



DISTRICT IRRIGATION PLAN

Kodagu, Karnataka



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CHAPTER 1: INTRODUCTION

1.1 Background

Preparation of decentralized area specific district planning process visualized in various plans took concrete shape through the years and initiatives like specific guidelines on methodologies and processes for preparation of district plans; framework for preparation of perspective plan, medium term and annual plans by then planning commission in 1969 and the 73rd and 74th constitutional amendments conferring constitutional status to Panchayats at district and sub district level; local self-government in urban areas; constitution of district planning committee to consolidate the plans prepared at Panchayats and municipalities and prepare a draft development plan for the whole district.

The decentralized planning process was further strengthened through emphasis by planning commission on preparation of district level plans and making it an integral part of the process of preparation of the states 11th five year plan. The Planning commission issued guidelines in August 2006 for preparation of the district plans. The guidelines define the District Planning as ‘the process of preparing an integrated plan for the local government sector in a district taking into account the resources (natural, human and financial) available and covering the sectoral activities and schemes assigned to the district level and below and those implemented through local governments in a state. The document that embodies this statement of resources and their allocation for various purposes is known as the District Plan”.

Government of India through a resolution in National Development Council on 29th May 2007 conceived a special Additional Central Assistance Scheme (ACAS) to address the slow growth of agriculture and allied sectors by incentivizing states to draw up plans for their agriculture sectors more comprehensively. The NDC resolution states "GoI introduced a new Additional Central Assistance Scheme to incentivize states to draw up plans for their agriculture sector more comprehensively, taking agro-climatic conditions, natural resource issues and technology into account, and integrating livestock, poultry and fisheries, etc. This involved a new scheme for Additional Central Assistance (ACA) to State Plans, administered by the Union Ministry of Agriculture over and above its existing Centrally Sponsored Schemes, to supplement the State-specific strategies including special schemes for beneficiaries

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of land reforms. The newly created National Rainfed Area Authority on request, was to assist States in planning for rainfed areas".

The NDC in its resolution advised the states to prepare a comprehensive district agriculture plans (C-DAP) that will fully utilize available resources and include allied agriculture sectors. Further, GOI issued a manual on preparation of comprehensive district agriculture plans to help the states prepare C-DAP. As per these guidelines, the objective of district planning is 'to design an integrated and participatory action plan for the development of local area in general and agriculture and allied sectors in particular'. The objectives of Comprehensive District Agriculture Plan (C-DAP) were:

- To prepare a Comprehensive District Agriculture Plan (C-DAP) through participatory process involving various organisations and stakeholders.
- To enable optimum utilisation of scarce natural, physical & financial resources.
- To assess and plan for the infrastructure required to support the agriculture development.
- To establish linkages with the required institutional support services, like credit, technology transfer, ICT, research etc.
- To evolve an action plan for achieving sustainable agricultural growth with food security and cropping system that will improve farmers' income.

The guidelines required the state/district authorities to (i) ensure that the agricultural plans are prepared for the district and then integrated into the agricultural plans of the State based on the agro-climatic conditions, availability of technology, trained manpower and natural resources; (ii) local needs / crops / feed and fodder / animal husbandry / dairying / fisheries / priorities are reflected in the plan; (iii) productivity gaps for important crops and livestock and fisheries are reduced; and (iv) the returns to the farmers from these are maximized.

The latest move in the process of strengthening of decentralized planning process was the Government of India guidelines issued in 2015 in the form of a template for the preparation of District Irrigation Plan (DIP) and State Irrigation Plan (SIP) as part of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) program and made the preparation of DIP and SIP mandatory for the states to receive funds from the

program. The present report is a product of these long drawn efforts of Government of India to strengthen the decentralized planning process in the country focusing on the vital resource i.e., water.

Water is of vital importance for human & animal life, maintenance of ecological balance and promotion of developmental activities. Considering its vital importance and ever increasing demand for water, in the face of population growth, urbanization & industrialization and considerations of climatic change, making water, an increasingly a scarce resource, available to multiple uses, planning and management of this vital resources, utilization of water economically, optimally and equitably assumes greater importance.

According to the 12th Five year Plan the water budget estimates of India by Ministry of Water Resources suggests an availability of 1123 billion cubic meters (BCM) against a current estimated demand of 710 BCM. The Standing Committee of the Ministry of Water Resources estimates that this water demand will rise to 1093 BCM by 2025. Though the existing water availability in the immediate future seems to be adequate, with the near constant supply of water resources in the face of increasing demand on account of population growth, urbanisation and industrialization will strain the water supply-demand balance.

The per capita water availability which stood at 5,177 cubic meters in 1951 was reduced to 1820 cubic meters in 2001 while the international prescribed limit is 1800 cubic meters. The projected per capita availability of water is 1341 cubic meters in 2025 and 1140 cubic meters in 2050 suggesting shortage of water in the medium term¹. Further, the all India water balance estimates does not reflect the variations in water balance across time and space- certain areas having a positive water balance and the others facing acute shortage. The problem is further accentuated by water quality related issues.

With the abundant surface and ground water supply in the first five decades since independence, more than 80 percent of the total available water resources were allocated for irrigation purposes and the rest meeting the domestic and industrial

¹Ministry of Water Resources (2011), Strategic Plan for Ministry of Water Resources, Government of India, New Delhi.

demands. In a recent study² on the demand for water from agriculture, domestic and industrial uses in 2000, 2025 and 2050 seems to suggest that domestic demand (34 BCM in 2000, 66 BCM in 2025 and 101 BCM in 2050) and industrial demand (42 BCM in 2000, 92 BCM in 2025 and 161 BCM in 2050) for water will utilize the total balance water available while agriculture demand for water will be (605 BCM in 2000, 675 BCM in 2025 and 637 BCM in 2050). This change is partly because of the changing sectoral contributions of India's GDP and also partly because of dynamics of irrigation development in the country where the initial expansion in area under irrigation is propelled by the availability of abundant water resources and availability of good quality land. This is no longer the case in many of the states where the availability of land and water are serious constraints for further expansion of irrigation. Further, as per the erstwhile planning commission up to March 2012 out of 141 million hectares of net sown area in the country 114 (or 81%) million hectares is Irrigation Potential Created (IPC) and 88 (or 62%) million hectares is Irrigation Potential Utilised (IPU) leaving almost 20% of irrigated potential unutilized. This leaves 40 percent of the net sown area in the country dependent on rainfall which makes farming a high risk and less productive.

The competing demands for water resources and the emerging issues and concerns were to be addressed through certain basic principles and commonality in approaches in dealing with planning, development and management of water resources³ under an Integrated Water Resource Management framework. The main objectives of water resource management as delineated in National Water Policy 2012 are:

- a) Planning, development and management of water resources need to be governed by common integrated perspective considering local, regional, State and national context, having an environmentally sound basis, keeping in view the human, social and economic needs.
- b) Principle of equity and social justice must inform use and allocation of water.
- c) Good governance through transparent informed decision making is crucial to the objectives of equity, social justice and sustainability. Meaningful intensive

²Amarasinghe, U.A., Shah T., Turrall, H. and Anand, B.K. 2007. *India's water future to 2025-2050: Business-as-usual scenario and deviations*. Research Report 123, International Water Management Institute, Colombo.

³Ministry of Water Resources, National Water Policy, 2012, Government of India, New Delhi.

participation, transparency and accountability should guide decision making and regulation of water resources.

- d) Water needs to be managed as a common pool community resource held, by the state, under public trust doctrine to achieve food security, support livelihood, and ensure equitable and sustainable development for all.
- e) Water is essential for sustenance of eco-system, and therefore, minimum ecological needs should be given due consideration.
- f) Safe Water for drinking and sanitation should be considered as pre-emptive needs, followed by high priority allocation for other basic domestic needs (including needs of animals), achieving food security, supporting sustenance agriculture and minimum eco-system needs. Available water, after meeting the above needs, should be allocated in a manner to promote its conservation and efficient use.
- g) All the elements of the water cycle, i.e., evapo-transpiration, precipitation, runoff, river, lakes, soil moisture, and ground water, sea, etc., are interdependent and the basic hydrological unit is the river basin, which should be considered as the basic hydrological unit for planning.
- h) Given the limits on enhancing the availability of utilizable water resources and increased variability in supplies due to climate change, meeting the future needs will depend more on demand management, and hence, this needs to be given priority, especially through (a) evolving an agricultural system which economizes on water use and maximizes value from water, and (b) bringing in maximum efficiency in use of water and avoiding wastages.
- i) Water quality and quantity are interlinked and need to be managed in an integrated manner, consistent with broader environmental management approaches inter-alia including the use of economic incentives and penalties to reduce pollution and wastage.
- j) The impact of climate change on water resources availability must be factored into water management related decisions. Water using activities need to be regulated keeping in mind the local geo climatic and hydrological situation.

Government of India launched Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) to address the constraints in providing assured irrigation as well as increasing efficiency and productivity of current water use to bring more prosperity to the rural areas.

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Priorities of Government of India were reflected in the Hon'ble President's address to the joint Session of the Parliament of 16th Lok Sabha where he indicated that ***“Each drop of water is precious. Government is committed to giving high priority to water security. It will complete the long pending irrigation projects on priority and launch the ‘Pradhan Mantri Krishi Sinchayee Yojana’ with the motto of ‘Har Khet Ko Pani’. There is a need for seriously considering all options including linking of rivers, where feasible; for ensuring optimal use of our water resources to prevent the recurrence of floods and drought. By harnessing rain water through ‘Jal Sanchay’ and ‘Jal Sinchan’, we will nurture water conservation and ground water recharge. Micro irrigation will be popularised to ensure ‘Per drop-More crop’.*”**

PMKSY has been approved with an indicative outlay of Rs.50,000 crore over a period of five years from 2015-16 to 2019-20. The programme is an amalgamation of on-going schemes of Ministry of Water Resources, River Development and Ganga Rejuvenation, Ministry of Agriculture & Cooperation and Ministry of Rural Development. The existing schemes AIBP, CADWM, MI, SWMA, Watershed & Convergence with MGNREGA were brought together under the umbrella program of PMKSY. Further the scheme seeks convergence with scheme like Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNRES), Rashtriya Krishi Vikas Yojana (RKVY), Jawaharlal Nehru National Solar Mission and Rural Electrification programmes (JLNNSM&REP), Rural Infrastructure Development Fund (RIDF), Members of Parliament Local Area Development Scheme (MPLAD), Members of Legislative Assembly Local Area Development Fund (MLALAD), Local Body Funds (LBF), Working Plan of State Forest Department (WPSFD) etc. The PMKSY will be implemented in an area development mode only by adopting a decentralized state level planning and projectised execution structure that will allow the state to draw up their own irrigation development plans based on DIPs and SIPs with a horizon of 5-7 years. The program will be implemented as part of Rashtriya Krishi Vikas Yojana (RKVY) with state agriculture department acting as the State Nodal Agency. However, the implementing departments for the four components like AIBP, PMKSY (Har Khet Ko Pani), PMKSY (Per drop more crop) and PMKSY (watershed development) will be decided by the respective program ministry/department.

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The funds under this program would be provided to the states as per the pattern of assistance of Centrally Sponsored Schemes (CSS) decided by the Ministry of Finance and NITI Aayog. During 2015-16 the existing pattern of assistance of ongoing scheme was continued. An outlay of Rs. 50,000 crore has been approved for 2015-20. The financial assistance provided to the state governments from this centrally sponsored scheme is subject to fulfillment of certain conditions. Firstly, a state will become eligible to access PMKSY fund only if it has prepared the District Irrigation Plans (DIP) and State Irrigation Plan (SIP), excepting for the initial year, and the expenditure in water resource development for agriculture sector in the year under consideration is not less than the baseline expenditure, which is defined as the average of the expenditure in irrigation sector irrespective of the department in the state plan in three years prior to the year under consideration. Secondly, States will be given additional weightage for levying charges on water and electricity for irrigation purposes, so as to ensure sustainability of the programme. Thirdly, interstate allocation of PMKSY fund will be decided based on

- Share of percentage of unirrigated area in the state vis-à-vis national average including prominence of areas classified under Desert Development Programme (DDP) and Drought Prone Area Development Programme (DPAP)
- Increase in percentage share of expenditure on water resource development for agriculture sector in State Plan expenditure in the previous year over three years prior to it and
- Improvement in irrigation efficiency in the state.

1.2 Vision

The overarching vision of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) will be to ensure access to some means of protective irrigation to all agricultural farms in the country, to produce 'per drop more crop', thus bringing much desired rural prosperity.

1.3 Objective

The objectives of the PMKSY are to:

- a) Achieve convergence of investments in irrigation at the field level (preparation of district level and, if required, sub district level water use plans).
- b) Enhance the physical access of water on the farm and expand cultivable area under assured irrigation (Har Khet Ko Pani),
- c) Integration of water source, distribution and its efficient use, to make best use of water through appropriate technologies and practices.
- d) Improve on-farm water use efficiency to reduce wastage and increase availability both in duration and extent,
- e) Enhance the adoption of precision-irrigation and other water saving technologies (More crop per drop).
- f) Enhance recharge of aquifers and introduce sustainable water conservation practices
- g) Ensure the integrated development of rainfed areas using the watershed approach towards soil and water conservation, regeneration of ground water, arresting runoff, providing livelihood options and other NRM activities.
- h) Promote extension activities relating to water harvesting, water management and crop alignment for farmers and grass root level field functionaries.
- i) Explore the feasibility of reusing treated municipal waste water for peri-urban agriculture, and
- j) Attract greater private investments in irrigation.

1.4 Strategy/approach

To achieve these objectives PMKSY adopted strategies that include

- a) Creation of new water sources; repair, restoration and renovation of defunct water sources; construction of water harvesting structures, secondary & micro storage, groundwater development, enhancing potentials of traditional water bodies at village level like Jal Mandir (Gujarat); Khatri, Kuhl (H.P.); Zabo (Nagaland); Eri, Ooranis (T.N.); Dongs (Assam); Katas, Bandhas (Odisha and M.P.) etc.
- b) Developing/augmenting distribution network where irrigation sources (both assured and protective) are available or created;
- c) Promotion of scientific moisture conservation and run off control measures to improve ground water recharge so as to create opportunities for farmers to access recharged water through shallow tube/dug wells;

- d) Promoting efficient water conveyance and field application devices within the farm viz., underground piping system, Drip & Sprinklers, pivots, rain-guns and other application devices etc.;
- e) Encouraging community irrigation through registered user groups/farmer producers' organisations/ NGOs; and
- f) Farmer oriented activities like capacity building, training and exposure visits, demonstrations, farm schools, skill development in efficient water and crop management practices (crop alignment) including large scale awareness on more crop per drop of water through mass media campaign, exhibitions, field days, and extension activities through short animation films etc.

1.5 Programme Components

PMKSY has following four components:

1. Accelerated Irrigation Benefit Programme (AIBP)

To focus on faster completion of ongoing Major and Medium Irrigation including National Projects.

2. PMKSY (Har Khet ko Pani)

This component focuses on-

- a) Creation of new water sources through Minor Irrigation (both surface and ground water)
- b) Repair, restoration and renovation of water bodies; strengthening carrying capacity of traditional water sources, construction rain water harvesting structures (Jal Sanchay);
- c) Command area development, strengthening and creation of distribution network from source to the farm;
- d) Ground water development in the areas where it is abundant, so that sink is created to store runoff/ flood water during peak rainy season.
- e) Improvement in water management and distribution system for water bodies to take advantage of the available source which is not tapped to its fullest capacity (deriving benefits from low hanging fruits). At least 10% of the command area to be covered under micro/precision irrigation.

- f) Diversion of water from source of different location where it is plenty to nearby water scarce areas, lift irrigation from water bodies/rivers at lower elevation to supplement requirements beyond IWMP and MGNREGS irrespective of irrigation command.
- g) Creating and rejuvenating traditional water storage systems like Khatri, Kuhl etc. at feasible locations.

3. PMKSY (Per Drop More Crop)

- a) Programme management, preparation of State/District Irrigation Plan, approval of annual action plan, Monitoring etc.
- b) Promoting efficient water conveyance and precision water application devices like drips, sprinklers, pivots, rain-guns in the farm (Jal Sinchan);
- c) Topping up of input cost particularly under civil construction beyond permissible limit (40%), under MGNREGS for activities like lining inlet, outlet, silt traps, distribution system etc.
- d) Construction of micro irrigation structures to supplement source creation activities including tube wells and dug wells (in areas where ground water is available and not under semi critical/ critical/ over exploited category of development) which are not supported under AIBP, PMKSY (Har Khet Ko Pani), PMKSY (Watershed) and MGNREGS as per block/district irrigation plan.
- e) Secondary storage structures at tail end of canal system to store water when available in abundance (rainy season) or from perennial sources like streams for use during dry periods through effective on-farm water management;
- f) Water lifting devices like diesel/ electric/ solar pumpsets including water carriage pipes, underground piping system.
- g) Extension activities for promotion of scientific moisture conservation and agronomic measures including cropping alignment to maximise use of available water including rainfall and minimise irrigation requirement (Jal Sarankchan);
- h) Capacity building, training and awareness campaign including low cost publications, use of pico projectors and low cost films for encouraging potential use water source through technological, agronomic and management practices including community irrigation.

- i) The extension workers will be empowered to disseminate relevant technologies under PMKSY only after requisite training is provided to them especially in the area of promotion of scientific moisture conservation and agronomic measures, improved/ innovative distribution system like pipe and box outlet system, etc. Appropriate Domain Experts will act as Master Trainers.
- j) Information Communication Technology (ICT) interventions through NeGP-A to be made use in the field of water use efficiency, precision irrigation technologies, on farm water management, crop alignment etc. and also to do intensive monitoring of the Scheme.

4. PMKSY (Watershed Development)

- a) Effective management of runoff water and improved soil & moisture conservation activities such as ridge area treatment, drainage line treatment, rain water harvesting, in-situ moisture conservation and other allied activities on watershed basis.
- b) Converging with MGNREGS for creation of water source to full potential in identified backward rainfed blocks including renovation of traditional water bodies

1.6 Rationale/ Justification

In reference to the status and need of irrigation, the water resource management including irrigation related priorities was identified for Kodagu district by the peoples' representatives of district with support from administration and technical experts. For instance the reports of Strategic Research and Extension Plan (SREP) prepared under ATMA program, Comprehensive District Agriculture Plan (C-DAP) prepared as part of Rashtriya Krishi Vikas Yojana (RKVY), Potential Linked Credit Plans (PLP) of NABARD and the Integrated District Development Plan etc. identified number of irrigation related issues for Kodagu district including (i) promoting water use efficiency through sprinkler and drip irrigation; (ii) promoting protected polyhouse cultivation to minimize risk factors and enhance quality and productivity; (iii) Improvement of on-farm water delivery and efficiency of existing irrigation systems; (iv) promotion of soil conservation of arable & non-arable land through

engineering measures; (vi) creation of new water harvesting structures, check dams, ponds, tanks, etc., and (vii) land improvement measures.

1.7 Methodology

During the course of preparation of District Irrigation Plan (DIP) the team visited Kodagu district to collect data and have interaction with all the stakeholders. Methodology adopted to prepare DIP is outlined in brief as under:

- a) Collection of primary and secondary data from field from various sources including published documents and websites.
- b) Various meetings were held to obtain ground level realities and data from key personnel/stakeholders through structured, unstructured interviews, focused group discussions etc.
- c) Meetings with various State Government departments and related institutions were held
- d) Meetings were also held with State Level authorities.
- e) GIS maps of the area's/clusters were studied to understand the land morphology, topography of the district.
- f) Focused group discussions and interaction with of agriculture officers, horticulture officers, soil conservation officers, extension officers, rural development department, animal husbandry department, irrigation officers both at blocks and district level for identifying the key issues and focus areas of the region.
- g) Discussion with NABARD officer of Kodagu district was also held during the visit.

On the basis of detailed discussion and analysis of data, the team arrived at the projections of various components of PMKSY and Department wise plan for four years from 2016-17 to 2019-20 as detailed in the plan.

CHAPTER 2: GENERAL INFORMATION OF THE DISTRICT

2.1 District Profile

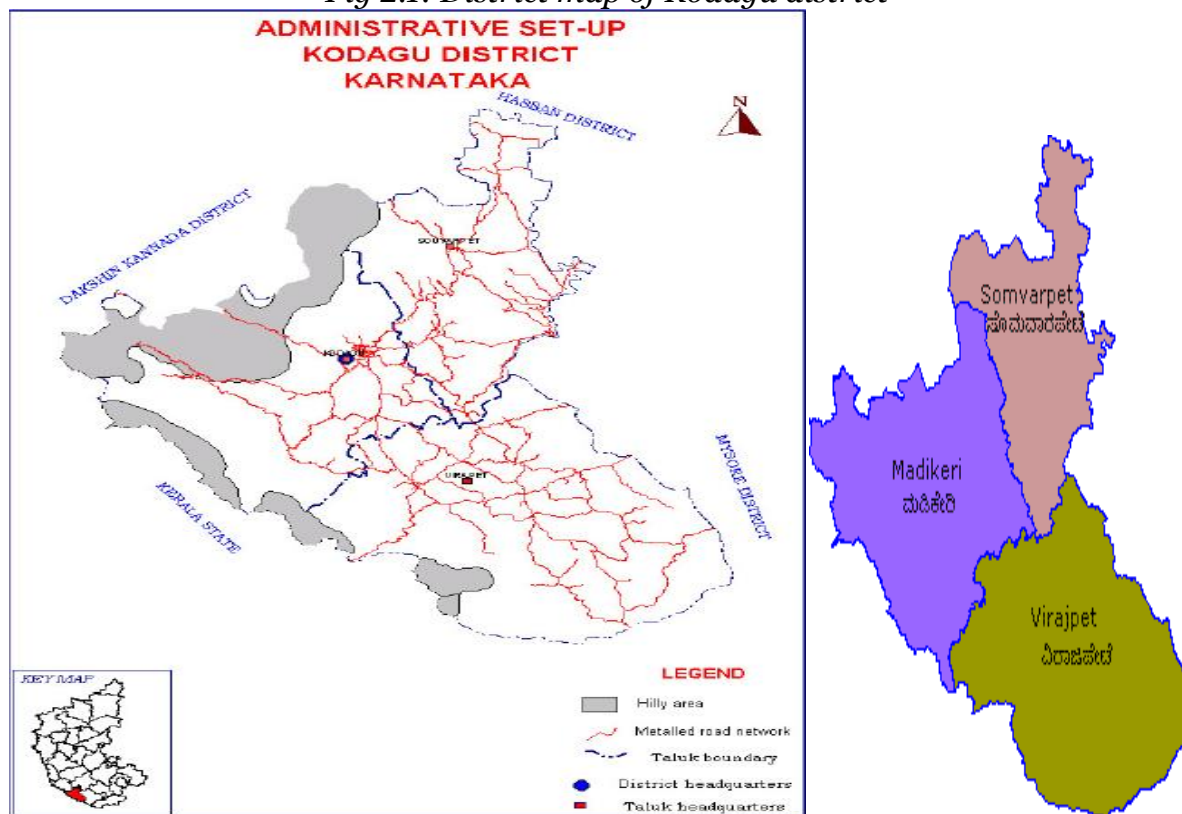
Kodagu district located in the south-western part of Karnataka state falls in the high precipitation zone with picturesque topography occupying the eastern and western slopes of the Western Ghats. Closed with primeval forest or glassy glades and broken by a few cultivated villages, it has mountainous configuration, which presents a grand panorama, verdant valleys, ravines, fast flowing streams, lofty peaks and awe-inspiring spurs. The terrain and climatic conditions here are somewhat unique and nature has bestowed the district with an abundance of forest wealth. Kodagu district falls under Malnad (hilly) region comprising steep ranges with valleys and hills running almost parallel to the coastal belt. It enjoys typical tropical climate. In the economy of the State and the country Kodagu enjoys a distinct place in view of its international reputation as a prominent coffee-producing centre. Cardamom, pepper and oranges of Kodagu are also quite famous. So also, the honey produced in Kodagu has a reputation for its taste and nutritive value. In conformity with the general pattern prevalent in the hilly regions, in Kodagu also the population density is low and small clusters of houses amidst rich vegetation, that is, scattered houses and homesteads, characterize the settlement pattern.

Table 2.1: District Profile

Name of the District	District code	Latitude	Longitude
Kodagu	576	11.4058° to 12.3375° N	76° 24"14" to 77°.46'55"

Kodagu is the second smallest district of Karnataka. The district comprises of three taluks namely Madikeri, Somvarpet and Virajpet having geographical areas 1449, 999 and 1654 sq. km respectively. The taluks are named after taluk head quarters. Madikeri is the district headquarters of Kodagu district. It is about 262 kms away from Bangalore. There are three Taluk Panchayats and 98 Grama Panchayats. District map is given in Fig 2.1.

Fig 2.1: District map of Kodagu district



2.2 Demography

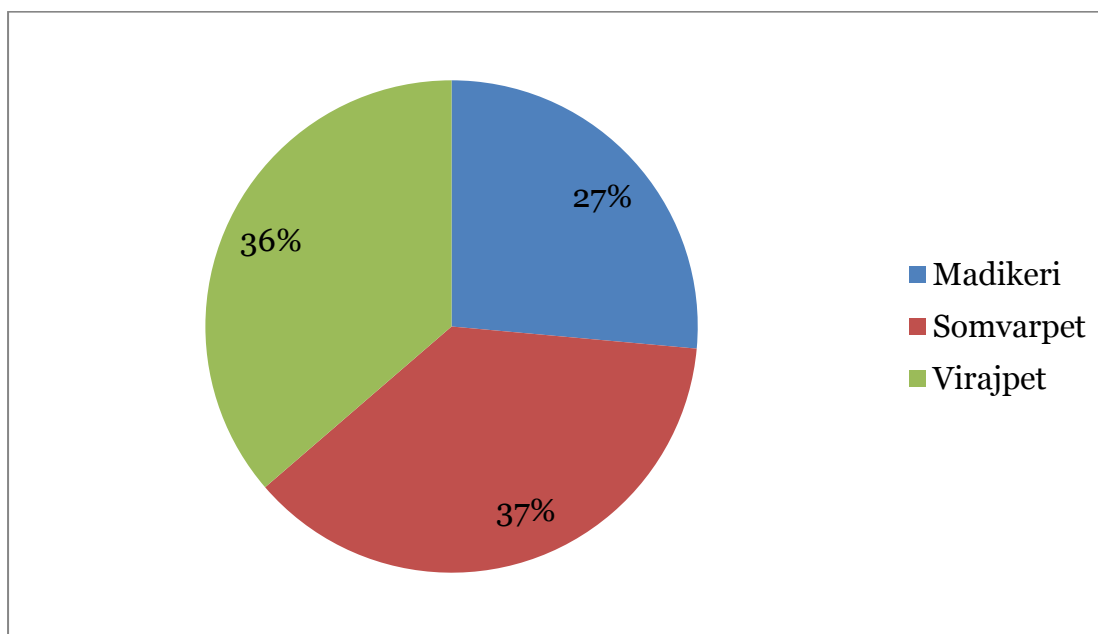
The total population of the Kodagu district as per 2011 census is 5,54,519 which include 2,74,608 male and 2,79,911 female. The sex ratio is 1019 female per 1000 male, which has healthier as compared to state (973) in 2001 census. The population density is only 135 inhabitants per square kilometer compared to state density of 319. The decadal growth for population during the period 2001-2011 is 1.09 % compared to 15.60 % of the state. The percentage of urban population to total population is only 14.61 %, it is 38.67 % of the state. The overall literacy rate of the district is 82.61 % as per 2011 census (State literacy rate is 75.36 %).

Table 2.2: Demographic Profile of Kodagu district

Name of the Blocks/ Taluka	No. of Villages	Population			
		Male	Female	Children(0-6 Yrs)	Total
Madikeri	65	72966	73617	14349	146583
Somvarpet	94	101888	104617	19991	206505
Virajpet	126	99754	101677	20393	201431
Total	285	274608	279911	54733	554519

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Fig 2.2: Block wise Population Distribution

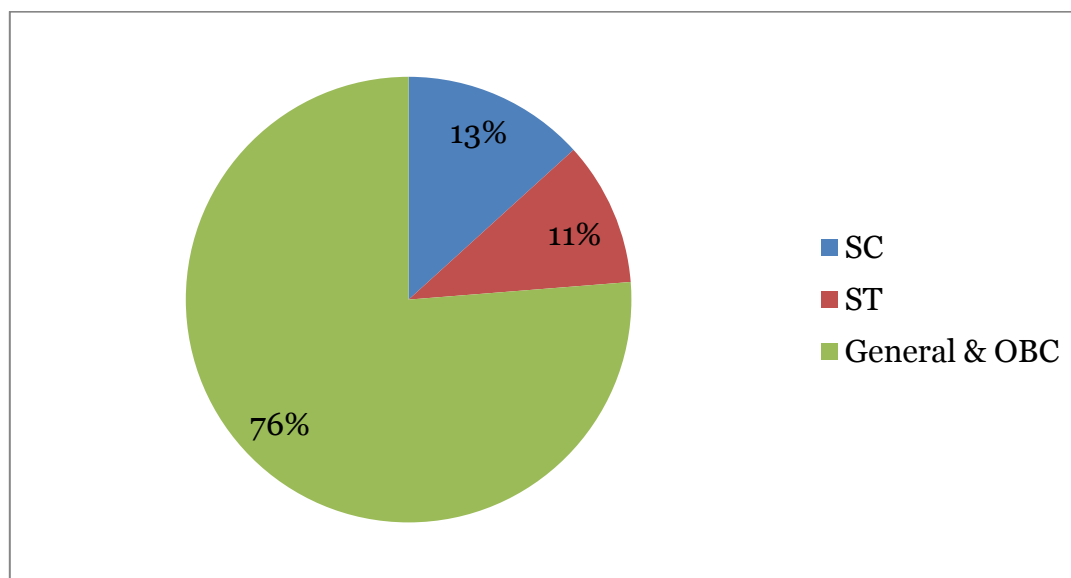


Out of total population of 5,54,519 the district is having 73,584 schedule caste members (13 %), 58,054 schedule tribe members (11 %) and 4,22,881 (76 %) general and OBC members as per the 2011 census. Block wise SC, ST and general population is detailed in Table.2.3.

Table 2.3: Demographic Profile of Kodagu district (No. of members)

Blocks/ Taluka	SC	ST	General & OBC	Total
Madikeri	16302	8024	122257	146583
Somvarpet	34527	10537	161441	206505
Virajpet	22755	39493	139183	201431
Total	73584	58054	422881	554519

Fig 2.3: Social Category wise Population Distribution



2.3 Livestock

The major source of livelihood for households in Kodagu district is agriculture followed by animal husbandry. In 2012 a total of 1.19 lakh cattle and draft animals (including buffalo) were reared in the district.

Among the small animals, the block of Somwarpet (84920) is the largest in the district followed by, Virajpet (87420) and Madikeri (61680). Block wise small animal details is provided in Table 2.4.

Table 2.4: Block Wise No of Livestock in Kodagu District (Small Animals)

Name of Block/Taluka	Poultry (No.)	Ducks (No.)	Pigs (No.)	Goats (No.)	Sheeps (No.)	Total small animals
Madikeri	52152	305	7880	1274	69	61680
Somwarpet	77052	365	3479	2932	1092	84920
Virajpet	77347	665	5589	3579	240	87420
Total	49939	206551	1335	16948	7785	234020

Somwarpet is the Taluka with largest number of large animals reared in the district, followed by Virajpet and Madikeri. Among the large animals, Indigenous cows and hybrid cows are widely reared in the district. Block wise large animal details is provided in Table 2.5.

District Irrigation Plan (DIP), Kodagu, Karnataka

Table 2.5: Block Wise No of Livestock in Kodagu District (Large Animals)

Numbers

Name of Taluka	Indigenous Cow	Hybrid Cow	In descriptive Buffalo	Hybrid Buffalo	Any other Milch or Meat Animal	Draft Animal Bulls	Draft Animal Buffalo	Total Large animals
Madikeri	15207	6882	3443	0	474	4152	797	30955
Somwarpet	26097	14929	5394	0	183	7358	393	54354
Virajpet	14291	11022	5639	0	66	2221	782	34021
Total	55595	32833	14476	0	723	13731	1972	119330

2.4 Agro-Ecology. Climate, Hydrology and Topography

As per the NARP classification, Kodagu District is a hilly area and belongs to 9th Agro climatic zone. As per ICAR, Agro-ecological region/ sub-region classification Kodagu comes under the Western Ghats And Coastal Plain, Hot Humid-Perhumid Eco-Region. Malnad area of Western Ghats. The district forms a part of Western Ghats with high range mountains running north – south. The whole district area, except for a narrow elongated strip, is mountainous. Kodagu district is drained by 6 perennial rivers namely East flowing Cauvery and West flowing Netravati, Payasyani, Ariyakodavu, Kuppam and Velapattanam. There are two dams namely Harangi and Chikli hole that provide irrigation water for the district.

The district enjoys typical tropical climate characterized by slight to medium humidity due to proximity to coast (about 32 Km). It is known to be quite pleasant and healthy, characterized by high humidity, heavy rainfall and cool summer. A major part of the year consists of rainy season as the monsoon period starting in June lasts till the ends of September. Even during the post monsoon months of October and November certain parts of the district receive a significant amount of rainfall. The southwest monsoon sets in usually during the early part of June. Generally, June, July and August are the months of heavy rainfall and the precipitation in July is incessant and very heavy. The average annual rainfall for the district is 2552.54 mm and the number of rainy days ranges between 85 and 153, with an average of about 118 rainy days in a year. The amount of rainfall and the number of rainy days varies considerably within the district. The analysis of the last 10 years data reveals that the highest rainfall (Average 3302.46 mm) has occurred in

Madikeri taluk and the lowest (Average 2105.22 mm) in Somvarpet, taluk. The orographic influence on rainfall is clear from the spatial distribution. Therefore, the rainfall is found to go on decreasing as one proceeds from the western part of the district to the eastern part. Detailed agro-ecological characteristics of Kodagu district is given in Table 2.6.

2.5 Soil Profile

The soils of the district are of a heterogeneous profile and consist of lateritic debris found in different stages of weathering and laterization. The valleys and slopes have fertile red loamy soils that are suitable for cultivation. In the eastern zone dark clay soils are predominant. These get water logged during monsoon and deep cracks appear during the summer months. In the central zone loamy soils are predominant. In the western zone, the soil is highly leached and being lateritic in content, tends to be quite shallow. The nature of the soil available in the district is suitable for crops like cardamom, coffee, pepper coconut and paddy. About 80 per cent of the soils in Madikeri district are acidic in nature

Kodagu district soils map is given in Fig 2.4, Soil slope map in Fig 2.5 and Soil erosion map in Fig. 2.6.

Fig 2.4: Kodagu district soils map

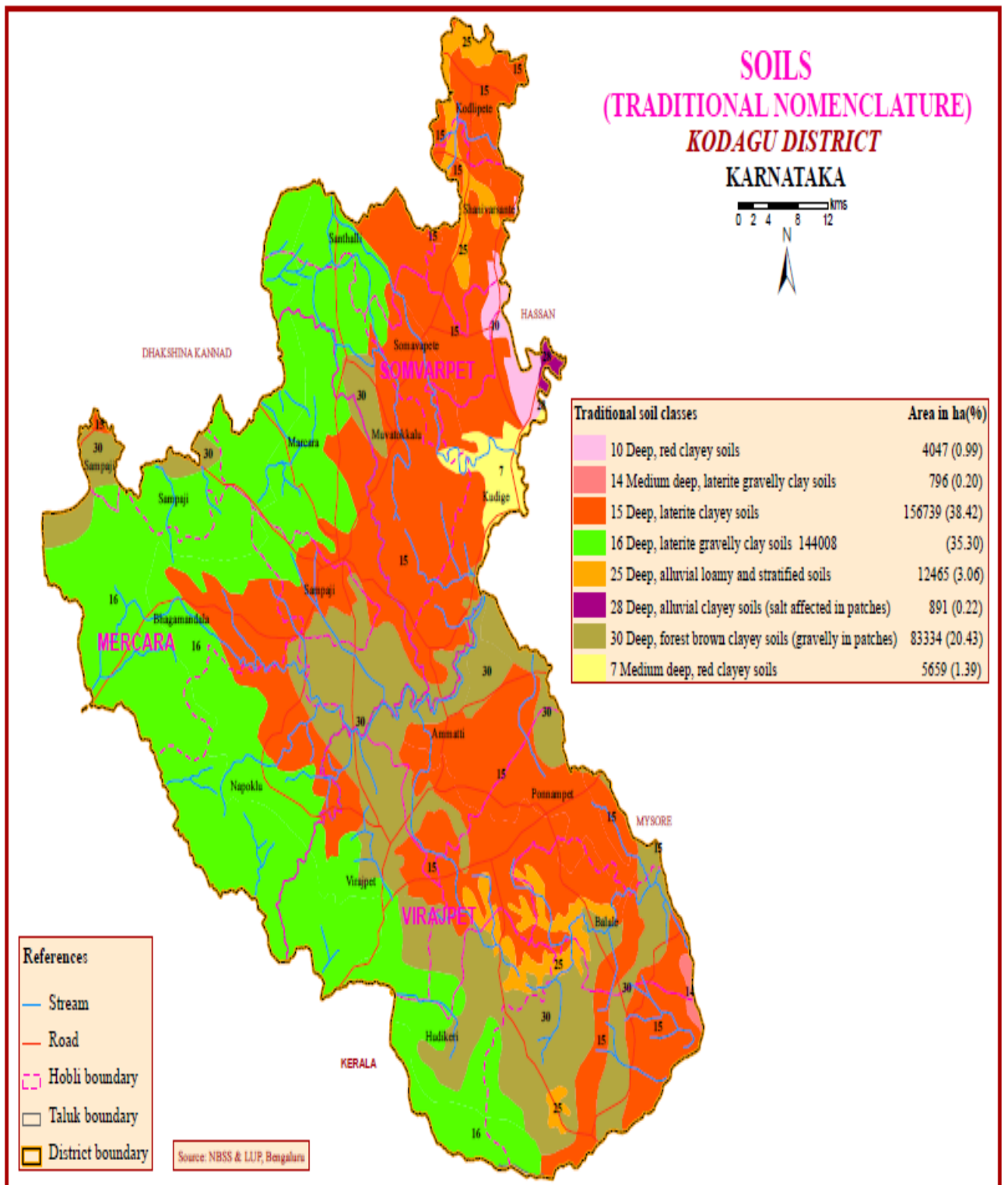


Fig 2.5: Kodagu district soil slope map

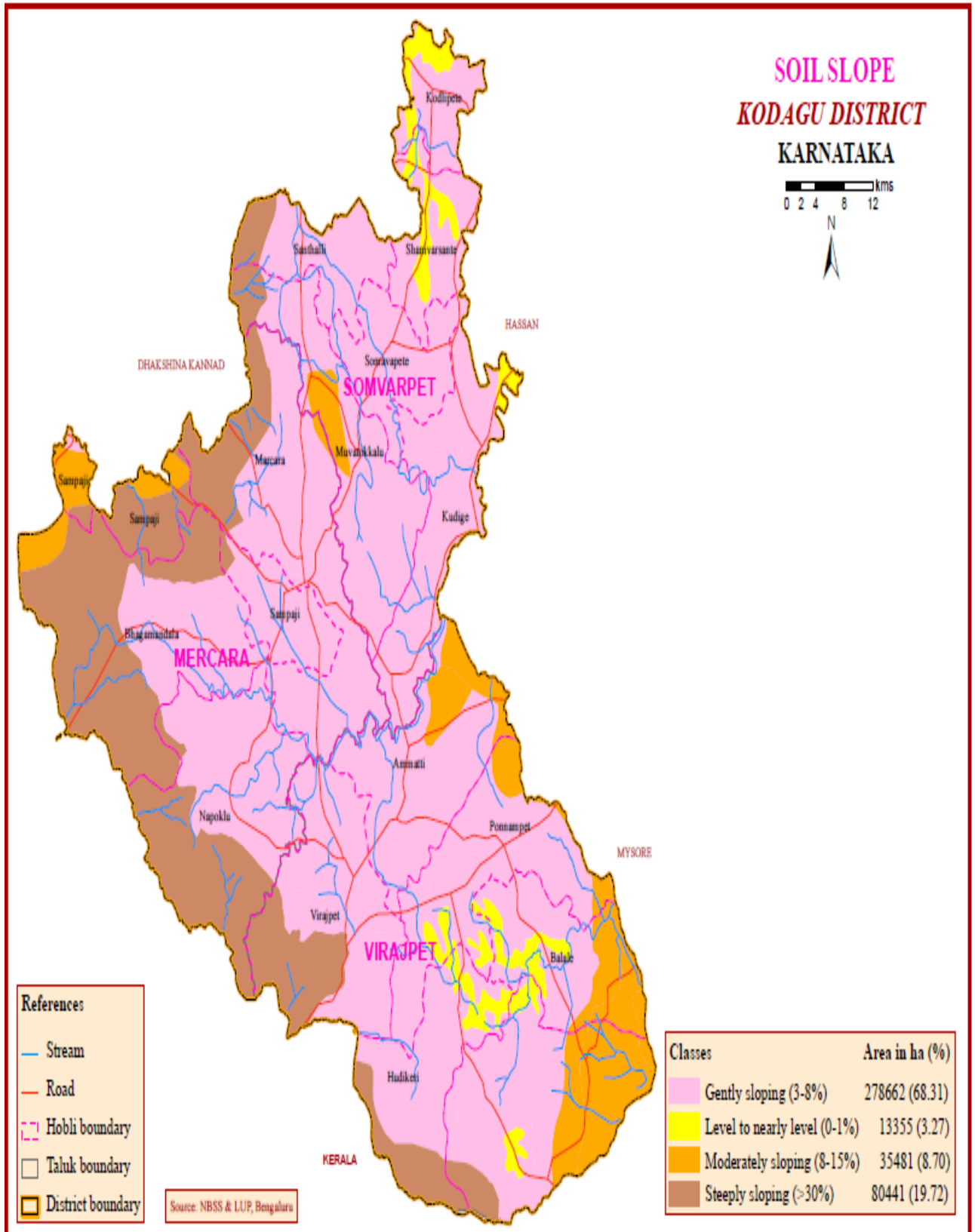
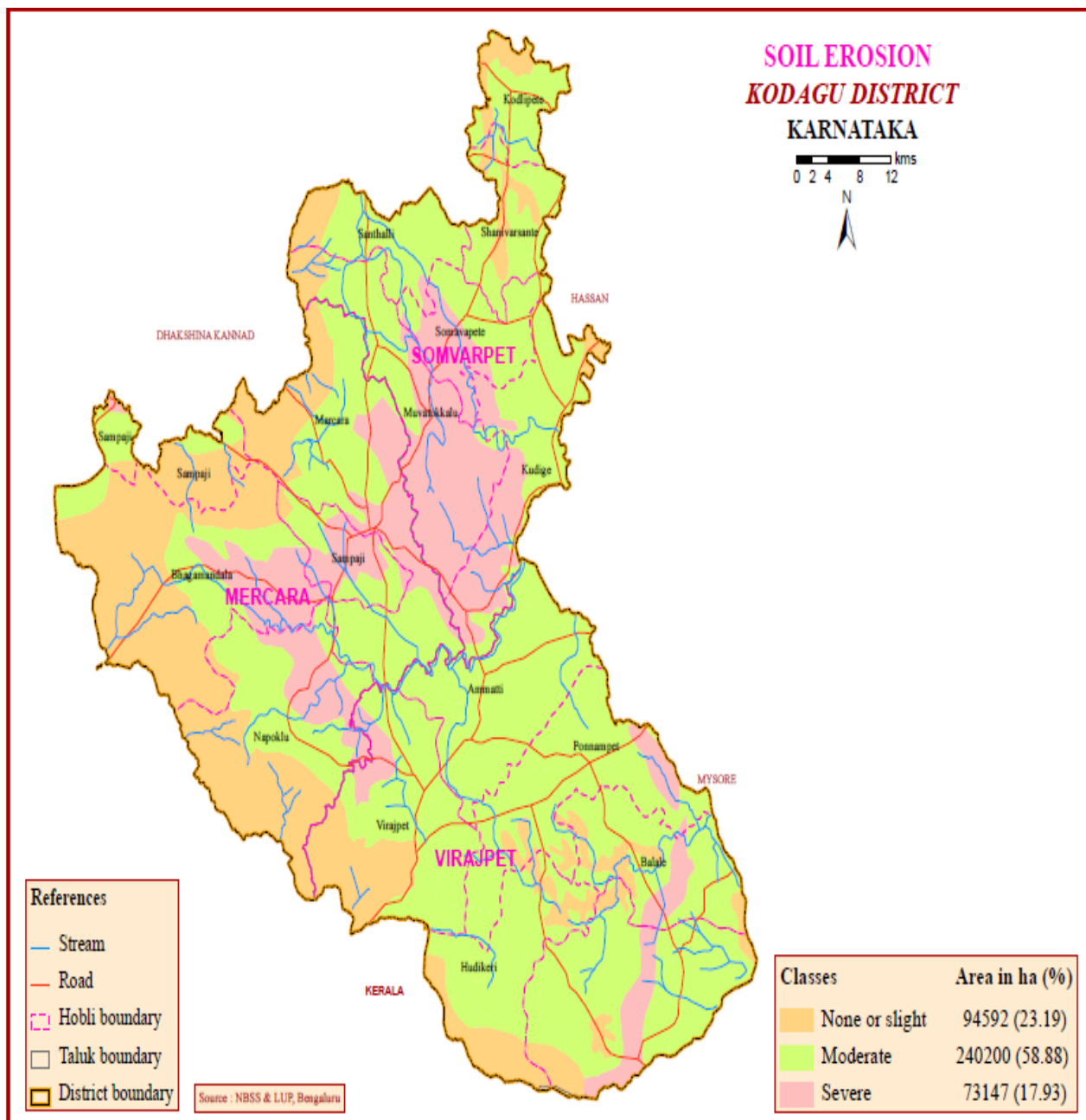


Fig 2.6: Kodagu district soil erosion map



2.6 Land Use Pattern

The total geographical area of the district is 4.11 lakh hectares out of which nearly **1.78 lakh ha** (or 43.30 %) is under Agriculture. Another 1.35 lakh ha (or 32.85 %) of the land is under forest. Block-wise land use pattern of the Kodagu district is given in Table 2.7.

District Irrigation Plan (DIP), Kodagu, Karnataka

Table 2.6: Agro ecology of Kodagu district

Name of the Block	Agro Ecological Zone Type	Block Area (ha)	Normal Annual Rainfall (mm)	Average Monthly Rainfall (mm)	No of Rainy Days (No)	Average Weekly Temperature (°C) P									Elevation		
						Period									Min	Max	Mean
						Summer (April - May)			Winter (Oct- Mar)			Rainy (June- Sept)					
						Min	Max	Mean	Min	Max	Mean	Min	Max	Mean			
Madikeri	Hilly	144900	2692	1010	111	15°	28°	28.6°	11°	17°	14.2°	14°	27°	21°	1724	5276	3500
Somwarpet	Hilly	99900	1297	130	111	26°	37°	29°	16°	28°	22°	18°	29°	23.5°	1027	1712	1370
Virajpet	Hilly	1654	2494	249	111	25°	32°	28.5	15°	24°	19.5	16°	28°	22°	900	1608	1254

Table.2.7: Block wise Land Use Pattern

Taluk	Geographical area	Forest area	Land under non-agri. Use	Cultivable waste	Permanent pastures	Land under miscellaneous tree crops and groves	Current fallow	Other fallows	Net sown area (1)	Gross cropped area (2)	Area sown more than one(2-1)	Cropping intensity (%)
Madikeri	145045	47514	17975	7485	4109	15421	1521	1037	49983	55169	5186	110%
Somwarpet	99999	20849	25201	883	3520	1123	2692	1084	44647	48122	3475	108%
Virajpet	165731	66234	12049	708	6255	3675	2753	1500	72557	79540	6983	110%
Total	410775	134597	55225	9076	13884	20219	6966	3621	167187	182831	15644	109%

CHAPTER 3: DISTRICT WATER PROFILE

Agriculture in general and horticulture in particular mainly contribute to the economy of Kodagu district. The agrarian economy of the district is mainly dependent on plantation and horticultural crops. Since the soils in almost all the taluk are acidic, Paddy is the only option. It is evident from Table 3.1 that paddy is a dominant crop in the district accounting for more than 90 per cent of the cropped area. Recently, maize is being grown in Somwarpet taluk. Plantation crops like coffee occupy are the major part of the cultivated area. Spices, fruit and flowers are other horticultural crops which are the main source of income.

3.1 Area Wise, Crop Wise Irrigation Status

Out of gross cropped area of 35383 ha (exclusive of horticulture crops) in the district, paddy alone accounts for 31828 ha (around 90 %). Except some negligible area, almost all agricultural crops are grown in Kharif only. Recently, maize and pulses are grown in some patches of Sowmarpet Taluk. Details of Area, Production and Productivity of agricultural crops in Kodagu districts are given in Table 3.1.

Table 3.1: Area wise and Crop wise Irrigation Status of Agriculture Crops

Crop Type	kharif			Rabi			Summer			Total		
	Irr	RF	Tot	Irr	RF	Tot	Irr	RF	Tot	Irr	RF	Tot
Paddy	2500	29195	31695	12	0	12	121	0	121	2633	29195	31828
Maize	3340	3340	95	0	95	52	0	52	147	3340	3487	3340
Pulses	0	0	0	40	40	28	0	28	28	40	68	0
Total	2500	32535	35035	107	40	147	201	0	201	2808	32575	35383

*Irr-Irrigated; RF-Rain-fed; Tol-Total

The district was having a total area of 140587.78 ha under horticulture crops during 2014-15. Out of the total area under horticulture crops coffee account for more than 75 %. Around 27 % of the area under horticulture crops was irrigated in the district. Area under different categories of horticulture crops is given in the table below:

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Table 3.2: Area under Horticulture Crops (Ha)

Crop Type	Irrigated	Rain-fed	Total
Fruits	2528	2153.26	4681.26
Vegetables	439.52	0	439.52
Spices	4483	16606	21089
Plantation	3435	5006	8441
Coffee	27149	78754	105903
Flowers	34	0	34
Total	38068.52	102519.26	140587.78

Block wise area under various agriculture crop categories in irrigated and rain-fed situation is highlighted in Table.3.3.

Table 3.3: Block wise area under various crop

Name of the Block	Crop Type	Kharif			Rabi			Summer			Total			
		Ir	RF	Tot	Ir	RF	Tot	Ir	RF	Tot	Ir	RF	Tot	
Madikeri	Paddy	0	6160	6160	6	0	6	10	0	10	16	6160	6176	
	Fruits													
	Citrus										125	374	499	
	Banana										577	0	577	
	Other fruits										39	331.26	370.26	
	Vegetables										79.52	0	79.52	
	Spices													
	Pepper											870	2612	3482
	Cardamom											0	5434	5434
	Ginger											160	0	160
	Plantation													
	Coconut											0	787	787
	Areca nut											1396	931	2327
	Oil palm											38	0	38
	Cashew											0	1940	1940
Other Plantation											112	54	166	
Flowers											23	0	23	
Coffee											1502	22702	24204	
Somwarpet	Paddy	2500	8090	10590	6		6	110		110	2616	8090	10706	
	Maize		3340	3340	95		95	52		52	147	3340	3487	

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Name of the Block	Crop Type	Kharif			Rabi			Summer			Total		
		Ir	RF	Tot	Ir	RF	Tot	Ir	RF	Tot	Ir	RF	Tot
	Pulses					40	40	28		28	28	40	68
	Fruits										0	0	0
	Citrus										140	431	571
	Banana										597	0	597
	Other fruits										26	385	411
	Vegetables										347	0	347
	Spices												
	Pepper										530	1581	2111
	Cardamom										0	2075	2075
	Ginger										1029	0	1029
	Plantation												
	Coconut										80	239	319
	Areca nut										316	0	316
	Oil palm										127	0	127
	Flowers										8	0	8
Coffee										23890	6020	29910	
Virajpet	Paddy		1494 5	14945				1		1	1	14945	14946
	Fruits												
	Citrus										148	446	594
	Banana										860	0	860
	Other fruits										16	186	202
	Vegetables										13	0	13
	Spices												
	Pepper										1555	4665	6220
	Cardamom										0	239	239
	Ginger										339	0	339
	Plantation												
	Coconut										50	464	514
	Areca nut										840	560	1400
	Oil palm										476	0	476
	Cashew										0	24	24
Other Plantation										0	7	7	
Flowers										3	0	3	
Coffee										1757	50032	51789	

*Irr-Irrigated; RF-Rain-fed; Tol-Total

3.2 Irrigation based Classification

The Gross Irrigated Area of Kodagu district is 40876 hectare which is around 30 % of the Gross Cropped Area of the district. Among the blocks, Somwarpet has largest

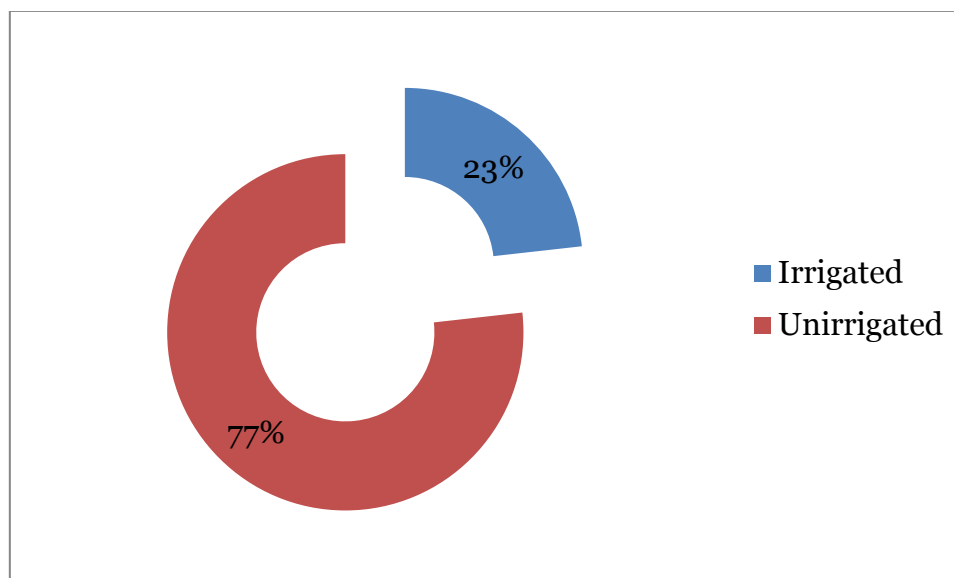
District Irrigation Plan (DIP), Kodagu, Karnataka

area under irrigation followed by Virajpet and Madikeri. Taluka wise area under irrigation and rain-fed is provided in Table 3.4.

Table 3.4:Block wise Irrigation based Classification (In Ha)

Name of Taluka	Irrigated	Un-Irrigated or Totally Rainfed	Total Area
Madikeir	4937.52	41325.26	46262.78
Somwarpet	29881	22201	52082
Virajpet	6058	71568	77626
Total	40876.52	135094.3	175970.8

Fig 3.1: Gross Irrigated and Rain-fed area in Kodagu district



CHAPTER 4: WATER AVAILABILITY

4.1 Status of Water Availability

Both surface and ground water facilities are available in the Kodagu district. The major source of surface water in the district is canal and water harvesting bodies. The total availability of Surface water in the district is 331.55 MCM.

Table 4.1: Block wise surface water availability (MCM)

Blcoks/ Taluka	Kharif	Rabi	Summer	Total
Madikeri	16.577	9.9462	4.14425	30.66745
Somwarpet	122.7773	73.66638	30.69433	227.138
Virajpet	39.8619	23.91714	9.965475	73.74452
Total	179.2162	107.5297	44.80405	331.55

As per the data provided by Minerals and Geoscience Department, Karnataka, Ground water is available in all the blocks of the district. The availability of ground water in the district is given in Table 4.2.

Table 4.2: Block wise ground water availability (MCM)

Blcoks/ Taluka	Kharif	Rabi	Summer	Total
Madikeri	2.5600	5.1167	17.9167	25.5933
Somwarpet	2.5600	5.1167	17.9167	25.5933
Virajpet	2.5600	5.1167	17.9167	25.5933
Total	7.68	15.35	53.75	76.78

Table 4.3: Water availability from Various Sources in Kodagu (MCM)

Sources	Khrif	Rabi	Summer	Total
Surface Water	179.2162	107.5297	44.80405	331.55
Ground Water	7.68	15.35	53.75	76.78
Total	186.8962	122.8797	98.55405	408.33

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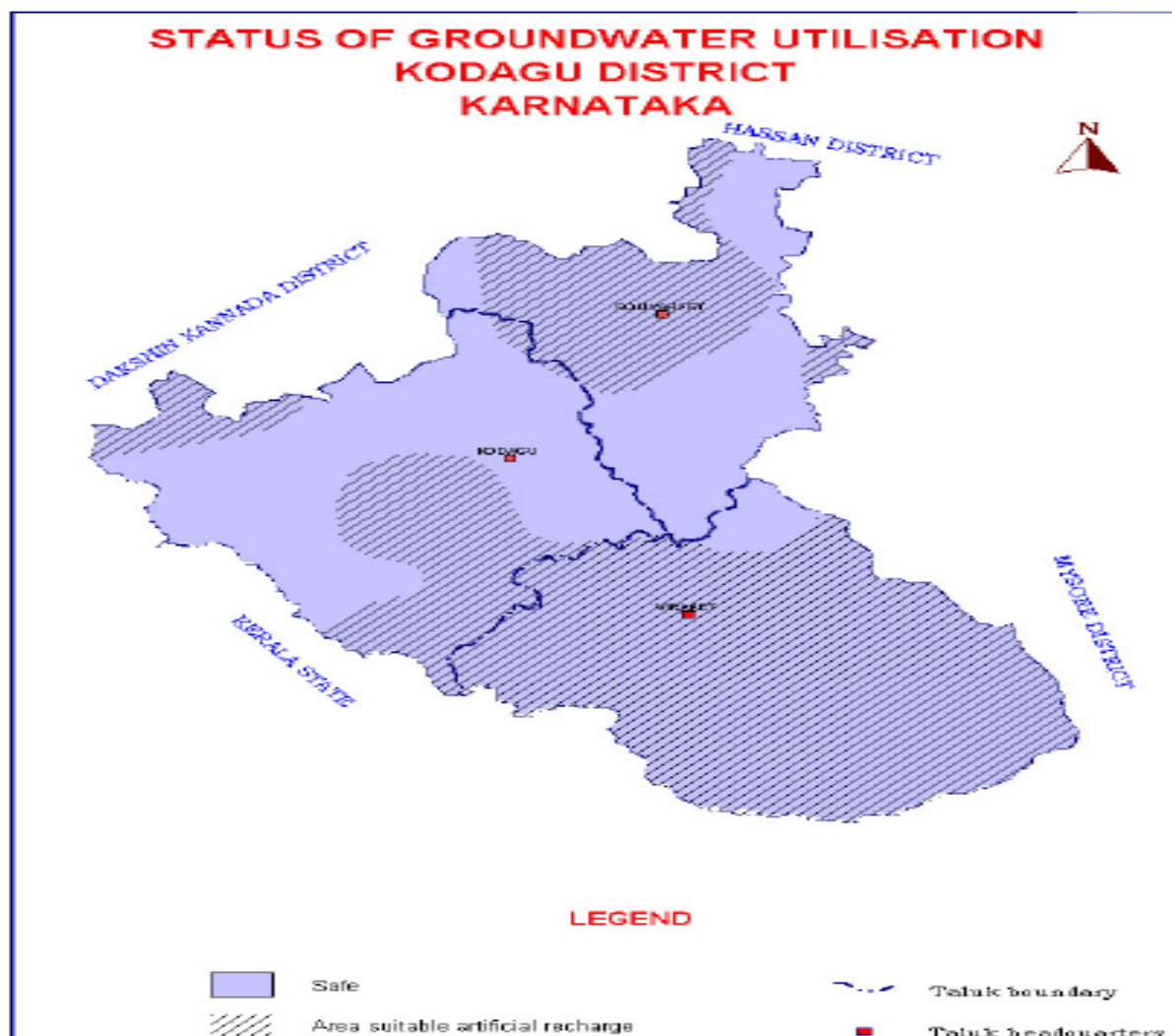
4.2 Status of Ground Water Availability

As per Central Ground Water Board notification, the status of ground water is safe in all three Talukas of the Kodagu district. Quality of groundwater in the district, in general, is good and potable. It is suitable for domestic and irrigation purposes. Block wise status of ground water and total draft and recharge details are given in following table. Status of ground water utilization map is given in Fig.4.1.

Table 4.4: Ground Water Status of Kodagu district (In MCM)

Taluk	Critical	Semi-Critical (%)	Safe (%)	Draft	Recharge	Gap
Madikeri	-	30	70	11.6364	90.1145	78.4781
Somwarpet	-	-	100	11.6364	90.1145	78.4781
Virajpet	-	-	100	11.6364	90.1145	78.4781
Total				34.9092	270.3435	235.4343

Fig 4.1: Status of ground water utilization map of Kodagu district



4.2.1 Hydrogeology

Hydro geologically, the area forms a part of hard rock terrain comprising of granites, gneisses, charnockites and amphibolites. Pegmatite veins and dolerite dykes are common intrusive in the area, especially in the eastern and southern sectors of the district. Dolerite dykes occur as detached boulders at places and as intrusive in granitic formations. The flat and low lying areas are covered by a thick mantle of fertile soil, while the elevated portions and hills are capped by laterites. The alluvium is found along the river course, contains silt, sand and gravel in varying proportions. The ground water occurs under phreatic conditions in weathered zones of granites and gneiss, and under semi-confined to confined conditions in joints and fractures of these rocks at deeper level. Weathering of granites and gneisses, has given rise to thick sandy residuum down to the depth of 2.0 and 25.0 m. bgl and it forms an important phreatic aquifer. Fractured granites and gneisses form prolific deeper aquifers in some parts of the district.

4.2.2 Depth of ground water

Ground water in the district generally occurs under unconfined to semi-confined conditions. In the shallower zones it is under phreatic conditions and in deeper zones it is under semi-confined conditions. The ground water is being exploited from the depth range of 10.00 to 20.00 m bgl through dug wells and from the depth range of 30.00 to 100.00 m bgl through dug-cum-bore wells and bore wells. The ground water exploration has proved the presence of prolific aquifers below the depth of 100 m. Out of 24 National Hydrograph Stations (NHS) located in Kodagu district, the depth to water levels in the NHS (dug wells) recorded during May-2006 were in the range of 0.70 to 19.65 m bgl. The depths to water levels in the national hydrograph stations (dug wells) recorded during November 2006 were in the range of 1.02 to 13.61 m bgl. The pre-monsoon and post-monsoon depths to water levels are depicted in Fig.4.3 and Fig.4.4. It is observed that major parts of the district has moderate to moderately deep-water levels between 5 to 20 m during the pre-monsoon period. The water levels in the 6 piezometer national hydrograph stations ranges from 5.47 to 16.21 m.bgl during May 2006 and 3.90 to 21.70 m bgl during November 2006.

Consequent upon seasonal rainfall, the water levels record a rise, indicating the build up of storage in ground water reservoir. During the non-monsoon period, this gets depleted due to exploitation and natural discharge. Therefore, the water levels, in general show, a receding trend from December to May. The seasonal water level

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fluctuation for the year 2006 is available for 21 dug well national hydrograph network stations. While seventy percent of the NH Stations have shown a rise in water levels in the range of 0.15 – 12.80 m, thirty percent of the stations have recorded a fall in water levels in the range of 0.22 – 7.80 m. The seasonal water level fluctuation for the year 2006 is available for six piezometer hydrograph network stations in the range between 2.79 – 7.32 m.

Fig 4.2: Hydrogeology map of Kodagu district

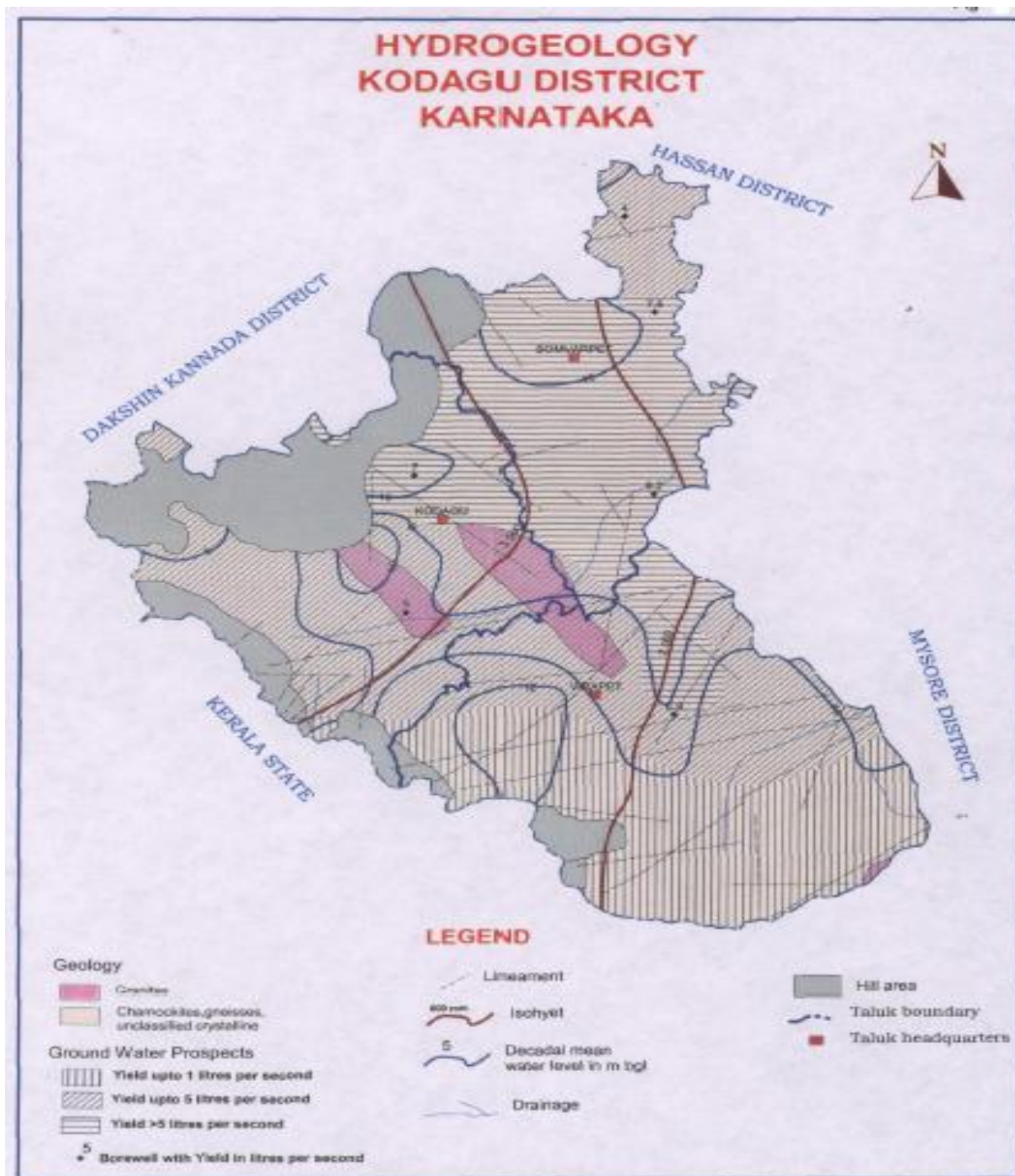


Fig 4.3: Pre-monsoon water depth map of Kodagu district

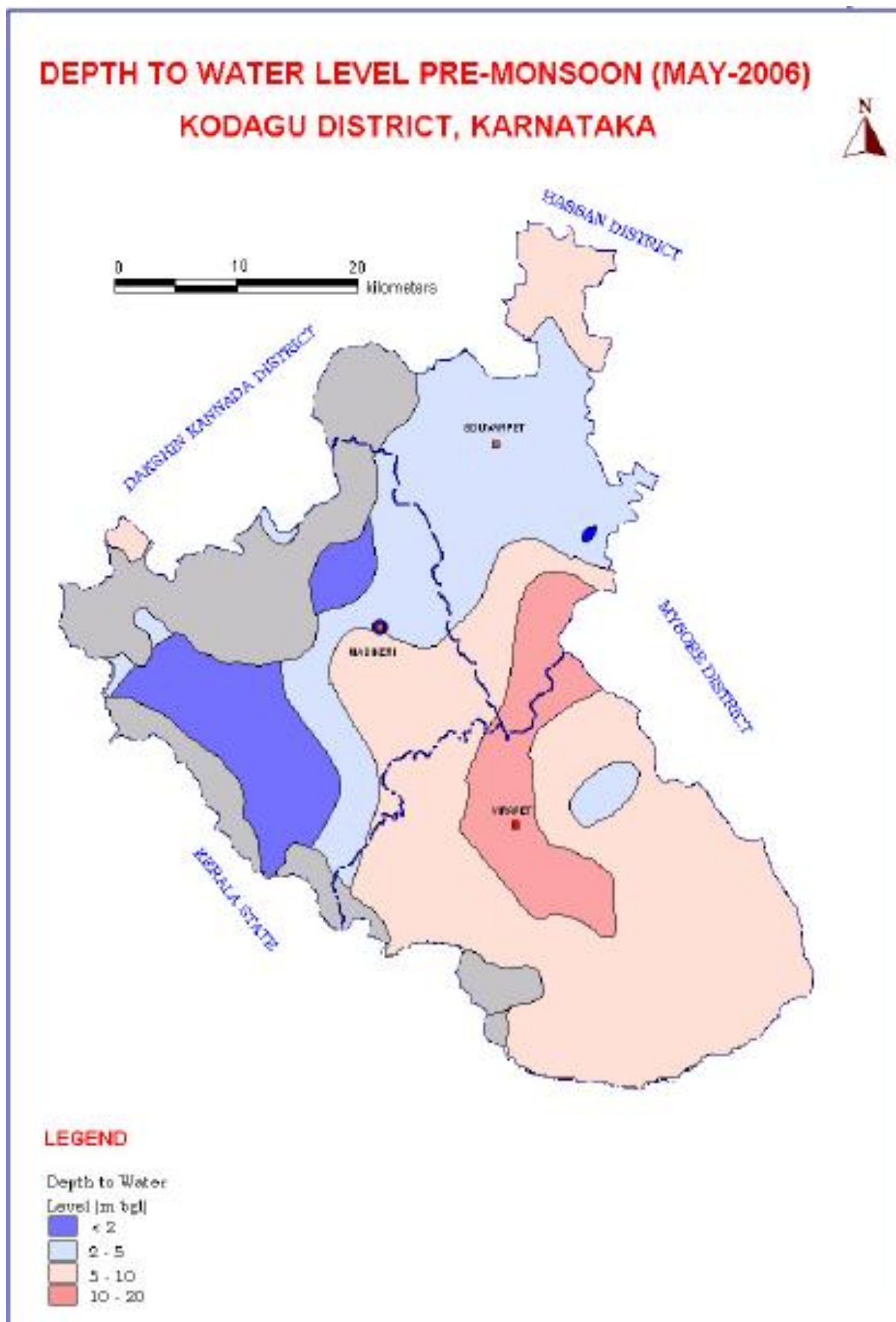
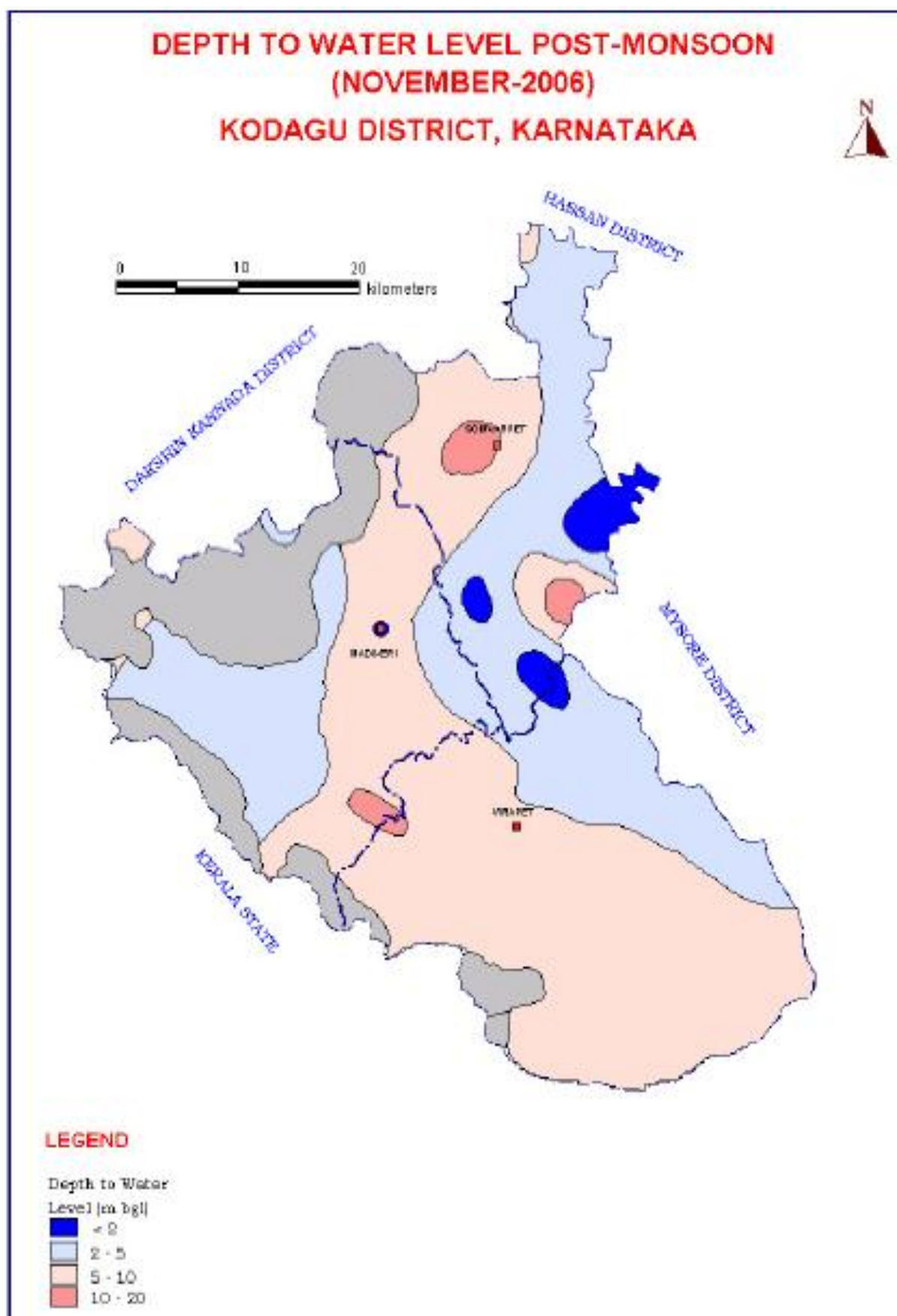


Fig 4.4: Post-monsoon water depth map of Kodagu district



CHAPTER 5: WATER REQUIREMENT /DEMAND

The earlier Chapters deals with the general profile, water profile and water availability of Kodagu district. The present chapter deals with the current (2016) and projected (2020) demand of water from various sectors. The demand for water has been assessed on the basis of data obtained from different departments.

5.1 Domestic Water Demand

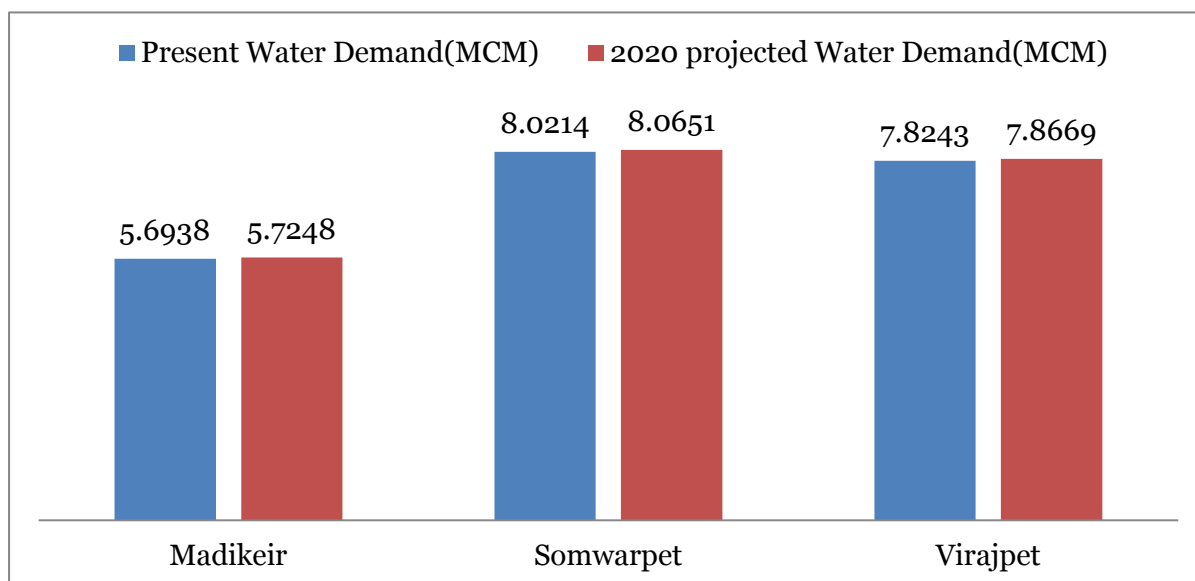
Data of Census 2011 and 2001 has been considered to arrive at the growth rate of population of the district. As per Census 2011, the district has shown an decadal growth rate of 1.09 %. Current population (in 2016) has been calculated by assuming a half of decadal growth rate of over a period of five years (from 2011-2016). Projected population has been calculated in similar way by assuming a growth rate for the plan period (2016-2020).

It has been assumed that per capita daily water requirement of people residing in urban areas of the district is 140 litres and for population in rural areas, the daily per capita daily water requirement is 100 litres. Even though state norm is to provide 100 liters per person per day in urban and 70 liters per person per day in rural area, national norms are considered for the study. By considering national norms, block-wise domestic water supply demand has been worked out and is given in Table 5.1 below.

Table 5.1: Domestic Water Demand (MCM)

Blocks	2011 Census Population	Population in 2016	Present Water Requirement (2016)	Projected Population in 2020	Annual Water Requirement in 2020
Madikeir	146583	147382	5.6938	148185	5.7248
Somwarpet	206505	207630	8.0214	208762	8.0651
Virajpet	201431	202529	7.8243	203633	7.8669
Total	554519	557541	21.5395	560580	21.6569

Fig 5.1: Block wise Domestic Water Requirement



It can be inferred from the table that considering the growth rate of population of the district, the quantity of water required in 2020 for domestic consumption shall be approximately 21.66 MCM which is 0.12 MCM more than the present water requirement.

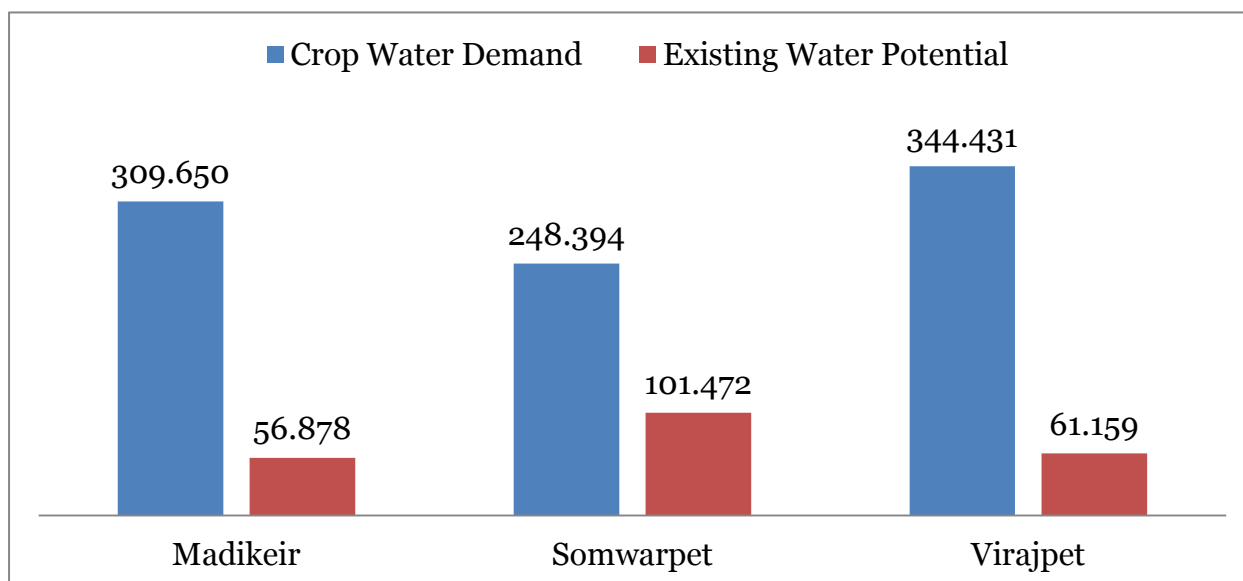
5.2 Crop Water Requirement

Crop water requirement for the blocks and district have been calculated based upon the cropping pattern followed in the various blocks of the district. Area under different crops has been discussed in Chapter 3 (Table 3.2). Taking into account in Table 5.2, requirement of water for different crops have been worked out. Existing water potential available (being utilized) has been assumed as the water used in irrigated land.

Table 5.2: Crop Water Requirement in MCM

Block	Area sown (Ha)	Irrigated area (ha)	Crop Water Demand	Existing Water Potential	Water Potential to be created
Madikeir	46262.8	4937.5	309.650	56.878	252.772
Somwarpet	52082.0	27381.0	248.394	101.472	146.922
Virajpet	77626.0	6058.0	344.431	61.159	283.272
Total	175970.8	38376.5	902.475	219.509	682.966

Fig 5.2: Crop Water Demand and Existing Water Potential



5.3 Livestock

The requirement of water for livestock of the district has been derived from the data obtained from Department of Animal Husbandry. The table below represents the animal wise water requirement as well as total water requirement of the district for livestock. The block wise water estimation for livestock is as follows;

Table 5.3: Livestock water demand (in MCM)

Block	Total number of livestock	Present water demand (MCM)	Water Demand in 2020 (MCM)	Existing water potential (MCM)*	Water potential to be created (MCM)
Madikeri	92635	0.6294	0.6923	0.6828	0.0095
Somwarpet	139274	1.0481	1.1529	1.1994	0.0000
Virajpet	121441	0.6891	0.7581	0.7971	0.0000
Total	353350	2.3666	2.6033	2.6793	0.0095

* It is assumed that present water requirement of animal is met from existing water usage and hence existing potential is equal to existing demand.

Based on the projected water requirement for livestock in 2020, the gap has been assessed. The total potential which has to be created for livestock in 2020 is around 0.01 MCM. This has been assessed on the terms of the following:

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- Per capita daily water requirement for Buffaloes 60 litres, Cows/ Draft animals 50 litres, sheep/goats 6 litres, Pigs 15 liters, Ducks 1 liters and Poultry 0.3 liters.
- For projecting the water demand of livestock, growth rate as deduced from census has been considered during calculations. It is assumed that present water requirement of livestock is met from existing water usage and hence existing potential is equal to existing demand.

5.4 Industrial Water Requirement

Industrial water requirement of the district is assessed based on the data collected from District Industries Center (DIC). As per the data, district has only three major industries and water requirement of these units is 0.037 MCM. The existing water availability is 0.045 MCM, which will be more than enough to meet the industrial water demand by 2020. Detailed industrial water demand and potential is given in Table 5.4.

Table 5.4: Industrial water demand and potential

Block	Water demand (MCM)	Water demand in 2020 (MCM)	Existing Water potential (MCM)	Water potential to be created (MCM)
Somwarpet	0.015	0.022	0.027	0.000
Virajpet	0.010	0.015	0.018	0.000
Total	0.025	0.037	0.045	0.000

5.5 Water Demand for Power Generation

Kodagu district has one hydro power generation unit near Harangi Reservoir. The power generation capacity of the unit is 13 MW. Initially it was 9 MW unit, recently capacity is increased by additional 4 MW. The water requirement for this unit will be 200 MCM. Details of water requirement for power generation in the district are given in Table 5.5.

Table 5.5: Water requirement for power generation in the district (MCM)

Block	Power generation capacity	Water demand	Water demand in 2020	Existing Water potential	Water potential to be created
Somwarpet	13MW	200.00	200.00	200.00	0.00
Total		200.00	200.00	200.00	0.00

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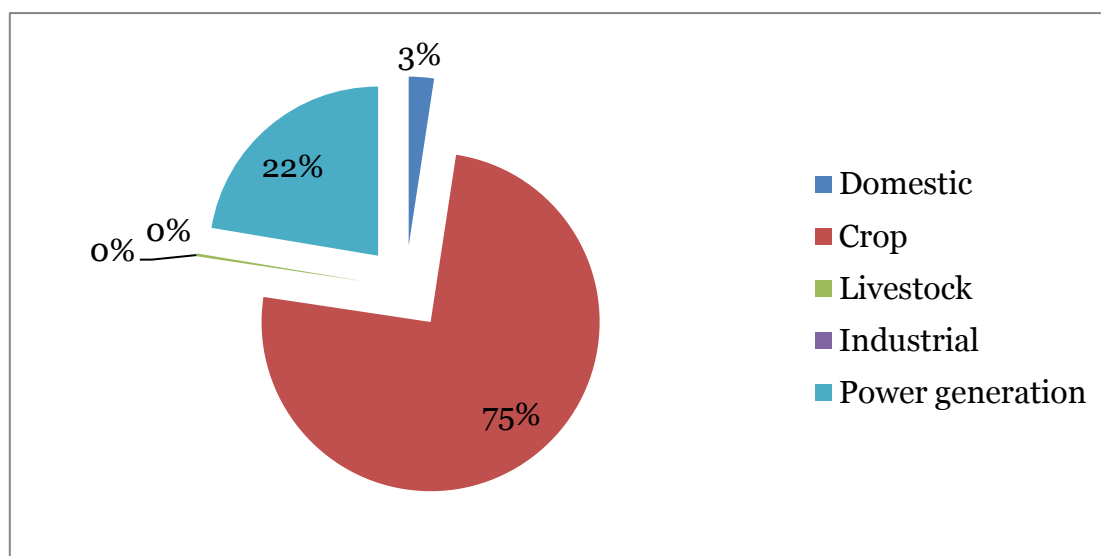
5.6 Water Demand

This section presents the total water demand of the district and has been calculated by summing up all major sectors consuming water. The current water demand has been indicated in Table 5.6 and the projected water demand has been depicted in Table 5.7.

Table 5.6: Present Water Demand of the district for various sectors

Blocks	Demand from components (MCM)					Total
	Domestic	Crop	Livestock	Industrial	Power Generation	
Madikeri	5.694	252.772	0.629	0.005		259.101
Somwarpet	8.021	134.422	1.048	0.010	200.000	343.502
Virajpet	7.824	283.272	0.689	0.010		291.795
Total	21.540	670.466	2.367	0.025	200.000	894.398

Fig 5.3: Water Requirement for Various Sectors



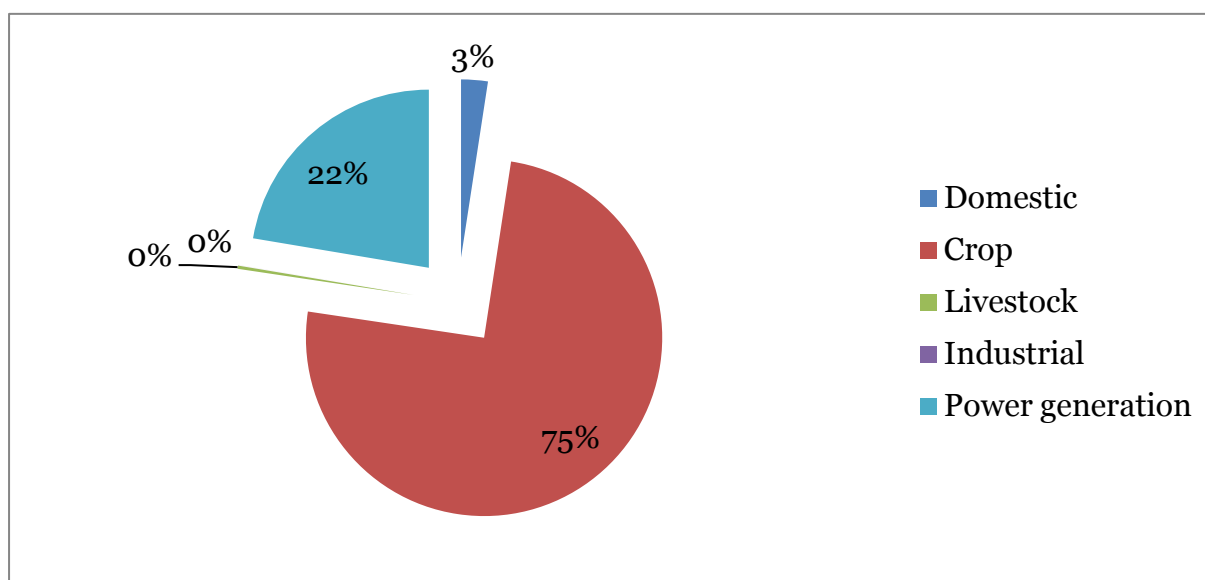
The present water demand of the district has been assessed at 906.898 MCM annually, with Somwarpet being the block with maximum water requirement (356 MCM), followed by Virajpet and Madikeri.

District Irrigation Plan (DIP), Kodagu, Karnataka

Table 5.7: Total Water Demand of the district for various sectors (Projected for 2020)

Blocks	Projected Demand from components (MCM)					Total
	Domestic	Crop	Livestock	Industrial	Power Generation	
Madikeri	5.725	252.772	0.692	0.007		259.197
Somwarpet	8.065	134.422	1.153	0.015	200.000	343.655
Virajpet	7.867	283.272	0.758	0.015		291.912
Total	21.657	670.466	2.603	0.037	200.000	894.764

Fig 5.4: Water Requirement for Various Sectors (2020)



During 2020, total water requirement of the district has been assessed at 907.264 MCM. The projected requirement of the blocks as well as district is almost in the similar proportion to present requirement.

5.7 Water Budget

A water budget reflects the relationship between input and output of water through a region. The water balance in table 5.8 shows the existing water usage and the current and potential water demand. Thus there is a direct comparison of supply of water and the natural demand for water. It is possible to identify the gaps in the supply and

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demand, thereby planning to invest in irrigation structures to support the blocks and villages and fulfill the water needs.

Table 5.8: Water Budget (Volume in MCM)

Name of Blocks	Existing water availability/ Usage (MCM)		Total (MCM)	Water Demand (MCM)		Water Gap (MCM)	
	Surface Water	Ground Water		Pre sent	Projecte d (2020)	Pre sen t	Projecte d (2020)
Madike ri	30.667	25.593	56.261	259.101	259.197	202.840	202.936
Somwarpet	227.138	25.593	252.731	143.502	143.655	-109.230	-109.076
Virajpet	73.745	25.593	99.338	291.795	291.912	192.457	192.574
Total	331.550	76.780	408.330	694.398	694.764	286.068	286.434

The total water gap for the district is currently 286.61 MCM and has been estimated at 286.43 MCM during 2020, i.e. the supply of water is insufficient to meet the current and future demand of the district. It is also observed that Somwarpet block was the only block which does not face the issue of supply shortage.

CHAPTER 6: STRATEGIC ACTION PLAN FOR IRRIGATION IN DISTRICT UNDER PMKSY

6.1 Department wise Coverage of Area

During the upcoming four financial years, a total of 78322.24 ha area will be covered under Pradhan Mantri Krishi Sinachyi Yojna. It includes both creation of additional area and renovation of existing area.

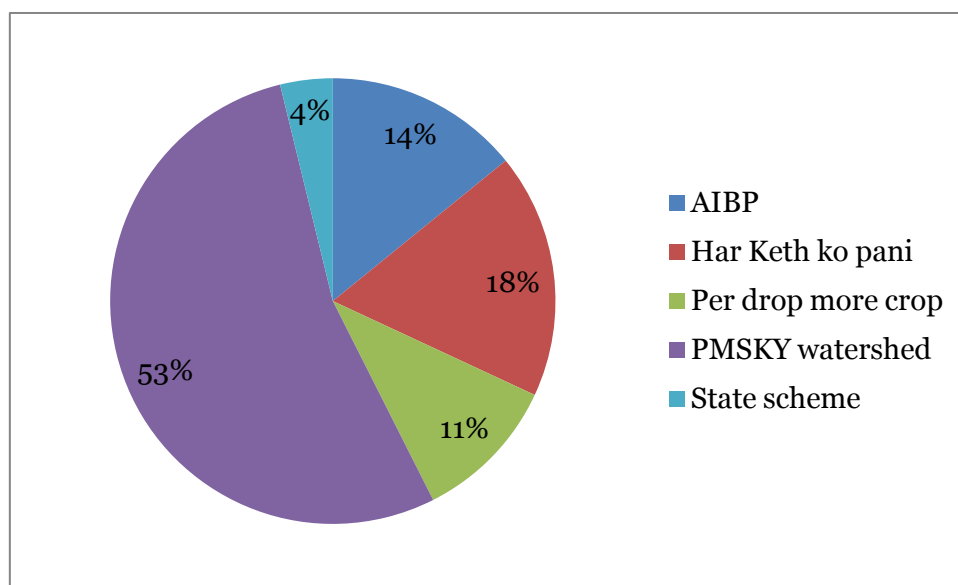
Out of the total area i.e. 78322.24 ha., planned to cover under PMKSY, Agriculture and watershed department is expected to cover an area of 62581.10 hectare under various activities like construction and renovation of check dams, farm ponds & trenches, Drought proofing of check dams . As per the plan Cauvery Neeravari Nigam Limited will create or renovate an area of 11695.28 Ha. Minor Irrigation Department will create or renovate an area of 3865.82 Ha. Other Departments like CADA, Panchayat Raj Department, Horticulture Department and Fisheries Department will create or renovate minor area.

6.2 Component wise Strategic Action Plan

Out of a total planned outlay of 48709.69 lakh rupees, PMKSY watershed component has the largest share of 53.63 per cent, followed by Har Keth ko pani (17.78 %), AIBP (14.15 %) and Per drop more crop (10.63 %). AIBP components are to be executed mainly by Cauvery Neeravari Nigam Limited and Minor Irrigation Department. Har Khet ko Pani component will be implemented by Cauvery Neeravari Nigam Limited, CADA and Minor Irrigation Department. Per drop more crop component will be executed by Agriculture and Watershed Department and Horticulture Department. PMSKY watershed component will be taken care implemented by multiple departments including Cauvery Neeravari Nigam Limited, Agriculture and Watershed Department, Horticulture Department, Panchayat Raj Department and Minor Irrigation Department. However, all the stakeholders need to have coordination among themselves to have the maximum irrigation efficiency and to avoid duplicity. Fig. 6.1 is the graphical representation of various components of PMKSY.

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Fig 6.1: Component wise Fund Distribution under PMKSY



Detail component wise break up of financial outlay can be observed in the following table.

Table 6.1: Component wise Financial Outlay for PMKSY

In Rupees Lakh

Component	2016-17	2017-18	2018-19	2019-20	Total
AIBP	1490.00	1800.00	1800.00	1800.00	6890.00
Har Keth ko pani	1556.50	2440.00	2445.00	2220.00	8661.47
Per drop more crop	1052.19	1376.00	1376.00	1376.00	5180.19
PMSKY watershed	4772.49	7117.00	7117.00	7117.00	26123.50
State scheme	49.52	857.50	857.50	90.00	1854.52
Total	8920.70	13590.50	13595.50	12603.00	48709.69

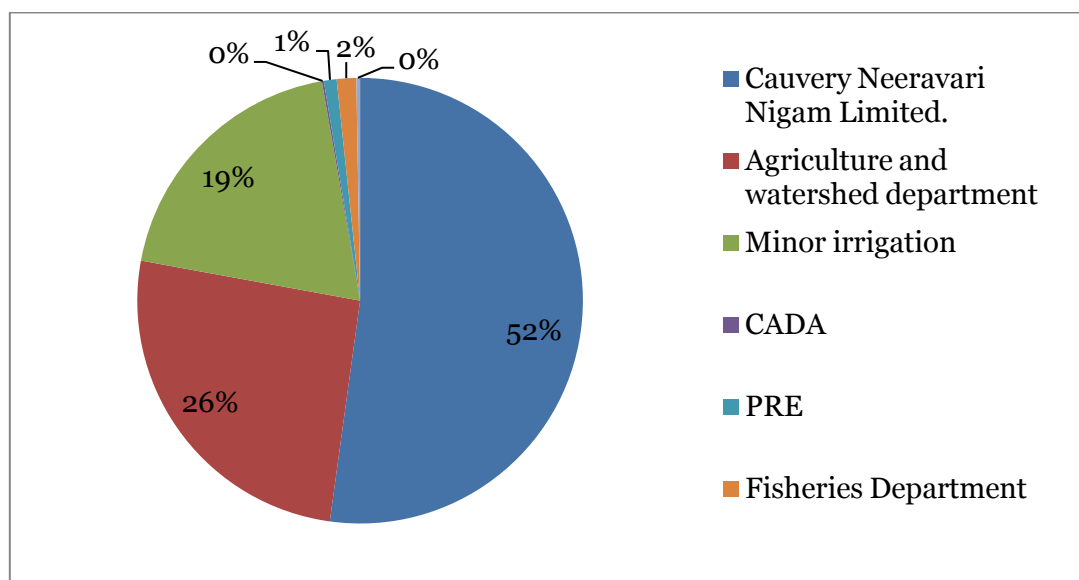
6.3 Department wise Strategic Action Plan

Total planned outlay in strategic action plan of Kodagu district is 48709.69 lakh rupees. Out of the total cost 52.17 %, which is 25413.59 lakhs of total, is incurred by Cauvery Neeravari Nigam Limited. Agriculture and Watershed Department has a share of 25.71 % of the total amount. It will incur 12521.78 lakh in four years of plan period. Minor Irrigation Department will have a plan outlay of 19.37 % of total district plan amount with 9435.00 lakh rupees. CADA, Panchayat Raj Department, Fisheries Department and Horticulture Department will have minor shares of 0.14

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%, 0.92 %, 1.41% and 0.27 % respectively of the total share in the funds planned for the next four years. Detailed share of each of the departments is given in Table 6.2.

Fig 6.2: Department wise Financial Outlay under PMKSY



Detail department wise break up of financial outlay can be observed in the following table.

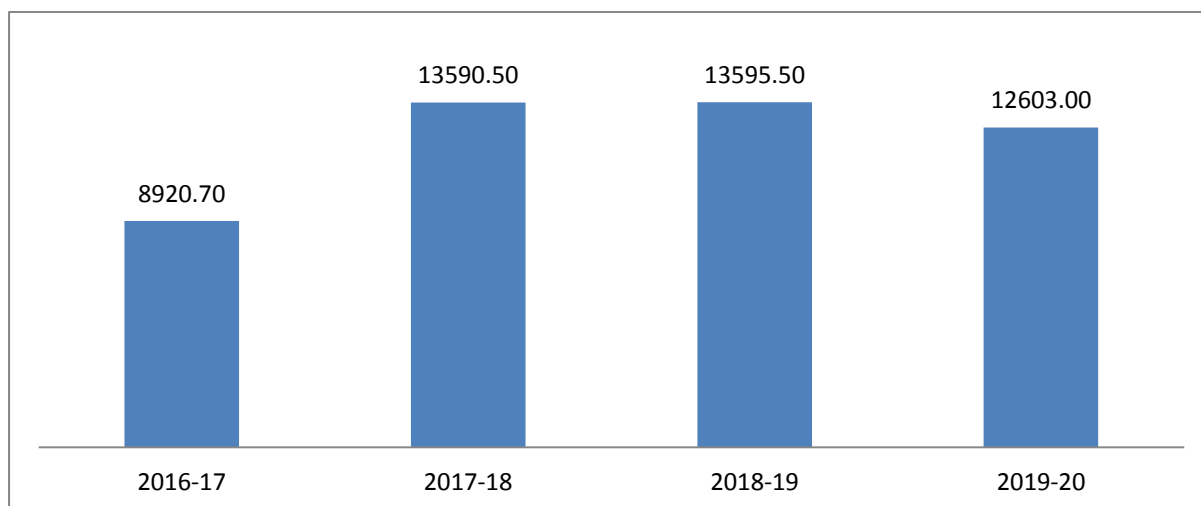
Table 6.2: Department wise Financial Outlay for PMKSY

Departments	2016-17	2017-18	2018-19	2019-20	Total
Cauvery Neeravari Nigam Limited.	4648.59	7252.50	7252.50	6260.00	25413.59
Agriculture and watershed department	2300.78	3407.00	3407.00	3407.00	12521.78
Minor irrigation	1785.00	2550.00	2550.00	2550.00	9435.00
CADA	14.33	15.00	20.00	20.00	69.33
Panchayat Raj	60.00	130.00	130.00	130.00	450.00
Fisheries Department	88.00	200.00	200.00	200.00	688.00
Horticulture Department	24.00	36.00	36.00	36.00	132.00
Total	8920.70	13590.5	13595.5	12603.0	48709.7

6.4 Year wise Strategic Action Plan

Year wise financial outlay for the four years can be observed in Fig.6.3. The total financial outlay required for four years i.e. 2016-17 to 2019-20 is Rs. 48709.70 lakh. In the first year of implementation, i.e. in financial year 2016-17, a budget of Rs. 8920.70 lakh is required. In the subsequent three years, Rs 13590.50 lakh, Rs 13595.50 lakh and Rs 12603.00 lakh budget is estimated for various departments.

Fig 6.3: Year wise Financial Outlay under PMKSY



6.5 Monitoring and Evaluation

The Strategic Action Plan of PMKSY will be monitored by the respective departments through the regular reporting system and component wise progress will be monitored by the District Level Irrigation Committee. Further, the activities, outputs and outcomes will be reported in web based MIS of PMKSY for review at state and national level. Some of the key indicators that will be used to monitor and evaluate the progress of PMKSY include:

- Annual irrigation water supply per unit irrigated area measured as the ratio of total volume of irrigation water supplied at intake divided by total area irrigated in all seasons
- Potential created and utilized measured as the ratio of total potential utilised (measured crop area) to irrigation potential created
- Output (agricultural production) per unit irrigated area measured as the ratio of total value of agriculture production divided by the total irrigated area.

- Output (agricultural production) per unit irrigation water supply measured as the ratio of total value of agriculture production divided by the total volume of irrigated water supplied.
- Total Operations & Maintenance (O&M) cost per unit irrigated area measured as the total Management, Operation and Maintenance (MOM) costs for the system divided by total area irrigated (potential utilised).
- Total Operations & Maintenance (O&M) cost per unit volume of water supplied measured as total Management, Operation and Maintenance (MOM) costs for the system divided Total volume of water supplied (all uses)
- Equity performance measured as actual area irrigated in head, middle and tail divided by Command area in head, middle and tail.

6.6 Suggestions

For successful implementation of PMKSY plan it is suggested that:

- All the stakeholders should convene meeting of Panchayat Samities and then finalise the village plan and prepare DPR.
- There should not be any duplicity of project.
- The Department should supplement each other so that the maximum irrigation efficiency is achieved.
- Agriculture and Horticulture Department should take micro irrigation projects in the command of minor irrigation projects which are either completed or likely to be completed in near future.
- All the irrigation projects should have a component of water conveyance so that the each drop of water is judiciously utilized.
- Where ever feasible, solar pumpsets should be installed.
- All the structures planned should be geo tagged and marked on map, so that social monitoring of the projects can be conducted. This will also avoid the duplicity.
- Priority should be given to projects to minimize the gap in potential created and potential utilized.
- Execution of the scheme should be expeditiously completed.
- There should be smooth fund flow for timely completion of the project and to avoid cost escalation.