhu watershed project is located in Pulikeezhu Block Panchayat of Pathanamthitta district. The project comprises of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The project, with an area of 4838 hectares has been selected for treatment under the Integrated Watershed Management Programme (IWMP). The project area covers the grama panchayats of Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. The project area comes under upper Kuttanad division and have tributaries of Pampa and Manimala rivers.

Table: 1.1: Project Back Ground of IWMP II/2012-13

Location	Micro Watersheds		GP	Wards		Total Area (in ha)	Treatable Area (in ha)	Project Amount (in Lakh)
	WS	Code No.		Full	Partial			
State: Kerala District- Pathanamthitta Taluk: Thiruvalla Block: Pulikeezhu	Ayyankonari	10P8a	Kadapra	1,2,3,10,11,12,13,14,15	-	2366	2366	283.92
			Niranam	1,2,3,4,5,6,7,8,9,10,11,12,13	-			
	Parumala	10P9a	Kadapra	5,6,7,8,9	-	418	418	50.16
	Keecherival kadav	10P10a	Kadapra	4	-	84	84	10.08
	Chathenkeri-kadav	11M 19a	Peringara	13,14,15	-	839	839	100.68
			Nedumbram	1,2,3,12,13	-			
	Podiyadi Puthenthodu	11M 20a	Peringara	2,9,10,11,12	-	1131	1131	135.72
			Nedumbram	4,5,6,7,8,9,10,11	-			
			Kuttoor	1,2	-			
Total						**4838**	**4838**	**580.56**

Table 1.2: Financial Allocation

No.	Head	Amount (Lakhs)
1	Administrative (10%)	580.560
2	Capacity Building (5%)	29.028
3	Monitoring(1%)	5.806
4	Preparation of DPR(1%)	5.806
5	EPA(4%)	23.222
6	Evaluation (1%)	5.806
7	Watershed Development Works (56%)	325.114
8	Production System and Micro-enterprises (10%)	58.056
9	Livelihood Activities for assetless Persons (9%)	52.250
10	Consolidation (3%)	17.417

1.2 Need and Scope for Watershed Development

The Integrated Watershed Management Programme (IWMP) aims to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The need for integrated watershed management arises because of the water scarcity, rapid depletion of ground water table, fragile ecosystems and the incidence of poverty in the area. Land degradation due to soil erosion, low rainwater use efficiency, high population pressure, low livestock productivity, underinvestment in water use efficiency are also observed. The scope of IWMP in the project area, therefore, includes identifying activities that will help to improve the livelihoods of the population in a sustainable manner through participatory watershed development. The expected outcomes are controlled and effective reduction in sediment production, reduction in damaging runoff, reduction in floods in the downstream areas, runoff utilization for useful purposes, enhanced groundwater storage, regeneration of natural vegetation and fodder resources. This enables multi cropping and the introduction of diverse agro-based activities, which will help to provide sustainable livelihoods to the people residing in the watershed area.

1.3 Objectives of the Project

Following are the specific objectives of the project:

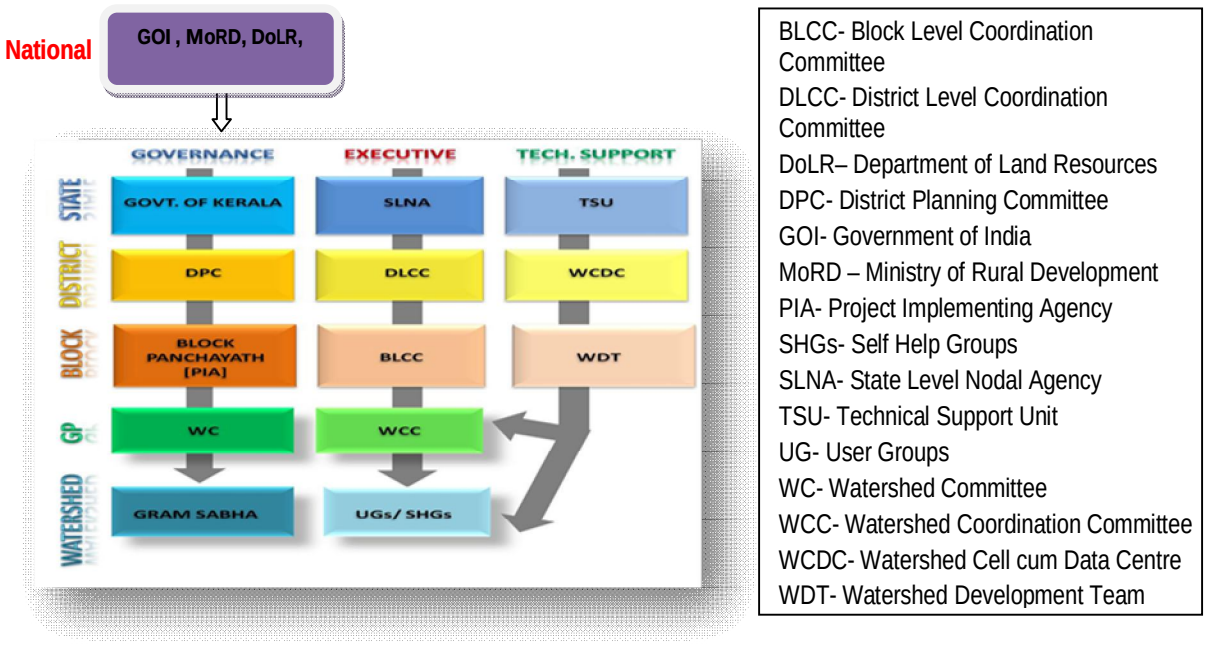
- To restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water.

- To maximise rain water harvesting and recharging of the ground water to improve water availability in the project area.
- To prevent degeneration of the biodiversity in the project area and regeneration of natural vegetation.
- To undertake water and soil conservation activities in a scientific manner so as to increase the production and productivity of agricultural crops.
- To undertake activities to prevent soil run-off, increase the fertility of the soil and water storage capacity of the land.
- To undertake activities for the revival and protection of dying water sources.
- To enhance livelihood opportunities of the people dependent on natural resources.
- To improve the natural resource base and employment opportunities of the project area.
- To minimise the impact of natural disasters such as flood and drought.
- To undertake activities to convert wasteland into cultivable land.

1.4 Organizational set-up of IWMP

The organizational set-up of IWMP at different levels is given below:

Figure 1.1: Institutional set up of IWMP



BLCC- Block Level Coordination Committee
DLCC- District Level Coordination Committee
DoLR– Department of Land Resources
DPC- District Planning Committee
GOI- Government of India
MoRD – Ministry of Rural Development
PIA- Project Implementing Agency
SHGs- Self Help Groups
SLNA- State Level Nodal Agency
TSU- Technical Support Unit
UG- User Groups
WC- Watershed Committee
WCC- Watershed Coordination Committee
WCDC- Watershed Cell cum Data Centre
WDT- Watershed Development Team

1.5 Funding Pattern

District	Name of Project	Name of PIA	No. Of Microwatersheds	Project Area (Ha)	Project Cos (Crores)	Central Share (90%)	State Share (10%)
Pathanamthitta	IWMP II/ 2011-12	Pulikeezhu Block Panchayath	5	4838	5.8056	5.225	0.5806

1.6 Approach and Methodology of Preparing the Detailed Project Report (DPR)

The project area lies in Pulikeezhu Block Panchayat of Pathanamthitta district. The common guidelines provide a flexible framework for the preparation of the Detailed Project Report of the projects under IWMP. The methodology for the preparation of the Detailed Project Report of IWMP – II/2011-12 of Pathanamthitta District is outlined below:

- The project comprises of five micro watersheds. A cluster approach has been followed in the preparation of DPR.
- Review of the official documents on MGNREGS at the national and state levels was done prior to the field level activities.
- Preliminary discussions with elected representatives and officials at the block and district level were conducted.
- Secondary Data: The DPR has to be based on a situation analysis of secondary data and information available from various sources. Basic information about the watershed such as rainfall, temperature, location, topography, hydrology, hydrogeology, soils, geology and geomorphology, demographic and socio-economic characteristics of the population, land-use pattern, major crops and productivity, soil and water conservation practices adopted, irrigation, livestock and microenterprisers were collected from different sources such as Census of India, development reports, publications of government departments etc.
- Baseline Survey: A detailed baseline survey was conducted covering all households in the project area. The database thus created is expected to facilitate the assessment of the impact of the watershed development programme on the project area during and after the implementation of the project.
- Participatory Rural Appraisal (PRA): The participation of stakeholders is essential in identifying the problems and needs of the people in the project area and in identifying suitable watershed

development activities. A Logical Framework Analysis was done at the project level for identifying the important problems (through problem tree analysis) as well as for the purpose of assessing the present situation. Other PRA techniques like transect walk, social mapping, resource mapping, seasonal calendar, etc., were employed in each micro watershed area.

- Use of GIS and Remote Sensing for Planning**:** GIS and remote sensing devices have made use in the preparation of DPR. Quantum GIS Software was used for preparation of maps. Google Earth images of the project area were also used for the planning. 1: 4000 scale cadastral maps of each village were the base map for planning.
- Indepth interviews, Focused Group Discussions with officials, farmers, entrepreneurs of micro-enterprises etc. were undertaken.
- An assessment of the resources likely to be available from other sources and schemes was done in the initial stages of the plan preparation.
- Field level verification of the identified interventions was undertaken by the DPR preparation team which includes the Technical Support Organisation, Watershed Development Team and Watershed Cell come Data Centre.
- Prioritisation: Prioritisation of the interventions was done taking into account the scientific and technical inputs.
- Identification of Entry Point Activities: The entry point activities were identified taking into account its potential as a model for replication.
- IEC and Capacity Building: IEC and capacity building plan has been formulated to achieve the desired results from watershed management programmes.

CHAPTER II

THE PROJECT AREA

2.1 Introduction

The project IWMP II/2012-13 Pulikeezhu watershed is a cluster of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The total project area of the watershed 4838 Ha has been selected for treatment under Integrated Watershed Management Programme (IWMP). The project area is located in Pulikeezhu Block of Pathanamthitta district.

Table 2.1: Basic Project Information

Name of the project	IWMP II/2012-13
District	Pathanamthitta
PIA & Block Panchayat	Pulikeezhu
No. of micro-watersheds	5
Total area (ha)	4838
Proposed area to be treated (ha)	4838
Geographical coordinates	Longitudes: 76°28' 22.98"to 76°34'37.884" ^{o}E Latitudes:9° 25' 7.896" to 9° 24'1.7274" ^{o}N
Gramapanchayats covered	Niranam,Kadapra,Kuttoor,Nedumbram,Peringara
Estimated cost (Rs. in crores)	5.80566

2.2 Details of the Micro Watersheds in the Project Area

The details of the selected watersheds in the project area are presented in Table 2.2.

Table 2.2: Details of the Selected Watersheds in the Project Area

Name	Code	Area (in Ha)	GPs covered	Wards covered
Ayyankonari	10P8a	2366	Kadapra	1,2,3, 10 to 15
			Niranam	1 – 13
Parumala	10P9a	418	Kadapra	5,6,7,8,9
Keecherivalkadavu	10P10a	84	Kadapra	4
Chathenkery Kadavu	11M19a	839	Peringara	13,14,15
			Nedumbram	1,2,3,12,13
Podiyadi Puthanthodu	11M20a	1131	Peringara	2,9,10,11,12
			Nedumbram	4,5,6,7,8,9,10,11
			Kuttoor	1,2

2.3 Brief History

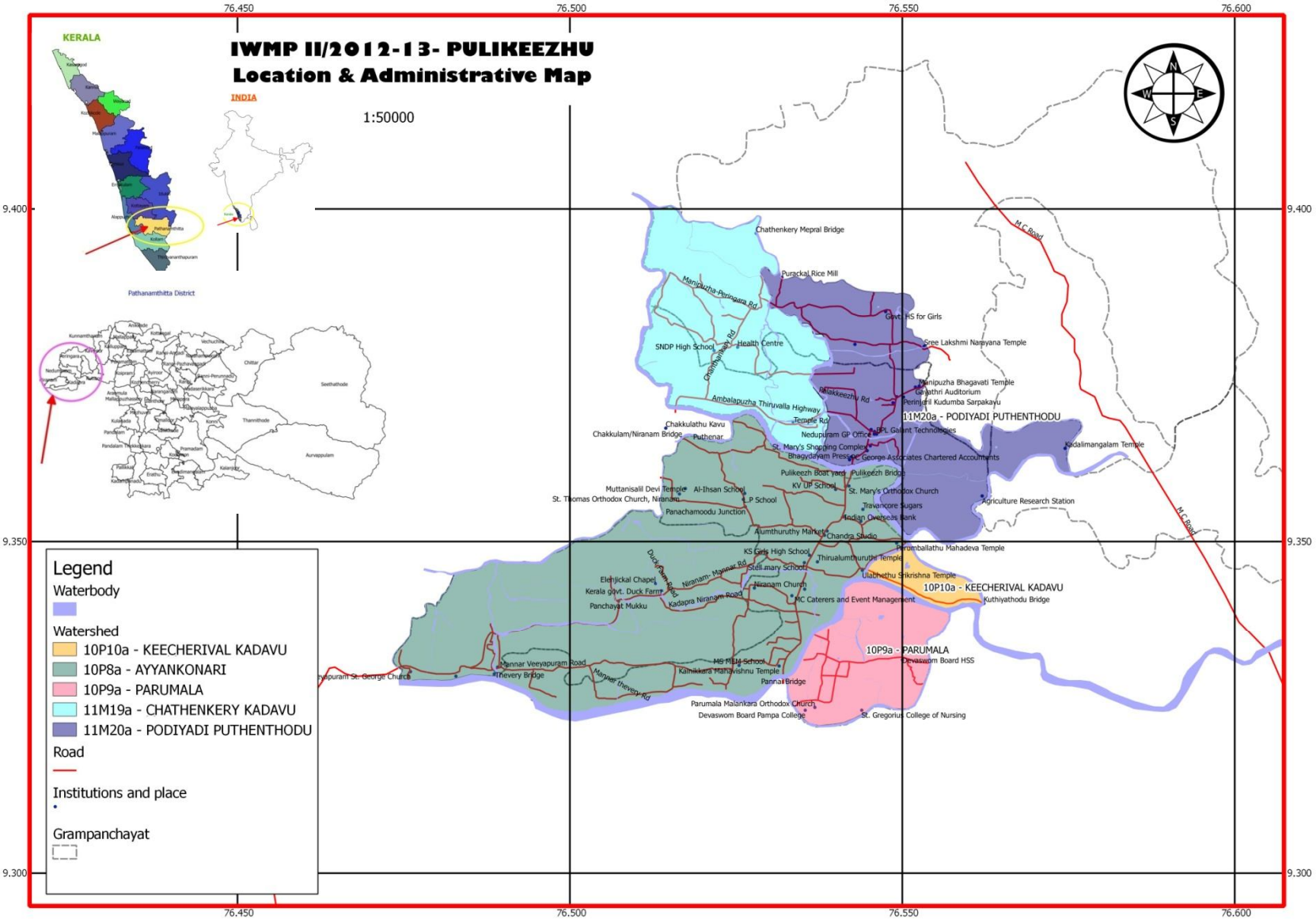
From 9th to 12th century A.D., Thiruvalla taluk of the then Alleppey district was part of Nantuzhainad and later it was merged to Odanad and subsequently with Thekkumkur. Pliny the famous traveller of the 1st century A.D. had described in his famous book 'Pereplus' about Niranam (Neleynda), the river Pamba (Baris) and about exporting pepper from Thiruvalla. The famous Niranam Poets - Madhava Panikkar, Sankara Panikkar and Rama Panikkar of the Kannassa family are well known for their great contribution to Malayalam literature. They lived between AD 1350 and 1450. It is believed that in A.D. 52, St.Thomas, one of the twelve Apostles of Jesus Christ, landed at Malankara and founded seven churches in Malabar coast, one of which is located at Niranam[1]. Pulikeezhu block was formed on December 23rd 1955 as the part of the Community Project Approach Programme[2].

2.4 Location

The project area is located in Pulikeezhu Block, Panchayat Pathanamthitta District and lies between longitudes 76. 47304 ^{o}E to 76.57719 ^{o}E and latitudes 9.32202 ^{o}N to 9.40048 ^{o}N. Among the eight blocks of Pathanamthitta district, Pulikeezhu block is the smallest. The project area is spread over five Grama Panchayats namely, Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. The total geographical area of the block is 68.66 sq.km. Pulikeezhu block is bounded on the Northern side by Madappally block (Kottayam District) and on the Southern side by Mavelikkara block (Alappuzha District). On the Eastern side it is bounded by Koyipram block and Thiruvalla Municipality (both in Pathanamthitta district) and on the Western side by Champakulam block (Alappuzha District).

[1] Pathanamthitta district urbanization report.
[2] http://lsgkerala.in/pulikeezhublock/

Figure 2.1: Location & Administrative Map



2.5 Criteria for Selection of the Project

The weightage and criteria for selection of the watershed management programme is given in Table 2.3. The weightage under different criteria for IWMP II/2012-13 Pulikeezhu watershed is given in Table 2.4.

Table 2.3: Criteria and Weightage for the Selection of Watershed

No	Criteria	Maximum Score	Ranges & scores			
i	Poverty index (% of poor to population)	10	Above 80 % (10)	80 to 50 % (7.5)	50 to 20 % (5)	Below 20 % (2.5)
ii	% of SC/ ST population	10	More than 40 % (10)	20 to 40 % (5)	Less than 20 % (3)	
iii	Actual wages	5	Actual wages are significantly lower than minimum wages (5)	Actual wages are equal to or higher than minimum wages (0)		
iv	% of small and marginal farmers	10	More than 80 % (10)	50 to 80 % (5)	Less than 50 % (3)	
v	Ground water status	5	Over exploited (5)	Critical (3)	Sub critical (2)	Safe (0)
vi	Moisture index	15	-66.7 & below (15)	-33.3 to -66.6 (10)	0 to -33.2 (0)	
	DPAP/ DDP Block		DDP Block	DPAP Block	Non DPAP/ DDP Block	Above 70 %

						(Reject)
vii	Area under rain-fed agriculture	15	More than 90 % (15)	80 to 90 % (10)	70 to 80% (5)	Fully covered (0)
viii	Drinking water	10	No source (10)	Problematic village (7.5)	Partially covered (5)	
ix	Degraded land	15	High – above 20 % (15)	Medium – 10 to 20 % (10)	Low-less than10% of TGA(5)	
x	Productivity potential of the land	15	Lands with low production & where productivity can be significantly enhanced with reasonable efforts (15)	Lands with moderate production & where productivity can be enhanced with reasonable efforts (10)	Lands with high production & where productivity can be marginally enhanced with reasonable efforts(5)	
xi	Contiguity to another watershed that has already been developed/ treated	10	Contiguous to previously treated watershed & contiguity within the micro watersheds in the project (10)	Contiguity within the micro watersheds in the project but non contiguous to previously treated	Neither contiguous to previously treated watershed nor contiguity within the micro watersheds in the project(0)	

				watershed (5)	
xii	Cluster approach in the plains (more than one contiguous micro-watersheds in the project)	15	Above 6 micro-watersheds in cluster (15)	4 to 6 micro watersheds in cluster (10)	2 to 4 micro watersheds in cluster (5)
xiii	Cluster approach in the hills (more than one contiguous micro-watersheds in the project)		Above 5 micro-watersheds in cluster (15)	3 to 5 micro watersheds in cluster (10)	2 to 3 micro watersheds in cluster (5)

Source: Integrated Watershed Management Programme, Preliminary Project Report (PPR), Pathanamthiita, Department of Land Resources, Ministry of Rural Development, Government of India.

Table 2.4: Weightage under Different Criteria

District										Pathanamthitta				
Name of the project										IWMP II/ 2011-12 Pulikeezhu Watershed				
No. of micro-watersheds proposed to be covered										5				
Proposed project area (ha)										4838				
Type of project(Hilly/ Desert/ Others)										Plains				
Proposed cost (Rs. in lakh)										580.56				
	i	**ii**	**iii**	**iv**	**v**	**vi**	**vii**	**viii**	**ix**	**x**	**xi**	**xii**	**xiii**	**Total**
	2.5	10	0	10	0	0	15	7.5	5	10	5	10	10	85

2.6 Major Reasons for Selection of Watershed

The major reasons for the selection of the micro watersheds as per PPR of IWMP are:

- Dilapidated traditional irrigation systems
- Low productivity of land
- Strong presence of SC/ST, BPL families and marginal farmers
- Poor adaptation to climate change

2.7 Physiography, Relief and Drainage

The major physiographic units identified in Pathanamthitta district are lowland (areas below 7.5 m from MSL), midland (areas between 7.5 m and 75 m above MSL) and highland (areas more than 75 m above MSL). The project area lies in mid land division and belongs to upper Kuttanad. The project area is characterized by the distribution of two main river networks namely Pampa, the third longest river of Kerala and Manimalayar. These rivers and various networks of streams and channels enriched the project area. The drainage pattern of the project area is dendritic (looks like the branching pattern of tree roots)

Table 2.5: Physiography, Relief and Drainage of the Project Area

Name of Project	Physiography	Maximum Relief (M)	Maximum Base in Relief (M)	Slope Range (%)	Major Drainage
IWMP II/2012-13 Pulikeezhu Watershed	Midland	4 to 13	1 to 17	0 to 1	Pamba and Manimala rivers

2.8 Climate

2.8.1Rainfall

The project area experiences humid tropical climate with a bountiful rainy season through the northeast and southwest monsoons and severe summer. The hot season is from March to May and it is followed by South West monsoon season from June to September. South west monsoon contributes the major part of the annual rainfall[3]. Average annual rainfall is 2920mm.There is no drought or dry spells, but Niranam and Peringara panchayats which come under Chathenkerykadavu (11M19a) and Podiyadi Puthenthodu (11M20a) experiences mild flood during rainy season. The South-West monsoon contributes nearly 59% of annual rainfall followed by 21% of North-Eatst monsoon. Summer showers contribute remaining 19%.

Table 2.6: Annual Rainfall from 1997 to 2010

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
1997	0	2.2	79.2	169.7	49	473.5	845	460	554	359	179	198	3368.6
1998	28	0	7.4	123	195.2	795.5	386	608.1	699.9	466.9	55.4	150.4	3515.8
1999	0	0	36	335.8	507.3	759.9	445.4	266.5	130.9	690.5	161.7	0	3334
2000	20	176.4	72	90.4	128.4	608.2	234.5	549.7	301	243.8	121	41	2586.4
2001	81.7	63.6	13	177.6	368.6	627.6	845	248	426.2	340.8	95.2	14.2	3301.5
2002	0	3	22.2	96.2	445.7	568.6	220.2	375.6	85	448.5	302	0	2567
2003	0	59	60	161.7	110.4	504.2	430.2	345.2	93.8	496.9	95.4	0	2356.8

[3] Ground Water Information Booklet of Pathanamthitta District, Central Ground Water Board, Ministry of Water Resources, Government of India.

2004	3.8	0	53.4	100.4	827.8	519.8	324	306.5	195.8	508.5	253	0	3093
2005	16.4	63.6	37.4	200.2	206.8	602.6	451.7	132.1	312.8	251.2	119.4	73.4	2467.6
2006	43	0	46	107.4	511	505.5	430.4	309.2	349.1	407.6	188.2	0	2897.4
2007	0	22.2	3.6	200.4	264.4	596.9	861.3	418.8	363.4	279.7	168	13	3191.7
2008	0	60	200.9	145.8	62	392.8	641.5	236.8	273.1	308.9	171	8.8	2501.6
2009	0	0	78.2	99.1	286.7	629.9	563.8	207	214.4	165.7	299.2	97.2	2641.2
2010	23.4	0	42.2	191.8	346.5	537.4	469.4	253.2	253.6	561.4	241.8	131	3051.7
Average during 1997 to 2010	15	32	54	157	308	580	511	337	304	395	175	52	2920
Share of different seasons 1997-2010 (%)	19 Jan-May					59 (June-Sept)				21 (Oct-Dec)			100

Source: Agriculture Contingency Plan, National Initiative on Climate Resilient Agriculture (NICRA)

2.8.2 Temperature

The humidity is higher during the monsoon period (from June to September). The maximum temperature ranges from 28.3^0 C to 34.2^0 C whereas the minimum temperature ranges from 20.5^0 C to 25^0 C[4]. Hottest month is April and coldest is December

Table 2.7: Monthly Mean Temperature during 2002 - 2011(° C)

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2002	Min	22.6	23.2	24.1	25.1	24.2	23.2	22.9	22.6	23.3	22.9	23.1	22.1

[4] Ibid

	Max	32.2	32.0	33.5	33.6	31.7	29.5	29.4	29.0	30.8	31.9	31.9	33.2
2003	Min	22.0	23.4	23.9	24.9	24.6	22.8	21.7	22.1	22.1	22.1	22.3	20.6
	Max	32.6	33.0	34.0	34.1	32.9	30.8	28.8	29.5	30.7	31.3	32.2	32.6
2004	Min	20.7	21.7	23.6	23.5	22.1	22.0	21.5	21.3	22.0	21.6	21.6	20.9
	Max	32.0	34.2	34.0	33.7	30.1	29.7	29.3	28.9	30.8	30.8	32.3	32.9
2005	Min	23.8	23.8	25.5	23.7	24.1	21.9	21.3	22.6	23.9	23.7	23.7	23.1
	Max	32.6	32.9	32.8	32.9	33.6	30.4	29.2	30.4	29.7	31.1	31.2	31.2
2006	Min	22.4	22.8	24.7	25.7	24.9	23.8	22.7	23.0	23.2	23.1	22.9	21.8
	Max	32.1	32.4	32.7	33.1	32.1	30.5	29.1	29.2	30.0	30.4	30.9	32.1
2007	Min	21.6	22.5	24.9	24.5	25.0	23.0	22.0	22.4	22.9	22.9	22.7	22.1
	Max	31.8	31.7	32.5	32.8	32.3	29.2	28.4	29.1	30.0	30.9	31.4	32.1
2008	Min	21.2	22.8	22.7	23.6	24.2	23.0	22.2	22.6	22.9	22.9	22.8	22.0
	Max	31.9	31.2	31.6	31.8	32.1	30.0	29.0	29.5	30.3	31.1	31.1	32.0
2009	Min	20.5	22.2	23.6	24.7	24.3	23.2	22.5	22.8	23.0	23.6	23.0	22.7
	Max	32.8	32.4	33.1	33.3	32.1	30.7	29.8	30.5	30.1	31.7	32.3	32.8
2010	Min	21.9	23.2	24.6	24.4	24.2	23.6	23.1	24.3	24.6	24.3	24.6	23.7
	Max	32.2	32.8	34.2	34.0	33.0	30.2	29.1	28.3	29.3	30.4	30.4	30.8
2011	Min	23.0	23.1	24.9	24.5	25.7	24.2	23.3	23.1	23.0	23.9	23.1	22.5
	Max	31.5	31.6	32.7	32.8	32.6	30.9	29.3	29.2	29.6	31.6	31.5	32.2

Source: Indian Meteorological Department, for Alappuzha, Thiruvananthapuram.

2.8.3 Wind

The table below shows that the project area experiences very low velocity wind. The highest velocity of wind is experienced during southwest monsoon and northeast monsoon.

Table 2.8: Wind Speed

Month	Wind Speed (m/s)				
	2009	2010	2011	2012	2013
January	0.4	NA	0.6	0.4	0.4
February	0.7	0.4	0.7	0.5	0.4
March	0.5	0.6	0.7	0.8	0.7
April	0.5	0.6	0.6	0.7	0.7
May	NA	0.7	0.6	0.8	0.7
June	NA	0.5	0.6	NA	NA
July	0.5	0.6	0.6	0.7	0.8
August	0.6	0.7	0.6	0.6	0.9
September	0.7	0.5	0.5	0.5	
October	NA	0.6	0.5	0.3	
November	NA	0.4	0.3	0.4	
December	NA	0.4	0.4	0.3	

Source: Agrometerological Observatory, Agricultural Research Station, Thiruvalla

2.9 Geology

The whole project area has sedimentary rocks consisting of a series of variegated clay and sandstones with lenticular seams of lignite known as Warkalli Formation. The most characteristic feature of the Warkalli Formation is the impersistent nature of the constituent beds, suggestive of shallow basin margin deposits[5]. Sand and clay are the major mineral resources of the project area.

2.10 Geomorphology

Table 2.9: Genesis of Geo-morphology

[5] Geology and Mineral Resources of Kerala, Geological Survey of India, Ministry of Mines, Government of India.

Genesis of Geo-morphology	Area in Sq. ha	%
Fluvial Origin-Active Flood Plain	3737.58	77.25
Coastal Origin-Younger Deltaic Plain	831.57	17.19
Denudational Origin-Pediment-PediPlain Complex	224.21	4.63
Waterbodies	44.64	0.92
Total	**4838**	**100**

Source: Nrsc / ISRO, Bhuvan

2.11 Ground Water

Table 2.10: Ground Water Resource of Pulikeezhu Block as on 31st December 2004

Particulars	Pulikeezhu block
Net annual ground water availability	26.23
Existing gross groundwater draft for all uses	8.07
Allocation for domestic and industrial requirement supply up to next 25 years	3.94
Net groundwater availability for future irrigation development	17.61
Net groundwater available in (MCM)	26.23
Total gross draft in 2004 (MCM)	8.07
Stage of GW development in 2004	30.77
Category	Safe

Source: Land Resources of Kerala State (2009), Kerala State Land Use Board &Ground Water Information Booklet of Pathanamthitta District, Central Ground Water Board, Ministry of Water Resources, Government of India.

Table 2.11: Depth of Ground Water Level Range in Meters Below Ground Level (mbgl)

Sl.No.	Microwatersheds	Geographical Coordinates of Wells Observed	Post Monsoon (November)	Pre Monsoon (April)
1	10P9a	76.54302°E,9.33266°N	2	5
2	10P9a	76.54789 °E,9.33168 °N	3	6
3	11M20a	76.55386 °E,9.36657 °N	2	3
4	11M20a	76.55451 °E,9.35646 °N	2	4
5	10P8a	76.53788 °E,9.35643 °N	2	4
6	11M20a	76.53788 °E,9.35643 °N	2	4
7	11M19a	76.52507 °E,9.37914 °N	2	4
8	11M19a	76.52114 °E,9.37675 °N	2	4
9	10P8a	76.54386 °E,9.34514 °N	2	4
10	10P8a	76.54035 °E,9.34568 °N	2	4
Average depth of ground water			2.1	4.2

Source: Primary Survey

As shown in the Table above, the average depth of ground water below ground level during post- monsoon is 2.1 meters and in pre-monsoon is 4.2 meters.

Table 2.12: Number of Water Sources in the Project Area

Micro Watershed	Open Well	Bore Well	Pond
10P8a	5303	58	59
10P9a	1406	25	3
10P10a	275	1	4
11M19a	1853	3	9
11M20a	3849	15	21
Total	12686	102	96

Source: Primary Survey

Table 2.13: Water availability in private wells

Micro Watershed	Less than 6 months	6-11 months	Throughout the year	Total
10P8a	212	1222	3846	5280
10P9a	83	234	1074	1391
10P10a	4	10	261	275
11M19a	134	54	1659	1847
11M20a	33	356	3455	3844
Total	466	1876	10295	12637

Source: Primary Survey

The table above shows that some of the wells are being either dried up or the water in them became unfit to drink. So a regular mechanism to monitor the water level of some of the wells in the project area should be there under this scheme.

2.12 Soil

The Soil Survey Organisation of the agriculuture department has categorized the soil in the project area Ayroor series. Ayroor series is a member of fine, mixed, isohyperethermic, Typic Ustifluvents. Ayroor soils have dark yellowish brown to brown colours, extremely too strongly acid, sandy clay loam to clay C horizons. These soils are formed on riverine alluvium on gently sloping to level fluvial terraces of Pathanamthitta district, at an elevation of 20 to 100 m above MSL. This soil series belong to land capability sub class IIIe (moderately good cultivable land subject to erosion and runoff) and land irrigability sub class 2t (irrigable land with moderate limitation subject to topography)[6].

2.13 Agro-Climatic Condition

[6] Bench Mark Soils of Kerala, Soil Survey Organization, Department of Agriculture (S.C.Unit), Government of Kerala

The State is divided into five agro-climate zones (South Zone, Central Zone, North Zone, Special Zone on Problem Areas, High Altitude Zone) as per State Land Use Board records. The project area comes under the South Zone. Based on altitude, rainfall, soil and topography, the state has been delineated into thirteen agro-ecological zones. Block Panchayath has been taken as the unit for the purpose of delineation. The Pulikeezhu block comes under Kuttanad zone. The details of the zones are presented in Table 2.14.

Table 2.14: Agro-ecological Situation of the Project Area

Zone	Altitude type	Rainfall pattern	Topography model	Soil type
Kuttanad	Type I: Up to 500 m above MSL (Low altitude zone)	Pattern I: Both the southwest and northeast monsoons are active and moderately distributed. Southwest monsoon give more rain with maximum rain in June	Model I: Extensive valleys with level but raised garden lands	Peat (Kari)

Source: Kerala Agricultural University

2.14 Socio-economic and Demographic Characteristics of the Population

The socio-economic characteristics of the population in the project area have been obtained by conducting a census survey of the households in the project area. As may be seen from Table 2.17, there are 15203 households in the project area. The sex ratio in project area is 1046 females per 1000 males (See Table 2.15).

Table 2.15: Details of the Population in the Project Area

Micro	Sex	Total	Sex

Watershed	Male	Female		ratio
10P8a	12988	13577	26565	1045
10P9a	3481	3647	7128	1048
10P10a	632	648	1280	1025
11M19a	5150	5450	10600	1058
11M20a	9042	9418	18460	1042
Total	31293	32740	64033	1046

Source: Primary Survey

Age wise classification of population in the project area is shown in Table 2.16.

Table 2.16: Age Distribution of Population in the Project Area

Micro Watershed	Age Group			Total
	Below 15 years	15 - 60 years	Above 60 years	
10P8a	4455	17448	4662	26565
10P9a	1303	4694	1131	7128
10P10a	223	836	221	1280
11M19a	1979	6707	1914	10600
11M20a	3180	12147	3133	18460
Total	11140	41832	11061	64033

Source: Primary Survey

Table 2.17: Number of Households in the Project Area

Micro Watershed	Grama Panchayat					Total
	Kadapra	Niranam	Peringara	Nedumbram	Kuttoor	
10P8a	2837	3472	0	0	0	6309
10P9a	1613	0	0	0	0	1613
10P10a	308	0	0	0	0	308
11M19a	0	0	1245	1261	0	2506

11M20a	0	0	1736	2153	578	4467
Total	4758	3472	2981	3414	578	15203

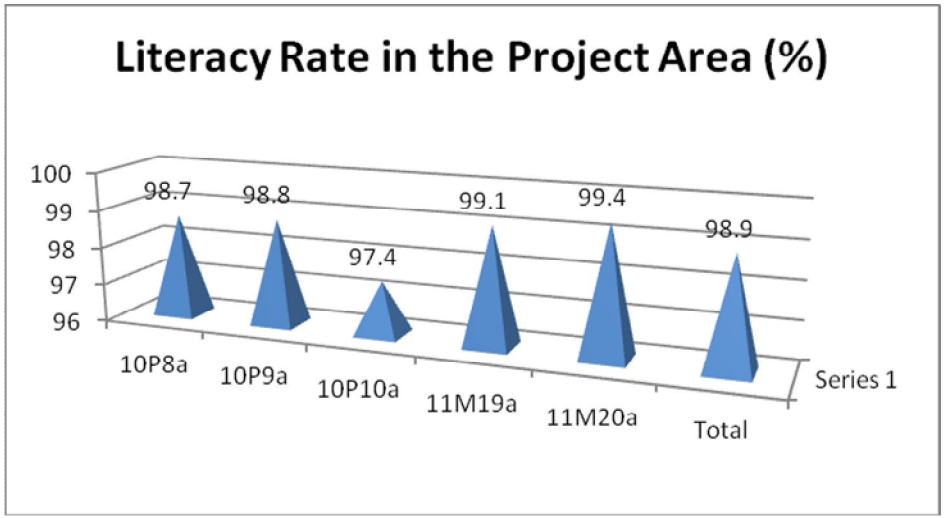
Source: Primary Survey

Table 2.18: Social Classification of Households in the Project Area and Literacy Rate

Watershed	Category		
	SC	ST	Others
10P8a	695	6	5608
10P9a	209	0	1404
10P10a	33	0	275
11M19a	177	8	2321
11M20a	290	11	4166
Total	1404	25	13774

Source: Primary Survey

Literacy rate of the population in the project area is in the chart given below.



Source: Primary Survey

Table 2.19. presents the details about the number and proportion of families living below poverty line (BPL) and those living above poverty line (APL). About 37 per cent of the families in the project area live below poverty line.

Table 2.19: Poverty status of households

Micro Watershed	BPL		APL		Total	
	No.	%	No.	%	No.	%
10P8a	2289	36.28	4020	63.72	6309	100.00
10P9a	696	43.15	917	56.85	1613	100.00
10P10a	137	44.48	171	55.52	308	100.00
11M19a	1007	40.18	1499	59.82	2506	100.00
11M20a	1535	34.36	2932	65.64	4467	100.00
Total	5664	37.26	9539	62.74	15203	100.00

Source: Primary Survey

The distribution of households according to the main source of income of the household is presented in Table 2.20.

Table 2.20: Main Source of Income of Households in the Project Area

Main source of income	Micro Watershed										Total	
	10P8a		10P9a		10P10a		11M19a		11M20a			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Agriculture	552	8.75	110	6.82	36	11.69	206	8.22	137	3.07	1041	6.85
Fishing	64	1.01	26	1.61	-	-	33	1.32	34	0.76	157	1.03
Daily labour	2743	43.48	785	48.67	148	48.05	1196	47.73	1860	41.64	6732	44.28
Agriculture labour	58	0.92	24	1.49	2	0.65	19	0.76	42	0.94	145	0.95
Salary -Government	246	3.90	72	4.46	17	5.52	111	4.43	358	8.01	804	5.29
Salary – Private	467	7.40	114	7.07	23	7.47	133	5.31	297	6.65	1034	6.80
Self employed/Business	359	5.69	118	7.32	6	1.95	119	4.75	305	6.83	907	5.97
Income from abroad	898	14.23	195	12.09	20	6.49	303	12.09	685	15.33	2101	13.82
Pension	711	11.27	144	8.93	40	12.99	285	11.37	619	13.86	1799	11.83
Others	211	3.34	25	1.55	16	5.19	101.	4.03	130	2.91	483	3.18
Total	6309	100.00	1613	100.00	308	100.00	2506	100.00	4467	100.00	15203	100.00

Source: Primary Survey

The decline in agricultural employment is an emerging issue in the project area. There has also been an alienation of the younger generation from the agriculture sector. The details about the landless households in the project area are presented in Table 2.21. Landless households constitute about two per cent of the total number of households in the project area.

Table 2.21: Details about the Landless Households in the Project Area

Micro Watershed	Landless Households	
	No.	% to total

10P8a	114	1.81
10P9a	5	0.31
10P10a	10	3.25
11M19a	30	1.20
11M20a	92	2.06
Total	251	1.65

Source: Primary Survey

Table 2.22. presents the details of land owned by farmers in the watershed area. Majority of the households in the project area have a land holding of less than 50 cents.

Table 2.22 Details of Land Owned by Farmers in the Microwatersheds in the Project Area

Land Holding Size (cents)	**10P8a**	**10P9a**	**10P10a**	**11M19a**	**11M20a**	**Total**
1-5	1581	545	76	589	1069	3860
5.1-50	3807	916	186	1437	2830	9176
51-250	782	140	36	406	463	1827
251-500 and above	25	7	0	44	13	89
Landless	114	5	10	30	92	251
Total HH	6309	1613	308	2506	4467	15203

Source: Primary Survey

Proportion of households with electric connection in the project area is shown in Table 2.23. Only one per cent of the households in the project area do not have access to electricity.

Table 2.23: Proportion of Households with Electric Connection

Micro Watershed	Yes		No		Total	
	No.	%	No.	%	No.	%
10P8a	6214	98.49	95	1.51	6309	100.00
10P9a	1582	98.08	31	1.92	1613	100.00
10P10a	307	99.68	1	0.32	308	100.00
11M19a	2457	98.04	49	1.96	2506	100.00
11M20a	4418	98.90	49	1.10	4467	100.00
Total	14978	98.52	225	1.48	15203	100.00

Source: Primary Survey

Table 2.24. presents main fuel used for cooking by households in the project area. More than half of the population use wood as main fuel for cooking.

Table 2.24: Main Fuel for Cooking in the Households

Micro Watershed	Main Fuel						Total	
	LPG		Wood		Others			
	No.	%	No.	%	No.	%	No.	%
10P8a	2230	35.35	4055	64.27	24	0.38	6309	100.00
10P9a	876	54.31	735	45.57	2	0.12	1613	100.00
10P10a	289	93.83	18	5.84	1	0.32	308	100.00
11M19a	692	27.61	1804	71.99	10	0.40	2506	100.00
11M20a	1890	42.31	2553	57.15	24	0.54	4467	100.00
Total	5977	39.31	9165	60.28	61	0.40	15203	100.00

Source: Primary Survey

The distribution of households according to the type of toilet facility available in the households is presented in Table 2.25. Toilet facility is not available in three per cent of the households in the project area.

Table 2.25: Toilet Facility of the Households in the Project Area

Micro Watershed	Type of Toilet									
	Septic Tank		Pit		Public Toilet		No toilet		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
10P8a	3419	54.19	2636	41.78	19	0.30	235	3.72	6309	100.00
10P9a	982	60.88	578	35.83	7	0.43	46	2.85	1613	100.00
10P10a	301	97.73	4	1.30	0	0.00	3	0.97	308	100.00
11M19a	1589	63.41	776	30.97	16	0.64	125	4.99	2506	100.00
11M20a	2222	49.74	2180	48.80	7	0.16	58	1.30	4467	100.00
Total	8513	56.00	6174	40.61	49	0.32	467	3.07	15203	100.00

source: Primary Survey

Table 2.26. presents participation of households in Self Help Groups. About half of the population have membership in SHGs of which large majority have membership in Kudumbasree SHGs.

Table 2.26: Membership in Self Help Groups

Micro Watershed	Type of SHG						No membership		Total	
	Kudumbashree		Block SHG		Others					
	No.	%	No.	%	No.	%	No.	%	No.	%
10P8a	3243	51.40	7	0.11	172	2.73	2887	45.76	6309	100.00
10P9a	865	53.63	47	2.91	10	0.62	691	42.84	1613	100.00
10P10a	171	55.52	2	0.65	0	0.00	135	43.83	308	100.00
11M19a	1217	48.56	5	0.20	44	1.76	1240	49.48	2506	100.00
11M20a	1819	40.72	14	0.31	140	3.13	2494	55.83	4467	100.00
Total	7315	48.12	75	0.49	366	2.41	7447	48.98	15203	100.00

Source: Primary Survey

2.15 Drinking and Irrigation

The details about the source of drinking water in the households in the project area are presented in Table 2.27. About 58 per cent of households depend on private wells for drinking water purposes. Rainwater is not tapped effectively in the project area. Wells and ponds are also used for domestic consumption.

Table 2.27: Main Source of Drinking Water in the Households in the Project Area

Main Source of Drinking Water	Micro Watersheds										Total	
	10P8a		10P9a		10P10a		11M19a		11M20a			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Private Water connection	618	9.80	118	7.32	11	3.57	1251	49.92	1274	28.52	3272	21.52
Public Tap	1029	16.31	34	2.11	9	2.92	617	24.62	607	13.59	2296	15.10
Well	4154	65.84	1346	83.45	271	87.99	580	23.14	2471	55.32	8822	58.03
Public well	106	1.68	66	4.09	15	4.87	12	0.48	66	1.48	265	1.74
Bore Well	11	0.17	19	1.18	2	0.65	1	0.04	2	0.04	35	0.23
Tanker	2	0.03	1	0.06	0	0.00	0	0.00	4	0.09	7	0.05
Buying water	7	0.11	3	0.19	0	0.00	2	0.08	5	0.11	17	0.11
Rain water Harvesting	4	0.06	0	0.00	0	0.00	0	0.00	0	0.00	4	0.03
Water bodies (Pond/Stream)	48	0.76	1	0.06	0	0.00	1	0.04	3	0.07	53	0.35
Others	330	5.23	25	1.55	0	0.00	42	1.68	35	0.78	432	2.84
Total	6309	100.00	1613	100.00	308	100.00	2506	100.00	4467	100.00	15203	100.00

Source: Primary Survey

Project area experiences water scarcity especially during summer season as the existing water resources are either dried up or become unfit for drinking due to high presence of iron and turbidity. Main source of drinking water in the project area are given in Table 2.27. Water availability in private wells is shown in Table 2.13. Open wells are usually dug up to 4 to 8 metres. Some of the households mainly depend on bore well for drinking and domestic purposes. Ponds were one

of the major sources of irrigation in the past but presently most of them are either converted to land by filling or using as a waste dumping place. Ponds are dug at a depth of 1.5 to 3 metres.

Table 2.28: Quality of water from Pulikeezhu Tube Well

Constituent	Value
pH	5.89
TH	1040
Calcium mg/l	184
Mg mg/l	141
CO_3	0
HCO_3	29
Cl	2244
F	0.21
Na	960
K	31
EC µs/cm at 25° C	6300

Source: Ground Water Information Booklet of Pathanamthitta District

The chemical analysis of water samples from a tube well at Pulikeezhu is summarized in Table 2.28. The data indicates that the water is brackish with the electrical conductivity value of 6300 µs/cm at 25°C. Thus the water is unfit for domestic and irrigation purposes[7].

There are large number of canals and vachals in the project area which are used for watering the crops and dewatering. Majority of streams are perennial and some are drying up due to sediment deposition. List of drainages and its status are given below.

Table 2.29 : Drainages in the Project Area

Watershed code	Grama Panchayath	Name of the drains/streams/ rivers	Perennial/Seasonal

[7] Ground Water Information Booklet of Pathanamthitta District, Central Ground Water Board, Ministry of Water Resources, Government of India.

10P8a	Niranam&Kadapra	Pamba	Perennial
10P9a	Kadapra	Pamba	Perennial
10P10a	Kadapra	Pamba	Perennial
11M19a	Peringara&Nedumbram	Mannimalayar	Perennial
1120a	Peringara, Kuttoor &Nedumbram	Mannimalayar	Perennial

Table 2.30: Number of Perennial and Seasonal Drainages in the Project Area

Watershed	No of Perennial Streams	No. Of Seasonal Streams
10P8a	18	8
10P9a	7	1
10P10a	1	0
11M19a	17	2
11M20a	4	4
Total	47	15

Figure 2. 2: Flow of Water by Season, Site and River Basin (MCM) – Pamba from 1998-99 to 2008-09

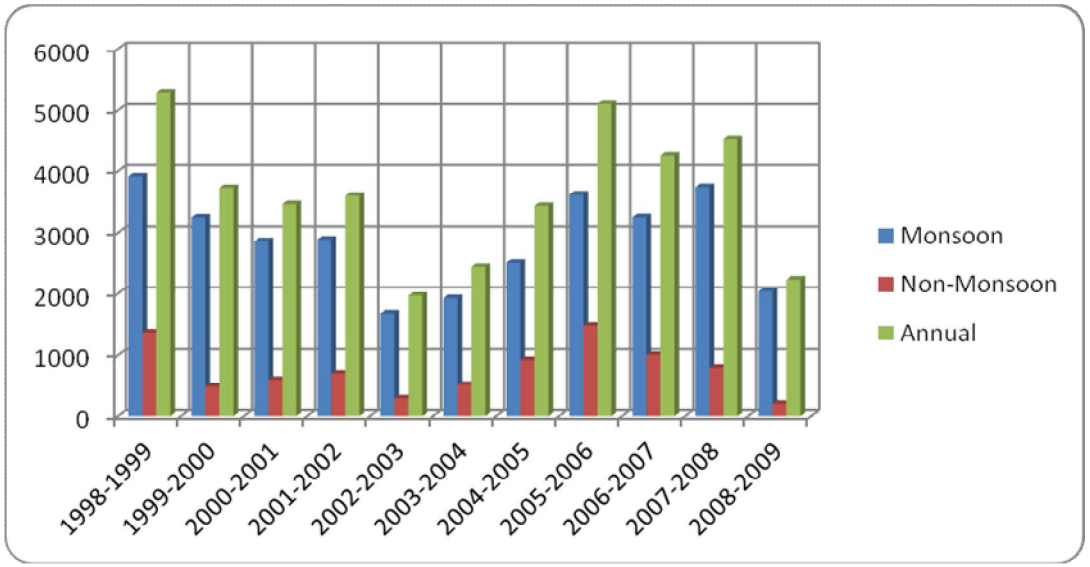


Figure 2.3: Flow of Water by Season, Site and River Basin (MCM) – Manimala from 1998-99 to 2008-09

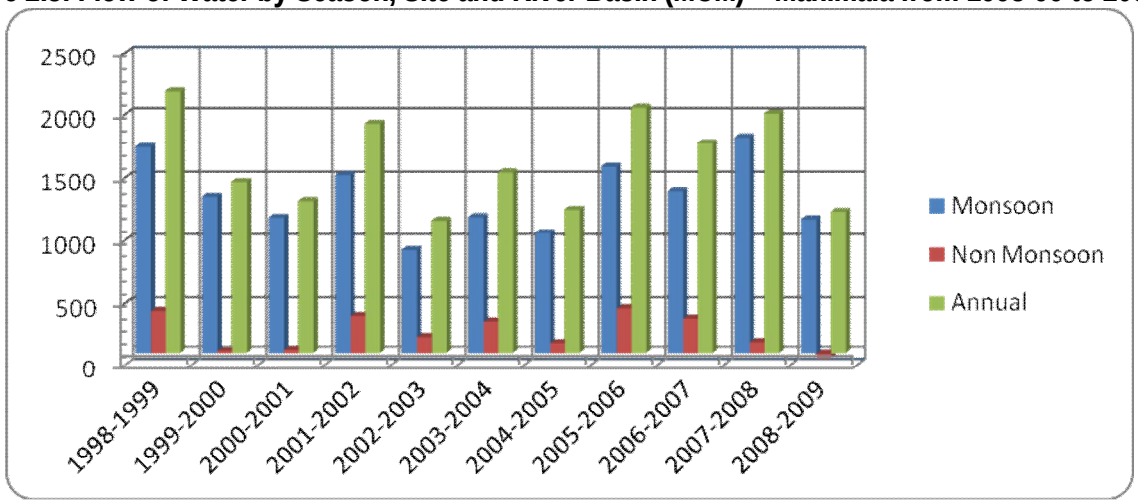


Table: 2.31: Number of Ponds and Water Storage Capacity in Cubic Metres

Watershed Code	Total no. of Water Storage Structures	Total storage capacity of water storage structures
10P8a	59	20320
10P9a	3	2400
10P10a	4	2560
11M19a	9	2880
11M20a	21	8400
Total	**96**	**36560**

Source: Primary Survey

2.16 Transport and Communication Facilities

All the microwatersheds in the project area are well connected with road transport. But unscientific construction of these roads without considering the flow of water leads to destruction of these roads during rainy season. Almost of all the households in the project area have access to telephone connection. A telephone exchange is also functioning in the project area

Table: 2.32: Length of Roads (in Km)

Watershed	Length of Roads	Tarred Roads
10P8a	209	94.1
10P9a	18.75	8.4
10P10a	6.25	2.8
11M19a	86.17	38.8
11M20a	86.17	38.8

Total	**297.34**	**182.9**

Source: Calculated using GIS

2.17 Agriculture and Land Use Pattern

Paddy is the main crop cultivated in the project area. Farmers here mostly use Uma variety of paddy for the 3rd Puncha season (October to March). 1st and 2nd crops are not popular in the area due to flood in the rainy season and lack of labourers. Some of the paddy fields are used for vegetable cultivation. Cow dung, organic manures, chemicals, pesticides etc are used for farming. Agriculture depends mainly on rainfall. Other crops like turmeric, mango, coconut, arecanut, banana, tapioca, pulses and vegetables like cucumber, snake gourd, bitter gourd, ivy gourd etc are also cultivated in the project area. The main problems faced by the agriculture sector are labour shortage, high labour cost, unutilization of fallow/wasteland, lack of interest among youngsters, climatic conditions, improper soil and water management, lack of repair/maintenance of ponds, extensive use of chemicals and pesticides, increased prices of fertilizers and chemicals etc.

Table: 2.33: Details of Cultivable Wasteland in the Project Area

Name of Micro Watershed	Area of Waste Land Cultivable (ha)	Problems	Suggestions
10P8a	47.33	Land is owned by the people who are not interested in farming and reluctant to lease it to others for farming. These families do not consider agriculture as a major source of income.	People's representatives could encourage the owners to lease the land to SHGs
10P9a	3.27		
10P10a	0		
11M19a	0		
11M20a	0		
Total	50.6		

Source: Preliminary Project Report for IWMP II/2012-13

2.18 Animal Husbandry, Dairying and Poultry

Livestock and poultry are important subsidiary activities in the project area. Rearing livestock in homestead is a source of income and employment. Cattle breeds like Holstein Friesian, Jercy etc are reared. Farmers have recently started raising buffalo for meat considering the increased demand of beef. The major problems in dairy sector identified through PRA are high cost of feed, lack of maintenance of shed, low selling cost of milk, etc. The livestock population in the project area is shown in Table 2.36.

Table 2.34: Details of Livestock and Poultry in the Project Area

Micro Watershed	Cow	Buffalo	Duck	Hen	Goat
10P8a	946	56	2574	6461	725
10P9a	221	8	72	531	47
10P10a	93	4	44	38	35
11M19a	331	35	929	7073	254
11M20a	544	47	514	3176	289
Total	**2135**	**150**	**4133**	**17279**	**1350**

Source: Primary Survey

2.19 Educational and Health Infrastructure in the Project Area

The details of the educational infrastructure in the project area collected through PRA techniques are presented in Table 2.37, 2.40 and 2.41. Health institutions in the project area are shown in Table 2.38

Table 2.35: Educational Institutions in the Project Area

Lower Primary School	33
Upper Primary School	11
High School	12
Higher Secondary School	1
Technical institution	2

Coaching center	4
College	4

Table 2.36: Medical Facilities in the Project Area

Health centre	4
Allopathy hospital	2
Ayurveda hospital	2
Homeopathy hospital	1

2.20 Recreation Facilities

Major recreation facilities in the project area are Arts and Sports clubs. There are 7 clubs functioning at various locations. Lack of public place is a limitation to the younger generation to engage in pass time activities. Six libraries are also functioning in the project area.

2.21 Other Infrastructure in the Project Area

Other infrastructure in the project area other than mentioned above are shown below

Table 2.37: Infrastructure in the Project Area

Facilities	Number
Anganwady	14
Commercial bank	8
Co-operative society/bank	4
Day Care Centre/Play School/Children home	3
Ration shop	9
Maveli store	4
Neethi store	4
Public market	6
Margin free market	2
Arts/ Sports club	7

Post office	5
Police station	1
Community hall	5
Library	6
Milk collection centre/society	4
Nursery	2
Krishi Bhavan	4
Veterinary hospital	6
Village office	4
Panchayat office	4
Market	8
Church	37
Temple	23
Mosque	4
Akshaya Information Centre	4
Auditorium	2
Telephone exchange	1
KSEB	2
Padanaveedu	1
Kudumbasree office	5

Source: Primary Survey

2.22 Land Use Pattern of the Project Area

Table 2.38: Present Land Use Pattern in Micro Watershed

	Micro Watersheds					
	Project area	**10P8a**	**10P9a**	**10P10a**	**11M19a**	**11M20a**
Land used for	**Area**	**Area**	**Area**	**Area**	**Area**	**Area**

	(Ha.)	(Ha.)	(Ha.)	(Ha.)	(Ha.)	(Ha.)
Paddy Fields	2157.17	1304.25	88.02	21.77	403.98	339.15
Mixed Crop	2533.76	1008.66	296.64	57.74	406.41	764.31
Paddy land converted to Annuals	102.42	31.75	32.25	2.7	21.18	14.54
Water body	44.64	21.34	1.09	1.79	7.43	12.992
Total cropped area	4919.48	2410.1	442.6	98.4	836.3	1131.5
Net Area	4838	2366	418	84	839	1131

Source: Calculated using GIS Maps & PRA

Present land use of the project area is given above. Major portion of the area is coconut dominated mixed crop. Inter cropping with vegetables, arecanut, spices, fruit trees and hard wood trees like teak, mahagony etc. Paddy is cultivated in one season depending on rainy season.

2.23 Major Ongoing and Completed Schemes in the Project Area

The major ongoing and completed schemes in the project area are presented in Table 2.43.

Table 2.39: Major Ongoing and Completed Schemes in the Project Area

Schemes/Programme	Brief description
Centrally sponsored schemes	
Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS)	Aims to enhance livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.
Sarva Shiksha Abhiyan (SSA)	Flagship programme run by the Government of India to provide universal access to elementary education for children 6-14 years old.

Indira Awas Yojana (IAY)	To help in construction/upgradation of dwelling units of rural BPL SC/ST households and other vulnerable sections by providing lump sum financial assistance.
Swarnjayanti Gram Swarozgar Yojana (SGSY)	To bring the assisted poor families above the Poverty Line by ensuring appreciable sustained level of income over a period of time. This objective is to be achieved by organising the rural poor into Self Help Groups (SHGs) through the process of social mobilization, their training and capacity building and provision of income generating assets.
Integrated Child Development Services (ICDS)	This scheme represents one of the world's largest and most unique programmes for early childhood development. ICDS is the foremost symbol of India's commitment to her children – India's response to the challenge of providing pre-school education on one hand and breaking the vicious cycle of malnutrition, morbidity, reduced learning capacity and mortality, on the other.
Support to State Extension Programmes for Extension Reforms	This is the main scheme to revamp agricultural extension across the country and aims at providing a decentralized and demand driven extension system by way of new institutional arrangements for technology dissemination in the form of an Agricultural Technology Management Agency (ATMA) at district level. Important farmer oriented activities under ATMA includes: (a) training of farmers (b) demonstrations on agriculture and allied sector (c) exposure visit of farmers (d) farmer-scientist interactions (d) farm schools.

Rashtriya Krishi Vikas Yojana (RKVY)	Aims at achieving annual growth in agriculture sector by a holistic development of Agriculture and allied sectors.
Kuttanad Package	To develop the six agronomic zones of Kuttanad, namely Kayal Lands, Lower Kuttanad, Upper Kuttaanad, North Kuttanad, Purakkadu Kari and Vaikom Kari, in an integrated manner based on principles of ecology, economics, gender equity and employment generation.
State sponsored schemes	
Sustainable Development of Rice-Based Farming System	Aims to sustain rice cultivation and to increase its productivity. It includes group farming, distribution of fertilizer, organic manure and weedicides at subsidized rate.
Restoration of Agro Ecosystems of Kuttanad through Sustainable Aquaculture	It's a 13th Finance Commission grant in aid project for the process of implementation of aquaculture in 1200 hectares on the period of three years. It aims to increase fish production, prawn production, income generation, employment generation etc.
State Horticulture Mission (SHM)	Area expansion and subsidy for rising banana, pineapple, cocoa, nutmeg, pepper & cut flowers.
Small Farm Mechanisation	The objective of the scheme is to provide credit for the purchase of new tractor/new tractor for 2nd time/tractor renovation /repair/replacement of spares/small tractors scheme/power tiller/thresher/power sprayer.
Matsya Samrudhi	Aims at increased production of fishes to 2.5 lakh tones in three years and increasing fish production by extending aquaculture to 15,000 hectares of inland water bodies.
Schemes for Integrated Pest Management System	The agriculture department of Government of Kerala proposed a scheme to establish a full-fledged system of pest surveillance in a

	phased manner, to cover major crops of the State. The thrust of the scheme will be on biocontrol measures from a long-term perspective. The main objectives of the scheme are: (a) To keep pests and diseases of crops below Economic Threshold level by adopting an integrated pest management practice. (b) Constant pest surveillance and monitoring to ascertain pest population (c) Creating awareness among farmers on the prominent pests and diseases, which cause severe damage to crops and suggest measures to prevent them.
Integrated Nutrient Management System	The scheme intends to promote usage of organic manures so as to maintain and to enhance the fertility level of soil. Objectives:(a) To establish soil nutrient balance (b) To increase orgasnic matter content of the soil and make it productive (c) To create awarness among farmers about the sustainability aspects of soil fertility (d)To chalk out soil fertility map of the panchayats (e) Strengthening of Soil/Fertiliser/Bio-fertiliser/Pesticide laboratories.
Schemes implemented by Government agency / departments in the project area	
Development of Aquaculture	Support from Agency for Development of Aquaculture Kerala (ADAK) for infrastructure development for fish culture; fish seed, fish food, pond perpetuation, pen culture, cage culture.
Fishermen welfare activities	Accidental death insurance; aid for education, marriage, house maintenance; subsidy for fishing equipments, freezing plants for SHGs; Saving Cum Relief Scheme to Fishermen under National Fishermen Welfare Fund (NFWF).
Dairy farmers welfare activities	Aid is given from welfare fund of dairy farmers for scholarships, marriage, pension, family pension, medical treatment.
Measures and schemes for cattle	Distribution of breeding calves, distribution of cattle food and medicine, subsidy for renovation of cow shed, compulsory vaccination and treatment of

protection.	livestock, cattle artificial insemination centre, preventive measures for communicable diseases, provide cattle insurance facility to farmers for their livestock, prevention and control of cattle borne diseases with the support of institutions and groups, conduct infertility camps, provide technical support for self employed farmers.

2.24 SWOT analysis

The SWOT analysis presents the strengths, weakness, opportunities and threats of Integrated Watershed Management Programme in the project area. It identifies the internal and external factors, which are favourable and unfavourable to achieve the objectives of the project. SWOT analysis of the project area is presented in Table 2.44.

Table 2.40: SWOT Analysis

Strength	(1) Interest of the people in watershed activities. (2) A well developed Panchayati Raj System. (3) Availability of water from Pampa and Manimalayar river networks for irrigation purposes.
Weaknesses	(1) Declining profit from paddy cultivation. (2) Water resources are dried up in summer season. (3) Shortage of agricultural labourers. (4) Non adoption of rainwater conservation methods. (5) Fodder grass shortage. (6) Improper management of land and water bodies

	(7) Improper waste management practices
Opportunities	(1) Scope for improving productivity of agricultural crops by adopting modern techniques of farming. (2) Possibilities of cooperative farming and organic farming practices. (3) Scope for improving land area under horticulture crops. (4) Scope for breed improvement, pisciculture, duck farming etc. (5) Scope for using fallow/wastelands for cultivation. (6) Scope for convergence with other schemes (7) Possibilities to adopt water conservation/harvesting and recharging structures (8) Scope for management programmes to control flood/water logging and sediment removal
Threats	(1) Change in climatic conditions. (2) Rise in cost of agriculture machines, pesticides, chemicals etc. (3) Lack of interest among new generation towards agriculture activities. (4) Excessive use of chemicals and pesticides. (5) Increase in cost of seeds, fertilizers, pesticides etc. (6) Spread of diseases (foot and mouth disease) among cattle. (7) Delay in implementation of renovation activities of water bodies. (8) Over grazing of land. (9) Delay in timely interventions by the authorities.

	(10) Contamination of drinking water because of seepage from latrines during flood. (11) Uncontrolled sand mining from Pamba and Manimala resulting in ground water level depletion.

CHAPTER III

INSTITUTION BUILDING AND PROJECT MANAGEMENT

3.1 Institutional Arrangements of IWMP

By adopting the principles and guidelines of Integrated Watershed Management Programme (IWMP), appropriate institutional arrangements are made at various levels in order to have an effective and professional management of watershed projects.

3.2 Institution Building at State and District Level

Department of Rural Development is the nodal department for the implementation of IWMP at the state level. State Level Nodal Agency (SLNA) is coordinating and providing guidelines for the effective planning and implementation of the individual IWMP projects. District Planning Committee (DPC) is responsible for the planning and implementation of the projects at the district level. To help the DPC and to coordinate the project level activities Watershed Cell Cum Data Centre (WCDC) is working at the District level. District Level Coordination Committee has been set up under the chairmanship of District Panchayath President, Pathanamthitta. District Collector is functioning as Member Secretary and Principal Agriculture Officer as Member Convener. All the district level officers of the line departments are functioning as members.

3.3 Institution Building at Block Level

Pulikeezhu Block Panchayat is the Project Implementation Agency (PIA) for this IWMP project. They are responsible for all the activities under the project starting from the preparation of Detailed Project Report (DPR) till the completion of project. A Block Level Coordination Committee (BLCC) has been formed for the timely implementation of the project and to provide help to the PIA in technical and administrative matters related to the project. Watershed Development Team (WDT) has been formed and started working under the PIA. Details of PIA are given below.

Table 3.1: Details of Project Implementation Agency (PIA)

Name of the Project	IWMP II/ 2011-12

Programme Implementation Agency	Pulikeezhu Block Panchayat
Implementation Officer	Block Development Officer, Pulikeezhu Block Panchayat
Address of PIA	Pulikeezhu Block Panchayat, Valanjavattom PO, Thiruvalla, Pathanamthitta.
Telephone	04692610708
Email	rddblplk@gmail.com

Table 3.2: Details of Watershed Development Team (WDT)

No.	Name	Age	Sex	Designation	Qualification
1	Aneena V G	43	Female	WDT Civil Engineer	Diploma in Civil Engineering
2	Serleena K	40	Female	Social Mobiliser	MSW-Rural Development
3	Rajesh Kumar V	40	Male	Data Entry Operator	M B A -IT

3.4 Institution Building at Grama Panchayat (GP) Level

Watershed management works are implemented at Grama Panchayat level. The GPs supervise, support and advise Watershed Committee. The different institutions formed as part of IWMP are given below.

3.5 Watershed Committee (WC)

Watershed Committee has a pivotal role to play during and after the project implementation period. The dates of Neerthada Gramasabha convened in each watershed are given below. These Grama Sabhas constitutes the WCs for each watershed. These WCs will work as the subcommittees of GPs. In the case of Watersheds spread over more than one GP, separate subcommittees are formed in each GP to manage the watershed development project in the GP.

Table 3.3: Dates of Neerthada Gramasabha

Sl No.	Name and code of Micro Watershed	Grama Panchayat	Date of Watershed Grama sabha
1	Ayyankonary, 10P8a	Niranam	14/6/2013
2	Podiyadi Puthanthodu, 11M20a	Nedumbram	15/6/2013
3	Keecherivalkadavu, 10P10a	Kadapra	17/6/2013
4	Parumala, 10P9a	Kadapra	2/7/2013
5	Chathenkery Kadavu, 11M19a	Peringara	29/8/2013

3.6 Self Help Groups (SHGs)

There are 246 SHGs working in the project area already. Under IWMP II/ 2011-12 project, until now 172 SHGs have been registered and the registration process is going on. These groups are organized through credit and thrift activities. Some of the groups are also engaged in micro-enterprises . Both women and men SHGs are active in the project area. Details of the SHGs in the project area are given below.

3.7 User Groups (UGs)

User groups are proposed to be formed to manage the different activities or assets created under the programme on a long term basis. The user groups are expected to collect user charges from their members, oversee the works and manage the benefits. At present, user groups to implement Entry Point Activities have been formed. Later on, it will be formed for each work.

3.8 IWMP Project Management

Table 3.4: Implementation phases of IWMP

Phase	Name	Duration
I	Preparatory Phase	1-2 years
II	Watershed Works Phase	2-3 years
III	Consolidation and Withdrawal Phase	1-2 years

Activities under each phase are mentioned below.

3.9 Preparatory Phase:

- Institution building, training and empowerment of institutions like watershed committee (WC), user groups (UGs) and self help groups (SHGs) through Capacity Builiding and IEC ativities.
- Preparation of Detailed Project Report with detailed action plans through participatory exercises Entry Point Activity shall be taken up during this phase to establish credibility of the Watershed Development Team (WDT) and create a rapport with the village community.

3.10 Watershed Works Phase:

- This phase is the heart of the programme in which the DPR will be implemented.
- Execution of yearly action plans (NRM works, Production System and Micro-enterprises and Livelihood activities will be implemented)

3.11 Consolidation and Withdrawal Phase:

- In this phase the resources augmented and economic plans developed in watershed work phase becomes the foundation to create new nature-based, sustainable livelihoods and raise productivity levels.
- Bridging the gaps for post project sustainability.
- Building the capacity of the community based organizations to carry out the new agenda items during post project period.
- Preparation of project completion report with details about status of each intervention.
- Documentation of successful experiences as well as lessons learnt for future use.

CHAPTER IV

MICRO WATERSHEDS IN THE PROJECT AREA

4.1 Introduction

The project IWMP II/2012-13 is a cluster of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a).The details of each micro watershed in the project area are presented in this chapter.

4.2 Location and Extent of Micro Watersheds

The location and extent of the selected watersheds in the project area are presented in Table 4.1.

Table 4.1: Location and extent of Watersheds

Name of the watershed	Ayyankonari			Parumala		Keecherivalkadavu		Chathekery Kadavi		Podiyadi Puthanthodu	
Code	10P8a			10P9a		10P10a		11M19a		11M20a	
Coordinates of Watershed		Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
	NW	9º20’42.72N	76º28’57.65E	9º20’34.99N	76º32’28.27E	9º21’39.45N	76º32’58.49E	9°24'0.37N	76°30'44.66E	9°23’25.93N	76°31'53.03E
	NE	9º21’39.45N	76º32’58.49E	9º20’23.33N	76º33’24.33E	9º20’29.34N	76º33’43.39E	9°23’25.93N	76°31'53.03E	9°23’12.47N	76°33'04.74E
	SE	9º19’34.74N	76º31’32.24E	9º19’29.22N	76º33’03.07E	9º20’23.33N	76º33’24.33E	9°21'46.79N	76°32'12.75E	9°21’37.07N	76°34'30.89E
	SW	9º19’45.37N	76º28’27.38E	9º19’23.12N	76º32’06.21E	9º20’34.99N	76º32’28.27E	9°22'34.41N	76°30'36.54E	9°21'46.79"N	76°32'12.75"E
Boundaries of Watershed	N	Manimala River		Pamba River		Pamba River		Chantha Thodu		Karakkal Thodu	
	S	Pampa River		Distributory of Pamba		Pamba River		Manimala River		Manimala River	
	E	Nakkada		Pamba River		Pamba River		Vaikathillam Thodu		Azhaki Thodu, Karakkal Thodu	
	W	Puthanar		Distributory of Pamba		Puthanar		Manimala River		Vykathillam Thodu	
Geographical Area (in Ha)	2366			418		84		839		1131	
Gram Panchayats covered	Kadapra		Niranam	Kadapra		Kadapra		Peringara	Nedumbram	Peringara	Nedumbram	Kuttoor
Wards covered	1,2,3, 10 to 15		1 – 13	5,6,7,8,9		4		13,14,15	1,2,3,12,13	2,9 - 12	4 to 11	1,2

4.3 Physiography, Relief and Drainage of Micro Watersheds

Physiographically the project area lies between 7.5 m and 75 m above MSL. The five micro watersheds coming under Pulikeezhu IWMP - 2 project falls under mid land division. The geographical area of these micro watersheds ranges from 80 – 2400 hectares. Maximum relief (elevation difference between highest and lowest point) of these micro watersheds ranges from 4 m to 13 m. Table 4.2 represents some characteristics of micro watersheds.

Table 4.2: Characteristics of Micro Watersheds coming under IWMP II / 2011-12

Watershed character	Project Area	10P8a	10P9a	10P10a	11M19a	11M20a
Compactness Index (C= P/2√π A)	2.95	1.45	1.25	1.59	1.61	1.43
Length of Main stream (KM)	71.4	24.96	9.09	3.87	16.49	16.99
Drainage Density (KM/Sq.KM)	1.5	1.1	2.2	4.6	2.0	1.5
Average Slope (%)	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1	0 to 1
Relief(M)	4 to 13	11	13	4	9	8
Elevation (M)	1 to 17	1 to 12	3 to 17	6 to 10	2 to 11	5 to 13
Perimeter(KM)	72.70	24.96	9.09	5.17	16.49	19.99
Area (KM^2)	48.38	23.67	4.18	0.84	8.39	11.30
Drainage inside the WS (KM)	51.1	29.7	3	2.4	6.7	9.3

Source: Calculated using GIS Maps

4.4 Agriculture and Present Land Use in Micro Watersheds

The details of the land use pattern in the micro watersheds are presented in this section

The details of area of land under various crops in the micro watersheds are shown in Table 4.3.

Table 4.3: Area of Land under Various Crops in Micro Watersheds (ha)

Name of the crop	Micro Watershed				
	10P8a	10P9a	10P10a	11M19a	11M20a
Paddy	968.0	40.8	17.4	380.7	297.6
Tapioca	58.8	48.0	7.3	20.7	27.7
Drumstick	13.9	0.0	0.6	4.8	6.6
Amaranthus	1.7	0.0	0.1	0.6	0.8
Brinjal	1.1	0.0	0.0	0.4	0.5
Bitter gourd	1.9	5.0	0.1	0.7	0.9
Snake Gourd	1.6	0.0	0.1	0.5	0.7
Little gourd	2.6	0.0	0.1	0.9	1.2
Ash Gourd	0.3	0.0	0.0	0.1	0.1
Long bean	3.7	0.0	0.2	1.3	1.7
Pumpkin	0.0	0.0	0.0	0.0	0.0
Cucumber	0.4	0.0	0.0	0.2	0.2
Green chili	0.1	0.0	0.0	0.0	0.0
Other Vegetables	3.7	0.0	0.1	1.3	1.7
Elephant Foot Yam	17.2	5.0	0.7	6.0	8.1
Cocolassia	21.7	5.0	0.9	7.5	10.2
Yam	3.9	0.0	0.2	1.4	1.9
Sweet Potato	0.0	0.0	0.0	0.0	0.0
Ginger	1.8	2.0	0.1	0.6	0.9
Turmeric	0.8	0.0	0.0	0.3	0.4
Coconut	794.5	50.0	49.2	230.6	529.4
Arecanut	24.1	0.0	1.0	8.4	11.3
Cashew	21.7	0.0	0.9	7.6	10.2

Pepper	24.7	0.0	1.0	8.6	11.6
Jack	91.7	5.0	3.8	31.9	43.1
Mango tree	90.4	5.0	3.7	31.4	42.5
Tamarind	7.9	0.0	0.3	2.7	3.7
Cloves	0.8	0.0	0.0	0.3	0.4
Nutmeg	33.6	0.0	1.4	11.7	15.8
Cocoa	18.4	0.0	0.8	6.4	8.6
Papaya	24.6	0.0	1.0	8.6	11.6
Banana	36.7	0.0	1.5	12.8	17.3
Pineapple	0.9	1.9	0.0	0.0	0.0
Plantain	24.9	0.0	1.0	8.6	11.7
Green Manure Plants	51.7	0.0	2.1	18.0	24.3
Vanila	0.2	0.0	0.0	0.1	0.1
Teak	59.3	10.8	2.4	20.6	27.9
Medicinal Plants	0.6	0.0	0.0	0.2	0.3

Source: Primary Survey

4. 5 Plant Species in Micro Watersheds

The plants like fruit plants, oil crops, pulses etc seen in the micro watersheds in the project area are shown in Table 4.4.

Table 4.4: Plant Species in Micro Watersheds

Crop type	Vernacular name	Common name	Scientific name
Tuber Crops	Kappa/Maracheeni	Tapioca	*Manihot esculenta*
	Chena	Elephant yam	*Amorphophallus companulatus*
	Kachil	Yam	*Dioscorea alata*
Vegetable	Padavalanga	Snake gourd	*Trichosanthes*

Crops			*cucumerina*
	Vellarikka	Cucumber melon	*Cucumis sativus*
	Kumbalanga	Ash gourd	*Benincasa hispida*
	Vazhuthananga	Brinjal	*Solanum melongena*
	Thakkali	Tomato	*Solanum lycopersicum*
	Pachamulaku	Chilli	*Capsicum annuum*
	Cheera	Amaranthus	*Amaranthus viridis*
	Achinga	Long bean	*Vina unguiculata*
	Pavakka	Bitter gourd	*Momordica charantia*
	Kovakka	Little gourd	*Coccinea indica*
	Mathanga	Pumpkin	*Cucurbita moschata*
	Churakka	Bottle gourd	*Lagenaria siceraria*
	Vendakka	Okra/Lady's finger	*Abelmoschus esculentus*
	Kudampuli	Garacenia	*Garcinia gummi-gutta*
	Valanpuli	Tamarind	*Tamarindus indicus*
	Kariveppila	Curry leaf	*Murayya koenigii*
	Irumbampuli	Bilimbi	*Averrhoa bilimbi*
Fruit Crops	Vazhapazham	Banana	*Musa paradisiacal. M.sapiendum*
	Manga	Mango	*Mangifera indica*
	Chakka	Jack fruit	*Artocarpus heterophyllus*
	Anjilichakka	Anjili	*Artocarpus hirsutus*
	Omakka	Papaya	*Carica papaya*
	Kaithachakka	Pineapple	*Ananas comosus*

	Perakka	Guava	*Psidium guajava*
	Sapota	Sapota	*Achras sapota*
	Rambutan	Rambutan	*Nephelium lappaceum*
	Chambanga	Water apple	*Syzgium aqueum*
	Kashumavu	Cashew	*Anacardium occidentale*
Oil Crops	Thengu	Coconut	*Cocos nucifera*
	Ellu	Seasame	*Sesamum indicum*
	Nilakkadala	Ground nut	*Arachis hypogea*
Spices and Condiments	Manjal	Turmeric	*Curcuma longa*
	Inchi	Ginger	*Zingiber officinale*
	Kurumulaku	Pepper	*Piper nigrum*
	Jathikka	Nutmeg	*Myristica fragrans*
Plantation Crops	Rubber	Rubber	*Heva brasiliensis*
	Kasumavu	Cashew	*Anarcadium occidentale*
	Karimbu	Sugar cane	*Saccharum officinarum*
	Kavungu	Arecanut	*Areca catchu*

The different medicinal plants seen in the micro watersheds in the project area are shown in Table 4.5.

Table 4.5: Medicinal Plants in Micro Watersheds

Vernacular name	Scientific name
Karuka	*Cynodon dactylon*
Kudumpuli	*Garcinia gummi gutta*

Mylanchi	*Lawsonia inermis*
Karivepu	*Murraya koenigii*
Thulasi	*Ocimum sanctum*
Keezharnelli	*Phyllanthus*
Cheroola	*Aerva lanata*
Shankupushpam	*Clirtoria ternatea*
Iruveli	*Coleus amboinicus*
Panikoorkka	*Coleus zeylanicus Benth*
Nilappana	*Curculigo orchioides Gaertn*
Manjal	*Curcuma longa*
Muthanga	*Cyperus rotundus.*
Asokam	*Saraca asoca*
Kallurukki	*Scoparia dulsis*
Kurumthotti	*Sida rhombifolia*
Adakkamaniyan	*Sphaeranthus indcus*
Kanjiram	*Strychnos nux-vumica*
Valanpuli	*Tamaridus indica*

CHAPTER V

PROBLEMS TO BE ADDRESSED

The treatment in a watershed depends on the specific problems faced by the area. The five micro watersheds in the project area face many common problems because of the similarities existing among the micro watersheds. In order to ensure that the benefits of the project reaches different sections of the population, particularly the vulnerable, the involvement of the community is essential right from the planning the project. The participation of the community, particularly the vulnerable sections of the society such as those living below poverty line, small and marginal farmers, women, landless families, SC/ST communities have been ensured in the identification of the problems. The major problems identified through PRA techniques in the IWMP II/2012-13 project are given below:

1. Acute drinking water shortage.
2. Vachals/Thodu filled with silt resulting in water logging.
3. Flood damage due to improper drainage.
4. Waste dumping into the water bodies.
5. Acidity of the soil and lack of reclamation practices.
6. Water bodies filled with water hyacinth.
7. Keeping paddy fields fallow.
8. Lack of conservation measures for agricultural and non-agricultural lands.
9. Insufficient milk production.
10. Lack of livelihood opportunities.
11. Other environmental issues

Recalling the ship wrecked sailors, water as far as up to the horizon, but not a single drop to drink. Inspite of having a large number of water bodies, many households of Nedumbram, Peringara, Kadapra, Niranam and Kuttoor faces difficulties to fetch a pot of drinking water. The yellow coloured water from open wells in summer, contaminated water due to flood in rainy season, irregular supply of drinking water of water authority are the major problems related to the availability of drinking water.

The main drinking water sources of the project area are open wells and piped water. The households mainly depend on open wells for drinking and domestic purposes. The project area is prone to flooding except the Parumala watershed. During flood, many of the latrines in the project area overflow due to the rise in water table, which in turn results in the contamination of open wells and water bodies. Immediately after the rainy season, the water table goes down up to 8 meters below ground level. In 2013, despite good rainfall, acute drinking water scarcity was a problem for the region due to unscientific infrastructure projects that block canals and flood-escape routes.

During summer season, the water in many wells is seen to be yellow in color due to the presence of silt and iron. Uncontrolled sand mining from Pamba and Manimala rivers resulted in drastic reduction of water table in the five micro watersheds. It compels the people to dig wells deeper. They still get turbid water.

The situation is worsened due to unhealthy practices of the watershed community such as depositing plastic wastes in water bodies. It necessitates a strong campaign for preserving precious water. To ensure availability of safe drinking water, the following interventions are suggested;

1. Providing roof top rain water harvesting ferrocement tanks to the community. The excess water from the harvesting tank can be diverted to nearby well.
2. Renovation of public wells.
3. Open well recharging from roof top.
4. Installallation of Reverse Osmosis Plant in highly polluted areas.
5. Providing Terrafil water filters to individual households.

The micro watersheds in the project area are endowed with several canals and channels. The canals have become dumping grounds for garbage in certain areas. In some places, the waste from the sewage pipes is dumped into the water bodies. Water logging due to poor drainage is another major problem reported in all the micro watersheds. Water logged areas becomes a habitation ground of mosquitoes. Silting, due to inadequate protection of the side walls, of the canals also adds to the gravity of the problem. Improper drainage affects environment and agriculture in the area. Desilting and increasing depth of canals and vachals will help to hold more rain water. Vachal is a suitable ecosystem for fish. While the removal of waste can be undertaken under MGNREGS, the activities related to side protection such as constructing side walls, planting vettiver, mangroves etc can be undertaken under the IWMP. Water flow can be improved by renovating the existing drainages which will ensure connectivity between channels and canals. Some of the canals and channels are blocked by the unscientific construction of roads and foot paths without culverts. It leads to water logging and flood. So construction of culverts has been suggested as an activity under the project.

One of the major agricultural crops in all the micro watersheds is paddy. The livelihood of a good number of households depends on the income from paddy farming. The low productivity and profitability of paddy farming has been a major problem faced by the area. Due to low profitability, many households have shifted to other jobs. We have also noticed that some of the paddy fields are being converted or kept uncultivated.

For paddy farming, water is to be pumped out of the fields prior to sowing. So strong outer bunds, around the field are inevitable to reduce the expenses for maintenance. These bunds can also be used as footpaths. Construction and strengthening of outer bunds for the paddy fields will improve the productivity and profitability of paddy cultivation in the project area. Hence, this activity has been proposed under the project. The dewatering of paddy fields necessitates the availability of motor, motor sheds, petti and para and electricity. Another aspect that leads to low profitability of paddy farming is the shortage of agriculture labourers. Soil of paddy fields have high acidity. So application of lime is essential to improve productivity.

Soil erosion from the homestead (ridges) to low lying areas is another problem noticed in the project area. Erosion decreases the productivity of the soil. So biofencing by local vegetation is proposed.

People having more than one cattle can be provided with biogas plants to make sure that the waste is not drained to the water bodies.

Proliferation of water hyacinthin the water bodies is another major problem in the project area. Ponds and canals are filled with these weeds. Removal of this can be converged with MGNREGA.

Lack of livelihood opportunities for the poor is another problem. In order to improve the livelihood opportunities of the population, the following interventions are proposed:

- Fisheries, duck farming, back yard poultry, cow/buffalo/goat rearing etc are suggested. Individuals and groups can be involved in this activity. Convergence is possible with the projects of the Department of Fisheries and animal husbandry.
- Land scarcity is a major barrier for horticulture development in the project area. So plants can be grown in plastic bags by filling soil and organic manure. These can be placed both in homestead and on the terrace of houses. The programme can be converged with the schemes of Vegetable and Fruit Promotional Council and the Department of Agriculture or RKVY.
- Other livelihood improvement options include floriculture, fodder cultivation, construction of cattle shed, production of different eco-friendly products, ornamental fish farming and lease farming.

CHAPTER VI

WATERSHED INTERVENTIONS

6.1 Introduction

The major objective of Integrated Watershed Management Programme (IWMP) is to restore the ecological balance by harnessing, conserving and developing degraded natural resources such as soil, vegetative cover and water. The watershed approach would result in improving the productivity of not only agriculture but also the overall production of bio-mass for enhancement of self-employment opportunities and thus the overall income of the rural households. Based on the problems identified through participatory methods and the inputs from several rounds of discussions with stakeholders including experts, suitable interventions for watershed development of the project area have been identified. The specific interventions under IWMP are broadly classified into Information, Education & Communication (IEC) Activities, Entry Point Activities (EPA), Natural Resource Management (NRM), Production System and Microenterprises (PSM) and Livelihood Activities.

6.2 Information, Education & Communication (IEC) Activities

Information, Education and Communication (IEC) is an important component and it has a vital role in creating awareness, mobilizing people and lays the basis for successful implementation of IWMP.

6.3 Entry Point Activities (EPA)

Entry point activities aim to mobilize the community in support of the subsequent interventions under the project. EPA helps to create rapport with the watershed community. Entry point activities are identified with a view to showcase them as model interventions which, in turn, would generate the interest of the community in watershed development activities. Community participation is essential to maximize the impact of the project and to ensure the sustainability of the project outcomes. Entry point activities identified in the project area are presented below:

(a). **Portable Biogas plant of capacity 3m^3**

Biogas/Biomethanation technology refers to the production of a combustible gas (biogas) and value added fertiliser (slurry) by the anaerobic fermentation of organic materials under certain controlled conditions of temperature, pH, C/N ratio. In the context of global warming the conversion of methane gas to CO_2 is important. The manure produced through a biogas unit has a comparative adavantage over ordinary manure in terms of both quantity and quality. It is rich in plant nutrients. The slurry improves soil fertility and therefore, increases crop yield.

Two plants are proposed, one in St. Mary's High School, Niranam and another in Devaswom Board High School, Kadapra.

Maintenance is proposed to be entrusted with the user group. The gas and slurry produced by the biogas plant can be used by the UGs.

(b). Construction of Roof top Rainwater Harvesting Ferrocement Tanks

Availability of safe drinking water is a major problem in the project area. To improve the availability of safe drinking water, roof water harvesting proposed. Here the water from the roof top is made to flow through a natural filter media and is then collected in ferrocement tanks for domestic use.

(c). Reverse Osmosis Plant

Reverse Osmosis (RO) is a proven technology that is used to remove large majority of contaminants from water by pushing the water under pressure through a semi-permeable membrane. It is capable of removing more than 99% of the dissolved salts (ions), particles, colloids, organics, bacteria and pyrogens from the feed water. Reverse Osmosis is very effective in treating brackish, surface and ground water.

RO membranes requires cleaning atleast once in every year. If the normalized pressure drop or the normalised salt passage increases by 15% indicates the time for cleaning the membrane. The cleaning work can be entrusted to reputed service providers. The annual cleaning of membranes costs Rs. 5000 to 15000. Primary Health Centre located on western part of the Niranam Grama Panchayat faces acute drinking water shortage. This PHC is visited, on an average, by 100 patients everyday. But safe drinking water is not provided here even though it has an open well. The households near the PHC also face water shortage. A reverse osmosis plant in the PHC is proposed. Maintenance is to be entrusted with the local people and the hospital authority. An amount of Rs. 0.50 per litre

can be collected from the beneficiaries and the same can be used for annual maintenance (cleaning of membrane). A collection point has to be provided at the entrance of the hospital with a time frame of supply.

(d).Rain Water Harvesting Syringe for Sub Surface Ground Water Recharge

It's a recharge or injection technique, directly to discharge water into water bearing zones. The roof water is stored in a tank is directed to the bore well. The water column exerts pressure and water will be spread in to the soil, pushing silt and other impurities backwards.The water is retained in the underground water column and this harvested water can be subsequently collected by simple piston pump or motor by constructing a tube well in the vicinity. 500 to 2500 litres of water can be drawn daily. The water thus harvested can be used for both drinking and minor irrigation.

(e). Renovation and Desiltation of dug out pond at Peringara

Renovation of dug out pond in Peringara High School is suggested to ensure continuous supply of safe drinking water in the school. Presently the pond is a dumping place of plastic wastes and bottles.

(f). Organic Vegetable Garden

Vegetable production in the project area is declining due to unscientific and unsustainable practices of vegetable cultivation such as uncontrolled usage of fertilisers, pesticides and weedicides. Hence a model vegetable garden is proposed at the Government High School Peringara.

To summarize, the entry point activities identified in the project area are presented in Table 6.2.

Table 6.1: Entry Point Activities – Location and Estimate

Rain Water Harvesting Tank (Capacity 50000 L)							
Sl.No.	**Location**	**Panchayat**	**Ward No**	**Amount**	**Persons/ Families Benefitte**	**Area Benefitted**	**Total Amount (in lakhs)**

					d	**(Ha)**	
1	Kannasa Smaraka School (9° 20' 53.66"E,9°.20' 53.66" ^{o}N)	Kadapra	14	2,40,300.00	400		14,41,800.00
2	Puthiyakavu School (76° 32' 1.28"E,9° 22' 2.495" N)	Nedumbram	12	2,40,300.00	300		
3	SNDP School Chathenkery (76° 31' 17.54"^{o}E,9° 22' 43.28" ^{o}N)	Peringara	14	2,40,300.00	200		
4	Govt:UP School,Mukaladi (76° 30' 38.01"^{o}E,76° 30' 38.01"^{o}N)	Niranam	06	2,40,300.00	200		
5	Govt:GHS,Peringara (76° 32' 50.96"^{o}E9° 23' 4.01"^{o}N)	Peringara	10	2,40,300.00	195		
6	Prince Marthanda Varma HSS, Peringara (76° 32' 34.58"^{o}E,9° 22' 46.45"^{o}N)	Peringara		2,40,300.00	1000		
II	**Portable Bio Gas Plant of Capacity 3m3(2 No)**						
1	Devaswom Board High School, Parumala (76° 33' 0.21"^{o}E,9° 19' 55.99"^{o}N)	Kadapra	07	81000.00	200		1,62,000.00
2	St. Mary's High School, Niranam	Kadapra	14	81000.00	250		
III	**Reverse Osmosis Plant(1 No)**						
1	Primary Health Centre (76° 30' 6.0474"^{o}E ,9° 20' 16.368")	Niranam	10	4,50,000.00	1000		4,50,000.00
IV	**Rain Water Harvesting Syringe for Sub Surface Ground Water Recharge**						
1	Govt. L.P School, Podiyadi	Nedumbram	01	39,000.00	75	5	39000.00
V	**Renovation and Desiltation of dug out pond at Peringara** (76° 32' 50.9634"^{o}E ,9° 23' 4.0194"^{o}N)		10	1,32,200		6	1,32,200
VI	**Organic Vegetable Garden**	Peringara	10	97000.00	400		97000.00

	(76° 32' 50.9634"^{o}E ,9° 23' 4.0194"^{o}N)						
Total Amount							**23,22,000.00**

6.4 Watershed Work Phase

The major activities in this phase are

i. Watershed Development Works or Natural Resource Management (NRM)

ii. Livelihood Activities for the poor people

iii. Production System and Microenterprises

The main watershed development interventions are as follows,

6.4.1 Watershed Development Works/Natural Resource Management (NRM) Activities

Natural resource management aims to maintain and improve natural resource base. People in the project area depend upon agriculture and allied activities. Management of natural resources helps to enhance livelihood of the local community on a sustainable basis. The main NRM activities identified for the project area are as follows:

(a). Renovation of Outer Bund/Strengthening/Construction of Outer Bunds for Conservation Measures of Agricultural Land

Strong outer bunds are prerequisite for successfull cultivation of paddy in the *Padasekharams.* Paddy fields in the project area are lying below or equal to the water level of canals. So to avoid water intrusion, renovation/strengthening/construction of outer bund is proposed. The works undertaken are listed in the annual action plan. Some of the *padasekharams* in the project area are willing to start "Orunellum Orumeenum" programme expecting more profitability from the farm. This could be encouraged by providing financial support to raise the field bund to hold sufficient water. Tharkolil, Valavanari, Niranathuthadam, Vanjippuzhappallam Paddy field, and Manakeri Padasekharams are identified for this intevention. This could be converged with Kuttanad Package.

(b). Vettiver/Fodder Grass Planting to Prevent Soil Erosion

Soil erosion from bund and raised land is occurring due to high amount of precipitation during monsoon. The bunds bordering canals and paddy fields are having gentle slope. During precipitation, soil on bund will erode to the water bodies and to paddy fields. This erosion causes degradation of soil fertility. It can be prevented by suitable soil conservation interventions like planting vettiver or fodder grass along the bunds and slope.

(c). Desilting/Deepening/Formation/Interlinking of Channels (*Vachals*)

Vachals are drainage channels in the padasekharams. These are used for irrigation as well as drainage of the *padashekarams*. In some padasekharams, vachals are being silted partially or completely, making the process of dewatering and irrigation insufficient. The proper management of *vachals* is required for water conservation irrigation and drainage. So desilting/deepening/formation/interlinking of drainage channels (*Vachals*) are suggested. This can be integrated with MGNREGA.

(d). Removal of Water Hyacinth from Canals

The canals are being filled with water hyacinth due to high eutrification. Low level of salinity, increased discharge of organic waste and fertilizer residues in water bodies are the main reasons for this. Aggressive growth of weeds is preventing the movement of ducks and is also affecting reproduction of fish. So removal of water hyacinth is suggested. It can be fully undertaken in MGNREGS.

(e).Desilting, Widening and Deepening of Canals for Conservation of Irrigation and Drainage

The project area has a number of canals around the padasekarams. Long back, they were used to transport agricultural produce to distant markets. Presently, most of the canals are filled with water hyacinth, waste and silt. Removal of silt will increase the water storage capacity of the canal and will, therefore, help to hold more water during flood. It will also be helpful to improve the quality of water in wells and ponds.

(f).Box Culverts and Shutter for the Management of Flood

Project area has a number of criss crossing water channels and these are being blocked due to unscientific construction of roads and foot paths without culverts. It leads to water logging and flood. So sufficient box culverts have to be constructed to avoid water logging. Regulation of water flow from the canals

and paddy fields are controlled by shutters. There is shortage of shutters in some of the paddy fields in the project area. So shutters are suggested in these padasekharams.

(g). Agro forestry at Home Stead/Bund Sides

The garden land (home stead) and raised bunds of paddy fields are occupied by a variety of plants adn trees. Even though the vegetative cover in the area is thick, further enhancement can be done by providing demand based supply of seedlings without compromising the natural habitat . So, seeds of fruit trees, cash crops, and other varieties of plants can be distributed among households free of cost.

(h). Strengthening of inner bunds of paddy fields

Inner bunds of paddy fields help in reducing soil erosion. At present, some of the inner bunds in Padasekharams are not maintained properly. Strengthening of inner bunds can be undertaken in MGNREGS.

(i).Renovation/Desilting of Dugout Ponds (Embankment & Side Wall Protection)

Ponds are considered as one of the important freshwater habitats and are useful for surface runoff harvesting and ground water recharging. It has an important role in maintaining the biodiversity of the area. Ponds in the project area are not maintained well. In the past, there were ponds in many homesteads. But later it got filled. Most of the public ponds are also facing degradation due to lack of proper maintenance. Silting and over growth of water hyacinth are the major problems. So removal of water hyacinth, desiltation and side wall protection is proposed. Removal of water hyacinth can be converged with MGNREGS.

(j). Rooftop Rainwater Harvesting Ferrocement Tanks

Project area faces acute drinking water shortage. Most people use traditional water harvesting technique by using a clean cloth or clean plastic sheet for collection of water. At present, they can store water only for a few days. Large storage facility is essential to conserve water. One option to improve drinking water availability is to make use of water harvesting technique.The process involves collecting rainwater from roof catchments, passing it through the natural filter media and storing it in ferrocement tanks for drinking and other domestic purposes. So it is suggested that ferrocemnent tank may be allotted to households and installed in public places.

(k).Open Well Recharging from Roof tops for Ground Water Recharge

Drinking water shortage due to turbidity of the water can be sorted to some extent through recharging from roof top. The process involves collection of rain water from the roof top and diverting directly to the well through a filter medium. Entry of rain water into the well results in a rise in water column. It will exert pressure and infiltrate into ground water

(l)Floating Drum Portable Biogas Plant

Improper waste management practices such as dumping waste in the water bodies and public places is an important problem identified through PRA. To solve this problem, it is suggested that floating drum portable biogas plants may be provided to households in the project area. The portable biogas technlology has the following advantages.

- Requires only kitchen waste and other biodegradable wastes from surroundings.
- Requires less space
- Portable nature.
- High gas production.
- Cheap and economical.
- Solution to biodegradable waste management.
- Ecofriendly approach.

A $1m^3$ litre plant will provide approximately 2.5 hours of cooking gas and the slurry coming out of the plant is a good bio-manure.

(m). Terrafil Water Filter

Project area is experiencing acute drinking water shortage due to high presence of iron and turbidity. So a low cost device, 'Household Terrafil Water Filter' (30 litre capacity), developed by CIPET Bhuvaneswar is suggested. TERAFIL is a low cost burnt red clay porous media (disc/candle), used for filtration & treatment of turbid raw water into clean drinking water for domestic/ community applications. Suspended particles, sediment, iron & many heavy metals, micro-organism, are separated from raw water effectively during filtration, without clogging the core of the TERAFIL. It can be fixed with any container for purification of water. Quality of product water is within BIS limits, especially for turbidity, iron & micro-organisms. Cost of purification is within Rs.2/- per ton of product water, considering total cost of plant. It operates without electricityAverage life of TERAFIL media is five years.

(n) Construction of Ramp for Land Management

Mechanised agriculture is common in the project area due to shortage of agriculture labourers. Presently, farmers are spending large amounts of money and man power to bring these machines to the fields. To avoid this burden, construction of ramp is proposed in suitable places.

(o) Well Renovation

There are a large number of public wells in the project area and most of them are being utilised by the people. But due to improper maintenance a number of them are unhygienic. It is suggested that some of the public wells are renovate to make them usable.

(p) Construction of New Well

Western end of the Niranam gram panchayat is facing acute drinking water shortage due to water contamination. Households in the area are located in very small land holdings from 3 cents to 5 cents. Every household in the area is having own toilet and they have no space for digging a new well at a safe distance from the toilet pit. About 50 families in the area and a health centre located in the area are fetching water from distant places. So digging a new well at the health centre is proposed. A reverse osmosis plant is also necessary to improve availability of safe drinking water. User group can collect Rs. 0.50 per litre for future maintenance.

6.6 Production System and Microenterprises

According to the Common Guidelines for Watershed Development Projects (2008), 10 per cent of the total project cost is to be assigned to support the production system and micro enterprises. This component aims to: (a). promote diversified production/farming system based livelihood activities/ interventions (b). encourage farmers to adopt and upscale successful experiences of proven technologies, integrated farming systems and improved farming practices for livelihood augmentation.

The activities / interventions planned under this component are:

Fodder Cultivation:

Promotion of fodder cultivation is important to reduce the production cost of milk and making cattle rearing profitable. Financial assistance of Rs. 550/Unit (10 cents) to farmers can be given through diary co-operative societies/ SHGs for grass cultivation

Liming for Reclamation of the Acidity of Soil

Due to acidity in soil, farmers spend a large amount to stabilize the pH value. Application of lime in soil helps to improve the soil quality. 700 – 1400 Kg of quick lime is recommended per hectare per year depending on the pH of the soil.

Lease Farming:

Labours shortage has been a major problem faced by the farmers and it has led many farmers to keep the land fallow. By providing financial and technical support, the SHG members could start agriculture meaningfully.

Cage Fish Farming

Cage culture of fish is an innovative method to grow fish in a limited space. Fishes are raised commercially in cages. This method is easier for fish stock monitoring and harvesting. It can be converged with schemes of the Fisheries department.

Horticulture - Vegetable Cultivation:

Project area is located very near to Thiruvalla Municipality, which is a thickly populated town. Most of the people in the town and in the project area are depending on the supplies from Tamil Nadu for vegetable. At the same time, a large extent of land, which are suitable for agriculture production are being kept fallow. The situation can be changed by providing financial and technical support to interested farmers or to a group of farmers to bring their land under vegetable cultivation.

Nursery Formation of Fruit and Spices Plants:

Formation of a nursery is suggested to produce seedlings of various plants like coconut, spices, mango, jack, medicinal plants etc. It directly helps to improve the vegetative cover of the project area.

Paddy Straw Mushroom cultivation:

Due to good demand for mushroom and because of the abundant availability of the base material (Paddy straw) mushroom cultivation by farmers can be encouraged in the project area.

Distribution of 6 month old buffalo Calveby farmers: Since the project area has a large extent of paddy fields, animal husbandary has good scope.

6.7 Livelihood Support

The Common Guidelines for Watershed Development Projects (2008) gives priority to livelihood support for landless/asset less persons. Nine per cent of the total project cost is assigned to support the livelihood activities of landless/asset less households. This aims to maximize the utilization of potential generated by watershed activities and in creating sustainable livelihoods for households within the watershed area.

The guiding principles for livelihood improvement initiatives are:

1. Livelihood improvement initiatives emphasize on natural resource based activities and conform to principles of equity, gender sensitivity and transparency. It strives to:-

a) Enhance livelihood opportunities for the poor through investment into asset creation and improvement in productivity and income.
b) Improve access of the marginalized communities including SC/ST, landless/ asset less people, women etc to the benefits.
c) Select the beneficiaries in a transparent manner.

2. Livelihood initiatives for landless/asset less households should aim at improved household income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.

The activities/interventions related to livelihood improvement suggested for the project area are as follows:

- **Ornamental fish farming:** Can be promoted among Kudumbasree groups and individuals. Rearing of ornamental fishes can be taken up in fresh water ponds, agrifilm ponds, canals, etc with the help of enterprises which are ready to buy the products.
- **Vegetable Retail Shop:** Vegetable retail shops along the state highways or main junctions are proposed.
- **Goat/Poultry/Duckery Rearing:** Groups of landless and poor households can be assisted to start purchase Goat/Poultry/Duckery.
- **Units for food processing:** There is some potential for starting food processing units on a small scale. Locally available rice can be powdered and dry roasted to make it suitable for cooking appam, puttu, dosa etc. If powdered in the traditional way, it can add value to the product.
- **Book binding units :** Project area is very close to Thiruvalla municipality and a number or government offices and educational institutions are there. Binding of books and project reports have a good scope from these offices. SHG Federations can start such units.

- **Garment Unit:** Spending on clothing by Malayalees have changed significantly over the years. There is an increase in demand for ready made clothing. To capitalise on this demand, garment making units suggested in the project area. Apart from making ready made garment, the units can also cater to the local demand for stitiching clothes

6.8 Sustainable Management Practices for Watershed Area

Micro watershed management involves integrating people, land and water. Management practices aims at long term well being of the local community. Following are some of the micro watershed management practices suggested for the project area:

a. Regular maintenance of ponds, wells and drainages
b. Prevent dumping of waste into water bodies.
c. Keep the drainages waste free.
d. Manage waste in home by using compost pits, bio gas plants etc.
e. Reuse the plastic items.
f. Install and maintain rain water harvesting structures and harvest maximum rain water using filtered tanks.
g. Regularly clean the rain water harvesting structures to ensure purity of drinking water. Also ensure that stored rain water is not contaminated.
h. Undertake vegetable cultivation/horticulture in yard or terrace using sacks and polythene covers.
i. Plant trees and preserve existing trees and shrubs to prevent soil erosion.
j. Do not spray pesticides indiscriminately.
k. Prevent over grazing by domestic animals (like goats, cows etc).

CHAPTER VII

DETAILED ACTION PLAN

7.1 Annual Action Plan

Table No. 7.1: Annual Action Plan - Instituition & Capacity Building *(Lakhs)*

I	**Instituition building**										**1.25**
II	**Information, Education & Communication (IEC) Activities in the Project Area**										**9.338**
III	**Capacity Building Programme**	**Year 1**		**Year 2**		**Year 3**		**Year 4**		**Total**	
		Physical	**Financial**	**Physical**	**Financial**	**Physical**	**Financial**	**Physical**	**Financial**	**Physical**	**Financial**
1	Empowering Elected Representatives for IWMP	2	0.144	2	0.144	1	0.072			5	**0.360**
2	Training Programme on IWMP	8	1.20	8	1.20	8	1.20	0		24	**3.60**
3	Training Programme for Watershed Committee Members	14	0.84	14	0.84	7	0.42	7	0.42	42	**2.52**
4	Training Programme for User Groups	10	0.60	10	0.60	10	0.60	4	0.22	34	**2.02**

5	Training programme on Production System and Micro enterprises (PS&M)	4	0.72	4	0.72	4	0.72	2	0.36	14	**2.52**
6	Training programme for Beneficiaries of Seed Money	5	0.90	5	0.90	5	0.90	4	0.72	19	**3.42**
7	Training Programmeon Major livelihood Activitie	4	0.80	4	0.80	2	0.40			10	**2**
8	Training on Accounting and Book Keeping	5	0.50	6	0.60	6	0.60	3	0.30	20	**2**
	Total	52	5.704	53	5.804	43	4.912	20	2.02	168	**18.44**
Total Instituition and Capacity building											**29.028**

Table No. 7.2: Annual Action Plan - Natural Resource Management

			Year 1		Year 2		Year 3		Year 4		
Sl.No	**Category of Work**	**Unit**	**Physical**	**Financial**	**Physical**	**Financial**	**Physical**	**Financial**	**Physical**	**Financial**	**Total Amount**
1	Agronomic Practices and Horticulture	Nos	0	0	0	0	0	0	64479	128958	128958
2	Bund strengthening		0	0	0	0	16000	2432000	0	0	2432000
3	Conservation measures for agricultural land		5548.64	311393	2000	304000	1875	84938	450	645600	1345931

4	Drinking water purifier		951	713250	0	0	452	339000	105	78750	1131000
5	Flood control/Irrigation		2	837253	0	0	6	1774432	11	386584	2998269
6	Ground water recharging		267	1068000	270	1080000	831	3324000	269	1076000	6548000
7	Household wastemanagement		5	85000	141	2397000	57	1033000	0	0	3515000
8	Land management for the passage of agricultural implements from one part to other		3	177204	1	42715	1	42715	0	0	262634
9	Management programme for conservaton irrigation and drainage		5444.84	827615	27012	4105824	21839.48	3319601	4508.98	685412	8938452
10	Management programme for drainage		1425.7	216706	0	0	0	0	0	0	216706
11	Recharge/Storage/Extraction of water from/to ground water		16	326057	19	544899	14	216636	21	324954	1412546
12	Surface runoff water harvesting and ground water recharging		3924	1316448	608	92416	900	136800	600	91200	1636864
13	Water harvesting structure		4	276000	29	805000	0	0	5	345000	1426000
14	Drainageline Treatment		100000	0	1	69000	0	0	100000	0	69000
15	Drinking water purification Plant		1	450000	0	0	0	0	0	0	450000
Total				**6604926**		**9440854**		**12703122**		**3762458**	**32511360**

Table 7.3 :Annual Action Plan - Production System & Micro-enterprises

Sl. No.	Activities	Rate	Unit	Expected WDF - Maximum	Year I		Year II		Year III		Year IV		Total Physical	Total Financial
					Physical	Fianancial	Physical	Fianancial	Physical	Fianancial	Physical	Fianancial		
1	Fodder Cultivation	550	/Unit (10 Cents)	46310	107	58850	132	72600	107	58850	75	41250	421	231550
2	Supply of Quiklime	10	Kg	222175	28330	283300	28125	281250	27330	273300	27303	273030	111088	1110880
3	Lease Farming	20000	/Ha	236000	11	220000	15	300000	15	300000	18	360000	59	1180000
4	Fisheries - Cage	12000	/Unit (5 Nos)	170400	10	120000	19	228000	20	240000	22	264000	71	852000
5	Horticulture - Vegetable Cultivation	17400	/Acre	222720	11	191400	15	261000	22	382800	16	278400	64	1113600
6	Nursery formation of Fruit and Spices plants	221020	/Unit	44205	0	0	1	221020	0	0	0	0	1	221020
7	Paddy Straw Mushroom cultivation	6775	/100 Kg Unit	56910	6	40650	10	67750	16	108400	10	67750	42	284550
8	Distribution of 6 month old buffalo Calves	14000	/Unit (2 Nos)	162400	9	126000	17	238000	19	266000	13	182000	58	812000
	Total			**1161120**		**1040200**		**1669620**		**1629350**		**1466430**		**5805600**

Livelihood Action Plan

The activities proposed under the livelihood action plan are meant for improving livelihood of the poor and marginalized people in the project area. It is proposed to earmark 9 percent of the total allotted amount for the activities under this plan. Major portion of this component is suggested to give to the SHGs working in the project area as revolving funds for improving their livelihood improvement/income generation activities. The beneficiary SHGs will be selected

mainly on the basis of criteria currently used to rate the SHGs. If any change in the criteria is required with regard to the selection of beneficiary SHGs, same will be decided at the time of selection considering the suitable factors and according to State level policies. The funding pattern under livelihood support will be as follows

Table 7.4: Financial Plan for Livelihood Activities

No	Category	Amount
1	**Seedmoney for SHGs**	3657528
2	Grant in aid for enterprising SHGs or Federation	**1567512**
	Total	**5225040**

Table 7.5 : Action Plan for Major Livelihood Activities

Activity	Expected Unit CostUnit cost	Physical	Amount From IWMP	Other Sources(Bank)	Beneficiary Contribution	Convergence	Total
Garment Unit	157000	5	392500	292500	100000	Khadi & Village Industries	785000
Book Binding Unit	619300	1	200000	219300	200000	Khadi & Village Industries	619300

Poultry Unit	162502	12	975012	925012	50000	Animal Husbandry/ Bank	1950024
Total		**18**	**1567512**	**1436812**	**350000**		**3354324**

Table 7.6 : Annual Action Plan for Livelihood –(Seed money)

Activity	Unit Cost	Year 1		Year 2		Year 3		Year 4		**Total**	
		Physical	Financial	Physical	Financial	Physical	Financial	Physical	Financial	**Physical**	**Financial**
Ornamental Fish Farming	25000	2	50000	2	50000	0	0	0	0	**4**	**100000**
Vegetable Retail Shop	25000	2	50000	2	50000	0	0	0	0	**4**	**100000**
Food Processing Unit	25000	1	25000	2	50000	2	50000	1	25000	**6**	**150000**
Backyard Poultry	20500	11	225500	21	430500	22	451000	11	225500	**65**	**1332500**
Backyard Duckery	25000	8	200000	14	350000	14	350000	12	300000	**48**	**1200000**
Goat Rearing	25000	4	100000	11	275000	12	300000	4	100000	**31**	**775000**
Unforeseen											**28**
Total		**28**	**650500**	**52**	**1205500**	**50**	**1151000**	**28**	**650500**	**158**	**3657528**

Table 7.7: Scope of Convergence

Sl. No.	Type of intervention	Department/Schemes which can be converged with IWMP
1.	Renovation of Pond	1. MGNREGA
2.	Bund Strengthening of Paddy fields	1. MGNREGA
3	Rain water harvesting Pit	1. MGNREGA
4	Afforestration	1. MGNREGA 2. LSGI 3. Department of Social Forestry
5	Horticulture	1. Department of Agriculture 2. MGNREGA 3. LSGI 4. Vegetable and Fruit Promotion Council
5.	Dairy development	1. Department of Dairy development 2. LSGI
6.	Waste Management Activities	1. Total Sanitation Campaign 2. Nirmal Bharat Abhiyan 3. NRHM 4. LSGI
7.	Exposure Visit	1. ATHMA

CHAPTER VIII

EXPECTED OUTCOMES

8.1 Expected Outcomes

The expected outcomes of the IWMP project are detailed below:

Table 8.1: Expected Outcomes

Sl. No	Activity	Target Group	Pre project period status	Post project period Status
1	Renovation of irrigation canals/Ponds	Farmers	• Irrigation canals filled with sediment deposit	• 27 drainages are deepen resulting in the following benefits • Smoothen water flow • Expansion of area irrigated(1197 Ha) • Production enhancement(5%)
2	Construction of Culvert/Shutter/Ramp	Farmers	• Lack of adequate flood control measures • Difficulty in movement of agricultural implements and machines	• 23 Nos of the Culvert/ Ramp/ Shutter will bring the following benefit: • Flood control (in 540 Ha) • Sufficient water availability (in 540 Ha) • Easy movement of agricultural implements and machines
3	Management of water resources	Watershed community	• Inadequate water • Water resources are polluted	• Recharging of 1658 open wells, desiltation of Pond (7184m^3), Rainwater Harvesting Ferrocement Tank (30 Nos), and distribution of 2147 purification devices will ensure the following results: • Water availability in summer season (12

				Months) • Better irrigation facility (At least 101 Ha) • Availability of pure drinking water (3638 families)
4	Strengthening/ Construction of bunds	Watershed community	• Weak/Insufficient height of bunds	• Construction of bund around the padasekharams (252253m^3) will bring the following results • Stronger bunds
5	Livelihood activities	Poor people (landless or asset less)	• 37 per cent of families live below poverty line.	• Atleast 125 SHGs will get aid for strengthening their livelihood activities every year. • Generate employment opportunities (At least for 1250 Households) • Empowerment of land less, asset less poor people especially women who are home makers without having any monetory benefit. Through the seed money they can earn Rs.2000 Per month)
6	Production system	Small and marginal farmers, asset less households	• Shortage of labour	• Rise in production of paddy, milk, fish catch, eggs, vegetables etc .(Fodder cultivation in 42 acrse will help to yield 5% more milk from milching animal, 53 Ha more vegetable cultivation will ensure more availability, 71 cage units will give atleast 9000 Kg of fish per year, buffalo calves will increase beef and milk availability

CHAPTER IX

WATERSHED DEVELOPMENT FUND & EXIT PROTOCOL

The main source of financial assistance for the post implementation period is Watershed Development Fund (WDF). One of the mandatory conditions for the selection of villages for watershed projects is people's contribution towards WDF. The Contribution to WDF shall be a minimum 10 % of the cost of NRM works executed on private land only. However, in case of SC/ST, small and marginal farmers, the minimum contribution shall be 5 % of cost of NRM works executed on their land. These contributions would be acceptable either in cash at the time of execution of works or voluntary labour. A sum equivalent to the monetary value of the voluntary labour would be transferred from the watershed project account to the WDF bank account that will be distinct from the Watershed Committee (WC) bank account. User charges, sales proceeds and other contributions, disposal amounts of intermediate usufruct rights shall also be deposited in the WDF bank account. Income earned from assets created under the project on common property resources shall also be credited to WDF.

For other cost intensive farming system based livelihood activities/interventions such as Aquaculture, Horticulture, Agro-Forestry, Animal Husbandry etc. on private land directly benefiting the individual farmers, the contribution of farmers will be 20 percent for general category and 10 percent for SC/ST beneficiaries and the project funds will meet the cost of farming system activity to a maximum limit of an amount equal to double of the unit cost of the project for watershed development (i.e. Rs 12,000/15,000 per ha, as the case may be). Farmers' contribution i.e. 20 percent for general category and 10 percent for SC/ST of this amount (i.e. a maximum of Rs 4800/6000 and Rs 2400/3000 as the case may be, respectively for general category and SC/ST beneficiaries) will go to WDF.

The Secretary, Watershed Committee (WC) shall maintain a completely separate account of the income and expenditure of the WDF. Rules for operation of the fund should be prepared by the Watershed Committee (WC) and ratified by the Gram Sabha. The WDF bank account should be operated by the President of the Gram Panchayat and any member from the SHG nominated by the Gram Sabha. Alternatively, the guidelines for the management and utilization of the WDF may be evolved by the concerned Nodal Ministry.

After completion of Phase II, at least 50% of the WDF funds shall be reserved for maintenance of assets created on community land or for common use under the project. Works taken up on private land shall not be eligible for repairing/ maintenance out of this Fund. The remaining money may be used as a revolving fund to advance loans to the villagers of the project area who have contributed to the fund. Individuals as well as charitable institutions should be encouraged to contribute generously to this Fund.

SUMMARY AND CONCLUSION

Pulikeezhu (IWMP 2) project is located in Pulikeezhu block in Thiruvalla Taluk of Pathanamthitta District. The project comprises of five micro-watersheds namely Ayyankonari (10P8a), Parumala (10P9a), Keecherivalkadavu (10P10a), Chathenkery Kadavu (11M19a) and Podiyadi Puthanthodu (11M20a). The project area is spread over five grama Panchayats of Pulikeezhu block namely Kadapra, Niranam, Peringara, Nedumbram and Kuttoor. There are 15203 households in the project area and the total population is 64033. The total project cost of the Pulikeezhu IWMP 2 project is Rs.580.53 lakhs.

Department of Local Self Government is the nodal department for the implementation of IWMP at the state level. State Level Nodal Agency (SLNA) is coordinating and providing guidelines for the effective planning and implementation of the individual IWMP projects. District Planning Committee (DPC) is responsible for the planning and implementation of the projects at the district level. To help the DPC and to coordinate the project level activities, Watershed Cell Cum Data Centre (WCDC) is working at the district level. The Pulikeezhu Block Panchayat is the Programme Implementing Agency (PIA) of the Pulikeezhu IWMP 2 project. A Block Level Coordination Committee (BLCC) has been formed for the timely implementation of the project and to provide help to the PIA in technical and administrative matters related to the project. Watershed Development Team (WDT) has been formed under the PIA. Centre for Socio-economic & Environmental Studies (CSES) is the Technical Support Organisation (TSO).

A cluster approach was followed in the preparation of DPR. The preparation of the DPR involved several rounds of discussions with elected representatives, officials and other stakeholders. A situational analysis was undertaken using secondary data and information collected from different sources. A baseline survey covering all the households in the project area was also conducted. A Logical Framework Analysis was done at the project level for identifying the important problems (through problem tree analysis) as well as for the purpose of assessing the present situation. Other PRA techniques like transect walk, social mapping, resource mapping, seasonal calendar, etc., were employed in each micro watershed area. GIS and remote sensing devices have been made use of in the preparation of DPR. Quantum GIS Software was used for the preparation of maps. 1:4000 scaled cadastral maps of each village formed the base map for planning. Depth interviews with officials,

farmers, fisher folk, entrepreneurs of micro-enterprises etc. were also undertaken. Field level verification of the identified interventions was undertaken by the DPR preparation team.

The five micro watersheds in the project area face many common problems because of the similarities existing among the micro watersheds. The major problems identified through PRA techniques which have led to the identification of the interventions to be undertaken under the IWMP project are drinking water shortage, canals filled with silt, waste dumping into the water bodies, flood during rainy season, water logging, weak bunds, acidity of the soil, water bodies filled with water hyacinth, fields reclaimed or kept uncultivated, shortage of agricultural labourers, unscientific construction of roads and foot paths, uncultivated paddy fields etc. The suggested interventions for the above mentioned problems are: (a) construction of ferrocement rain water harvesting tanks (b) maintenance of wells and ponds for the availability of fresh water (c) install reverse osmosis plant (d) installation of a water quality testing lab (e) de silting and increasing depth of canals and vachals to hold more water (f) planting vettiver, fodder grass etc for side protection (g) construction of culverts to prevent water logging and flood (h) construction and strengthening of outer bunds for the paddy fields to improve the productivity and profitability of paddy cultivation (i) install biogas plants (j) removing water hyacinth (k) improve livelihood opportunities by promoting pisciculture, horticulture**,** cage fishing, floriculture, fodder cultivation, supply of cow, goat, duck, chicks etc, training on production of different eco-friendly products etc. The scope for convergence with other schemes and programmes have been examined in identifying interventions under IWMP. The interventions under IWMP is expected to help in restoring the ecological balance of the project area, conserving the natural resources and in improving the livelihood opportunities of the people.

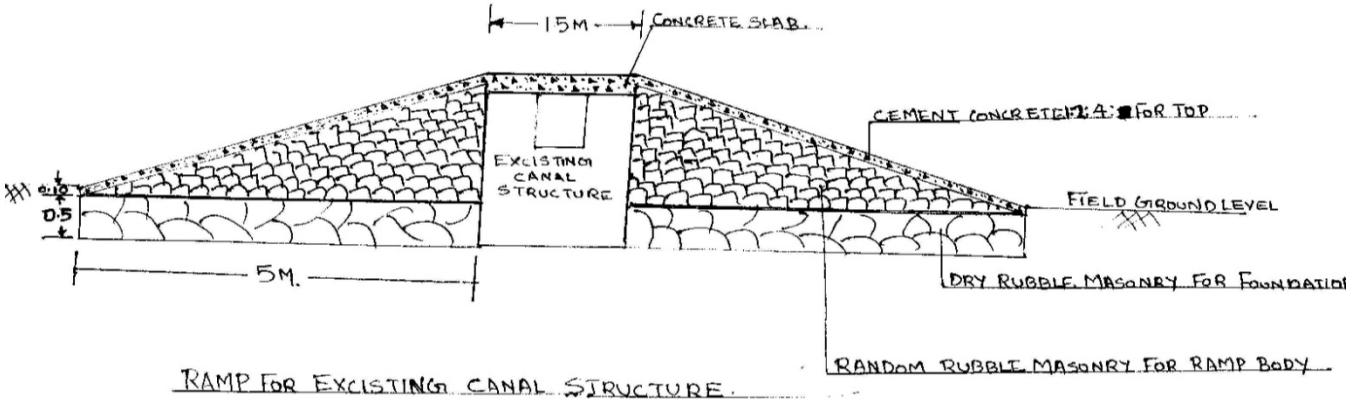
Table 9.1: Project at a glance

Total Geographical Area of Project (Lakh Hectares)	0.04838
Treatable Area	0.04838
Wasteland (Lakh Hectares)	0.0005
Rainfed Agricultural Land (Lakh Hectares)	0.04838
Total Cropped Area (Lakh Hectares)	0.04919
Net Sown Area (Lakh Hectares)	0.04341
Total no. of Water Storage Structures	96
Total no. of Water Extracting Units	12788
Total storage capacity of water storage structures (cubic meters)	36560
No. of Household	
SC	1404
ST	25
Others	13774
Total HHs	15203
Total Population in the project Area	64033
No. of Household of Landless people	251
Total no. of BPL Household	5664
No. of Small Farmer's Household	77
No. of Marginal Farmer's Household	14286
Depth of Ground Water (meters) below Ground Level	
Pre-monsoon	4.2
Post-monsoon	2.1
No. of person-days of Seasonal Migration	45198
Name of the Project	IWMP II/2012-13 Pulikeezhu Watershed
District	Pathanamthitta
Blocks Covered	Pulikeezhu
Name & Code of micro-watersheds	Ayyankonari - 10P8a, Parumala - 10P9a, Keecherivalkadavu - 10P10a, Chathenkery Kadavu - 11M19a, Podiyadi Puthanthodu - 11M20a.
Gram Panchayats covered	Kadapra, Niranam, Peringara, Nedumbram, Kuttoor

APPENDIX -I

DETAILED ESTIMATE

Detailed Estimate														
SL NO.	DESCRIPTION	NO	LENGTH	BREADTH	DEPTH	QUANTITY	RATE/	UNIT	AMOUNT	MATERIAL (COST+CONVEYANCE)	LABOUR	TAX (6%)	TOTAL
1. RAMP CONSTRUCTION(2 sides)													
	Earth work excavation in or under water and depositing cutsoil on the side of paddy field												
	For foundation	4	5	1.2	1	24							
	For blocks	2	1.8	0.6	0.5	1.08							
1						25.08	m^3	1515.6	/10 m^3	3801.12		3801.12		
2	Dry rubble masonary for foundation including all charges conveyance, labour charges etc. Complete	4	5	1.2	0.5	12	m^3	1524.8	/m^3	18297.60	10609.2	7688.4		
	Random rubble masonary for superstructure including all charges conveyance, labour charges etc. Complete													
	For side walls	4	5	0.6	(1.5+.50)/2	12.6								
	For bed block	2	1.2	0.6	0.5	0.72								
3	Total					13.32	m^3	2882.49	/m^3	38394.77	28730.4408	9664.326		

	Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone for reinforced cement concrete work including all form work watering curing etc. complete.													
	For slab	1	1.5	3	0.2	0.9								
	For top (coping concrete)	4	5.5	0.6	0.1	1.32								
4	Total					2.22	m^3	6511	$/m^3$	14454.42	10478.4	3976.02		
5	Rough stone dry packing for forming road surface	2	5	1.8	0.6	10.8	m^3	1468.42	$/m^3$	15858.94	9548.3	6310.7		
6	Providing reinforcement					20	kg	4839.41	/100 kg	967.88	756.29	211.592		
	Total									**91774.73**	**60122.6108**	**31652.114**	**5506.483776**	**97281.21**
	 RAMP FOR EXISTING CANAL STRUCTURE.													

	2. VAACHAAL NIRMANAM													
1	Clearing grass and other overgrowths of vegetation and small trees of girth up to 30 cm	1	500	2.1		1050	m^2	188.5	/100 m^2	1979.25	0.00	1979.25		
2	Earth work excavation in or under water and depositing cutsoil on the side of paddy field for channel (vaachaal)	1	500	0.9	0.6	270	m^3	1515.6	/10 m^3	409212.00	0.00	409212		
												411191	**24671**	**435862.7**
	3. CONSTRUCTION OF RAMP(SLOPE)													
	Earth work excavation in or under water and depositing cutsoil on the side of paddy field													
	For foundation	2	5	1.2	1	12								
	For blocks	1	1.8	0.6	0.5	0.54								
1						12.54	m^3	1515.6	/10 m^3	1900.56		1900.56		
2	Dry rubble masonary for foundation including all charges conveyance, labour charges etc. Complete	2	5	1.2	0.5	6	m^3	1524.8	/m^3	9148.80	5304.6	3844.2		
	Random rubble masonary for superstructure including all charges conveyance, labour charges etc. Complete													
3	For side walls	2	5	0.6	(1.5+.50)/2	6.3		2882.49	/m^3	19197.	14365.22	4832.16		

	For bed block	1	1.2	0.6	0.5	0.36				38				
	Total					6.66	m^3							
4	Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone for reinforced cement concrete work including all form work watering curing etc. complete.													
	For top (coping concrete)	2	5.5	0.6	0.1	0.66								
	Total					0.66	m^3	6511	$/m^3$	4297.26	3115.2	1182.06		
5	Rough stone dry packing for forming road surface	1	5	1.8	0.6	5.4	m^3	1468.42	$/m^3$	7929.47	4774.1	3155.3		
6	Providing reinforcement					5	kg	4839.41	/100 kg	241.97	189.0725	52.898		
	Total									**42715.44**	**27748.2**	**14967**	**2562.9**	**45278.37**
	4. POND RENNOVATION													
1	Bailing out water with (5 H P) engine and pump set	1				2	days	1256	/day	2512	966	1546		
2	Earth work excavation in or under water and depositing on the side of pond with one additonal lift	1	27	11	1.2	356.4	m^3	1666.4	/10 m^3	59390.5		59390.5		
	Total									**61902.5**	**966.00**	**60936**	**3656.2**	**64592.69**
	5. WELL RENNOVATION													
1	Bailing out water with (5 H P) engine and pump	1				1.00	day	1256	/day	1256.0	966.00	1546.00		

	set									0				
2	Desilting	1	3.14	1.44	1.80	8.14	m^3	2571	/10 m^3	1046.33		1046.33		
3	Plastering with cement mortar	1	3.14	2.4	1.5	11.30	m^2	1863	/10 m^2	2105.38	923.04	1182.34		
4	Cement concrete 1:2:4 (for nellipalaka)	1	3.14	1.44	0.10	0.45	m^3	6511	/m^3	2944.01	2134.20	809.82		
5	Filltering media													
	24mm gravel	1	3.14	1.44	0.3	1.36	m^3	1508	/m^3	2045.57	2045.57			
	sand	1	3.14	1.44	0.3	1.36	m^3	2880	/m^3	3906.66	3906.66			
	Coal	1	3.14	1.44	0.3	1.36	m^3	1600.00	/m^3	2170.37	2170.37			
	Total									**15474.33**	**12145.84**	**4584**	**928.46**	**16402.79**
				6. CANAL CONSTRUCTION										
				-	-	-	-	-						
1	Clearing grass and other overgrowths of vegetation and small trees of girth up to 30 cm	1	350	2.2		770	m^2	188.5	/100 m^2	1451.45	0	1451.45		
2	Earth work excavation in or under water and depositing cutsoil on the side of paddy field for channel (vaachaal)	1	350	2.2	0.3	231	m^3	1515.6	/10 m^3	350103.60	0.00	350104		
3	Cement concrete 1:4:8 for bed	1	350	2.2	0.2	154	m^3	4432.22	/m^3	682561.88	535969.28	146593		

4	shuttering for sides	2	350	2.6		1820	m^2	1989.73	/10 m^2	362130.86	202516.86	159614		
5	Cement concrete 1:3:6 for sides	2	350	0.6	1	420	m^3	5292.96	/m^3	2223043.20	1647097.2	575946		
6	wearing coat 1:2:4	1	350	1	0.075	26.25	m^3	6511	/m^3	170913.75	123900	47013.8		
7	plastering with C.M	1	350	6.2		2170	m^2	1862.51	/10 m^2	404164.67	177193.52	226971		
	Total									4194369.41	2686676.86	1507692.55	251662.16	4446031.57
	7. CONSTRUCTION OF WELL													
Item No.	**Description**	**No.**	**L**	**B**	**D**	**Qty**	**Rate**	**Unit**		**Amount**				
1	Earth work excavation in hard soil for digging well with initial lift up to 1.50m	3.14	1.175	1.175	1.50	6.5	2710	10	m^3	1761.30				
2	Earth work excavation in hard soil for digging well with 2nd depth up to 3.00m including all charges(20% add every one lift)	3.14	1.175	1.175	1.50	6.5	3252	10	m^3	2113.56				
3	Earth work excavation in hard soil for digging well with 3rd depth up to 4.50m including all charges	3.14	1.175	1.175	1.50	6.5	3902	10	m^3	2536.27				
4	Earth work excavation in ordinary rock for digging well with 4th depth up to 6.00m including all charges	3.14	1.175	1.175	1.50	6.5	4682	10	m^3	3043.52				
5	Earth work excavation in ordinary rock for digging well with 5th depth up to 7.50m including all charges	3.14	1.175	1.175	1.20	5.2	5619	10	m^3	2921.78				
6	Cement concrete 1:11/2:3 for ring	12.00	0.4239			5.0868	6900	1	m^3	35098.92				

7	Form work	12.00	8.478			101.736	1990	10	m^2	20242.72				
8	Reinforcement	12.00	12.717			152.604	4839	100	kg	7384.51				
9	Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone including watering curing etc. complete.	1.00	0.3251			0.33	6511	1	m^3	2116.73				
10	Pointing with cement mortar	12.00	(2X3.14X1.075)			81.01	405.87	10	m	3288.03				
11	Filltering media									8122.60				
	Total									**88630**			**5317.8**	**93947.72**
	8. RENNOVATION OF WELL OF DIA 3M (PLATFORM &SIDE WALL)													
Item No.	**Description**	**No**	**L**	**B**	**D**	**Qty**	**Rate**	**Unit**		**Amount**				
1	Dismantiling clearing away and carefully stacking materials useful for reuse for any thickness of walls of brick, laterite or rubble in mud, including disposal of debris within a distance of 150m													
	Protection wall	3.14	3.08	0.50	1.60	7.74								
	Platform	3.14	3.75	0.40	0.40	1.88								
	Pillar	3.00	0.35	0.23	0.90	0.22								
						9.84	434	1	m^3	4269.83				

2	Earth work excavation in ordinary soil and depositing on bank with initial lead up to 50m and lift upto 1.5m including breaking clods, watering, ramming and sectioning of spoil bank, etc. complete.													
	Platform	3.14	4.95	0.40	0.40	2.49	1263	10	m^3	314.09				
3	Dry stone masonry for retaining walls.													
	Platform	3.14	4.95	0.40	0.40	2.49	1525	1	m^3	3792.49				
4	Rough stone dry packing for aprons and revetments.	3.14	4.35	1.00	0.25	3.41	1577	1	m^3	5385.06				
5	Brick work in mud mortar with country burnt bricks (nominal size 22.9cm X 11.2cm X 7.0cm) for well lining	3.14	3.08	0.23	0.80	1.78	3187	1	m^3	5671.27				
6	Brick work in cement morter 1:6 using country burnt bricks nominal size 22.9x11.2x7cm. For well lining as per standrad specification	3.14	3.08	0.23	0.90	2.00	4155	1	m^3	8318.05				
7	Brick work in cement mortar 1:6 using country burnt bricks nominal size 22.9x11.2x7cm. For super structure in ground floor upto 5m height.													
	Pillar	3.00	0.35	0.23	0.90	0.22	3881	1	m^3	843.54				
8	Cement concrete 1:2:4 using 20mm (nominal size) hard granite broken stone including watering curing etc. complete.	3.14	4.35	1.00	0.075	1.02	65	10	dm^3	6658.76				
9	Plastering with cement morter 1:4, 12mm thick one coat using 54kg of cement /10m2 plastering, floated hard and trowelled smooth including cost and conveyance of all materials labour charges etc. complete as directed by dept. Officers at site													
	Outer side of parapet wall	3.14	3.35	0.90		9.47								

	Inner side of parapet wall	3.14	2.85	0.90		8.05								
	Top portion of parapet wall	3.14	3.10	0.23		2.24								
	Pillar	3.00	1.16	0.90		3.13								
						22.89	1816	10	m2	4157.19				
10	Conveying and laying GI 50mm dia pipes	1	2.90			2.9	42	1	m	121.80				
11	Supplying and fixing Iron pulley including all charges.	1				1	66	1	nos	66.00				
12	Bailing out water with (5 H P) engine and pump set	1.00	2.00				1,256	1	day	2512.00				
										42110.00			**2526.6**	**44636.60**
	9. SHUTTERS													
	VENGAI WOOD ROUGHT & PUT-UP	1	3.5	2.5	0.075	0.65625	535.5	10	dm^3	**35144.5**			**2108.7**	**37253.21**
11. Rain Water Harvesting Syringe														
1	Shallow tank[pvc] 1000 litres									Rs 5500				
2	Syringe/Suction line work@Rs-1750/per meter-**7 meter**									Rs 13250				
3	Rain water filter									Rs 1500				
4	Rain water pressure line 2'pvc,1'pvc pipes-**7 meter**									Rs 1750				
5	Plumbing charges									Rs 4500				

6	Pvc fittings,foot valve,valves,elbows									Rs 2500				
7	0.5 HP self priming pump,fittings									Rs 2500				
8	Transporting charges									Rs 2000				
9	Design,Consultancy, and supervision									Rs 5000				
10	Other unseen expense									Rs 1000				
	Total									**Rs 39000**				
	10 BOXCULVERT													
1	Putting up ring bund 1m top width and 2m bottam width and height 2.5m with 1/2 split coconut post 5m long driving down 2m below bedlevel 60cm c/c both side and tying with 1/3 split coconut post and bamboos alternatively tied with coconut plated cudjan both sides and filling with clay and dismantiling the bund after completion of work.													
	2	8			16									
					16									
	16m@Rs. 3194/m					51104								
2	Bailing out water with 5HP Engine and pumpset including hire charges cost of fuel lubricatingoil, pay of staff etc. complet.													
					10									
					10									
	10days@Rs1351/day					13510								
3	Earth work excavation in loose clay in or under water and depositing the cutsoil including lead													

	and lift as per direction													
			4	3.5	1.35	18.9								
						18.9								
	18.9m3@Rs.1117/10m3					2793								
4	Supplying and stacking well matured coconut posts 5m to 7mlong													
	(4/0.60) +1=6.67 say7 nos													
	(3.5/0.60)+1 =5.83 say6nos		7	6	7	294								
						294								
	294m@Rs.113/m					33222								
5	Driving down wooden piles 200to 300mm dia to lines and levels as per the directions													
	Qty wide item no.4				294									
					294									
	294m@Rs.439/m					126432								
6	providing sand bedding with clear grity river sand including applying and spreading the sand in lines and levels													
			4	3.5	0.4	5.6								
						5.6								
	5.6m@Rs3811/m3					21341.6								
7	Rough stone Dry packing for D.R Foundation abow coconut pileing													

			4	3.5	0.4	5.6								
						5.6								
	5.6m3@Rs 2148/m3					12028.8								
8	Cement Concrete1:4:8 using 40mm broken stone in open foundations complete as per drawings and technical specification													
			4	3.5	0.25	3.5								
						3.5								
	3.5m3@Rs 5370/m3					18795								
9	Cement Concret 1:1.5:3 using 20mm broken stone work including the cost of formwork, watering curing etc complete.													
	Bottom slab		4	3.5	0.3	4.2								
	vertical wall 2No		1.75	3.5	0.4	4.9								
	Top slab		4	3.5	0.3	4.2								
	Hunches 4No		4	0.5	0.5	4								
	Parapetwall 2No		3.5	0.15	0.75	0.7875								
	Total					**18.0875**								
	18.09@Rs.98.20/10dm3					177619.25								
10	Reinforcement for RCC works including benting tying and placing in position													
	Qty wide item no.9					19.67								

	18.09m3@120kg/m3					**2171**	Kg							
	24Qtl@Rs6339/Qtl					137619.69								
11	Earth work excavation in loose clay in or under water and depositing the cutsoil including lead and lift as per direction													
	Wingwall 4No		5	1.2	0.5	12								
	Total					**12**								
	12m3@Rs1263/10m3					1515.6								
12	DR masonry for foundation and super structre including all charges convayance labour charges etc. for the side protection of the pipe culvert													
	1. Foundation													
	Wingwall 4No		5	1.2	0.5	28								
	2. Super structre													
	Wingwall 4No		5	0.8	1.75	28								
	Total					**56**								
	56m3@Rs2096/m3					117376								
13	Cement concrete 1:3:6 using 20mm broken stone for wearing coat including hire for form work watercuring all labour charges etc. complete													
	Wingwall 4No		5	0.5	0.075	0.75								
	Total					**0.75**								
	.75m3@Rs68/10dm3					5100								

15	Earthwork filling with gravelly earth cut and convayed from availabe source including allcost of convayance labourcharge for spreading and cosolidating by using power roller or tamping with rammer or 600mm dia stone rollr etc complete..													
			4	3.5	1	14								
	4No		5	1	1	20								
						34								
	44m3@Rs.9059/10m3					30800.6								
	GRAND TOTAL													
	RUPEES TWELVE LAKHS ONLY					**752345.09**								
	TAX 6%					45140.7051								
	TOTAL					**797485.79**								
	SAY EIGHT LAKHS RUPEES													
	11. Open Well Recharging													
1	150 mm gutter pipe	1	7.5					1	Nos	675				
2	150 mm Stopper	2						65	Nos	130				
3	150 mm dropper	2						60	Nos	120				
4	150 mm GI clamp	7						70	Nos	210				
5	63 mm Pipe Gm (4+2)	6						70	Nos	420				
6	Supplying and Fixing 300 litre sintex tank	1				300		5	litre	1500				

7	Filtering Media (LS)									500				
	Un forseen Charges									445				
	Total									**4000**				
	12. Deepening of Canal/Pond													
1	Earth Work Excavation in ordinary Soil		1	1	1			1117	10m 3	1117				
2	Adding .4 women for addional 1.5 m lift									151				
3	Adding 20% in or under water or liquid mud									253.6				
	Total									**1521.6**				

FERRO CEMENT WATER TANK OF 15000litres

DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
Clearing the Tank site	36	m^2	1.20	43.20
Excavation in hard soil for foundation	1.1602	m^3	150.00	174.03
P.C.C 1:4:8 using 20mm broken stone for foundation	0.3867	m^3	4828.73	1867.27
Brick work in CM 1:6 for foundation and basement	1.5822	m^3	4286.43	6781.99
Basement filling with boulders	1.0935	m^3	1031.00	1127.40
PCC 1:4:8 using 20mm broken stone below base slab	0.45	m^3	4828.73	2172.93
Steel reinforcement for belt and floor concrete	0.5131	Qtl	5213.40	2675.00
Floor &belt concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work but excluding reinforcement	1.1695	m^3	6020.84	7041.37
Making steel cage for wall, dome and filter chamber with 8mm & n6mm bars including supply of material and labour	0.5131	Qtl	7388.40	3790.99
Supplying and winding with 1 layer of 10 guage, 50 mm x 50mm welded mesh over the steel cage including material and labour	20.72	m^2	228.88	4742.39
Supplying and winding with two layers of 10 cage, 12.5x12.5 mm GI chicken mesh around the cylindrical steel cage, dome and filter including material and labour	31.574	m^2	180.00	5683.32
Plastering with CM 1:2.5, 21 mm thick each on both sides of tankwall, applied in layers and finished smooth with cement flushing coat including material and labour	41.44	m^2	285.75	11841.48
Plastering with CM 1:3, 15mm thick each on both sides of dome and filter chamber applied in layers and finished smooth with cement flushing coat including	21.71	m^2	267.00	5796.57

material and labour				
Plastering tank floor by applying one of neat cement slurry and then with CM 1:3, 15mm thick, mixed with water proofing compound and finished with cement flushing coat.	7.065	m^2	280.00	1978.20
Cement washing 2 coats	31.57	m^2	12.52	395.26
Providing roof water collection and conveyance system, filter, first flush and drainage system including material and labour	LS			6000.00
Supply and fixing of tap, platform,over flow pipe etc etc	LS			1630.00
Scaffolding, water, curing, writing etc	LS			3500.00
TOTAL				69000.00

FERO CEMENT WATER TANK OF 5000litres

DESCRIPTION	QUANTITY	UNIT	RATE	AMOUNT
Clearing the Tank site	16	m^2	1.20	19.20
Excavation in hard soil for foundation	0.4752	m^3	150.00	71.28
P.C.C 1:4:8 using 20mm broken stone for foundation	0.2376	m^3	4828.73	1147.31
Brick work in CM 1:6 for foundation and basement	0.7344	m^3	2438.00	1790.47
Basement filling with boulders	0.6615	m^3	1031.00	682.01
PCC 1:4:8 using 20mm broken stone below base slab	0.2205	m^3	4500.00	992.25
Steel reinforcement for belt and floor concrete	0.3697	Qtl	4211.00	1556.81
Floor &belt concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work but excluding reinforcement	0.6066	m^3	3214.00	1949.61
Making steel cage for wall, dome and filter chamber with 8mm & n6mm bars including supply of material and labour	0.4197	Qtl	2000.00	839.40

Supplying and winding with 1 layer of 10 guage, 50 mm x 50mm welded mesh over the steel cage including material and labour	11.25	m^2	132.00	1485.00
Supplying and winding with two layers of 10 cage, 12.5x12.5 mm GI chicken mesh around the cylindrical steel cage, dome and filter including material and labour	15.255	m^2	136.25	2078.49
Plastering with CM 1:2.5, 21 mm thick each on both sides of tankwall, applied in layers and finished smooth with cement flushing coat including material and labour	22.5	m^2	190.00	4275.00
Plastering with CM 1:3, 15mm thick each on both sides of dome and filter chamber applied in layers and finished smooth with cement flushing coat including material and labour	8	m^2	123.00	984.00
Plastering tank floor by applying one of neat cement slurry and then with CM 1:3, 15mm thick, mixed with water proofing compound and finished with cement flushing coat.	3.14	m^2	180.92	568.09
Cement washing 2 coats	15.255	m^2	12.52	190.99
Providing roof water collection and conveyance system, filter, first flush and drainage system including material and labour	LS			1500.00
Supply and fixing of tap, platform,over flow pipe etc etc	LS			1500.00
Scaffolding, water, curing, writing etc	LS			1005.00
TOTAL				22634.90

Supply and Erection of 12501ph ROD plant

Sl No	Qunty	Description of items	Amount
1.	1 Set	Supply of water treatment plant reverse osmosis system capable of removing TDS, fluoride etc: protected drinking water having constantly output capacity of 1250 liter/hrs., operating pressure 5 to 10 kg/cm2 and operating temperature 25^{o}c to 40^{o}c. The system will capable of treating of raw water having TDS up to 3000PPM and fluoride up to 10 PPM and beyond the corresponding treated water will confirm to ISS drinking water standard IS 10500/ 1991 and packaged drinking water standard IS 14543 of approved make. The system will have the following essential components.	
1	1Set	Raw water pump set of compressor / centrifugal type of approved make motor having capacity 30001ph.	5000
2	1set	FRP dual media having media of graded sand and activated carbon with a flow rate of 30001ph , 25 NB PP multiport valve having the size of14 inch ×58 inch	40000
3	1set	Micron filter with a capacity of 30001ph micron rating of 10 inch PP jumbo	5000
4	1set	Anti Scalant Dozer of electronic type with flow rate of 5 liter/hr with container for the storage of chemicals.	20000
5	1set	A high pressure pump of reciprocating/ centrifugal having capacity 3000 LPH, 5 to 10 kg/cm2 pressure and motor rating 2 to 3.5 HP	65000

6	6Nos	RO membrane will be ESPA or reputed make 4040 spiral wounded of polyamide – 2Nos. each	175000
7	LS	Valves and pipe lines will be CPVC / SS/PVC	5000
8	3Nos	The housing of the membrane will be stailneless steel 4inch × 8inch	40000
9	1No	TDS indicating meter	5000
10	3Nos	Glycerin filled pressure guages	1000
11	2No	High pressure and low pressure cut off switches	5000
12	1No	Low and high voltage trip system	In Built
13	LS	Sampling cocks at appropriate point	1000
14	1No	Bulk flow meter of ISI C class 20mm mini Dia.	10000
15	1set	Instrumentation panels with ELCB, proper earthing and wiring	30000
16	1No	Voltage stabilizer of approved brand	inbuilt
17	1Set	A storage tank of raw water capacity 1000 liter of UPVC of approved brand	10000
18	1Set	A storage tank of raw water capacity 1000 liter of syntax tank with all PVC pipes	10000
19	1No	Providing clear water storage tank's platform of size 1.20 ×1.20× 1.1m with 1:2:4 CC for foundation and top platform brick work in CM 1:5 using wire cut bricks for super structure, 1:3, 12mm thick plastering 30 × 30 CM glazed tiles to the four sides and top, supplying red earth for the filling of platform including necessary earth work excavation for foundation and cost of supply of materials and all labour charges etc. complete as per the direction of departmental officers.	10000
20	LS	Providing all tope of pipes and specials of various dia. And materials required for the taping connection, and delivery of raw and clear water of plant.	8000
21	1set	Erection and trial running the ROD plant with all pipe line works as per the direction of departmental officers including first year normal warranty.	5000

		TOTAL	**4,50,000.00**

Rain water harvesting with ferro cement Water Tank

Kannasa Samaraka HSS, Kadapra

Capacity **50000 Litres**

Sl No.		Qty	Unit	Rate (Rs)	Amount (Rs)
1	Clearing the Tank site	61.34	Sq.m	1.89	115.9
2	Earth work excavation in hard soil for foundation	3.48	Cu.m	235.6	820.0
3	R.C.C 1:2:4, using 20mm broken stone for belt, including form work and excluding steel	0.70	Cu.m	7688.0	5381.6
4	Laterite masonry in CM 1:6 for foundation and basement	3.22	Cu.m	3878.0	12487.2
5	Basement filling with boulders	5.04	Cu.m	1333.8	6722.4
6	PCC 1:4:8, using 20mm broken stone below base slab including form work	2.24	Cu.m	6091.6	13645.2
7	Steel reinforcement for belt, floor and pillar	3.23	Qtl	6339.4	20476.3

8	Floor concreting in R.C.C 1:11/2:3, using 20mm broken stone including form work and excluding reinforcement	3.23	Cu.m	7114.0	22978.2
9	R.C.C 1:11/2:3, using 20mm broken stone for central pillar with formwork but excluding reinforcement	0.104	Cu.m	15220.0	1582.9
10	Making steel cage for wall, dome and filter chamber with 8mm & 6mm bars including supply of material and labour	1.79	Qtl	7397.4	13241.3
11	Supplying and winding with 1 layer of 10 guage, 50mm × 50mm welded mesh over the steel cage including material and labour	42.13	Sq.m	315.4	13287.8
12	Supplying and winding with three layers of 24 guage, 12.5 × 12.5 mmG1 chicken mesh, including material and labour	43.90	Sq.m	227.8	10000.4
13	Supplying and winding with two layers of 24 guage, 12.5 × 12.5 mm GI chicken mesh for dome and filter chamber including material and labour	32.63	Sq.m	152.7	4982.6
14	Plastering with CM 1:2.5, 21 mm thick each on both sides of tank wall, applied in layers and finished smooth with cement flushing coat including material and labour	73.12	Sq.m	399.6	29218.8
15	Plastering with CM 1:3,15mm thick each on both sides of dome and filter chamber applied in layers and finished smooth with cement flushing coat including material and labour	59.05	Sq.m	237.4	14018.5
	Plastering tank floor by applying one coat of neat cement slurry	24.96	Sq.m	254.5	6352.3

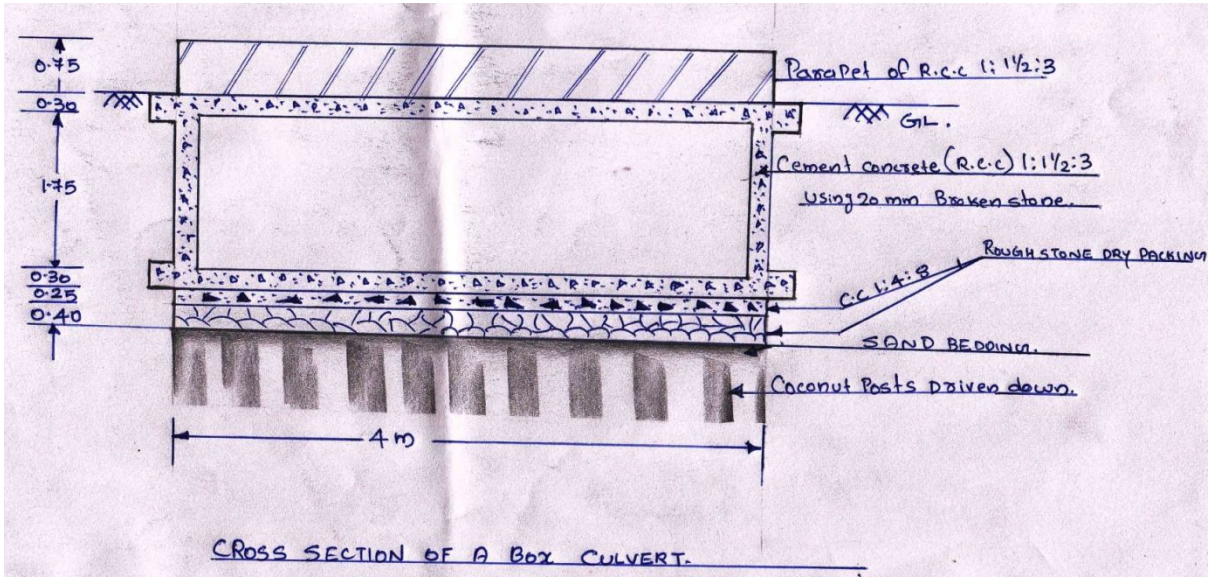
16	and then with CM 1:3, 15mm thick, mixed with water proofing compound and finished with cement flushing coat .				
17	Cement washing 2 coats	66.08	Sq.m	9.3	613.2
18	Providing roof water collection and conveyance system, filter, first flush and drainage system including material and labour			LS	6000.00
19	Supply and installation of 1 HP submersible pump, laying of 5 pumping line, 1.5 mm electrical cable and accessories with necessary specials including material and labour.			LS	17500.00
20	Supply and installation of 500litres capacity HDPE tank distribution line, taps, with necessaries specials and valves including material and labour			LS	5000.00
21	Stone and writing charge			LS	2500.00
22	Contingencies			LS	250
	Sub total				207175
23	Management charges to SEUF @ 8% as per GO No. 71858/DA1/11/LSGD dated 27/3/12				16574.0
24	KVAT including cess @ 4%				8287.0
25	KCWWF @ 1%				2072.0
26	IT @ 2%				4143.0

27	Service tax @ 12.36% of item No.21				2049.0
	Total				**240300**

ESTIMATE FOR BIOGAS PLANT

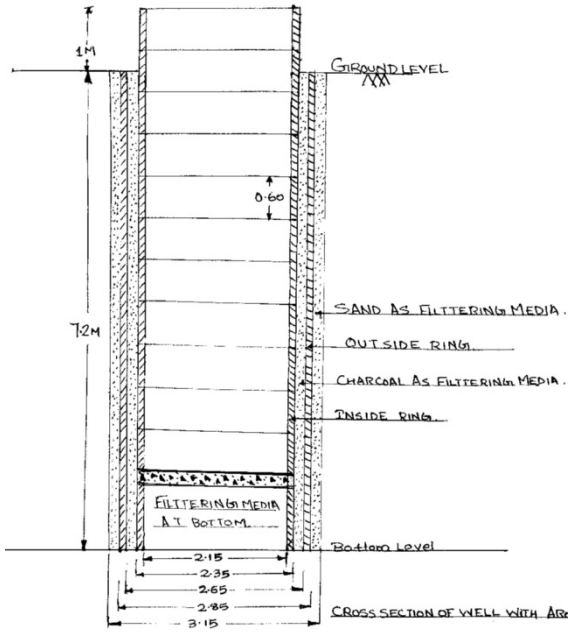
	Description	**Quandity**	**Unit**	**Rate** (Rs)	**Amount**(Rs)
1	Excavation of hand soil for plant erection	4 labours		500	2000
2	Portable biogas plant with double burner and gas pipe	1	no		60000
3	Cow dung	50	Basket	50	2500
4	Installation Charge	1			3000
5	Transportation and others		LS		2500
6	Contingency				696
	Sub Total				70696
7	Management charges to SEUF @ 8% as per GO No.71858/DA 1/ 11/LSGD dated 27/3/2012				5655.7
8	KVAT including cess @ 4.04%				2856.1184
9	KCWWF @ 1%				706.96

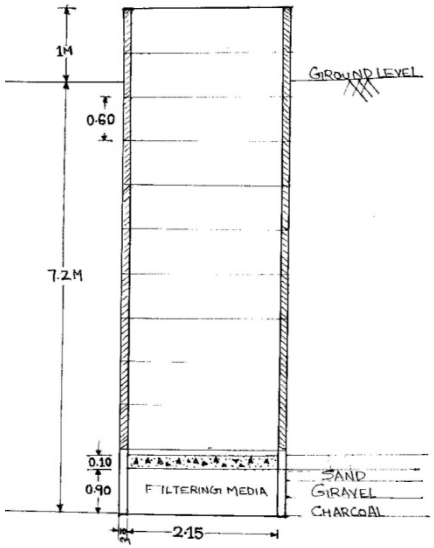
10	IT including cess @ 1.01%				714.0296
11	Service tax @ 12.36% of item no 4				371
	TOTAL				**81000**
	(Rupees Eighty One Thousand only)				



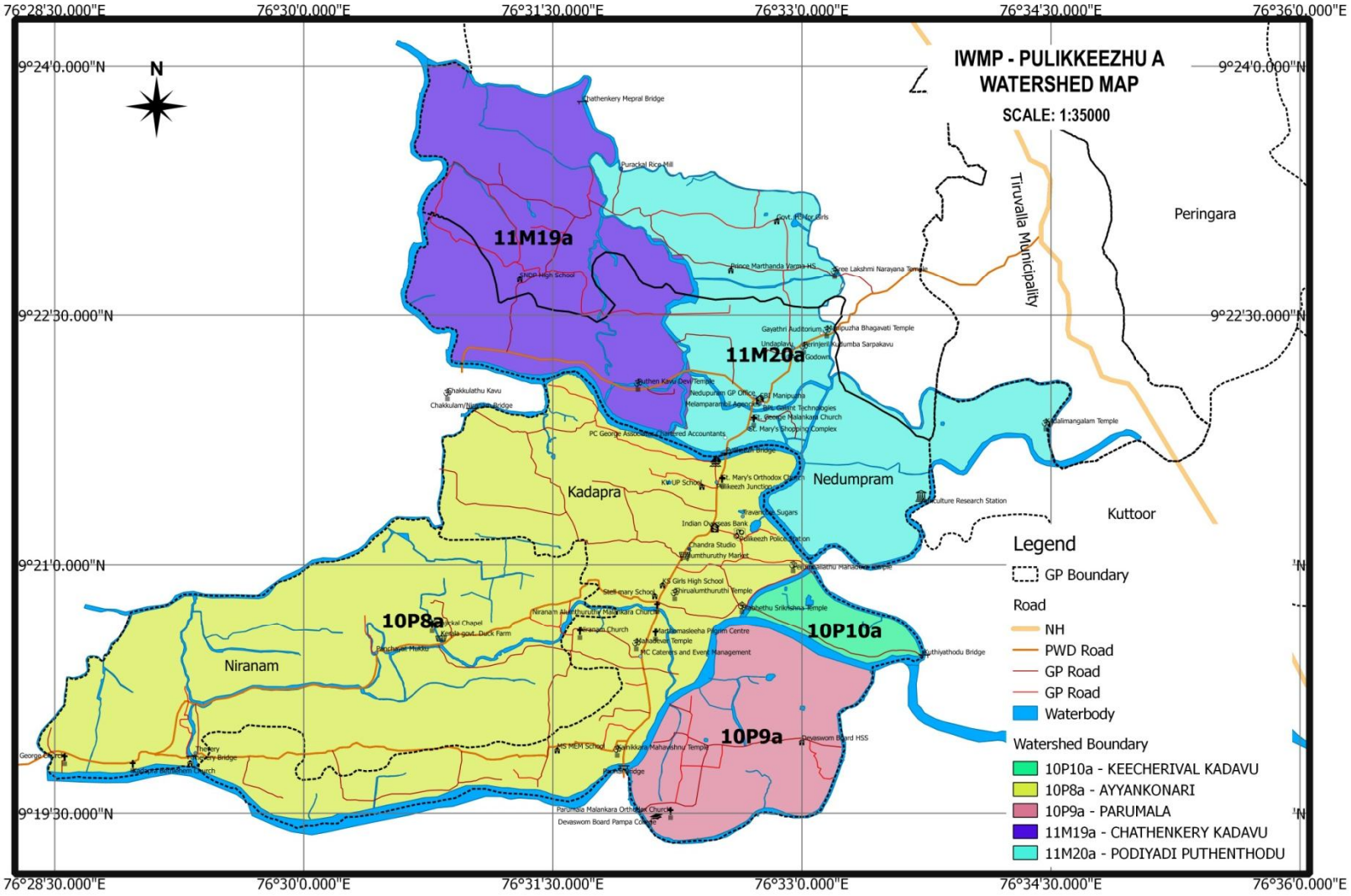
CROSS SECTION OF WELL WITH FILTER MEDIA AT BOTTOM & SIDES

CROSS SECTION OF OPEN WELL





CROSS SECTION OF OPEN WELL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WATERSHED MAP
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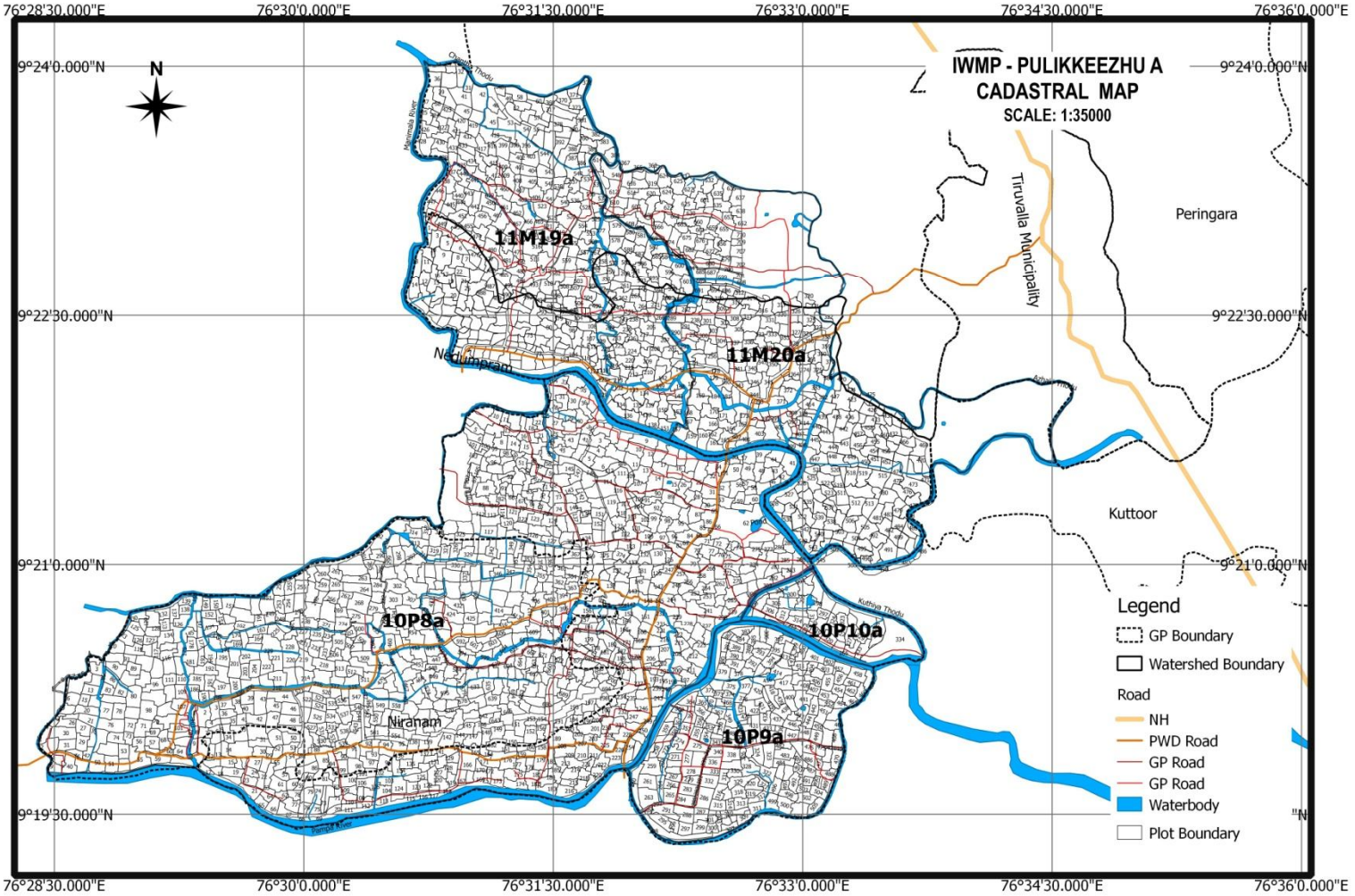
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
9°24'0.000"N
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N
11M19a
11M20a
10P8a
10P10a
10P9a
Kadapra
Nedumpram
Niranam
Peringara
Kuttoor
Tiruvalla Municipality
Legend
GP Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Watershed Boundary
10P10a - KEECHERIVAL KADAVU
10P8a - AYYANKONARI
10P9a - PARUMALA
11M19a - CHATHENKERY KADAVU
11M20a - PODIYADI PUTHENTHODU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CADASTRAL MAP
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76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
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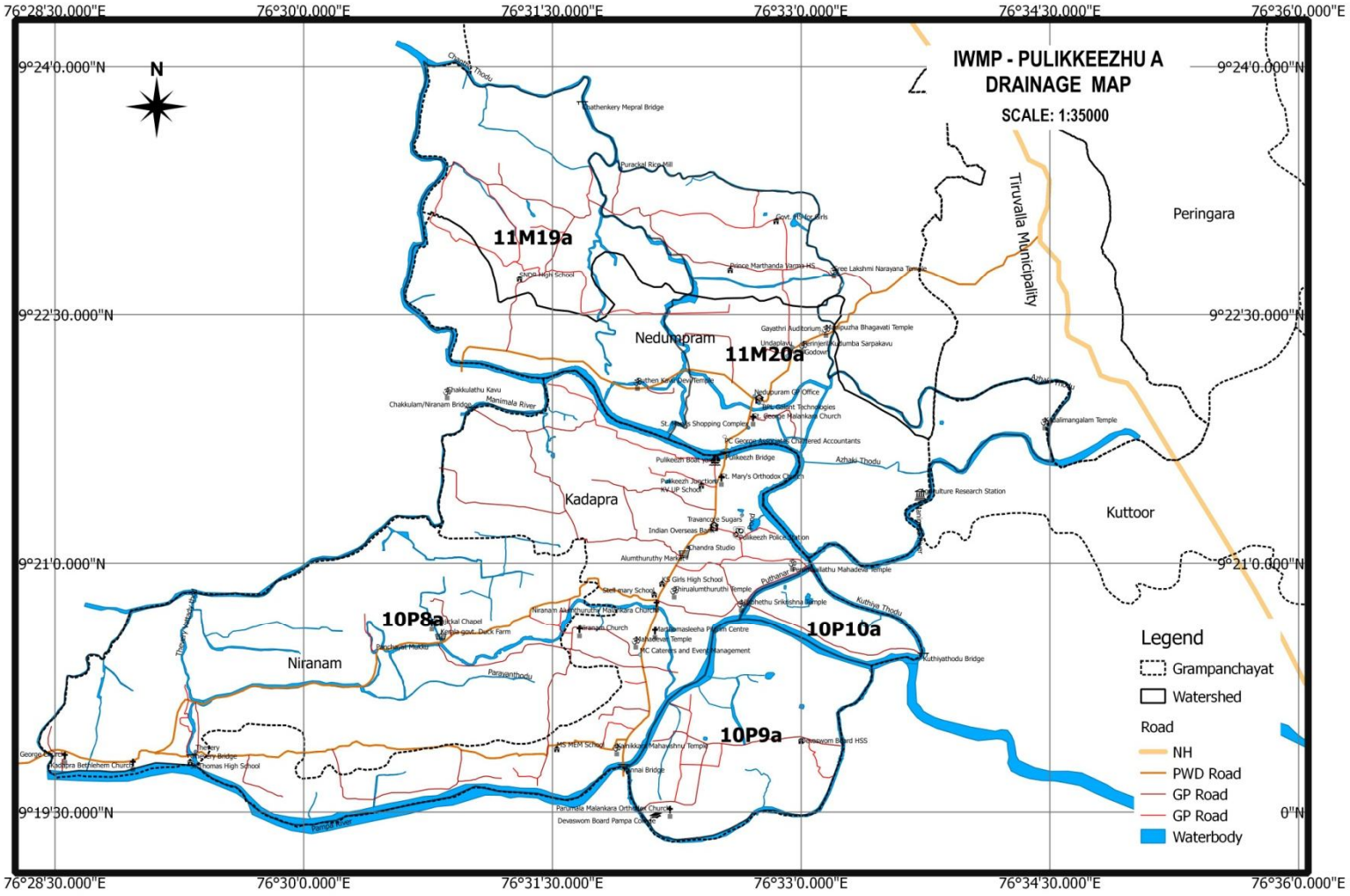
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N
11M19a
11M20a
10P8a
10P9a
10P10a
Peringara
Tiruvalla Municipality
Kuttoor
Niranam
Legend
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary


IWMP - PULIKKEEZHU A
DRAINAGE MAP
SCALE: 1:35000
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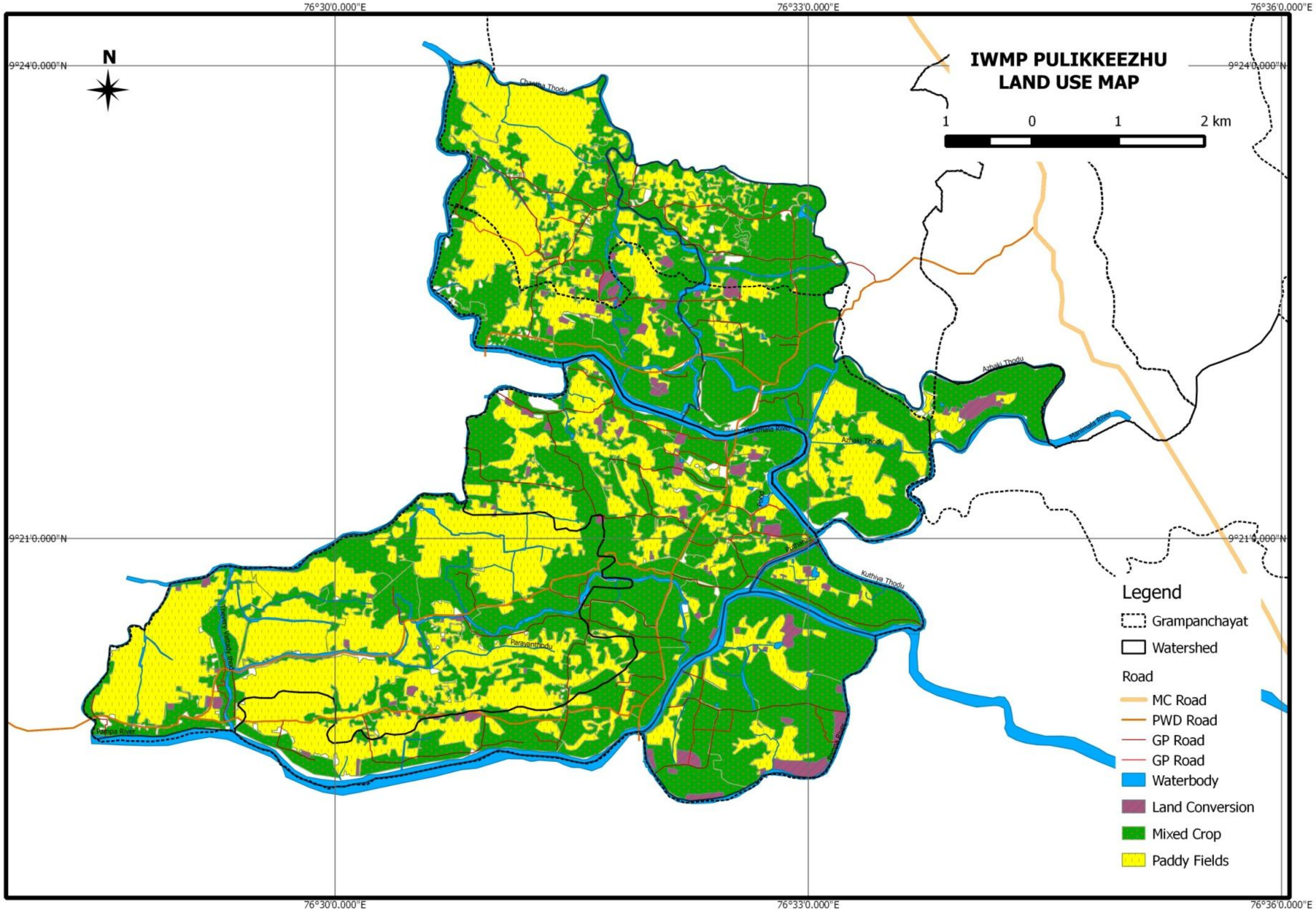
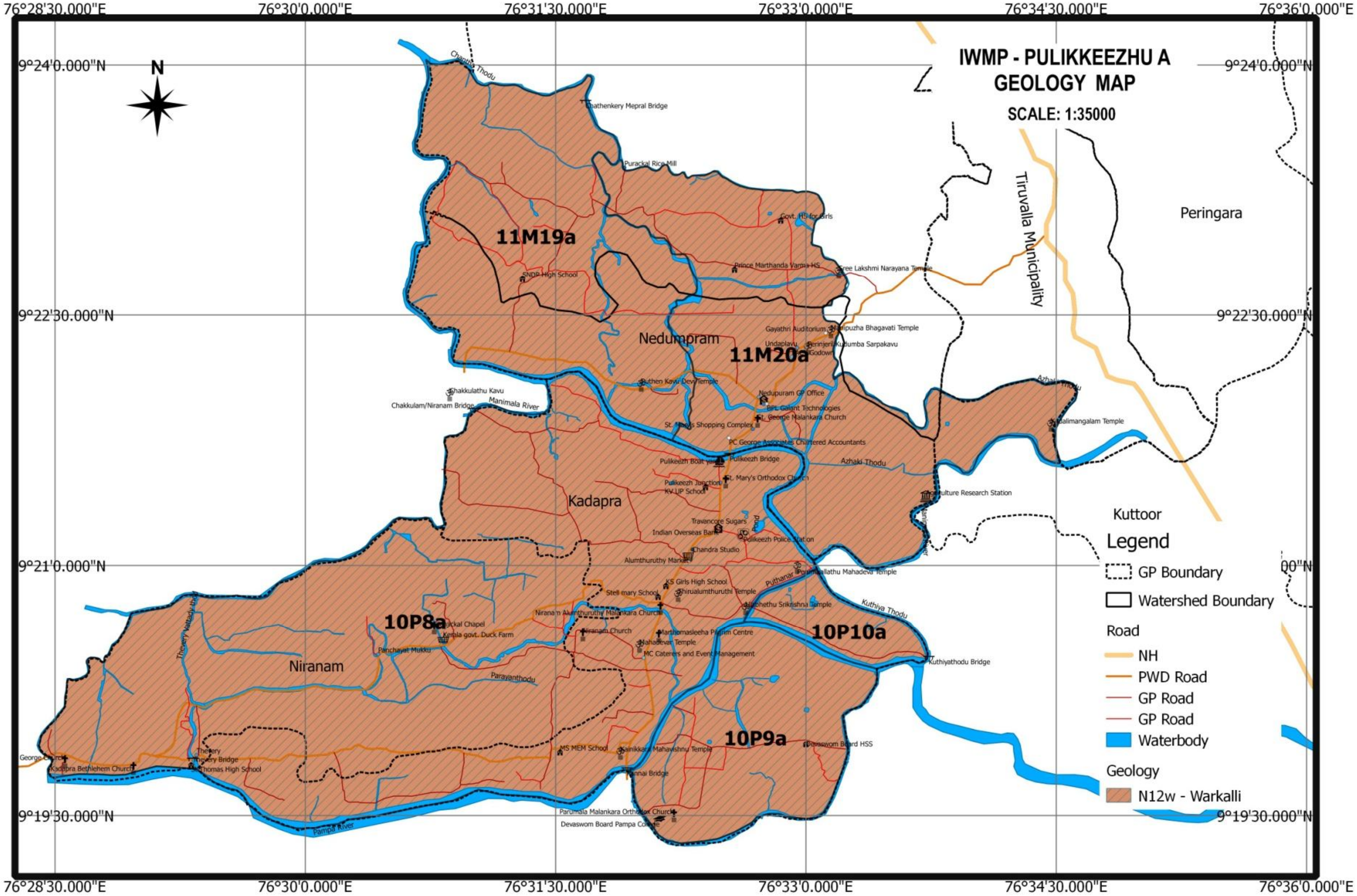
11M20a
10P8a
10P10a
10P9a
Nedumpram
Kadapra
Niranam
Peringara
Kuttoor
Tiruvalla Municipality
Manimala River
Thodiyar
Parayanthodu
Kuthiya Thodu
Legend
Grampanchayat
Watershed
Road
NH
PWD Road
GP Road
GP Road
Waterbody
76°28'30.000"E
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
9°24'0.000"N
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N


IWMP PULIKKEEZHU
LAND USE MAP
1 0 1 2 km
N
76°30'0.000"E
76°33'0.000"E
76°36'0.000"E
9°24'0.000"N
9°21'0.000"N
Legend
Grampanchayat
Watershed
Road
MC Road
PWD Road
GP Road
GP Road
Waterbody
Land Conversion
Mixed Crop
Paddy Fields



IWMP - PULIKKEEZHU A
GEOLOGY MAP
SCALE: 1:35000
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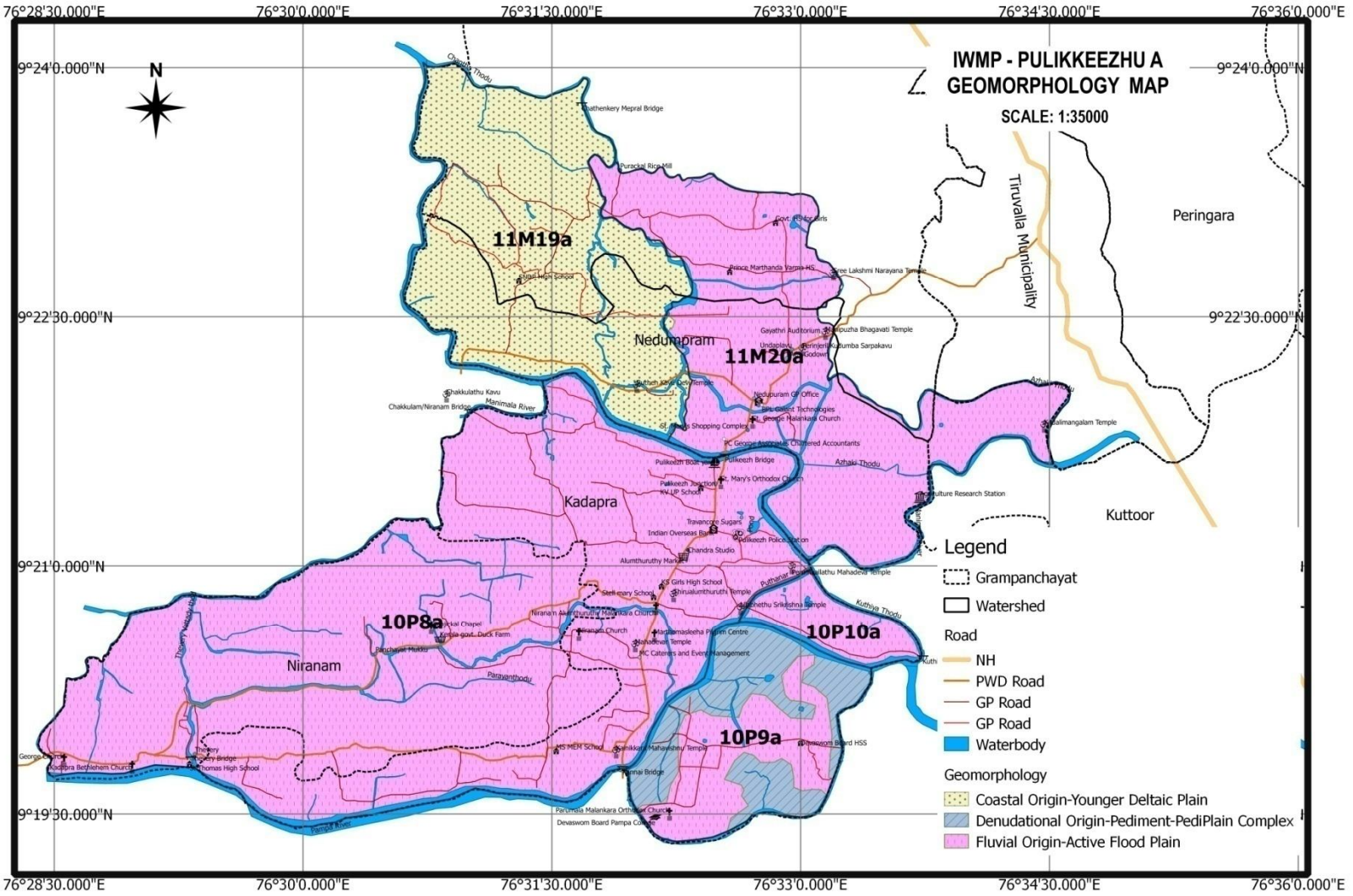
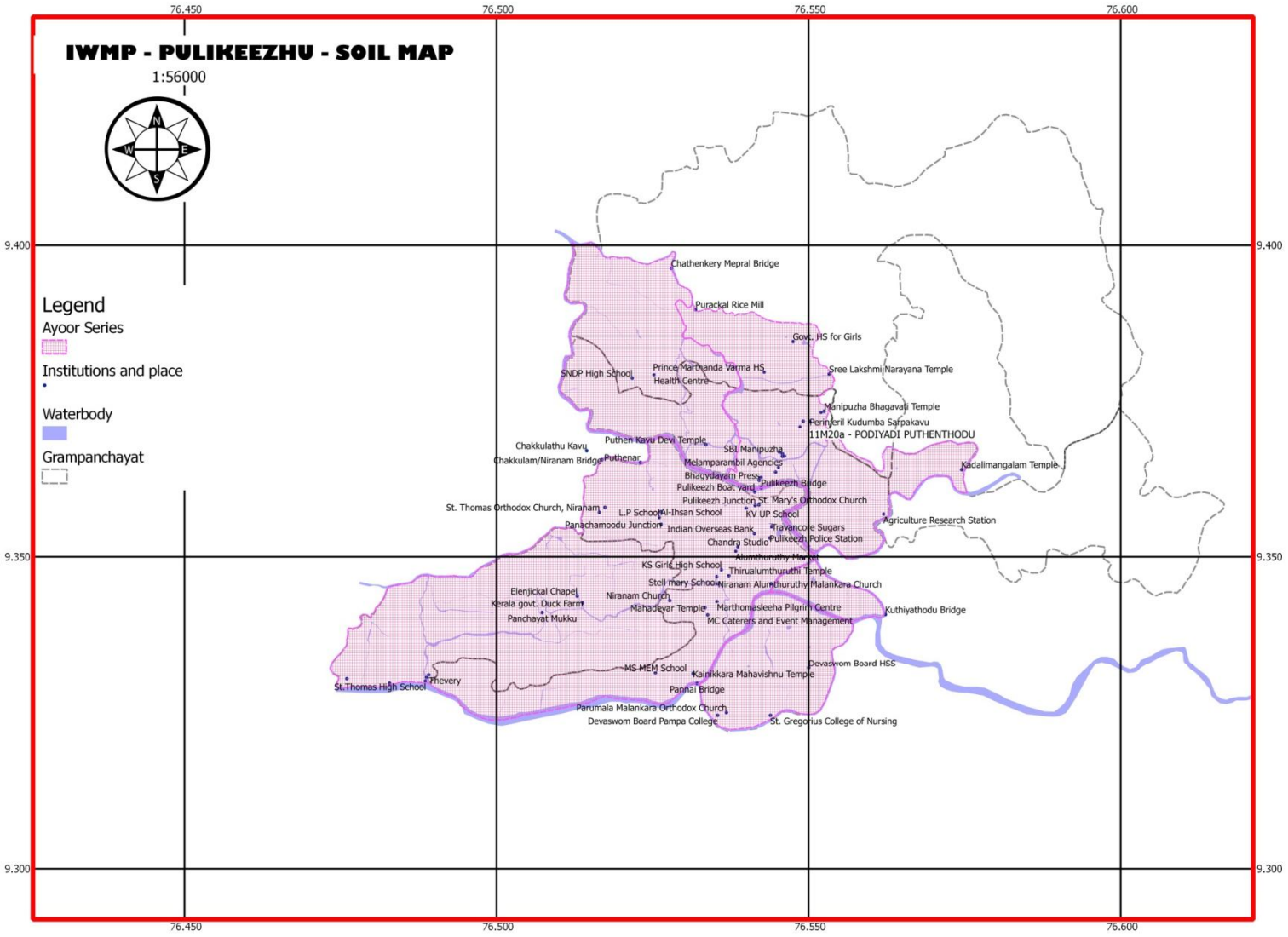
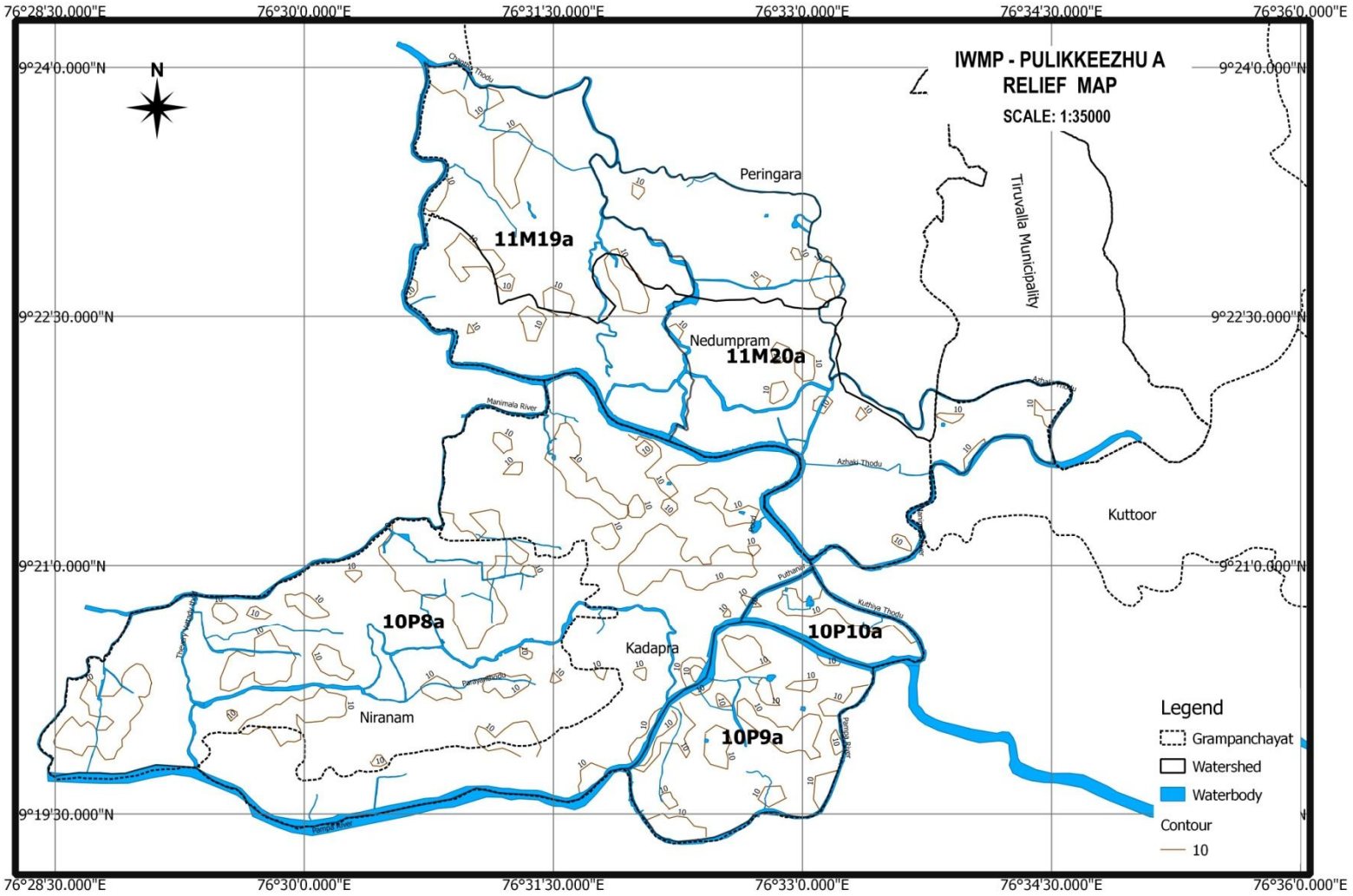
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
9°24'0.000"N
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N
N
11M19a
11M20a
10P8a
10P9a
10P10a
Nedumpram
Kadapra
Niranam
Peringara
Kuttoor
Tiruvalla Municipality
Manimala River
Pampa River
Azhaki Thodu
Kuthiya Thodu
Parayanthodu
Legend
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Geology
N12w - Warkalli


IWMP - PULIKKEEZHU A
GEOMORPHOLOGY MAP
SCALE: 1:35000
N
76°28'30.000"E
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
9°24'0.000"N
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N
11M19a
11M20a
10P8a
10P9a
10P10a
Nedumpram
Kadapra
Niranam
Peringara
Kuttoor
Tiruvalla Municipality
Manimala River
Pamba River
Legend
Grampanchayat
Watershed
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Geomorphology
Coastal Origin-Younger Deltaic Plain
Denudational Origin-Pediment-PediPlain Complex
Fluvial Origin-Active Flood Plain


IWMP - PULIKEEZHU - SOIL MAP
1:56000
N
W
E
S
Legend
Ayoor Series
Institutions and place
Waterbody
Grampanchayat
76.450
76.500
76.550
76.600
9.400
9.350
9.300
Chathenkery Mepral Bridge
Purackal Rice Mill
Govt. HS for Girls
SNDP High School
Prince Marthanda Varma HS
Health Centre
Sree Lakshmi Narayana Temple
Manipuzha Bhagavati Temple
Periyeril Kudumba Sarpakavu
11M20a - PODIYADI PUTHENTHODU
Chakkulathu Kavu
Chakkulam/Niranam Bridge
Puthen Kavu Devi Temple
Puthenar
SBI Manipuzha
Melamparambil Agencies
Kadalimangalam Temple
Bhagydayam Press
Pulikeezh Boat yard
Pulikeezh Bridge
Pulikeezh Junction
St. Mary's Orthodox Church
St. Thomas Orthodox Church, Niranam
L.P School
Al-Ihsan School
KV UP School
Agriculture Research Station
Panachamoodu Junction
Indian Overseas Bank
Travancore Sugars
Pulikeezh Police Station
Chandra Studio
Alumthuruthy Market
KS Girls High School
Thirualumthuruthi Temple
Stell mary School
Niranam Alumthuruthy Malankara Church
Elenjickal Chapel
Kerala govt. Duck Farm
Panchayat Mukku
Niranam Church
Mahadevar Temple
Marthomasleeha Pilgrim Centre
Kuthiyathodu Bridge
MC Caterers and Event Management
Devaswom Board HSS
MS MEM School
Kainikkara Mahavishnu Temple
Thevery
St.Thomas High School
Pannai Bridge
Parumala Malankara Orthodox Church
Devaswom Board Pampa College
St. Gregorius College of Nursing


IWMP - PULIKKEEZHU A
RELIEF MAP
SCALE: 1:35000
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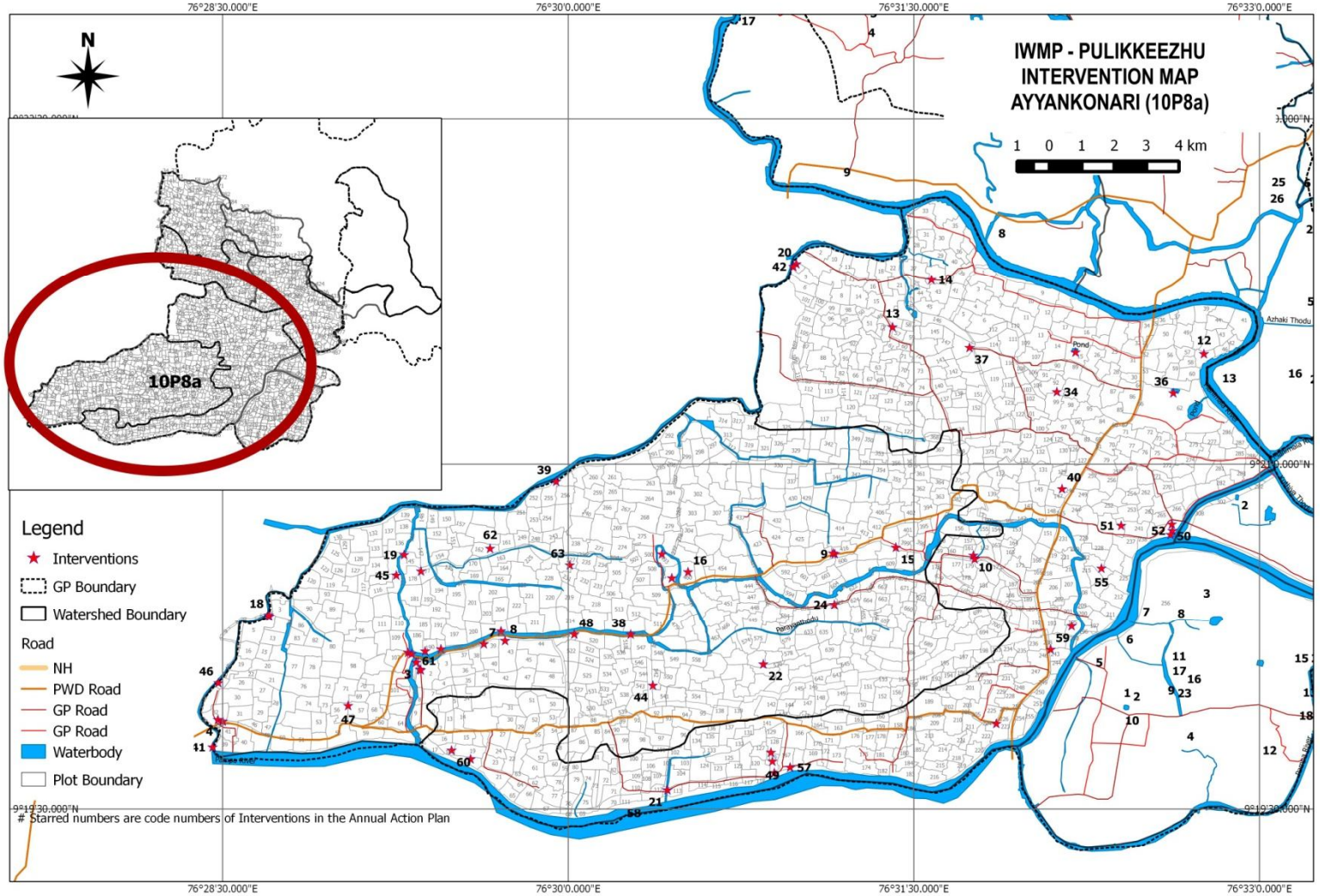
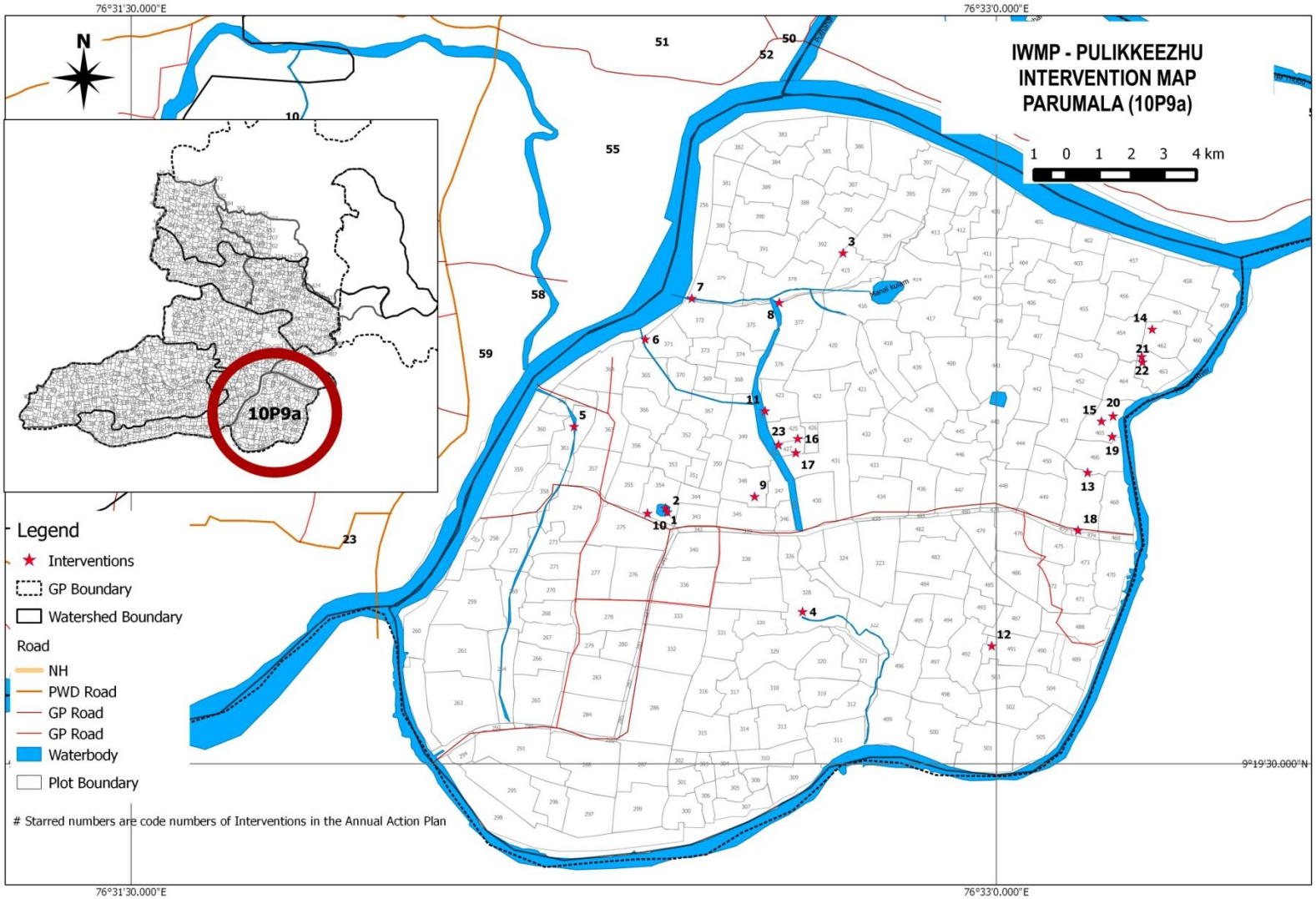
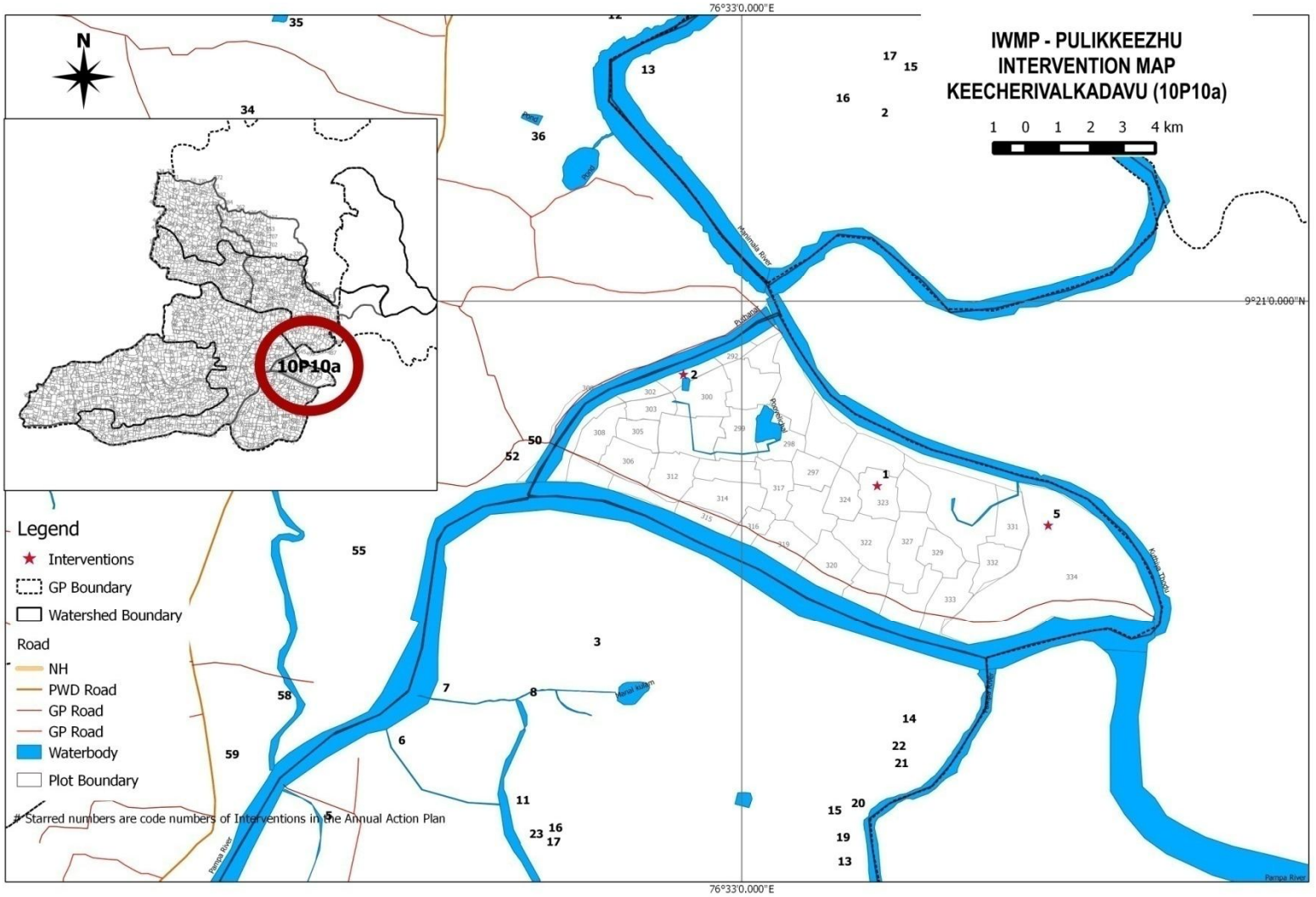
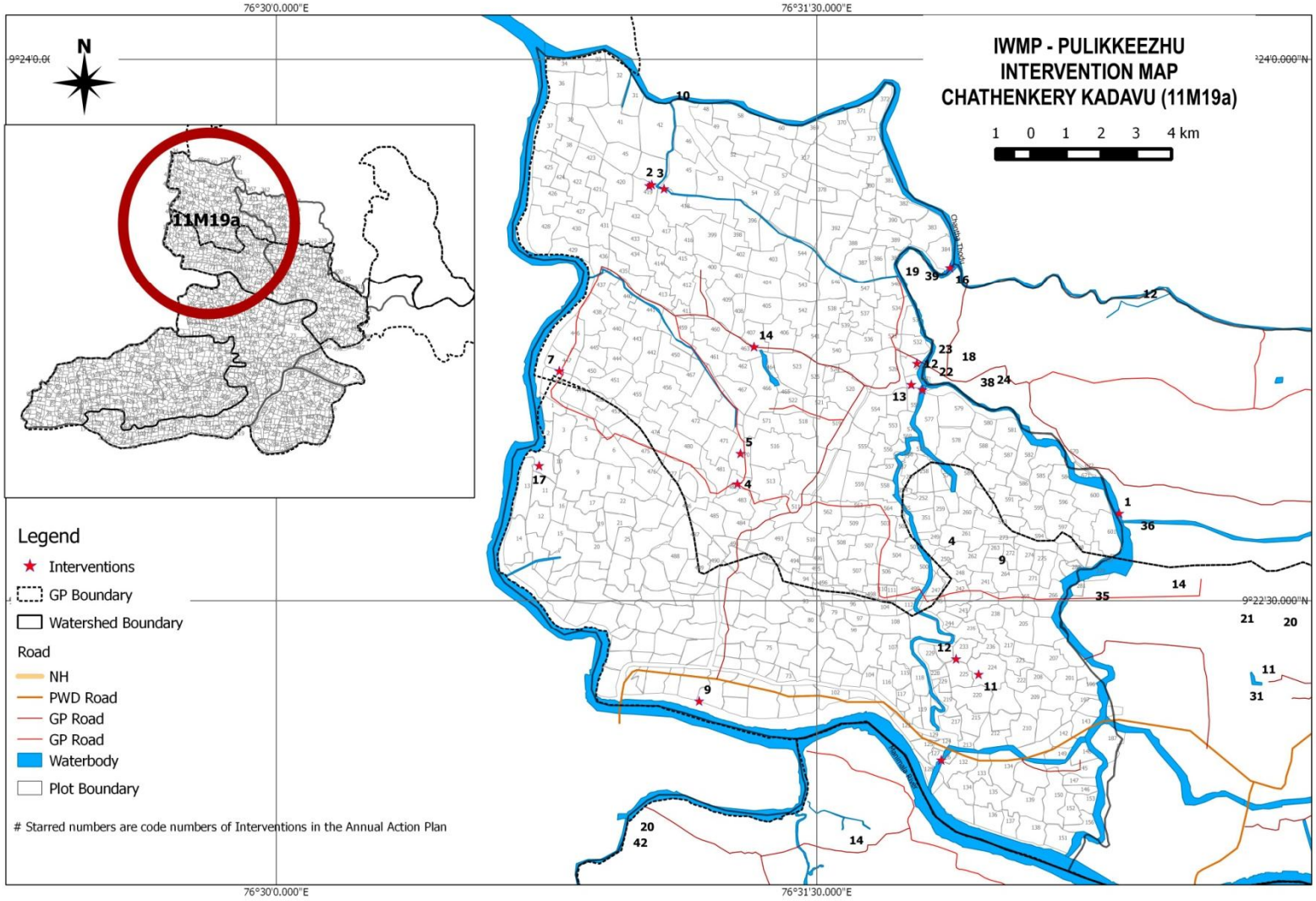
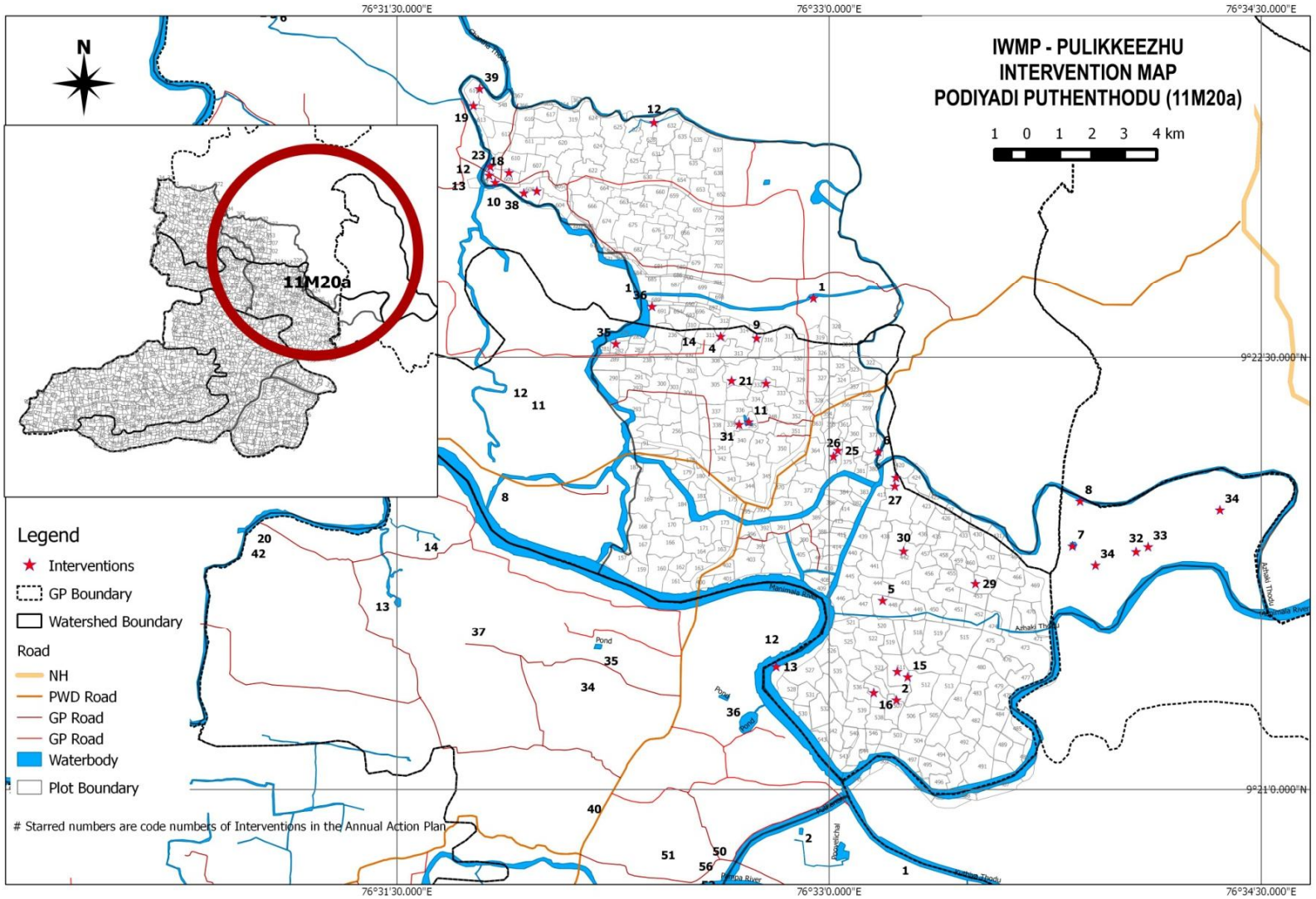
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
76°36'0.000"E
9°24'0.000"N
9°22'30.000"N
9°21'0.000"N
9°19'30.000"N
Peringara
Nedumpram
Kadapra
Niranam
Kuttoor
Tiruvalla Municipality
11M19a
11M20a
10P8a
10P9a
10P10a
Manimala River
Azhaki Thodu
Kuthiya Thodu
Pampa River
Legend
Grampanchayat
Watershed
Waterbody
Contour
10


IWMP - PULIKKEEZHU
INTERVENTION MAP
AYYANKONARI (10P8a)
1 0 1 2 3 4 km
N
10P8a
76°28'30.000"E
76°30'0.000"E
76°31'30.000"E
76°33'0.000"E
9°12'30.000"N
9°10'30.000"N
Legend
Interventions
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary
Starred numbers are code numbers of Interventions in the Annual Action Plan


IWMP - PULIKKEEZHU
INTERVENTION MAP
PARUMALA (10P9a)
1 0 1 2 3 4 km
N
76°31'30.000"E
76°33'0.000"E
9°19'30.000"N
10P9a
Legend
Interventions
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary
Starred numbers are code numbers of Interventions in the Annual Action Plan


IWMP - PULIKKEEZHU
INTERVENTION MAP
KEECHERIVALKADAVU (10P10a)
1 0 1 2 3 4 km
N
10P10a
76°33'0.000"E
9°21'0.000"N
Legend
Interventions
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary
Starred numbers are code numbers of Interventions in the Annual Action Plan
Manimala River
Pampa River


IWMP - PULIKKEEZHU
INTERVENTION MAP
CHATHENKERY KADAVU (11M19a)
1 0 1 2 3 4 km
N
11M19a
76°30'0.000"E
76°31'30.000"E
9°24'0.000"N
9°22'30.000"N
Legend
Interventions
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary
Starred numbers are code numbers of Interventions in the Annual Action Plan


IWMP - PULIKKEEZHU
INTERVENTION MAP
PODIYADI PUTHENTHODU (11M20a)
1 0 1 2 3 4 km
N
11M20a
76°31'30.000"E
76°33'0.000"E
76°34'30.000"E
9°22'30.000"N
9°21'0.000"N
Legend
Interventions
GP Boundary
Watershed Boundary
Road
NH
PWD Road
GP Road
GP Road
Waterbody
Plot Boundary
Starred numbers are code numbers of Interventions in the Annual Action Plan