

# Soil and Water environmental up gradation for Hirehalli Village Gram Panchayath in Karnataka by RS and GIS Technique

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## Abstract

The soil and water conservation structure is been proposed for the hirehalli village in karnataka. Action plan for the same is been developed in order to improve the agriculture productivity and to control soil erosion. These suggestion can be improve the village development. The driving force for the resulting spatial extent of these lands cover classes and their changes could be attributed to population growth demand for locally produced food products. Global issues such as higher energy process and climate change will potentially increase where humans live and how they use land for the various purpose. our projection of human population growth suggested that urbanization will obviously increase, this urbanization will further decrease the crop land.

**Keywords:** soil conservation. structure, water conservation structure, check dam, Nala bund. Vegetative check, Boulder check, De silting of tank, Recharge pit.

## 1. Introduction

Soil and water conservation structure is been designed to improve the quality of the life in the rural areas. Further efficient supply of water and efficient disposal of waste in every locality are the permanent civil needs. Effective utilization of natural resource and their management is very essential, it needs catalyze the planning process at gross root level each Panchayath or local body planning aims that inclusive participatory and co-ordinated approach for local area development. For the development of a plant resource in pre-requisite, reliable, and timely informed. To help agriculture and industrial improve water resources are very essential to create income in rural areas and it decrease poverty timely information on the available natural resource is highly essential to create compressive land use plan for sustainable development in extent to expanding population the demand of natural resources are excreting detrimental impact on environment.

## 2. Study Area

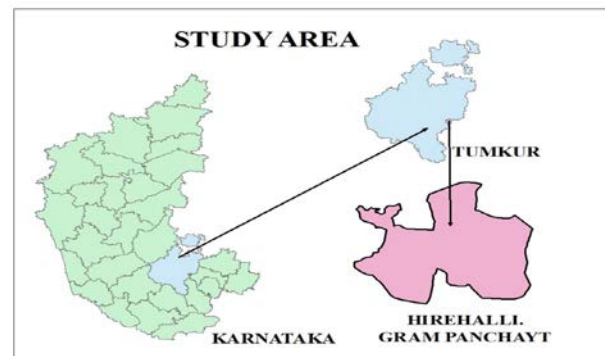


Fig 1: Study Area, Hirehalli Gram Panchayath.

The study area of the Hirehalli Gram Panchayath, Tumkur taluk. Tumkur District, it lies between 13°28'12" latitude, 77°18'84" longitudes. According to Census 2011 information the location code or village code of Hirehalli village is 611397. It is situated 12km away from Tumkur, which is both district & sub-district headquarter of Hirehalli village. Hirehalli has a total population 2435 peoples. As per 20011 statistics, Hirehalli village is a Gram Panchayath. The total geographical area of Hirehalli Gram Panchayath is 2405.50 hectares. The study area location map as shown in the Fig 1.

Surprisingly, there is found to be no soil and water conservation structure in this village, and agriculture is the main source of income in this area, hence 25 different water and soil conservation structure are been proposed for hirehalli gram panchayath village.

### 3. Data Used and Its Sources

The different software was used in the study mentioned below.

- Arc Map 10.1
- QGIS 2.12.0
- Microsoft Excel

Table 1. Data and Its Sources.

Data	Sources
LISS-IV+Cartosat-1 Cadastral Map Toposheet Vector Data Set CARTO DEM	Karnataka State Remote Sensing Applications Center Bangalore
School Attribute	PDO Hirehalli
Location Details Attribute Details	Field data collection and taluk Panchayath/G.P.
Road, Railway line, Vector Data:1:100000, LULC, Slope Map, Soil Map, Drainage, Geomorphology, Watershed.	SIS-DP project KRSRSAC
Rainfall Data	KSNDMC
Census Data	<a href="http://www.censusindia.govt.in">www.censusindia.govt.in</a> <a href="http://www.karnatakageoportal.in">www.karnatakageoportal.in</a>

### 3. Methodology.

Proposed Soil and conservation structure for hirehalli gram panchayath village can be achieved by various steps like, Collection of data, Identification of Ground Truth, and prepare a action plan.

#### 3.1 Collection of Data

The data like rainfall, temperature etc from various sources and various department has been collecteed. Satellite image of high resolution 0.6m is taken from KRSRSAC and different cadastral maps, thematic layers of the study area is been collected.all the maps are Geo Referenced and preparation of asset mapping and natural resurces is been mapped on the map, LU/LC is been Digitized for the village, and the satellite image in been overlaid on the thematic map.

#### 3.2 Identification of Ground truth

Field data is been collected, and different attributes like builtup area, soil map, crop land map, vegetative map is been mapped for the village, identifying the beneficiaries and gaps for the upcoming year has to be considered.

#### 3.3 Pre Processing.

The input data for the LU/LC Mapping of Hirehalli gram Panchayath is the CARTOSAT-1 and LISS-IV data provided by NRSC (National Remote Sensing Centre) to KRSRSAC (Karnataka State Remote Sensing Application Centre). The pre-processing was done by KRSRSAC and given for the current study. The CARTOSAT -1 LISS-IV Merged Images are Geo Referenced having a UTM projection and WGS 84 datum.

#### 3.4 To prepare a Action Plan

To Prepare the action plan land resource and infrastructure development has to be mapped using 2018 image as base and to collect the assets to identify the gaps and to show the asset location with survey number details then Implement the action plan village in order to prepare the village development plan.

### 4. Result And Discussion

Boundary map of Hirehalli Gram Panchayath is been Taken from KRSRSAC and Ground truth is been found from 8 different villages in the Hirehalli Gram Panchayath. Ground truth is a process of collecting the ground information with the help of GPS instruments, which acts as a reference for visual interpretation, usually ground truth points are collected at the roads, water body, school location, hospital etc. The GPS map camera app used for the ground truth data collection, because of its various features such as photograph of location with latitude longitude information time of acquisition, location of place in Google maps etc. The data set were used to create thematic layers and generated by using software Arc GIS version10.1. The layers were then geo processed and various Arc GIS tools were utilized to obtain the desired outputs from the data pertaining to Hirehalli gram Panchayath.



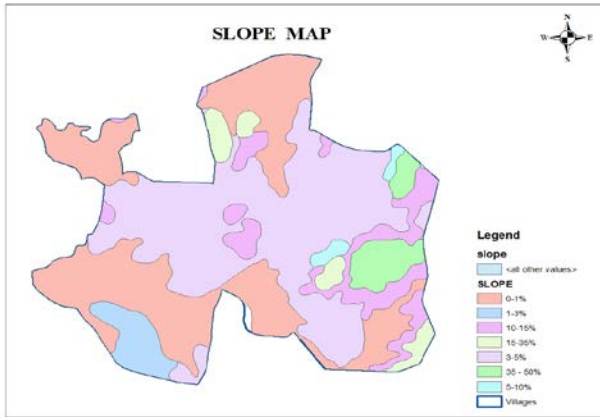


Fig 6. Slope map Of Hirehalli Village.

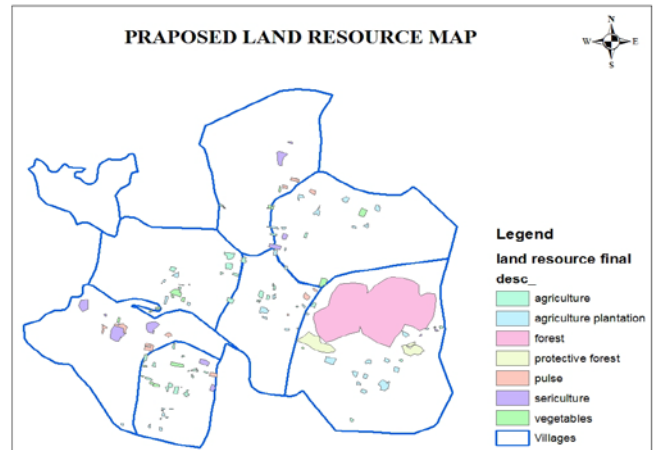


Fig 8. Proposed Land Resource Map.

#### 4.5 Soil Map

The different categories and the soil texture viz., clay gravelly loamy sand, loamy sand, sandy clay, and sandy loan shown in the Fig.7. The LU/LC is depends on the soil texture classes.

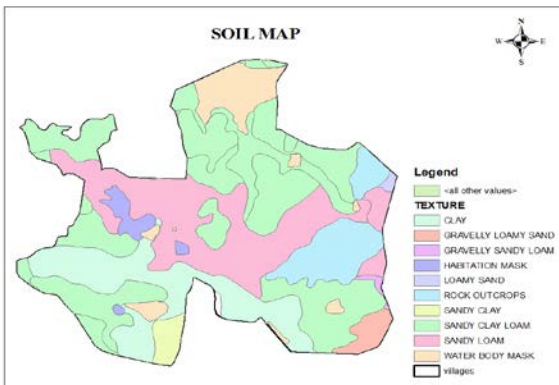


Fig 7. Soil Map Of Hirehalli Village.

#### 4.6 Proposed Land Resource Map

In this category include land under crop like irrigated, un irrigated, fallow, plantation etc. the data for land use/land cover can be obtained Karnataka State Remote Sensing Application Center .the collected data can be used to show the analysis of LU/LC the map

#### 4.6 Water Bodies Map

Formation of surface water in the shape of lake, pond stream reservoir canal etc. These areas generally possess blue to dark blue color shows water body depends on depth of water, it can be seen in satellite image. The water body which covers in the area 165.85ha in the Hirehalli Gram Panchayath. The red line indicates drainage line small blue color polygon shows ponds, lakes, reservoir, darks blue lines shows stream lines, of the Hirehalli Gram Panchayath in the year 2018

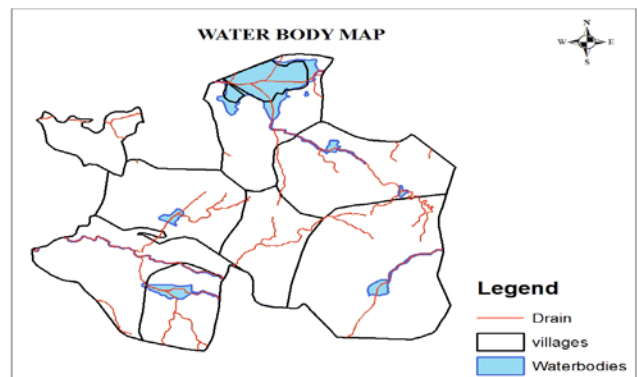


Fig 9. Water Bodies In Hirehalli Village.

#### 4.7 Built Up Area

In Hirehalli Gram Panchayath the built-up area was 3.38% in the year 2012, it was increased to 5.26% in the year of 2018. The increase built up was due to rapid urbanization and industrialization took place in the Hirehalli Gram Panchayath. The existing built up during 2012-13 was 3.38ha, whereas the proposed built up area is 6.25ha

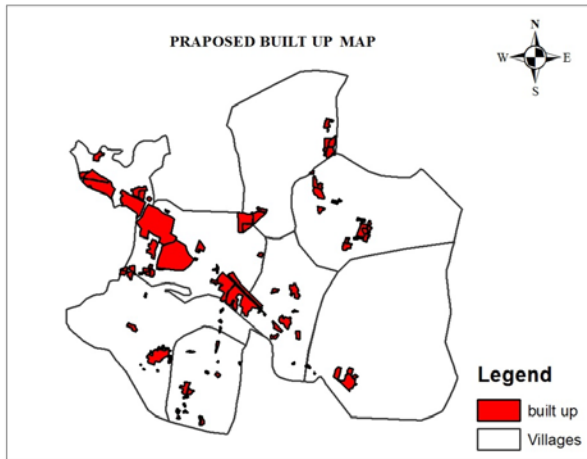


Fig 10. Proposed Built Up Map

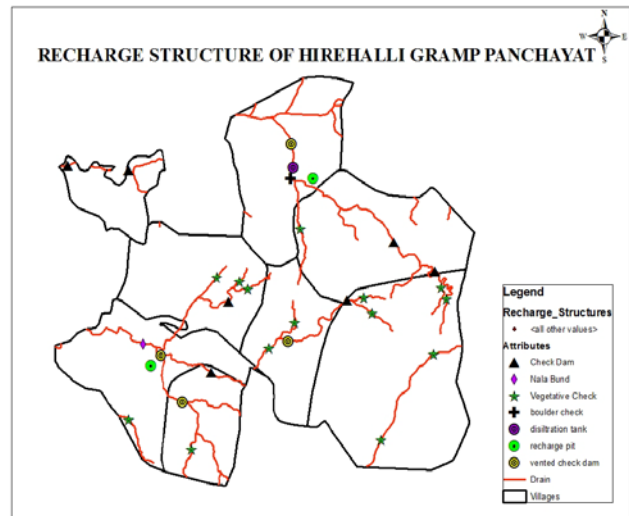


Fig 11. Recharge Structure Of Hirehalli Gram Panchayath.

#### 4.8 Recharge Structures

The different criteria consider for soil and water conservation for the Hirehalli G.P. (NRSC guidelines)

Table 2. Criteria considered for recharge structure for site selection

Recharge structure	Criteria to be considered
Check dam	They have been placed on the 1 <sup>st</sup> and 2 <sup>nd</sup> order stream, along the foot hill zones and in the areas with 0-0.5% slope
Percolation tanks	They have been placed on the 1 <sup>st</sup> to 3 <sup>rd</sup> order streams, located in the plains and valleys having sufficient weathered zones /loose material/fractures.
Recharge well	They have been placed in buried Padi plains with the top soil having low permeability or in the impervious zones
De silting of tanks	The de silting has been recommended in small tanks, which are partially silted up siltation in the tanks have been found by the studying the spectral signatures of the landsat8 satellite image and the by correlating it with the ground truth
Recharge pit	They have been located around the habitations where the drainage does not exist

Table 3. Existing And Proposed Recharge Structure.

Sl no.	Structures	Existing	Proposal action plan
1	Check dam	Nil	06
2	Nala bund	Nil	01
3	Vegetative check	Nil	14
4	Boulder check	Nil	01
5	De silting of tanks	Nil	01
6	Recharge pit	Nil	02
7	Total	Nil	25

The proposal recharges structure of Hirehalli Gram Panchayath Red color line indicates drainage line of the area, Black line shows village boundaries Recharge structure are very useful for to protect the soil and water conservation. The proposed Soil and water conservation structures of Hirehalli Gram Panchayath Tumkur taluk shown in Fig.11.

## 5. Conclusion

The study shows RS and GIS based on LU/LC mapping is very useful. It helps to change detection in the area. The proposed action plans of an area. The existing land use/land cover has been dynamic in nature from 2012 to 2016 Hirehalli Gram Panchayath Tumkur Taluk. The asset mapping shows exact location with their survey numbers. The study shows that there is slight increase in agricultural, builtup area and has been observed that there is drying up of water bodies. Natural resource amenities are identified throughout the planning area for both preservation and enhancement. Open spaces are viewed as a design amenity to be embraced and accentuated in development plans. The study we can suggest the horticulture and irrigation, agriculture and small industries in the Hirehalli Gram Panchayath and to suggest the soil and water conservation structure. The action plan for the area its helps in improve the agriculture productivity and to control soil erosion. These suggestion can be improve the village development.

## References

- [1] P Balakrishnan, Abu Ibrahim, Ground water quality mapping using GIS, A case Study of Gulbarga Karnataka, India, African journal of environmental science and technology, December 2011, Vol. 5(12), pp. 1069-1084.
- [2] Abhay Prakash, Sustainable watershed development of the Bandu village (India) watershed using advance geospatial techniques: A case study documenting the importance of Remote Sensing and GIS in developing nations. INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES, 2015, Volume 6, No 1.
- [3] Hariprasad N. V. , Dayananda H. S, Environmental Impact due to Agricultural Activities, International Journal of Scientific and Research Publications, may 2013, Volume 3, no:103.
- [4] L Udaya Simha and Vinay Shankar : Climate change, A case Study On regional basis, National conference on recent advances, Civil Engineering, Bangalore. Published by jain university, jnana chilume 2018: Set jain university ISBN: 978-81-936882: 05.
- [5] Brett A. Bryan , Simon Barry & Steve Marvanek: Development of a system to produce maps of Environmental profit on a continental scale. INTERNATIONAL JOURNAL OF GEOMATICS AND GEOSCIENCES, 2016, Volume 16, No 11.
- [6] Water quality analysis report for Hirehalli Village, Tumkur District ,Karnataka 2011.
- [7] [www.kgis.gov.in](http://www.kgis.gov.in).
- [8] Prajapati Girish, Sanju Vinchurkar, "Sustainable development in the watershed area Through water conservation activities", M.E. Dissertation, SanGadge Baba Amravati Univerisity, Amravati, April 2012.
- [9] (PDF) Study And Evaluation of Impact of Water Conservation Treatments On Selected Watershed Area. April 2019.
- [10] Kale, S.P.; M.D. Gund and R.B. Pawar, Effect of soil conservation measures and cropping systems on the soil and water conservation and the Biomass production in different micro watersheds. Indian J. Soil Conserv, (june 2010) 20 (1&2 ):70-74 vol 6.no12.