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New Generation Watershed Development Project WDC-PMKSY 2.0

DETAILED PROJECT REPORT

Idukki- WDC-1/2021-22

Project Implementing Agency
ADIMALI BLOCK PANCHAYATH
IDUKKI
Technical Support Organisation
KERALA STATE LAND USE BOARD
THIRUVANANTHAPURAM

January 2022

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Message

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President
Block Panchayath
Adimali

Watershed development approach has evolved from the initial objectives of soil & water conservation alone to the current integrated approach of managing the biological, physical, and social elements in a landscape within the watershed boundary.

Objectives of the New Generation Watershed Development Projects WDC-PMKSY2.0 is to improve productive potential of the project area through integrated watershed management and to strengthen community based local institutions for promotion of livelihoods & watershed sustainability. The programme gives special emphasis for agriculture engineering measures for Natural Resource Management, effective use of rain water by constructing small water harvesting structures, diligent planning for crop system diversification for risk management, diversification of the watershed economy by adopting IFS – agronomic and horticulture crops, livestock, agro-forestry, fishery etc and most importantly establishing economically vibrant institutions like Farmers Producers Organization (FPO) for innovative sustainable livelihood development of the community.

High level of coordination is necessary between the various stakeholders involved along with forward and backward linkages between the various organizations like the Local Self Government Institutions, Development Departments, Watershed Committees, Neighborhood Groups for achieving the goal.

Kerala State Land Use Board, the Technical Support Organization has prepared the Detailed Project Report for the New Generation Watershed Development Project Idukki WDC- 1/ 2021-22 with the close involvement of all stakeholders. The plans included reflects the perceptions and priorities of women, farmers and landless and will definitely encourage people's participation in all stages of project implementation.

I thank State Level Nodal Agency, Kerala State Land Use Board, three-tier people's representatives and officials of Development Departments for their active participation and valuable suggestions. I hope the recommendations will help in improving the agricultural, horticultural and livestock productivity, increase the livelihood opportunities for landless and marginal farmers and strengthen microenterprises in the project area.

Soman Chellappan

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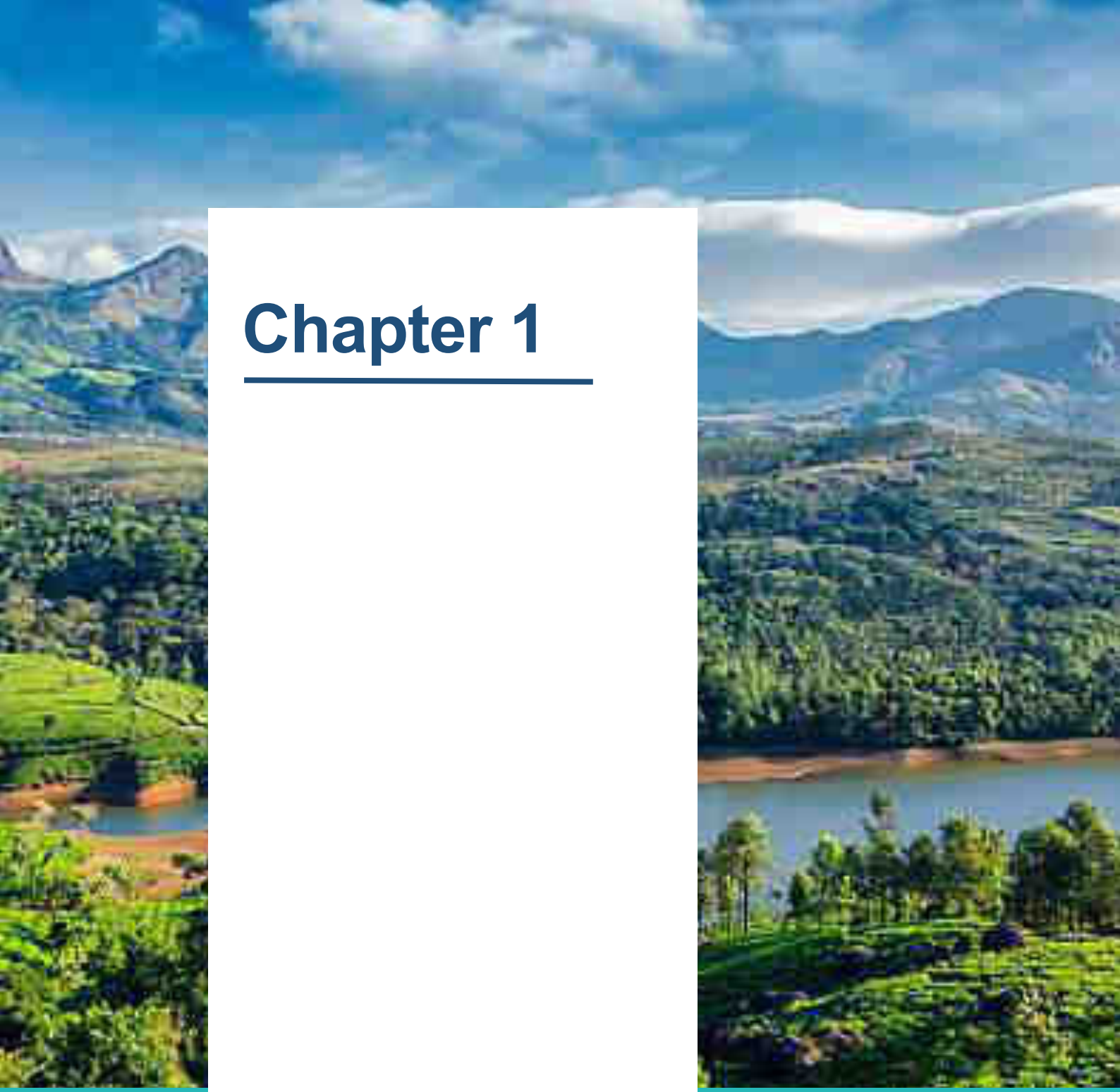


Chapter 1

INTRODUCTION

IDUKKI WDC-1/21-22

1.INTRODUCTION

Soil, water and biomass are vital natural resources for human survival. The growing population in the world and increasing demand are placing tremendous pressure on these resources, which results in fast depletion of these resources in many countries posing serious problems to agriculture sustainability, livelihood opportunities and vulnerable communities. Soil, water and biomass conservation including micro-scale water resource development is the foundation of any watershed development programme. The Watershed approach represents the principle carrier for transfer of rainfed agriculture. A watershed is a geographic area that drains to a common point, which makes it an ideal planning unit for conservation of soil, water and biomass; and encourage the sustainable development of the area by empowering people at the local level to manage their own resources. Watershed development provides immense scope for effective integration of various sectoral programs, primarily based on a "ridge to valley" approach. watershed management is a prerequisite not only for land, water, and biomass management of degraded areas but also for improving the livelihood of farmers as well as for conservation of areas so that biodiversity is protected for future generations.

Food security and social security are the two vital linkages of stability and wellbeing of man-kind. Anyone who has concern for the 'mother earth' and 'future generation' cannot be a silent spectator to the excessive greediness of certain human beings for mere economic motives at the cost of our food and social security. Increasing biotic pressure, absence of appropriate technology, lack of strong policy and public participation coupled with the lack of proper understanding of environmental interlinkages etc. have led to progressive decline of natural resources and environment. Sustainable development has been the key objective of development strategies since 1970s.

The increasing human and livestock population is continuously exerting pressure on the natural resource base for land, food, fuel and fodder. Due to ever increasing extension of agricultural land towards the marginal and steep hill slopes, deforestation, erosion and many such ill-effects on local environment have been on the rise. Faced with immediate survival needs, local people often have no alternative and are being involved in extracting more natural resources. The forests have been ruthlessly over-exploited by both the legal and illegal encroachments. Consequently, forest depletion has accentuated further soil erosion, decline in land productivity and mounting dearth of fuel, fodder and water resources. People who sustain their livelihood on the utilization of such fragile environment and natural resources have over exploited these resources over a period of time and they have further eroded the resource base on which they must subsist.

Among the various environmental issues, accelerated rate of soil erosion, massive deforestation, productivity decline, drying up of large number of springs, climatic changes etc. have stood as the main threats to the environment. All these go a long way towards influencing the conditions of development. Thus, human interference has caused a decrease in forest land ratio. Many efforts have been made in order to maintain the productivity of land resources after the initiation of the five year plan in the country. The output of such resources has also increased by many folds, but in practice most of the people in mountain and hill regions still suffer from malnutrition. In short, backwardness of a region is not caused by lack of resources but by the problem of resource development and management.

High level of coordination strongly associated with high quality of communication is necessary between the various stakeholders involved in participatory natural resource management. Forward and backward linkages between the various organisations (such as PRI, transferred institution, NHG, watershed committee etc.) has to be assured for achieving the coordination towards the common goal. Separate strategy has to be worked out to participate different strata of society incorporating diverse interests and various hydrological units including private land, water resources, drainage line, government land, etc.

The new opportunities for sustainable production systems for natural resources management and livelihood options put forward in the New Generation Watershed Development projects (WDC-PMKSY2.0) needs to be seized and provided with socio political impetus in the above line for watershed management to take root in the state.

The New Generation Watershed Development projects (WDC - PMKSY 2.0) is planned with an aim of integrated sustainable eco-friendly development of the rural areas of the country. The objective of the New Generation Watershed Development projects (WDC - PMKSY 2.0) is to promote more agriculture engineering measures rather than mechanical/Engineering treatments with overwhelming focus on trees, cropping systems, soil moisture conservation & management. More emphasis is given on realizing effective use of rain water by relying more on water productivityalong with Diligent planning for crop systems diversification for risk management; enhancing productivity by adopting water use efficient crops and opting for crop alignment as a principle. It also Emphasises on clear risk management plans for adaptation and mitigation of adverse impacts of climate variability and change; diversification of the watershed economy by adopting integrated farming systems – agronomic and horticulture crops, livestock, agro-forestry, fishery, poultry etc.; enlarging livelihood portfolios; building climate change projections into water harvesting designs; precision based use of water for managing drought spells; and timely agro-met farm advisories to deal with climate induced uncertainties. It is also intended to establish economically vibrant institutions, like Farmers Producers Organization (FPO), to promote agri-business services and take up watershed activities for rejuvenation of springs.

Sustainable development of an economy depends on many factors. Especially the critical sector like agriculture plays a key role not only for the development but also for livelihood security. India is no exception to this phenomenon. The progress in agricultural sector in India during the past 60 years has been significant by changing the food shortage situation to the surplus state.

However, the increasing population, development of other sectors and the liberalized trade policies pose greater challenge to agricultural sector. This situation becomes more complex when the resources especially land and water, available for agricultural sector is shrinking day by day due to its competing uses. Climate change issues and its impacts witnessed in the recent past have also adversely impacted ecology in general and agricultural production systems in particular, posing grave challenges to sustainable livelihoods,

1.1 WATERSHED DEVELOPMENT PROGRAMMES - KERALA EXPERIENCE

Watershed development programmes are being implemented in Kerala for the last three decades or more by central and state agencies and a host of Non-Governmental Organizations. The Western Ghats Development Programme (WGDP) was the beginning point as far as the state was considered. This is followed by the Integrated Wasteland Development programme, Hariyali and the Integrated Watershed Management Programme and now the New Generation Watershed Development projects (WDC - PMKSY 2.0) implemented through the Department of Land Resources, Ministry of Rural Development. Departments like the Agricultural Department, Land Use Board & Soil Survey Department are also engaged in watershed development activities in the state. Various NGOs also are in the field taking up projects funded by central and state agencies. The concept regarding watershed development has undergone considerable change during this period. The treatments carried out by the different agencies differed at conceptual and implementation levels. This has generated a lot of debate regarding the effectiveness of the development programmes being implemented.

Watershed development programmes were aimed at land and water management, emphasis being on enhancing water availability. The ridge to valley treatment mainly includes civil engineering works like gully plugging, contour bunding, terracing construction of water percolation pits etc. These were aimed

at enhancing water availability and improving the ground water recharging as well as reducing soil erosion. To further enhance water retention & improve the biomass cover, tree planting including social forestry activities were resorted to. All these activities were expected to support agricultural activities. More area was brought under cultivation and agricultural productivity and agricultural production increased subsequently.

1.2 RELEVANCE OF WATERSHED MANAGEMENT IN KERALA

The relevance of watershed management in Kerala is established for the following reasons.

1. **Steep slopes.**
   90% of the geographical area of the State comes under the midland and hilly regions with steep slopes making the area more prone to erosion hazards.
2. **Unscientific agricultural practices**
   The increase in density of population has resulted in people migrating to the hilly and forest areas resulting in drastic changes in the agricultural setup and land use of the State. The unscientific land use, change in cropping pattern, deforestation, etc. due to the encroachment hastened deterioration of the natural resources.
3. **Intense rainfall confined to relatively lesser number of days.**
   Even though the State receives more than 3000mm of annual rainfall, the rainwater is not conserved or utilized effectively because of the improper water conservation and rain water harvesting measures. The per capita availability of water in the State is far below than the States of Rajasthan, Gujarat, etc.
4. **Degradation of upper catchments**
   Degradation of upper catchments due to human interference resulting in drying up of river and siltation of reservoirs.
5. **Rapid land use change**
   Rapid land use changes due to deforestation, plantation crops and setting up of human habitations.
6. **Fast running and short rivers**
   Most of the rivers of the State originate from the Western Ghats. Because of the steepness of the hill slopes and minimal horizontal distance to the sea, rainwater flows rapidly to the sea as soon as it reaches the ground.
7. **Unscientific human interventions**
   Sand mining, destabilization of hill slopes, filling of wetlands and marshes for commercial and industrial purposes, conversion of paddy lands for cultivation of other cash crops and non-agricultural purposes are the common human interventions encountered in the State leading to instability of the natural ecosystem
8. **Degradation of forest resources.**
   The forest area lying adjacent to human settlements are being subjected to rapid degradation due to human interventions.
9. **Flood and drought**
   Though Kerala is receiving more than 3000 mm rainfall the State is facing intermittent drought and flood due to unscientific land utilization and soil and water conservation practices.
10. **Soil Erosion**
    About 9.5lakh ha of land is prone to severe erosion in the State. Annually around 15 tons of soil is lost from 1ha of such land. At the same time the formation of one inch of soil requires around 1000 years.
11. **Ground water scenario of the state.**

Because of the over exploitation of the ground water resources, 5 blocks have been classified as over exploited, 15 blocks as critical and 30 blocks as semi critical. Besides this deterioration, critical levels of iron, NO3 and fluoride has been noticed in some places.

1.3 PRINCIPLES OF WATERSHED MANAGEMENT

Sound watershed management means controlling floods and reducing land degradation as well as improving livelihood of farmers.

The main principles of watershed management are given below:

1. Utilizing the land according to its carrying capacity.
2. Maintaining adequate vegetative cover particularly during the rainy season
3. Conserving maximum possible rainwater at the place where it falls
4. Draining out excess water with a safe velocity to avoid soil erosion and diverting it to storage tanks for future use
5. Preventing gully formation and checking at suitable intervals to control soil erosion and recharge groundwater
6. Maximizing productivity per unit area, per unit time, per unit of water
7. Increasing cropping intensity and land equivalent ratio through intercropping and sequential cropping
8. Safe utilization of marginal lands through alternative land use systems
9. Ensuring sustainability of the ecosystem benefiting the man-animal-plant-land water complex in the watershed
10. Maximizing the combined income from the interrelated· and dynamic crop livestock-tree-labour complex over the years
11. Stabilizing total income and cutting down risks during aberrant weather situations,
12. Improving infrastructural facilities with regard to storage, transportation, and marketing, systematic and proper delineation of the watersheds,
13. Emphasizing localized initiatives and acknowledging larger public interest,
14. Taking long-term approach to use the best available scientific information and
15. Formulation of action plans based on an ecosystem approach.

Even after withdrawal of economic resources, technical expertise and infrastructure if the program survives, then it is sustainable. Hence it is important to note that People's participation right from pre-planning stage along with local level people's institution is required.

1.4 NEED AND SCOPE FOR WATERSHED DEVELOPMENT

A large portion of the rainfed areas (65 per cent of arable land) in India is characterized by low productivity, high risk and uncertainty, low level of technological change and vulnerability to degradation of natural resources. The rainfed region houses a sizable number of unemployed, poverty ridden and undernourished population. The majority of the population in the region is depending on agriculture. Water is critical for rainfed areas. Not because of scarcity per se but lack of proper management that accelerates shortages. Broadly, the rain fed areas are confronted with two major technical and waterrelated problems

(i) heavy and intense rainfall and surface run-off during the monsoons leading to soil erosion and siltation or pollution of water bodies in downstream, and

(ii) severe drought in the summer season leading to acute scarcity of water for post-rainy season crops.

These two extreme eventualities need to be managed for enhancing agricultural productivity, augmenting income and preventing degradation of soil and water resources. The watershed programme was initiated with the basic premise to overcome such anomalies in the country. It was viewed as the key programme, which could meet the emerging and complex challenges of rainfed areas: deplorable poverty, huge unemployment and acute degradation of natural resources. The programme was reckoned as a catalyst to bring the second-generation green revolution in the rainfed areas. The programme was expected to benefit the poor marginal farmers and bridge the gap between irrigated and rainfed areas. The Integrated Watershed Management Programme (WDC - PMKSY 2.0) was taken up to reduce the severity of drought especially in dry lands and bring them under productive use through soil conservation and other water resource development activities such as construction of major and minor check dams, percolation ponds, renovation of tanks, farm ponds, developing agro forestry plantation, horticulture, tree plantation, homestead plantation etc.

1.5 THE MAIN OBJECTIVES OF THE WDC - PMKSY 2.0

Objectives of watershed development projects are to improve productive potential of rainfed degraded land through integrated watershed management; to strengthencommunity based local institutions for promotion of livelihoods & watershed sustainability, and to improve the efficiency of watershed projects through crosslearning and incentive mechanism. At macro - level, the vision of WDC-PMKSY2.0 projects is to accelerate the economic growth rate of agriculture in the less endowed rainfed areas of the country. Moreover, this should be achieved by adopting harmony with ecological principles of development for ensuring sustained transformation of economy and ecology. The guiding principles shall be a better *Economy, Ecology* and *Equity* in the rainfed regions of the country.

At watershed level, the development plan shall be guided by the need to achieve higher incomes for farmers, expanded livelihood options for landless, equity in distribution of benefits, community ownership and management, and ecologically sustainable action plan.

1. Enhancing economic growth of village community dependent on watershed by:
    a. Securing production and farmers‟ income against climate variability and its risks of drought spells through diversification of crop systems & animal husbandry, and varied livelihood portfolios; efficient water harvesting and retention of rainwater in soil profile; and entitling all project members to ground and surface water resources for life saving irrigation on equitable basis.
    b. Improving intensity and productivity of various crops, livestock, fisheries and biomass production systems through optimal, integrated, sustainable and efficient use of natural resources in project areas.
    c. Recognizing the stake of non-land holding project members, and promoting alternate livelihood opportunities.
    d. Building an ecosystem of enterprises for facilitating efficient scales of operations, access to credit, and market linkages; knowledge sharing; and resource convergence led by vibrant member managed farmers‟ institutions.
2. Ecological restoration and sustainable management of natural resources across the project area through:
    a. Sustained community action in management of natural resources/assets such as groundwater, soil, community resources, etc. by way of building community organisations like User Groups (UG), and transferring maintenance responsibilities to

them. Further, supporting UGs with regulatory norms, that are institutionalized through the Gram Panchayats.

b. Promotion of simple, easy to use and affordable technologies and practices, that builds upon local knowledge and available materials.

3. Improving the economic and social conditions of the resource poor, asset-less, differently-abled and women in particular through:
   a) Shared and equitable access to the land, water and biomass resources developed.
   b) Greater access to income generating opportunities.
   c) Facilitating co-option of members of these categories in various community institutions i.e., FPO, User Groups etc.

1.6 WATERSHED APPROACH TO WDC - PMKSY 2.0

The watershed approach has conventionally aimed at treating degraded lands with the help of low cost and locally accessed technologies such as in-situ soil and moisture conservation measures, afforestation etc. and through a participatory approach that seeks to secure close involvement of the user-communities. The broad objective was the promotion of overall economic development and improvement of the socio-economic conditions of the resource poor sections of people inhabiting the programme areas. Many projects designed within this approach, at different points of time, were taken up by the Government of India. The Drought Prone Area Programme (DPAP) and the Desert Development Programme (DDP) were brought into the watershed mode in 1987. The Integrated Wasteland Development Programme also aimed at the development of wastelands on watershed basis. Other major programmes now being implemented through this approach are the 'National Watershed Development Project for Rainfed Areas' (NWDPRA) and the 'Watershed Development in Shifting Cultivation Areas' (WDSCA) of the Ministry of Agriculture (MoA). While the focus of these programmes may have differed, the common theme that underpinned their structure has been the basic objective of land and water resource management for sustainable development of natural resources and community empowerment. Prof. Hanumanta Rao Committee, constituted by the Ministry of Rural Development (MoRD) studied the implementation and impact of the Drought Prone Area Programme and Desert Development Programme all over the country and recommended a common set of operational guidelines, objectives, strategies and expenditure norms of watershed development projects integrating the futures of these programmes under the Ministry of Rural Development (MoRD). Accordingly, the guidelines of Watershed Development were framed and brought into force with effect from 1st April 1995 and subsequently reformulated the guideline by 2001.

Currently guidelines have been issued by the Government of India to implement the New Generation Watershed Development Projects (WDC-PMKSY 2.0) and agencies have been identified at the State level as well as at the district level to effectively implement and monitor the programme.

The programme has been designed in such a way that it encourages peoples' participation in all the stages of project implementation. The programme activities therefore have to be evaluated at different stages in order to have clear understanding about the status of implementation and the impact on soil-moisture conservation by undertaking the works viz., contour bunding, land leveling, summer ploughing; drainage line treatment activities such as construction of major and minor check dams, retaining wall and gully control measures; water resource development measures through percolation pond, renovation of tank, cattle pond and farm pond, afforestation and pasture development through developing social forestry, avenue plantation, fruit plantation, fodder development etc.; and other activities such as coir pith compost training, sericulture, homestead plantation, formation of self-help groups and other community organizational activities etc.

The contemporary and near future context warrants a paradigm shift in watershed development approach, that is largely describable by „biomass generation, crops- livestock system of production, and livelihood options‟ This suggests the need for rejuvenation of life in the watershed landscape, with its multiple dimensions of topography, soils, moisture regimes, water bodies, grasses, trees, diverse crop & livestock systems, and people depending on these resources.

Regeneration of landscapes implies regeneration of all these elements of the landscape and their inter-relationships. It also includes various ecosystem services such as base flow in the streams, increased spring discharge, improved pest- predator complex etc., that contribute to enhanced productivity of all the dependent systems while minimizing the use of external inputs.

1.7 KEY FEATURES OF WDC - PMKSY 2.0

The New Watershed programme (WDC-PMKSY 2.0) is envisaged to affect the following shifts:

a) A clear transition from the current predominant practice of mechanical/ engineering treatments to more agriculture engineering measures. This implies overwhelming focus on trees, cropping systems, soil moisture conservation & management and soil organic matter.

b) Emphasis on realizing effective use of rain water by relying more on water productivity. This involves integrated measures to enhance water percolation for storage of rainfall in the soil profile for longer periods; and supplementing of moisture deficits in crops with water that is harvested by constructing small water harvesting structures like field bunds, trench cum bunds, contour trenches, continuous contour trenches, farm ponds, diversion weirs, embankments, percolation tanks, check dams etc.

c) Diligent planning for crop systems diversification for risk management; enhancing productivity by adopting water use efficient crops (like nutri- cereals, pulses and oil seeds, besides dryland horticulture); and opting for crop alignment as a principle. An important initiative would include aligning crop growth phase with water availability, to provide a protective irrigation at critical stages of crop growth.

d) Clear risk management plans for adaptation and mitigation of adverse impacts of climate variability and change; diversification of the watershed economy by adopting integrated farming systems – agronomic and horticulture crops, livestock, agro-forestry, fishery, poultry etc.; enlarging livelihood portfolios; building climate change projections into water harvesting designs; precision based use of water for managing drought spells; and timely agro-met farm advisories to deal with climate induced uncertainties. Access to technology suite that forecasts events like pest & disease, price & demand etc. would further help in risk negotiation.

e) Economically vibrant institutions, like Farmers Producers Organization (FPO), to promote agri-business services and impart efficiency to transactions at both input and output management stages. Such organizations are to be people – owned, people – managed and people-centric approach.

f) Setting up and nurturing of community groups that will take interventions beyond mere creation of assets and promote responsible ownership and management. Formation of User Groups based on common identities and interests around natural resources and work consciously towards integrating the principle of sharing.

g) Focus on decentralization, flexibility, community empowerment and greater role for village-level institutions in the planning process with a view to accommodating the local social and traditional strengths.

h) Rejuvenation of springs by taking up appropriate watershed activities in the watershed development projects.

1.8 GUIDING PRINCIPLES OF WDC - PMKSY 2.0

The common guidelines for watershed development projects are based on the following principles:

I. Equity and Gender Sensitivity:

Watershed Development Projects should be considered as levers inclusiveness. Project Implementing Agencies (PIAs), must facilitate the equity processes such as a) enhanced livelihood opportunities for the poor through investment in their assets and improvements in productivity and income, b) improving access of the poor, especially women to the benefits, c) enhancing role of women in decision making processes and their representation in the institutional arrangements and d) ensuring access to usufruct rights from the common property resources for the resource poor

II. Decentralization:

Project management would improve with decentralization, delegation and professionalism. Establishing suitable institutional arrangements within the overall framework of the Panchayat Raj Institutions (PRIs), and the operational flexibility in norms to suit varying local conditions will enhance decentralization. Empowered committees with delegation to rationalize the policies, continuity in administrative support and timely release of funds are the other instruments for effective decentralization.

III. Facilitating Agencies:

Social mobilization, community organization, building capacities of communities in planning and implementation, ensuring equity arrangements, etc. need intensive facilitation. Competent organizations including voluntary organizations with professional teams having necessary skills and expertise would be selected through a rigorous process and may be provided financial support to perform the above specific functions.

IV. Centrality of Community Participation:

Involvement of primary stakeholders is at the centre of planning, budgeting, implementation and management of watershed projects. Community organizations may be closely associated with and accountable to Gram Sabhas in project activities.

V. Capacity Building and Technology Inputs:

Considerable stress would be given on capacity building as a crucial component for achieving the desired results. This would be a continuous process enabling functionaries to enhance their knowledge and skills and develop the correct orientation and perspectives thereby becoming more effective in performing their roles and responsibilities. With current trends and advances information technology and remote sensing, it is possible to acquire detailed information about the various field level characteristics of any area or region. Thus, the endeavour would be to build in strong technology inputs into the new vision of watershed programmes.

VI. Monitoring, Evaluation and Learning:

A participatory, outcome and impact oriented and user-focused monitoring, evaluation and learning system would be put in place to obtain feedback and undertake improvements in planning, project design and implementation.

VII. Organizational Restructuring :

Establishing appropriate technical and professional support structures at national, state, district and project levels and developing effective functional partnerships among project authorities, implementing agencies and support organizations would play a vital role.

In order to implement effectively, under the umbrella of State Level Nodal Agency (SLNA) various institutional mechanisms are formed. They are:

i. Watershed Cell cum Data Centre (WCDC)
ii. Project Implementation Agency (PIA)
iii. Watershed Development Team (WDT)
iv. Watershed Committee (WC)
v. Neighbourhood Groups (NHGs)
vi. Self Help Groups (SHGs)
vii. User Groups (UGs)

The vision of the new generation of watershed development projects will be achieved through PWDP prepared by the watershed community with technical guidance from the WDTs.

The following constitute broader components of the watershed development plan:

i. Ecosystem Regeneration and Production.
ii. Natural Resources Management and Governance.
iii. Services & Livelihoods.

These three are organically linked and relate to development, management and governance of natural resources. The plan should focus on effective and efficient use of natural resources to realize better income for the rural people.

1. Ecosystem Regeneration and Production Plan

a. Crops and the land use vary in accordance with the topography. Its characteristics and tenurial relations also determine the land use. The watershed landscape is first zoned into relatively homogenous units based on its physical characteristics, usage (crops, grasses, trees) and tenurial status (such as private/ commons/ forest department owned lands). The types of zonation vary across different agro- ecologies.
b. In addition to the physical watershed treatment plan covering ridge to valley, the ecosystem regeneration plan should look at the land use crops grown or types of grass lands or vegetation in each of the zones and the status of groundwater/ aquifers etc.
c. The plan should indicate the measures taken up for improving soil health in terms of soil organic matter, regeneration of vegetation, mitigation of climate risks in crop production, crop diversification including horticulture, approach to improve crop (soil) cover for longer duration in a year, arresting land degradation, harvesting rainfall and protective irrigation.
d. An important aspect of this plan is integration and strengthening of livestock production systems, integration of livestock feed and fodder into crop systems, promotion of fodder trees and regeneration of grass lands, as the broad components.
e. The plan for each of the zones must show measurable indicators for assessing the ecosystem regeneration and projected improvement in production of various crop systems as a result of interventions made. The change can be appreciated only when the baseline index of these indicators is included in the plan.
f. For comprehensive ridge to valley treatment is the watershed development approach. The forests and common lands on the upper reaches will necessarily constitute the first candidates for watershed activities. Well-treated upper reaches impact the lower reaches including the arable lands positively. The additional benefit of such a treatment would result in improvement in quality of forest, besides augmenting forest produce adding to supplementary income of the community.

2. Natural Resources Management and Governance Plans

These plans will have three parts as discussed below:

a) Maintenance of natural resources related assets

Natural resources related physical works need maintenance, and the bio-works such as plantation require strong protection measures and care. The watershed committee responsible for undertaking treatment works and asset creation should maintain a Watershed Assets Register, and the list of completed works recorded and updated continuously. The completed assets should be transferred to the Gram Panchayat for their continued maintenance at the end of each year of implementation.

A system of annual audit of natural resource assets should be taken up by the GP to assess their status and maintenance needs. These can be integrated into the MGNREGS by a resolution of the Gram Panchayats. The WDT should ensure that these processes are institutionalized into the functioning of Gram Panchayat and followed regularly from 2nd year onwards. The activities planned to achieve this should be submitted as a part of the overall Project development plan.

b) Water Budgeting, Management/Regulatory Norms and Governance

It is crucial for the community to establish reference sites of wells/ bore wells, and regularly monitor groundwater along with local rainfall, so as to arrive at regulatory norms on water extraction, type of crops to be grown and area coverage.The groundwater monitoring exercise may be taken up twice a year (April- May & September-October / before the crop season), and results be placed after analysis, before the Gram Sabha. The purpose should be to build a common understanding and consensus in the project community for sustainable use of groundwater. The community should be brought to agree on potential restrictions on new extraction structures, reducing area under water intensive crops and other such norms that economise on water use. These exercises are to be taken up twice a year and activities proposed should be part of the watershed development plan.A suitable arrangement for carrying out this exercise should be made by PIA in consultation with Watershed Committee and also provide requisite training for the same.

c) Protection and Regulation/Regeneration of Common Lands

Common lands that are typically in the upper reaches of the watershed slopes, including forests, pastures etc. should receive focused attention,along with identification of users, their needs and organizing them into user groups. The plan for regeneration and development should also enlist various products, usufructs arising out of the planned regeneration process, and their benefit sharing norms. Protection measures, norms and their enforcement mechanisms need to be arrived at and must have sanction of the Gram Panchayat.

3. Services and Livelihood Plan of FPOs

These are essentially economic growth plans of the watershed community building upon the social capital base and investments in natural resources. An FPO is formed from the beginning as a business entity that efficiently provides services, organizes inputs, promotes value added commodities produced by local enterprises, and undertakes aggregation and marketing, protecting the interests of small & marginal farmers, SC/ST members and women.

The FPO shall start with organizing the three regular components:

- **Custom Hiring Centre (CHC)**- renting out implements/ equipment/ small machines for use by small holder farmers, women and agriculture labour
- **Input Shop**- where inputs required for farming, small implements, quality seeds (produced by its farmers or procured from outside) are readily available within close proximity
- **Information Centre**- providing weather forecasts, weather advisories, crops and livestock related information, information on various schemes, hosting knowledge sources like videos, a library etc.

The plan for economic growth and livelihood activities ideally starts with assessment of the potential impact on crop, livestock, fish and other agricultural production system that comes from the investments

made on natural resources. From the perspective of monetising the produce, attention is needed on post-production activities, including value addition & marketing. Hence, investments for creating/upgrading infrastructure, building human resources and skills, and working capital are assessed, and included in the watershed development plan.

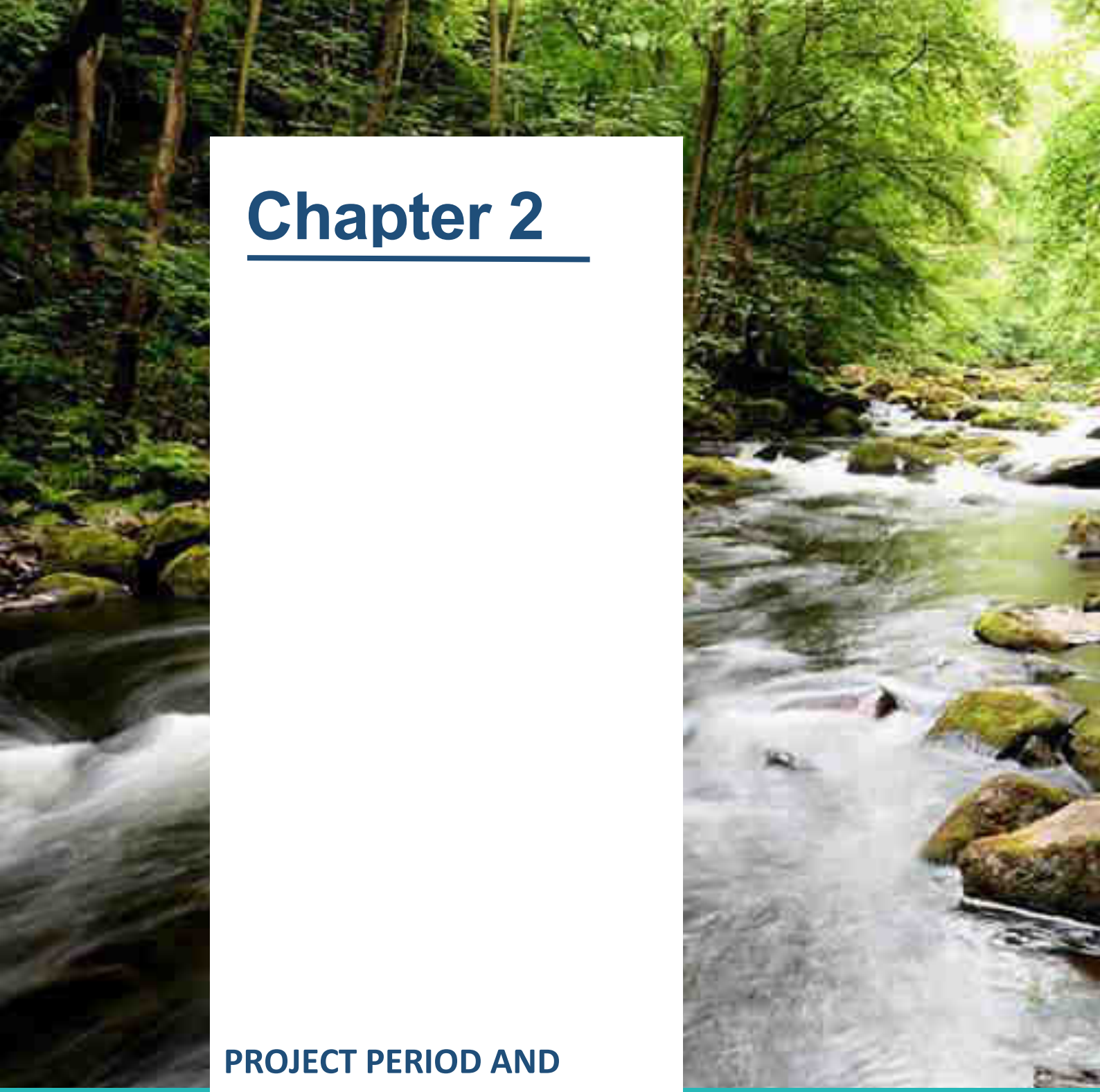
The FPO should be able to undertake these responsibilities by taking active support of Watershed Committees, Gram Sabha and Gram Panchayats.

4. Convergence Planning

Several government schemes can complement the watershed development initiatives. Once the overall project development plans are prepared, the WCDC will need to discuss with the PIA supported by its WDT and prioritise the activities. This should also involve exploration of scope for sourcing funds from various ongoing relevant schemes. The focus should be on supplementing project activities and funds by effecting convergence with relevant ongoing schemes.

5. Springshed Development

Springshed Development will be taken up as an activity under watershed projects. Any intervention attempting to develop springs as a natural resource must involve assessment of geological controls on springs, recharge potential of springs at micro level, maintenance and protection of springs, and effective monitoring of spring discharge and water quality. Spring conservation and management activities should use integrated landscape management approaches to synergize the positive linkages with livelihood practices, while also preventing practices that have negative impacts (overgrazing, deforestation, creation of artificial gullies, haphazard road construction, over-extraction of springs, etc



Chapter 2

PROJECT PERIOD AND PHASING

IDUKKI WDC-1/21-22

2. PROJECT PERIOD AND PHASING

In view of the expanded scope and expectations under the new generation watershed; development program, the project duration would be three to five years. The phases and duration of each phase is shown in the table below

Phase	Name	Duration	
I	Preparatory Phase	upto 1	Year
II	Works Phase	2 to 3	Years
III	Consolidation and Withdrawal Phase	upto 1	Year

2.1 PREPARATORY PHASE

The major objective of this phase is to create people-centric platform by mobilizing the project community and setting up institutions. Towards this, the main activities will include the following:

1. Mobilisation of Community and Promotion of Institutions

a) Mobilizing the local community, creating awareness, leading them into various User Groups around natural resources with a view to promote their sustainable usage, and initiating opportunities for livelihood activities. This also involves orientation of members belonging to GP, local institutions, various stakeholders, and other VLIs.

b) Formation of WCs.

c) Preparing farmers to organise themselves into an FPO, or strengthen the existing ones.

d) Finalising appointment of the Secretaries of WC and FPO, and taking them through the required orientation & training programs.

e) Overall orientation of the people, the local PRI members and the officials concerned to be oriented for executing a community-led watershed project.

f) Day to day functions and activities to ensure progress.

2. Mapping and Creating Watershed Databases

a) Compilation of basic demographic and spatial data - the data sets accumulating over several planning exercises need to be integrated with the base data/maps, both across households and space.

b) Building Land Resource Inventory (LRI) assessing soil characteristics of the watershed reaction along with hydrological and meteorological data and Socio- economic status.

c) Baseline surveys needed for preparation of the project development plan, along with that necessary for assessment of project success and end results to be completed. The data must be disaggregated, such that granular data and information are made available to appreciate the benefits that have accrued to different categories of the project stakeholders including the landless, small & marginal farmers, women and SC/ST members.

2.2 WATERSHED WORKS PHASE

This phase is the heart of the program during which the planned activities will be implemented. The main challenge of the new approach to watershed development arises from the need for taking up an integral view of multiple expectations and harmonising their realization.

The plan of implementation should parallelly address three streams namely

(a) ecosystem regeneration and production enhancement

(b) natural resources governance; and
(c) services & livelihoods.

Some of the following activities are suggested that greatly emphasize agronomic, biological and livelihood activities, while not compromising on the needed mechanical measures for soil and water conservation.

a) Multi-purpose trees (fodder, nitrogen-fixing, biomass for incorporation into soils) to be promoted. Nursery raising for fodder, fuel, timber and horticultural species should form an important activity. As far as possible, local species may be given priority.
b) Land development including in-situ soil and moisture conservation, and drainage management measures like field bunds, contour and graded bunds fortified with plantation, terracing in hilly terrains etc.
c) Water budget-based promotion of Integrated Farming System (IFS) models, that promote crops, horticulture, livestock and agro-forestry and facilitate deriving the benefits arising from supplementary and complementary relationships among these enterprises.
d) Pasture development to support livestock activities.
e) Exploring the scope for introducing fisheries by assessing the period & availability of water. The tanks/ponds/other water bodies may be designed and executed in accordance with hydro-geological assessment.
f) Veterinary services for promotion of livestock activities.
g) Agro-ecology based crop alignment and demonstrations for popularizing new crops/varieties, animal breeds, resource use efficient practices (soil health card -based soil health management, micro-irrigation systems etc.), and various agronomic practices that help in negotiating production risks (pests, diseases, weather variations etc.).
h) Climate risk management activities like Custom Hiring Centre, portable micro irrigation, drought/flood resistant varieties, protected cultivation, seed bank, fodder bank, tools for dissemination of agro advisories etc.
i) Thrust on secondary agriculture for increased farm income adding value to primary agriculture activities; taking up alternative enterprises that can utilise the available land and labour particularly the landless to take up activities like mushroom cultivation, bee keeping, back yard poultry, compost making, rearing of small ruminants & and rabbits etc.
j) Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio-fuel plantations etc. This intervention needs careful consideration after examining the local social and cultural milieu, including the critical livelihood options of the household(s) concerned.

2.3 CONSOLIDATION AND WITHDRAWAL PHASE

Around 3rd to 4th year of implementation of the Project, majority of the planned works would have been executed, and FPO shareholders would have risen to substantial numbers. As planned projects get executed, the role of WC diminishes and that of the FPO, User Groups and SHG increases. Sustainability of economic and ecological benefits from watershed investments is predicated upon effective functioning of these institutions. Sustainability after the completion of project work and withdrawal will also depend upon the quality of works executed. Hence, the phase of consolidation and respectful withdrawal from project work assume importance. In this context, the scope of work during this phase is suggested as follows:

1. Project Implementation Related

a) Completion and consolidation of all the planned works and activities.

b) Documented experiences of the farmers and identified champion farmers during the 2nd and 3rd years of work can be used to scale up the practices to larger areas.

c) With two years of focus on productivity gains, production increase of targeted commodities can be expected. The FPO now needs to work for a robust post- harvest management by operationalizing basic agri-logistics, primary processing, aggregation and marketing. FPOs will need to prepare an integrated action plan and roll it out during the 4th and 5th years of the project. Promoting warehouse-based storage and electronic Negotiable Warehousing Receipts (eNWR) will address concerns of finances and allay distress sale by farmers.

All such post- harvest issues need to be taken into account while planning production strategies itself, and further needed action plan readied simultaneously. This will make it possible to roll out by 3rd - 4th year of the project period, and exhibit stability as exit begins.

d) Documentation of successful experiences and lessons learnt are useful for course correction and continuous improvement in the quality of implementation. Social media can also be activated to achieve wider dissemination.

e) Prepare for and undertake terminal evaluation of project to evaluate the extent of expected outcomes realized successfully

f) Preparing for and operationalization of capacity building programs for all the community-based organizations (CBOs), so that they will be able to take over management of different tasks after the Project Team withdraws.

2. Consolidating the Strength of FPO

a) Building capacity of the FPO as a vibrant business organization of farmers is critical to management of the watershed post withdrawal. Annual business plans, linkages with financial institutions, regular updating of books of accounts, legal compliances and functional governance are key responsibilities of a well-functioning FPO.

The outcomes of various capacity building activities and prescribed management processes undertaken as per annual action plans, may be taken stock of, and additional support required to address the gaps provided.

b) Increasing the capital base of the FPO and linkages with financial agencies for credit are crucial for its healthy growth. The WCDC should now ascertain the status of FPO with respect to its areas of activities and annual turnover, bridge the gaps, if any, by offering support from various initiatives of the government. The importance of coordination and convergence cannot be over emphasized. Facilitating matching grant for the FPO is one such important support.

c) During the 4th and 5th years, FPO must focus on building various backward and forward linkages and infrastructures that will support practice of agriculture as an integrated value system. Convergence with other ongoing Government schemes should be the norm and guiding principle for the FPOs.

3. Auditing of Natural Resources

a) Natural resources developed need to be used in a sustainable manner by reconciling ecology, equity and economic considerations. The use of, and expected outcomes thereof

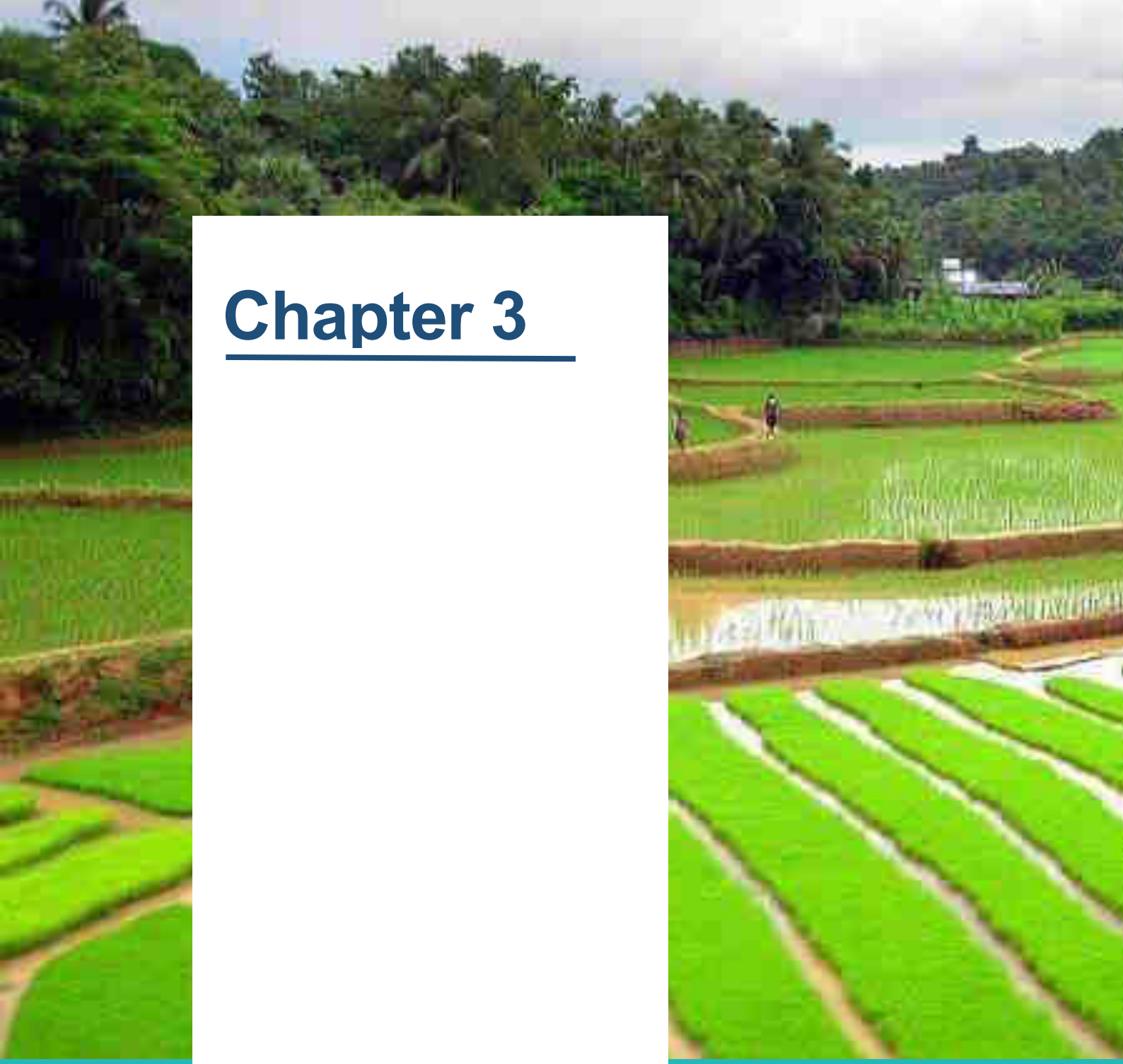
must be viewed through the prism of balance and harmony. Over-emphasis on any one of these three factors to the neglect of other two should be avoided at any cost.

b) Regularizing the Annual Audit of Natural Resource Assets: All the natural resource assets created (along with the existing ones) should be visited and assessed by the WC. These assets are to be maintained by tapping different sources of funds – MGNREGS, such other infrastructure funds, and WDF for critical investments and even voluntary contributions in cash or kind.

c) The process of resource audit should also consider, i) implementation of the sharing agreements on usufruct rights; effectiveness of regulatory norms; and health of the natural resource.

d) During the consolidation phase, the core functions of the WC should be institutionalized. Also, the user groups should be active and stable.

During this phase, local-level institutions are expected to reach maturity, and exit protocols now become operative for the PIA. The WCs may begin to use the WDF for repair and maintenance of structures created in Phase II. However, accessing of the fund should preferably happen after exploring sourcing funds from other ongoing schemes.



Chapter 3

DETAILED PROJECT REPORT

IDUKKI WDC-1/21-22

3.DETAILED PROJECT REPORT

A Detailed Project Report (DPR) describe what a Watershed Project will try to achieve over a tenure of watershed project of 4 to 7 years and how it intends to achieve it. DPR is containing the general features of the watershed project, contain an analysis of the current situations of watershed project area and particularly needs of the community with respect to land and water and existing potential in the project area.

Adimali watershed project (WDC - PMKSY 2.0) of Adimali block of Idukki district is proposed for four years duration (2022- 2025).

3.1 Objectives of DPR

PIA decided the following objectives for the DPR.

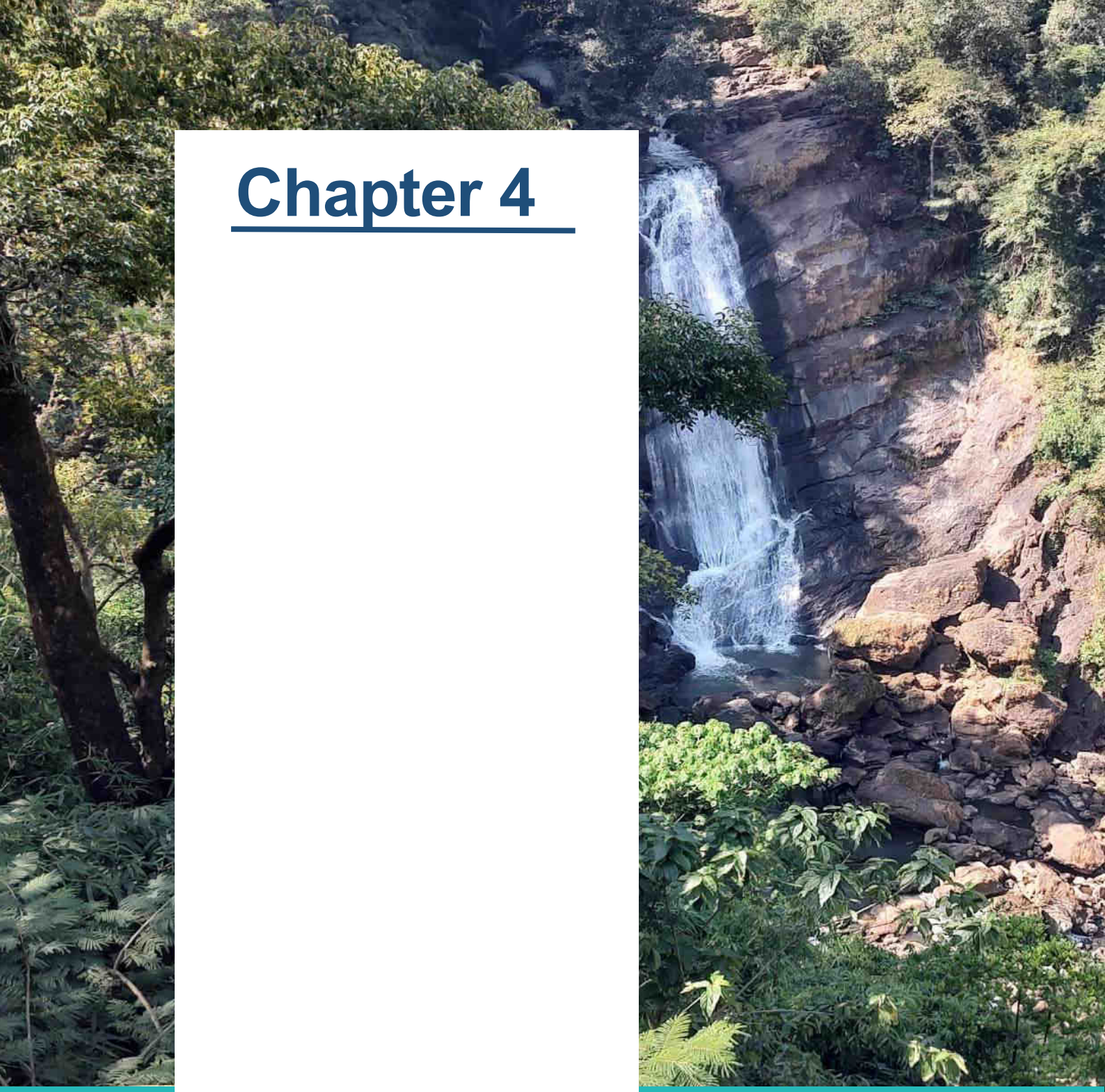
- To prepare a Simple, Logical, Community Friendly and Comprehensive Detail Project Report following community base participatory approaches involving all segments of communities and stakeholders.
- To develop a livelihood plan through livelihood analysis for optimum utilization of scarce available resources viz. natural, physical, human and financial and analysis of vulnerability in the project.
- To develop a detailed plan for improving agricultural and livestock productivity and to strengthen the micro enterprises in the project area.
- To develop a management grid for convergence with other department and their authorities for pool out the financial resources in the project area.

3.2 Methodology adopted

The following methodology adopted for the preparation of DPR.

1. **Rapport building in the project area** – PIA members and TSO devoted sincere efforts in the project area to understand the communities. TSO described about the project to the stakeholders. Through different levels of discussions and field visit, TSO understood the communities, their culture, socio economic status and project area. These efforts helped to establish a rapport in the project area.
2. **Organized Village Meetings** – PIA and TSO organized meetings to make aware the communities about the watershed project. Elected representatives and senior officers from the PIA also attended the meetings to motivate the community and develop faith in the project
3. **Base Line Survey** - TSO conducted survey in the project area and data collected were related to socio-economic status of project area. Secondary data were collected from the records and reports available with line departments.
5. **Develop thematic layers of watershed** - TSO developed the thematic layers of the watershed by using GIS and remote sensing technology. These maps help to understand the basic characteristics of the watershed area. The details are given in the coming chapters.
6. **Desk Research** - A systematic and focused desk research and internet assisted search for relevant documents, reports and appraisals were reviewed during preparation of DPR.
7. **Processing and Analysis of Data** - All the collected information from the primary and secondary sources, desk reviews were analyzed and calibrated. The findings of the analysis data have been used for developing vision document, strategy and action plan of the project

8. **Writing of DPR** - A comprehensive report was prepared by the TSO following the prescribed DPR template issued by State Level Nodal Agency.
9. **Sharing the plan in the Grama Sabha** – PIA shared the action plan of the concerned Grama Panchayat in the respective Gram Sabha.
10. **Approval** – After approval of Grama Sabha, it will be submitted to Block Panchayat, District Panchayat and State Level Nodal Agency for approval at different tiers.



Chapter 4

PROJECT AREA

IDUKKI WDC-1/21-22

4.PROJECT AREA

4.1 IDUKKI DISTRICT

Idukki, the second largest district of Kerala State came into existence on 26th January 1972 by splitting the district of Kottayam into two parts. Situated in the middle part of Kerala the district lies between 90 16'16" to 100 21'25" North latitude and between 760 37'44" to 770 24'47" East longitude with a total geographical area of 436328 ha. The district is bounded by Tamil Nadu State on the Northern and Eastern parts, Pathanamthitta, Kottayam and Ernakulam districts in the Southern and Western parts respectively. The name Idukki was derived from the word Idukku which means a gorge. Geographically the district forms a high-altitude plateau with rugged mountainous terrain, several river valleys and deep gorges. The district lies in the Western Ghats of Kerala and has a vast forest reserve area. More than a half of the district is covered by forests which are rich in natural biodiversity. As a tourist destination Idukki offers diverse attraction like wild life sanctuaries, hill stations, dams etc. In the north, the highest peak in South India, the Anamudi hills towers over Eravikulam National Park, where the rare, blue Neelakurinji flower blooms every 12 years. Nearby, Munnar is a hill station known for its sprawling tea plantations and Tea Museum. Farther south is the vast, curved Idukki Dam and Periyar National Park, a tiger and elephant reserve. The district is also known for its Hydroelectric Power Projects which supplies 66% of the State's Power needs. Though it is the second-largest district in the region in terms of area, it has the lowest population density among the districts of Kerala. There are only two municipalities in the district and the urban population is comparatively much lower than the rural population. Idukki is the second largest place in Kerala where the most number of scheduled tribes and tribal ambiguities exist. The following clans are found in the scheduled tribes Malayarayan ,Mannan , Muthuvan, Oorali ,Paliyan , Hilpulayan, Malapandaram , Ulladan and Malayan.

GEOGRAPHY

Idukki district is geographically known for its Mountainous Hills and Dense Forests. Major parts of the district are known as Highranges. Based on physiographic features, the district falls under five sub micro regions namely Anamalai forested hills, Marayoor forested hills, Cardamom hills, Periyar river basin and Thekkady forested hills. The entire northern part of the district forms a sub plateua higher than the rest of the district, this region includes the tallest peaks like Anamudi and includes the areas around Munnar, Pallivasal, Kanthalloor, Vattavada and Mankulam. The Pambar river valley (Marayoor, Keezhanthoor) forms an eastern sloping rain shadow region of the Western Ghats. The eastern frontier of the district constitutes the Cardamon hills. The western part of the district is covered by forests and hills bordering the eastern regions of Ernakulam and Kottayam district. Places like Thodupuzha, Koothattukulam, Udumbanoor and Muttom are situated in the semi elevated Thodupuzha river plains with scattered hills. The Periyar river basin in the district which includes Vandiperiyar, Ayyapankoil, Rajakkad, Idukki, Cheruthoni and Adimaly is an elevated plateua crisscrossed by river valleys and lies between the high peaks of the western and eastern parts of the district. The southern region is entirely covered with the forests of the Periyar National Park.

CLIMATE

The climate of the Idukki district varies due to its peculiar topography. The high land region is having a comparatively cold climate. Idukki has the benefit of the South-West monsoon (Edavapathi) during June to September and NorthEast monsoon (Thulavarsham) during October and November. Idukki received

an annual rainfall of about 4250.0 mm during 2021. The rainfall increases from East to West. Eastern part of the district lies in the rain shadow region of Western Ghats. The Western part of the district experiences moderate climate. The major rainfall contribution is from South-West monsoon from June to September which contributes 49.60 % of the total annual rainfall. The North-East monsoon from October to December contributes 29.55 % of the annual rainfall and the balance 20.85 % during the period January to May. The relative humidity is more during the morning hours and is less during evening hours. The hot season in the district lasts for 1.9 months, from March 12 to May 9, with an average daily high temperature above 30.55°C. The hottest month of the year in Idukki is April, with an average high of 31.66°C and low of 20.55°C. The cool season lasts for 3.6 months, from June 9 to September 27, with an average daily high temperature below 26.66°C. The coldest month of the year in Idukki is January, with an average low of 16.11°C and high of 26.66°C.

FLORA AND FAUNA

The green mountains and deep forests of Idukki district are home to a variety of rare flora and fauna. Santalum album or chandanam, Anogeissus latifolia or Mazhukanjiram, Tamarindus Indica or Puli, Terminalia arjuna or nirmaruthu, Pongamia glabra or pongau, Largerstoemia lanceolata or Ventheku, Dalbergia latifio or Rosewood, Tectona grandis or Teak, Cassia fistula or Konna, Terminalia bellerica or Thanni, Emblica officianalis or Nelli etc. are the common species found here. Rhododendrom Nilagiricum or Kattu chemparathi, Elaeocarpus recurvatus or Bhadraksam, and Strobillanthus kunthianus or Neelakurunji grow in these areas. The district is also known as spice garden of Kerala. Over twelve varieties of spices, including ginger, garlic, cardamom, vanilla, pepper, cinnamon, coffee, tea, clove and nutmeg are cultivated in Idukki and the surrounding areas of this district.

This district has several protected areas including Periyar Tiger Reserve in the south, Kurinjimala Sanctuary to the east, Chinnar Wildlife Sanctuary to the northeast, Eravikulam National Park and Anamudi Shola National Park to the north and Pampadum Shola National Park to the south. These protected areas are well known for several threatened and endemic species including tiger, Nilgiri tahr, grizzled giant squirrel, Nilgiri wood-pigeon, elephant, gaur, sambar deer, purple frog and neelakurinji. The Periyar Tiger Reserve is ideal for watching the Asian Elephant in close proximity. It has a varied topography and it is stretched across 777 sq. km, the central part constituting an area of 350 sq. km and is one of the largest in India.. The Chinnar wild life sanctuary is lying in Devikulam Taluk of Idukki district and is located in the rain shadow region of Western Ghats. It is the second habitat for the endangered Giant Grizzled Squirell in India. This sanctuary has an area of 90.422 sq km, and has the unique thorny scrub forest with Xerophytic species.

WATER RESOURCES

The main rivers flowing through the district are Periyar, Pambar, Pamba, Manimala and Muvattupuzha . The Periyar the longest of all rivers in Kerala and also the largest in potential. It originates from Sivagiri in the southeast part of the district and touches all the taluks of the district. The Periyar is harnessed at various points in its course for generating electricity and for irrigation purpose. The Pambar is one of the east flowing rivers in the State, which has its origin from Benmore tea estates. There are a few natural lakes in the district. They are Eravikulam and Devikulam lakes in Devikulam taluk, Elavizhapunchira, in Thodupuzha taluk. Out of 53 reservoirs in Kerala 18 are situated in Idukki district. Among these the Idukki and Idamalayar dams hold 48 percent of the total storage capacity combined of all dams in Kerala.

AGRICULTURE

Agriculture plays a vital role in the district with a total cropped area of 266385 ha. The economy of Idukki district is predominantly on agriculture. The major crops grown in the district are cardamom, pepper, nutmeg, ginger, sugarcane, tea etc. Idukki stands first for the cultivation of Cardamom, Tea, Jack, Coca, Pepper and Sugarcane. Major cultivation of Cardamom is in Idukki district and the contribution to total area is 78.51%. Another important crop tea is extending to an area of about 25508 ha. Pepper was cultivated in an area of 42822 ha. Idukki is one of the district with large area covering Sugarcane, there was 849 ha under this crop during 2019-20 period. District also contributes a major share in fresh fruit and vegetable cultivation.

DEVELOPMENT BLOCKS

Idukki District is divided into eight community development blocks (block panchayats). The community development blocks are further divided into talukas. The blocks are Adimaly Block, Devikulam Block, Azhutha Block, Elamdesom Block, Idukki Block, Kattappana Block, Nedumkandam Block and Thodupuzha Block.

SOCIO-ECONOMIC CONDITION

It is predominantly an agricultural district and majority of work force is engaged in agriculture. Crop husbandry and animal husbandry are thus the main occupation of the people. Agriculturists and agricultural labourers constitute the bulk of the population. About ten per cent of the total population are estate labourers. The native tribes of the district work as agricultural labourers in the tea and cardamom estates. In the district, the working population constitutes total main workers (415,947), cultivators (85,723), agricultural laborers (112,391), household industry workers (4,933), and other workers (212,900). Tourism also plays a major role in district economy. With its matches scenic beauty the district has tremendous tourist potentialities. The Munnar hill station and Periyar Wild Life Sanctuary at Thekkady is in the district and it ranks the foremost among the places of tourist attractions in Kerala.

4.2 PERIYAR WATERSHED

Watershed Code : 14 P

The Periyar watershed lies between 9° 15' to 10° 20' North latitudes and 76° 05' to 77° 25' East longitudes and is located in the districts of Idukki, Thrissur and Ernakulam of Kerala State. It is bounded by Mukundapuram taluk of Thrissur district in the North, Kunnathunad, Kochi and Muvattupuzha taluks of Ernakulam district, in the South, Tamil Nadu in the East and Arabian Sea, Muvattupuzha taluk of Ernakulam district, Peerumade and Thodupuzha taluks of Idukki district, Meenachil and Kanjirapally taluks of Kottayam district and Ranni taluk of Pathanamthitta district in the West. The watershed has a total area of 5029.03 sq.km covering 88 villages spread over 102 panchayats, 21 blocks and 3 districts.

Physiography

Elevation

The Periyar river emerges from Udamala near Periyar Wild Life Sanctuary at an elevation of 1593m above MSL and flows to the Arabian sea at less than 2m above MSL. The general elevation ranges from 75m to 2690m in the upper region, 8m to 60m in the middle region to less than 2m in the lower region.

Aspect

The river emerges from the South-Eastern portion of the watershed and initially traverses in a northerly direction through an immense cliff of rocks, receiving several streamlets in its course. Further

downstream, the Mullayar joins the main river at an elevation of 883m above MSL. The river flows westwards for a few kilometres and changes to North-West till it reaches Vandiperiyar. The Kattapanayar joins the main river and flows in a North Westerly direction between the Kuravan Malai and the Kurathi Malai, before it is joined by the Cheruthoni Ar. The Periyar continues to flow in a northerly direction and takes it major tributary, the Muthirapuzha Ar coming from the opposite direction. After the confluence, the main river flows in a West-Northwesterly direction. The Thotti Ar and the Idamala Ar joins the main river further downstream. The river bifurcates at Aluva and one branch joins the Chalakudy river at Puthenvelikkara. After receiving the Chalakudy river, the Periyar expands itself into a broad sheet of water at Munambam and finally merges with the Arabian Sea. The other branch falls into the Vembanad lake at Varapuzha.

Landforms

The broad landforms in the upper region of the watershed are high hills, medium hills and low hills with isolated hillocks. The landforms of the middle region are lateritic mounds, narrow valleys, medium hills and low hills with isolated hillocks. The landforms of the lower region are valleys, sub merged lands with swamps and marshes and subdued sand dunes.

Slope

The slope of the watershed ranges from nearly level to steeply sloping. Dominant slope groups occurring in different physiographic regions are furnished below.

Upper region	Middle region	Lower region
Gently sloping (3-5%) to Moderately steeply sloping (10-15 %)	Nearly level (0-1%) to steeply sloping (15-30%)	Level (0-1 %) to very gently sloping (1-3 %)

Upper region : above 75 m MSL
Middle region : 7.5 to 75m above MSL
Lower region : less than 7.5m above MSL

Shape

The watershed has an inverted ‘L’ shape with maximum width at the interjection. The length –width ratio is 6:1.

Drainage

The major river draining through this watershed is the Periyar which has a length of 244 Km. The river is west flowing. The tributaries of the river are Mullayar, Kottamala Pallam, Madakkutti thodu, Karangal thodu, Inchippara thodu, Vazhukkappara thodu, Ummikkuppan thodu, Churakkotta thodu, Kallaradichan thodu, Irukutti Oda, Puvarasu Oda, Aruvi Oda, Kochchara Ar, Muntiri Medu, Palar Ar, Panni Ar, Kolikanam Oda, Thenkasi Oda, Machan Oda, Anchuruli Oda, Tekkanam thodu, Kirikkara thodu, Periyakadavu thodu, Tengakkai thodu, Chintalar Ar, Kattappana Ar, Emakkadu Ar, Kallar Ar, Tuval Ar (Kari thodu), Chinnar Ar, Chemman Ar, Mutirapuzha, Gudrale Ar, Kannimala Ar, Kallarkutti Ar, Kadal Ar, Anaimudi Ar, Bhimamala Ar, Vembantanni, Puvarnadi, Kumarikkal Ar, Nadalkal Ar, Karindiri Ar, Kuvala thodu, Kannambadi thodu, Cherutoni thodu, Palkulam thodu, Churuli thodu, Pazhayeri thodu, Devi Ar, Chittar Ar Kunji Ar, Melasari Ar, Metakadu Ar, Pambakampara Ar, Anakkulam Ar, Mamala thodu, Thudupi Ar, Kuttampuzha, Pooyamkutty Ar, Manali Ar, Idamala Ar,

Kudal Ar, Pichi Ar, Nallamalai Ar, Kakkani thodu, Kuzhimberi thodu, Cherpuram thodu, Pachankuttu thodu, Anaikayal thodu, Vadathpara thodu. Thundallil thodu, Rapra thodu, Kulinirkai thodu, Kulampattu thodu, Mannathil thodu, Chela thodu, Vattakalathu thodu, Perumtodu, Vamuzhi thodu, Pullani thodu, Maravetti thodu, Puliyampalli thodu, Chengal thodu, Kotayi thodu, Chulli thodu, Varapuzha, Nedungad Puzha, Nayarambalam thodu, Aniyil thodu, Thattapalli Ar, Onji thodu, Kotakulangara thodu, Anachal thodu, Penturuttu thodu, Pachappalli thodu, Pullut Ar, Ramavarama Canal, Iyyampilli thodu, Chattangad thodu, Pazhangad thodu, Shanmugam canal, Conolly thodu and Muttika thodu. The drainage pattern appears to be dendritic to parallel.

Geology

The major geological formation of the watershed is Archaean formation.

Upper region: The major rock types of the upper region are quartz-feldspar-hypersthene granulite, pyroxene granulite, gabbro, hornblende gneiss, calc-granulite, granite and garnet-biotite gneiss.

Middle region: The rock types of the middle region are quartz-feldspar- hypersthene granulite, pink granite gneiss, garnet-biotite gneiss, gabbro and pyroxene granulite.

Lower region: The formations of the lower region are laterites, coastal sand and alluvium, hornblende gneiss and quartz-feldspar-hypersthene granulite.

Water Resources

Surface water resources: The major river of this watershed is the Periyar River which has a total yield of 11341 Mm^3 and is perennial in nature. The annual utilizable yield of this river is 8004 Mm^3. It has one hundred and four tributaries including major and minor ones. The waterbodies in this watershed are Periyar Lake, Idukki reservoir, Edamalayar reservoir and Anairangal reservoir on the upper region and Ernakulam Kayal in the lower region.

Ground water resources: The area falls in the category of 'white' which means that only less than 65% of the ground water is utilized. There is no restriction for further development. The area under Mala block will be in the category of 'grey' in the near future.

The upper region of the watershed is suitable for domestic wells. The middle and the lower regions are suitable for large diameter dug wells and filter point wells respectively. The middle region has moderately shallow water table. The water table of the lower region ranges from shallow to moderately shallow.

Watershed Delineation

Periyar watershed is divided into 183 sub-watersheds and 448 microwatersheds. Among these 3 microwatershed comes in the middle portion viz, 14P35a, 14P35b, 14P35c are selected for this project.

Special Problems

According to the Watershed Atlas prepared by the Land Use Board the major problems in the river basin are as follows:

- Karumallur of Paravur taluk, Inchappara, Deviyar colony, Kuttampuzha, Chithirapuram, Vellathuval, Kunchithanny, Anachal, Devikulam, Anaviratty, Vattavada, Kottakampoor villages of Devikulam taluk, Churuli, Thattakany and Karimpanakandam of Thodupuzha taluk, Vandiperiyar, Elapara, Mlapra, Kumily and Upputhara of Peerumedu taluk, Padamugham, Konnathady, Panichankudy, Pallivasal, Vathikudy, Chinnakanal, Pathinaramkandam, Mavadi,

Kailasam, Murikkasseri, Pothenkadu, Chemmanar, Senapathy, Aruvilamchal, Poonamala, Kalkoonthal, Charalamedu, Kochuthovala, Kunthalampara, Kombayar, Palar, Pushpakandom, Chottupara, Anakeramedu, Karimban, Upputhodu, Kamakshy, Parakkadavu, Prakash, Kattekana, Balagram, Balagram south, Sanyasioda, Gajendrapuram, Ramakalmedu, Pallikanam, Kottar villages of Udumbanchola taluk, Neendapara of Kothamangalam taluk have shown indications of landslips/landslides.

- The forest land of the upper and middle regions are of degraded nature.
- The erosion status of the upper region of the watershed is moderate to severe.
- The area experiences streambank erosion along the river course. The severity of the streambank erosion is observed in the middle and lower region.

4.3 ADIMALI BLOCK

Adimali Block Panchayat is located in Devikulam Taluk of Idukki District. Adimaly Block Head Quarters is Adimaly town. It consists of Adimali, Konnathadi, Bison Valley, Vellathooval and Pallivasal Grama Panchayats. The Block Panchayat covers an area of 400.86 sq km and is spread over the villages of Mannamkandam, Konnathadi, Bison Valley, Rajakkad, Vellathooval, Kunchithanni, Pallivasal and Anaviratti. There are 13 wards in the block. Adimaly block is bordered by Devikulam block on north, Ernakulam district in the west, Nedumkandam block on the east and Idukki block on the south. It is located on the National Highway 49, now NH 85, known as Kochi-Dhanushkodi National Highway, earlier known as the Kochi Madhura Highway connecting Kochi and Madurai, India. Cheeappara Falls and Valara Falls situated in the Adimaly block panchayath are famous for its scenic view.

The total population of the block as per 2011 census is 126262 of which 63282 are male and 62980 are female. The population density is 314.98 and literacy rate is 83%. Out of total population 104901 are literate. Among males the literacy rate is 85% as 53809 males out of total 63282 are literate however female literacy rate is 81% as 51092 out of total 62980 females are literate.

Based on physiographic nature, Kerala is divided into three regions namely highland, midland and lowland. Adimaly block falls under high land category characterized by undulating to rolling lands interspersed with narrow valleys and hills with steep gradients. The block is approximately The major soil found in these area are forest loam, laterite and hilly soils. These soils have reddish brown to yellowish red/strong brown colour.

Cash crops such as cardamom, pepper, coffee, cumin, cocoa, coconut and rubber are grown in the hills and on the slopes of the block. Cardamom is mainly grown on the slopes of high hills. Pepper is cultivated in 7102.42 ha area in the block. Ginger and Turmeric are also widely cultivated in these area. On assessing the Agricultural Statistics report 2019-20, Adimaly block panchayath stand first in the cultivation of ginger and turmeric in Idukki district with an area of 100.63 and 47.95 ha respectively. Among vegetables, the cultivation Brinjal is highest with a total area of 814.05 ha. The block panchayath also hold the first position for cocoa cultivation with an area of 3596.28 ha in the district. The Paddy is cultivated in 55.69 ha area in the block. The cultivation of paddy decreased as compared to the previous year.

Table 4.3.1 Demographic Details of Adimali Block

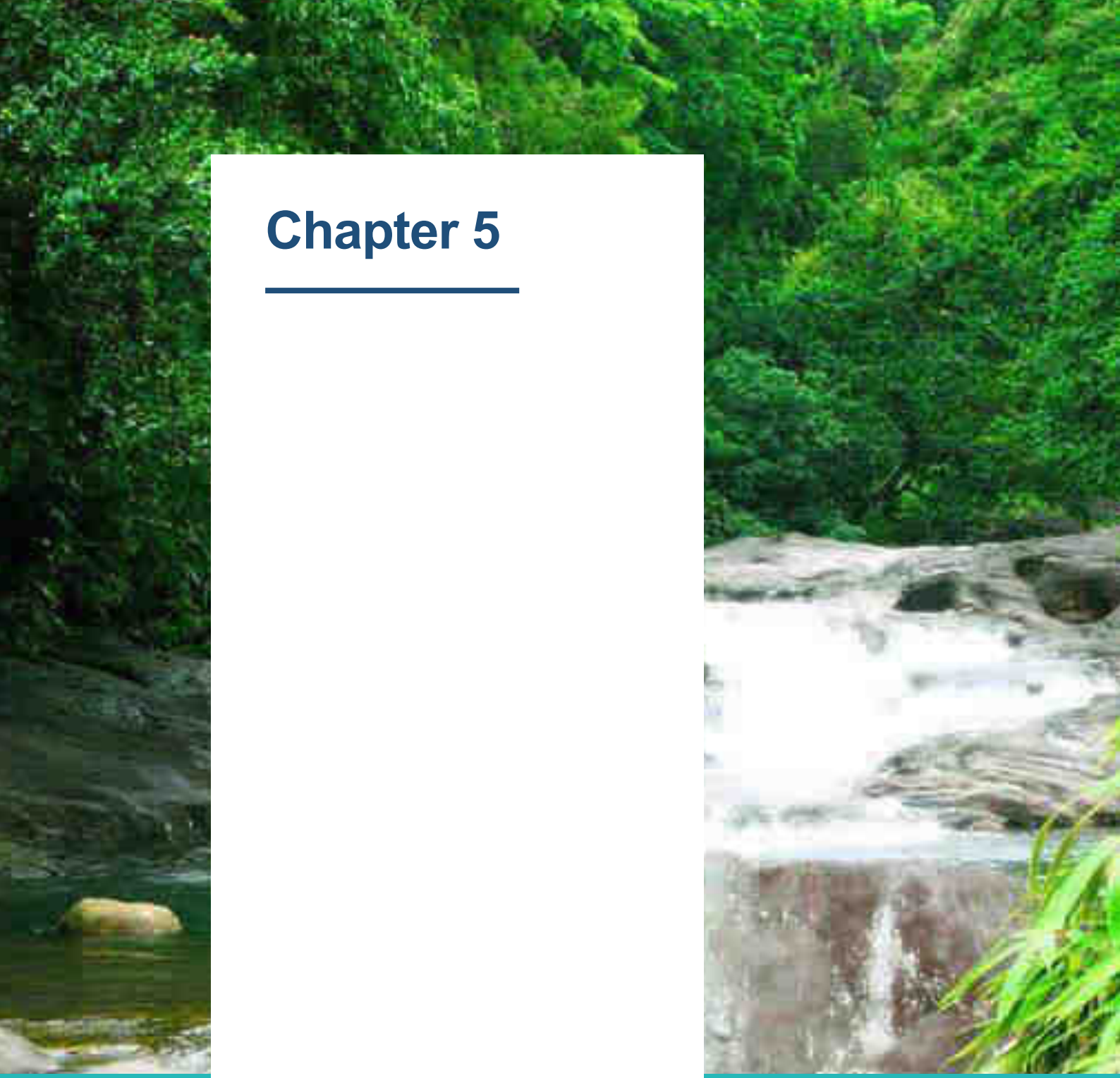
Name of Panchayath/Block	Area (in Sq. Km)	No. of House Holds	Density of population (Sq. Km.)	Total Population			Scheduled Castes			Scheduled Tribes		
				Person	Male	Female	Person	Male	Female	Person	Male	Female
Vellathuval	71.29	6437	360.51	25701	12896	12805	1656	837	819	355	176	179
Adimali	157.60	10336	256.87	40484	20217	20267	3158	1529	1629	6655	3320	3335
Pallivasal	41.09	4269	414.75	17044	8539	8505	4570	2250	2320	115	60	55
Konnathady	68.33	7398	425.75	29092	14637	14455	908	463	445	769	403	366
Baisonvally	62.54	3474	222.91	13941	6993	6948	1127	559	568	695	357	338
Adimali Block	**400.86**	**31914**	**314.98**	**126262**	**63282**	**62980**	**11419**	**5638**	**5781**	**8589**	**4316**	**4273**

4.4 GRAMA PANCHAYATS FALLING IN THE PROJECT AREA

Parts of the Adimali Grama Panchayats coming under Adimali Block panchayat fall in the project area. The details are given in Table below:-

Table 4.4.1 Grama Panchayats falling in the project area

Sl. No.	Panchayat	Total Geographical Area (TGA)	WDC-PMKSY project area
1.	Adimali	4609.56	4313.00



Chapter 5

CRITERIA FOR SELECTION OF WATERSHED DEVELOPMENT PROJECT

IDUKKI WDC-1/21-22

5.CRITERIA FOR SELECTION OF WATERSHED DEVELOPMENT PROJECTS

The watershed development projects will be broadly taken up in the most vulnerable rainfed Districts by prioritization of micro-watersheds. While prioritizing the watershed projects in the critical areas of the districts, the following criteria may be used in selection:

- Frequency of drought occurrence.
- Acute scarcity of drinking water Degree of over exploitation of ground waterresources.
- Preponderance of degraded lands/wastelands.
- Decline in Normalized Difference Vegetation Index (NDVI).
- Status of soil health, aquifer characteristics and topography.
- Hydrological assessment of surplus run off from watersheds Contiguity toanother watershed that has already been developed/ treated.
- High proportion of population belonging to scheduled castes and scheduledtribes, and other socially & economically backward population.
- Low productivity of major crops to that of District/State average.
- Willingness of village community to make voluntary contributions, adopt regulatory norms for maintenance of common property resources, and ensure equitable sharing of the resources/benefits.

Table 5.1.1 Criteria for Selection of Watershed

Sl. 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/ DPAP/ DDP Block	15	-66.7 & below (15) DDP Block	-33.3 to -66.6 (10) DPAP Block	0 to -33.2 (0) Non DPAP/ DDP Block	
vii	Area under rain-fed agriculture	15	More than 90 % (15)	80 to 90 % (10)	70 to 80% (5)	Above 70 % (Reject)
viii	Drinking water	10	No source (10)	Problematic village (7.5)	Partially covered (5)	Fully covered (0)
ix	Degraded land	15	High – above 20 % (15)	Medium – 10 to 20 % (10)	Low- less than 10 % of TGA (5)	

Sl. No.	Criteria	Maximum score	Ranges & scores		
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 microwatersheds in the project (10)	Contiguity within the microwatersheds in the project but non contiguous to previously treated watershed (5)	Neither contiguous to previously treated watershed nor contiguity within the microwatersheds in the project (0)
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 microwatersheds in cluster (10)	2 to 4 microwatersheds 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 microwatersheds in cluster (10)	2 to 3 microwatersheds in cluster (5)

Watershed Development Programme is prioritized on the basis of thirteen parameters namely Poverty Index, Percentage of SC/ST, Actual wages, Percentage of small and marginal farmers, Ground water status, Moisture Index, Area under rainfed agriculture, drinking water situation in the area, Percentage of the degraded land, Productivity potential of the land, Continuity of another watershed that has already developed/treated, Cluster approach for plain or for hilly terrain. Based on these thirteen parameters, a composite ranking was given to WDC-PMKSY Watershed project as given in table below: -

Table 5.1.2 Weightage of the Project

Sl No	Criteria	Weightage
1	Poverty index (% of poor to population)	7.5
2	% of SC/ ST population	5
3	Actual wages	0
4	% of small and marginal farmers	10
5	Ground water status	0
6	Moisture index/ DPAP/ DDP Block	0
7	Area under rain-fed agriculture	15
8	Drinking water	7.5
9	Degraded land	5
10	Productivity potential of the land	15
11	Contiguity to another watershed that has already been developed/ treated	10
12	Cluster approach in the plains (more than one contiguous micro-watersheds in the project)	0
13	Cluster approach in the hills (more than one contiguous micro-watersheds in the project)	10
	Total	**85**

5.2 WATERSHED INFORMATION

Table 5.2.1 . General Features of Adimali Watershed Project

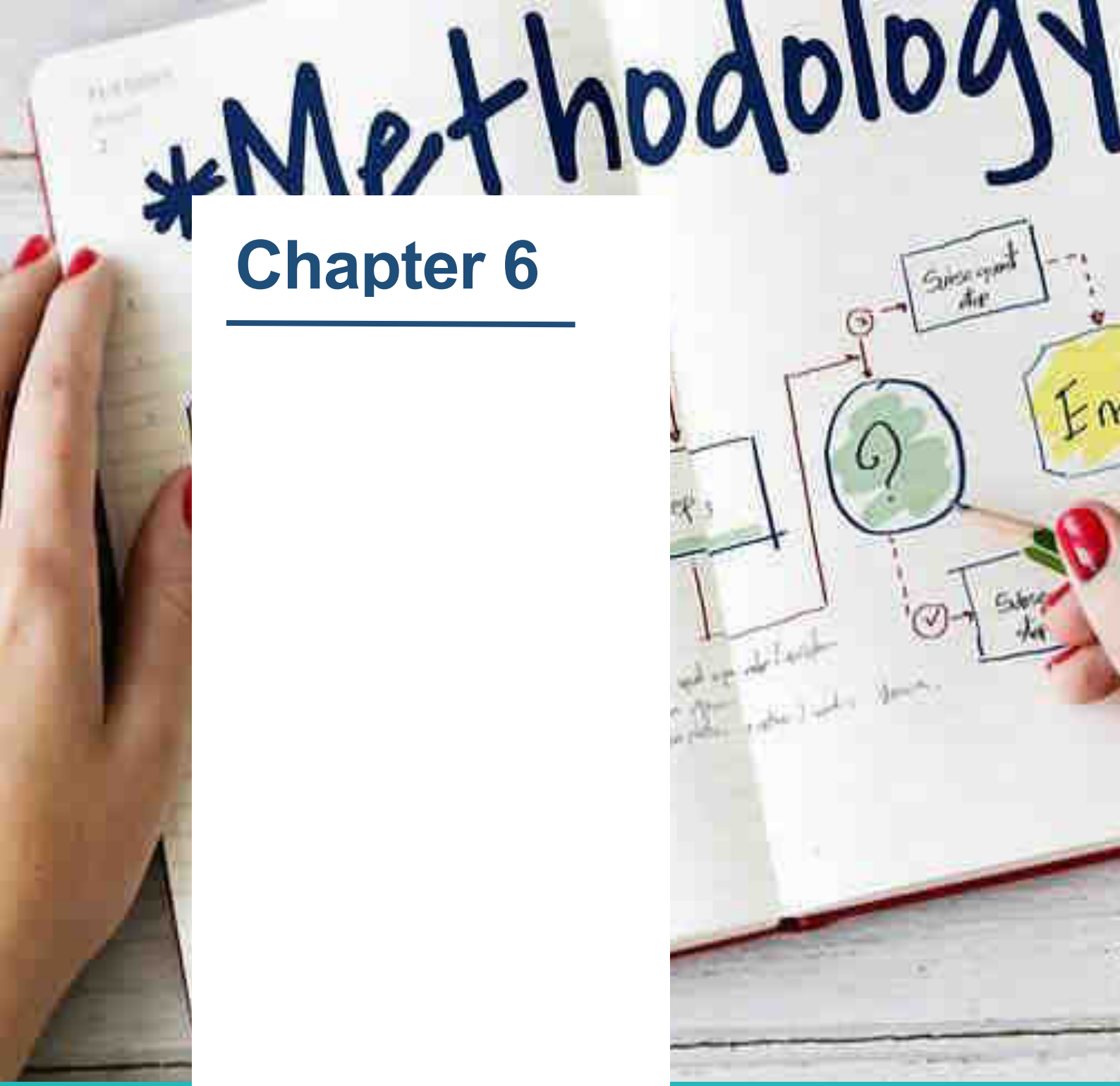
Name of Project	Adimali Watershed
Name of Program	WDC-PMKSY 2.0
Location	
Blocks	Adimali
District	Idukki
Type of project	Hilly
Total Villages	1
Total Gram Panchayats	1
No. of micro watersheds	3
Total Watershed Committees	3
Total Geographical Area	4609.56 Ha
Area available for treatment	4313.00 Ha
Sanctioned Area	4313.00 Ha
Total Sanctioned Cost	Rs. 120764000
Proposed budget on NRM	56759080
Proposed budget on Livelihood Enhancement	18114600
Proposed budget on Productivity Enhancement	18114600
Cost per Ha (WDC-PMKSY 2.0 project)	28000 per Ha
From Project Cost	Rs. 120764000
From Convergence	
Agro climate zone	Southern and Central foothills, Southern High Hills
Major crops	Pepper, Cardamom, Rubber, Banana, Tapioca, Coconut, sw Vegetables
Major slope range	
Major streams	first and second order
River Basin	Periyar
Major soil series	Kanjikuzhi, Karimannur, Suryanelli, Pambla
Rainfall	3065 mm
Marginal and Small farmers	
Major option of livelihoods	Agriculture, Animal husbandry, Wage employment
Water table	8 to 9 meter
Source of drinking water	Open well, Bore well, Hand pump
Quality of drinking water	Good
Irrigation source	Open well and surface water bodies
Cattle	Cow, Buffalo and Goat
Name of PIA	Adimali Block Panchayath
Coordinating Person in PIA	Secretary, Block Panchayath
Address	Adimali Block Office Idukki- Pin - 685561

5.3 BUDGET

The distribution of budget for Adimali Idukki WDC-1/21-22 for the various components as per WDC-PMKSY 2.0 guidelines is given below:

Table 5.3.1 Budget

Head	Subhead	% of Budget	Adimali
Administrative	Management Cost	10	12076400
	Monitoring and Evaluation	2	2415280
Preparatory Phase	Entry Point Activity	2	2415280
	DPR Preparation	1	1207640
	Institution and Capacity Building	3	3622920
Work Phase	Natural Resource Management	47	56759080
	Production System	15	18114600
	Natural Resource Management & Governance	2	2415280
	Livelihood Activities for the asset less persons Micro Enterprises & Business Development	15	18114600
Consolidation and Withdrawal Phase		3	3622920
Total		**100**	120764000



Chapter 6

METHODOLOGY

IDUKKI WDC-1/21-22

6. METHODOLOGY

6.1 Watershed Development Strategy

Watershed is a geo-hydrological and biological unit draining through a common point called outlet. It is a dynamic system of living and non-living things. It simply described as development of physical and biological elements for sustainable and self-reliant interdependence. It is obvious that watershed development is the development of all the constituents of a watershed. Such a development can be achieved through a complete understanding of a system and sub-system of the watershed. Hence, the exploration of all the elements of a watershed becomes an important component of watershed planning so as to efficiently address the needs of all the dependents.

Soil and water conservation remains the core activity. Soil conservation mainly means conserving and protecting the soil from wind or water erosion. It also means improving the microbial activities in the soil and making it "live". Water conservation will be achieved through both engineering and biological measures. In addition to soil and water conservation, watershed development project ought to address several issues for achieving sustainable development. Adoption of the following strategies can ensure sustainable watershed development. Scientific planning with participatory approach is only and one method to make the programme successful.

Watershed management as a strategy has been adopted by Government of India especially in the rainfed regions of semi-arid tropics. These regions are characterized by low and undependable rain, low soil fertility, poor infrastructure development, low literacy and high incidence of migration. Several studies have identified that there is a great need of a systematic and scientific approach to deal with watershed development. The common guidelines generate a fresh and flexible framework for the next generation watershed development.

6.2 Scientific Planning

i) Cluster Approach

This envisages a broader vision of Geo-hydrological unit which involves treating a cluster of micro-watershed. The WDC-PMKSY 2.0 Project consists of three micro- watersheds namely as 14P35a, 14P35b, 14P35c as their respective codes. The project falls in part of Adimali Grama Panchayat under Adimali Block Panchayats.

ii) Transect Walk

Transect walk is a kind of exploratory walk, under taken by the team with the villagers to collect information on the soil type, land use pattern, cropping pattern, existing resource etc.,

In order to identify the areas to be treated, proposed work sites and assess the feasibility, the experts carried out a reconnaissance survey through transect walk. The sites were marked and the different treatment measures required for the treatment of the area were also recommended. During the exploratory walk the present status of the watershed is observed along with their problems. The ground water level is observed and analyzed by the team during the summer and winter. The transect walk also enables in the understanding of the plantation crops and vegetables grown in the watershed area. Livestock populations are also accounted. Various pending and unsolved problems are located and are given prior importance as EPA.

iii) Base line Survey:

To access the impact of any watershed development programme a detailed baseline survey has to be conducted. This acts a benchmark for any intervention during and post implementation of any development programme. A detailed baseline survey was undertaken which involved Bio-physical survey and Village level data collection.

Bio-physical survey was undertaken to identify various natural resources available in the village. It included the soil typology, well in the area, crop taken in the field, Cropping pattern, fertilizer used and various sources of irrigation in the field.

iv) Secondary data: The secondary data was obtained through Census reports and Panchayat Level Statistics. Data pertaining to social profile is also collected through Census reports. Secondary data related to different kinds of capital assets were collected from different departments of Government agencies such as Village Office, KrishiBhavan, Primary Health Center, District Rural Development Agency initiative-SGSY Programme office, Kudumbasree working on poverty alleviation, Grama Panchayat, other NGO's and development societies etc. Climatic information like annual rainfall with monthly distribution of five year and temperature is collected from the Indian Meteorological Department. The Resources Maps prepared by Kerala State Land Use Board provides the details of land use/land cover, drains, transport network, assets and other water resources. The Detailed Soil Survey report prepared by Department of Soil Survey and Soil Conservation was used to understand the soil classification, texture, depth, erosion and land capability.

v) Technical/ Field to field Survey: To know the present land use/land cover and slope, field to field survey was also carried out in the project area with the involvement of the local people. It also includes the numbers of water harvesting structure in the area, crop taken in the field, cropping pattern, fertilizer used and various sources of irrigation in the field. For the ridge –valley planning the field-to-field survey is carried on to demarcate the terrain in the cadastral map.

While implementing the project it is necessary that the treatments are carried out starting form ridge and progressing towards the valley. This approach is followed with the following objectives

- protect the upper reaches to avoid erosion and reduce runoff
- avoid siltation of structures in the middle and lower catchments
- ensure the cost effectiveness of structures in the valley and
- Improve overall efficacy of the measures.

vi) Focus Group Discussion

Kerala State Land Use Board has carried out the FGD with farmers and women in order to understand various issues related to their day-to-day life. PRA tools such as time line, daily activity chart, details of SHG's, details of common property resources, seasonal health problems, child education, problems of agriculture and seasonal charts were discussed. In this discussion women were encouraged to speak about their problem. The women who drew these charts described the differences between the rainy and dry season patterns. In the dry season, it took longer to get water from the well and collecting firewood to stockpile for the rainy season. When the rains come, things are much busier and the women's days are much longer because of all the work to be done in the fields.

Problem Identification

After analysis all the information collected during field survey and Focus Group Discussions, the main problems identified includes the following:

- Problem in drinking water facilities
- Low production due to practices of traditional method of cultivation
- Low milk production due to local/ non descript breed and less availability of fodder
- Low economic condition due to low production
- Soil erosion from farm land
- Less cultivation of vegetables
- Lack of value addition practices
- Less availability of fodder
- Migration

vii) Use of GIS and Remote Sensing for planning

Remote sensing and GIS play an important role in the study of natural resources and helps in planning water resources development. One of the greatest advantages of using remote sensing data for hydrological investigations and monitoring is its ability to generate information in spatial and temporal domain, which is very crucial for successful analysis, prediction and validation Use of various high science tools has been promoted at various stages of watershed development.

Prioritization: Geographical Information System (GIS) has been used for prioritization process. Various layer maps were created like Geo-morphological, Soil, BPL Population, SC/ST population, Ground water Status, Drinking water situation and Slope percent. These were all given proper weightage and this helped in prioritization of various watershed areas.

Planning: A action plan matrix was been formulated by taking into account various features like the slope percent, soil depth, soil texture, soil erosion in the area for wasteland, forest land and agricultural land. Global Positioning System (GPS) was used to identify each and every water conservation structures available in the project area. This was used to create a map. Contour Map of vertical interval of 10 meter at a scale of 1:25000 was used for identifying various location specific recommendations for soil and water conservation structures.

Hydrological modeling: Hydrology modeling technique was been used for locating drainage, stream length, flow direction, sink, and flow accumulation. This model overlaid over cadastral map help to calculate the catchment area of each structures like the check dam etc. This has helped to remove the human error which generally occurring while calculating the catchment area of a check dam.

Table no. 6.2.1: Details of Scientific Planning and Inputs in WDC-PMKSY 2.0 projects

Scientific criteria/ inputs used	Scientific Criteria Used
(A) Planning	
Cluster approach	Yes
Whether technical back-stopping for the project has been arranged? If yes, mention the name of the Institute	Yes Kerala State Land Use Board
Baseline survey	Yes
Hydro-geological survey	Yes
Contour mapping	Yes
Participatory Net Planning (PNP)	Yes
Remote sensing data-especially soil/ crop/ run-off cover	Yes
Ridge to Valley treatment	Yes
Online IT connectivity between	
(1) Project and DRDA cell/ZP	Yes
(2) DRDA and SLNA	Yes
(3) SLNA and DoLR	Yes
Availability of GIS layers	
1. Cadastral map	Yes
2. Village boundaries	Yes
3. Drainage	Yes
4. Soil (Soil nutrient status)	Yes
5. Land use	Yes
6. Ground water status	Yes
7. Watershed boundaries	Yes
8. Activity	Yes
Crop simulation models#	No
Integrated coupled analyzer/ near infrared visible spectroscopy/ medium spectroscopy for high speed soil nutrient analysis	No
Normalized difference vegetation index (NDVI)	No
Weather Station	
(B) Inputs	No
1. Bio-pesticides	No
2. Organic manures	Yes
3. Vermicompost	Yes
4. Bio-fertilizer	No
5. Water saving devices	Yes
6. Mechanized tools/ implements	Yes
7. Bio-fencing	Yes
8. Nutrient budgeting	No
9. Automatic water level recorders & sediment samplers	No

Usage of Data

The data, primary as well as secondary, which was obtained from the various authentic sources, was used in formulation of the local needs of the populace and also to plan the interventions required for the optimum utilization of the available resources in the watershed area. The due emphasis was given to plan the activities to fill in the existing gaps and to address the weak indicators.

Preparation of Action Plan

Data was analyzed and based on the identified needs and problems in the watershed area, a draft action plan was prepared

Chapter 7

SWOT ANALYSIS

IDUKKI WDC-1/21-22

7.SWOT ANALYSIS

SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses/Limitations, Opportunities, and Threats involved in the implementation of a project. It involves specifying the objective of the project and identifying the internal and external factors that are favorable and unfavorable to achieve the objectives of the project. Setting the objective should be done after the SWOT analysis has been performed. This would allow achievable goals or objectives to be set for the organization.

- Strengths: characteristics of the project team that give it an advantage over others
- Weaknesses (or Limitations): are characteristics that place the team at a disadvantage relative to others
- Opportunities: external chances to improve performance (e.g. make greater profits) in the environment
- Threats: external elements in the environment that could cause trouble for the project

Identification of SWOTs is essential because subsequent steps in the process of planning for achievement of the selected objective may be derived from the SWOTs.

7.1 A SWOT analysis was done for the PIA and the result is as follows:

Strengths:

(1)Strong linkages with line departments for technical guidance.
(2)Scientific planning with the help of Kerala State Land Use Board.
(3)State level and District level committees for monitoring, coordination & Co-operation.
(4)Previous knowledge of convergence with various line departments
(5)Prior acquaintance of officers with the villagers of selected project area, hence ease in implementation of project.
(6)Well informed farmers and general public
(7)Most of the project area is near to the PIA's office.

Weakness:

(1)Inadequate infrastructural facilities
(2)Various schemes are being implemented by the PIA with limited human resources.
(3)Shortage of reputed training centres for capacity building at village level to ensure the proper implementation of the project.

Opportunities:

(1)A number of different other development schemes of the government are running; so, there can be horizontal integration and convergence of programmes.
(2)Neighbourhood Groups, User groups and Self Help Groups
(3)Better financial provision under WDC- PMKSY, So better quality of work can be expected
(4)Usage of new ICT tools like GIS, GPS and MIS integration of the project with the State Level Data Cell for online monitoring and evaluation.
(5)Can easily identify and resolve the problems of the area
(6)Transparency in Accounting System

Threats:

(1) Heavy rainfall and landslide are unreliable in the project area, the activities planned to be taken up may yield limited impact.
(2) Overloaded work may mislead the watershed project or may divert the vision at the time of implementation of the projects of WDC-PMKSY 2.0

(3) Options in production system are limited due to the lack of sufficient natural resources and due to limited resource base.
(4) Irregularities in fund flow can derail the smooth functioning.
(5) Political interference can dissatisfy the team to work properly.

In addition to this separate SWOT analysis was carried for the different area of intervention for identifying the internal and external factors that are favorable and unfavorable to achieve the objectives of the project. The details are presented in the Table below.

Table. No. 7.1.1 SWOT Analysis of Adimali IDUKKI WDC-1/21-22

Sl. No	Area of Intervention	Strengths	Weaknesses	Opportunities	Threats
1	Agriculture	• Fertile land created by clearing off forest area. • Area potential to increase productivity • High productivity of pepper and cardamom • Suitable climate for the production of spices	• Attack of wild animals in farm field • Lack of integrated farming practices. • Lack of processing units for spices	• If wild animals attack is controlled, considerable increase in agriculture production can be assured. • Increasing demand for spices. • Value addition of spices can increase the income of farmer	• Heavy and unreliable rainfall • Area is prone to land slides and soil erosion
2	Horticulture	• Favorable climate for floriculture • Farmers are interested in the cultivation of Cocoa, Nutmeg and Coconut • Suitable area for starting spice garden	• Lack of advanced varieties. • Lack of marketing facilities. • Lack of storage facilities	• Area is on the way to Munnar hill station, ventures like spice garden, medicinal garden will get more attention. • Interest of the villagers to expand horticulture activities. • Increasing price level • Increased demand for homemade chocolate	• Rapid Climate Change. • Pest and disease attack
3	Animal Husbandry	• Favourable environment to raise cow and goats. • Cow and goat rearing are the main income generating activity other than crop cultivation	• Lack of good quality fodder availability. • Lack of milk processing unit. • Lack of milk transportation and cooling facility for dairy cooperatives	• Providing more advanced cattle breeds can increase the milk production and enhance their subsidiary livelihood option. • Providing milk processing and storage units to dairy cooperative will increase the income of farmer • Value addition of milk	• Animal Diseases. • Lack of awareness of Dairy farming as a commercial activity. • Severe climatic conditions.

			• Low level of Milk production.		
4	Natural Resources	• Extensive natural drainage system • High biodiversity	• No direct water distribution mechanisms. • Land slides and soil erosion • Poor water quality	• Strip terracing can minimize soil erosion from farm land • Construct water storage tanks for drinking as well as house hold activities.	• Heavy and unreliable rainfall. • Land slides
5	BPL Household's Livelihoods	• Most of them are small and marginal farmers. • Major income generating activities are dairy and poultry	• Less income and limited livelihood options. • Practicing traditional way of farming which is based on subsistence. .	• If more viable and income generating livelihood practices are followed higher income can be achieved. • Scientific way of farming can increase income as well as quality of life of BPL families. • Peoples are interested to take up livelihood activities.	• Due to adverse weather conditions the normal working days are very less.
6	Micro-Enterprises and Production systems.	• Scope for spice based micro-enterprises in the area • Availability of natural/man-made resources • Interest of farmers to start micro-enterprises	• Lack of organizing and Management skills. • Lack of proper organization among farmers. • Lack of collection units and marketing facilities.	• If proper orientation and training is given farmers can run micro-enterprises by themselves. • Technical support can be given to farmers organization for proper working.	• Due to adverse weather conditions the normal working days are very less.

7.2 PROBLEM TOPOLOGY

Some of the major issues viz., land, water resources, common property resources and drinking water were analyzed and the details are presented below.

Table No. 7.2.1 Problem Topology of Adimali IDUKKI WDC-1/21-22

Issues	Problem area	Constrains	Solutions	Project support	Likely benefit/ beneficiaries
Land	• Soil erosion • Productivity • Land slides	• Undulated Topology • Severe Soil erosion • Uncontrolled Drainage • Heavy run off in the downstream and bank erosion • Poor soil status	• Renovation of WHS • Construction of new WHS • Catchments of WHS will be treated • Renovation of old wells and stone patching • Percolation Tank, LBS, LBCD, Field bunding, masonry check dam, gully plugs in the area. LBCD with vegetative barriers, Earthen/ Masonry check dam	• Renovation of existing water bodies • Construction of new water bodies • Different soil conservation measures from ridge to valley • Promting Horticultural crops through convergence	• Soil and water conservation • Increase in production • All farmers
Water Resource	• Surface water source • Ground water source	• Poor irrigation potentiality of WHS and water bodies • Siltation of water bodies • Erratic rainfall and Heavy rainfall	• Repair of existing water bodies • Creation of new water bodies • Different soil and water conservation measures to recharge ground water • Field bunding	• Repair of existing WHS and ponds • Field bunding and contour bunding • Percolation tank in the upper reach • Ring wells and farm ponds in the lower reach	• Increase in ground water table • Increase production & income • All farmers

Issues	Problem area	Constrains	Solutions	Project support	Likely benefit/ beneficiaries
			• Farm pond and ring wells in the lower reach to tap the ground water		
CPR	• Awareness	• Encroached by watershed dwellers • Poor soil status • More prone to grazing	• Mutual solution for possible measures • Pasture land development	• Pasture land development for community fodder bank	• Increase the Income of watershed dwells • Meet the basic need like food, fodder and fuel • All House holds
Drinking Water	• Poor Drinking water quality • Availability • Low water table	• During rainy season drinking water source get contaminated • Symptom of high level of iron and fluoride content in the water • Open wells get dried during summer due to low water table	• Repair of platform with drain and soak pit • Ground water recharge through various water conservation measures	• Water testing of drinking water sources • Well recharging • Rain water harvesting	• All House holds

The Adimali project area has low productivity because of the following reasons:

i) Full dependence on monsoon:

The project area is dependent on monsoon. Water is essential input in agriculture. Due to the absence of proper irrigation facility,90% of the total cultivated area depends on the uncertain monsoon. Therefore, the success or failure of the monsoon determines the success or failure of agriculture production. The rainfall is unreliable due to two factors: untimely and inadequate.

ii) Low use of fertilizer per unit cropped area:

Farmers do not use sufficient fertilizer due to lack of water, scarcity of fertilizer in market and insufficient money for fertilizer. Many a times they don't get fertilizer at the right time.

iii) Traditional farming methods:

This also leads to low productivity. There is a lot of ignorance about the use of new farming methods and technologies such as multiple cropping. They are Some use of FYM and other input in a proper way; that is why they don't get 90% output. So these factors contribute to low productivity.

iv) Lack of adequate farm machinery:

Even today a large number of farmers in Vamanapuram use wooden ploughs and bullocks. They don't have adequate machinery like seed drill. So, old machineries take more time in tillage practices.

v) Lack of finances for farmers:

In the project area, most of the farmers are marginal and small. They do not have enough money to buy good quality seeds, machinery and other inputs.

vi) Lack of good quality seeds and fertilizers:

Good quality seed, fertilizer and pesticide are important factor in agriculture productivity. The use of good quality leads to higher land productivity. In the project area, however, there are two limitations in the use of fertilizer. First these fertilizers are most useful in irrigated condition. But in the project area, 90 per cent of land depend on rainfall.

vii) Lack of other facilities such as storage and marketing:

4-8% of agriculture product damage after harvesting due to scarcity of proper storage and proper market for sale. So he sells to local traders at the low prices. Farmers mainly face proper means of transportation. And second problem is farmers don't have proper storage facilities.

7.3 Project Implementation

The Block Panchayat having the major area under the programme is selected as the Project Implementing Agency (PIA) by the State Level Nodal Agency (SLNA) for The New Generation Watershed Development Project WDC-PMKSY 2.0 in Kerala. The PIA is responsible for implementation of WDC- PMKSY watershed project. In Idukki district, the Adimali Block Panchayat is selected as the Project Implementing Agency. The office of PIA is located at Adimali.

The Project Implementing Agency (PIA) provides necessary technical guidance to the Grama Panchayat for preparation of development plans for the watershed and undertake community organization and training for the village communities, supervise watershed development activities, inspect and authenticate project accounts, encourage adoption of low cost technologies and build upon indigenous technical knowledge, monitor and review the overall project implementation and set up institutional arrangements for post-project operation and maintenance and further development of the assets created during the project period.

The PIA, after careful scrutiny, shall submit the Action Plan for Watershed Development Project for approval of the DRDA and other arrangements. The PIA shall submit the periodical progress report to

WCDC. The PIA shall also arrange physical, financial and social audit of the work undertaken. It will facilitate the mobilization of additional financial resources from other government programmes, such as MGNREGS, State Horticulture Mission, VFPCK, Tribal Welfare Schemes, Artificial Ground Water Recharging, Greening India, etc.

7.4 Co-ordination

The full responsibility of overseeing the watershed programme within the district will lie with the WCDC which will work in close collaboration with the District Planning Committee (DPC). The DPC will provide full governance support to the programme. The DPC will approve the perspective and annual action plans relating to watersheds projects in the district. DPC will integrate the watershed development plans with over all district plans and also oversee its implementation. DWDU will help the DPC in providing oversight and ensuring regular monitoring and evaluation of the programme. The District Panchayat will have an important role of governance in matters relating to the co-ordination of various sectoral schemes with watershed development projects, review of progress, settling disputes etc.

Chapter 8

BIOPHYSICAL RESOURCES

IDUKKI WDC-1/21-22

8.BIO PHYSICAL RESOURCES

8.1 LOCATION OF THE PROJECT

Project area is mainly located in Adimali block of Idukki district of Kerala State. The project is a cluster of 3 micro watersheds viz..The total area of the project is 4609.56 Ha of which 4313.00 Ha is proposed to be treated under the New Generation Watershed Development Project (WDC-PMKSY 2.0).

Table- 8.1.1 Details of Watershed code, name and area

Sl No	Code of watershed	Name of watershed	Area in Ha	Percentage
1	14P35a	Valara	788.74	17.11
2	14P35b	Irumbupalam	1386.28	30.07
3	14P35c	Machiplavu	2434.54	52.82
	Total		**4609.56**	**100.00**

The project area falls in the Adimali GramaPanchayat under the Block Panchayat Adimali

Table- 8.1.2 Details of Watersheds, Grama Panchayaths and area

Sl No	Code of watershed	Grama Panchayath	Area in Ha
1	14P35a	Adimali	788.74
2	14P35b	Adimali	1386.28
3	14P35c	Adimali	2434.54
	Total		**4609.56**

8.2 CLIMATE

The project area has a humid tropical climate.

8.2.1 Temperature

The mean maximum temperature is 32 °C (April – May) and the mean minimum temperature is 19°C (December – January). Humidity is high and rises to about 90 percent during the south west monsoon. The monthly mean daily temperature is given below.

Table No. 8.2.1 Monthly mean maximum and minimum temperature

Month	Mean temperature(^{0}C)	
	Maximum	Minimum
January	29ºC	19°C
February	30°C	20°C
March	31°C	21°C
April	32°C	22°C
May	30°C	22°C
June	28°C	21°C
July	27°C	21°C
August	28°C	21°C
September	28°C	21°C
October	28°C	21°C
November	28°C	20°C
December	28°C	19°C

8.2.2 Rainfall

Rainfall is the major source of ground water recharge and rainfall pattern plays an important role on the water levels in the phreatic aquifer and also indirectly to the deeper leaky and confined aquifers. The rainfall data for Idukki district from Indian Meteorological Department, Idukki, is analyzed.

Table- 8.2.2 Details of Seasonal Rainfall

Monsoon 2021	Actual (mm)	Normal (mm)	Percentage Departure (%)	
Winter Rainfall 1 st jan to 28 th feb	129.2	29	346	Large Excess
Premonsoon 1 st March to 31 st may	756.5	426.4	77	Large Excess
South West Monsoon 1 st june to 30 th September	2108.4	2615	-19	Deficient
North East Monsoon 1 st October to 31 st december	1256	567.7	121	Large Excess

Winter period:- During the month of January to March 2021, the district receives a surplus of rainfall than the normal. The percentage departure from normal rainfall was 346 %.

Hot weather period**:-** During the month of April-May 2021, the departure of pre-monsoon rainfall recorded is 77 % ie surplus type of rainfall during the season.

South West Monsoon period**:-** During the south west monsoon season from June to September 2021, the departure of rainfall recorded in the district is -19 %. The district recorded deficient type of rainfall during the season.

North East Monsoon period**:-**During the north east monsoon period from October to December 2021, the district received a surplus of rainfall. The percentage departure from normal rainfall was 121 %.

Annual rainfall distribution

The annual rainfall received for the year 2020 is 3356.3 mm. The monthly annual rainfall distribution from 2010-2020 is given in table below.

Table- 8.2.3 Details rainfall over a period of 10 years

Ten year rainfall distribution of Idukki district (in mm)																
Sl.No	Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Actual	Normal	Departure %
	2	3	4	5	6	7	8	9	10	11	12	13	14			
1	2010-2011	777.3	543.6	306.1	428.5	305.6	24.5	43.7	40.5	17.4	272.2	81.1	869.3	3709.8	3600.4	3.0
2	2011-2012	676.1	709.9	382.3	363.6	172.2	46.0	8.8	2.6	47.4	277.0	106.4	423.9	3216.2	3342.8	-3.8
3	2012-2013	501.0	606.1	273.1	202.4	158.4	5.3	0.3	15.1	51.7	109.9	95.5	1123.1	3141.9	3303.0	-4.9
4	2013-2014	1025.0	688.6	507.2	230.0	199.2	13.7	7.8	14.2	27.1	86.8	235.0	493.0	3527.6	3303.2	6.8
5	2014-2015	873.8	749.4	590.6	421.6	127.1	40.1	1.4	14.4	80.1	261.4	165.9	436.3	3762.1	3303.2	13.9
6	2015-2016	436.3	270.7	343.8	253.6	248.1	125.2	5.1	5.1	26.1	37.9	458.6	586.3	2796.8	3302.5	-15.3
7	2016-2017	540.8	322.6	119.8	117.1	37.9	19.1	12.8	1.1	122.2	71.1	210.0	517.9	2092.4	3302.5	-37.0
8	2017-2018	128.5	282.4	412.2	322.5	369.0	258.5	3.5	8.6	110.7	128.3	246.7	459.2	2730.1	2695.7	1.0
9	2018-2019	1296.0	1478.9	212.4	325.6	194.3	6.5	3.0	22.9	16.7	104.4	56.9	335.7	4053.3	3345.4	21.0
10	2019-2020	532.8	976.7	480.0	373.5	106.1	33.2	2.9	1.6	61.9	131.7	255.6	400.3	3356.3	3345.4	0.0

8.3 SLOPE

Slope has a scale connotation. It refers to the ground surface configuration for scale that exceeds about 10 m and range upward to the landscape as a whole. Slope has gradient, complexity, length and aspect. Slope gradient is the inclination of the surface of the land from the horizontal. It is generally measured with a hand level. The difference in elevation between two points is expressed as percentage of the distance between these points. If the difference in elevation is 1 m over a horizontal distance of 100 m, slope gradient is 1%. A slope of 45^0 is a slope of 100%, because the difference in elevation between two points 100 m apart horizontally is 100 m on a 45^0 slope.

Slope complexity refers to the surface form on the scale of mapping. Slope complexity has an important influence on the amount and rate of run-off and on sedimentation associated with run-off.

Slope aspect is the direction towards which the surface of the land faces. The direction is expressed as an angle between 0 degree and 360 degrees (measured clockwise from true north) or as a compass point such as east or north- north west. Slope aspects may affect soil temperature, evapo-transipration and winds received.

Generally, with increase in slope of the land, soil is subjected to erosion and the intensity of the erosion depends upon slope percentage. Steep slopes are prone to landslides.

The table showing the slope class, description, area and percentage are given below:

Table No. 8.3.1 Slope class, description, area and percentage

Sl. No.	Particulars	14P35a	14P35b	14P35c	Total	%
1.	0-3% - Level/Gentle	36.33	144.61	370.15	551.08	11.96
2.	3-5% - slight Slope	14.75	6.63	24.44	45.82	0.99
3.	5-10% -Moderately Sloping	62.17	87.72	110.24	260.13	5.64
4.	10-15% -Strongly Sloping	43.27	65.16	93.94	202.37	4.39
5.	15-35% -Moderately Steep Sloping	230.43	498.45	796.25	1525.14	33.09
6.	>35% -Steep Slope	401.79	583.70	1039.53	2025.02	43.93
	Total	**788.74**	**1386.28**	**2434.54**	**4609.56**	**100.00**

8.4 GEOLOGY

The project area falls in the geological division viz. Archean Crystalline rock. This comprises of Penisular Gneissic Complex Group and Migmatite Group. Migmatite are evenly distributed in the major part of the area as narrow zones within Granitiferouss illimanite gneiss. Two major rock groups viz Penisular Gneissic Complex Group of rocks and Migmatite complex. The major group in the project area is the Migmatite complex group of rocks (82.54%).

The table showing the distribution of geology in the three watersheds are given below:

Table No. 8.4.1: Distribution of geological units in watersheds

Sl No.	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	Migmatite Complex		1381.34	2423.30	3804.63	82.54
2.	Penisular Gneissic Complex	770.03	0.16	7.29	777.48	16.87
3.	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	788.74	1386.28	2434.54	4609.56	100.00

8.5 GEOMORPHOLOGY

The thematic map on geomorphology revels that there are seven geomorphological units in the project area. Terrain basement rocks like Khondalite and Migmatite has an undulating to rolling topography and is characterized by undulating spurs. Thick columns of laterite soils in the area supports the growth of coconut. A quantitative analysis of the ground water potential of these units are also made through interpretation of lineaments supported by necessary ground truth. The various geomorphological units identified in the project area and their spatial extent is given below:

Table No. 8.5.1: Geomorphological units description, area and percentage

Sl No	Particulars	14P35a	14P35b	14P35c	Total	%
1.	Denudational Structural Hills	565.22	942.68	1603.54	3111.45	67.50
2.	Piedmont Zone	170.64	218.70	616.25	1005.59	21.82
3.	Valley	34.17	181.90	132.80	348.87	7.57
4.	Structural Valley		38.22	77.99	116.21	2.72
5.	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	**788.74**	**1386.28**	**2434.54**	**4609.56**	**100.00**

8.6 LAND USE

Agriculture is one of the prime activity in the watershed area. The major land use category mapped in the watershed area is Forest with barren rocky area (13.83 %). The second major category is the Agricultural Mixed Crop - Mixed Crops which are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately. This extents in an area of 635.93 Ha. An area of 84.52 ha of paddy lands has been left as fallow which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. The details of land use categories with spatial extent is given in table.

Table No. 8.6.1: Land Use Area (Ha)

No.	Particulars	14P35a	14P35b	14P35c	Total	%
1.	Agricultural Fallow Land - Current Fallow			11.48	11.48	0.25
2.	Agricultural Mixed Crop - Mixed Crops	64.38	100.86	470.70	635.93	13.80
3.	Agricultural Perennial Crop - Arecanut	7.55	55.31	135.01	197.87	4.29
4.	Agricultural Perennial Plantation Crop - Cardamom			1.78	1.78	0.04
5.	Agricultural Perennial Crop - Coconut	2.77	2.08		4.86	0.11
6.	Agricultural Perennial Plantation Crop - Others	1.43		9.75	11.18	0.24
7.	Agricultural Perennial Plantation Crop - Rubber	67.57	151.88	228.55	448.00	9.72
8.	Agricultural Perennial Plantation Crop - Tea	9.68	18.81	80.04	108.53	2.35
9.	Built up Land - Built ups + Mixed Crops		1.62	65.18	66.80	1.45

No.	Particulars	14P35a	14P35b	14P35c	Total	%
10.	Built up Land - Commercial		1.60	20.57	22.17	0.48
11.	Built up Land - Others		0.50	4.45	4.95	0.11
12.	Built up Land - Public/Semi Public			1.01	1.01	0.02
13.	Built up Land - Residential	5.22	21.35	53.45	80.02	1.74
14.	Built up Land - Roads	4.78	4.03	7.83	16.64	0.36
15.	Forest - Plantation (Cardamom)			15.28	15.28	0.33
16.	Forest - Plantation (Tea)	120.73	449.29	4.14	574.16	12.46
17.	Forest - Deciduous (Dense Evergreen/Semi Evergreen)	225.29	8.86	70.20	304.35	6.60
18.	Forest - Evergreen/Semi evergreen (Fairly Dense)	102.06	86.58	338.39	527.03	11.43
19.	Forest - Others (Coconut)	6.42			6.42	0.14
20.	Forest - Others (Dense Mixed Forest)	20.07	52.46	25.44	97.97	2.13
21.	Forest - Others(Arecanut)	8.71	108.08	98.17	214.96	4.66
22.	Forest - Paddy Cultivating (Current Fallow)			4.29	4.29	0.09
23.	Forest - Settlement	2.15	4.60	4.93	11.67	0.25
24.	Forest - Settlement with Mixed Crops		0.14		0.14	0.00
25.	Forest - Waste Land (Barren Rock)	92.13	163.71	381.89	637.73	13.83
26.	Forest - Waste Land (Land with Scrub)	4.54	9.80		14.33	0.31
27.	Paddy Converted to Built up - Others			5.27	5.27	0.11
28.	Paddy Converted to Built up - Residential	0.74	8.31	52.08	61.13	1.33
29.	Paddy Converted to Mixed Crops	6.48	35.30	91.80	133.57	2.90
30.	Paddy Converted to Mixed Crops + Built ups			45.74	45.74	0.99
31.	Paddy Converted to Perennial Crops		11.03	11.96	22.98	0.50
32.	Paddy Converted to Seasonal Crops		11.54	29.41	40.95	0.89
33.	Paddy Cultivating Land	6.15	40.58	45.05	91.78	1.99
34.	Paddy Cultivating Land - Current Fallow	10.51	28.20	45.81	84.52	1.83
35.	Waste Land - Barren Rocky Land	0.66	4.67	64.37	69.69	1.51
36.	Waste Land - Land with Scrub	0.02	0.30	6.44	6.76	0.15
37.	Waterbody - River Island	0.30			0.30	0.01
38.	Waterbody - River/Stream	18.42	4.78	3.96	27.16	0.59
39.	Waterbody - Lake/Ponds			0.13	0.13	0.00
	Total	**788.74**	**1386.28**	**2434.54**	**4609.56**	**100.00**

8.7 SOILS

Soil is the basic natural resource that supports all life on earth's surface. Its thickness varies from a few centimeters to a few meters on earth's surface, but takes millions of years for its formation. Knowledge of soils is fundamental to well being of the present generation and the prosperity to come.

Soil survey is essential a study and mapping of soil as they occur in nature. This involves the systematic examination, description, identification, classification, correlation and finally mapping the geographic distribution of different soil in the landscape. Thus soil surveys provide basic information on soils for planning development programmes.

A soil survey describes the characteristics of the soils, classifies them, plots the boundaries of the soils on an appropriate base map and makes predictions about the behavior of the soils. This information collected in a soil survey helps in the development of optimum land use plans and evaluates and predicts the effects of land use on the environment.

Soil Depth

The physical properties of the soil largely determine how best it can be made suitable for growing a particular crop, different species or types of crops. Some of the important soil properties are water holding capacity, permeability to water, aeration, plasticity, nutrient supplying ability, etc. they are influenced by the size, proportion, arrangement and mineral composition of the soil particles. The proportion of the four major components of the soil- inorganic or mineral particles, organic material, water and air vary substantially from place to place and with depth. So soil depth is an important parameter for agriculture development and according to the depth, the soils have been classified into:

1. Very Shallow - less than 25 cm
2. Shallow - 25-50 cm
3. Moderately shallow - 50-75 cm
4. Moderately deep - 75-100 cm
5. Deep - 100- 150 cm
6. Very deep - more than 150 cm

The table showing the distribution of soil depth in the three micro watersheds are given below:

Table No. 8.7.1: Distribution of soil depth in watersheds

Sl No	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	deep	19.44		76.77	96.20	2.09
2.	deep to very deep	662.32	1247.90	2233.79	4144.01	89.90
3.	Rock Out Crops		8.21	45.58	53.80	1.17
4.	Very deep	88.27	125.39	0.07	213.72	4.64
5.	Habitation			74.39	74.39	1.61
6.	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	**788.74**	**1386.28**	**2434.54**	**4609.56**	**100.00**

Surface Soil Texture

A number of soil factors, the important of which are soil texture, moisture content and temperature modify delivery of ions to plant root surface by diffusion and mass flow. The finer the texture of the soil, the less rapid will be the movement of the soil texture and diffusion of ions through the water. Also, ions diffusing through soil moisture in clay soil are much more likely to be attracted to adsorption sites than on sandy soil.

The important texture classification of soil are (1) sandy, (2) loamy, (3) clayey. Sandy soils are very permeable and well drained; butt are less water retentive and hence need more frequent irrigation for successful crop growth. The clayey soils can hold more moisture, but they have high wilting percentage. They are also subjected to water logging resulting in poor aeration and drainage. The moderately fine texture soils, the loams are the most suitable soils for crop growth, since they have the advantage of both sand and clay.

The various surface soil textures identified in the project area and their spatial extent is given below:
The major soil texture of the project area constitutes that of Sandy clay loam texture which covers an area of 2450.34 ha (53.16 %).

The table showing the distribution of surface soil texture in the three watersheds are given below:

Table No. 8.7.2: Distribution of surface soil texture

Sl No	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	Clay Loam	119.59	20.14	543.94	683.67	14.83
2.	Gravelly Sandy Clay Loam	115.34	106.44	865.5	1087.28	23.59
3.	Sandy Clay Loam	535.1	1246.71	668.53	2450.34	53.16
4.	Sandy Clay			232.64	232.64	5.05
5.	Rock Out Crops		8.21	45.58	53.79	1.17
6.	Habitation			74.39	74.39	1.61
7.	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	**788.74**	**1386.28**	**2434.53**	**4609.55**	**100.00**

Soil Erosion

Soil erosion is the process of detachment and displacement of soil particles from land surface. This mainly occurs by natural erosion on the geologic erosion and through accelerated as soil erosion. The accelerated erosion is caused by the unscientific cultivation practices, heavy grazing and destruction of tree cover. The major factors influencing erosion are the rainfall, wind, type of soil, slope of the land, ground cover/ land use pattern and human factors.

Four major erosion classes are mapped in the project area

1 – slight
2 –moderate
3 – severe
4 - very severe

The majority of the area is under moderate to severe erosion class. An area of 3056.67 Ha (66.31% of TGA) is under this class. Nearly 232.64 ha area is having slight erosion, which are the low lying fields in the project area.

The table showing the distribution of soil erosion in the 3 watersheds are given below:

Table No. 8.7.3: Distribution of surface soil erosion

Sl No	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	moderate to severe erosion	589.77	915.02	1551.88	3056.67	66.31
2.	moderate water erosion	180.27	458.26	526.09	1164.62	25.27
3.	none to slight water erosion			232.64	232.64	5.05
4.	Rock Out Crops		8.21	45.58	53.79	1.17
5.	Habitation			74.39	74.39	1.61
6.	Waterbody	18.71	4.78	3.95	27.44	0.60
		788.75	**1386.27**	**2434.53**	**4609.55**	**100.00**

Hydrologic Soil Group

Hydrologic Soil Group (HSG) means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and

produce much more runoff. Majority of the project area is with Soils with low infiltration rate, moderately high run-off potential. An area of 2088.49 Ha (45.31 %) is under this category.

Table No. 8.7.4: Distribution of Hydrologic Soil Groups

SlNo	Particulars	14P35a	14P35b	14P35c	Total	%
1	Forest	493.00	933.97	609.62	2036.59	44.18
2	Habitation			74.39	74.39	1.61
3	Rock Out Crops		8.21	45.58	53.80	1.17
4	Soils with low infiltration rate, moderately high run-off potential	257.59	439.32	1391.59	2088.49	45.31
5	Soils with moderate infiltration rate, moderately low run-off potential			232.64	232.64	5.05
6	Soils with very low infiltration rate, high run-off potential	19.44		76.77	96.20	2.09
7	Waterbody	18.71	4.78	3.95	27.44	0.60
		788.74	1386.28	2434.54	4609.56	100.00

8.8 LAND CAPABILITY

Land capability classification is an interpretative grouping of soils mainly based on the inherent soil characteristics, external land features and environment factors that limit the use of land. Information on first two aspects is provided by standard detailed soil survey. The internal characteristics include the nature of parent material, colour, texture, structure of soil, depth, soil erosion, etc. and the external land features includes the slope, erosion, drainage, etc.

The classification of soil units into capability grouping enables one to get a picture of the hazards of the soil to various factors which cause soil damage, deterioration or lowering in fertility and its potential for production. A soil with a capacity to grow a large variety of crops and giving high yields will naturally qualify to be grouped in a better class. Thus, the soils are mainly classified into 8 capability class and of which 4 classes and its associations falls in the project area.

Class	Description
II	Good cultivable land
IV	Fairly good cultivable land suites for occasional or limited cultivation
VI	Well suited for forest or grazing. Suited for plantation crops which require minimum tillage
VII	Fairly well suited for grazing or forestry

These classes based on their limitations have the following sub-class association

c - climate limitation

e - erosion and run- off

s - soil limitations

w - wetness, high water table, flooding, drainage, etc.

Class I land is the best devoid to any limitation for intensive cultivation of all climatically adopted crops. Class II to VII lands has progressively increasing hazards or limitation. The sub classes provides information about the kind of problem involved. Climatic limitation (uneven rainfall distribution and high temperature) being common to the area has not been indicated along with the land capability class.

The table showing the distribution of land capability in the three watersheds are given below:

Table No. 8.8.1: Distribution of land capability classes in watersheds

Sl No.	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	Forest	493.00	933.97	609.62	2036.59	44.18
2.	VII	19.44		76.77	96.20	2.09
3.	VI	115.34	106.44	865.50	1087.28	23.59
4.	IV	142.25	332.87	526.09	1001.21	21.72
5.	II			232.64	232.64	5.05
6.	Rock Out Crops		8.21	45.58	53.80	1.17
7.	Habitation			74.39	74.39	1.61
8.	Water Body	18.71	4.78	3.95	27.44	0.60
	Total	**788.74**	**1386.28**	**2434.54**	**4609.56**	**100.00**

The major land capability associations are:

II : The area of 232.64 ha mapped under miscellaneous land type come in this class. These are good cultivable lands with deep to very deep soils occurring on gently sloping lands subject to slight to modulate erosion. Spice trees, areca nut, coconut, betel vine, banana, vegetables etc are the crops suited to the type of land.

IV : An area of 1001.21 ha comes under this class These are fairly good cultivable lands occurring in strongly sloping to steep lands subject to moderate erosion hazards. These lands are suitable for the cultivation of coconut, banana, pepper, rubber, pineapple, fruit trees, etc.

VI: An area of 1087.28 ha comes under this class.

VII : An area of 96.20 ha comes under this class. These soils have moderately shallow such occurring on very deep steep to very steep lands subject to severe erosion. Rockiness, steep slope and moderately shallow depth are the limitation. These lands are non arable lands but due to pressure on land, these lands are also cultivated to rubber and mixed trees. Permanent vegetative cover is suggested to protect this soil.

8.9 LAND IRRIGABILITY

Soil is the reservoir for water in retaining and supplying the soil moisture to plant growth. The periodical recharging of water in soil pore spaces can be made either by irrigation or rainfall. The recharged water has to be supplied to plant system.

This retention capacity and supply capacity varies from soil to soil based on its physical and chemical properties. Based on this, soil classification is made for its suitability for irrigation. This classification is also known as irrigability classification. Majority of the project area is coming under forest followed by the category of Lands that are marginal for sustained use under irrigation (24.68 %)

Table No. 8.9.1: Land Irrigability

Sl No	Particulars	14P35a	14P35b	14P35c	Total	%
1	Forest	493.00	933.97	609.62	2036.59	44.18
2	Habitation			74.39	74.39	1.61
3	Lands that are marginal for sustained use under irrigation	165.59	106.44	865.57	1137.60	24.68
4	Lands that are marginal for sustained use under irrigation	19.44		76.77	96.20	2.09

5	Lands that have moderate soil limitation for sustained use under irrigation		332.87	232.64	565.52	12.27
6	Lands that have severe soil limitation for sustained use under irrigation	92.00		526.02	618.02	13.41
7	Rock Out Crops		8.21	45.58	53.80	1.17
8	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	788.74	1386.28	2434.54	4609.56	100.00

8.10 GROUND WATER

Groundwater has been the mainstay for meeting the domestic needs of more than 80% of rural and 50% of urban population besides, fulfilling the irrigation needs of around 50% of irrigated agriculture. The ease and simplicity of its extraction has played an important role in its development. Recent the problems of decline in water table, contamination of groundwater, seawater intrusion etc. are being reported at many places.

The ground water potential of Kerala is very low as compared to that of many other states in the country. The estimated ground water balance is 5590 Mm^3. Dug wells are the major ground water extraction structure in Kerala. The dug wells have a maximum depth of about 10 to 15 meters and have a diameter of about 1 to 2 meters in coastal region and 2 to 6 meters in the midland and high land. The open well density in Kerala is perhaps the highest in the country – 200 wells per sq.km in the coastal region, 150 wells per sq.km in the midland and 70 wells per sq.km in the high land. The ground water withdrawal is estimated as 980Mm^3 and the State Ground Water Department calculate the effective recharge as 8134 sq Mm^3.The ground water level receding drastically during the summer months and drying up of wells are common features of the ground water levels in many parts of Kerala. The ground water replenishment and hence the levels depends also on the geo-morphological, physical and chemical properties of the soil in general, The depth of water level in Kerala state varies from few cm bgl to 56 M bgl and most of the area fall under 0-20 M bgl. The depth of the water level in the weathered crystalline of midland areas in Kerala varies from 3- 16 M bgl. The midland area sustains medium capacity dugwells. Borewells tapping deeper fractured aquifer are feasible along potential features in the midland and hill ranges. Potential fractures are seen down to 240 M and the most productive zone is between 60 M and 175 M. The discharge of borewells range between 3,600 Iph and 1,25,000 Iph. In laterites, which is the most widely distributed lithological area in the state having a thickness from a 3 M to 30 M, the depth of water level ranges from less than a meter to 25 M.bgl. Lateries from potential aquifer along valleys and can sustain wells with yields in the range of 0.5 M^3 to 6 M^3 per day. Along the coastal plains the ground water occurs at depth ranging from less than a meter to 6 M.bgl. Filter point wells are feasible wherever the saturated availability indicate that ground water depths are farthest for laterite regions and shallowest for coastal alluvium during all times of the year. The availability of the groundwater level between the post and ore monsoon levels varies widely. The water level fluctuations in the post monsoon and ore monsoon vary between coastal alluvium, river alluvium and valley hills.

The details of the ground water resource, ground water resource potential and observation wells in the study area are given below:

The details of the ground water resource, ground water resource potential and observation wells in the study area are given below:

Table No. 8.10.1 : Ground water resource Prospects of Adimali Block

Sl No	Particulars	14P35a	14P35b	14P35c	Total	Percentage
1.	Moderate			40.94	40.94	0.89
2.	Moderate to Poor			236.50	236.50	5.13
3.	Poor	647.66	1132.68	1571.91	3352.25	72.72
4.	Very good	122.37	63.27	50.59	236.23	5.12
5.	Very good to good		185.56	530.65	716.20	15.54
6.	Waterbody	18.71	4.78	3.95	27.44	0.60
	Total	**788.74**	**1386.28**	**2393.60**	**4609.56**	**100.00**

Table No. 8.10.2 : Ground water resource of Adimali Block

Sl No	Domestic 2017	543.42
1.	Industrial 2017	1.15
2.	Total Annual GW recharge (MCM)	3363.65
3.	Natural discharge during non-monsoon season (MCM)	336.37
4.	Net annual GW availability (MCM) (2-3)	3027.28
5.	Existing gross ground water draft for irrigation (MCM)	874.00
6.	Existing gross ground water draft for domestic & Industrial water supply (MCM)	544.57
7.	Existing gross ground water draft for all uses (MCM) (5+6)	1418.57
8.	Allocation for domestic and industrial water supply upto next 25 years (MCM)	543.42
9.	Requirement for domestic and industrial water supply upto next 25 years (MCM)	543.42
10.	Net GW availability for future irrigation development (MCM) (4-5-8)	1608.71
11.	Stage of GW Development in % (7/4 x 100)	46.86
12.	Category	safe

Source: GROUND WATER RESOURCES OF KERALA
(MARCH 2017)

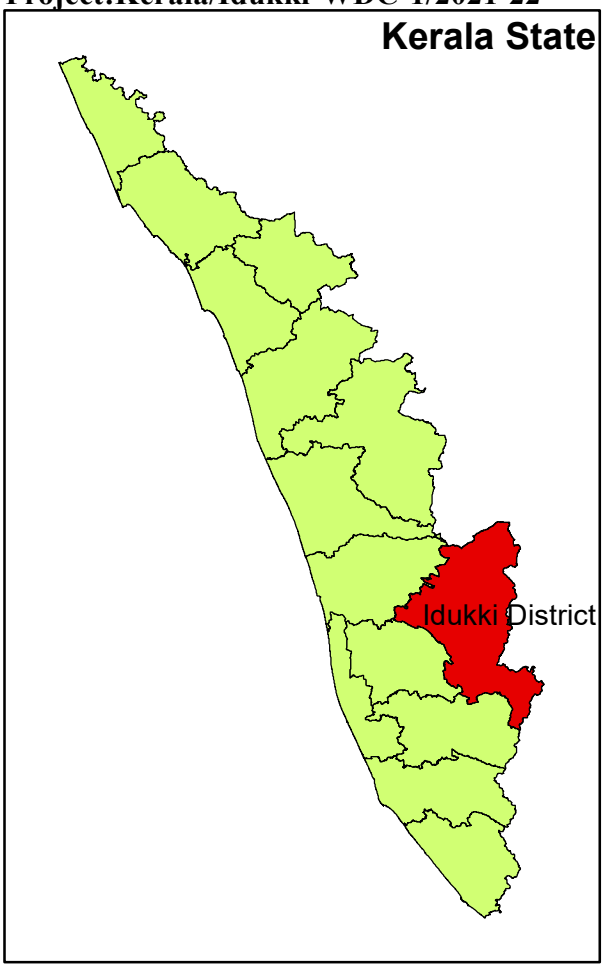
Table No 8.10.3 Ground water resource potential of Adimali Block

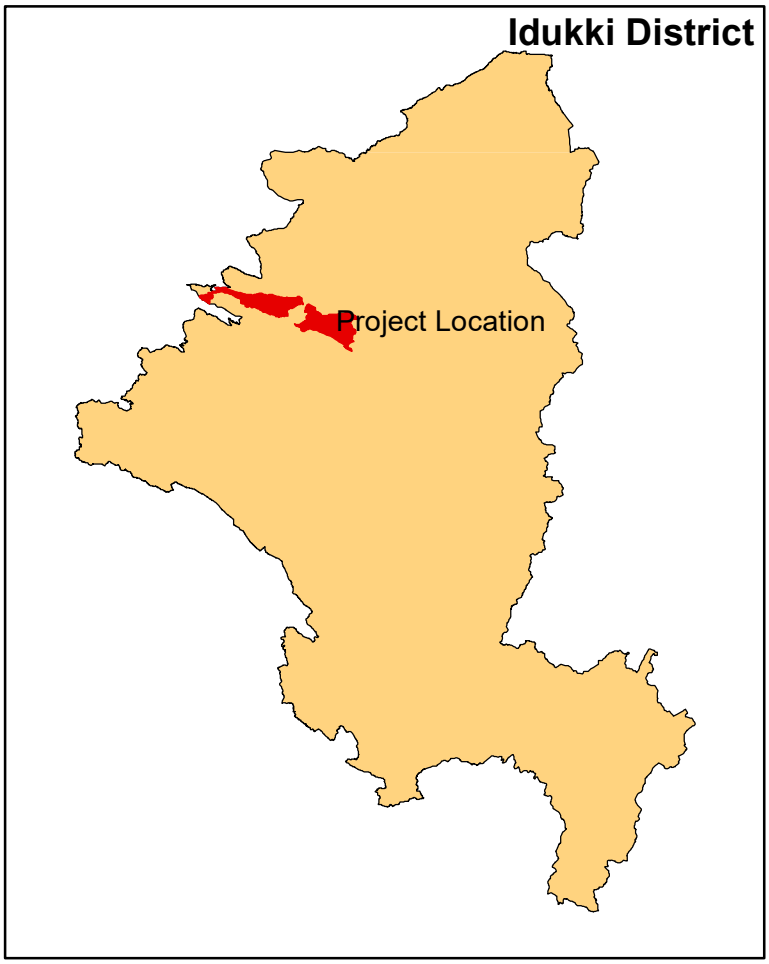
Assessment Unit/ District	Adimali
Command / Non Command	Non-command
Recharge from rainfall during monsoon season	2591.83
Recharge from other sources during monsoon season	34.62
Recharge from rainfall during non monsoon season	553.32
Recharge from other sources during non monsoon season	183.88
Total Annual Ground Water Recharge [(4) +(5)+(6)+(7)]	3363.65
Total Natural Discharges	336.37
Annual Extractable Ground Water Recharge [(8)-(9)]	3027.28

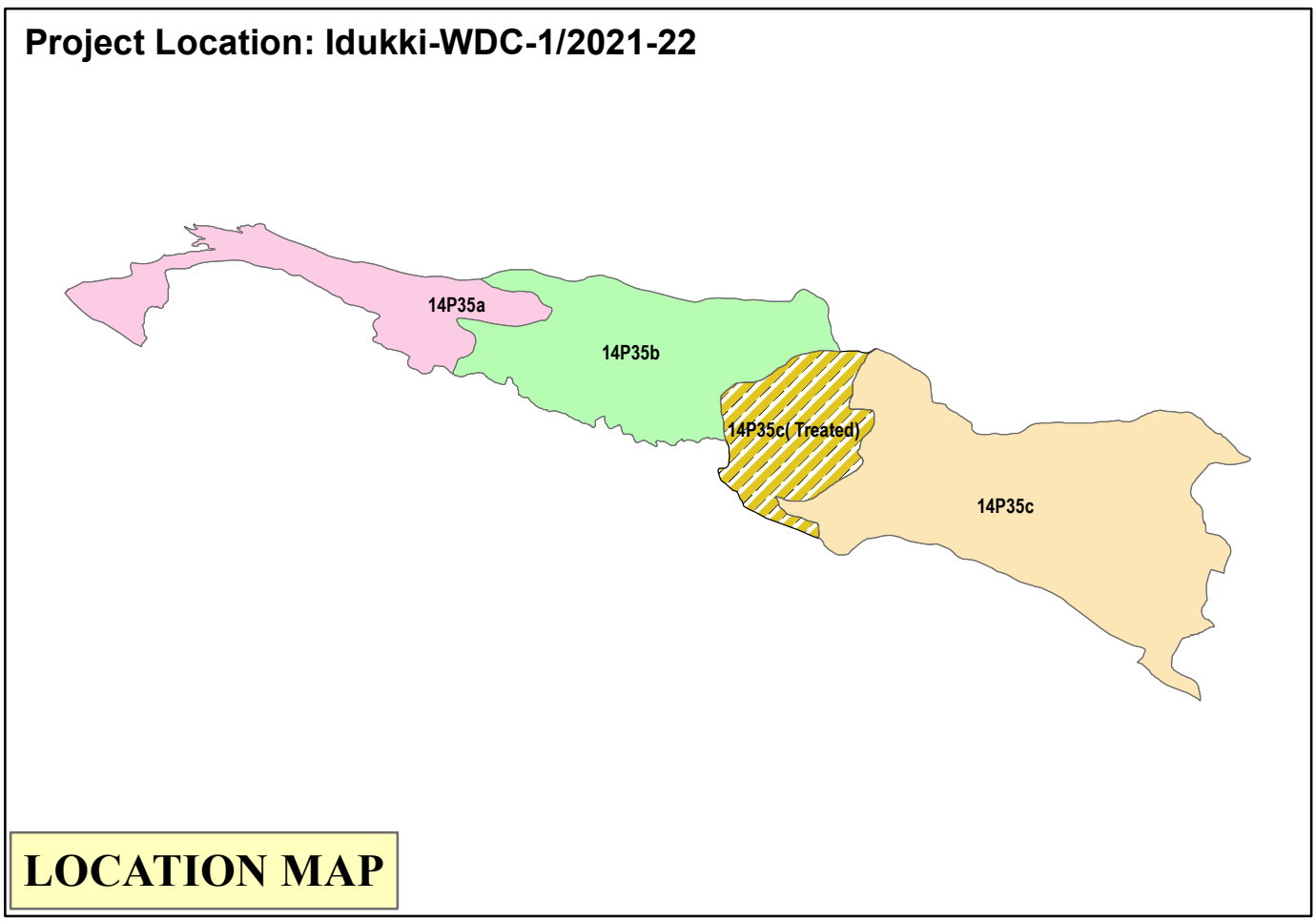
PRADHAN MANTRI KRISHI SINCHAYEE YOJANA

NEW GENERATION WATERSHED DEVELOPMENT PROJECTS (WDC-PMKSY-2.0)

Project:Kerala/Idukki-WDC-1/2021-22







PIA: Adimali Block Panchayath

Fig. No.

TSO: Kerala State Land Use Board

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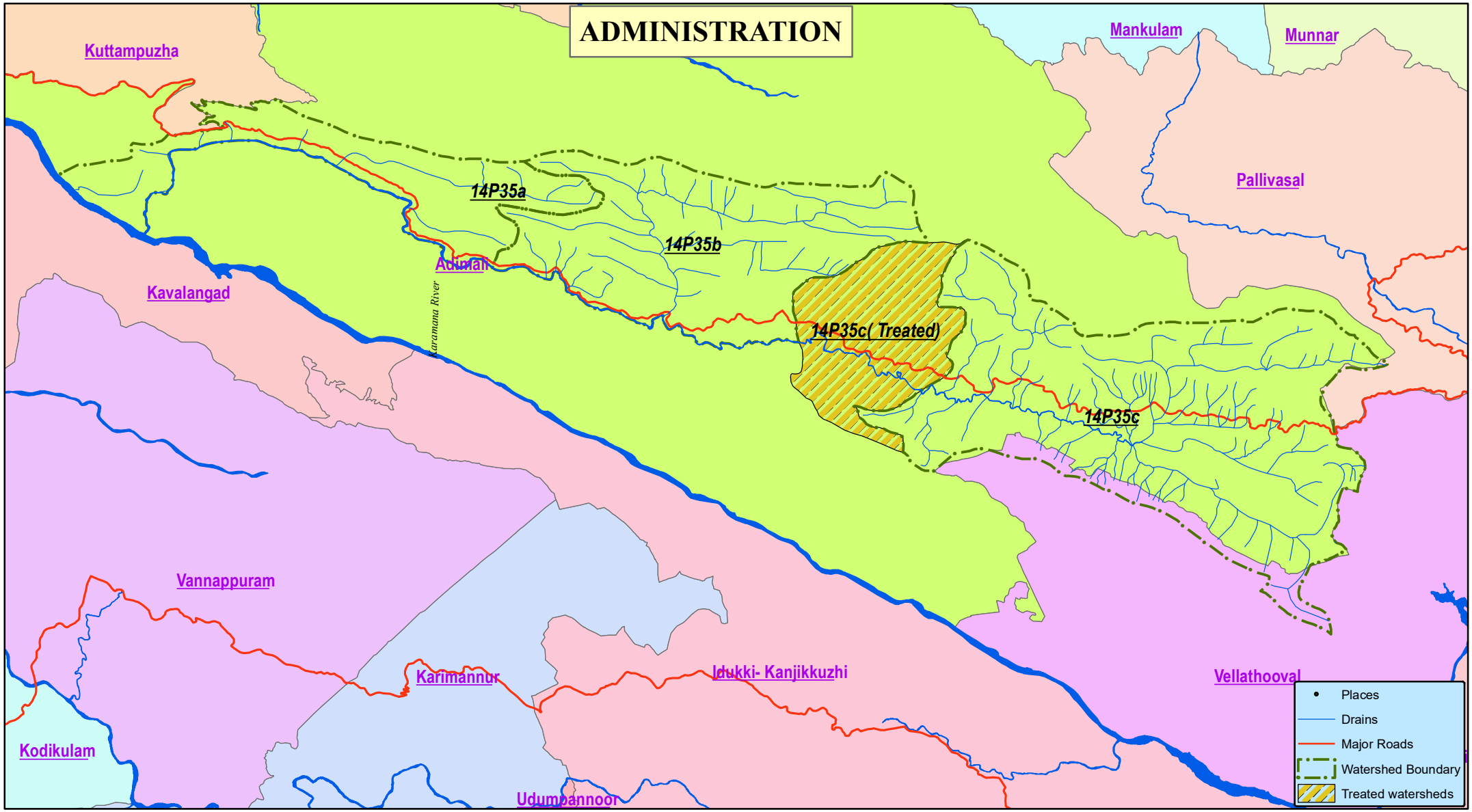

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PIA: Nemom Block Panchayath

Fig. No.

TSO: Kerala State Land Use Board

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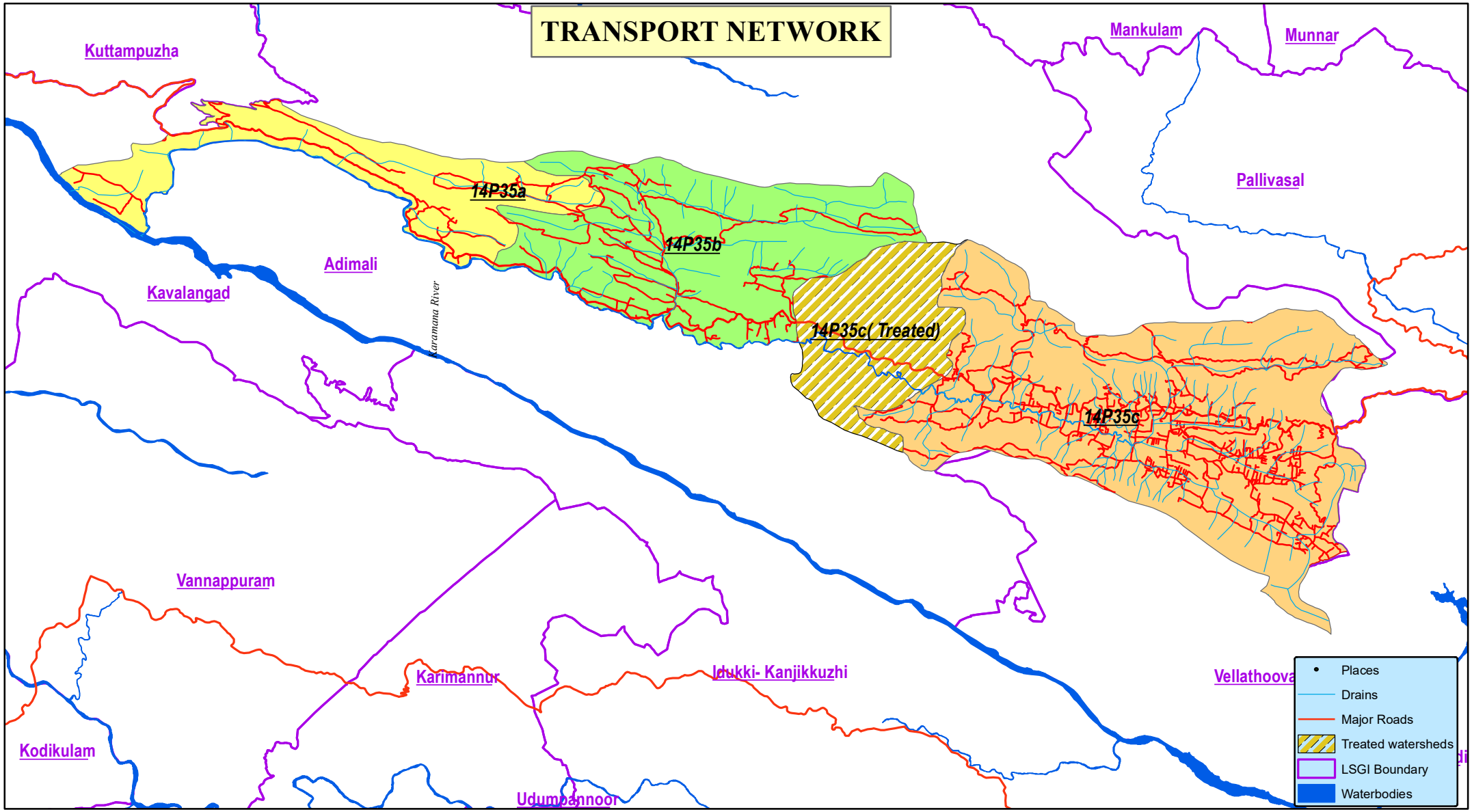

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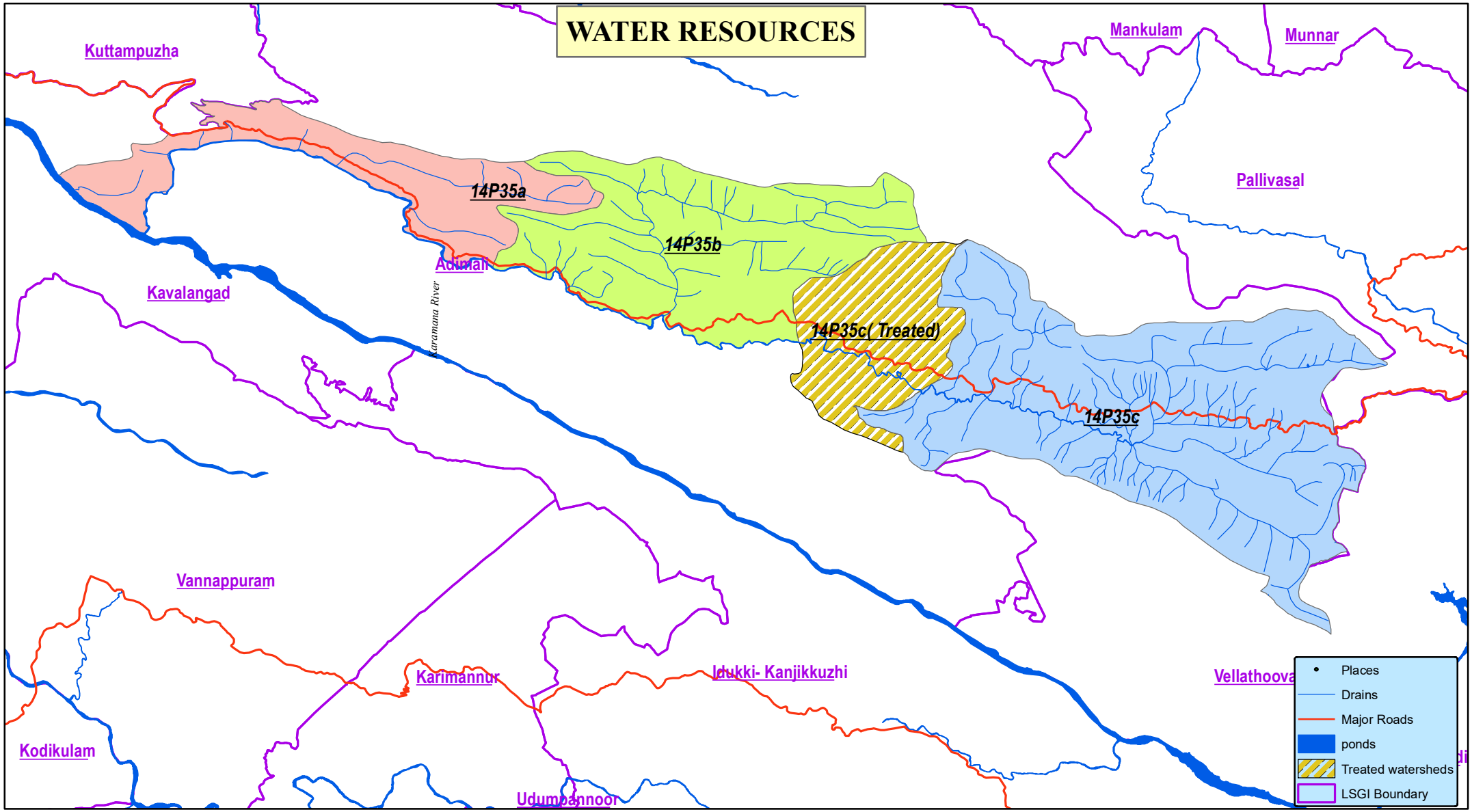

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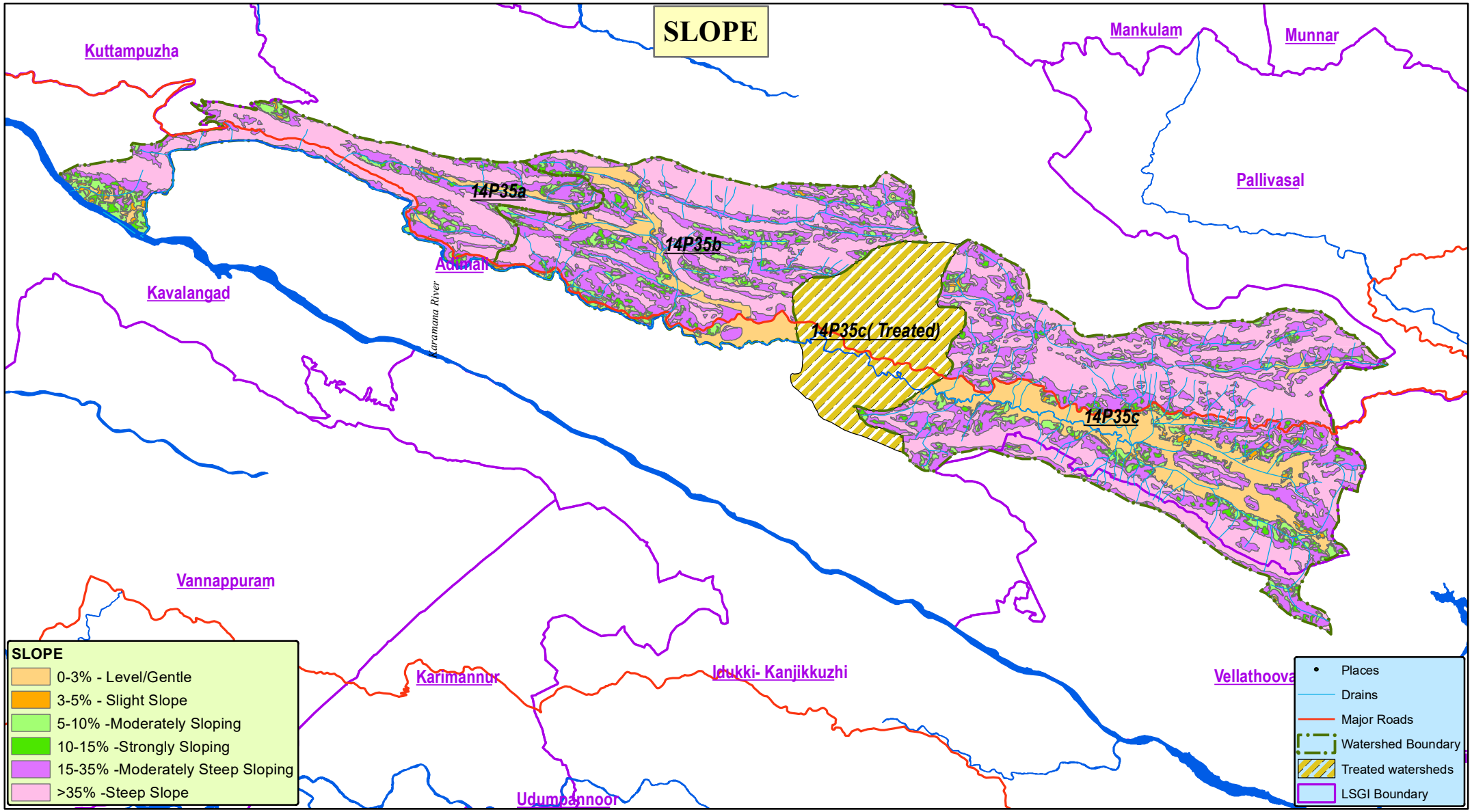

N W E S

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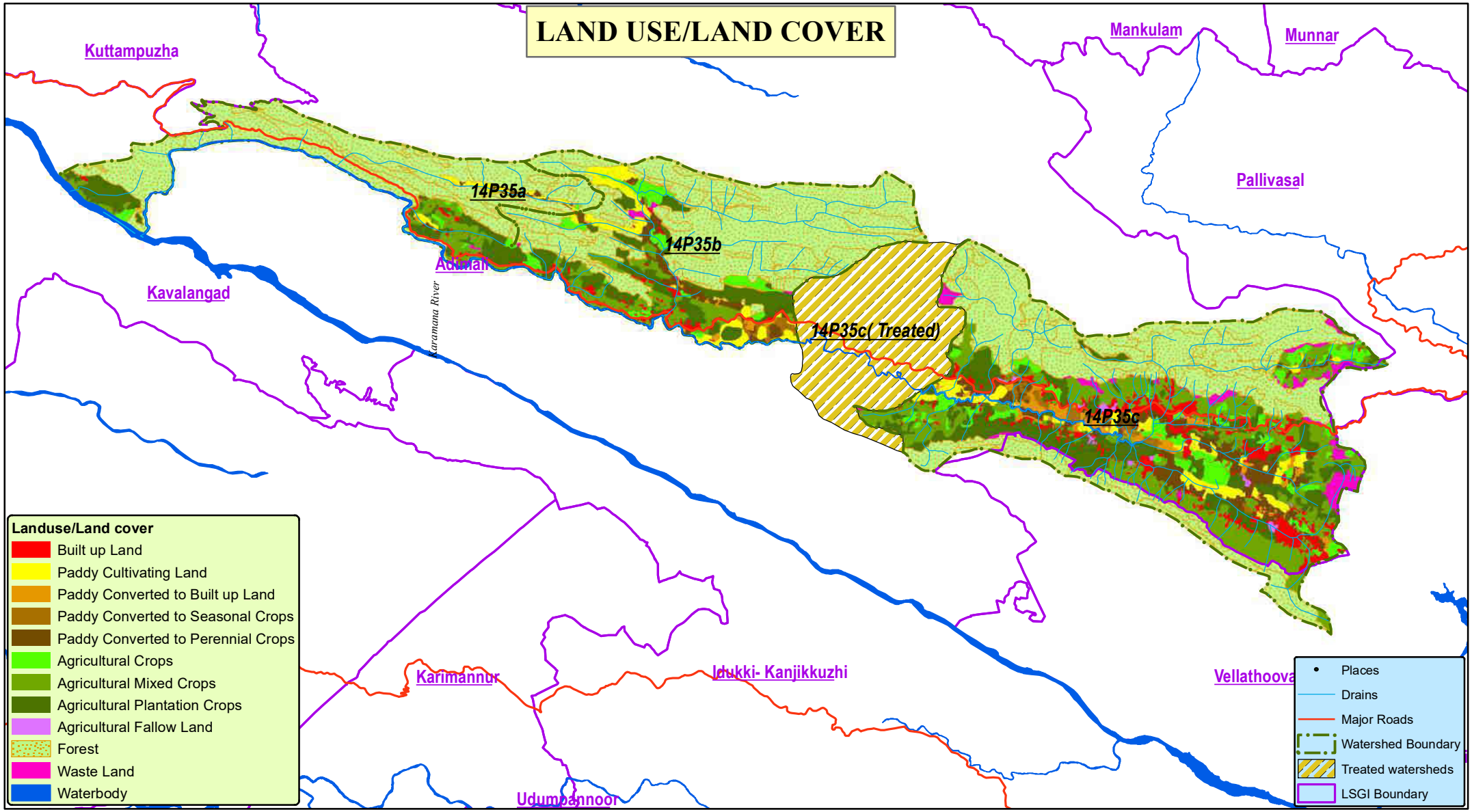

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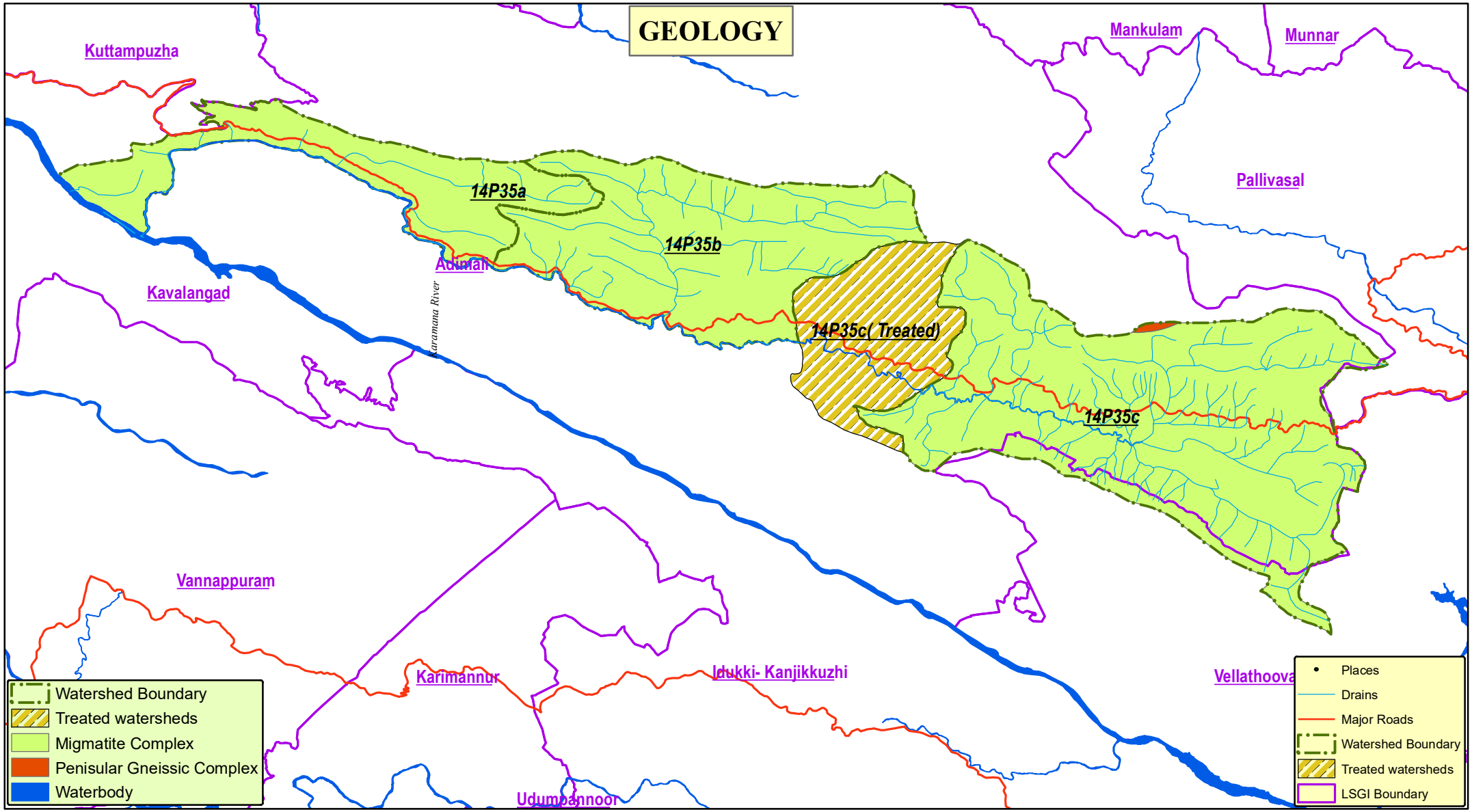

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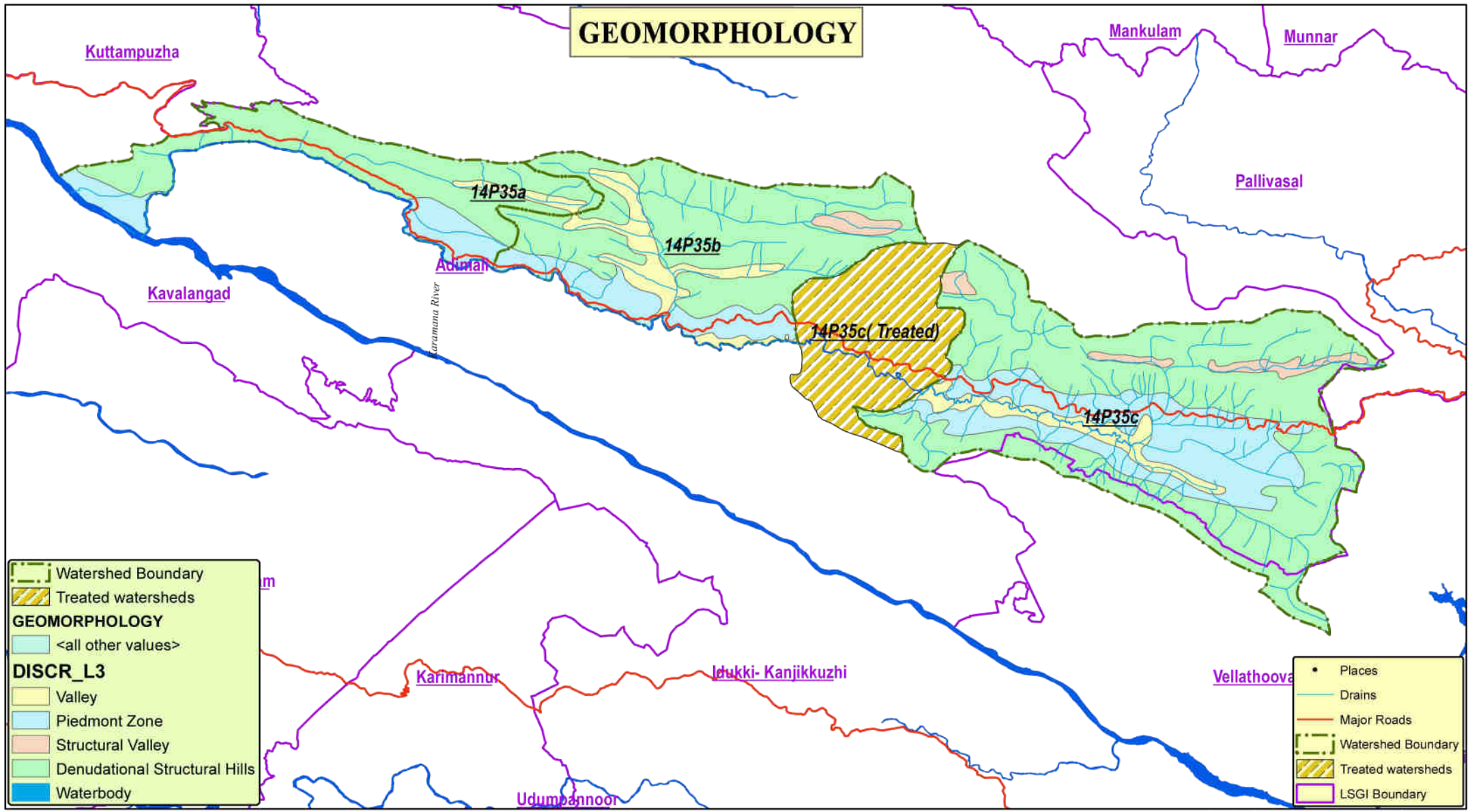

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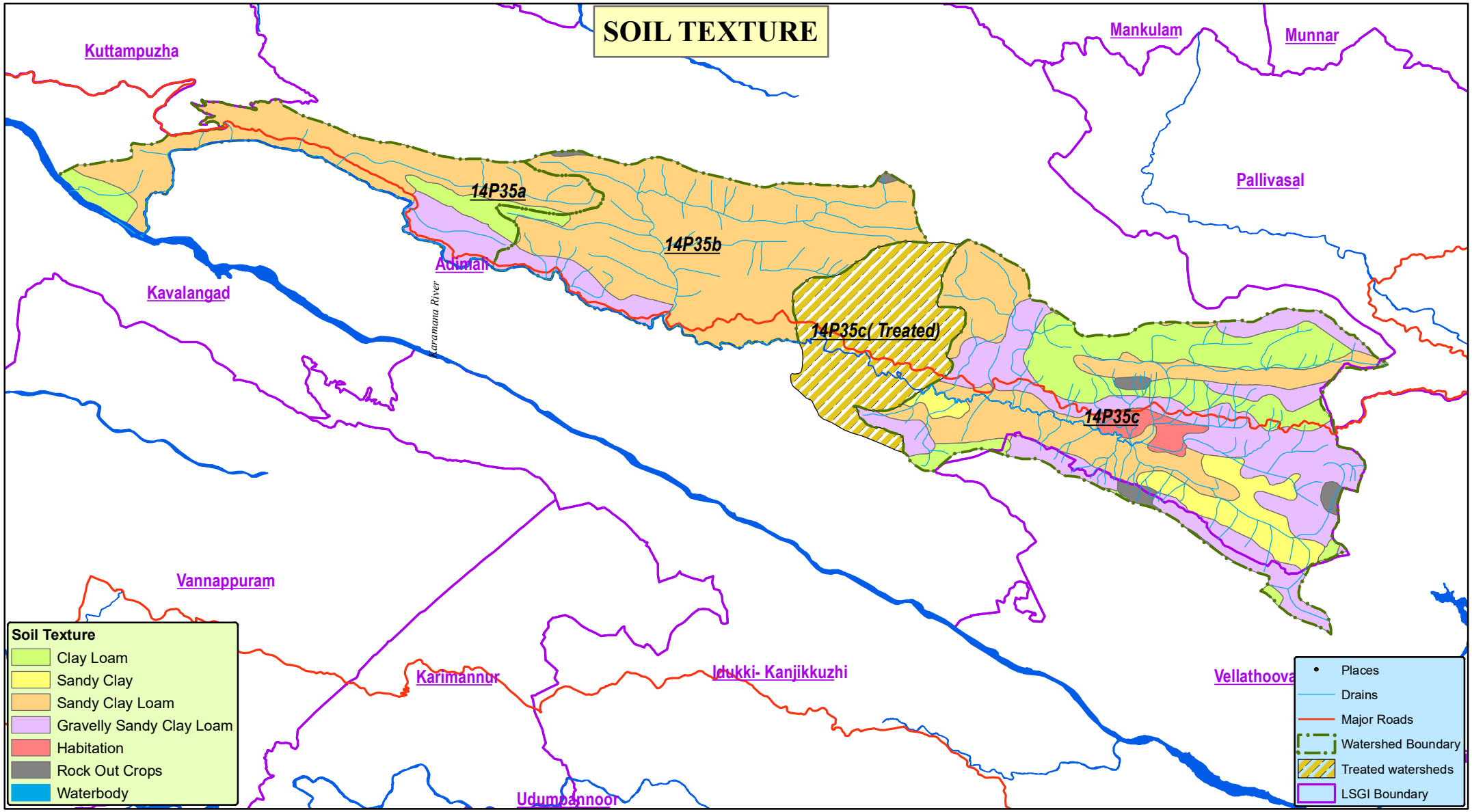

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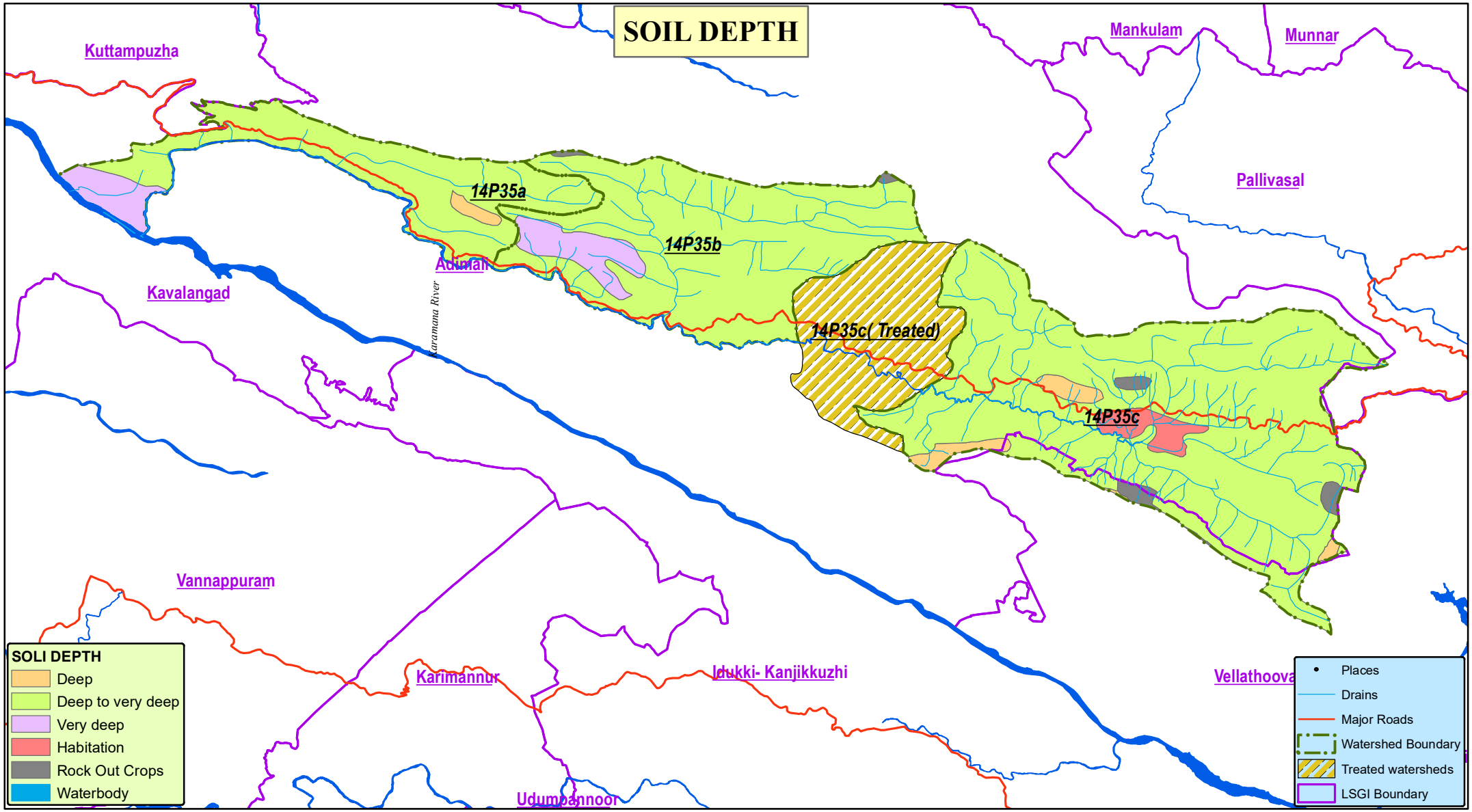

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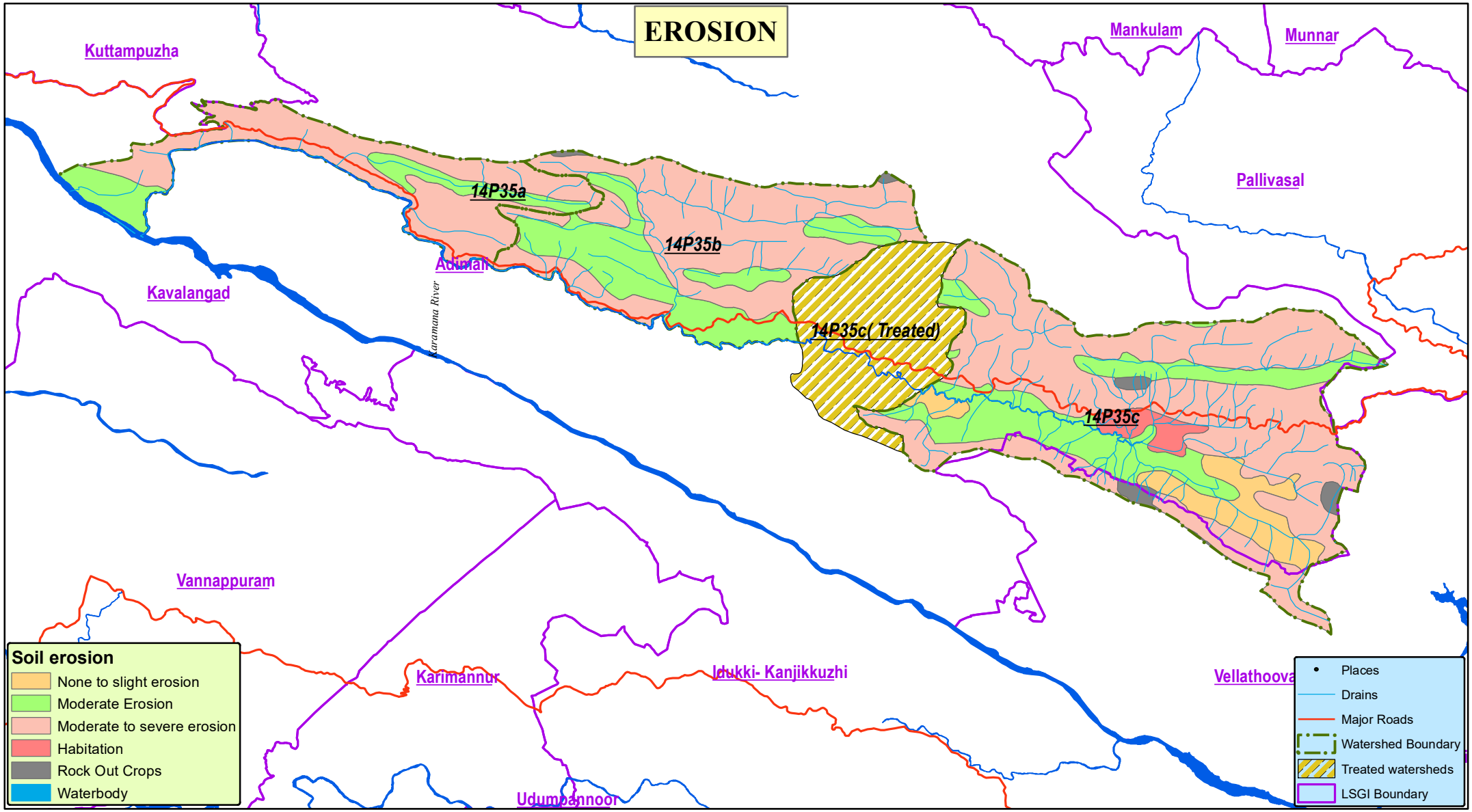

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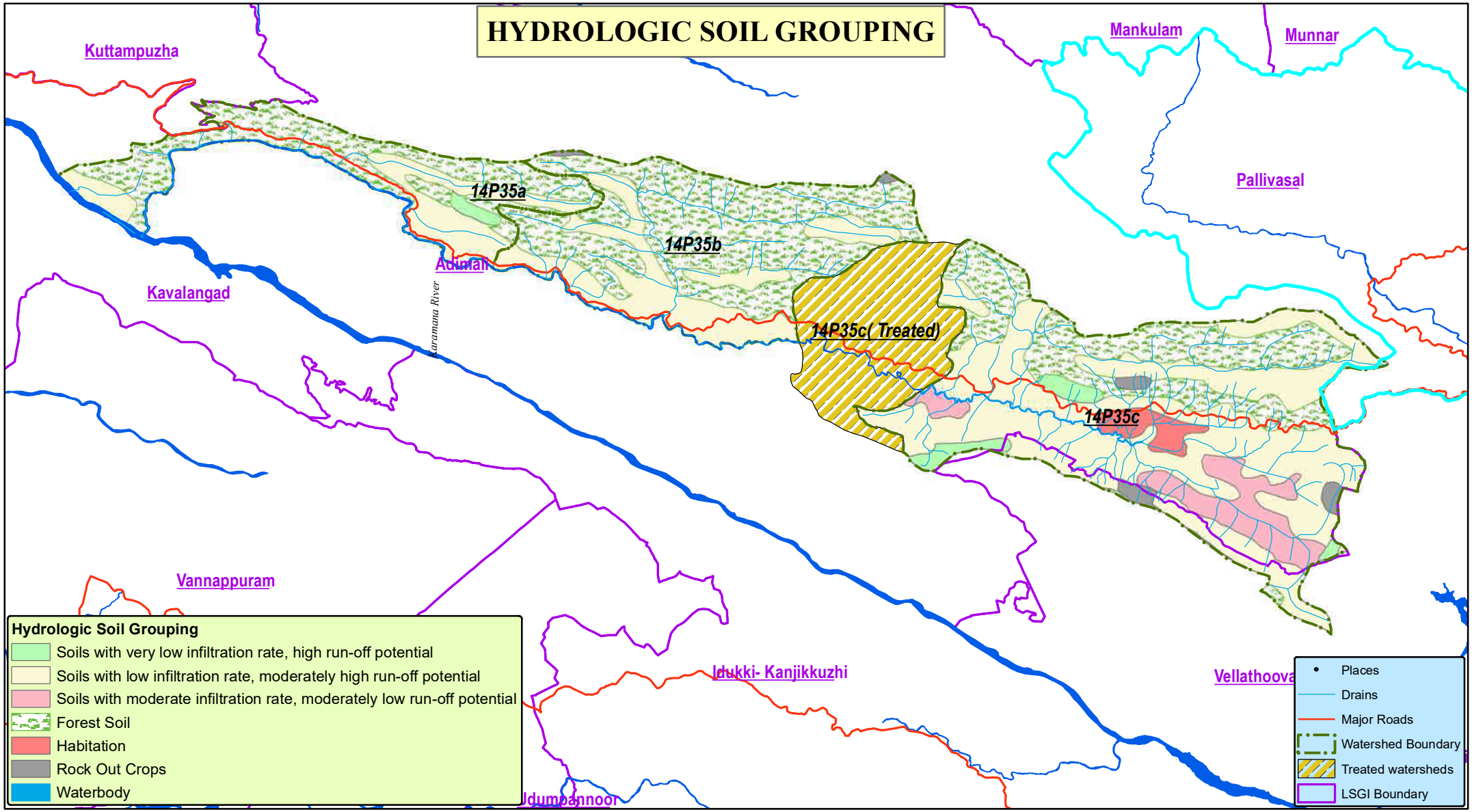

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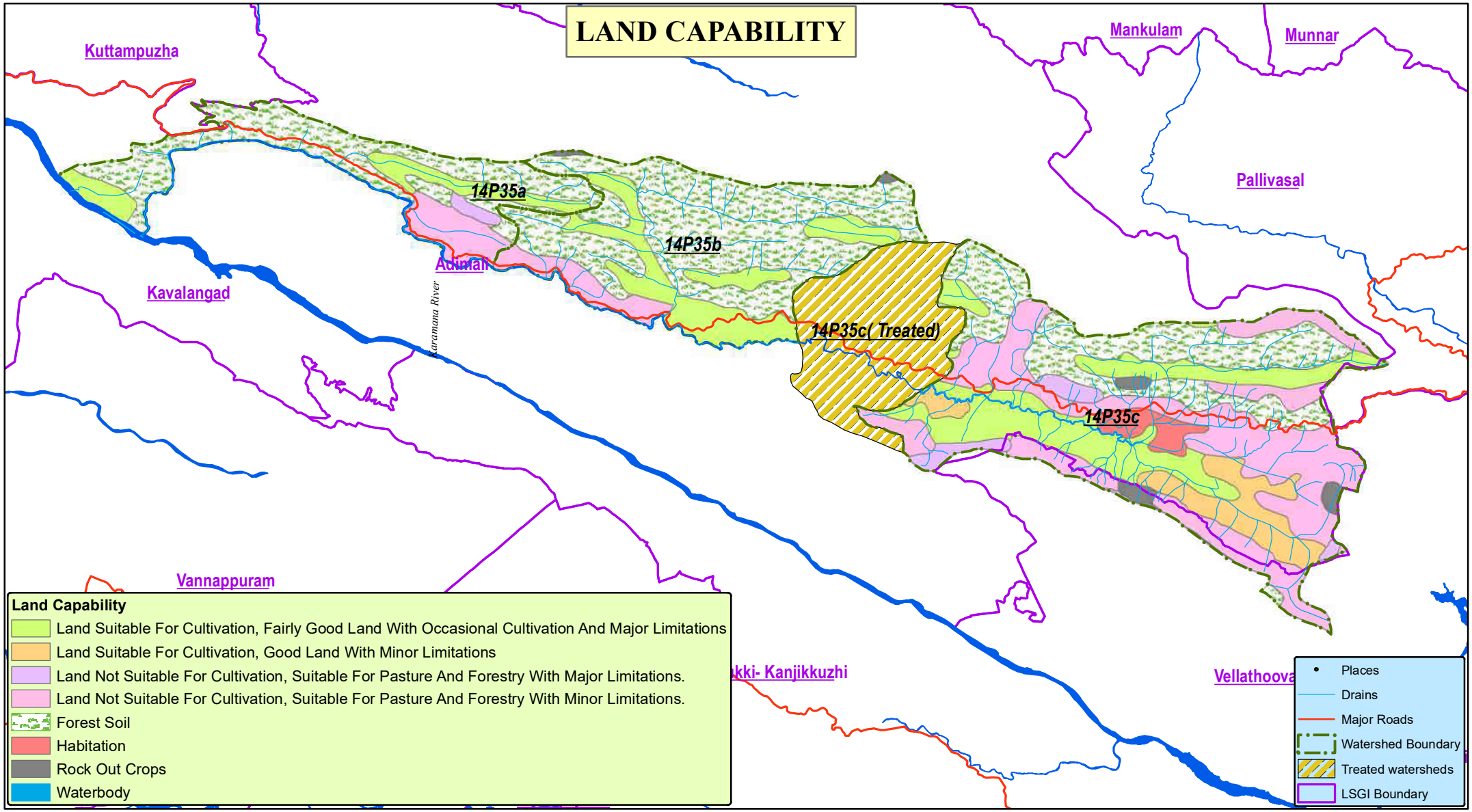

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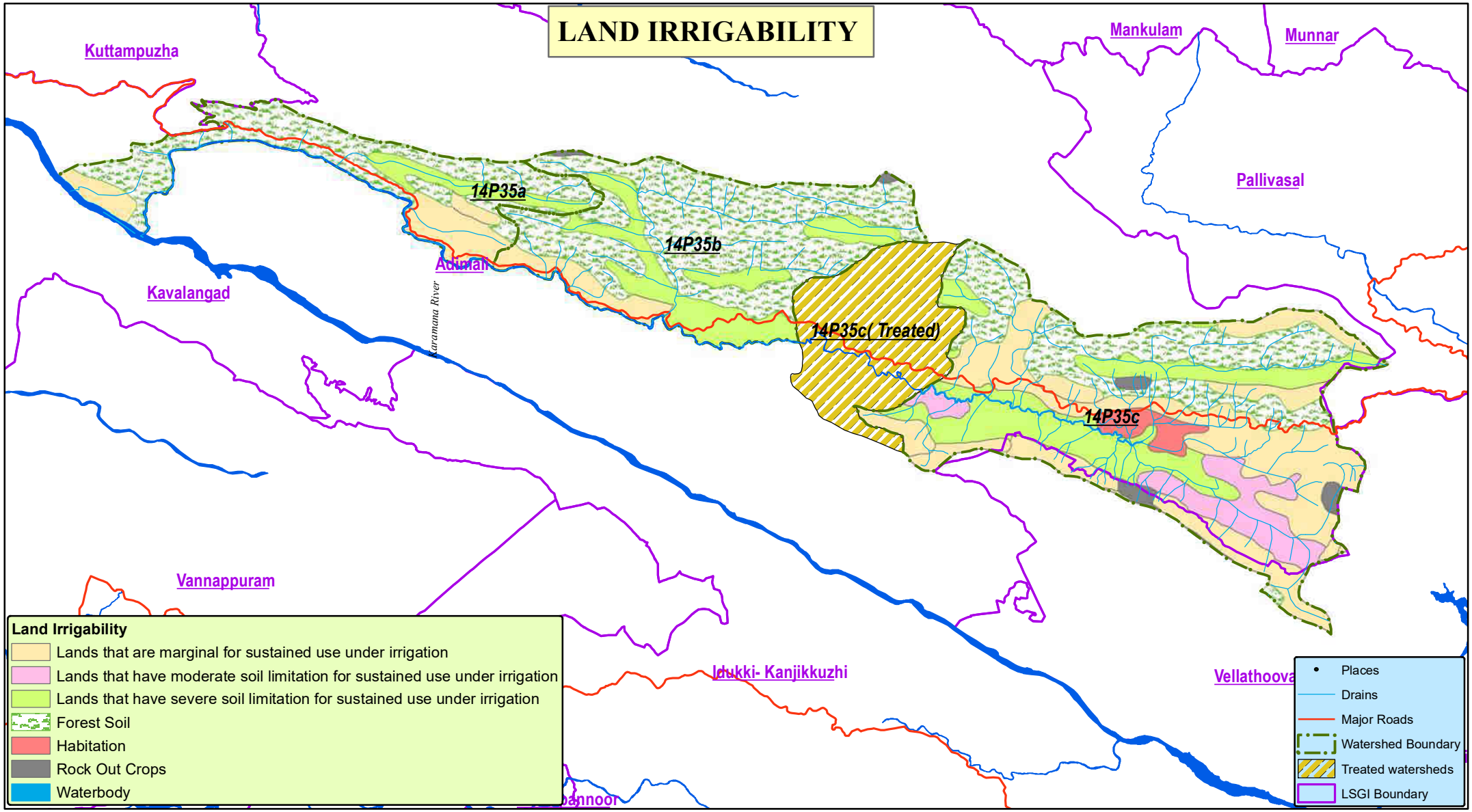

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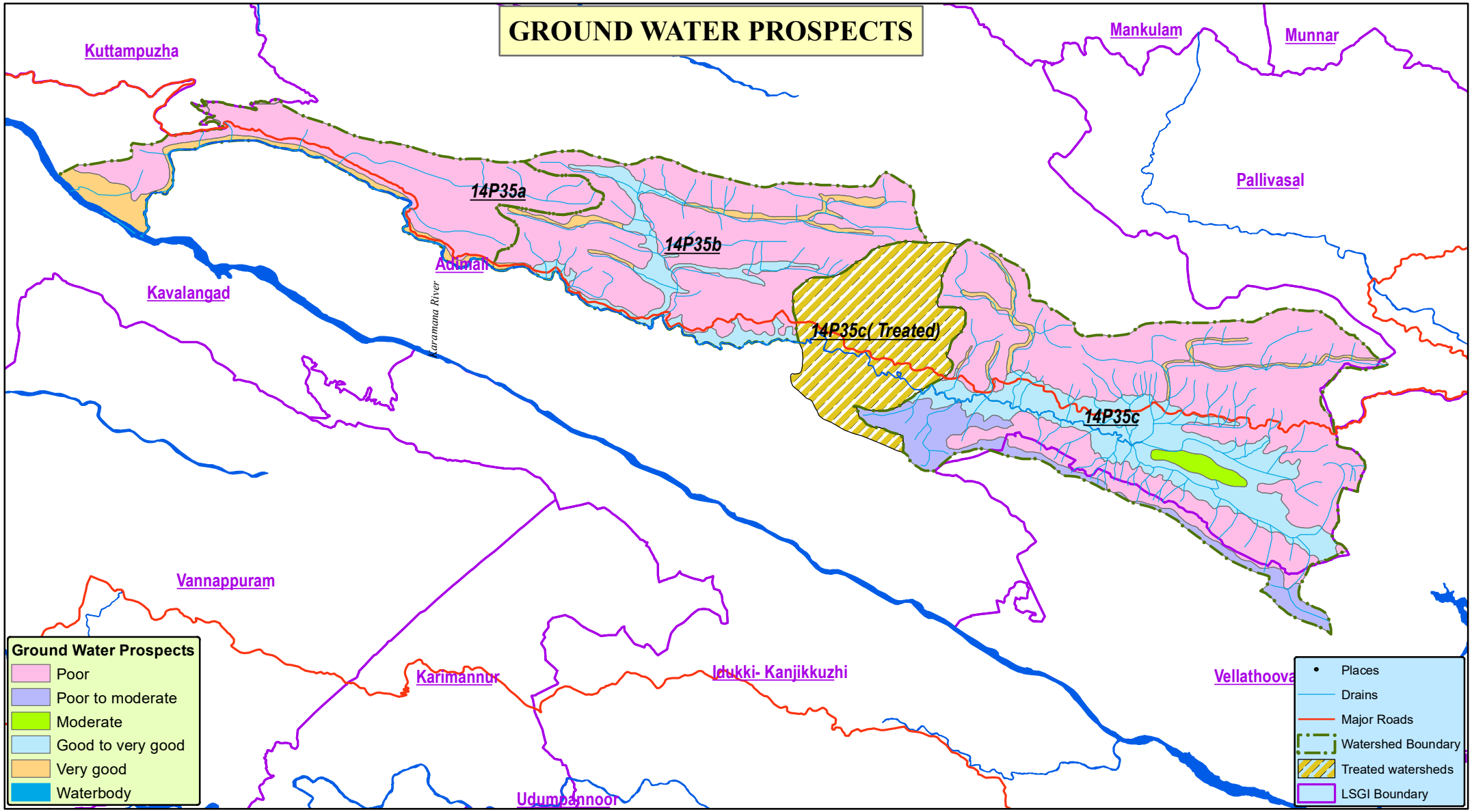

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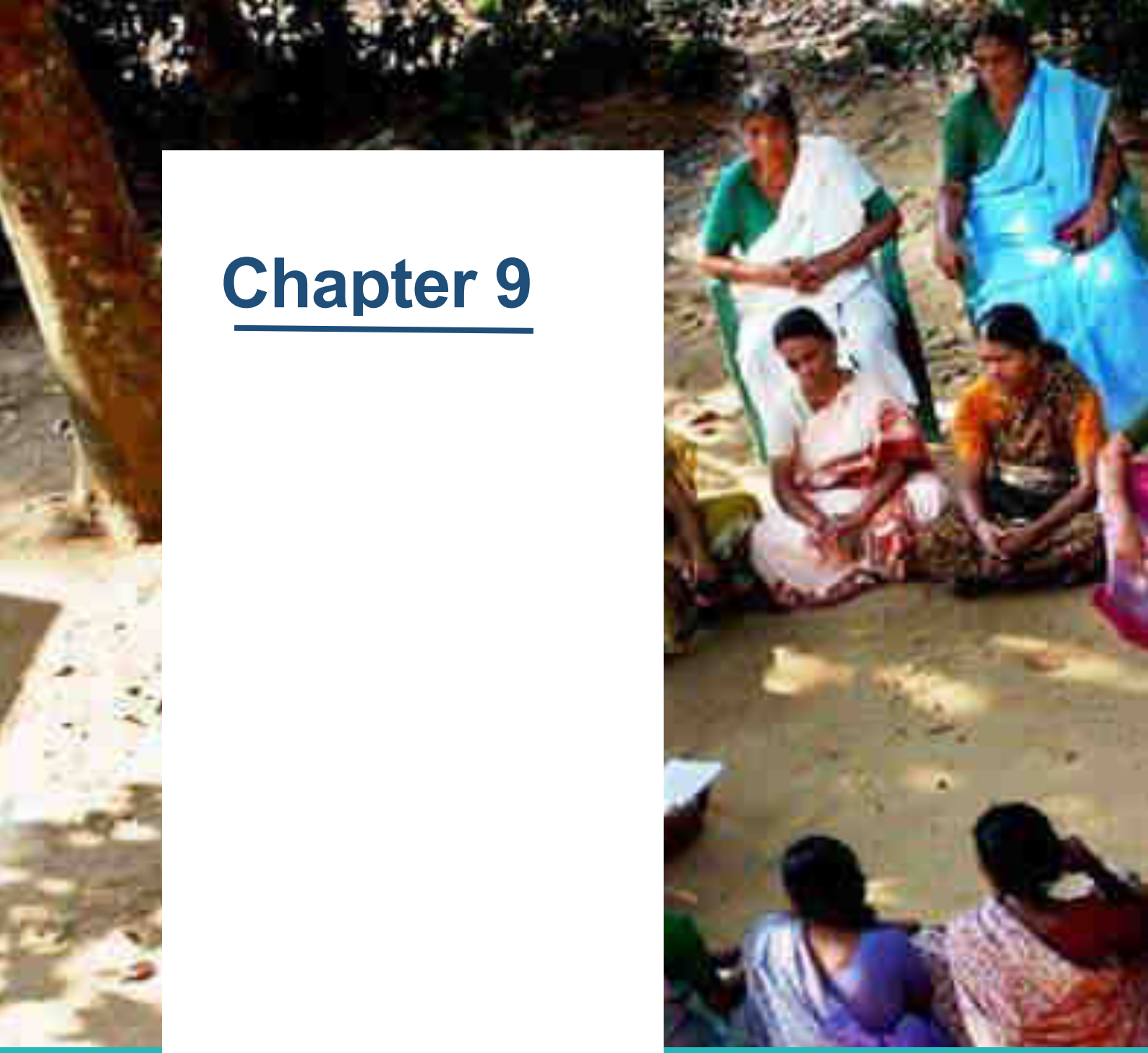


Chapter 9

INSTITUTION BUILDING

IDUKKI WDC-1/21-22

9. INSTITUTION BUILDING

The watershed development project has great potential and scope to empower socially disadvantaged sections of the community. Considering the needs and priorities of these sections, special activities were designed to reduce their drudgery. This was involved in a skills upgradation programme. People's organizations hold the key in ensuring the right integration between sustainable development and social equity. Such organizations have representations from socially backward communities and women with separate special interest groups. Within group interactions across group interactions and representation in village level institutions provide a platform for the disadvantaged groups to become a part of mainstream development. It is also important to note that it was properly ensured that these groups obtain equal opportunities to access the resources developed at the community level.

In order to implement effectively, under the umbrella of State Level Nodal Agency (SLNA) various institutional mechanisms are formed. They are:

i. Watershed Cell cum Data Center (WCDC)
ii. Project Implementation Agency (PIA)
iii. Watershed Development Team (WDT)
iv. Watershed Committee (WC)
v. Neighbourhood Groups
vi. Self Help Groups (SHGs)
vii. User Groups (UGs)

State Level Nodal Agency

A dedicated State Level Nodal Agency (SLNA) is constituted by the State Government with Agricultural Production Commissioner as the Chairman.SLNA is having an independent bank account. The SLNA sanction watershed projects for the State on the basis of approved state perspective and strategic plan as per procedure in vogue and oversee all watershed projects in the state within the parameters set out in these Guidelines.

Functions of the SLNA

SLNA shall be a key agency to shoulder the primary responsibility for successful implementation of projects in the State/UT. The list of indicative responsibilities is as follows:

a) To prepare a State Perspective and Strategic Plan (SPSP) of watershed development projects for the State /UT (if not already prepared and approved)on the basis of plans prepared at the Block and District levels. SLNA may also consider developing springs especially in hilly terrain of States / UTs. It shall then submit this along with implementation strategy, expected outcomes and financial outlays to the NLNA for appraisal and clearance.
b) To establish and maintain a State Data Cell (SDC) from the funds sanctioned to the States / UTs, and connect it online with the NDC.
c) To provide technical support to all the WCDC, set up at the District level.
d) To approve DPRs. While approving DPRs, it should be ensured that relevant activities originating from GPDP documents are incorporated in the DPRs.
e) To approve a list of independent institutions for capacity building of various stakeholders within the State /UT, and work out overall capacity building strategy in consultation with NRAA/NLNA/SLND.
f) To arrange sanctioning of individual watershed development projects submitted by the WCDC

after appraisal and recommendation of Steering Committee of NLND, keeping in mind the budgetary authorization made by the SLSC.

g) To approve PIAs identified/selected by WCDC by adopting objective and transparent selection criteria, and establish monitoring, review, evaluation and learning systems at various levels (internal and independent external systems);

h) To undertake regular on-line monitoring of implementation projects in the State /UT. It shall also hold review meetings at fixed intervals, besides undertaking field visits to ensure quality of implementation. Commissioning of studies,evaluations, workshops, learning meets and the like, is another important task tobuild a feedback loop.

i) To constitute a State level Panel of Independent Evaluating Agencies. Theevaluating agencies may be shared with the districts to take up Mid-term and End- of- term evaluation of independent projects.

j) To prepare State-specific Process Guidelines, and Technology Manuals etc. in coordination with the SLND.

To design and obtain approval of competent authority to release „Guidelines for Establishment and Utilization of Watershed Development Fund (WDF)" based on model Guidelines

Watershed Cell cum Data Centre (WCDC)

An exclusive Cell, called the WCDC shall be established at District level to oversee implementation of watershed development projects in each District. The WCDC shall have a team of professionals. A separate zero balance account shall be maintained in respect of the WCDC

The District Collector/Deputy Commissioner may be designated as the Chairperson, and CEO, ZP as Co-Chairperson of the District Cell. All the administrative and implementation responsibilities shall vest in the Project Manager, who in effect will serve as the CEO of this Cell. He/she will service the Cell and support its Chairpersonin carrying out all assigned responsibilities.

Functions of WCDC

a) To select suitable PIAs by following due process of selection prescribed by the SLNA and procurement norms of the respective State/UT Governments.

b) To take up overall responsibility of facilitating preparation of strategic and Annual Action Plans (AAP) for watershed development projects in respective districts. Springshed development should find adequate focus in AAP wherever possible.

c) To provide professional and administrative/managerial guidance to PIAs in planning and execution of watershed development projects.

d) To examine and recommend the project proposals to SLNA for approval.

e) To bring effective convergence of other schemes with the project works by effective coordination with various developmental and welfare Departments for synergy of delivery at field level.

f) To effectively support scientific organizations in District or in nearby Districts for infusing technical and domain knowledge for development of projects.

g) To develop action plans for capacity building of various manpower and community-based organisations associated with project works. The support knowledgeable and experienced resource organizations may be tapped for thispurpose.

h) To carry out regular monitoring, evaluation and learning exercises to promotequality of execution, to ensure the principles of economy, ecology and equity.

i) Ensure unhindered flow of funds as per budget approvals to the PIAs, WCs andothers to whom

it may be due.

j) To ensure smooth flow of funds to watershed development projects.

k) To establish and maintain District Data Cell (DDC), and link it to State and National Data Centres.

l) To integrate watershed development plans into District Plans of the District Planning Committee.

m) To observe the primary responsibility to establish close linkages with all the three (ZP,TP/BP/MP and GP) democratic bodies and District DevelopmentCoordination and Monitoring Committee (DISHA) in the interest of watershed development projects.

n) To actively participate in DISHA committee meeting, maintain an office record on recommendation made by the members and action taken by the WCDC thereon. The reports may be uploaded on Ministry of Rural Development website.

Project Implementing Agency (PIA)

Constitution of PIA

The SLNA may evolve and lay down appropriate mechanisms for selecting and approving the PIAs, who would be responsible for implementation of watershed development projects through WCs. These PIAs may include relevant line Departments, autonomous organizations under State/Central Governments, Government Institutes/Research Bodies, Panchayats, Voluntary Organizations (VOs), development agencies set up by Private Trusts and Industries to operate their Corporate Social Responsibility (CSR) activities and the like. It is the WCDC that will select the PIAs in accordance with the laid down norms.

Roles and Responsibilities of the PIA

a) To orient GPs and communities towards the program, its objectives, and expectations, community organization, maintenance of transferred assets, developing of regulatory norms for use of groundwater & other common property resources. An important role of the PIA will be to prepare GPs to adopta resolution to provide all the support to the project life cycle.

b) To put in place a WDT immediately after signing the MoU, begin community mobilization & organization into FPO. Various UGs and SHGs, undertake orientation & training programs for them. It shall set up WC, which shall be the field execution agency.

c) The WDT shall work with the WC and get the project communities involved in preparing comprehensive action plan. It may adopt scientific approaches and processes to promote active participation of people. WDT shall, in discussion with the project communities initiate Entry Point Activities (EPA) and to get theproject action plan vetted from the GS, and forward it to WCDC for its approval.

d) To supervise implementation activities, inspect and authenticate project accounts; encourage adoption of low-cost technologies, building upon indigenous technical knowledge, monitor & review the overall projectimplementation.

e) To ensure MIS in place. This includes submission of periodical progress reports in prescribed formats and uploading data online, feeding into various DataPortals. PIA should attend reiew meetings convened by the WCDC.

f) To make institutional arrangements to carry out post-project Operation & Maintenance (O&M) functions.

g) To arrange for physical, financial and social audits of all the works undertaken.

h) The PIA, with support from WCDC, may bring in the services of local KVK and SAU/CAU for

developing the norms and monitoring procedures for natural resource governance. Relevant training modules and training programs may be developed by the PIA.

i) PIA shall orient and help communities towards springshed development in hilly areas.

The Guidelines consider PIAs as the key agency in driving a people- centric and science-based watershed development approach for implementation of the projects. It is, therefore critical, that the SLNA and WCDC should select very competent PIAs and constitute strong WDT.

Participatory Watershed Development Plan (PWDP)

The overall responsibility for preparation of a PWDP for a watershed projects, along with DPR is given to the PIA

a) The project level committees, including the all-important watershed committee will be constituted and guided to prepare a comprehensive development plan, by adopting participatory approach. The comprehensive plan for the project period shall show year-wise actions plan indicating various activities/ works. This will be placed before the Gram Sabha, and with its approval sent up for consideration and approval of the WCDC.

b) At the time of submitting the plan for consideration of the WCDC, project level community institutions, namely, FPO, User Groups, SHG etc. must be in place, and the profile must be incorporated into the Plan.

c) The Plan needs to detail out the potential benefits that will be generated from various interventions in favour of the project community as individuals and as a group, and also the positive impact on the ecology. The time schedules in respect of these varying benefits must also be reflected.

d) In the plan, the project area will need to be clearly delineated by mapping sub- watersheds/landscape zones, and their characteristics. It must contain all baseline data in respect of all the parameters.

The details relating to existing production systems (activities-crops, livestock etc., cropping intensity, degree of diversification, productivity levels, constraints etc.), and the proposed changes to be adopted for higher productivity and cumulative output may be incorporated.

The Plan must identify the potential climate risks to production activities, through consultations with the farmers, and show the response mechanisms that will be implemented.

e) Hydro-geological assessment of the watershed includes an inventory of both surface and groundwater resources, identified locations of springs and their characteristics, including delineation of recharge and discharge areas.

f) In case of rejuvenation of springs in hilly areas, details of the aquifer profile and its recharge potential need to be studied for identifying both natural and artificial recharge interventions.

g) Groundwater monitoring and local weather monitoring systems needs to be established based on the hydro-geological assessment for use in participatory water budgeting exercise should to be taken up from the second year.

h) Workout and include detailed resource-use agreements (for surface water, groundwater and common/forest land usufructs) among User Group members in a participatory manner based on principles of equity and sustainability.

i) Common land properties are identified along with their users, the status of the lands is detailed, and the package of activities for regeneration and maintenance of the commons is finalised as a part of the Plan

j) The WC should take up the responsibility of regular monitoring of groundwater.

k) The plan must also describe the proposed interventions (physical and financial, including the time schedule).

l) Based on the local priorities, the plan may detail the sequence of activities and their budget requirements such that implementation is spaced appropriately for realising the desired quality.

m) The project plan must be in alignment with the District Irrigation Plan. Water budgeting based on available water and the potential quantum that is proposed to be harvested in the project area, will help in determining an optimal crop plan.

n) Entry point activities are taken up by the WDT to build rapport with the village community and gain their confidence towards people-centric project development. The progress made in respect of the entry point activities like formation of FPO and establishment of custom hiring centre may be included in the plan being submitted. However, a few other activities that the local situation may demand, and the WDT finds it necessary may also be taken up by preferably sourcing funds from ongoing schemes like MGNREGS, RKVY etc.

Formation of FPO with about 300 shareholding members would be an optimal entry point activity for the program. Entry point related budget will be released to the FPO as soon as it has been registered with at least 50 paid shareholders and has a space to open its office. The FPO can then be supported to operationalize a CHC too as its initial activity.

o) The comprehensive project plan containing all details, forms the basis for the program‟s MIS. It must therefore be elaborate enough in terms of data, information, technical details, budget etc., so that its MIS can be linked with State and National Data Centres.

p) The plan must be flexible enough, so that necessary changes can be effected to accommodate emerging experiences/ learning and innovations felt useful. The plan can be reviewed and amended biannually, if necessary, with the approval of the WCDC.

q) Action plan must show a clearly demarcated project area boundary with specific details of survey numbers, ownership, as also year-wise sites for various works/activities that will be undertaken.

Watershed Development Team (WDT)

Establishment of WDT

The WDT shall be set up by PIA. It shall act as the technical team at the Project level,and guide WC in planning and implementation of Project activities.

Each WDT shall have a minimum of four members; at least one of them should be a woman. Broadly, the domain knowledge and experience of the team should encompass agriculture (includes all related agricultural sciences), forestry, soil health management, water management and community mobilization & institutionalbuilding.

The team members should preferably have a professional degree in the related domain. However, the qualification can be relaxed by the WCDC in favour of experienced candidates with the approval of SLNA. The PIA shall designate one of the WDT members as the Project Leader.The WDT should be positioned as close as possible to the project location. The WDT should function in close collaboration with the team of experts/professionals at the district and State levels.

Roles and Responsibilities of WDT

The WDT shall guide WC in formulation of project action plan and its execution. An indicative list of the roles and responsibilities of WDT would include, among others, the following:

a) To assist GP/GS in constitution and functioning of WC.

b) To organizing and nurture village level institutions and FPOs in developing & implementing their business plans and services. WDT shall ensure institutionalizing governance mechanisms.

c) To mobilize women to ensure adequate reflection of perspectives and interests of women in the watershed action plan.
d) To conduct participatory base-line surveys, training and capacity buildingactivities.
e) To prepare detailed PWDP for each watershed for consideration and approval of the Gram Sabha. Such plans constitute detailed actions related to focal areaslike regeneration of biomass and water resources in private and common lands,equitable sharing of regenerated resources, reducing risks due to climate variability, water management value addition to enhance farmers‟ income and to promote sustainable livelihoods at household level. WDT shall ensure that the action plan has laid due emphasis on biological activities as a sustainable route to implementation and success of projects.
f) To undertaking engineering surveys, prepare engineering drawings and cost estimates for structure(s) to be built, maintain of Measurement Book (MB) etc.
g) To monitor, assess and undertake physical verification & measurements of the work done.
h) To facilitate development of livelihood opportunities for the landless people.
i) To maintain project accounts.
j) To arrange physical, financial and social audits of the work undertaken.
k) To setup suitable arrangements for post-project operation, maintenance and future upgradation of assets created during the project period.
l) To place the statement of progress of various works/activities before the WCin its monthly meetings.
m) To ensure the use of available of digital maps at Bhuvan, GIS and webplatforms enable smooth integration of field data with maps/spatial data and also use of Land Resource Inventory (LRI) data wherever available while preparing the Detailed Participatory Watershed Development Plan DPWDP/ Detailed Project Report (DPR).
n) To geo-tag of assets (like water harvesting Structures and block plantations) created under programme and maintain physical records and action plans /DPRs for better understanding of programme by the Community.

Watershed Committee (WC)

The Gram Sabha will constitute WC to take primary responsibility for executing project development. The Committee shall be registered as a Society under the Societies Registration Act, 1860. Alternatively, the WC shall be constituted by the GSas a sub-committee of GP chaired by the Sarpanch. In such case, no registration underSocieties Registration Act, 1860 will be required.

The Committee shall comprise a minimum of eleven members; five members representing various user groups and the SHGs; three from FPO (one member each representing the FPO itself, CHC, and such other unit, like at sale outlet set by it); oneGP member; and one WDT. The Secretary selected will serve as Member-Secretaryof WC. The eleven member committee (including the Secretary) shall have, at least two representations each, from among the women and SC/ST members.

The Committee members in a specially convened meeting shall choose one among themselves to serve as the Chairperson and another as Co-Chairperson. Either Chairperson or co-Chairperson shall be essentially a woman.

The Secretary of the Committee shall be a paid functionary, and his emolument shall come from the administrative component of the budget of watershed project.

The Committee may approach the Gram Panchayat for a suitable space to set up its office or hire a

building from where it can operate on a regular basis.

Functions of the Watershed Committee (WC)

The most important peoples‟ body responsible for the project success is the WC, as it shall shoulder the major responsibility for preparing and executing the project plan. It shall be guided all along by the WDT.

a) To ensure active partnership of the project community in planning and implementation.

b) To approve works and activities to be taken up as per action plan and DPR. It shall adhere to cost norms approved by the State Government, i.e., Schedule ofRates (SRs) for different infrastructure works. In case of individual beneficiaryactivities, the rates as prescribed under the scheme shall be the norm.

c) To prepare plans for implementation at GP level and submit it in the planning module of e GramSwaraj portal with the help of WDT.

d) To open and maintain a zero-balance joint bank account in one of the scheduled banks and operate it under the joint signature of the account holders (Reference

e) To receive funds entitled under these Guidelines into the bank account and after expenditure submit utilization certificates to PIA for further submission

f) To focus on nurturing community participation by supporting various User Groups, Self- Help Groups as well as FPO. It shall enforce regulatory norms relating to various assets and resources created and developed through action plan with the help of Gram Panchayat.

g) To conduct annual audit of natural resources leading to asset maintenanceplan, water budgeting exercise, twice a year for establishing regulatory norms on water use, and laying down protection norms for regeneration of the common land.

h) To own resources during the implementation of project activities and enforce its implementation by taking necessary support of Gram Panchayat and PIA. The new generation watershed development program is expected to generate wider experiences in community managed participatory governance of natural resource management for universalization.

i) To finally transfer the assets created to the Gram Panchayat at the end of financial year. Further, it shall take an active part in inspecting the assets and works from time to time and ensure their repair, maintenance and upgradation as required. For this, financial resources available from ongoing schemesunder GP and Watershed Development Fund (WDF) may be accessed.

Self Help Groups (SHGs)

SHGs have proved successful across the country, particularly as centres of micro- credit. Further, they have also taken up variety of livelihood activities in diverse fields. Promoting alternate livelihood activities being an important objective of a watershed project, conscious efforts should be made to make the existing SHGs as active partners in development strategy within the project area. While strengthening the existing ones, need based/resource based new ones may also be formulated. Effort may be make to federate all SHGs to improve business opportunities.

The WDT and WC should take this responsibility and create homogenous groups based on the common identity and interests of local people. The landless and weaker section members in particular will need to be mobilized. This initiative can be linked with the program of NABARD, MGNREGS, NRLM etc.

The members of existing and new SHGs will need to be trained in different aspects of operations, credit management and livelihood activities. The NLNA/NLND may decide on the size of revolving

fund to be made available to the SHGs in the Project area.

User Groups (UGs)

Watershed approach of development is a landscape approach, wherein resources like land, water, and assets thereon, are planned/utilized keeping conservation and regeneration in view.This warrants total involvement of the people in terms of ownership and management of the assets created. These assets include, soil & water conservation measures, water harvesting structures, pastures, horticulture&plantations etc.

In this context,promotion of collective effort of farmers & other stakeholders atplanning, decision making, implementation and management stages would be useful. This can be achieved by creating and nurturing several „User Groups (UGs)" comprising of persons with common interest around different resources.

The PIA shall focus on forming homogenous groups of different stake holders around various initiatives at the implementation stage. This will help in associating thepotential users in deciding on the work details. For example, the decision for developing a pasture land may involve the ratio of fodder trees and grasses to be adopted, the species to be opted. Such an approach builds ownership and a stake in developing and maintaining it later. UGs may be encouraged to join FPOs and avail of various services offered by them.

Further, the WC should roll out resource-use agreements among UGs based on the principles of equity and sustainability. These agreements must be worked out before the activity is undertaken. The UGs shall be responsible for adhering to the user norms, and upkeep of the concerned assets.

The Gram Panchayat will need to take over these assets and provide operation and maintenance support. The WDF resources could also be made available for the upkeep of assets.

Chapter 10

ENTRY POINT ACTIVITIES

IDUKKI WDC-1/21-22

10.ENTRY POINT ACTIVITIES

Entry point activities are necessary to bring the community members towards the project and to bring about a positive air in the project area. Entry Point Activities are part of community mobilization process to get more and more participation of the community in the watershed planning and to meet a part of community needs. Entry Point Activities are those interventions identified by the community as felt needs, during the initial awareness.

EPA activities are taken up under watershed projects to build a rapport with the village community to make them to feel the presence at the beginning of the project; generally, certain important works which are in urgent demand of the local community are taken up. A Focus Group Discussion was conducted and entry point activities were determined.

According to the Guidelines of WDC- PMKSY 2 per cent of the total project cost is earmarked for Entry Point Activities. A total amount of Rs. 2415280/- is available for EPA and the details showing the watershed code, name of watershed, area and amount is given below:

10.1.1- Suggested works and Budget

No.	Code	Budget (Rs.)	Name of activity	Amount (Rs.)
1.	14P35a	424480	Ozhuvathadam - Cheeyapparathodu Side wall protection (50 m)	376750
			Ozhuvathadam-Olikkalpadi public pond cleaning	35000
2.	14P35b	750960	Kunnathanpadithodu Check dam (6m)	687000
			Kunchipetti public pond renovation (deepening 1m)	36000
			Mudippara panchayath pond - Cleaning, GI mesh roofing	17000
3.	14P35c	1239840	Farmers producer organization	550000
			Adimali-thalamalithekkekkara thodu- Check dam (6m)	687000
	Total	**2415280**		**2388750**

10.1 FPOs, Farmers' Income and Value Addition

In contrast to production-centric agriculture, that has largely been practised in the country so far, the Government's vision of doubling farmers income, has shifted the attention to income – centric policy framework. This entails market- based production decisions, and integrating farm-produce with markets, with a view to enabling the farmers to capture optimal value from his farm output.

This calls for mobilising farmers into FPOs, to impart efficiency to operations at both production and post-production stages.It further calls for effective post- harvest management by focussing on agri-logistics (storage and transportation), processing and marketing. The PWDP would do well build a robust FPO system that can take care of important issues as listed below:

- The PWDP must incorporate mobilisation of farmers into a healthy FPO, to shoulder the responsibilities. It should become the foremost entry point activity.
- The FPO should focus on providing inputs to farmers at reasonable price, and evacuating farmers" produce to markets by depending on alternate market channels, always preferring for direct sale

options. It needs to put in place the needed infrastructure and management systems in place for this purpose.

- It should support the farmers to undertake primary processing of the produce, so that it is able to command higher prices when put to price discovery mechanisms, including online trade platforms.
- It should establish basic infrastructure that will enable assaying and aggregation of the small lots of the farmers; and further facilitate produce transportation through one or more of the markets now available under new market architecture, comprising Grameen Agricultural Markets (GrAMs), reformed Agriculture Produce Market Committees (APMCs)/ Agriculture Produce and Livestock Market Committees (APLMCs), Export platforms, Futures Trade platforms and the like.
- Supporting the farmers to overcome distress sale, which is common after the harvest is critical to capture optimal value on their sales and realise better incomes. The FPO can play a crucial role by hand holding the farmers in adopting warehouse facilities. The farmers will stand to benefit from electronic Negotiable Warehouse Receipt (eNWR) system available in the country.
- FPOs can provide/facilitate many other services like input supplies, farm advisories, custom hiring of farm machineries, credit, contract farming etc.

10.2 FPO – Subsidiary Institutions and Services Offered

The FPOs can set up several subsidiary activities, create backward & forward linkages, and serve both, farmers and other non – farmer stakeholders of the project. Some of such services that an FPO can manage and deliver are indicated below:

a) **Custom Hiring Centre (CHC):** Farm machinery and associated services can be rented out to the farmers and landless labourersfor achieving higher productivity and reducing cost of cultivation. The FPO can run it on a revenue model by charging reasonable rates of rent. The FPO should try to avail itself of the ongoing CHC scheme.

b) **Community Seed and Planting Material Centre:** It can take up seed and planting material production of various agronomic, fodder and horticultural crops. The FPO must focus on providing seed and planting materials of varieties recommended for the local area, their timely delivery at reasonable rates. These can become the brand value of such an initiative.

c) **Integrated Farming System:** FPO can ideally focus on the strength of farmers and facilitate promoting integrated farming system by taking up suitable combination of sectors like -afforestation (agro-forestry), fishery, goatery, apiary, piggery, horticulture plants like moringa, amla, mango, cashew nut, floriculture etc through convergence with PDMC.

d) **Promote micro irrigation** like drip, sprinkler and pivot irrigation, drip cum mulch, small size green house and shadenet with foggers through convergence with PDMC.

e) **Post-harvest management**: FPO can develop facilities and capacity to aggregate the local produce and link to alternate market channels. These include both online and physical transactions, with preference for direct sale. The concomitant logistics for primary processing, aggregation, storage and transport may be set up by the FPO. It should attempt to benefit from several of ongoing relevant schemes.

f) **Creation of sale outlet and service centre**: FPO can create Centre from where the farmers can purchase various inputs and avail of services such as insurance, credit, vaccination for animals by levying service fee at a single place.

g) **Promoting secondary agriculture activities** by facilitating skill development, access to institutional credit besides assistance under government scheme.

h) Managing an information centre for disseminating weather based agro meteorological-advisories, package of practices for cultivation etc.

i) Any other social / business activity as per the local needs.

11. WATERSHED DEVELOPMENT WORKS

Watershed work phase is the core component of the project. Creating permanent structures as required the slope, geology and topography starting from ridge to valley to conserve rain water at point of its incidence with ground. Tapping the water resources at right place at right time will increase the effectiveness of this project. The objective being reclamation of natural resources and creating sustainability to assets created under this project. A multi-tier ridge to valley sequence approach was approached towards implementation of watershed development projects. A net budget of 56 percent is allotted for this work.

11.1 NATURAL RESOURCES MANAGEMENT

The physical treatments are to be carried on during the watershed development work phase. While implementing the project, it is necessary that the treatments are carried out starting form ridge and progressing towards the valley. This approach is followed with the following objectives:

a) Protect the upper reaches to avoid erosion and reduce runoff
b) Avoid siltation of structures in the middle and lower catchments.
c) Ensure the cost effectiveness of structures in the valley and
d) Improve overall efficacy of the measures.

This phase is the heart of the programme in which the DPR will be implemented. Some of the important activities included in this phase are:

a. Ridge Area Treatment : All activities required to restore the health of the catchment area by reducing the volume and velocity of surface runoff, including regeneration of vegetative cover in forest and common land, afforestation, staggered trenching, contour and graded bunding, bench terracing etc.
b. Drainage line treatment with a combination of vegetative and engineering structures, such as earthen checks, brushwood checks, gully plugs, loose boulder checks, gabion structures, under dykes etc.
c. Development of water harvesting structures such as low-cost farm ponds, nalla bunds, check-dams, percolation tanks and ground water recharge through wells, bore wells and other measures.
d. Nursery raising for fodder, fuel, timber and horticultural species. As far as possible local species may be given priority.
e. Land development including in-situ soil and moisture conservation and drainage management measures like field bunds, contour and graded bunds fortified with plantation, bench terracing in hilly terrain etc.
f. Crop demonstrations for popularizing new crops/varieties, water saving technologies such as drip irrigation or innovative management practices. As far as possible varieties based on the local germplasm may be promoted.
g. Pasture development, sericulture, bee keeping, back yard poultry, small ruminant, other livestock and micro-enterprises.
h. Veterinary services for livestock and other livestock improvement measures.
i. Fisheries development in village ponds/tanks, farm ponds etc.

j. Promotion and propagation of non-conventional energy saving devices, energy conservation measures, bio fuel plantation etc.

Soil and Water Conservation Works

Mainly the watershed development works are divided into three stages such as ridge area treatments, Slope treatment, Plains or flat level (Area treatment) and Drainage line treatments. Different treatments are planned for each micro watershed to see the geographical and socio economic condition of that specific area. The details are briefly described below:

Ridge Area Treatment Plans:

It is very important to treat the ridge as this is where the major water resources originate. This involves mainly hilly region in WDC-PMKSY 2.0-1 watershed. For the ridge area treatment of WDC-PMKSY 2.0-1 watersheds, following structure are been proposed after interaction between the watershed committee, Neighbour Hood Groups, GramaPanchayats, Block Panchayat and other field staff of line departments and WDT engineer.

a) Graded Bunding
b) Gully Plug
c) Contour Trenches
d) Staggered Trenches
e) Earthen Bund

Graded Bunding:

"Graded bunds or graded terraces or channel terraces are the bunds or terraces laid along a pre-determined longitudinal grade very near the contour but not exactly along contour".

The graded bunds, commonly used are comparable to the narrow base terraces. They are used for the safe, disposal of excess runoff high rainfall areas and regions where the [clay] soil is relatively impervious. Farming operations are not done on bunds or bund channels.

Function:

1. These terraces act primarily as drainage channel to regulate and conduct runoff at non erosive velocity.
2. To make the runoff water to trickle rather than to rush out.

Gully Plug: The portion where the stream begins, the structure is constructed with arranging loose boulder perpendicular to the flow of water is called gully plug.

Benefits:

1. Prevents soil erosion of land and reduces the flow of water and further prevents the formation of new streams.
2. Very useful in moisture conservation and reduces the scroucing and desiltation of the streams.

Contour trenching:

It is a simple, and a low-cost method of checking the velocity ofrunoff in the ridge area of any watershed. A contour trench is a trench dug along acontour line. A contour line is a line, which joins together points of the sameelevation. Digging a trench along such a line increases the chances of containingrunoff for a longer period of time within the trench. It is also true that if trencheswere not to follow a contour, such digging could actually increase the possibility ofsoil erosion because there would be a rise in the velocity of runoff following anincrease in the slope of the land.

Objectives:

- Slowing down the velocity of runoff
- Checking soil erosion, and
- Improving local soil moisture profile

Contour trenches are constructed in the ridge area of a watershed. Rainwater,which falls in this area, flows unchecked carrying with it eroded soil into the flatterportion of the watershed referred to as the "valley". This eroded soil gets depositedas silt in the reservoirs and ponds, thereby reducing their life. Thus, any waterharvesting work undertaken in the valley will become meaningless unlessappropriate measures such as contour trenching are undertaken to control runoffand soil erosion on the ridge. Contour trenches serve to collect the rainwater thatfalls in the ridge area. This way the soil moisture profile in the area adjacent to thetrench gets improved. Along with the water, the eroded fertile topsoil also getsdeposited in the trench. It is, therefore, necessary to combine trench construction with plantation

Staggered trenches:- In medium rainfall areas with highly dissected topography, Staggered

ContourTrenches are adopted. The length of the trenches is kept short around 2-3 m and the spacingbetween the rows may vary from 3-5 m. The chances of breaches of SCT are less as comparedto Continuous Contour Trenches. Over time, experience of watershed programs has shown that it is better to staggerthe digging of contour trenches. This is because it has been found that invariably errors havebeen made in contouring over long distances. If the contour trench is not level and by mistakesloped, then water starts to flow from the high point to the low point, cutting a path and increasing soil erosion. Therefore, instead of making trenches continuously, they should bemade in a staggered, discontinuous manner.

Objectives:

- Slowing down the velocity of runoff
- Checking soil erosion, and
- Improving local soil moisture profile

Contour earthen bunds

Contour bunding is a simple and low-cost method of checking the velocity of runoff in the ridge area of any watershed. A contour bund is a bund constructed along a contour line. A contour line is a line, which joins together points of the same elevation. Making a bund along such a line increases the chances of containing runoff for a longer period of time within the bund.

Objectives:

- Slowing down the velocity of runoff
- Checking soil erosion
- Improving local soil moisture profile-

Contour bunds are constructed on the ridge area of a watershed. Rainwater, which falls in this area, flows unchecked carrying with it eroded soil into the flatter portion of the watershed - the "valley". This silt gets deposited into the reservoirs and ponds, thereby reducing their life. Thus, any water harvesting work undertaken in the valley, will become meaningless unless appropriate measures such as contour trenching and bunding are undertaken to control runoff and soil erosion on "the ridge. Like contour trenches, blinds also collect the rainwater that falls in the ridge area. This way the soil moisture profile in the area adjacent to the blind is improved. Along with the water, eroded fertile topsoil also gets deposited in the blind. It is, therefore, important to combine contour blinding with appropriate vegetative measures.

Land Development

The second tier treatment is the slope treatment. This is generally done on agricultural land or waste land. This generally includes water conservation or surface water storage structures. This being highly labour intensive, will involve more of manual labour; so, funds from Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) can be taken. Following structures are been proposed in these areas

Following structures are been proposed in these areas

a. Land Leveling
b. Plantation
c. Earthen Bund

Land leveling- Bench terracing means construction of nearly level steps like fields along contours usually by half cutting and half filling procedure. It is an earthen embankment or a ridge and channel, constructed across the slope at a suitable location to intercept surface runoff water. It may be constructed with an acceptable grade to an outlet or with a level channel and ridge. By adopting bench terracing, both degree and length of slope are reduced which help in soil moisture conservation for enhanced crop production. Bench terracing is recommended for slopes from 10 to

30%.

Plantation-Several agronomical measures are adopted, supplementing the mechanical measures in the treated lands. The processes of soil erosion (detachability and transportability) will continue resulting fluctuating crop fields. These measures include: -

- Contour Farming - planting on contours.
- Mulching using various techniques that will increase the water retention capacity of the soil, for instance mixing straw and breaking clods. Mulching is particularly helpful in vegetable cultivation, where assured soil moisture is a necessity.
- Use of dense growing crops/ cover crops for instance cowpea, pulses, paddy. These will reduce splash erosion.
- Mixed cropping. increasing the capacity to retain water
- Intercropping or strip cropping, alternating either blocks or strips with different crops.
- Use of organic manure or green manuring with legumes, such as cowpea, dhaincha, pulses.This improves water-holding capacity.

Farm Bunds: Bunding, also called a bund wall, is the area within a structure designed to prevent inundation or breaches of various types. Field bunding is one of the important structures which check the runoff of water from the Farm level. Often Farm area left without proper bunding, water freely flows out of the Farm and scope for percolation is almost negligible. Hence Farm bunding plays an important role in conservation of moisture at Farm level. As the multi-tier approach ridge to valley, drainage line treatment and land development farm bund fall in the third agenda.

Plains or Flat Level Treatment:

These are at field level of farmers where farmers are operating at a very high labour intensive way. These generally field bunding, crop pattern alteration. The prime aim is to conserve the rain in the field. In this area stone bunding is not feasible due to unavailability of stone in the local area. So in the plain or flat level treatment the two things are proposed as under.

1. Farm Bund
2. Centripetal terracing
3. Rain water harvesting pits
4. Afforestation/ Plantation

Water conservation Structures and activity: The activities are generally taken in the bottom area/ valley region of the watershed area. The structures will help in the storage of the water which increases the soil moisture and water table of the area. Land can be irrigated through these structures. The proposed structures are as follows:

1. Rain (Roof)Water Harvesting
2. Farm ponds/Irrigation wells
3. Check Dam
4. Well Recharge

Rainwater harvesting from rooftop catchments

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the household needs through storage in tanks. The main objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dryland, hilly, urban and coastal areas. Rainwater harvesting usually involves collecting water from cleaner surfaces, such as roofs. There are several reasons for harvesting rainwater today including: low-cost irrigation, domestic water supply, water and soil conservation, aquifer recharge, and flood control. It is also desirable to use rain because of the high quality and softness of the water and the relative absence of contaminates such as disinfection byproducts (chlorinated hydrocarbons), endocrine disrupting compounds (antibiotics and hormones), heavy metals, agricultural chemicals and chlorine resistant microbes that are increasingly appearing in our ground and tap water. Rainwater collection systems are cost effective and easy to maintain by the average homeowner and are easier to install and use than wells or surface ponds.

Well recharge

The broad aim of the programme is to improve the water quantity and quality levels of homestead open dug wells and small homestead ponds. This will contribute to enhanced health and welfare of the community through improved access to drinking water. The reduction of public spending on Tanker Water Distribution to the water stressed regions which is common during summer is also envisaged as a broader goal of the programme.

The specific objectives of the programme are

- recharge ground water
- improved drinking water availability across the year
- significantly reduce the impact of drought and consequent public spending on supply of drinking water in tankers to the water stressed regions
- Improved agricultural production and productivity.

The programme would also envisage strengthening of the decentralization programme and the PRIs, in discharging their basic mandate in water sector through community efforts that are cost effective and sustainable.

Biogas plants

The term 'biogas' is commonly used to refer to a gas which has been produced by the biological breakdown of organic matter in the absence of oxygen. The gases methane, hydrogen and carbon monoxide can be combusted or oxidized with oxygen and the resultant energy release allows biogas to be used as a fuel. Biogas is a commonly used bio fuel around the world and is generated through the process of anaerobic digestion or the fermentation of biodegradable materials such as biomass, manure, sewage, municipal waste, rubbish dumps, septic tanks, green waste and energy crops. This type of biogas comprises primarily methane and carbon dioxide.

Biogas has a wide variety of uses and can be used as a relatively low-cost fuel for the generation of energy and heating purposes, such as cooking. For example, basically any facilities which need power are able to use biogas to run engines, or to generate either mechanical or electrical power. Biogas can be compressed, similar to natural gas, and is able to be used to power motor vehicles. Biogas is a renewable fuel, so it qualifies for renewable energy subsidies in some parts of the world. It is possible to concentrate the methane within biogas to the same quality standards as fossil fuel derived natural gas to produce biomethane. If concentrated and compressed this biogas can then be used in vehicle transportation.

MINI DRINKING WATER SUPPLY SCHEMES

In spite of heavy annual rainfall, and numerous rivers and ponds, the State of Kerala is paradoxically situated among the country's lowest per capita ground water availing state. Water plays an important role in the welfare of societies through its widespread linkages. Water needs are complexly linked with the daily life and its scarcity can be an obstacle to economic growth. The important aspects in this regard are (i) the availability of water for production and income generation; (ii) water for domestic needs, which have a significant role in maintaining human health; and (iii) sustainable environmental management. Among the water users in different sectors, consumption by households has very specific influence on human well-being. Even though the household consumption constitutes only eight per cent of the total water usage, the value of water for household purposes is reckoned much higher than the value of it for industrial use and farming.

Hence, providing potable water to all sections of the society becomes one of the major concerns of the governments. The problem of financing the water service may be one of the contributing factors for institutional change. In this context, privatization or market based profit dominated approach to water supply service has emerged as a policy suggestion to tackle the problem. However, privatization of an essential service of water is not politically and socially viable. Further market strategies and privatization tend to raise inequalities. Another approach, aiming both economic

and environmental sustainability includes decentralized development with co-operation of NGOs and local communities. Community management of drinking water has recently emerged as an alternative. Declining water table has a consequence on the family managed drinking water supply. In this background, conservation of the exiting water resources and its efficient management becomes the priority issue at policy level.

CROP DEMONSTRATIONS

The agricultural system is characterized by low productivity, shift towards less labour intensive crops and increasing marginalization of agricultural income in the household economies. These deplorable conditions form the backdrop to the local initiative for agricultural rejuvenation.

At present the agricultural activities in the area are mainly aimed to meet the local needs and only small amount of vegetables are sent to outside market for sale. The farmers rely on old techniques and patterns for agricultural production. The area has wider scope for the use of modern techniques and improved tillage practices. As banana and vegetables are the key horticulture produce in the area, it is proposed to bring more area under these crops. To popularize these crops, crop demonstrations were taken under the Entry Point Activities. It is proposed to give 5 banana seedlings to all households and to introduce organic vegetable cultivation in 50 cents per Neighbourhood Group. As crop diversification is also essential for economic sustainability, it is proposed to introduce water melon, jasmine and floriculture. The plants of money fetching horticulture plants like mango, rambutan, mangosteen, guava, etc. will also be supplied to the households to improve the economic condition of the farmers.

The activities aimed at irrigation will enhance the productivity and will irrigate more area which paves way to bring more area under agriculture/horticulture production.The villagers expressed much enthusiasm towards expanding their horticulture activities.Moreover the watershed area holds good potential for horticulture activities. Hence it is important to promote and expand horticulture activities in the area.

Avenue plantation

Afforestation is the process of establishing a forest on land that is not a forest, or has not been a forest for a long time by planting trees or their seeds. Trees could be planted along the roads, which could check the erosion in the depression of the roadside.

Advantages:

- It helps meet the world's increasing demands for timber and forest products
- Soil erosion is avoided as trees prevent rapid run off after heavy rainfall.
- Jobs are provided.
- Trees provide oxygen
- The beauty of the landscape is preserved
- Trees absorb carbon dioxide and help cut down the danger of global warming
- Trees help prevent heavy storms

Alarmed over the massive degradation of its lush green cover, it is proposed to launch an ambitious social forestry project aimed at instilling a love for nature in the student community, and other inhabitants. The programme will have three elements - 'Our Trees' for school students, 'Puzhayoram' for those who live in the reaches of major drains in the area including the banks of Vamanapuram River and 'Vazhiyoram' (roadside tree shades) for other inhabitants of the area. Under the 'Our Tree' programme, students from Classes 5 will plant fruit trees in their school premises and take good care of it and manage them for five years. Necessary arrangements will be sought to provide grace marks according to how well they take care of the plants. Under 'Puzhayoram' seedlings of bamboo, reeds and other suitable plants will be planted along the sides of the major drains ensuring the side wall protection. Under 'Vazhiyoram', other inhabitants will plant trees along the sides of major roads. The persons who plant trees alongside the road sides will be responsible for taking care of them too. The Project Implementation Agency will be working in tandem with the Public Works Department to implement the project. The Social Forestry division of Kerala Forest Department will provide saplings of around 25 varieties of trees including teak, jackfruit, anjili, bamboo, reeds and gooseberry that would be planted as part of the programme.

It is proposed to bring all the educational institutions in the project area under this scheme

Budget

11.1.1- Budget of Natural Resource Management activities

No	Code of watershed	Name of watershed	Area in ha	Amount in Rs.
1	14P35a	Valara	758.00	9975280
2	14P35b	Irumbupalam	1341.00	17647560
3	14P35c	Machiplavu	2214.00	29136240
	Total		**4313.00**	**56759080**

11.2 PRODUCTION SYSTEM

One of the important components in the watershed development activities under WDC -PMKSY includes support to production/farming system based livelihood activities and enterprises. Ten percent of the total project cost is assigned to support the production system and microenterprises for land owning households. This component aims to diversify and maximize the production and productivity of agriculture system as a whole and targets the land holders with cascading benefits to landless agriculture labour, leased -in farmers and share -croppers.

The objective is to

a) Promote diversified production/farming systems-based livelihood activities/ interventions, and.
b) Encourage farmers to adopt and up-scale successful experiences of proven technologies, integrated farming systems and improved farming practises for livelihood augmentation.

Planning and Implementation

a. The status of natural resources potential was analysed to determine the befitting production system and microenterprises based livelihoods conducive to the socio economic situation and existing livelihood capitals of the watershed village(s) in a participatory manner, at village level under each micro-watershed during the group discussions and user interactive workshops organised as part of the DPR preparation of the project.

b. An action plan was prepared for production system and microenterprises based livelihood activities such as aquaculture, horticulture, agriculture, agro-forestry, animal husbandry, microenterprise, agro- processing, value addition, marketing etc for the project area.

c. To ensure convergence with other production system and microenterprises schemes, the PIA should work in close association with other schemes such as MGNREGS, NRLM,VFPCK, Kudumbasree, NHM, RKVY, NFSM, etc.

d. Production system and microenterprises action plan contains location/farmer centric schedule of activities and interventions and these are delineated on the map.

Mode of Operation and Eligibility for Availing the Production System Funds:

a. Individual land holders/owners can avail the benefits of production system on their private land. The small and marginal farming households, women headed farming households, SC & ST farmers will be given preference.Those households whose land is in close proximity to the developed natural resources may be preferred to make full use of natural resource potential.

b. Selection of beneficiaries will be done by PIA, in consultation with WC.

c. Beneficiaries having common interest will be organized into User Groups to pool and manage their resources as well as manage aggregating their produce for effective disposal and marketing, besides maintaining their natural resource base. This may also provide a means for deciding resource use arrangements based on equity and sustainability.

d. The funds were earmarked for cost intensive farming system based livelihood activities/interventions such as aquaculture, agriculture, horticulture, agro-forestry, animal husbandry, agro-processing, value addition, etc.

e. The beneficiary contribution of farmers will be 20 percent for general category and 10 percent for SC/ST..

Budget

11.2.1- Budget of Production System

No	Code of watershed	Name of watershed	Area in ha	Amount (Rs)
1	14P35a	Valara	758.00	3183600
2	14P35b	Irumbupalam	1341.00	5632200
3	14P35c	Machiplavu	2214.00	9298800
	Total		**4313.00**	18114600

11.3 LIVELIHOOD ACTIVITIES FOR THE LANDLESS/ASSET LESS HOUSEHOLDS

One of the key features of the watershed development includes focused priority on livelihood activities for landless/asset less persons. Nine percent of the total project cost has been assigned to support the livelihood activities for landless/asset less households. This component aims to maximize the utilization of potential generated by watershed activities and creation of sustainable livelihoods and enhanced incomes for households within the watershed area. This will facilitate inclusiveness through enhanced livelihood opportunities for the poor through investment into assets, improvements in productivity and income, and access of the poor to common resources and benefits and augment the livelihood strategy at household level.

Guiding Principles

Livelihood improvement initiative emphasizes on natural resource based activities and conform to principles of equity, gender sensitivity and transparency. It strive 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/assetless people, women, etc., to the benefits.
c. Select the beneficiaries in a transparent manner.

Livelihood guidelines for landless/ assetless households aims at improved household income, participation and division of labour, access to information, knowledge, appropriate technologies and resources.

Planning and Implementation

The most important aspect is the inclusion of 'micro level livelihood planning' as an empowerment tool for the marginalized communities. This planning helps in understanding existing livelihood assets/capitals in a highly participatory manner to augment the existing livelihood platform.

Planning

i. An awareness drive was undertaken at Panchayat level for communication & sensitization of the target beneficiaries.
ii. A "Livelihood Action Plan" (LAP) was prepared for availing the funds under the livelihood component.
iii. The livelihood action plan was prepared by analyzing the socio-economic conditions and existing livelihood capitals of the watershed and focus group discussion, in order to facilitate collection of information to feed into the livelihood action planning process. Livelihood action plan contains schedule of activities, interventions, no. of SHGs to be assisted and expected outcome.
iv. To promote convergence, the PIA has worked in close association with other employment generating programmes such as MGNREGS, NRLM, Kudumbasree, VFPCK, NHM, etc.

Mode of Operation

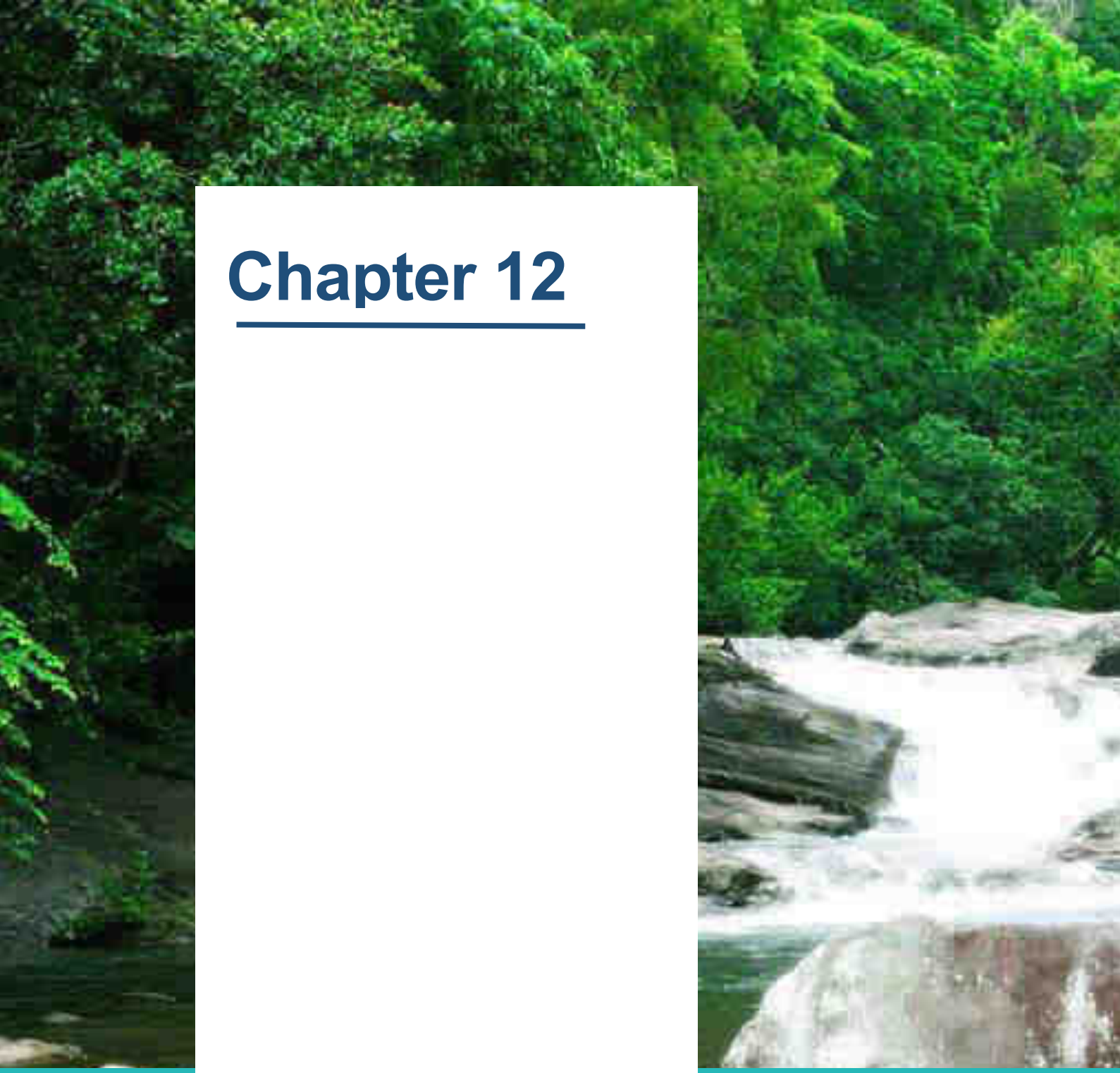
i. The livelihood action plan will be implemented through Self Help Groups and/or their federation. However financial support to enterprising individuals was also be considered subject to a maximum of 15% of the funds under the livelihood component.

ii. Livelihood activities will be carried out either through the existing SHGs having good performance or new SHGs formed with a group of 5-20 persons.
iii. SHGs selected for implementing livelihood action plan will be homogeneous in-terms of their existing livelihood capitals, common interest and need.
iv. SHGs can undertake any permissible activity jointly as a group or the group may decide to support individual(s) for the activities under the umbrella of the main SHG. In case of individual support under the SHGs, the individuals will be accountable to the main SHG for finances and performance.
v. The financial support to enterprising individuals who prepare and submit a viable livelihood proposal, will be considered by Watershed Cell cum Data Centre (WCDC) on the recommendation of the Watershed Committee (WC). The plan has to be approved by the WCDC before extending financial support. However, support to individuals should not exceed a maximum of 15 % of funds under the livelihood component.

Budget

11.3.1- Budget of Livelihood

No	Code of watershed	Name of watershed	Area in ha	Amount in Rs.
1	14P35a	Valara	758.00	3183600
2	14P35b	Irumbupalam	1341.00	5632200
3	14P35c	Machiplavu	2214.00	9298800
	Total		**4313.00**	18114600



Chapter 12

MICROWATERSHED BASED ACTION PLAN- 14P35a

IDUKKI WDC-1/21-22

MICROWATERSHED BASED ACTION PLAN
12. VALARA MICRO WATERSHED (14P35a)

12.1 General Description

Valara micro watershed is the smallest micro watershed in the WDC-PMKSY 2.0 cluster with an area of 788.74 Ha (17.11% of total geographical area). This micro watershed is located mainly in Adimali Grama Panchayath.

Name of micro watershed	:	Valara
Micro watershed code	:	14P35a
River basin	:	Periyar
District	:	Idukki
Block Panchayath	:	Adimali
GramaPanchayath	:	Adimali
Villages	:	Mannamkandam
Latitude	:	10°3'45.550- 10°2'13.019 N
Longitude	:	76°52'8.730 - 76°47'8.286 E
Wards	:	1,2,3,4,20,21
Total Treatable Area	:	758.00 ha
% area in the WDC-PMKSY cluster	:	17.57%

Socio Economic Profile

The general socio economic situation of the micro watershed is average. As per the information provided in the baseline survey conducted, Valara micro watershed has a total number of 476 households with a total population of 1866. 300 numbers of BPL families reside in the micro watershed area. 146 people belong to Schedule Caste and 307 people belong to Schedule Tribe. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood for some families in the watershed area. The socio economic details of the Valara micro watershed is given below

Table 12.1.1 – Demography Details of 14P35a

No	Watershed name	Total families	Population			BPL Families	Land holding/ Family (in Ha)
			Total	SC	ST		
1	14P35a	476	1866	146	307	300	1.65

12.2 Methodology

In line with the guidelines of WDC-PMKSY 2.0, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.

2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Overseers were engaged for taking field estimates of the proposed activities.
5. Induction training was given for the project staff on concept of maps and Resource Mapping.
6. block level online discussions were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
7. This was followed by orientation meeting at GramaPanchayats.
8. Conducted transect walk with ward members and ADS.
9. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
10. A block levelonline meeting was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented.
11. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map.
12. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by online technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
13. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of ward members.
14. Detailed field survey was done for net plan preparation at Grama Panchayat level with the help of ward members & ADS Chairpersons, Vice Presidents & Joint Secretaries of NHGs, MGNREGS officials, etc. The information gathered includes soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up in each microwatershed. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also collected.
15. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
16. Panchayat Level online meetings convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
17. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalsied. The livelihood action plan and the activities under production system were also consolidated.
18. The suggestions were split for four years and four separate annual plans were also prepared.

19. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
20. Major activities included in the watershed project are.

- Soil and moisture conservation measures like centripetal and bench terracing, earthen and stone pitched contour bunding, trenching, vegetative barriers, etc.
- Rain water harvesting activities like farm ponds, percolation tanks, check dams etc.
- Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
- Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
- Encouraging natural regeneration including fodder cultivation.
- Promotion of agro-forestry and horticulture
- Capacity building and creation of a greater degree of awareness among the participants.
- Encouraging people's participation with the involvement of NHGs.
- Livelihood activities for asset less people
- Production system and Micro enterprises

12.3 Biophysical resources

Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the steep sloping area having >35% slope. The category spreads over an area of 401.79 ha (50.94%) and these lands requires urgent soil and water conservation measures.

Table No. 12.3.1 Slope of Valara micro watershed

Sl No.	Particulars	Area (Ha)	Percentage(%)
1.	0-3% - Level/Gentle	36.33	4.61
2.	3-5% - slight Slope	14.75	1.87
3.	5-10% -Moderately Sloping	62.17	7.88
4.	10-15% -Strongly Sloping	43.27	5.49
5.	15-35% -Moderately Steep Sloping	230.43	29.21
6.	>35% -Steep Slope	401.79	50.94
	Total	**788.74**	**100.00%**

Drains

The Periyar River is the major drain of this watershed. A number of drains are originating from different parts of this watershed which drains to the Periyar River. The watershed also has 5 number of ponds distributed throughout the watershed area. The details of the drains and ponds in the watershed area is given in tables given below.

Table No. 12.3.2 Details of Drains in Valara micro watershed

Sl No	Drains
1.	Kambiline cheeyappara thodu
2.	Kambiline Valarakuthu thodu
3.	karipelo gopi bhagam thodu
4.	6mile thodu
5.	ozhuvathadam chanal
6.	valara Kaveri thodu

Table No. 12.3.3 Table showing the details of Ponds in Valara micro watershed

Sl. No	Pond
1	Ozhuvathadam, 25 cent Public pond
2	Chillithod, Krishnankuttipadi - Public pond
3	Kanjiraveli Public pond
4	Rajiv Gandhi Drinking Water Plan Public pond
5	Ozhuvathadam Drinking Water Plan Public well

Land use

Agriculture is one of the prime activity in the watershed area. The major land use category mapped in the watershed area is Forest - Deciduous (Dense Evergreen/Semi Evergreen) with an area of 225.29 ha (28.56%). The second major category is the Forest - Plantation (Tea). This extents in an area of 120.73 ha. An area of 10.51 ha of paddy land has been left as fallow which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. An area of 10 ha is under the built-up land and an area of 0.66 ha is under the rocky area. The details of land use categories with spatial extent are given in table.

Table No. 12.3.4 Land use categories in Valara micro watershed

Sl No	Particulars	Area(Ha)	Percentage(%)
1.	Agricultural Mixed Crop - Mixed Crops	64.38	8.16%
2.	Agricultural Perennial Crop - Arecanut	7.55	0.96%
3.	Agricultural Perennial Crop - Coconut	2.77	0.35%
4.	Agricultural Perennial Plantation Crop - Others	1.43	0.18%
5.	Agricultural Perennial Plantation Crop - Rubber	67.57	8.57%
6.	Agricultural Perennial Plantation Crop - Tea	9.68	1.23%
7.	Built up Land - Residential	5.22	0.66%
8.	Built up Land - Roads	4.78	0.61%
9.	Forest - Plantation (Tea)	120.73	15.31%
10.	Forest - Deciduous (Dense Evergreen/Semi Evergreen)	225.29	28.56%
11.	Forest - Evergreen/Semi evergreen (Fairly Dense)	102.06	12.94%
12.	Forest - Others (Coconut)	6.42	0.81%

13.	Forest - Others (Dense Mixed Forest)	20.07	2.54%
14.	Forest - Others(Arecanut)	8.71	1.10%
15.	Forest - Settlement	2.15	0.27%
16.	Forest - Waste Land (Barren Rock)	92.13	11.68%
17.	Forest - Waste Land (Land with Scrub)	4.54	0.58%
18.	Paddy Converted to Built up - Residential	0.74	0.09%
19.	Paddy Converted to Mixed Crops	6.48	0.82%
20.	Paddy Cultivating Land	6.15	0.78%
21.	Paddy Cultivating Land - Current Fallow	10.51	1.33%
22.	Waste Land - Barren Rocky Land	0.66	0.08%
23.	Waste Land - Land with Scrub	0.02	0.00%
24.	Waterbody - River Island	0.30	0.04%
25.	Waterbody - River/Stream	18.42	2.34%
	Total	**788.74**	**100.00**

Geology

The major geological units in the watershed is Penisular Gneissic Complex group of rocks occurring in an area of 770.03 ha (91.05%).

Table No. 12.3.5 Geological units in Valara micro watershed

Sl No.	Particulars	Area(Ha)	Percentage(%)
1.	Penisular Gneissic Complex	770.03	91.05
2.	Waterbody	18.71	8.25
	Total	**788.74**	**100.00**

Geomorphology

There are three geomorphological units of which 71.66% (565.22 ha) of the area falls under the category Denudational Structural Hills.

Table No. 12.3.6 Geomorphology categories in Valara micro watershed

Sl No	Particulars	Area (Ha)	Percentage(%)
1.	Denudational Structural Hills	565.22	71.66%
2.	Piedmont Zone	170.64	21.63%
3.	Valley	34.17	4.33%
4.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00**

Soils

The major soil series mapped in the watershed area Kanjikuzhi (115.34 Ha), Karimannur (92 Ha), Suryanelli (404.33 Ha), Pambla (49.78 Ha). Majority of area is Sandy Clay Loam in texture. This is distributed in an area of 535.1 ha (67.84 %). Soils in more than half of the watershed area is deep to very deep soils (662.32 Ha) .

More than 50 % of the watershed area is prone to moderate to severe soil erosion which calls for proper soil and water conservation measures in the area.

Table No. 12.3.7- Soil Texture in Valara micro watershed

Sl No.	Particulars	Area(Ha)	Percentage(%)
1.	Clay Loam	119.59	15.16%
2.	Gravelly Sandy Clay Loam	115.34	14.62%
3.	Sandy Clay Loam	535.1	67.84%
4.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00**

Table No. 12.3.8 - Soil Depth in Valara Micro Watershed

Sl No.	Particulars	Area(Ha)	Percentage (%)
1.	Deep	19.44	2.46%
2.	Deep To Very Deep	662.32	83.97%
3.	Very Deep	88.27	11.19%
4.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00**

Table No. 12.3.9 - Soil Erosion in Valara Micro Watershed

Sl No.	Particulars	Area(Ha)	Percentage (%)
1.	Moderate To Severe Erosion	589.77	74.77%
2.	Moderate Water Erosion	180.27	22.86%
3.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00**

Hydrologic Soil Group

Hydrologic Soil Group (HSG) means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and produce much more runoff. Majority of the project area is with soils with low infiltration rate, moderately high run-off potential. An area of 257.59 Ha (32.66 %) is under this category.

Table No. 12.3.10 – HSG in Valara micro watershed

Sl No.	Particulars	Area (Ha)	(%)
1.	Forest	493.00	62.51%
2.	Soils with low infiltration rate, moderately high run-off potential	257.59	32.66%
3.	Soils with very low infiltration rate, high run-off potential	19.44	2.46%
4.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00**

Land Irrigability

Soil is the reservoir for water in retaining and supplying the soil moisture to plant growth. The periodical recharging of water in soil pore spaces can be made either by irrigation or rainfall. The recharged water has to be supplied to plant system.

This retention capacity and supply capacity varies from soil to soil based on its physical and chemical properties. Based on this, soil classification is made for its suitability for irrigation. This classification is also known as irrigability classification. Majority of the micro watershed area is coming under the category Lands that are marginal for sustained use under irrigation (20.99 %)

Table No. 12.3.11 – Land Irrigability in Valara micro watershed

Sl No.	Particulars	Area (Ha)	(%)
1.	Forest	493.00	62.51%
2.	Lands that are marginal for sustained use under irrigation	165.59	20.99%
3.	Lands that are marginal for sustained use under irrigation	19.44	2.46%
4.	Lands that have severe soil limitation for sustained use under irrigation	92.00	11.66%
5.	Waterbody	18.71	2.37%
	Total	**788.74**	**100.00%**

12.4 Budget

Table No. 12.4.1 –Budget 14P35a

Sl No.	Particulars	Amount in Rs.
1.	Management	2122400
2.	Monitoring	424480
3.	EPA	424480
4.	DPR	212240
5.	Capacity Building	636720
6.	NRM	9975280
7.	Livelihood	3183600
8.	Production	3183600
9.	NRM and Governanace	424480
10.	Consolidation	636720
	Total	21224000

12.5 14P35a- Microwatershed Action Plan -Natural Resource Management
I year Plan

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
1.	Cultivation of horticultural crops in wastelands	25 cent	2	20000		2000
2.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	2	12000		1200
3.	Crop demonstration - vegetable garden in government institution	25 cent	1	10000		1000
4.	Medicinal plants in public institutions	5 cent	1	5500		550
5.	Earthen bunds	rm	1036		147112	
6.	Centripetal terracing with mulching	no.	139		24881	
7.	Stone pitched contour bunds	rm	1751		243389	
8.	Staggered trenches	no.	1000		141000	
9.	Strip terracing for rubber/Inward terracing for plantation	no.	3942		559764	
10.	Moisture Conservation pits	no.	37		4699	
11.	Live fencing	rm	288		14688	
12.	Gully plugs	no.	85		68680	
13.	Brushwood check dams	rm	1200		922800	
14.	Check dam using blasted rubble 2m length	no.	1		8325	
15.	Permanent check dam/VCB	no.	1	400000		
16.	Sidewall protection of drains (geotextiles)	m2	2600		418600	
17.	Sidewall protection of ponds (geotextiles)	m2	200		32200	
18.	Desiltation of drains	m3	2500		355000	
19.	Desiltation of ponds	10m3	400		566400	
20.	Side varambu earthening of drains	m	1200		170400	

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
21.	Embankment protection of river	100m	5		4500	
22.	Side protection of drains with bamboo planting	no.	200		6930	
23.	Construction of farm ponds (6m x 6 m)	no.	4		320000	
24.	Well recharging	no.	4		32000	
25.	Percolation pond (2 m dia)	no.	5		90000	
26.	Construction of new well	no.	2		100000	
27.	Renovation of public wells	no.	2	72000		
28.	Mini Drinking water schemes	no.	1	300000		
29.	Biogas plants (1 m3)	no.	2	15000	45000	1500
30.	Crop residue biomass composting	no.	5	18750	56250	1875
31.	Ozhuvathadam - cheeyappara thodu Check dam (6m)	no.	2	1682000		
32.	Ozhuvathadam - cheeyappara thodu Side wall protection (150m)	no.	1	1130250		
33.	Valara-vadakkechal thod renovation Side wall (275m)	no.	1	2554750		
	Total		16620	6220250	4332618	8125

14P35a- Microwatershed Action Plan -Natural Resource Management

II year Plan

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
1.	Cultivation of horticultural crops in wastelands	25 cent	1	10000		1000
2.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	1	6000		600
3.	Crop demonstration - vegetable garden in government institution	25 cent	1	10000		1000
4.	Earthen bunds	rm	1037		147254	
5.	Centripetal terrracing with mulching	no.	139		24881	
6.	Stone pitched contour bunds	rm	2000		278000	
7.	Staggered trenches	no.	1000		141000	
8.	Strip terracing for rubber/Inward terracing for planatation	no.	3942		559764	
9.	Moisture Conservation pits	no.	37		4699	
10.	Live fencing	rm	288		14688	
11.	Gully plugs	no.	85		68680	
12.	Brushwood checkdams	rm	1200		922800	
13.	Check dam using blasted rubble 3m length	no.	1		13625	
14.	Sidewall protection of drains (geotextiles)	m2	2600		418600	
15.	Sidewall protection of ponds (geotextiles)	m2	200		32200	
16.	Desiltation of drains	m3	2500		355000	
17.	Desiltation of ponds	10m3	400		566400	
18.	Side varambu earthening of drains	m	1200		170400	
19.	Side protection of drains with bamboo planting	no.	200		6930	
20.	Construction of farm ponds (6m x 6 m)	no.	2		160000	

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
21.	Well recharging	no.	4		32000	
22.	Percolation pond (2 m dia)	no.	5		90000	
23.	Construction of new well	no.	3		150000	
24.	Renovation of public wells	no.	1	36000		
25.	Biogas plants (1 m3)	no.	2	15000	45000	1500
26.	Crop residue biomass composting	no.	5	18750	56250	1875
27.	Kanjiraveli canal extension (300m)	no.	1	1440000		
28.	Kanjiraveli vathalloor pubic well deepening (1.8m)	no.	1	75300		
29.	**Total**		**16856**	**1611050**	**4258171**	**5975**

14P35a- Microwatershed Action Plan -Natural Resource Management

III year Plan

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
1.	Cultivation of horticultural crops in wastelands	25 cent	1	10000		1000
2.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	1	6000		600
3.	Medicinal plants in public institutions	5 cent	1	5500		550
4.	Centripetal terrracing with mulching	no.	138		24702	
5.	Stone pitched contour bunds	rm	1504		209056	
6.	Staggered trenches	no.	893		125913	
7.	Strip terracing for rubber/Inward terracing for planatation	no.	3940		559480	
8.	Moisture Conservation pits	no.	37		4699	
9.	Live fencing	rm	288		14688	
10.	Gully plugs	no.	85		68680	
11.	Brushwood checkdams	rm	1408		1082752	
12.	Permanent check dam/VCB	no.	1	400000		
13.	Sidewall protection of drains (geotextiles)	m2	2416		388976	
14.	Sidewall protection of ponds (geotextiles)	m2	100		16100	
15.	Desiltation of drains	m3	2630		373460	
16.	Desiltation of ponds	10m3	400		566400	
17.	Side varambu earthening of drains	m	800		113600	
18.	Side protection of drains with bamboo planting	no.	100		3465	
19.	Construction of farm ponds (6m x 6 m)	no.	2		160000	

Sl No	Activities	Unit	Volume	WDC-PMKSY	Convergence	WDF
20.	Well recharging	no.	2		16000	
21.	Percolation pond (2 m dia)	no.	2		36000	
22.	Construction of new well	no.	1		50000	
23.	Biogas plants (1 m3)	no.	1	7500	22500	750
24.	Crop residue biomass composting	no.	5	18750	56250	1875
25.	Ozhuvathadam - cheeyappara thodu Check dam (6m)	no.	2	1682000		
	Total		**14758**	**2129750**	**3892721**	**4775**

12.6 -14P35a- Microwatershed Action Plan – Production System
I year Plan

Sl.No	Project	Unit cost/Nos	Area/No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	3	240000	30000	90000	150000	18000
2	IFS (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	IFS (41 cents-2 ha)	120000	1	120000	50000	50000	70000	10000
4	Mechanisation of dairy farm (5 cow unit)	100000	4	400000	50000	200000	200000	40000
5	Bee hives (2 hives) for scaring off wild animals	4000	130	520000	2400	312000	208000	62400
7	Fodder grass cultivation (1 acre)	12140	1	12140	6070	6070	6070	1214
7	Grow bag cultivation (25 grow bags)	2000	136	272000	1500	204000	68000	40800
8	Rain shelter cultivation (100 m2)	67000	1	67000	30000	30000	37000	6000
9	Promotion of nutritional garden (distributing kit containing 2 to 3 varieties)	100	480	48000	50	24000	24000	4800
10	Fallow land cultivation- Paddy (0.5 acre)	71026	3	213078	8094	24282	188796	4856
11	Fruit tree distribution (Rambutan and Mango graft)-5 plants each	1375	82	112750	1031	84542	28208	16908
12	Hybrid Coconut and nutmeg seedling distrubution-5 plants each	1375	89	122375	1031	91759	30616	18352
	Total			**2327343**		**1196653**	**1130690**	**239331**

14P35a- Microwatershed Action Plan – Production System

II year Plan

Sl.No	Project	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	3	240000	30000	90000	150000	18000
2	IFS (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	IFS (41 cents-2 ha)	120000	1	120000	50000	50000	70000	10000
4	Mechanisation of dairy farm (5 cow unit)	100000	4	400000	50000	200000	200000	40000
5	Bee hives (2 hives) for scaring off wild animals	4000	130	520000	2400	312000	208000	62400
6	Small nursery (0.5 acre)	300000	1	300000	150000	150000	150000	30000
7	Fodder grass cultivation (1 acre)	12140	2	24280	6070	12140	12140	2428
7	Grow bag cultivation (25 grow bags)	2000	136	272000	1500	204000	68000	40800
8	Rain shelter cultivation (100 m2)	67000	2	134000	30000	60000	74000	12000
9	Promotion of nutritional garden (distributing kit containing 2 to 3 varieties)	100	480	48000	50	24000	24000	4800
10	Fallow land cultivation- Paddy (0.5 acre)	71026	2	142052	8094	16188	125864	3237.6
11	Fruit tree distribution (Rambutan and Mango graft)-5 plants each	1375	82	112750	1031	84542	28208	16908.4
12	Hybrid Coconut and nutmeg seedling distrubution-5 plants each	1375	89	122375	1031	91759	30616	18351.8
	Total			**2635457**		**1374629**	**1260828**	**274925.8**

14P35a- Microwatershed Action Plan – Production System

III year Plan

Sl.No	Project	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	2	160000	30000	60000	100000	12000
2	IFS (31-40 cents)	100000	1	100000	40000	40000	60000	8000
4	Mechanisation of dairy farm (5 cow unit)	100000	2	200000	50000	100000	100000	20000
5	Bee hives (2 hives) for scaring off wild animals	4000	65	260000	2400	156000	104000	31200
7	Grow bag cultivation (25 grow bags)	2000	68	136000	1500	102000	34000	20400
8	Rain shelter cultivation (100 m2)	67000	1	67000	30000	30000	37000	6000
9	Promotion of nutritional garden (distributing kit containing 2 to 3 varieties)	100	240	24000	50	12000	12000	2400
10	Fallow land cultivation- Paddy (0.5 acre)	71026	3	213078	8094	24282	188796	4856.4
11	Fruit tree distribution (Rambutan and Mango graft)-5 plants each	1375	41	56375	1031	42271	14104	8454.2
12	Hybrid Coconut and nutmeg seedling distrubution-5 plants each	1375	44	60500	1031	45364	15136	9072.8
	Total			**1276953**		**611917**	**665036**	**122383.4**

12.7- 14P35a- Microwatershed Action Plan -Livelihood and Microenterprise

I year Plan

Sl No	Activities	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1.	Pig farming unit (5 pigs + cage+biogasplant)	90000	2	180000	45000	90000	90000
2.	Mushroom cultivation (80-100 bed)	28125	6	168750	11250	67500	101250
3.	Backyard poultry unit (5 bird+ cage)	2600	80	208000	800	64000	144000
4.	Rabit rearing (4 rabbit +cage)-3-month-old	8000	9	72000	2500	22500	49500
5.	Quail rearing (50 quail 5 month old+ cage)	10850	9	97650	2925	26325	71325
6.	Pisciculture (Padutha pond) 2 cent	123000	2	246000	49200	98400	147600
7.	Vermicompost unit (30'x8'x2.5')	100000	4	400000	50000	200000	200000
8.	Cow rearing (milching)	65000	14	910000	27500	385000	525000
9.	Goat rearing (female 2)	32000	20	640000	16000	320000	320000
	Total			**2922400**		**1273725**	**1648675**

14P35a- Microwatershed Action Plan – Livelihood and Microenterprise

II year Plan

Sl No	Activities	Unit cost/No	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	2	180000	45000	90000	90000
2	Mushroom cultivation (80-100 bed)	28125	6	168750	11250	66400	101250
3	Backyard poultry unit (5 bird+ cage)	2600	83	215800	800	179200	149400
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	10	80000	2500	25000	55000
5	Quail rearing (50 quail 5 month old+ cage)	10850	8	86800	2925	23400	63400
6	Pisciculture (Padutha pond) 2 cent	123000	2	246000	49200	98400	147600
8	Vermicompost unit (30'x8'x2.5')	100000	4	400000	50000	200000	200000
9	Cow rearing (milching)	65000	14	910000	27500	385000	525000
10	Goat rearing (female 2)	32000	20	640000	16000	320000	320000
	Total			**2927350**		**1275700**	**1651650**

14P35a- Microwatershed Action Plan – Livelihood and Microenterprise

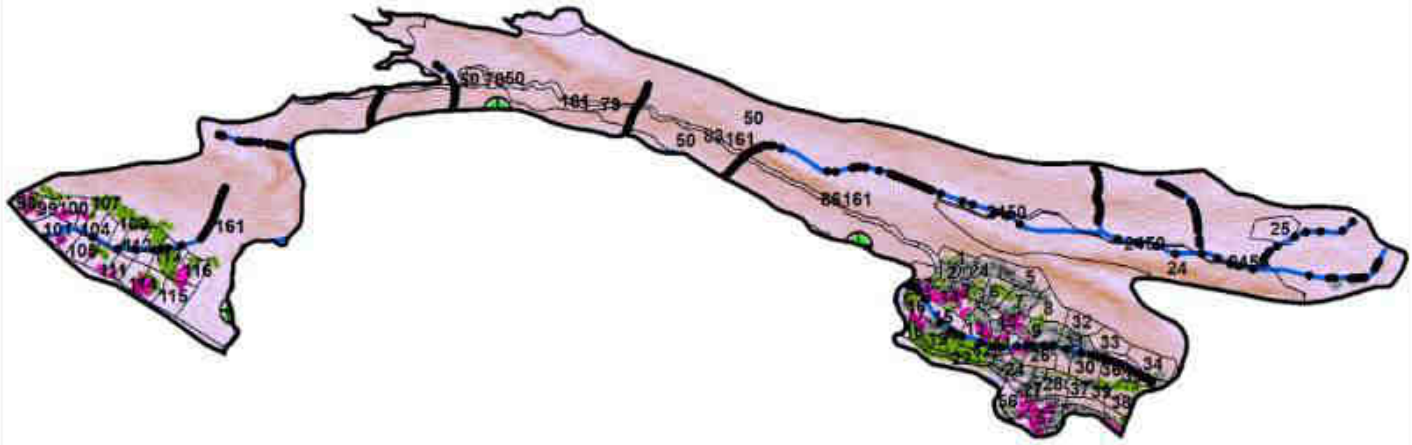
III year Plan

Sl No	Activities	Unit cost/Nos	Area/No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	1	90000	45000	45000	45000
2	Mushroom cultivation (80-100 bed)	28125	3	84375	11250	33750	50625
3	Backyard poultry unit (5 bird+ cage)	2600	40	104000	800	32000	72000
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	4	32000	2500	10000	22000
5	Quail rearing (50 quail 5 month old+ cage)	10850	4	43400	2925	11700	31700
6	Pisciculture (Padutha pond) 2 cent	123000	1	123000	49200	49200	73800
8	Vermicompost unit (30'x8'x2.5')	100000	2	200000	50000	100000	100000
9	Cow rearing (milching)	65000	7	455000	27500	192500	262500
10	Goat rearing (female 2)	32000	10	320000	16000	160000	160000
	Total			**1451775**		**634150**	**817625**

ARABLE LAND AND DRAINAGE INTERVENTIONS

MICROWATERSHED - 14P35a

SCALE 1: 50,000



Legend

- Gully Plugs
- Brush Wood Check Dam
- Gabion
- Permanent Check Dam
- Vented Cross Bar
- Drains
- Eathern Bunds
- Stone Bunds
- Staggered Trenches
- Contour
- Cadastral Boundary
- Watershed_Boundary

Prepared by : KERALA STATE LAND USE BOARD

13.IRUMBUPALAM MICRO WATERSHED (14P35b)

13.1 General Description

Irumbupalam micro watershed has an area of 1386.28 Ha (30.07 % of total geographical area). This micro watershed is located mainly in Adimali Grama Panchayath.

Name of micro watershed	:	Irumbupalam
Micro watershed code	:	14P35b
River basin	:	Periyar
District	:	Idukki
Block Panchayath	:	Adimali
GramaPanchayath	:	Adimali
Villages	:	Mannamkandam
Latitude	:	10°3'16.496 - 10°1'27.917 N
Longitude	:	76°55'6.249 - 76°51'7.279 E
Wards	:	2,3,4,5,6,21
Total Treatable Area	:	1341.00 Ha
% Area in the WDC-PMKSY cluster	:	31.09 %

Socio Economic Profile

The general socio economic situation of the micro watershed is average. As per the information provided in the baseline survey conducted, Irumbupalam micro watershed has a total number of 838 households with a total population of 3283. 528 numbers of BPL families reside in the micro watershed area. 256 people belong to Schedule Caste and 540 people belong to Schedule Tribe Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood for some families in the watershed area. The socio economic details of the Irumbupalam micro watershed is given below:

13.1.1 – Demography Details of 14P35b

No	Watershed name	Total families	Population			BPL Families	Land holding/ Family (in Ha)
			Total	SC	ST		
1	14P35b	838	3283	256	540	528	1.65

13.2 Methodology

In line with the guidelines of WDC-PMKSY 2.0, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

- Prepared the cadastral maps pertaining to the project area.
- Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification
- Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
- Overseers were engaged for taking field estimates of the proposed activities.

- Induction training was given for the project staff on concept of maps and Resource Mapping.
- block level online discussions were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
- This was followed by orientation meeting at GramaPanchayats.
- Conducted transect walk with ward members and ADS.
- During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
- A block levelonline meeting was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented.
- Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map.
- Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by online technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
- The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of ward members.
- Detailed field survey was done for net plan preparation at Grama Panchayat level with the help of ward members & ADS Chairpersons, Vice Presidents & Joint Secretaries of NHGs, MGNREGS officials, etc. The information gathered includes soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up in each microwatershed. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also collected.
- Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
- Panchayat Level online meetings convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
- The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalsied. The livelihood action plan and the activities under production system were also consolidated.
- The suggestions were split for four years and four separate annual plans were also prepared.
- Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
- Major activities included in the watershed project are.
- Soil and moisture conservation measures like centripetal and bench terracing, earthen and stone pitched contour bunding, trenching, vegetative barriers, etc.
- Rain water harvesting activities like farm ponds, percolation tanks, check dams etc.

- Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
- Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
- Encouraging natural regeneration including fodder cultivation.
- Promotion of agro-forestry and horticulture
- Capacity building and creation of a greater degree of awareness among the participants.
- Encouraging people's participation with the involvement of NHGs.
- Livelihood activities for asset less people
- Production system and Micro enterprises

13.3 Biophysical resources

Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the steep sloping area having >35% slope. The category spreads over an area of 583.70 ha (42.1%) and these lands requires urgent soil and water conservation measures.

Table No. 13.3.1 Slope of Irumbupalam micro watershed

Sl No	Particulars	Area (Ha)	Percentage(%)
1.	0-3% - Level/Gentle	144.61	10.4%
2.	3-5% - slight Slope	6.63	0.5%
3.	5-10% -Moderately Sloping	87.72	6.3%
4.	10-15% -Strongly Sloping	65.16	4.7%
5.	15-35% -Moderately Steep Sloping	498.45	36.0%
6.	>35% -Steep Slope	583.70	42.1%
	Total	**1386.28**	**100.00%**

Drains

The Periyar River is the major drain of this watershed. A number of drains are originating from different parts of this watershed which drains to the Periyar River. The watershed also has 22 number of ponds and public wells distributed throughout the watershed area. The details of the drains and ponds in the watershed area is given in tables given below.

Table No. 13.3.2 Details of Drains in Irumbupalam micro watershed

Sl No	Drains
1.	Deviyar Thodu
2.	20cent-10th Mile
3.	Irumpupalam Thodu
4.	Vaikalamkandam Thodu
5.	Perunnuchal Thodu
6.	14th Mile Rationkada Padi Thodu
7.	Chillithodu Thodu

Sl No	Drains
8.	Plakkayam Thodu
9.	Kunjipettikudi Thodu
10.	Sidharathan Padithodu
11.	Kunnathanpadi Thodu
12.	Ozhuvathadam-Kampashanpadi Thodu
13.	Colonypaalam Thodu

Table No. 13.3.3 Ponds in Irumbupalam micro watershed

Sl. No	Pond
1	Iron bridge, near Muslim mosque Public pond
2	Muthikkad Public pond
3	Thonippara Public pond
4	Chillithod, Chappathipadi
5	Chillithod, Siddharthanpadi Public pond
6	Chillithod, Nurserykkunnu Public pond
7	Chillithod, Krishnankuttipadi 2 pond
8	Thumbippara Drinking Water Plan Public pond
9	Pottakkashajippadi Public pond
10	Melekudi Thankappankutti Public pond
11	Deviyar Colony Bridge Public pond
12	Six Acre Drinking Water Plan pond
13	4 cent Drinking Water Plan pond
14	Kadalikandam Drinking Water Plan Public pond
15	Mudippara Drinking Water Plan Public pond
16	Ozhuvathadam Drinking Water Plan Public Well
17	Ozhuvathadam Drinking Water Plan Public Well
18	Kunchippetti Public Well
19	Adaykkakkulam Public Well
20	12th Mile Public Well
21	12th Mile Public Well
22	Panchayath Drinking Water Plan Public Well

Land use

Agriculture is one of the prime activity in the watershed area. The major land use category mapped in the watershed area is Forest - Plantation (Tea) with an area of 449.29 ha (32.41%). The second major category is the Forest - Waste Land (Barren Rock). This extents in an area of 163.71 ha. An area of 28.20 ha of paddy lands has been left as fallow which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. An area of 29.10 ha is under the built up land and an area of 4.67 ha is under the rocky area. The details of land use categories with spatial extent is given in table.

Table No. 13.3.4- Land use categories in Irumbupalam micro watershed

Sl No.	Particulars	Area(Ha)	Percentage(%)
1.	Agricultural Mixed Crop - Mixed Crops	100.86	7.28%
2.	Agricultural Perennial Crop - Arecanut	55.31	3.99%
3.	Agricultural Perennial Crop - Coconut	2.08	0.15%
4.	Agricultural Perennial Plantation Crop - Rubber	151.88	10.96%
5.	Agricultural Perennial Plantation Crop - Tea	18.81	1.36%
6.	Built up Land - Built ups + Mixed Crops	1.62	0.12%
7.	Built up Land - Commercial	1.60	0.12%
8.	Built up Land - Others	0.50	0.04%
9.	Built up Land - Residential	21.35	1.54%
10.	Built up Land - Roads	4.03	0.29%
11.	Forest - Plantation (Tea)	449.29	32.41%
12.	Forest - Deciduous (Dense Evergreen/Semi Evergreen)	8.86	0.64%
13.	Forest - Evergreen/Semi evergreen (Fairly Dense)	86.58	6.25%
14.	Forest - Others (Dense Mixed Forest)	52.46	3.78%
15.	Forest - Others(Arecanut)	108.08	7.80%
16.	Forest - Settlement	4.60	0.33%
17.	Forest - Settlement with Mixed Crops	0.14	0.01%
18.	Forest - Waste Land (Barren Rock)	163.71	11.81%
19.	Forest - Waste Land (Land with Scrub)	9.80	0.71%
20.	Paddy Converted to Built up - Residential	8.31	0.60%
21.	Paddy Converted to Mixed Crops	35.30	2.55%
22.	Paddy Converted to Perennial Crops	11.03	0.80%
23.	Paddy Converted to Seasonal Crops	11.54	0.83%
24.	Paddy Cultivating Land	40.58	2.93%
25.	Paddy Cultivating Land - Current Fallow	28.20	2.03%
26.	Waste Land - Barren Rocky Land	4.67	0.34%
27.	Waste Land - Land with Scrub	0.30	0.02%
28.	Waterbody - River/Stream	4.78	0.34%
	Total	**1386.28**	**100.00**

Geology

The major geological units in the watershed is Migmatite Complex group of rocks occurring in an area of 1381.34 ha (99.64%). The remaining area is composed of Penisular Gneissic Complex group of rocks.

Table No. 13.3.5 Geological units in Irumbupalam micro watershed

Sl No	Particulars	Area(Ha)	Percentage(%)
1.	Migmatite Complex	1381.34	99.64%
2.	Penisular Gneissic Complex	0.16	0.01%
3.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00**

Geomorphology

There are four geomorphological units of which 68.00 % (942.68 ha) of the area falls under the category Denudational Structural Hills.

Table No. 13.3.6 Geomorphological units in Irumbupalam micro watershed

Sl No	Particulars	Area (Ha)	Percentage(%)
1.	Denudational Structural Hills	942.68	68.00%
2.	Piedmont Zone	218.70	15.78%
3.	Valley	181.90	13.12%
4.	Structural Valley	38.22	2.76%
5.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00%**

Soils

The major soil series mapped in the watershed area Kanjikuzhi (106.44 Ha), Karimannur (332.87 Ha), Suryanelli (788.45 Ha), Pambla (20.14 Ha). Majority of the area is Sandy Clay Loam in texture. This is distributed in an area of 1246.71 ha (89.93 %). Soils in more than half of the watershed area is deep to very deep soils (1247.90 Ha).

More than 50 % of the watershed area is prone to moderate to severe soil erosion which calls for proper soil and water conservation measures in the area.

Table No. 13.3.7 - Soil Texture in Irumbupalam micro watershed

Sl No.	Particulars	Area(Ha)	Percentage
1.	Clay Loam	20.14	1.45%
2.	Gravelly Sandy Clay Loam	106.44	7.68%
3.	Sandy Clay Loam	1246.71	89.93%
4.	Rock Out Crops	8.21	0.59%
5.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00%**

Table No. 13.3.8 -Soil Depth in Irumbupalam micro watershed

Sl No	Particulars	Area(Ha)	Percentage (%)
1.	Deep to very deep	1247.90	90.02%
2.	Rock Out Crops	8.21	0.59%
3.	Very deep	125.39	9.04%
4.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00%**

Table No. 13.3.9 -Soil Erosion

Sl No.	Particulars	Area(Ha)	Percentage (%)
1.	Moderate To Severe Erosion	915.02	66.01%
2.	Moderate Water Erosion	458.26	33.06%
3.	Rock Out Crops	8.21	0.59%
4.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00%**

Hydrologic Soil Group

Hydrologic Soil Group (HSG) means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and produce much more runoff. Majority of the project area is with soils with low infiltration rate, moderately high run-off potential. An area of 439.32 Ha (31.69 %) is under this category.

Table No. 13.3.10 - HSG in Irumbupalam micro watershed

Sl No.	Particulars	Area (Ha)	%
1.	Forest	933.97	67.37%
2.	Rock Out Crops	8.21	0.59%
3.	Soils with low infiltration rate, moderately high run-off potential	439.32	31.69%
4.	Waterbody	4.78	0.34%
	Total	**1386.28**	**100.00**

LAND IRRIGABILITY

Soil is the reservoir for water in retaining and supplying the soil moisture to plant growth. The periodical recharging of water in soil pore spaces can be made either by irrigation or rainfall. The recharged water has to be supplied to plant system.

This retention capacity and supply capacity varies from soil to soil based on its physical and chemical properties. Based on this, soil classification is made for its suitability for irrigation. This classification is also known as irrigability classification. Majority of the micro watershed area is coming under the category Lands that have severe soil limitation for sustained use under irrigation (24.01 %)

Table No. 13.3.11 – Land Irrigability in Irumbupalam micro watershed

Sl No	Particulars	Area (Ha)	%
1.	Forest	933.97	67.37
2.	Lands that are marginal for sustained use under irrigation	106.44	7.68
3.	Lands that have severe soil limitation for sustained use under irrigation	332.87	24.01
4.	Rock Out Crops	8.21	0.59
5.	Waterbody	4.78	0.34
	Total	**1386.28**	**100.00**

13.4 Budget-14P35b

Table No. 13.3.12

Sl No.	Particulars	Amount (Rs.)
1.	Management	3754800
2.	Monitoring	750960
3.	EPA	750960
4.	DPR	375480
5.	I & CB	1126440
6.	NRM	17647560
7.	Livelihood	5632200
8.	Production	5632200
9.	Governanace	750960
10.	Consolidation	1126440
	Total	37548000

13.5- 14P35b- Microwatershed Action Plan -Natural Resource Management
I year Plan

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1.	Avenue planting	no.	142	100		14200	
2.	Cultivation of horticultural crops in wastelands	25 cent	10000	6	60000		6000
3.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	5	30000		3000
4.	Crop demonstration - vegetable garden in schools and other government institution	25 cent	10000	2	20000		2000
5.	Medicinal plants in public institutions	5 cent	5500	2	11000		1100
6.	Earthen bunds	rm	142	800		113600	
7.	Centripetal terrracing with mulching	no.	179	104		18616	
8.	Stone pitched contour bunds	rm	139	4500		625500	
9.	Staggered trenches	no.	141	2600		366600	
10.	Strip terracing for rubber/Inward terracing for planatation	no.	142	8860		1258120	
11.	Moisture Conservation pits	no.	127	28		3556	
12.	Live fencing	rm	51	320		16320	
13.	Gully plugs	no.	808	270		218160	
14.	Brushwood checkdams	rm	769	2000		1538000	
15.	Loose boulder check dams (2 m length)	no.	2124	5		10620	
16.	Loose boulder check dams (3 m length)	no.	3186	3		9558	
17.	Loose boulder check dams (4 m length)	no.	4249	4		16996	
18.	Check dam using blasted rubble 2m length	no.	8325	1		8325	
19.	Vented cross bars (VCB)	no.	400000	1	400000		
20.	Sidewall protection of drains (geotextiles)	m2	191	7200		1375200	

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
21.	Sidewall protection of ponds (geotextiles)	m2	161	400		64400	
22.	Desiltation of drains	m3	142	8900		1263800	
23.	Desiltation of ponds	10m3	1416	600		849600	
24.	Side varambu earthening of drains	m	142	4500		639000	
25.	Side protection of drains with bamboo planting	no.	34.65	100		3465	
26.	Construction of farm ponds (6m x 6 m)	no.	80000	4		320000	
27.	Well recharging	no.	8000	6		48000	
28.	Percolation pond (2 m dia)	no.	18000	6		108000	
29.	Construction of new well	no.	50000	6		300000	
30.	Renovation of public wells	no.	36000	1	36000		
31.	Biogas plants (1 m3)	no.	30000	2	15000	45000	1500
32.	Crop residue biomass composting	no.	15000	10	37500	112500	3750
33.	Kunnathanpadi thodu Check dam	no.	687000	1	687000		
34.	Kunchipetti new public pond construction (15m x 15m x 5m)	no.	2009000	1	2009000		
35.	Colony palam thodu - Ushapadi check dam (6m)	no.	687000	1	687000		
36.	Irumpupalam Pazhampallichal homiyopady stream- Side wall protection (50m)	no.	486000	1	486000		
37.	12th mile 4 cent colony kaithod - Side wall protection (50m)	no.	416000	1	416000		
	Total			**41351**	**4894500**	**9347136**	**17350**

14P35b- Microwatershed Action Plan -Natural Resource Management
II year Plan

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1.	Avenue planting	no.	142	100		14200	
2.	Cultivation of horticultural crops in wastelands	25 cent	10000	6	60000		6000
3.	Intercropping in coconut plantations	25 cent	5500	1	5500		550
4.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	5	30000		3000
5.	Crop demonstration - vegetable garden in schools and other government institution	25 cent	10000	2	20000		2000
6.	Earthen bunds	rm	142	700		99400	
7.	Centripetal terrracing with mulching	no.	179	104		18616	
8.	Stone pitched contour bunds	rm	139	4500		625500	
9.	Staggered trenches	no.	141	2500		352500	
10.	Strip terracing for rubber/Inward terracing for planatation	no.	142	8860		1258120	
11.	Moisture Conservation pits	no.	127	28		3556	
12.	Live fencing	rm	51	320		16320	
13.	Gully plugs	no.	808	270		218160	
14.	Brushwood checkdams	rm	769	2000		1538000	
15.	Loose boulder check dams (2 m length)	no.	2124	5		10620	
16.	Loose boulder check dams (3 m length)	no.	3186	3		9558	
17.	Loose boulder check dams (4 m length)	no.	4249	4		16996	
18.	Check dam using blasted rubble 3m length	no.	13625	1		13625	
19.	Vented cross bars (VCB)	no.	400000	1	400000		

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
20.	Sidewall protection of drains (geotextiles)	m2	191	7200		1375200	
21.	Sidewall protection of ponds (geotextiles)	m2	161	400		64400	
22.	Desiltation of drains	m3	142	8900		1263800	
23.	Desiltation of ponds	10m3	1416	600		849600	
24.	Side varambu earthening of drains	m	142	4500		639000	
25.	Side protection of drains with bamboo planting	no.	34.65	100		3465	
26.	Construction of farm ponds (6m x 6 m)	no.	80000	4		320000	
27.	Well recharging	no.	8000	6		48000	
28.	Percolation pond (2 m dia)	no.	18000	6		108000	
29.	Construction of new well	no.	50000	6		300000	
30.	Mini Drinking water schemes	no.	250000	1	250000		
31.	Biogas plants (1 m3)	no.	30000	4	30000	90000	3000
32.	Crop residue biomass composting	no.	15000	10	37500	112500	3750
33.	Kunnathanpadi thodu -Side wall protection(80m)	no.	577000	1	577000		
34.	Sidharthanpadi thodu -Sidewall protection (200m)	no.	1442000	1	1442000		
35.	Kunchipetti padasekharam- Side wall protection (3 drains having 200m length , 2m height)	no.	8252000	1	8252000		
	Total			41150	11104000	9369136	18300

14P35b- Microwatershed Action Plan -Natural Resource Management

III year Plan

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1	Avenue planting	no.	142	50		7100	
2	Cultivation of horticultural crops in wastelands	25 cent	10000	3	30000		3000
4	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	5	30000		3000
6	Medicinal plants in public institutions	5 cent	5500	3	16500		1650
7	Earthen bunds	rm	142	802		113884	
8	Centripetal terrracing with mulching	no.	179	104		18616	
9	Stone pitched contour bunds	rm	139	3807		529173	
10	Staggered trenches	no.	141	2437		343617	
11	Strip terracing for rubber/Inward terracing for planatation	no.	142	8859		1257978	
12	Moisture Conservation pits	no.	127	27		3429	
13	Live fencing	rm	51	319		16269	
14	Gully plugs	no.	808	269		217352	
15	Brushwood checkdams	rm	769	2552		1962488	
16	Loose boulder check dams (2 m length)	no.	2124	5		10620	
17	Loose boulder check dams (3 m length)	no.	3186	2		6372	
18	Loose boulder check dams (4 m length)	no.	4249	4		16996	
22	Sidewall protection of drains (geotextiles)	m2	191	6944		1326304	
23	Sidewall protection of ponds (geotextiles)	m2	161	400		64400	
24	Desiltation of drains	m3	142	9132		1296744	
25	Desiltation of ponds	10m3	1416	600		849600	

Sl No.	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
26	Side varambu earthening of drains	m	142	4000		568000	
27	Side protection of drains with bamboo planting	no.	34.65	50		1732.5	
28	Construction of farm ponds (6m x 6 m)	no.	80000	4		320000	
29	Well recharging	no.	8000	4		32000	
30	Percolation pond (2 m dia)	no.	18000	6		108000	
31	Construction of new well	no.	50000	3		150000	
34	Biogas plants (1 m3)	no.	30000	2	15000	45000	1500
35	Crop residue biomass composting	no.	15000	8	30000	90000	3000
38	12th mile 4 cent colony public well deepening, GI mesh roofing, water tank construction (10000 l)	no.	357000	1	357000		
41	Ozhuvathadam compassion padi thodu renovation -Stop dam (4m on rock) 0.9m height	no.	440000	1	440000		
45	Kasim padi kulikkadav -Side wall protection (100m) & Foot step construction	no.	729000	1	729000		
	Total			40404	1647500	9355675	12150

14P35b- Microwatershed Action Plan – Production System

I year Plan

Sl.No	Project	Unit cost/Nos	Area /No	Total cost	Rate of assistance as per existing norms/ unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	6	480000	30000	180000	300000	36000
2	IFS (31-40 cents)	100000	4	400000	40000	160000	240000	32000
3	IFS (41 cents-2 ha)	120000	2	240000	50000	100000	140000	20000
4	Mechanisation of dairy farm (5 cow unit)	100000	6	600000	50000	300000	300000	60000
5	Fooder grass cultivation (1 acre)	12140	2	24280	6070	12140	12140	2428
6	Bee hives (2 hives) for scaring off wild animals	4000	120	480000	2400	288000	192000	57600
7	Small nursery (0.5 acre)	300000	2	600000	150000	300000	300000	60000
8	Grow bag cultivation (25 grow bags)	2000	400	800000	1500	600000	200000	120000
9	Rain shelter cultivation (100 m2)	67000	2	134000	30000	60000	74000	12000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	100	704	70400	50	35200	35200	7040
11	Fallow land cultivation- Paddy (0.5 acre)	71026	2	142052	8094	16188	125864	3237.6
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	120	165000	1031	123720	41280	24744
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	126	173250	1031	129906	43344	25981.2
	Total			**4308982**		**2305154**	**2003828**	**461030.8**

14P35b- Microwatershed Action Plan -Production System

II year Plan

Sl.No	Project	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	6	480000	30000	180000	300000	36000
2	IFS (31-40 cents)	100000	3	300000	40000	120000	180000	24000
3	IFS (41 cents-2 ha)	120000	3	360000	50000	150000	210000	30000
4	Mechanisation of dairy farm (5 cow unit)	100000	6	600000	50000	300000	300000	60000
5	Fodder grass cultivation (1 acre)	12140	2	24280	6070	12140	12140	2428
6	Bee hives (2 hives) for scaring off wild animals	4000	120	480000	2400	288000	192000	57600
7	Small nursery (0.5 acre)	300000	1	300000	150000	150000	150000	30000
8	Grow bag cultivation (25 grow bags)	2000	400	800000	1500	600000	200000	120000
9	Rain shelter cultivation (100 m2)	67000	2	134000	30000	60000	74000	12000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	100	704	70400	50	35200	35200	7040
11	Fallow land cultivation- Paddy (0.5 acre)	71026	3	213078	8094	24282	188796	4856.4
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	120	165000	1031	123720	41280	24744
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	126	173250	1031	129906	43344	25981.2
				4100008		**2173248**	**1926760**	**434649.6**

14P35b- Microwatershed Action Plan -Production System

III year Plan

Sl.No	Project	Unit cost/Nos	Area /No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	3	240000	30000	90000	150000	18000
2	IFS (31-40 cents)	100000	2	200000	40000	80000	120000	16000
3	IFS (41 cents-2 ha)	120000	1	120000	50000	50000	70000	10000
4	Mechanisation of dairy farm (5 cow unit)	100000	3	300000	50000	150000	150000	30000
5	Fodder grass cultivation (1 acre)	12140	1	12140	6070	6070	6070	1214
6	Bee hives (2 hives) for scaring off wild animals	4000	60	240000	2400	144000	96000	28800
7	Small nursery (0.5 acre)	300000	1	300000	150000	150000	150000	30000
8	Grow bag cultivation (25 grow bags)	2000	200	400000	1500	300000	100000	60000
9	Rain shelter cultivation (100 m2)	67000	1	67000	30000	30000	37000	6000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	100	352	35200	50	17600	17600	3520
11	Fallow land cultivation- Paddy (0.5 acre)	71026	1	71026	8094	8094	62932	1618.8
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	60	82500	1031	61860	20640	12372
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	64	88000	1031	65984	22016	13196.8
	Total			**2155866**		**1153608**	**1002258**	**230721.6**

14P35b- Microwatershed Action Plan – Livelihood and Microenterprise

I year Plan

Sl No	Activities	Unit cost/Nos	Area/No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1.	Pig farming unit (5 pigs + cage+biogasplant)	90000	4	360000	45000	180000	180000
2.	Mushroom cultivation (80-100 bed)	28125	14	393750	11250	157500	236250
3.	Backyard poultry unit (5 bird+ cage)	2600	324	842400	800	259200	583200
4.	Rabit rearing (4 rabbit +cage)-3 month old	8000	19	152000	2500	47500	104500
5.	Quail rearing (50 quail 5 month old+ cage)	10850	14	151900	2925	40950	110950
6.	Pisciculture (Padutha pond) 2 cent	123000	5	615000	49200	246000	369000
7.	Vermicompost unit (30'x8'x2.5')	100000	10	1000000	50000	500000	500000
8.	Cow rearing (milching)	65000	16	1040000	27500	440000	600000
9.	Goat rearing (female 2)	32000	28	896000	16000	448000	448000
	Total			**4851050**		**2019150**	**2831900**

14P35b- Microwatershed Action Plan -Livelihood and Microenterprise

II year Plan

Sl No	Activities	Unit cost/Nos	Area/No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	4	360000	45000	180000	180000
2	Mushroom cultivation (80-100 bed)	28125	14	393750	11250	157500	236250
3	Backyard poultry unit (5 bird+ cage)	2600	324	842400	800	259200	583200
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	10	80000	2500	25000	55000
5	Quail rearing (50 quail 5 month old+ cage)	10850	10	108500	2925	29250	79250
6	Pisciculture (Padutha pond) 2 cent	123000	2	246000	49200	98400	147600
5	Milk processing and packing unit	1700000	1	1700000	850000	850000	850000
8	Vermicompost unit (30'x8'x2.5')	100000	2	200000	50000	100000	100000
9	Cow rearing (milching)	65000	16	1040000	27500	440000	600000
10	Goat rearing (female 2)	32000	28	896000	16000	448000	448000
	Total			**6066650**		**2687350**	**3379300**

14P35b- Microwatershed Action Plan -Livelihood and Microenterprise

III year Plan

Sl No	Activities	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/unit	Total assistance	Beneficiary contribution
1.	Pig farming unit (5 pigs + cage+biogasplant)	90000	2	180000	45000	90000	90000
2.	Mushroom cultivation (80-100 bed)	28125	7	196875	11250	78750	118125
3.	Backyard poultry unit (5 bird+ cage)	2600	160	416000	800	128000	288000
4.	Rabit rearing (4 rabbit +cage)-3 month old	8000	7	56000	2500	17500	38500
5.	Quail rearing (50 quail 5 month old+ cage)	10850	6	65100	2925	17550	47550
6.	Pisciculture (Padutha pond) 2 cent	123000	1	123000	49200	49200	73800
7.	Vermicompost unit (30'x8'x2.5')	100000	3	300000	50000	150000	150000
8.	Cow rearing (milching)	65000	8	520000	27500	220000	300000
9.	Goat rearing (female 2)	32000	14	448000	16000	224000	224000
	Total			**2204975**		**925000**	**1279975**

ARABLE LAND AND DRAINAGE INTERVENTIONS

MICROWATERSHED - 14P35b

SCALE 1: 40,000

Legend

- Gully Plugs
- Brush Wood Check Dam
- Gabion
- Permanent Check Dam
- Vented Cross Bar
- Drains
- Eathern Bunds
- Stone Bunds
- Staggered Trenches
- Contour
- Cadastral Boundary
- Watershed_Boundary

Prepared by : KERALA STATE LAND USE BOARD

14. MACHIPLAVU MICRO WATERSHED (14P35c)

Machiplavu micro watershed is the largest micro watershed in the WDC-PMKSY 2.0 cluster with an area of 2434.54 Ha (52.82% of total geographical area). This micro watershed is located mainly in Adimali Grama Panchayath.

14.1 General Description

Name of micro watershed	:	Machiplavu
Micro watershed code	:	14P35c
River basin	:	Periyar
District	:	Idukki
Block Panchayath	:	Adimali
GramaPanchayath	:	Adimali
Villages	:	Mannamkandam
Latitude	:	10°2'26.767 - 9°58'50.558 N
Longitude	:	76°59'18.974 -76°54'25.417 E
Wards	:	6,7,8,9,10,11,12,14,15,16,17
Total Treatable Area	:	2214.00 Ha
% Area in the WDC-PMKSY cluster	:	51.33 %

Socio Economic Profile

The general socio economic situation of the micro watershed is average. As per the information provided in the baseline survey conducted, Valara micro watershed has a total number of 1496 households with a total population of 5868. 943 numbers of BPL families reside in the micro watershed area. 457 people belong to Schedule Caste and 902 people belong to Schedule Tribe. Agriculture is the major source of livelihood in the micro watershed area. Apart from agriculture/horticultural practices, animal husbandry is also a source of livelihood for some families in the watershed area. The socio-economic details of the Machiplavu micro watershed is given below:

14.1.1 – Demography Details of 14P35c

No	Watershed name	Total families	Population			BPL Families	Land holding/ Family (in Ha)
			Total	SC	ST		
1	14P35c	1496	5868	146	307	300	1.65

14.2 Methodology

In line with the guidelines of WDC-PMKSY 2.0, as suggested by Government of India, the following methodology was adopted for NRM planning and resource mapping.

1. Prepared the cadastral maps pertaining to the project area.
2. Overlaid the micro watershed boundaries over cadastral maps and corrected the boundaries through ground truth verification

3. Project Fellows were appointed as animators. The animators assisted the People's representatives in the formation of Neighbour Hood Groups. They act as master trainers and collected primary and secondary field data. The animators worked as the interface between LSGI and NHGs
4. Overseers were engaged for taking field estimates of the proposed activities.
5. Induction training was given for the project staff on concept of maps and Resource Mapping.
6. block level online discussions were conducted for People's representatives of District/Block/GramaPanchayats, line departments, Kudumbasree, and other functionaries.
7. This was followed by orientation meeting at GramaPanchayats.
8. Conducted transect walk with ward members and ADS.
9. During the transect walk, major drains, gullies and drainage lines are identified and marked in the cadastral map.
10. A block levelonline meeting was organized on drainage line treatment. Followed by Technical presentations, group discussions were held at Grama Panchayat level to draw out the requirements. The suggestions were presented.
11. Various resources like different water bodies, wells and farm ponds are identified and marked in the cadastral map.
12. Focus Group Discussions were organised at Panchayat level for ward members & ADS Chairpersons, Presidents & Secretaries of NHGs, Padashekhara Samithi, Kera Samithi, Kudumbasree, MGNREGS, Officials of Agriculture, Veterinary& Soil Conservation Departments. Followed by online technical sessions, group discussions at ward level were held and suggestions were presented by Grama Panchayat members.
13. The land resource maps already prepared were updated using high resolution satellite imagery and these interpreted maps were corrected with the help of ward members.
14. Detailed field survey was done for net plan preparation at Grama Panchayat level with the help of ward members & ADS Chairpersons, Vice Presidents & Joint Secretaries of NHGs, MGNREGS officials, etc. The information gathered includes soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up in each microwatershed. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also collected.
15. Thematic maps on geology and geomorphology were interpreted from the high resolution satellite imagery and were corrected through ground truth verification.
16. Panchayat Level online meetings convened at Grama Panchayats and the list of entry point activities suggested were discussed and finalized.
17. The information gathered on soil and water conservation activities to be taken up through MGNREGS and other schemes and list of agricultural/veterinary/fisheries activates to be taken up were finalized. The list of drains/ponds/wells to be rejuvenated/renovated and the details of group activities/livelihood activities to be taken up in each NHG were also finalsied. The livelihood action plan and the activities under production system were also consolidated.
18. The suggestions were split for four years and four separate annual plans were also prepared.
19. Finally a proposed land use map, area treatment map and drainage line treatment map were so prepared which is treated as the strategic action plan on Natural Resources Management perspective for the micro watershed during the entire project period.
20. Major activities included in the watershed project are.

21. Soil and moisture conservation measures like centripetal and bench terracing, earthen and stone pitched contour bunding, trenching, vegetative barriers, etc.
22. Rain water harvesting activities like farm ponds, percolation tanks, check dams etc.
23. Well recharging and rain water harvesting structures like roof water harvesting and rain water collection pits.
24. Planting and sowing of multipurpose trees, shrubs, grasses, legumes and pasture land development.
25. Encouraging natural regeneration including fodder cultivation.
26. Promotion of agro-forestry and horticulture
27. Capacity building and creation of a greater degree of awareness among the participants.
28. Encouraging people's participation with the involvement of NHGs.
29. Livelihood activities for asset less people
30. Production system and Micro enterprises

14.3 Biophysical resources

Slope

The watershed area is divided into six categories of slope classes. The majority of area is under the steep sloping area having >35% slope. The category spreads over an area of 1039.53 ha (42.1%) and these lands requires urgent soil and water conservation measures.

Table No. 14.3.1 Slope of Machiplavu micro watershed

Sl No.	Particulars	Area (Ha)	Percentage(%)
1.	0-3% - Level/Gentle	370.15	15.2%
2.	3-5% - slight Slope	24.44	1.0%
3.	5-10% -Moderately Sloping	110.24	4.5%
4.	10-15% -Strongly Sloping	93.94	3.9%
5.	15-35% -Moderately Steep Sloping	796.25	32.7%
6.	>35% -Steep Slope	1039.53	42.7%
	Treatable Area	**2434.54**	**100.00%**

Drains

The Periyar River is the major drain of this watershed. A number of drains are originating from different parts of this watershed which drains to the Periyar River . The watershed also has 17 number of ponds distributed throughout the watershed area. The details of the drains and ponds in the watershed area is given in tables given below.

Table No. 14.3.2 Details of Drains in Machiplavu micro watershed

Sl No.	Drains
1.	Mandiram Thodu
2.	Deviyar River
3.	Eastern School Padi Thodu
4.	Muthuvanpara Thodu
5.	Chinnaparakudi Thodu

Sl No.	Drains
6.	Mannamkala Collage Bhagam Thodu
7.	Vallppadi Thodu
8.	Victory Leksham Veedu Colony Thodu
9.	Karinkulam Thodu
10.	Adimali Thodu
11.	200acre Pothu Neerchal
12.	Pettimudi Thodu
13.	Thalamali Thodu
14.	Thattekannan Thodu
15.	Millumpadi Thodu
16.	Eastern Padi Deviyar Link Thodu
17.	Chattuparakudi-Rangaswamipadi Thodu
18.	Kuthirayila Padashekara Thodu
19.	Muslim Pallikunnu Thodu
20.	Thannerinpadi Thodu
21.	Mappani Thodu
22.	Priyadarshini-Sooryanagar Thodu
23.	Mannamkala-Kalpanchawla Thodu
24.	Puthukadan City Thodu
25.	4 Cent Colony Kaithodu
26.	Polinjapalam Thodu

Table No. 14.3.3 Details of Ponds in Machiplavu micro watershed

Sl. No	Pond
1	Chattuparakkudi Public pond
2	Thattekkannankudi Public pond
3	Machiplavukudi Public pond
4	Anganavadi pond, Machiplavukudi Public pond
5	kuthirayala Public pond
6	Kuthirayala Public pond
7	Kuthirayala Public pond
8	Near Ganapathi Temple Public pond
9	Pettimudi Public pond
10	Karimkulam Public pond
11	Lakshamveedu Colony Public pond
12	Madampadi Public pond
13	Kumbanpara Public pond
14	Polinjapalam Jathithottam Public pond
15	200 Acre, Kumban para vala, Public pond

Sl. No	Pond
16	Koykkakudi Junction Public pond
17	Nalucent Colony, Kuttanpadi Public pond
18	Kottancheri padam Public pond
19	Ittappsir Padam Public pond
20	Chinnappara Kudi, S.P.kudi Public pond
21	Thalanirappan kudi Public pond
22	Puthukkattpadi Public pond
23	Churakkettan, Panchakulam Public pond
24	Priyadarsini Colony Public Well
25	Mappanikkunnu, Mathanagar Public Well
26	Nalucent Colony(14), Near MB College Public Well
27	Machiplavu, School Junction Bore Well
28	Chattupara, Pottas Junction Bore Well
29	Thattekannan kudi Public pond

Land use

Agriculture is one of the prime activity in the watershed area. The major land use category mapped in the watershed area is mixed crops which are the typical homestead cultivation of Kerala wherein the different crop species are grown together that cannot be spatially mapped separately.It consist an area of 470.70 ha (19.33%). The second major category is the Forest - Waste Land (Barren Rock). This extents in an area of 381.89 ha. An area of 45.81 ha of paddy lands has been left as fallow which can be brought to paddy cultivation by providing necessary labour and irrigation facilities. An area of 152.49 ha is under the built up land. The details of land use categories with spatial extent is given in table.

Table No. 14.3.4 Land use categories in Machiplavu micro watershed

Sl No.	Particulars	Area(Ha)	Percentage(%)
1.	Agricultural Fallow Land - Current Fallow	11.48	0.47%
2.	Agricultural Mixed Crop - Mixed Crops	470.70	19.33%
3.	Agricultural Perennial Crop - Arecanut	135.01	5.55%
4.	Agricultural Perennial Plantation Crop - Cardamom	1.78	0.07%
5.	Agricultural Perennial Plantation Crop - Others	9.75	0.40%
6.	Agricultural Perennial Plantation Crop - Rubber	228.55	9.39%
7.	Agricultural Perennial Plantation Crop - Tea	80.04	3.29%
8.	Built up Land - Built ups + Mixed Crops	65.18	2.68%
9.	Built up Land - Commercial	20.57	0.84%
10.	Built up Land - Others	4.45	0.18%
11.	Built up Land - Public/Semi Public	1.01	0.04%
12.	Built up Land - Residential	53.45	2.20%
13.	Built up Land - Roads	7.83	0.32%
14.	Forest - Plantation (Cardamom)	15.28	0.63%
15.	Forest - Plantation (Tea)	4.14	0.17%
16.	Forest - Deciduous (Dense Evergreen/Semi Evergreen)	70.20	2.88%
17.	Forest - Evergreen/Semi evergreen (Fairly Dense)	338.39	13.90%

Sl No.	Particulars	Area(Ha)	Percentage(%)
18.	Forest - Others (Dense Mixed Forest)	25.44	1.04%
19.	Forest - Others(Arecanut)	98.17	4.03%
20.	Forest - Paddy Cultivating (Current Fallow)	4.29	0.18%
21.	Forest - Settlement	4.93	0.20%
22.	Forest - Waste Land (Barren Rock)	381.89	15.69%
23.	Paddy Converted to Built up - Residential	52.08	2.14%
24.	Paddy Converted to Built up - Others	5.27	0.22%
25.	Paddy Converted to Mixed Crops	91.80	3.77%
26.	Paddy Converted to Mixed Crops + Built ups	45.74	1.88%
27.	Paddy Converted to Perennial Crops	11.96	0.49%
28.	Paddy Converted to Seasonal Crops	29.41	1.21%
29.	Paddy Cultivating Land	45.05	1.85%
30.	Paddy Cultivating Land - Current Fallow	45.81	1.88%
31.	Waste Land - Barren Rocky Land	64.37	2.64%
32.	Waste Land - Land with Scrub	6.44	0.26%
33.	Waterbody - Lake/Ponds	0.13	0.01%
34.	Waterbody - River/Stream	3.96	0.16%
	Total	**2434.54**	**100.00**

Geology

The major geological units in the watershed is Migmatite Complex group of rocks occurring in an area of 2423.30 ha (99.54%).

Table No. 14.3.5 Geological units in Machiplavu micro watershed

Sl No.	Particulars	Area(Ha)	Percentage (%)
1.	Migmatite Complex	2423.30	99.54%
2.	Penisular Gneissic Complex	7.29	0.30%
3.	Waterbody	3.95	0.16%
	Total	**2434.54**	**100.00%**

Geomorphology

There are four geomorphological units of which 65.87% (1603.54 ha) of the area falls under the category denudational Structural Hills.

Table No. 14.3.6 Geomorphologic units in Machiplavu micro watershed

Sl No	Particulars	Area (Ha)	Percentage(%)
1.	Denudational Structural Hills	1603.54	65.87%
2.	Piedmont Zone	616.25	25.31%
3.	Valley	132.80	5.45%
4.	Structural Valley	77.99	3.20%
5.	Waterbody	3.95	0.16%
	Total	**2434.54**	**100.00%**

Soils

The major soil series mapped in the watershed area Kanjikuzhi (853.71 Ha), Karimannur (526.02 Ha), Suryanelli (142.51 Ha), Pambla (467.11 Ha). Majority of area is Gravelly Sandy Clay Loam in texture. This is distributed in an area of 865.5 ha (35.55%). Soils in more than half of the watershed area is deep to very deep soils (2233.79 Ha).

More than 50 % of the watershed area is prone to moderate to severe soil erosion which calls for proper soil and water conservation measures in the area.

Table No. 14.3.7 - Soil Texture in Machiplavu micro watershed

Sl	Particulars	Area(Ha)	Percentage(%)
1.	Clay Loam	543.94	22.34%
2.	Gravelly Sandy Clay Loam	865.5	35.55%
3.	Sandy Clay Loam	668.53	27.46%
4.	Sandy Clay	232.64	9.56%
5.	Rock Out Crops	45.58	1.87%
6.	Habitation	74.39	3.06%
7.	Waterbody	3.95	0.16%
	Total	**2434.53**	**100.00%**

Table No. 14.3.8 - Soil Depth in Machiplavu micro watershed

Sl No	Particulars	Area(Ha)	Percentage (%)
1.	deep	76.77	3.15%
2.	deep to very deep	2233.79	91.75%
3.	Rock Out Crops	45.58	1.87%
4.	Very deep	0.07	0.00%
5.	Habitation	74.39	3.06%
6.	Waterbody	3.95	0.16%
	Total	**2434.54**	**100.00%**

Table No. 14.3.9 Soil Erosion

Sl No	Particulars	Area(Ha)	(%)
1.	Moderate To Severe Erosion	1551.88	63.74%
2.	Moderate Water Erosion	526.09	21.61%
3.	None To Slight Water Erosion	232.64	9.56%
4.	Rock Out Crops	45.58	1.87%
5.	Habitation	74.39	3.06%
6.	Waterbody	3.95	0.16%
	Total	**2434.53**	**100.00%**

Hydrologic Soil Group

Hydrologic Soil Group (HSG) means a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from group A soils, with high permeability and little runoff produced, to group D soils, which have low permeability rates and produce much more runoff. Majority of the project area is with soils with low infiltration rate, moderately high run-off potential. An area of 1391.59 Ha (57.16 %) is under this category.

Table No. 14.3.10 – HSG in Machiplavu micro watershed

Sl No.	Particulars	Area(Ha)	Percentage
1.	Forest	609.62	25.04%
2.	Habitation	74.39	3.06%
3.	Rock Out Crops	45.58	1.87%
4.	Soils with low infiltration rate, moderately high run-off potential	1391.59	57.16%
5.	Soils with moderate infiltration rate, moderately low run-off potential	232.64	9.56%
6.	Soils with very low infiltration rate, high run-off potential	76.77	3.15%
7.	Waterbody	3.95	0.16%
	Total	**2434.54**	**100.00%**

LAND IRRIGABILITY

Soil is the reservoir for water in retaining and supplying the soil moisture to plant growth. The periodical recharging of water in soil pore spaces can be made either by irrigation or rainfall. The recharged water has to be supplied to plant system.

This retention capacity and supply capacity varies from soil to soil based on its physical and chemical properties. Based on this, soil classification is made for its suitability for irrigation. This classification is also known as irrigability classification. Majority of the micro watershed area is coming under the category Lands that are marginal for sustained use under irrigation (35.55%)

Table No. 14.3.11– Land Irrigability in Machiplavu micro watershed

Sl No	Particulars	Area (Ha)	%
1.	Forest	609.62	25.04%
2.	Habitation	74.39	3.06%
3.	Lands that are marginal for sustained use under irrigation	865.57	35.55%
4.	Lands that are marginal for sustained use under irrigation	76.77	3.15%
5.	Lands that have moderate soil limitation for sustained use under irrigation	232.64	9.56%
6.	Lands that have severe soil limitation for sustained use under irrigation	526.02	21.61%
7.	Rock Out Crops	45.58	1.87%
8.	Waterbody	3.95	0.16%
	Total	**2434.53**	**100.00**

14.4 Budget-14P35c

Table No. 14.4.1

Sl No	Particulars	Amount (Rs.)
1.	Management	6199200
2.	Monitoring	1239840
3.	EPA	1239840
4.	DPR	619920
5.	I & CB	1859760
6.	NRM	29136240
7.	Livelihood	9298800
8.	Production	9298800
9.	Governanace	1239840
10.	Consolidation	1859760
	Total	**61992000**

14.5- 14P35c- Microwatershed Action Plan -Natural Resource Management

I Year

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1.	Avenue planting	no.	142	120		17040	
2.	Cultivation of horticultural crops in wastelands	25 cent	10000	6	60000		6000
3.	Pachathuruthu	5 cent	6000	1	6000		600
4.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	8	48000		4800
5.	Crop demonstration - vegetable garden in schools and government institution	25 cent	10000	4	40000		4000
6.	Medicinal plants in public institutions	5 cent	5500	4	22000		2200
7.	Earthen bunds	rm	142	1500		213000	
8.	Stone pitched contour bunds	rm	139	15000		2085000	
9.	Staggered trenches	no.	141	4000		564000	
10.	Strip terracing for rubber/Inward terracing for planatation	no.	142	13334		1893428	
11.	Live fencing	rm	51	644		32844	
12.	Gully plugs	no.	808	502		405616	
13.	Brushwood checkdams	rm	769	5500		4229500	
14.	Loose boulder check dams (2 m length)	no.	2124	10		21240	
15.	Loose boulder check dams (3 m length)	no.	3186	6		19116	
16.	Loose boulder check dams (4 m length)	no.	4249	5		21245	
17.	Check dam using blasted rubble 2m length	no.	8325	1		8325	
18.	Check dam using blasted rubble 3m length	no.	13625	1		13625	
19.	Check dam using blasted rubble 4m length	no.	19950	1		19950	
20.	Vented cross bars (VCB)	no.	400000	1	400000		

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
21.	Sidewall protection of drains (geotextiles)	m2	161	17700		2849700	
22.	Sidewall protection of ponds (geotextiles)	m2	161	800		128800	
23.	Desiltation of drains	m3	142	19700		2797400	
24.	Desiltation of ponds	10m3	1416	800		1132800	
25.	Side varambu earthening of drains	m	142	8000		1136000	
26.	Construction of farm ponds (6m x 6 m)	no.	80000	6		480000	
27.	Well recharging	no.	8000	8		64000	
28.	Percolation pond (2 m dia)	no.	18000	9		162000	
29.	Construction of new well	no.	50000	10		500000	
30.	Artificial recharging in Public Institutions	no.	150000	1	0	150000	
31.	Biogas plants (1 m3)	no.	30000	4	30000	90000	3000
32.	Crop residue biomass composting	no.	15000	15	56250	168750	5625
33.	Adimali-thalamali thekkekkara thod- Public well maintentance	no.	282000	1	282000		
34.	Puthukkadan city thodu- Side wall protection (25m)	no.	337000	1	337000		
35.	Puthukkadan city private well cleaning	no.	8000	1	8000		
36.	Mukkalekkar Urava samrakshanam- Water tank construction (10000l)	no.	290000	1	290000		
37.	Machiplavu-Kallar thod- Chattupara kudi- Public pond side wall protection	no.	700000	1	700000		
38.	Chattuparakudi Ranghaswamipadi check dam (6m)	no.	841000	1	841000		
39.	Chattupara-Thevarmadam padi public pond construction (12m x 12mx 6m)	no.	1545000	1	1545000		
40.	Mappani thodu renovation- Deepening (3 km, 0.3m)	no.	1200000	1	1200000		
41.	Millumpadi waterfalls - Check dam (3m)	no.	488000	1	488000		
42.	Mannamkala Kalpana Chaula thod side wall protection(100m)	no.	152000	1	152000		
43.	Koyikkakudi waterfalls - Water tank construction (10000l)	no.	290000	1	290000		
44.	Muslim pallikkunnu side wall protection (200 m)	no.	966957	1	966957		
45.	Pettimudi-Kallar padasekharam public pond construction (15m x 15m x 5m)	no.	2009000	1	2009000		

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
46.	Pettimudi rajanmanippadi public pond sidewall protection and cleaning (12m x 9m)	no.	626000	1	626000		
47.	Pettimudi rajanmanippadi check dam renovation	no.	324000	1	324000		
48.	Thazhekkad pothukulam maintenance	no.	327000	1	327000		
49.	Thanelil padi thodu- Keeppanassery check dam (3m)	no.	488000	1	488000		
	Total			**87717**	**11536207**	**19203379**	**26225**

14P35c- Microwatershed Action Plan -Natural Resource Management

II Year

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1.	Avenue planting	no.	142	120		17040	
2.	Cultivation of horticultural crops in wastelands	25 cent	10000	8	80000		8000
3.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	9	54000		5400
4.	Crop demonstration - vegetable garden in schools and government institution	25 cent	10000	4	40000		4000
5.	Medicinal plants in public institutions	5 cent	5500	4	22000		2200
6.	Earthen bunds	rm	142	1500		213000	
7.	Stone pitched contour bunds	rm	139	15000		2085000	
8.	Staggered trenches	no.	141	4000		564000	
9.	Strip terracing for rubber/Inward terracing for planatation	no.	142	13334		1893428	
10.	Live fencing	rm	51	644		32844	
11.	Gully plugs	no.	808	502		405616	
12.	Brushwood checkdams	rm	769	5500		4229500	
13.	Loose boulder check dams (2 m length)	no.	2124	10		21240	
14.	Loose boulder check dams (3 m length)	no.	3186	6		19116	
15.	Loose boulder check dams (4 m length)	no.	4249	5		21245	
16.	Check dam using blasted rubble 3m length	no.	13625	1		13625	
17.	Check dam using blasted rubble 4m length	no.	19950	1		19950	
18.	Sidewall protection of drains (geotextiles)	m2	161	17700		2849700	
19.	Sidewall protection of ponds (geotextiles)	m2	161	800		128800	
20.	Desiltation of drains	m3	142	19700		2797400	
21.	Desiltation of ponds	10m3	1416	800		1132800	

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
22.	Side varambu earthening of drains	m	142	8000		1136000	
23.	Construction of farm ponds (6m x 6 m)	no.	80000	6		480000	
24.	Well recharging	no.	8000	8		64000	
25.	Percolation pond (2 m dia)	no.	18000	9		162000	
26.	Construction of new well	no.	50000	10		500000	
27.	Renovation of public wells	no.	36000	1	36000		
28.	Mini Drinking water schemes	no.	300000	1	300000		
29.	Artificial recharging in Public Institutions	no.	150000	2	0	300000	
30.	Biogas plants (1 m3)	no.	30000	4	30000	90000	3000
31.	Crop residue biomass composting	no.	15000	10	37500	112500	3750
32.	Mb college-mannamkala thodu renovation- Deepening (0.3m) and Side wall protection (200m, 3m height)	no.	6156000	1	6156000		
33.	Machiplavu-kallar thod- chattupara kudi- private pond Side wall protection	no.	700000	1	700000		70000
34.	Vallappadi public pond renovation- Cleaning, GI mesh roofing, Motor connection	no.	57000	1	57000		
35.	Mannamkala colony public pond renovation- Cleaning (8m x 5m x4m)	no.	66000	1	66000		
36.	Kuthirayila- Ampalapadi stream side wall protection (4m)	no.	144000	1	144000		
37.	3 Acre public well renovation and cleaning (0.25m)	no.	250000	1	250000		
38.	Kuttiyamma -Naganpadi public pond renovation- Increasing side wall height	no.	127000	1	127000		
39.	Priyadarsini-Surya nagar thodu - Side wall construction (150m)	no.	142000	1	142000		
40.	Pettimudi public pond renovation	no.	37000	1	37000		
41.	Sankarankunnu public well renovation- Cleaning, deepening (1.8 m)	no.	75300	1	75300		
42.	Koyikkakudi Idaykkadu pond cleaning (private)	no.	20000	1	20000		2000
43.	Thanelil padi thodu- Keeppanassery check dam (3m)	no.	488000	1	488000		
44.	Priyadarsini colony bore well maintanance, tank construction (10000l)	no.	298100	1	298100		
	Total			**87710**	**9159900**	**19288804**	**98350**

14.5- 14P35c- Microwatershed Action Plan -Natural Resource Management

III Year

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
1.	Avenue planting	no.	142	60		8520	
2.	Cultivation of horticultural crops in wastelands	25 cent	10000	4	40000		4000
3.	Fruit tree planting (Jack fruit, rambutan, mango)	25 cent	6000	8	48000		4800
4.	Crop demonstration - vegetable garden in schools and government institution	25 cent	10000	4	40000		4000
5.	Medicinal plants in public institutions	5 cent	5500	4	22000		2200
6.	Earthen bunds	rm	142	1631		231602	
7.	Stone pitched contour bunds	rm	139	15233		2117387	
8.	Staggered trenches	no.	141	4342		612222	
9.	Strip terracing for rubber/Inward terracing for planatation	no.	142	13329		1892718	
10.	Live fencing	rm	51	642		32742	
11.	Gully plugs	no.	808	502		405616	
12.	Brushwood checkdams	rm	769	5562		4277178	
13.	Loose boulder check dams (2 m length)	no.	2124	5		10620	
14.	Loose boulder check dams (3 m length)	no.	3186	6		19116	
15.	Loose boulder check dams (4 m length)	no.	4249	5		21245	
16.	Sidewall protection of drains (geotextiles)	m2	161	17652		2841972	
17.	Sidewall protection of ponds (geotextiles)	m2	161	700		112700	
18.	Desiltation of drains	m3	142	19676		2793992	
19.	Desiltation of ponds	10m3	1416	600		849600	
20.	Side varambu earthening of drains	m	142	8000		1136000	

Sl No	Activities	Unit	Rate	Volume	WDC-PMKSY	Convergence	WDF
21.	Construction of farm ponds (6m x 6 m)	no.	80000	3		240000	
22.	Well recharging	no.	8000	6		48000	
23.	Percolation pond (2 m dia)	no.	18000	7		126000	
24.	Construction of new well	no.	50000	0		0	
25.	Biogas plants (1 m3)	no.	30000	4	30000	90000	3000
26.	Crop residue biomass composting	no.	15000	10	37500	112500	3750
27.	Illathanpadi thodu sidewall protection (160m)	no.	2282000	1	2282000		
28.	Kuthirayila Marthadankunnu stream side wall protection (25m)	no.	1327000	1	1327000		
29.	Public pond renovation- Property of sivamani (10m x 10m x 4m) (1m)	no.	38000	1	38000		
30.	Kuthirayila-Chinnammakrishna padi public pond renovation	no.	36000	1	36000		
31.	Kuthirayila padabhagam- Side wall protection (150 m)	no.	1188000	1	1188000		
32.	Kuthirayila O.N Gopi public pond renovation- Cleaning, Side wall height increase, GI mesh	no.	103000	1	103000		
33.	Mannamkala colony public well cleaning, construction water tank (10000l)	no.	300000	1	300000		
34.	Mannamkala muslim palli thod - Sidewall construction (100m)	no.	753500	1	753500		
35.	Telephone exchange road side wall construction (80 m)	no.	603000	1	603000		
36.	Chattupara Nethaji nagar public well cleaning	no.	8000	1	8000		
37.	Chattupara Kurukkanmala - pond construction (12m x 12m x6m)	no.	1545000	1	1545000		
38.	Laksham veed colony public pond renovation- Cleaning, GI mesh roof (4.5m x 4.5m)	no.	37000	1	37000		
	Total			**88007**	**8438000**	**18129730**	**217500**

14.6- 14P35c- Microwatershed Action Plan -Production System
I year

Sl. No	Project	Unit cost/Nos	Area/Nos	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	6	480000	30000	180000	300000	36000
2	IFS (31-40 cents)	100000	5	500000	40000	200000	300000	40000
3	IFS (41 cents-2 ha)	120000	4	480000	50000	200000	280000	40000
4	Mechanisation of dairy farm (5 cow)	100000	7	700000	50000	350000	350000	70000
5	Fodder grass cultivation (1 acre)	12140	4	48560	6070	24280	24280	4856
6	Bee hives (2 hives) for scaring off wild animals	4000	160	640000	2400	384000	256000	76800
7	Small nursery (0.5 acre)	300000	2	600000	150000	300000	300000	60000
8	Grow bag cultivation (25 grow bags)	2000	800	1600000	1500	1200000	400000	240000
9	Rain shelter cultivation (100 m2)	67000	4	268000	30000	120000	148000	24000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	100	1000	100000	50	50000	50000	10000
11	Fallow land cultivation- Paddy (0.5 acre)	71026	9	639234	8094	72846	566388	14569.2
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	310	426250	1031	319610	106640	63922
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	312	429000	1031	321672	107328	64334.4
	Total			**6911044**		**3722408**	**3188636**	**744481.6**

14P35c- Microwatershed Action Plan -Production System

IIYear

Sl. No	Project	Unit cost/ Nos	Area/No	Total cost	Rate of assistance as per existing norms/unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	6	480000	30000	180000	300000	36000
2	IFS (31-40 cents)	100000	4	400000	40000	160000	240000	32000
3	IFS (41 cents-2 ha)	120000	4	480000	50000	200000	280000	40000
4	Mechanisation of dairy farm (5 cow)	100000	8	800000	50000	400000	400000	80000
5	Fodder grass cultivation (1 acre)	12140	4	48560	6070	24280	24280	4856
6	Bee hives (2 hives) for scaring off wild animals	4000	160	640000	2400	384000	256000	76800
7	Small nursery (0.5 acre)	300000	2	600000	150000	300000	300000	60000
8	Grow bag cultivation (25 grow bags)	2000	800	1600000	1500	1200000	400000	240000
9	Rain shelter cultivation (100 m2)	67000	3	201000	30000	90000	111000	18000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	1000	1000	1000000	50	50000	950000	10000
11	Fallow land cultivation- Paddy (0.5 acre)	71026	9	639234	8094	72846	566388	14569.2
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	310	426250	1031	319610	106640	63922
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	312	429000	1031	321672	107328	64334.4
	Total			**7744044**		**3702408**	**4041636**	740481.6

14P35c- Microwatershed Action Plan -Production System

III Year

Sl. No	Project	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/ unit	Cost to be met from project fund	Beneficiary contribution	WDF
1	IFS (5-30 cents)	80000	15	1200000	30000	450000	750000	18000
2	IFS (31-40 cents)	100000	12	1200000	40000	480000	720000	24000
3	IFS (41 cents-2 ha)	120000	10	1200000	50000	500000	700000	20000
4	Mechanisation of dairy farm (5 cow)	100000	19	1900000	50000	950000	950000	40000
5	Fodder grass cultivation (1 acre)	12140	10	121400	6070	60700	60700	2428
6	Bee hives (2 hives) for scaring off wild animals	4000	400	1600000	2400	960000	640000	38400
7	Small nursery (0.5 acre)	300000	5	1500000	150000	750000	750000	30000
8	Grow bag cultivation (25 grow bags)	2000	2000	4000000	1500	3000000	1000000	120000
9	Rain shelter cultivation (100 m2)	67000	8	536000	30000	240000	296000	6000
10	Promotion of nutritional garden (distributing sampling kit containing 2 to 3 varieties)	100	2500	250000	50	125000	125000	5000
11	Fallow land cultivation- Paddy (0.5 acre)	71026	22	1562572	8094	178068	1384504	6475.2
12	Fruit tree distribution (Rambutan and Mango graft)- 5 plants each	1375	776	1067000	1031	800056	266944	32167.2
13	Hybrid Coconut and nutmeg seedling distribution- 5 plants each	1375	780	1072500	1031	804180	268320	32167.2
				17209472		**9298004**	**7911468**	**374637.6**

14P35c- Microwatershed Action Plan -Livelihood and Microenterprise
I year

Sl No	Activity	Unit cost/Nos	Area/No	Total cost	Rate of assistance as per existing norms/ unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	6	540000	45000	270000	270000
2	Mushroom cultivation (80-100 bed)	28125	40	1125000	11250	450000	675000
3	Backyard poultry unit (5 bird+ cage)	2600	402	1045200	800	321600	723600
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	14	112000	2500	35000	77000
5	Quail rearing (50 quail 5 month old+ cage)	10850	11	119350	2925	32175	87175
6	Pisciculture (Padutha Pond) 2 cent	123000	5	615000	49200	246000	369000
8	Vermicompost unit (30'x8'x2.5')	100000	8	800000	50000	400000	400000
9	Cow rearing (milching)	65000	36	2340000	27500	990000	1350000
10	Goat rearing (female 2)	32000	54	1728000	16000	864000	864000
	Total			**8424550**		**3608775**	**4815775**

14P35c- Microwatershed Action Plan -Livelihood and Microenterprise

II Year

Sl No	Activity	Unit cost/No	Area/No	Total cost	Rate of assistance as per existing norms/ unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	6	540000	45000	270000	270000
2	Mushroom cultivation (80-100 bed)	28125	40	1125000	11250	450000	675000
3	Backyard poultry unit (5 bird+ cage)	2600	402	1045200	800	321600	723600
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	10	80000	2500	25000	55000
5	Quail rearing (50 quail 5 month old+ cage)	10850	8	86800	2925	23400	63400
6	Pisciculture (Padutha Pond) 2 cent	123000	3	369000	49200	147600	221400
5	Cardamom processing unit (Minimal) 700 kg/day	2500000	1	2500000	1375000	1375000	1125000
8	Vermicompost unit (30'x8'x2.5')	100000	8	800000	50000	400000	400000
9	Cow rearing (milching)	65000	20	1300000	27500	550000	750000
10	Goat rearing (female 2)	32000	34	1088000	16000	544000	544000
	Total			**8934000**		**4106600**	**4827400**

14P35c- Microwatershed Action Plan -Livelihood and Microenterprise

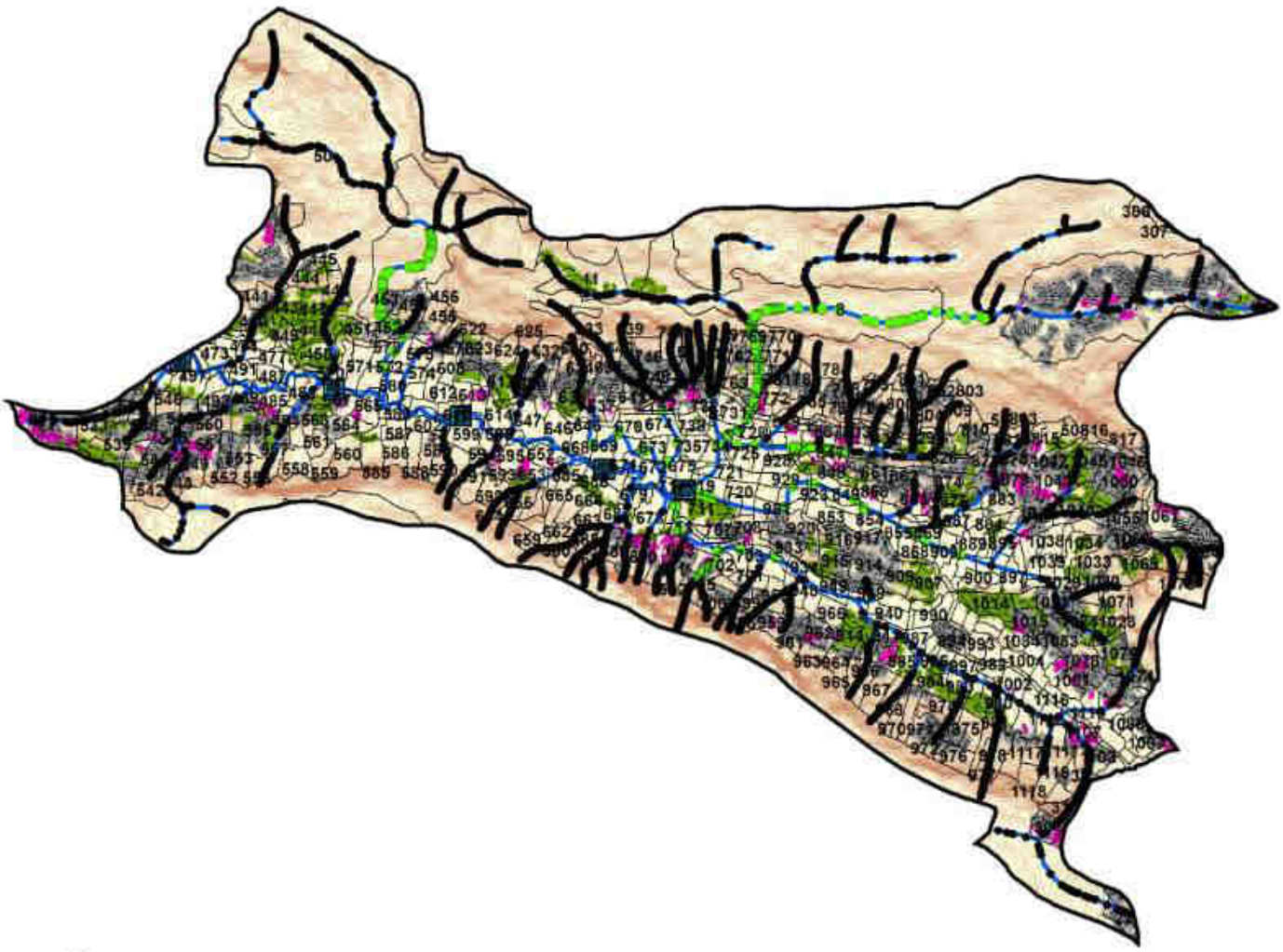
III Year

Sl No	Activity	Unit cost/Nos	Area/ No	Total cost	Rate of assistance as per existing norms/ unit	Total assistance	Beneficiary contribution
1	Pig farming unit (5 pigs + cage+biogasplant)	90000	3	270000	45000	135000	135000
2	Mushroom cultivation (80-100 bed)	28125	20	5662500	11250	225000	337500
3	Backyard poultry unit (5 bird+ cage)	2600	201	522600	800	160800	361800
4	Rabit rearing (4 rabbit +cage)-3 month old	8000	6	48000	2500	15000	33000
5	Quail rearing (50 quail 5 month old+ cage)	10850	4	43400	2925	11700	31700
6	Pisciculture (Padutha pond) 2 cent	123000	2	246000	49200	98400	147600
8	Vermicompost unit (30'x8'x2.5')	100000	4	400000	50000	200000	200000
9	Cow rearing (milching)	65000	14	910000	27500	385000	525000
10	Goat rearing (female 2)	32000	22	704000	16000	352000	352000
	Total			**3706500**		**1582900**	**2123600**

ARABLE LAND AND DRAINAGE INTERVENTIONS

MICROWATERSHED - 14P35c

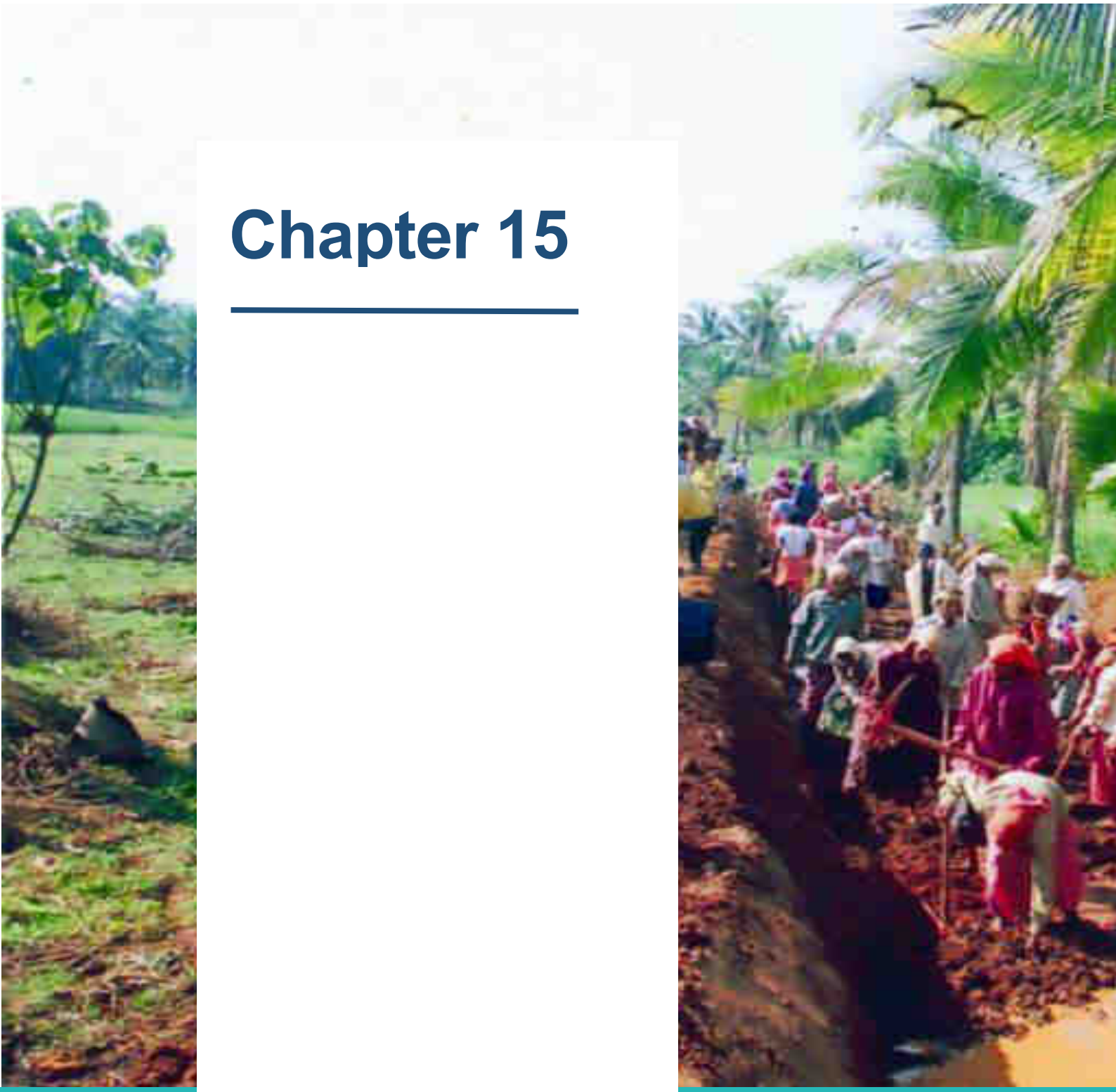
SCALE 1: 40,000



Legend

- Gully Plugs
- Brush Wood Check Dam
- Gabion
- Permanent Check Dam
- Vented Cross Bar
- Drains
- Eathern Bunds
- Stone Bunds
- Staggered Trenches
- Contour
- Cadastral Boundary
- Watershed_Boundary

Prepared by : KERALA STATE LAND USE BOARD



Chapter 15

CONVERGENCE

IDUKKI WDC-1/21-22

15. CONVERGENCE

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), notified on September 7, 2005, marked a paradigm shift from the previous wage employment programme with its rights-based approach that makes the Government legally accountable for providing employment to those who demand it. The act aims at enhancing livelihood security households in rural areas of the country by providing at least one hundred days of guaranteed wage employment in a financial year to every household whose adult members volunteer to do unskilled manual work.

Such inter sectoral convergence becomes instrumental towards.

- Establishing synergy among different government programme in planning and implementation to optimize use of public investments.
- Enhancing economic opportunities.
- Strengthening democratic processes.
- Mitigating the effects of Climate change
- Creating conditions for sustainable development.

  Convergence is an evolving process and while broad principles can be laid out at the centre, the actual contours of convergence will be determined by the resources at the Central, State, District and the project level. Also, to identify the possibilities of convergence, it may be necessary to make a beginning with select programmes, so that the experience of implementation may further inform and refine strategies for convergence.

Convergence between MGNREGS and Watershed Programmes

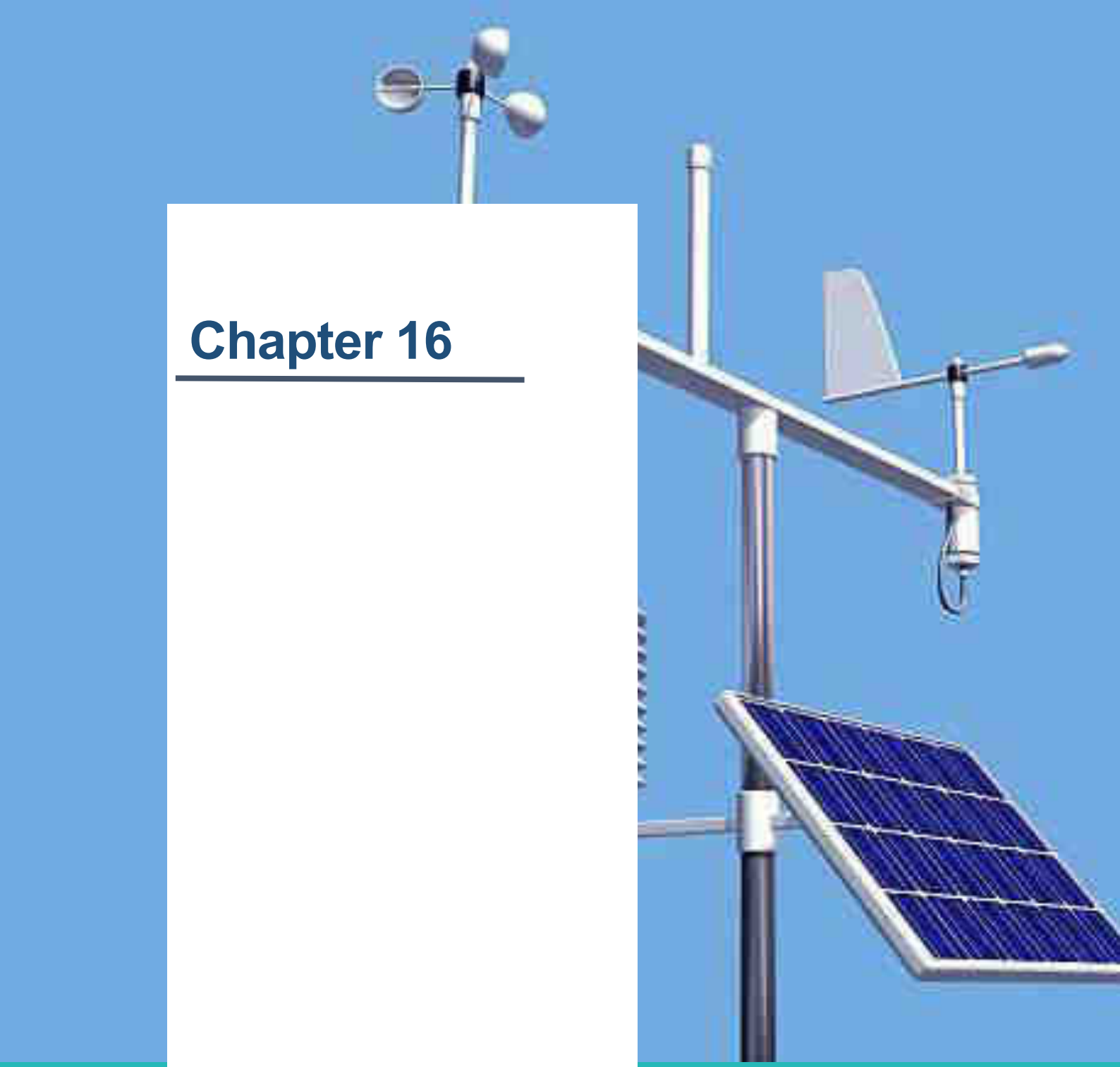
Under MGNREGA almost all the activities required for watershed development are permitted. Convergence between NREGA and watershed Programme of DoLR will be mutually beneficial for rainfed areas.

Non-Negotiable for works executed under MGNREGS:

- Only Job Card holders to be employed for MGNREGS component.
- Muster rolls will be maintained on work site, with copies in the Gram Panchayat and to be electronically maintained on nrega.nic.in
- Wage payments will be through no-frills accounts in banks/post offices.

Need for convergence :

Since more than 50% of activities related to Watershed development are conversed under MGNREGA, there is need for convergence to meet gap in funds requirements under WDC-PMKSY 2.0. Detailed survey had been conducted in Watershed villages and it has emerged that there is need for more funds to augment and strengthen the activities underWDC-PMKSY 2.0. Out of 8 sub watersheds, all sub watersheds need more funds to meet the gap. Therefore, some of the works have been converged with MGNREGA. The labour component would be met out of funds made available under MGNREGA. The details of such fund requirements from MGNREGA are given in the lists for estimates for each sub watershed.



Chapter 16

Natural Resources Management and Governance Plans

IDUKKI WDC-1/21-22

16.Natural Resources Management and Governance Plans

a) Maintenance of natural resources related assets

Natural resources related physical works need maintenance, and the bio-works such as plantation require strong protection measures and care. The watershed committee responsible for undertaking treatment works and asset creationshould maintain a Watershed Assets Register, and the list of completed works recorded and updated continuously. The completed assets should be transferred to the Gram Panchayat for their continued maintenance at the end of each year of implementation.

A system of annual audit of natural resource assets should be taken up by the GP to assess their status and maintenance needs. These can be integrated into the MGNREGS by a resolution of the Gram Panchayats. The WDT should ensure that these processes are institutionalized into the functioning of Gram Panchayat and followed regularly from 2nd year onwards. The activities planned to achieve this should be submitted as a part of the overall Project development plan.

Various types of engineering structures & biological interventions like water harvesting structures such as check dams, *nala* bunds, diversion drains, percolation tanks, vented dams, farms ponds, artificial recharge structures, equipment for natural resource governance, specific interventions for spring rejuvenation etc., created in the watershed are prone to damages by stray cattle,rain, sunshine, wind and unexpected natural calamities. Over the period there can alsobe natural damage or there may be need for its renovation for better results.There may be need strengthen or rejuvenate biological activities like block plantationspastures etc.In such cases, if the assets exist on common properties, resources from WDF may be accessed. Expenditure can be incurred also on assets built on private land but serve the community, and an agreement to this effect has been created between the WC and the land owner, and this has been shared with the GP.

b) Water Budgeting, Management/Regulatory Norms and Governance

It is crucial for the community to establish reference sites of wells/ bore wells, and regularly monitor groundwater along with local rainfall, so as to arrive at regulatory norms on water extraction, type of crops to be grown and area coverage.The groundwater monitoring exercise may be taken up twice a year (April- May & September-October / before the crop season), and results be placed after analysis, before the Gram Sabha. The purpose should be to build acommon understanding and consensus in the project community for sustainable use of groundwater. The community should be brought to agree on potential restrictions on new extraction structures, reducing area under water intensive crops and other such norms that economise on water use. These exercises are to be taken up twice a year and activities proposed should be part of the watershed development plan. A suitable arrangement for carrying out this exercise should be made by PIA in consultation with Watershed Committee and also provide requisite training for the same.

c) Protection and Regulation/Regeneration of Common Lands

Common lands that are typically in the upper reaches of the watershed slopes, including forests, pastures etc. should receive focused attention, along with identification of users, their needs and organizing them into user groups. The plan for regeneration and development should also enlist various products, usufructs arising out of the planned regeneration process, and their benefit sharing norms. Protection measures, norms and their enforcement mechanismsneed to be arrived at and must have sanction of the Gram Panchayat.

Appropriate Technology Centres (ATCs)

It is proposed to set up **Appropriate Technology Centres (ATCs)** that could function more like dedicated cells (or more like special purpose vehicles – SPVs) within the project area. ATCs would function as the technology arm of the WC and PIA and work under their They could also be a registered institution, thereby functioning as legal entities. This will open up opportunities to integrate appropriate technology with gender sensitivity, convergence, environment friendliness, transparency etc.

The functions of ATCs could include (i) awareness building and sensitisation about appropriate technologies: their need, scope, benefits, etc., (ii) piloting and demonstration of various appropriate technology options in different areas, (iii) provision of various technology services and implementation of projects on a turnkey basis, (iii) taking up repairs and maintenance and (iv) trainings and handholding of technology applications. In order to improve the efficiency,

Each ATC can have about 5-6 members. It is important that the members together should have the capabilities in terms of skill base to perform the above-mentioned functions covering all the areas mentioned above. In short, they should be multi-skilled groups. Capacity building of the members would be very crucial most of the appropriate technology options would be new to them. Since the selected members would already have a bit of technology bent it would be easy for them to absorb the technologies easily. The ATCs need to function in a professional manner and cannot be based on voluntarism. This would require a work station in the form of a space with adequate infrastructural facilities and instrumentation. The space required to create this facility can be made available by the PIA. If so, then as per very rough estimation, the capital cost required would be about Rs. 15 lakh per centre. This would include the cost of the establishing the workshop facility, and basic instrumentation and allied facilities. Each ATC would require about Rs. 2 lakh as working capital. An appropriate cost estimate will have to be worked out considering the deployment requirement of ATCs over the years to reach all the GPs and ULBs. The working capital could be raised by the ATCs through different ways including bank especially cooperative bank loans, CSR funds, inviting the public (the members of ATCs who can invest, SHGs and Kudumbashree units from the concerned LSG, and also the wider public), to invest with an assured interest or return on investment that can match and/or 1 or 2% higher than the interest fetched by term deposits. User fees appropriately charged can be another source of revenue for the ATCs. Also, the funds earmarked for technology support for various development programmes and schemes like watershed development, renewable energy programmes, etc., can be also made available to the ATCs.

With ATCs in place, it has a potential of creating green jobs or self-employment. The number can increase with more and more activities taken up by the ATCs. The members of the ATCs can be drawn from a large catchment including the Kudumbashree units, landless and agricultural labourers, workers from other informal sectors like construction and also from the Gulf returnees. It is estimated that nearly 8 lakh people have come back from the Gulf after the outbreak of the pandemic. Of this, at least 1 to 2 lakh would stay back in Kerala and would require some employment. These are people with different skill sets and the ATCs should be able to tap into this huge skilled human resource. Probably they can also make investments into the ATCs (as part of the running costs as discussed above) as most of them would have some savings.

The experience of Integrated Rural Technology Centre (IRTC) at Mundur, Palakkad and such other institutions at present can provide valuable lessons in the functioning of ATCs.

If the ATCs need to succeed then they would require handholding support throughout. For this we propose setting up Support Centres (SCs) at block level which will seek expert inputs from nearest engineering/agricultural colleges and such other technical institutions. The functions of the SCs could be (i) dissemination of Information, Education and Communication (IEC) material related to appropriate technologies that could be used for awareness building (ii) assessment of the feasibility and relevance of suggested alternative technologies (iii) capacity building of the ATC members in various appropriate technologies and this would also include identification of other resource persons/institutions who can provide specialised training in a particular field and lining up the same, (iv) monitoring and periodic evaluations to see that the ATCs function within the agreed upon criteria of alternative technologies, examine quality of work, etc., (v) suggest ways to strengthen the functioning of ATCs including its financial matters (for example suggest sources from where the ATCs can source financial resources for the running cost) and (vi) facilitate bulk purchase of materials, tools and equipment for the ATCs.
The SCs can be housed in the block level office of one of the related line departments (agriculture, PWD, Water Resources, etc). The SC team could include persons from related departments, educational institutions (Industrial Training Institutes, polytechnics, engineering colleges, regular colleges, science teachers), NGOs including Parishad units, etc. The costs would be mainly in the form of running costs – compensation for the time spent, travel, etc. There would not be capital costs as the SCs would be housed in the premises of one of the line departments. There could be various ways to meet the running costs like: small grant by the state government, CSR money, a portion of the funds earmarked for the technology component of various development programmes and schemes, user fees form the ATCs, etc. The SC and ATC can merge with a conventional institutional arrangement as the PIA or WDT, thereby reducing the institutional complexities to a large extent.

Table 16.1- Budget

Sl. No	Activity	No	Unit cost	Amount
1	Geospatial Resource Information System	1	500000	500000
2	Automatic weather stations for local predictions	3	150000	450000
3	Establishment of observation wells and datacollection using mobile app	1	200000	200000
4	Appropriate Technology centres	1	300000	300000
5	Water Budgeting	5	100000	500000
6	Installation of scales in selected ponds and establishment of observation	1	200000	200000
7	Regeneration of common land	1	250000	250000
	Total			2400000

Chapter 17

CAPACITY BUILDING & TRAINING PLAN

IDUKKI WDC-1/21-22

17. CAPACITY BUILDING AND TRAINING PLAN

The proposed capacity building and training plan aims in strengthening the skills, competencies and abilities of people and communities in developing societies in order to overcome the causes of their exclusion and suffering. This will help to guide their internal development and activities. It is proposed to carry out the following institutional based training and capacity building programmes during the project period in order to equip various stakeholders for successful participation and implementation of the project action plans. The support of knowledgeable and experienced resource organizations will be tapped for this purpose.

Sl. No	Activity	Amount
1	Awareness seminars	362200
2	Orientation Workshops	724600
3	Skill Training	1086800
4	Exposure visit	362300
5	Videos, Shortfilms and documentary for training	543400
6	Training for WDT and WC	543400
	Total	3622700

Programme No. 1

Title of the Programme	Orientation Programme on Participatory Watershed Development
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	• Features and process of watershed programme • Institutional and financial arrangements • Managerial skills • Coordination and linkages with Line-department and LSGIs • Convergence of programmes • Implementation process
Training Methodology	• Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	Members of District Level Coordination Committee
Duration	2 days
No. of expected participants	15 participants
Implementing Agency	SLNA
Expected Outcome	Ensure smooth implementation of the project with full participation and coordination of line departments and LSGIs

Programme No. 2

Title of the Programme	Orientation &Capacity building on conceptual, technical and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development
Coverage/ topic	• Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination and linkages Convergence of programmes • GIS, MIS training
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions • Field visit
Target Groups	Members of WCDC
Duration	4 days
No. of expected participants	3 persons
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project

Programme No. 3

Title of the Programme	Orientation & capacity building on WDC-PMKSY 2.0
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	• Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	District, Block and Grama Panchayat level department officials
Duration	1 day
No. of expected participants	120 persons (40 x 3 batch)
Implementing Agency	PAU
Expected outcome	Ensure smooth implementation of the project with full participation and coordination of line departments and LSGIs

Programme No. 4

Title of the Programme	Orientation & capacity building on conceptual, technical and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development
Coverage/ topic	• Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes • Documentation • Community organization
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	Block presidents, GP Presidents, Block and Grama Panchayat members, BLWC, PLWC
Duration	1 day
No. of expected participants	120 persons (40 x 3 batch)
Implementing Agency	PAU
Expected outcome	Ensure smooth implementation of the project with full participation and coordination

Programme No. 5

Title of the Programme	Empowering people's representatives for WDC-PMKSY 2.0
Training Objectives	The need for watershed based development programs, concepts involved in watershed development, WDC-PMKSY 2.0 its objectives, steps involved in the implementation of the program, financial management etc.
Coverage/topic	• To create awareness among the peoples representatives regarding the need for watershed based development programs. • Concepts of WDC-PMKSY 2.0 • Projects involved in the programs • Scope of the project. • Role and responsibilities. • Financial management.
Training Methodology	• Lecture - cum - discussion • Group exercises
Target Groups	District, Block and Grama Panchayath members

Duration	2 days
No. of participants	100
Implementing Agency	PIA
Expected outcome	Ensure smooth implementation of the projects, interfere with issues if any while implementation, financial transparency, ensure peoples participation.

Programme No. 6

Title of the Programme	**Orientation &Capacity building on conceptual, technical, non-technical and Managerial aspects**
Training Objectives	To empower the technical knowledge regarding watershed development
Coverage/ topic	• Measurement and valuation • Fundamentals of watershed • Roles and responsibilities • GIS & MIS • Documentation • Community organization
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions • Field visit
Target Groups	WDT members , Watershed Committee members
Duration	3 days
No. of expected participants	90 persons (30 x 3 batch)
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project by empowering on technical knowhow.

Programme No. 7

Title of the Programme	Orientation & capacity building on conceptual and Managerial aspects
Training Objectives	To familiarize the participants about various dimensions of participatory watershed development
Coverage/ topic	• Participatory approach in watershed management • Fundamentals of watershed • Roles and responsibilities • Institutional and financial arrangements • Coordination and linkages Convergence of programmes
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions

Target Groups	BDO/J.BDO, HSC, UDC
Duration	2 days
No. of expected participants	30 persons
Implementing Agency	SLNA
Expected outcome	Ensure smooth implementation of the project

Programme No. 8

Title of the Programme	Participatory approach in Planning and implementation of WDC-PMKSY 2.0
Training Objectives	To orient the participants on different dimensions of participatory watershed management
Coverage/ topic	• Fundamentals of watershed • Participatory approach in watershed management • Roles and responsibilities • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	Lecture - cum – interactive sessions
Target Groups	NHGs
Duration	1 day
No. of expected participants	20,000 participants (50x 400 batch)
Implementing Agency	PIA
Expected outcome	Ensure full participation of users for the smooth implementation of the project

Programme No. 9

Title of the Programme	Concept of watershed management, roles and responsibilities.
Rationale	Impart awareness among the watershed committees regarding the concept of watershed management, roles and responsibilities, operational guidelines, financial management etc.
Training Objectives	• To create awareness among the WCs regarding the concept of watershed management. • To define the roles and responsibilities of WC. • Financial management of the project. • Management of WDF.
Training Methodology	• Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	WCs
Duration	2 days
No. of participants	90 participants (30 x 3 batch)

Implementing Agency	PIA
Expected outcome	Empowerment of WCs for effective implementation of the project and proper maintenance of commonly created asset.

Programme No. 10

Title of the Programme	**Operational Strategies and financial management of implementation of watershed projects in WDC-PMKSY 2.0**
Training Objectives	To orient the participants on operational strategies and financial management in participatory watershed management
Coverage/ topic	• Leadership • Implementation • Management • Roles and responsibilities • Fundamentals of watershed • Participatory approach in watershed management • Institutional and financial arrangements • Coordination, linkages Convergence of programmes
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	Watershed Committee Members
Duration	3 days
No. of expected participants	90 participants (30 x 3 batch)
Implementing Agency	PIA
Expected outcome	Empowerment of WCs on operational Strategies and financial management for effective implementation of the project and proper maintenance of records.

Programme No. 11

Title of the Programme	**Operational guidelines for Watershed Committees in WDC-PMKSY 2.0**
Training Objectives	To orient the participants on operational guidelines for Watershed Committees in WDC-PMKSY 2.0
Coverage/ topic	• Leadership • Institutional and financial arrangements • Conducting meetings • Recording the proceedings • Office management • Accounting procedures

	• Book keeping
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	Watershed Committee Members
Duration	1 day
No. of expected participants	90 participants (30 x 3 batch)
Implementing Agency	PIA
Expected outcome	Empowerment of WCs on operational guidelines in WDC-PMKSY 2.0 for effective implementation of the project and proper maintenance of records.

Programme No. 12

Title of the Programme	**Awareness programme on production system and Micro Enterprises (PS & M) and livelihood support system (LSS)**
Training Objectives	The watershed community must be made aware of the various PS & M and LSS programmes envisaged in the project, group formation, credit support through banks, Accounting procedures etc.
Coverage/topic	• Various PS & M. • Generating additional income from such activities. • Self sustainability. • Women empowerment.
Training Methodology	• Lecture - cum - discussion • Group exercises • Case Analysis • Group discussions
Target Groups	SHGs : rearing cattle, fodder cultivation, Pisiculture, Apiculture, Horticulture, Mushroom cultivation, Food processing etc.
Duration	1 day
No. of participants	10000 participants (50 x 200 batches)
Implementing Agency	PIA
Expected outcome	Increase the standard of living through increase in percapita income, attain self sustainability etc.

Programme No. 13

Title of the Programme	**Develop action plan for PS&M and LSS**
Training Objectives	More than 50% of the communities are often land less agri labours. For attain self sustainability LSS is the main option.
Coverage/topic	• Various LSS activities envisaged in the project. • Operational guidelines

	• Action plan for each watershed depending upon their suitability.
Training Methodology	• Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	Members of District, Block and Grama Panchayat members, Watershed Committees
Duration	1 day
No. of participants	10
Implementing Agency	PIA
Expected outcome	A need based location specific, economically feasible and communally acceptable action plan.

Programme No. 14

Title of the Programme	**Planning and implementation of projects related to creation of common assets.**
Training Objectives	To create awareness among UGs regarding the mode of creation of common assets.
Coverage/topic	• Responsibility of UGs • Establishing common assets. • Mode of operation in establishing common assets. • Financial procedures involved.
Training Methodology	• Interactive sessions • Group exercises • Task Analysis • Panel discussions
Target Groups	UGs
Duration	1 day
No. of participants	1-2 persons from each UG
Implementing Agency	PIA
Expected outcome	Empower the UGs to take up the responsibility of creating common assets as well as their future maintenance.

Programme No. 15

Title of the Programme	**Training of Trainers (ToT) in WDC-PMKSY 2.0**
Training Objectives	To build a team of faculties for imparting training, monitoring and evaluation
Coverage/topic	• Fundamentals of watershed • Leadership • Managerial skills • Effective communication • Implementation

	• Management • Roles and responsibilities • Monitoring and evaluation.
Training Methodology	• Lecture – cum - discussions • Interactive sessions • Group exercises • Task Analysis • Role play • Panel discussions
Target Groups	Officials from various departments and extension faculty members, One facilitator from each NHG.
Duration	2 day
No. of participants	400 (20 x 20 batch)
Implementing Agency	PIA
Expected outcome	A well trained faculty team who are capable of disseminating the concept of watershed and other activities related to watershed management.

Programme No. 16

Title of the Programme	**Exposure visit**
Training Objectives	To visit other states to understand different methodology used in watershed management
Coverage/ topic	• Methodology • Techniques • People participation • Implementation • Documentation
Training Methodology	• Field visit
Target Groups	Block presidents, GP Presidents, Block and Grama Panchayat members, Watershed Committee
Duration	3 days
No. of expected participants	150 participants (50 x 3 batch)
Implementing Agency	PIA
Expected outcome	Understanding various innovative and cost effective techniques adopted in watershed management

Skill Development Training Programmes

Title of the Programme	**1.** Agriculture **2.** Horticulture **3.** Animal Husbandry **4.** Pisci Culture **5.** Rain water harvesting

	6. Well recharging **7.** Soil and Water conservation methods **8.** Livelihood **9.** Entrepreneurship development
Training Objectives	To provide skills and techniques of various activities
Coverage/ topic	• Organic Vegetable cultivation • Organic Banana cultivation • Post harvest technologies • Cow rearing • Goat rearing • Fodder cultivation • Pisci culture • Different types of rain water harvesting • Recharging of open wells • Mushroom cultivation • Beekeeping • Biogas • Cottage industries • Trading of products • Value addition
Training Methodology	• Lecture - cum - discussion • Demonstration • Video Film show
Duration	1 – 2 days
Target Groups	Selected Beneficiaries
No. of expected participants	10,000 (200 trainings x 50 persons in each batch)
Implementing Agency	PIA
Expected outcome	Acquire necessary skills. A need based location specific, economically feasible and communally acceptable action plan.

LIST OF TRAINING INSTITUTES FOR CAPACITY BUILDING

Sl. No.	Name of Institute/Organization	Full Address	Type of Institute/ Organization	Area of Specialization
1	KILA-State Institute of Rural Development (KILA-SIRD)	Director SIRD, ETC. P.O. Kottarakkara Kollam District, Pin 691531	Government	Rural Development
2	Kerala Institute of Local Administration (KILA)	Director, KILA, Mulankunnathukavu P.O., Thrissur District. Pin 680581	Government	Decentralized Administration
3	Centre for Earth Science Studies (CESS)	Director CESS, Akkulam, Thiruvananthapuram	Government	Resource Mapping and planning
4	Centre of Water Resources Development and Management (CWRDM)	Director, CWRDM, Kunnamangalam Kozhikode	Government	Water resources management watershed management
5	Kerala Agricultural University (KAU) and its various research station.	Vice Chancellor KAU Vellanikkara, Thrissur	Government	Crop management, improved varieties, innovative technologies, Economic planning etc.
6	NARP Research Stations of various Zones	Director Regional Agronomic Research Station (RARS) Vellayani, Kayamkulam	Government	Location specific crop management, Adoption of improved and innovative technologies for crop improvement suited to each locality.
7	Mahatma Gandhi University (M G University)	Vice Chancellor MG University Kottayam	Government	GIS Environmental impacts, Eco preservation.

8	Tropical Botanical Garden and Research Institute (TBGRI)	Director TBGRI, Palode, Thiruvananthapuram	Government	Bio diversity Eco restoration
9	Social Conservation Training Institute under the soil conservation dept.	Additional Director of soil Conservation, Thiruvananthapuram	Government	Various soil and water conservation techniques, watershed management etc.
10	Krihi Vijnan Kendras (KVK)	Director KVK All Districts	Government	Modern Agricultural practices.
11	Extension Training Centre (ETC)	Principal ETC, Kottarakkara, Kollam	Government	Participatory Planning, Extension techniques, PRA, RRA, Poverty alleviation, Watershed management etc.
12	Land Use Board (LUB)	Commissioner LUB, Vikas Bhavan, Thiruvananthapuram	Government	Resource Mapping, Watershed Management, GIS etc.
13	Institute of Management in Government (IMG)	Director IMG Trivandrum	Government	Administration
14	Socio Economic Unit Foundation (SEUF)	Director SEUF Idukki	NGO	Sanitation and Gender Development.

Chapter 18

EXPECTED OUTCOME

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18. EXPECTED OUTCOME

This project is a need based project which aims to increase the individual income, to generate self employment and to increase the agricultural productivity in the Panchayaths of Adimali and Vellanad blocks under theWDC-PMKSY 2.0. . This project will be focused on multi approach activities which create an employment opportunity in their native villages for sustaining their income and check the migration, which became a key to defeat the present problems. Project will not only focus on create employment opportunity but also focus on the sustainable use of natural resources by using latest appropriate technology and strengthening the local leaders through capacity building and training, which ultimately ensure the sustainable livelihood of the people of the project area. The details of expected outcomes are given below.

1. Employment

One of the prominent features of watershed program is to create self-sustenance to stake holder in terms of livelihood and increase in employment opportunities is one of the benchmark that can unravel the effect of watershed. Watershed creates employment opportunities during the work phase for labour intensive activities like construction of gully plug, earthen dam, farm bund, check dam, check wall and through the asset created under watershed program have a direct impact on agriculture and natural resource development. Livelihood for self-employed, wage labour and income generating activities have ample scope for employment generation. As the net employment increases, the per capita income of agriculture, animal husbandry and other allied activities will also increase.

2. Expected Migration Checked

Watershed development works can generate new opportunities in local area through the physical treatments of the watershed activities and increase the production of agriculture produces through adopting updated/ new techniques. The number of seasons under cultivation will increase as sufficient ground water level is available to the farmers in the winter and summer season. The farmers will be able to take second and third crop in their agriculture land. Hence the watershed development increased demands for labour. This will lead to decrease in the number of seasonal migration from the area.

3. Ground water table

In the presence scenario the ground water level of open wells varies from 10 meter to 16 meter, from village to village. The groundwater has gone down due to rapid urbanization and maximum ground water harvesting without any sustainable measure. The watershed activities like roof water harvesting, well recharging, rain water harvesting pits, staggered trenches, etc. will help in ground water recharging under this project and it is expected that the ground water level will come up and reach at 8 to 12 meter.

4. Drinking water

The villages in the project area totally depend upon hand pump and open well for drinking and other domestic activities. The availability of water is only for 10 months at maximum. The activities of watershed and the linkage with the Jalanidhi will increase the ground water table so that the expected status of drinking water will increase. Comparative status of drinking water between pre-project and expected post project are furnished as under.

5. Expected Crops Yield.

Due to additional availability of water, farmers of the project area will be able to take more crops in their available land. Even after taking rainy season and post-rainy season crops into consideration, they will get a good price for vegetables in summer also. The productivity will also increase due to the use of updated techniques.

6. Horticulture

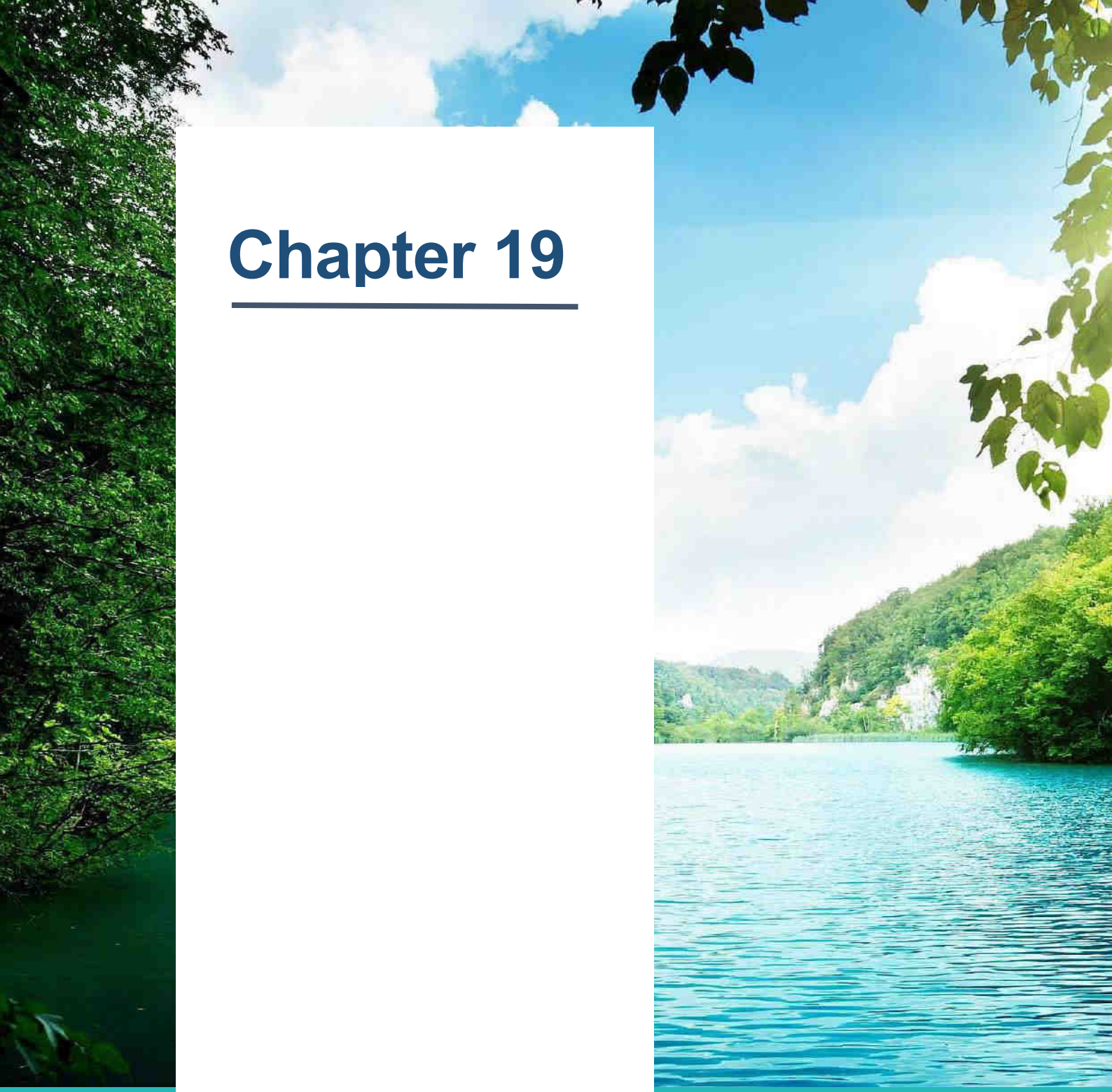
The watershed area holds good potential for horticultural activities. It is expected that due to increase in horticulture plantation area, the production will go up fetching more money in the hands of the farmers which will add to the other allied economic activities. It is also proposed to diversify horticulture activity by bringing more area under money fetching horticulture plants like Rambutan, etc. The expansion of horticulture in the area will directly increase the income levels of all the household engaged in the horticulture activities. There will be significant increase in the area covered under horticulture.

7. Livestock

Milch-animals include cow and buffalo in the project area. Productivity of the cow is 3 liters per day where as the buffalo give 4 liters of milk per day. Advanced breeds like Jersey and other improved species will be promoted in the watershed area in order to enhance the milk production. The introduction of the nature fresh model is expected to increase the quality and quantity of milk production. Due to the various interventions, the productivity will be increased to 5 and 6 liters respectively.

8. Quality and quantity of fodder

With the distribution of good quality fodder seeds and fodder plants to all households involved in livestock activities, the farmers will be able to produce the required fodder intheor own lands and attain self-sufficiency in fodder. This will ensure fodder throughout the year encouraging the farmers to take up animal husbandry activities on a broader scale to improve their living conditions. .



Chapter 19

CONSOLIDATION AND WITHDRAWAL PHASE

IDUKKI WDC-1/21-22

19. CONSOLIDATION AND WITHDRAWAL

The last two years are the Consolidation and Withdrawal Phase of the Watershed development programme. This is the crucial phase of the project as the local institutions will be trained to manage the project independently after withdrawal of the Government Institutions from the project area.

The main purpose of this phase is to create innovative nature based, sustainable livelihoods and raise productivity levels of the augmented resources and local economic development plans developed during the watershed works phase.

The activities those will be under taken during this phase are:

1. Completion of various works under taken during work phase.
2. Consensus among the villagers to take up any new works out of any unspent amount.
3. Preparation of Project completion report with details about status of each asset.
4. Documentation of successful experiences as well as lessons learnt for future use.
5. Evolving mechanisms to improve the sustainability of various interventions made in the project area.
6. Formulation of mechanisms for allocation of user right over common property resources.
7. Formulation of mechanisms to collect user charges for common property resources.
8. Creation of awareness and building capacity of the community to repair, maintain and protection of common property resources.
9. Training the user groups for optimum utilization of the developed natural resources.
10. Up scaling of successful experiences related to farm production system and off-farm livelihood activities undertaken through revolving fund under the project as well as credit and technical support from external institutions.
11. Evolving marketing arrangements of the farm produce as well as the off-farm and other micro enterprises.
12. Formation of Farmers' Federation for credit, input procurement, sale of local produce etc.
13. Forward and backward linkage of the SHGs and User groups for sustainable livelihoods.
14. Formulating mechanisms for empowering Watershed Committee and its smooth management in a long run.
15. Formulating mechanism for utilising the Watershed Development Fund

The subsequent activities are planned to be carried out during this stage.

- **Documentation** : It is proposed to document the activities carried out during the watershed implementation period. It will help to maintain the records and identify and propagate the successful activities carried out under the project.
- **Up-Scaling of successful experiments** : It is proposed to identify the best practices carried out during the project period and up-scaling the same as per feasibility and propagate the same among others members of the watershed area.
- **Evaluation** : Evaluation is a very important activity to assess the success of implementation of the project. It is proposed to carry out evaluation at the following levels.
    - *Social Audit* : It is proposed to conduct the social audit of the programe at the watershed level where the Gram Sabha will evaluate the programme where the beneficiaries should explain their benefits and current status of the activity. The watershed committee should place the books of accounts of watershed programmes for approval.

- *Evaluation by external agency* : An external agency with experience in implementation and monitoring and evaluation of watershed projects should be assigned for the evaluation of the watershed programme
- The proper and regular monitoring and evaluation of the project can trim down the improper implementation of activities so that the quality can be controlled at the right time. The chapter extends with the appropriate post-project techniques for project sustainability and research and documentation for maintaining the records, locate the loop falls in implementing and follow up the project with a new and suitable adaptation for the area development.

Plans for Monitoring

To control the activities at the stage of implementing, proper plans was formed for monitoring and Evaluation. Project monitoring is one of the important components in watershed development programmes. The broad objectives of a watershed project demand good monitoring framework. A monitoring framework is suggested within the capacity of watershed development teams and watershed committees. No great deal of training, human resources or instruments are expected to be employed. The monitoring should actually assist the project team to provide a guideline for improvement in the activities and output the project. Selection of an appropriate measure for the given area and ensuring the quality of project measures are to be given great attention at the time of monitoring.

Three Tiers of Monitoring:

The following three tiers of monitoring are planned:

First Tier (Monitoring of activities):

This will be carried out by PIA along with WDT and WC to monitor the implementation of all activities as per the action plan. The monitoring also aims at ensuring that the quality of work is as per the guidelines prescribed for each activity.

Second Tier (Monitoring of outputs):

To check the outputs of the activities, PIA along with WDT monitors as per the logical frame work. The indicators are selected considering the broad objectives of the project. One can adopt or modify these as per requirement at the time of implementation. The output level indicators needs to be devised by the project team based on the outcome level indicators on. Outputs need to be monitored frequently, may be once in a quarter/ six months.

Third Tier (Monitoring of Outcomes):

Project Implementation Agency along with the WC will monitor the overall outcomes of the objectives as per the logical frame. The outcomes level monitoring wtll start in the second year and continue on an annual basis. Most of the information can be available from the sets of output level indicators. Participatory methods will be used at the time of monitoring the activities.

The methods of collecting sample data for the monitoring activities will be clearly documented in the monitoring report. The detail of the monitoring system is presented in the table as under.

Tiers of Monitoring	Basis of monitoring	Frequency of monitoring	Orientation of the Indicator	Monitoring by
First tier	Immediate result basis	Regular Monthly Monitoring	Activity oriented	Local People organizations
Second Tier	Monitoring of Outputs	Regular monitoring (Quarterly, half yearly and annually)	Objective oriented	Internal project team (WDT, PIA & Experts)
Third Tier	Monitoring of Outcomes	Annually but monitoring start from second year onwards.	Goal Oriented	• Specified monitoring team formed by WCDC, • External Monitoring team by PIA

Vigilance and Monitoring Committees

- For every work sanctioned under the Scheme, there should be a local vigilance and monitoring committee, composed of members of the locality or village where the work is undertaken, to monitor the progress and quality of work while it is in progress. The Gram Sabha will elect the members of this committee and ensure that SC/STs and women are represented on it.
- The Implementing Agency should apprise this committee of estimates regarding the work, time frame and quality parameters. The final report of the committee should be attached along with the Completion Certificate of the work, and should also be placed at the next meeting of the Gram Sabha in the Panchayat where work has been executed.
- Local beneficiary committees may also be constituted for effective articulation of their entitlements and their access to them. The PIA members will be responsible for ensuring that local monitoring committees/beneficiary committees are constituted.

Research support in watershed management:

Watershed management requires the support of research. Watershed projects will be used as on-farm sites for research designed and implemented with significant involvement of farmers and extension workers to produce site-specific technological solutions. This leads to problems in adoption and up-scaling of research findings within specific watersheds. There is also the question of up-scaling technologies and approaches beyond a designated watershed. At the same time, researchers will be able to relate research activities to the real problems facing farmers or to capture the locally developed or modified technologies. Yet there is a need to give technologies appropriate technical and scientific definition and to disseminate them widely.

Farmer organization and empowerment:

The management of natural resources requires strong and effective farmer organizations. Such organizations empower farmers and create a good foundation for the transfer, adoption and use of information on new technologies. They also help in negotiating for inputs at favorable prices. Strong farmers' organizations can be a conduct for services that meet felt needs. These needs include information to improve production and marketing, credit, and demand driven approaches that ensure ownership and sustainability of interventions. Farmers' organization allows the use of participatory approaches that recognize local capacity and indigenous knowledge. It incorporates the aspirations and

perceptions that influence decision-making, while giving farmers an important role in planning and implementation of watershed management activities. Such participation is important for the success, continuity and sustainability of the resource management programmes. Often a successful watershed knits together many aspects of the people's lives apart from purely technical issues. Many conservation and basic group production initiatives have widened into a social movement dealing with matters such as weddings, funerals, care for the elderly and the disadvantaged, and other issues in the community. The initial natural resources focus also widens into a set of integrated activities such as the improvement of houses, provision of water and electricity, acquisition of improved tools, seeds and livestock, all in the name of watershed management. Empowerment of farmers therefore allows farmers to demand services and to ensure the continued role of the state in supporting watershed development.

Use of traditional institutions and indigenous knowledge:

Experience has shown that to effectively reach the farmers and to create viable watershed management options, it is important to respect indigenous knowledge and combine it with the formal modern science and technology. Local traditional institutions should be part and parcel of the process. For instance, there is a lot of under-used indigenous knowledge about climate, soils, biodiversity and other production conditions that confront farmers. A lot of research findings are abstract to extension providers and farmers alike. Such findings need to be married with indigenous knowledge and disseminated in a language that farmers and members of traditional institutions can understand.

Withdrawal Mechanism:

1. At the end of the project, The Watershed Committee is to take the responsibility for post project management .For which the Memorandum of Agreement is to be formulated between the PIA and Watershed Committee basing on the following terms and conditions.
2. The list of assets created under EPA, NRM, Farm production system and Livelihood support system is to be prepared with joint signature of the Chairman, Secretary of the Watershed committee and PIA. The Watershed Committee will retain one copy of the list for future reference.
3. The amount lying unspent as on closing date will be transferred to the Watershed Development Fund.
4. Watershed Committee will be authorised to use only one Bank account i.e WDF account.
5. Yearly auditing of the accounts by the Chartered Accountant will be mandatory and to be adhered strictly.
6. The office bearer of the Watershed Committee shall involve all the community irrespective of caste, creed and religion.
7. The Gram Sabha shall have the right to decide the user charges to be collected from the beneficiaries which shall be deposited under the watershed development fund.
8. The cost of repair and maintenance of the assets created out of NRM component shall be borne out of Watershed development fund by using maximum 50% of the amount collected in a year.
9. The WDF account will primarily run as revolving fund.
10. No individual beneficiary should be granted any sort of grant or financial assistance in any form.
11. The SHGs and UGs shall have the eligibility to take loan from the WDF with marginal interest as decided by Gram Sabha.
12. The Watershed Committee is also at their liberty to start new profit making ventures by utilising WDF as security deposit and the profit earned should go to the WDF.

13. The remuneration for the Watershed secretary will be finalised in the Gram Sabha.
14. The Watershed Committee may collect financial assistance from any other sources to augment the WDF. All donations, interests, fines and fees shall be deposited in the WDF.
15. The WDF shall be jointly operated by the Chairman and Secretary of the watershed committee.
16. All the expenditure shall be authenticated by the Watershed committee.
17. Annual meering of the Gram Sabha is mandatory. However it may meet at any time if required.
18. The Watershed Committee should meet in every quarter to review the income and expenditure.
19. Any change in the Watershed Committee or its office bearer shall be made once it is resolved in the Gram Sabha. The Gram Sabha should believe in rotational leadership.
20. All the group representatives, at least one from each group shall be ensured in the Watershed Committee.
21. The decision approved and resolved in the Gram Sabha will only be implemented by the Watershed Committee.
22. In case of any embezzlement of fund, the Administrative system shall proceed according to Rules and Laws.
23. In the event of Gram Sabha and watershed Committee become defunct, the assets created under the project and WDF will be transferred to the Panchayat.

Table 18.1- Budget

Sl. No	Activities	Amount (Rs.)
1	Project evaluation and documentation	**543400**
2	Auditing of Natural resources	**1268000**
3	Training for CBOs and FPOs for management of different activities after withdrawal	**905700**
4	FPO strengthening	**905700**
	Total	**3622800**

Chapter 20

PLANS FOR POST PROJECT MANAGEMENT

IDUKKI WDC-1/21-22

20.PLANS FOR POST PROJECT MANAGEMENT /SUSTAINABILITY APPROACH

The Project management of any watershed programme is very important. It mainly depends upon the community organization and the village level institutes. In all villages, watershed committee and various self help & user groups have been formulated for post project operation and maintenance of assets created during project period. Major emphasis will be on equity and sustainable benefit of the project even after implementation stage. A proper link-up will be built during project period with various institutes and capacity building organization. They will act as a major kingpin during post implementation for scaling up the successful experience during project.

Watershed development project can be rendered sustainable through an appropriate combination of environmental balance, community participation and institutionalization of process. So the detail plans for the post project management are described as under:

Adopting Environment friendly conservation measures

The measures taken up will be long lasting. Along with engineering measures, efforts will also be made to establish tree cover in the upper catchment areas and on the slopes. The downstream area will have prolonged stream flows. The stream banks will be vegetated to create a buffer between land and water bodies. Such vegetation helps in stabilizing streams, enhancing recharge and improving the riparian habitat.

Appropriate species of trees and grasses will be selected for developing a vegetative cover at the time of implementation of WDC-PMKSY 2.0-1 project of Vamanapuram. The diversity of vegetative measures is the key to sustainability. Combination of shallow and deep-rooted plants, fast and slow growing plants, productive and medical plants and herbs will be encouraged. The vegetation created will ultimately help to recharge the rainwater, use the soil moisture optimally and provide direct and indirect benefits to the community and environment as a whole.

Land use pattern will go hand in hand with carrying capacity of the watershed. Optimum use of water and increased use of organic fertilizers is the key to conserve the precious land source. Water overuse and excessive fertilization leads to permanent damage of lands and groundwater. It is important to maintain soil quality through crop management. Crop diversity and crop rotation helps in improving the micro flora and fauna present in the soil and maintaining the healthy symbiotic subsystems relationship.

Participation of local community in development and management

During the planning phase, the local people's participation were involved and it is planned that the involvement during implementation and post project maintenance will enhance the impact of project and maintain the structures. However, participation without empowerment does not help in achieving sustainable development. So people will be made aware of different concepts and options for their livelihood and natural resource management. Local wisdom is important in understanding rural dynamics that includes the interface between human behavior and its economic / ecological implications. The interests of a community will be created and maintained by adopting the measures in such a manner that they provide immediate, medium term and long term benefits to the community.

Institutionalization for post project management

A dynamic institutional arrangement is necessary for project management, facilitation of benefit sharing and maintenance of the resources. This usually includes small user groups for different resources / assets as well as village level organizations. In-built system and mechanisms will be developed for qualitative growth and dynamisms of the organizations. The community organizations will be linked to other Government and Non Government institutes of interest. The potential people's organizations formed in the project area include Watershed Committees, Neighbour Hood Groups and Users Groups.

Watershed Committee

Watershed level organization is established right from the beginning of the project. The overall planning, coordination, management and maintenance are possible through this representative body. This clearly implies representation from different sections of the community – landholders and landless, upper reach and lower reach, men and women, lower and upper castes, Gram Panchayat and other existing political or non political organizations.

Neighbour Hood Groups

Neighbour Hood Groups are established in every micro watershed combining 40 to 50 households living as clusters. The overall planning, coordination, management and maintenance of the activities pertaining to the area are done through this Group with people's participation. These families are further subdivided into clusters of 7-8 houses and a person is selected to represent this cluster in the Neighbour Hood Committee ensuring proper representation on different sections.

User Groups

The other categories of institutions are formed of various groups with common areas of interest in the project area named user groups. These include, depending upon necessity, Self Help Groups of women and men, User Groups for common assets, Natural Clubs, etc. The capacities of different groups will be developed time to time for effective functioning of these groups. A mechanism will be developed to ensure continuity, both in learning, functioning and actions that from responsibilities of such groups during the implementation project activities.

WATERSHED DEVELOPMENT FUND (WDF)

Creation of Fund

Watershed Development Fund (WDF) shall be created at each watershed level in all the Watershed Development Project for ensuring post-project maintenance of so created community assets. One of the mandatory conditions as per the Guidelines for selection of villages for watershed projects is people‟s contribution towards the Fund.

The Guidelines envisage that a part of contribution of natural resource management (NRM) works shall be contributed by the owners of land, when executed on their land. This norm has been fixed at 10% for general category farmers, and 5% in case of SC/ST farmers. This can serve as the seed money for the Fund (Para 26.1 of the Guidelines).

Sources of Fund

The following sources may contribute towards this WDF:

a) Contributions made by the farmers against NRM works taken up on private lands @ 10 % and 5 % in case of general category and SC/ST category farmers respectively

b) Contributions made by the farmers when receiving benefits from individually livelihood activities (horticulture, animal husbandry, agro-forestry, aquaculture, water bodies and the like) on their privately owned lands
The contributions shall be @ 20 % and 10 % of the estimated cost of the farming system activity
c) Collections made by the Watershed Committee on account of user changes, sale proceeds and recurring incomes earned from the assets created in the project area (this includes existing ones too) over common properties (land, water, pastures etc).
d) Contributions received from philanthropic individuals and institutions.

Composition of WDF and Joint Bank Account

Composition of the Committee: The WDF will be handled by a Sub-committee approved by the Gram Sabha, comprising of members of the project area. All members of the Watershed Committee including its selected Chairperson and excluding the selected Secretary shall become ex-officio members of this Fund. The Chairperson of the Gram Panchayat, and not the Chairperson of the WC shall serve as the Chairman of the Fund.

Joint bank account: An exclusive joint back account shall be opened in any of the scheduled commercial bank (public or private), or public sector cooperative bank or Regional Rural Bank (RRB) in the name of the Chairperson of the Gram Panchayat, and the PIA representative on the Fund Committee. In case of the PIA being a Non- Government Organization, the DLNA (District Level Nodal Agency) shall nominate one of the Block level Government officers to hold and operate the joint account. This too shall be placed before the Gram Sabha for its approval. Fund shall be used optimally and in a transparent manner. It may be invested in medium/long term deposits after assessing current and future the requirements.

Registration of WDF:

The Committee constituted by the Gram Sabha in accordance may either be registered as an Independent society under the provisions of the Societies Registration Act,1860 or be considered as a Sub-committee of the already registered WS, by incorporating a specific provision to this effect. In the alternative, the Gram Sabha may consider recommending to the Gram Panchayat recognise this as one of its Sub-committee.

Utilisation of the Fund

The money from the Fund can be utilized for post-project activities, when the project implementation team has withdrawn at the end of completion of the developmental activities. The utilization shall be as follows:

a) A sum amounting to 50 % of the Fund shall be reserved for maintenance of assets created on community properties (land, water, pastures, etc.) or/and common uses under the project
b) The remaining 50 % may be used as Revolving Fund for advancing loans to the

Operational Guidelines for WDF

Assets that need maintenance: Various types of engineering structures & biological interventions like water harvesting structures such as check dams, nala bunds, diversion drains, percolation tanks, vented dams, farms ponds, artificial recharge structures, equipment for natural resource governance, specific interventions for spring rejuvenation etc., created in the watershed are prone to damages by stray cattle, rain, sunshine, wind and unexpected natural calamities. Over the period there can also be natural damage or there may be need for its renovation for better results.

There may be need strengthen or rejuvenate biological activities like block plantations pastures etc. In such cases, if the assets exist on common properties, resources from WDF may be accessed and works taken up. Expenditure can be incurred also on assets built on private land but serve the community, and

an agreement to this effect has been created between the WC and the land owner, and this has been shared with the GP.

Monitoring of the Fund:

The amount available in the WDF account can be spent for post-project maintenance activities in the manner as shown in the Table below:-

S.No.	Year	Principal amount	Interest accrued
1.	1st year	10%	**30%**
2.	2nd year	15%	**25%**
3.	3rd year	20%	**20%**
4.	4th year	25%	**15%**
5.	**5th year**	**30%**	**Remaining interest**

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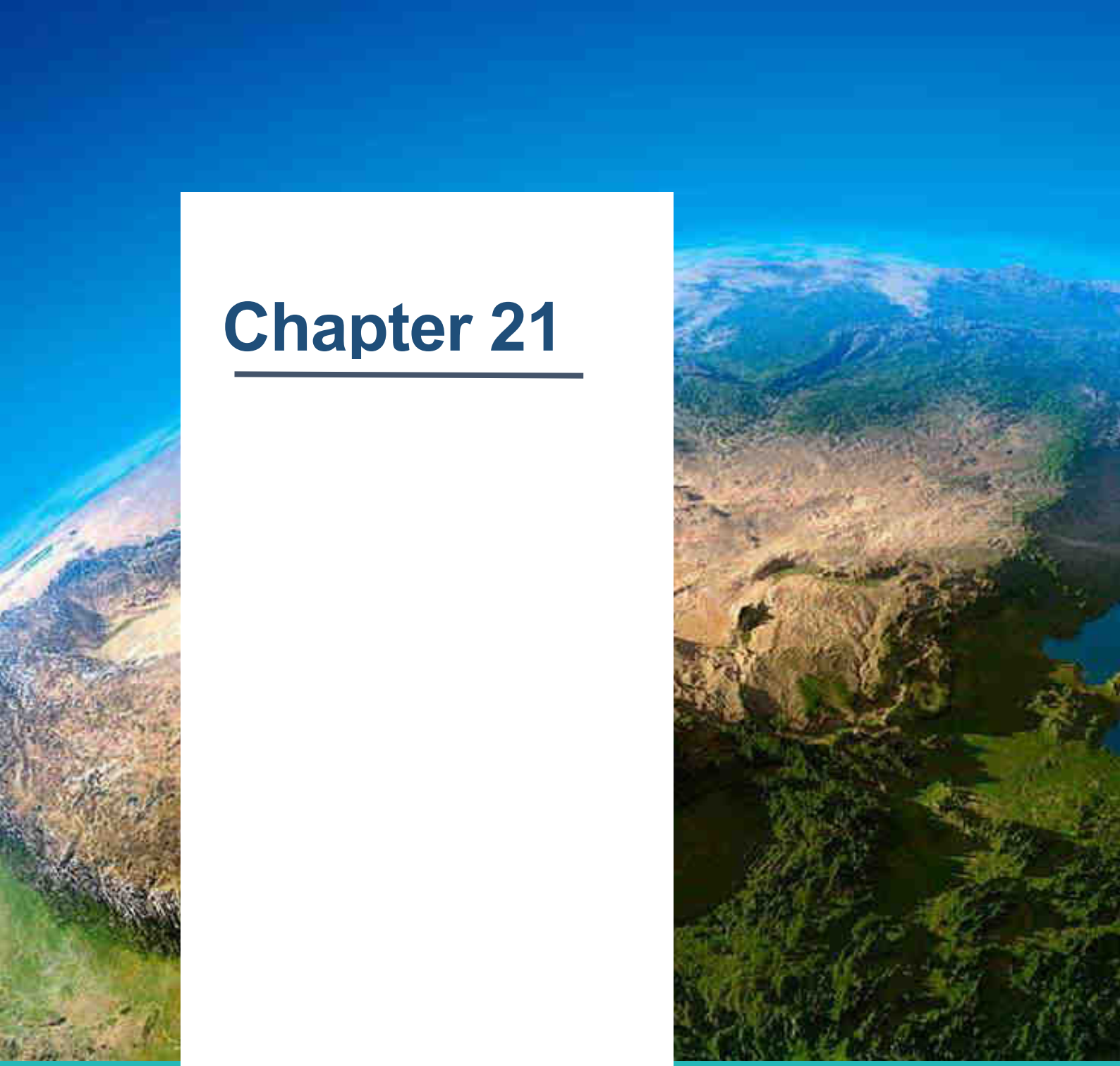

Chapter 21

ABOUT THE TECHNICAL SUPPORT ORGANISATION

IDUKKI WDC-1/21-22

21. ABOUT THE TECHNICAL SUPPORT ORGANISATION

KERALA STATE LAND USE BOARD

Kerala State Land Use Board was established in 1975 under Department of Planning and Economic Affairs, Government of Kerala and is functioning as a full-fledged department. The Department is functioning as an agency to assist the State Government to frame policies for optimum land use and natural resource management in the State, with the basic objective of providing necessary advisory support on matters related to the optimum use of land and land resources viz; soil, water, plant, animal system. The Department also uses the technology of remote sensing and GIS to cater its requirement.

- The major **objectives** of Land Use Board are review of existing land uses in the State and exploring possibilities of effective land use in a sustainable manner. The objectives includes, taking effective measures to protect good agricultural lands against (i) depletion on account of soil erosion due to wind, water, sea. (ii) water logging and salinity (iii) loss of fertility (iv) urbanization and industrialization. The department advises the government regarding land use policy in general with particular references to the problems relating to conservation, development and management of lands.
- The main **functions** of the department are (i) to collect and collate data on land resources and land use (ii) to undertake surveys on current land resources and land use (iii) to initiate studies on appropriate land use and related aspects (iv) recommend appropriate policy framework to help the Government to arrive at correct decisions on land and (v) to administer and co-ordinate the implementation of the decisions of the Govt. related to land use without displacing the existing agencies.
- State Land Use Board has a niche of natural **database** on land resources and many organizations are making use of these facilities available in the department. The department organizes awareness among students, youths, farmers, planners and men of all walks of life on need for conservation, development and management of our most precious land resources. The available database includes (i)land use, geomorphology, structural geological map, proposed land use and soil conservation map of Idukki district, (ii) land use, geomorphology, transport network, drainage network, settlements, watersheds of Kerala in 1:50,000 and 1:12,500 scale, (iii) wasteland map of Kerala in 1:50,000 scale, (iv) soil series, depth, erosion, drainage, AWC, texture, land capability and irrigability in 1:250,000 scale, (v) PRM maps (hardcopy & softcopy) in cadastral scale, (vi) agro ecological zonation map of ten districts in1:50,000 scale and (vii) wetland (Paddy land) map of Kerala in 1:12,500 scale.
- The important **services** provided by the department includes (i) preparation of land and water related thematic resource maps, (ii) delineation of watersheds, (iii) agro-ecological zonation, (vi) recommendation of suitable land use, (v) preparation of watershed based master plans for LSGIs, (vi) studies on land resources, (vii) awareness on land resource conservation and management (viii) consultancy service on land use planning & GIS for various line departments, LSGIs, etc.

Organisational Set Up & Infrastructure

The department has its State office (Headquarters) at Vikas Bhavan Complex, Thiruvananthapuram. There is a Regional Office for the department functioning at the Municipal Shopping Complex, 2nd Floor, D- Block, Patturaickal, Thrissur – 680 022. The department is presently working with the

following sections for carrying out the administrative and technical responsibilities entrusted with it. Land Use Commissioner is the Head of the Department.

Technical Wing

Technical Officers in the cadre of Joint Directors, Deputy Directors, Assistant Directors and Agricultural Officers from disciplines of Agriculture, Soil Conservation, Soil Survey & Statistics is entrusted with the planning and implementation of the technical programme as per the mandate of the department and also for the implementation of the different plan schemes as envisaged in the plan document of Government. The Regional Office at Thrissur is set up for the implementation of the Plan Scheme "Resource Survey at Panchayat Level" *ie*. Panchayat Resource Mapping Programme (PRM). The Regional Office is headed by an Assistant Director with supporting technical & administrative staff, created as temporary plan posts and project mode staff for carrying out the PRM programme.

Cartography, RS &GIS

Toposheets, cadastral maps, aerial photographs, satellite data, land resources data at macro and micro level generated through the projects are maintained by this wing. The Cartographic wing of the department is headed by a Cartographer with Draftsman, Planning Surveyors, Laboratory Assistants and Cartographic Assistant as supportive staff.

Administrative Section

Headed by the Senior Superintendent with supporting ministerial staff in various cadre.

Geoinformatics laboratory

It is equipped with computers and softwares capable of analyzing remote sensing data and resource maps for land resource management and planning. The Geoinformatics lab provides a new environment in natural resources planning by meeting the challenges of implementing the new IT paradigm in all aspects of land resource planning. The lab's hardware's include high end workstations, server, scanner and other packages for digital data analysis and for interpretation of digital imageries. The customisation packages are developed for preparing user friendly information systems for different users. The service of this lab is provided to all line departments and LSGIs. The Lab also imparts on-going program of training staff on GIS technology required to the operation of the lab.

Major Projects

- One of the major plan schemes implemented by the Department is generation of resource maps at cadastral level through the Panchayat Resource Mapping Programme (PRM). Comprehensive data base on land and water resources required for local level planning has been generated. The State Planning Board (SPB) has recommended for digital updation of the data base already created through PRM and for creating awareness and training in utilizing these data base at LSGI level for meaningful planning, as a follow up action. The SPB has also recommended that the State Land Use Board should initiate action programmes for formation of data base.
- One of the major consultancy projects implemented by the Department is the preparation of watershed based action plans for the Local Self Governments. Many line departments are demanding for the digital output of the already created the data base under this project. There is also great demand from LSGIs for creating awareness and training in utilizing these data base at LSGI level for meaningful planning, as a follow up action.

- Presently the department is functioning as the Technical Support Organization for preparing the Detailed Project Report for Block Panchayats under the Integrated Watershed Management Programme. The State Level Nodal Agency of WDC-PMKSY 2.0 has entrusted the department with the preparation of Preliminary Project Reports for Thiruvananthapuram and Kollam districts. Airport Authority of India, Town Planning Department, Local Self Governments and several other agencies has awarded consultative GIS projects.