LAND SUITABILITY ANALYSIS

5.1 LAND USE SUITABILITY

The preparation of a development plan requires consideration of all components of the environment that exist before the creation of a new plan and the environment to be created by the new development plan. So, the plan may not be effective if any of these components is treated disjunctively. It is therefore essential that, a comprehensive development plan should interrelate all elements that form a community. It is primarily because, the land is a concrete form and any plan must be flexible enough to change established uses either to correct mistakes or to accommodate changing needs. The steps that are followed in the preparation of development plan proceed from deciding what land to develop to when and how to develop it. So, the development plan should encompass physical characteristics, constraints and socio-economic possibilities. Basically it refers to the potentiality of the land for development. Land potentiality includes both land suitability as well as land value. The land suitability designates land according to its physical capability regardless of any planner's conceptual interest. The land value should index the value of various sections of the land into three categories such as a) market value which is calculated from past, present and future values, b) subjective value of topographical characteristics and c) values of proximity. The integration of land suitability and land value maps produce a land potential map, which can be later, combined with socio-economic variables to prepare final alternative development plan.

Identification of suitable areas for urban development is, therefore, one of the critical issues in the preparation of a development plan. *In the present study, the task of Land Suitability Analysis has been carried out in association with Space Application Center, Ahmedabad.*

5.2 PARAMETERS

The land suitability is not only based on a set of physical parameters but also very much on the economic factors. The composite effect of these parameters determines the degree of suitability and also helps in further categorizing the land into different classes of development. Moreover, the process of suitability assessment is very much dependent upon the prevalent conditions such as pressure on land. If the pressure on land is too high, it may give rise to a high order of speculation and may lead to development of land, which is otherwise not suitable from suitability point of view. This clearly states that the level of inputs would be high due to the market forces. It is in this context, the suitability analysis attempted in this study must be viewed as a basic "*Prioritization of land for urban development*".

Therefore, in the development plan of Sangli town, a multi-disciplinary study (field surveys, ground realities, old maps and remote sensing imagery) has been taken up to carry out land use suitability analysis identifying the areas to be used for construction purpose and the areas to be conserved under green belt. The parameters considered for land use suitability are:

1. Existing land use
2. Hydro geomorphology
3. Ground water prospects
4. Geology
5. Lineaments (faults and fractures)
6. Soil depth
7. Soil texture
8. Slope in percent (gradient)
9. Flood hazard
10. Erosion hazard
11. Drainage
12. Surface water bodies
13. Existing infrastructure (distance from the road network, rail nodes etc.)
14. Land values and

15. Climatic variations

The assessment of physical parameters gives an identification of the limitations of the land for urban development (Table-5.1). The concept of limitation is derived from the quality of the land. For example, if the slope is high the limitation it offers is more than for a land, which has gentle slopes or a flat terrain. Practically, this would mean that the development of the high slope land would require considerable inputs (finance, manpower, materials, time etc.) and thus may be less suitable as against the flat land where the inputs required are considerably less. This concept is true for all the land parameters that are assessed.

In this particular study, some of the crucial physical parameters responsible for construction have been considered for analysis towards the identification of suitable areas for urban development in the town as well as its environs. This has been achieved adopting a multivariate index analysis of these parameters in GIS environment.

5.2.1 Multivariate Index Analysis

One of the classic problems in decision theory or multi-parameter analysis is the determination of the relative importance (weights) of each parameter with respect to the other. This is a problem, which requires human judgment supplemented by mathematical tools. As all parameters of the land cannot be weighted equal for the suitability assessment, it is essential that a weighted method needs to be employed where the relative importance of the parameters defines the weightage. A number of methods are available to deal with such problems.

Saaty has developed analytic hierarchy process to compare economy of different countries in the world. In this process, the weightage is assigned to each country with respect to the economic condition of other countries. This method is widely accepted for scaling the weights of parameter by constructing a pair-wise comparison matrix of parameters whose entries indicate the strength with which one element dominates over another vis-à-vis the relative criterion. The pair-wise comparison of parameters results into the "importance matrix", which is based on a scale of important intensities and is generated by a group of experts. The Saaty's scale of importance is presented in Table-5.2.

Therefore in this approach, first of all, the importance matrix for the parameters needs to be generated scaling the weights of parameters by constructing a pair-wise comparison matrix of parameters whose entries indicates the strength with which one element dominates over another vis-à-vis the relative criterion. The importance level will be assigned based on the consensus reached through discussion and also the experience of urban planning exercises. The importance of each parameter with respect to the other parameter will be determined and a matrix of “N” x “N” size will be created. The other elements of the matrix i.e. the lower portion of the matrix will be automatically determined by the reciprocal of the matrix. A sample of importance matrix generated earlier for the suitability analysis is presented in Table-5.2.

Table 5.1: Development constraints of various physical parameters in land suitability analysis

Sr. No.	PARAMETER	CATEGORY	CNSTRAINT	DEVELOPMENT CONSIDERATIONS
1	Soil	Soil depth	Foundation inadequacy	Very deep-to-deep soils are required for urban development from the foundation point of view as well as providing infra-structural facilities. The cost to be incurred for developing rocky areas is very high and un-economic.
2	Soil	Soil texture	Foundation inadequacy	Areas with unsuitable foundation materials such as swelling/shrinking soils, compressible soils etc. Pile foundation is required in such soils, which is expensive.
3	Physiography	Slope	Steepness and stability	Land with high and medium slopes (more than 7 percent) provides constraint for urban land use and development. It is uneconomic to develop this type of land.
4	Land use	Agricultural and forest lands	Productivity	Productive agricultural and forest lands should not be considered for development as they are essential for producing food and fiber wood etc.
5	Flood	Flood plains and low lying areas	Land subject of flooding.	Development of low-lying area is not cost effective.
6	Erosion	Ravinous land	Land subject to gully erosion	These are loose and unconsolidated material areas where the development cost is quite high.
7	Ground water	Excellent, Very good and good prospects	Conservation point of view	These are the areas to be conserved for the purpose of future water requirements and not to be taken up for urban development as water has already been over exploited.
8	Surface water	Lakes/Ponds	Conservation	Needs conservation for future use.
9	Geology	Rock types	Foundation inadequacy	Development of hard rock areas is very difficult when compared with soft rock areas.
10	Lineaments	Faults/fractures	Foundation inadequacy	Development should be considerable only in the areas, which are away from active faults.
11	Road	Road network	Infrastructure development.	Areas nearer to transportation network have higher potential for development. Areas away from the road network require development of infrastructure facilities and are expensive.

Table 5.2: A sample of Importance Matrix for urban land use suitability analysis

Sr. No.	Para-meter	SD	ST	SL	FL	ER	LU	GW	SW	Rdn	Rln
1	SD	1	5	2	3	3	3	1	1	8	7
2	ST	1/5	1	1/3	1/2	1/2	3	1	1	8	7
3	SL	1/2	3	1	1	1	3	1	1	8	7
4	FL	1/3	2	1	1	3	3	1/3	3	8	7
5	ER	1/3	2	1	1/3	1	2	1/2	1/3	8	7
6	LU	1/3	1/3	1/3	1/3	1/2	1	2	2	9	8
7	GW	1	1	1	3	2	1/2	1	1	9	8
8	SW	1	1	1	1/3	3	1/2	1	1	9	8
9	Rdn	1/8	1/8	1/8	1/8	1/8	1/9	1/9	1/9	1	1/4
10	Rln	1/7	1/7	1/7	1/7	1/7	1/8	1/8	1/8	4	1

SD = Soil Depth; ST = Soil Texture; SL = Slope; FL = Flood; ER = Erosion; LU = Land Use; GW = Ground Water; SW = Surface Water; Rdn = Road Network; Rln = Railway Stations.

5.2.2 Derivation of weightages for the parameters

Then, the importance matrix has to be solved to get the exact weightage values for all the parameters. There are number of methods available to solve the importance matrix viz. "Eigen vector" method (as proposed by Saaty) or "Least square" method to arrive at the weightages of each parameter. The matrix solving is essential to get the weightages for each parameter and to remove human bios in constructing the matrix.

Applying the above two methods, the actual weightages will be derived for the said parameters. The weightage tables will be made with respect to discussions to different group of experts. The weightage table will be created with respect to each group of experts will be assigned to the parameters in such a way that importance will be given to the most dominant factor for urban land use suitability with respect to a particular group of experts. For example, the first group of experts may feel that the tectonic activity is most important when compare to other parameters while assigning the weightages to all parameters. The second group of experts may feel that existing infrastructure is most dominant among all the parameters considered for urban land use suitability. Likewise, different groups feel different ways in assigning the weightages for urban land use suitability. In this particular study all the views of experts will be considered and planning scenarios will be created with respect to each importance matrix.

5.2.3 Assignment of ranks:

Assignment weightage is not enough in determining the urban land use suitability. It is necessary to consider each category in the parameter to assess the urban land use suitability for different purposes. It is in this context, a rank will be assigned to each category within the parameter depending upon its importance towards land suitability. The ranks to the individual categories are assigned in such a way that higher the rank higher is the suitability and lesser are the limitations. Lower is the rank, lower the priority for urbanisation and higher are the limitations for development. So, the categories of parameters considered for suitability are studied carefully and will be arranged in different ranges for the assignment of ranks. A sample of ranking to the categories is presented in Table-5.3.

Finally, an integration analysis will be carried out and a composite urban land development unit map will be prepared in GIS environment. Composite suitability indices will be obtained by multiplying weightages with rank numbers of each category and by summing up the values of all categories. The entire study area will then be divided into suitable classes for urban suitability based upon mean and standard deviation values of composite suitability indices for the purpose of identifying the areas for construction and the areas to be conserved under greenbelt.

5.3 STUDY AREA AND DATA ANALYSIS

The Sangli town is basically located comparatively on an elevated mound surrounded by small hillocks. The study area covers both the Sangli settlement area as well as its surroundings, measuring an area of about 2765 ha. The general ground level is around 7m to 8m above mean sea level (msl). However, the town is located between 45m and 60m above msl. The maximum height of the hill in the area is 92m above msl and is located on the ridge. The general topography lies around 30m height above msl. Towards east of the town, it has been observed that a 5 km long east-west trending ridge is manifested by the raised detached hills. West of Sangli town, a crescent shaped hill occupies the area on which the basalt of Deccan trap is exposed. The discontinuous hills also form the east-west trend in the western part of the town. About a kilometer north of the town, the slope is towards north. The general gradient is in the south direction particularly in the Sangli town and its southern part.

The thematic maps viz. land use map, hydrogeomorphology, ground water prospects, transportation network, surface water bodies etc. have been prepared using latest satellite data employing visual interpretation techniques in conjunction with the maps provided by Geological Survey of India (GSI), Survey of India topographic maps and ground survey. The information on other thematic maps such as geology, lineaments, soil information maps etc. were collected from ancillary data. All these maps have been registered with respect to a spatial framework created in GIS environment. The weightages for different parameters have been assigned after detailed discussions held with different thematic experts and groups. Weighted index analysis has been initiated. A composite coverage was generated by integrating all the above-mentioned thematic coverages. The composite coverage contains composite units and each unit has the characteristics of all the parameters considered for the suitability analysis. All the units were assigned weightages by creating separate fields in the coverage. The ranks with in the parameter were assigned to all the units by creating a separate field. Thus, each unit in the composite map is associated with both weightage and rank. Finally, a Composite Suitability Index (CSI) was calculated for each composite unit by multiplying weightage with rank of each parameter and summing up the values of all the parameters. Categorization of the CSI was achieved by ranging the CSI into four classes where each range indicates the amount of limitation acceptable for each class. The values related to minimum, maximum, mean and standard deviation of CSI were used for the categorization of land into various suitability classes. In all four urban land use suitability classes were identified in the study area based upon mean and standard deviation values. The classification of these four classes has been done using the following method.

Class I: $\text{Maximum} \geq \text{CSI} > \text{Mean} + 1\sigma$
Class II: $\text{Mean} + 1\sigma > \text{CSI} > \text{Mean}$
Class III: $\text{Mean} > \text{CSI} > \text{Mean} - 1\sigma$
Class IV: $\text{Mean} - 1\sigma > \text{CSI} \geq \text{Minimum}$
Where σ = Standard Deviation

Table 5.3: Ranking system for the categories with in the parameter

S. No.	Parameters	Range of values defining Rank-4	Rank-3	Rank-2	Rank-1
		Min.<----------------------	Limitation	---------------->Max.	
1.	Soil Depth	Very Deep	Deep	Moderate	Shallow
2.	Soil Texture	Sandy Loamy	Loamy	Clayey	Rocky/stony
3.	Slope	<5%	5-15 %	15-30 %	>30%
4.	Land use	Wasteland	Fallow	Plantation	Ag./Forest
5.	Ground water	Low	Moderate	Good	Very good
6.	Flood hazard	low	Moderate	High	Very high
7.	Erosion hazard	low	Moderate	High	Very high
8.	Surface water	Small/ Shallow Shallow	Medium/ deep	Large/ very deep	Large /
9.	Road dist.	<500m	500-1000m	1000-2500m	>2500m
10.	Rail head Distance.	<500m	500-1000m	1000-2500m	>2500m

Higher the CSI value, higher is the priority for urban development and lower are the limitations for development. Lower the CSI value, higher are the limitations for urban development and hence lower is the priority for urban development. Finally, the CSI values of composite coverage have been grouped into four categories of urban land use suitability. Therefore, the first two classes have been identified for urban development and the other two classes have been identified for conservation.

5.4 RESULTS

5.4.1 Land use/cover pattern

The existing land use/cover map of Sangli town was prepared using latest IRS data (LISS-III and Panchromatic data of IRS ID of June2001) at 1:12,500 scale employing visual interpretation techniques. The map has been finalized in conjunction with local maps, Survey of India topographic maps and ground truth data. The extent and spatial distribution of various land use categories are presented in enclosed map on land use and the area under different land use categories is presented in Table-5.4. As per this map, one can notice that in all there are four major classes identified in the study area. They are 1) Built-up land, 2) Crop land, 3) Wasteland, 4) Water bodies. The built-up land is further divided into five-sub categories viz. residential, commercial, industrial, public and semi-public and transportation (road and rail network). Among all the land use categories, the cropland is the major category in the area followed by built-up land and wasteland. The cropland occupies an area of about 5429.8 ha, built-up land with 3750 ha and wasteland with about 736 ha. The built-up land is centered around the township only and is encircled on the northeast and southwest by agricultural land. It has been observed that the built-up land is growing along the transportation network and the new Sangli Township is developing on the northern side of the railway line. Towns Sangli, Miraj and Kupwad appear to be growing towards becoming a conglomeration of a big town. As a result, the open/vacant land, cropland, fallow land and wasteland adjoining to these towns are being converted into built-up land. This phenomenon has been primarily observed along the transportation network between these towns.

Table 5.4: Land use/cover statistics

SN	CATEGORY	AREA (ha)
1.	Residential	1810.9
2.	Commercial	93.5
3.	Recreational	31.7
4.	Industrial	280.6
5.	Public & Semipublic	464.7
6.	Public Utility	59.3
7.	Open-Vacant Land	1813.3
8.	Transportation	1041.9
9.	Crop Land	5429.8
10.	Fallow Land	335.39
11.	Undulating Land with Scrub	264.51
12.	Undulating Land without Scrub	471.57
13.	River	150.01
14.	Water Bodies	147.8
	TOTAL SMKMC area	11174

Though the area is agricultural predominant, there is still an area of about 335 ha lies under fallow land. This land needs to be brought under cultivation by adopting various soil and land conservation measures. This productive agricultural land needs to be conserved at any cost to have a sustainable development in the region. The area under culturable wasteland is about 736 ha. As per the urban land use suitability criteria, this is the land, which is most suitable for urban development.

However, this land is not sufficient for the urbanization of Sangli town for the future period as the population of Sangli town has increased manifold from 202461 in 1971 to 271096 in 1981 and then jumped to 351917 in 1991 registering a decadal percentage rise of 32%. The urban population of Sangli town has shown a decadal growth of 30 per cent during 1981 to 1991. Therefore, it is necessary to identify area, which is most suitable for urban development in order to meet the needs of future generations of Sangli town. Hence, the land around the Sangli region has been studied in conjunction with land use, slope (gradient), soil depth, soil texture information, earthquake hazard and infrastructure etc. for the purpose of identifying the areas suitable for construction and the areas that needs to be conserved under greenbelt.

5.4.2 Percent Slope

The slope map was prepared using elevation information provided by total survey conducted in the study area and using TIN/Lattice model analysis in GIS environment. The map is presented in Map-2 and the area under each unit is presented in Table-5.5. As per this map, one can notice that the entire area is divided into seven slope classes. However, majority of the area lies in two classes viz. 0-1 percent and 1-3 per cent slope. Thus, the entire study area is a plain land with some dispersed undulations. From the suitability point of view, these areas are very good for construction activities. However, the area has to be studied in conjunction with various natural hazards before being taken for the urbanization.

Table 5.5: Area statistics of percent Slope classes

SN	CATEGORY	AREA (ha)
1	Nearly level (0-1%)	9104.34
2	Very gentle sloping (1-3%)	1756.04

SN	CATEGORY	AREA (ha)
3	Gently sloping (3-5%)	112.76
4	Moderately sloping (5-10%)	14.35
5	Strongly sloping (10-15%)	0.47
6	Moderately steep to steep (15-35%)	0.17
7	River/ Water body	185.86
	TOTAL	11174

5.4.3 Soil information

The Soil information collected from NBSS&LUP, Nagpur has been studied and soil coverage has been created. Each polygon has the information related to the association of soil series and its physical characteristics. Therefore, from this map, the information related to soil type, soil depth, soil texture and soil erosion have been extracted and thematic maps have been prepared separately. As it has been seen in Table-1, these parameters play a vital role in urban land use suitability analysis and identifying the areas for construction. These maps are presented in Maps 3,4 and 5 and the area under different units is presented in Table-5.6, 5.7 and 5.8.

The description of each soil unit in the study area is as follows.

SOIL TYPE-I: Loamy, mixed, calcarious, hyperthermic, Lithic Camborthids; Coarse loamy, mixed hyperthermic, typic Camborthids.

These soils are shallow, well-drained, calcareous loamy soils on very gently sloping residual hills with moderate erosion; associated moderately shallow, well-drained, coarse loamy soils on gently sloping lands, with severe erosion.

SOIL TYPE-II: Loamy, mixed, hyperthermic, Lithic Camborthids; Fine loamy, mixed (calcareous), hyperthermic, typic Calciorthids.

These soils are shallow, well-drained, loamy soils on gently sloping, residual hills with moderate erosion; associated with deep well drained, calcareous, fine loamy soils with moderate erosion.

SOIL TYPE-III: Loamy, mixed, hyperthermic, Lithic Camborthids; Fine loamy, mixed (Calcareous), hyperthermic, Ustochrepts, Camborthids.

These soils are shallow, loamy soils on very gently sloping, residual hills with severe erosion; associated with deep, well drained, calcareous, fine loamy soils with severe erosion.

Table 5.6: Area under Soil depth classes

SN	CATEGORY	AREA(ha)
1	Deep	8855.95
2	Very Shallow	2132.19
3	River/ Water body	185.79
	TOTAL	11173.9

Table 5.7: Area under Soil texture classes

SN	CATEGORY	AREA(ha)
1	Fine	8089.71
2	Fine calcareous	766.255

3	Loamy	2132.19
4	River/ Waterbody	185.779
	TOTAL	11174

Table 5.8: Area under Soil erosion class

SN	CATEGORY	AREA(ha)
1	Moderate	10988.1
2	River/ Waterbody	185.811
	TOTAL	11173.9

5.4.4 Road Network

The road network is one of the important parameter in identifying the areas for urban development as it provides linkages between the settlements. The entire study area has been classified as major roads and minor roads.For the purpose of urban land use suitability analysis, all-important roads have been taken from the transportation network map prepared using RS and SOI maps. Buffer zones of 500m, 1000m and 2000m on either side of these roads have been generated. The area lying 500 m distance on both sides of the road network is ranked high for development and consequently the area lying between 1000m and 2000m is ranked low development. The area under each buffer zone is shown in Table-5.9.
Road buffer zones map is enclosed

Table 5.9: Area under different road buffer zones

SN	CATEGORY	AREA(ha)
1	0 – 500 m	4001.71
2	500 – 1000 m	2930.72
3	1000 – 2000 m	2749.5
4	> 2000 m	1306.23
5	River/ Waterbody	185.8
	TOTAL	11174

5.4.5 Rail Network

Sangli town is one of the important settlements in the Maharashtra state region. It is well connected by rail (broad gauge railway line) to Belgaum, Kolhapur, and Mumbai. It is also connected by narrow gauge railway line to Pandharpur from Miraj.The buffer zones of 500m, 1000m, and 2000m have been created around the rail node for the purpose of urban land use suitability analysis (Map-9). Similar to road network, the area nearer to railway station gets a higher rank for development and area away from the railway station gets low rank for development. The area under each buffer zone is shown in Table-5.10.

Table 5.10: Area under Railway node buffer zones

SN	CATEGORY	AREA(ha)
1	0 – 500 m	167.34
2	500 – 1000 m	496.303
3	1000 – 2000 m	1981.52
4	> 2000 m	8343
5	River/ Waterbody	185.8
	TOTAL	11174

Table 5.11: Earthquake hazard zone area statistics

SN	CATEGORY	AREA(ha)
1	Moderate risk zone	1556.52
2	Low risk zone	2536.37
3	Very low risk zone	6895.33
	River/ Waterbody	185.779
	TOTAL	1556.52

5.4.6 Integrated analysis for urban suitability in GIS environment

As per the methodology mentioned in section 3.0, weightages are given to the physical parameters, by comparing each parameter with respect to the other parameter. Three different models have been prepared by giving importance to different parameters. The weightages assigned for all the parameters in three models are given in Table 5.12 The ranks to each category within the parameter have been kept same for all the three models as per the methodology given in section-3.0

The urban land use suitability maps prepared using three different models are presented in Maps 10, 11 and 12. The map presented in Map-11 (i.e. Model I) has been taken up as the final suitability to be adopted for the study area. The observations made from this map are as explained below.

The model selected for implementation in the entire study area has all the four suitability classes and are well distributed. The area under each suitability class is presented in Table-14 (Model-1).

Class-I (Highly suitable) covers an area of about 615.8 ha and Class–II (Moderately suitable) cover an area of about 2486.7 ha in the study area. Areas under class-III (Less suitable) are about 3494.1 ha and constitute the areas where there is poor accessibility, good ground water prospects, earthquake and erosion hazards. Class-IV is about 1127.2 ha and the area has productive agricultural lands away from the existing settlement with very poor accessibility and good ground water potential. Rest of the area is under water bodies. The first two classes are of great importance for the purpose of future development of the Sangli town. The area under the other two classes needs to be conserved as they constitute productive agricultural lands, very good to good groundwater prospects, erosion and earthquake prone.

The area under first two urban land use suitability classes is best for the development in the Sangli town. However, engineers have a different approach towards soil classification. This is mostly based on soil physical properties such as texture, permeability, water content, plasticity and consistency etc. Such properties are required to be tested for each site. Detailed soil property description available can be interpreted for engineering properties. These will provide only generalized information for the evaluation of different areas. The development considerations with respect to all the four urban land use suitability classes are presented in Table-16. From this table, it is clear that intensity of engineering investigations are either negligible or less in the first two classes of suitability. As the investigations are negligible, the cost for construction also becomes very low. Similarly, the 3rd and 4th classes of suitability require medium to intensive engineering works, which result in high costs for development. It is in this regard; the geo-technical investigations (Standard Penetration test and Unconfined Compressive Strength) carried out by GSI have to be taken into consideration while developing the land particularly in Class-1 and Class-2 suitability areas.

Table 5.12 : Weightages derived for the ten parameters

S.No.	Parameter	Weightages		
		Model 1	Model 2	Model 3
1	Soil depth	0.235	0.130	0.103
2	Soil Texture	0.068	0.068	0.068

S.No.	Parameter	Weightages		
		Model 1	Model 2	Model 3
3	Slope	0.150	0.150	0.150
4	Flood hazard	0.113	0.113	0.113
5	Erosion hazard	0.076	0.076	0.076
6	Land use	0.068	0.068	0.200
7	Ground water	0.146	0.146	0.146
8	Surface water	0.103	0.103	0.103
9	Road network	0.024	0.129	0.024
10	Railway station	0.017	0.017	0.017

Note :
Model – 1 : Soil depth and slope parameters have been given more importance
Model – 2 : Road network and soil depth have been given equal importance and
Model – 3 : Land use have been given more importance.

Table 5.13: Urban suitability classes versus development considerations

Sr. No.	CONSIDERATIONS	URBAN SUITABILITY CLASSES			
		Class-I	Class-II	Class-III	Class-IV
1.	Overall degree of constrains	Negligible	Slight	Moderate	Severe
2.	Urban land use suitability	Very high	High	Moderate	Low
Suitability with respect to land use types					
1.	High rise structures	Highly suitable	Moderately suitable	Not suitable	Not suitable
2.	Medium rise structures	Highly suitable	Moderately suitable	Not suitable	Not suitable
3.	Low rise structures	Highly suitable	Moderately suitable	Not suitable	Not suitable
4.	Active recreation(the term active relates to the amount of ground disturbance only)	Highly suitable	Moderately suitable	Not suitable	Not suitable
5.	Passive recreation(the term passive relates to the little disturbance of land during development)	Highly suitable	Moderately suitable	Not suitable	Not suitable
6.	Protection under green belt	No	No	Yes	Yes
Development considerations					
1.	Intensity of engineering investigations	Negligible	Low	Medium	Intensive
2.	Engineering costs	Low	Low	Medium to high	High to uneconomic

(Modified from urban land use capability survey handbook , Welington, 1987)

Table 5.14 Urban land use suitability area statistics (model-1, more significance to : Soil)

SN	CATEGORY	AREA(ha)
1	Highly suitable	615.8
2	Moderately suitable	2486.7
3	Less suitable	3494.1
4	Not suitable	1127.2
5	Existing built-up	3264.4
6	River /Waterbody	185.9

SN	CATEGORY	AREA(ha)
	TOTAL	11174.0

Table 5.15 Urban land use suitability area statistics (model-2 More significance to : Land use)

SN	CATEGORY	AREA(ha)
1	Highly suitable	632.1
2	Moderately suitable	1080.2
3	Less suitable	4383.8
4	Not suitable	1627.6
5	Existing built-up	3264.4
6	River /Waterbody	185.9
	TOTAL	11174.0

Table 5.16 Urban land use suitability area statistics (model-3 more significance to : Transportation network)

SN	CATEGORY	AREA(ha)
1	Highly suitable	848.2
2	Moderately suitable	2557.5
3	Less suitable	2776.8
4	Not suitable	1541.3
5	Existing built-up	3264.4
6	River /Waterbody	185.9
	TOTAL	11174.0

5.5 TO SUMMARIZE

1. In the development plan of Sangli town, a multi-disciplinary study (field surveys, ground realities, old maps and remote sensing imagery) has been taken up to carry out land use suitability analysis identifying the areas for "*Prioritization of land for urban development*". The parameters considered for land use suitability are:

    1. Existing land use
    2. Hydro geomorphology
    3. Ground water prospects
    4. Geology
    5. Lineaments (faults and fractures)
    6. Soil depth
    7. Soil texture
    8. Slope in percent (gradient)
    9. Flood hazard
    10. Erosion hazard
    11. Drainage
    12. Surface water bodies
    13. Existing infrastructure (distance from the road network, rail nodes etc.)
    14. Land values and
    15. Climatic variations

2. Physical parameters responsible for construction have been considered for analysis towards the identification of suitable areas for urban development in the town as well as its environs adopting a multivariate index analysis of these parameters in GIS environment.

3. Three models have been derived from the Integrated analysis for urban suitability in GIS environment as per the methodology detailed out in the relevant section on Land Suitability Analysis. Of these, Model 1 has been taken up as the final suitability to be adopted for the study area. The model selected for implementation in the entire study area has all the four suitability classes and are well distributed. Class-I (Highly suitable) covers an area of about 615.8 ha and Class–II (Moderately suitable) cover an area of about 2486.7 ha in the study area. Areas under class-III (Less suitable) are about 3494.1 ha and constitutes the areas where there is poor accessibility, good ground water prospects, earthquake and erosion hazards. Class-IV is about 1127.2 ha and the area has productive agricultural lands away from the existing settlement with very poor accessibility and good ground water potential. Rest of the area is under water bodies. The first two classes are of great importance for the purpose of future development of SMKMC area.