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Study and Analysis of Economic Conditions of Two Talukas using Geo-Informatics Technology

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***Abstract* - This paper mainly focuses behind the role of irrigation in the socio-economic development of rural areas along with other parameters like education, health-care facilities, connectivity etc. In this project villages of two talukas, Anand and Limbdi are compared using Geo-Informatics software, Quantum GIS. The method used for the analysis is Analytical Hierarchy Process (AHP), in which pair wise comparisons are made. Finally an index is generated for each village. Villages are compared within the taluka and between other villages of other taluka. As per the results most of the villages of Limbdi taluka have a lower index value because of low level of irrigation as compared to Anand (where most of the area is irrigated). Finally, we have suggested the measures for proper utilization of large wastelands present in Limbdi taluka so as to provide an alternative source of income and employment to rural people and thus improve the village economy.**

INTRODUCTION

Motivation

Development is the process of economic and social transformation that is based on complex cultural and environmental factors and their interaction. Land, labour and capital (Physical and Human) are the inputs required for growth. But however history has shown water has been an important factor of settlement. For example even though Land is required for cultivation, water is required for the crops. Capital in the form of industries and educational institution setup where there is availability of water. And also we know that water is the most basic need of life.

Using this as our base we thought of comparing the two talukas Anand (a very well irrigated taluka) and Limbdi (not so well irrigated compared to Anand) in terms of some development parameters so as establish a relation between development and availability of water/ level of irrigation.

Purpose of the Research

In rural India because of improper planning farmers rely mainly on rains and whenever there is a delay in rain it leads to crop failure. Also the farmers are seasonally employed because they either grow kharif crop or Rabi Crop leading to poverty. Also there is a huge amount of wasteland available in these areas which have not been properly utilized. Thus we will be suggesting the ways for the better use of these wastel-and and redistribution of public funds along with skill development to provide conditions for overall socio-economic development of these areas (mainly for Limbdi since Anand is better off).

Objectives

Our project is "Study and Analysis of Economic Conditions of two Talukas using Geo-Informatics Technology", which is basically the study of economic conditions of the rural areas of Gujarat and its relation to the level of irrigation and availability of water supply in those areas. In this project we will be comparing two talukas of Gujarat namely Anand and Limbdi and their villages and comparing the level of development in these areas. We need to show by developing an indicator that in rural India irrigation and water availability are the major factors leading to their overall development like schools, hospitals, and better availability of basic amenities of life and a comparatively higher proportion in the number of literates as compared to rural areas which are less irrigated and have large number of wastelands.

Scope

To compare the villages we developed an indicator using the Analytical Hierarchy Process (AHP). However the drawback of the process is that AHP can incorporate only fifteen parameters of development. Secondly there might be some exception that is even though some villages might be less irrigated they might be more developed. This might happen due to other factors such availability of more number of schools, amenities, hospital. Also some of the data was not available with us so we had to put a dummy variable. We did that by giving equal weightage to all the villages.

Methodology

The methodology used in this project is quite different from that generally applied in similar contexts. Generally analysis is based on the raw data available but in this project we used Geo-Informatics technology combined with the census data and other data sets provided by the government and based on this combined data results were evaluated. Suggestions were provided as per the evaluated results.

STEP 1:

Using open-source software Quantum GIS and the vector and raster data about the geography of the areas being compared, Geo-Spatial maps were generated and parameters such

as total area the talukas, individual village area, irrigated land area in individual villages etc. were calculated and data sheets are generated.

The diagram below illustrates the work done for Anand using QGIS for different villages.

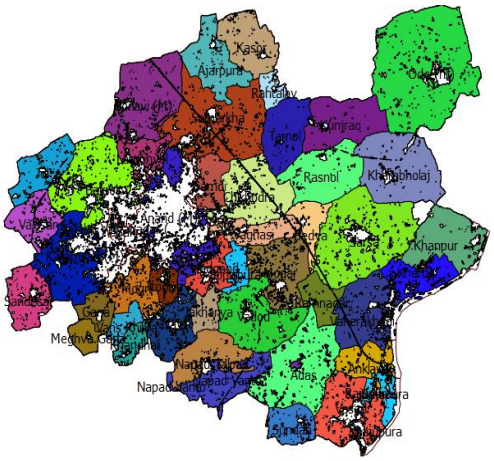


Fig1: Anand Taluka Village Boundary

STEP 2:

Using Google Earth software the wasteland areas were marked for individual villages and total wasteland area was calculated. This calculated data was then combined with the information generated from QGIS to calculate the proportion of irrigated area and wasteland area out of total available area. Following image is imported from Google earth for a village called Jambu in Limbdi.

FIG2: Google Earth Showing Wasteland

In this image area in yellow shade is waste land.

STEP 3:

Using the data sets generated from the two software, the census data about the total population, population of people in different age groups, sex, demographics, literates, labour population etc. are finally combined for each area for their analysis.

STEP 4:

Different economic indicators were generated using the information collected and different areas were then evaluated based on these indicators and were compared to know their level of economic development. The method used for the comparison is called Analytical Hierarchy Process (AHP). Using the AHP method an index value was generated to compare the villages. AHP was used to compare villages among the same talukas and also the villages in two different talukas.

STEP 5:

The index value thus generated using AHP was then used to compare it with the ratio of total irrigated area to total area of each village so as to verify whether the final results were those intended or not. Index value was compared to the ratio instead of total irrigated area of each village because the total area of each village differed to a large extent and we intended to compare the level of irrigation of each village not the total area actually irrigated.

STEP 6:

Villages were visited to get a clear picture of what actually can be done and how exactly can the wasteland be utilized properly.

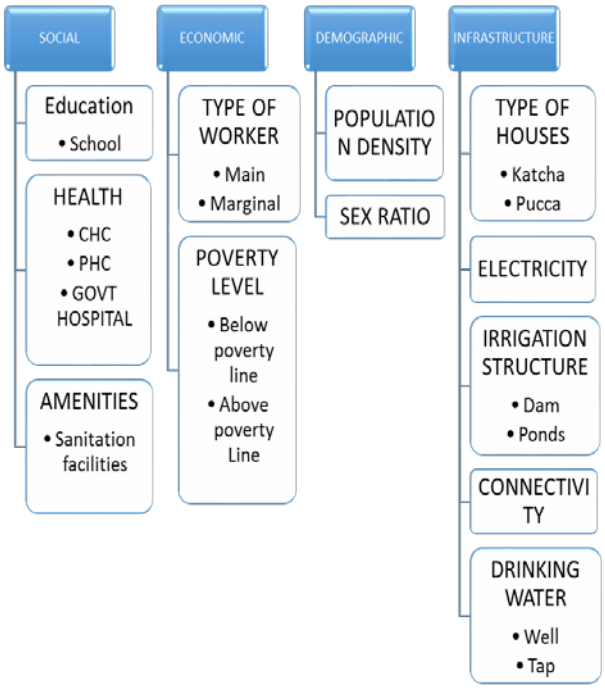
STEP 7:

Suggestions were given about the allocation of public funds and development of basic infrastructure in the backward areas so as to attain an overall development as the areas with the natural level of irrigation and availability of water sources. Mainly suggestions are based on the proper utilization of wasteland, setting up industries, small businesses and skill development.

Parameters used for Analysis

The parameter we considered are as follows along with their weights assigned for AHP (Analytical Hierarchy Method):

Table 1: Parameters of Development



Drinking Water: 9

• Proper drinking water is one of the basic necessity for human life plus its availability also shows the level of development in the area.
• It is the most important requirement for a healthy population, whether it is skilled or unskilled, literate or illiterate, rich or poor etc.
• Also history shows that most of the developed areas were located near fresh water bodies to support the subsistence of population.

Connectivity: 7

• Proper connectivity is one of the most important indicator for development of an area.
• Proper connectivity especially through road transport in rural area signifies that the produce of the farmers can easily reach the towns and cities nearly. This enables them to receive a suitable and fair price for their crops.
• It also enables other employment opportunities for the locals in nearby towns and cities.
• Easy transportation of fertilizers, seeds and equipments.
• Enable other services like proper functioning of healthcare centers, easy travel of teachers and other professional to rural areas for skill development.
• With proper connectivity locals can use easily use the services prevalent in urban areas like banking, hospitals, schools, entertainment services etc.

Electricity: 7.5

• We can assume almost no development without electricity. Now it seems to be almost impossible to assume life without electricity.
• It brings with the fulfilment of basic household as well as agricultural needs.
• It provide proper irrigation through tube wells.
• It also allows the threshing, winnowing, separation and other services locally.
• It also provides a lost cost alternative to the machinery based mainly on fossil fuels etc.
• It fulfils basic household needs such a TV, refrigeration, mixer grinders, washing machines etc. It basically automates most of the manual work in a typical house. The time saved due to this automation can be used for other productive purposes.
• It provide lighting at night and thus enables a secure environment.

Education Facilities: 6

• Children are the future of tomorrow. We need to educate them. Also we need to educate the people so that no one can take undue advantage of them.
• In today's world literate population forms the backbone of the economy.
• Education will also help them to understand that how could they increase their crop productivity.
• It helps to increase human capital and bring alternative source of employment.
It is given less weightage because its effects cannot be seen in a short term period.
• Although it brings an overall development to the rural economy, most of the literates try to migrate to urban areas for better employment opportunities, not affecting the development of rural areas much.

Health Facilities: 8.25

• It is one of the most basic necessity of any region, whether be rural or urban.
• Health services like CHC, PHC, SC etc. provides cheap healthcare services.
• It also brings other opportunities like medicals stores, vaccinations, awareness about basic sanitation etc.
• It brings skilled labour to these areas and also provide employment to local people.
• Ensures a healthy working labour force and citizens.
• Raise general awareness among locals.
• It is given a high weightage because it is one of the most basic necessity of any society.

Amenities: 7

• Amenities include warehouses for crops, factory, cyclone shelter, aganwadi etc.
• Farmers require a warehouse to store their crop
• Also they can act as areas of protecting the cattle in times of disasters.
• However it is not the most basic need of live.
• Thus has been given a weight of 7.

Poverty Level: 8

• It defines how much can people spend per day or simply their economic condition.
• Poverty level directly signifies the level of development in any area.

• This parameter is of high importance, especially in rural areas as it defines the overall economic development of that area.
• It also signifies the capacity of farmers and others locals to produce their products and their ability to purchase and expand what they are doing.
• If an area is very poor it also restricts innovations and improvements, large no. of innovations and basic structural improvements are observed in places where economic status is quite good.
• This is one of the reason for such a high level of growth in urban areas as compared to rural. This is the reason that poverty level is given such high weightage.

Irrigation Structure: 8.5

• It defines the mode of irrigation used. For example tube wells, canals, rivers, local bodies like ponds, lakes, check dams etc.
• Though monsoon is one of the biggest factor for the total irrigation in any area, but it is not always sufficient due to its uncertainty. It also varies to a great extent from time to time and region to region.
• Alternative sources of irrigation are very important for overall agriculture because it can ensure a timely sowing and harvesting of crops.
• Areas where tube wells are not restricted generally have a far better level of irrigation than areas that totally depend upon monsoon.
• Presence of canals have shown a great improvement in the overall level of irrigation in most of the areas and it can be easily seen in comparison of Anand with Limbdi.
• Development of local water bodies like ponds, lakes and check dams ensures better irrigation for a small area around it. Also these water bodies can be efficiently used for rearing cattle and for fisheries.
• Agriculture is the backbone of the rural economy and provides subsistence to majority of Indian population so it is highly important to support it by developing an advanced irrigation structure.

Population Density: 5

• It can be defined as the total population living on an unit area of land. Usually defined in terms of number of people living per square kilometer of area.
• Usually urban areas have a very high level of population density as compared to rural areas due to lack of availability of land.
• A very low level of population density signifies a low level of development, while a very high level can cause congestion problems.
• In our analysis a higher population density signifies a higher development, but it is not a very crucial factor for rural development. That's why it has been assigned a significantly lower weight.

Wasteland Area: 4.5

• Wasteland refers to the area which is naturally not cultivable, also most of the time if it is cultivated artificially it how produce a very high yield.
• Only a very few types of trees and shrubs can be grown on a wasteland.
• The more the wasteland in a rural area, less will be the cultivable area and thus less produce.
• Wasteland can be effectively be used for non-agricultural purposes such as setting up industries, building of settlements etc.
• It has been assigned very less weight as most of the wasteland negatively impact rural economy unless they are used for other productive purposes.
• Effect on growth on the level of wasteland present in an area can be easily seen in most of the villages of Limbdi Taluka, where there is a very large area of wastelands. While at the same time economy of villages in Anand is significantly higher as on an average more than 90% of the area is irrigated and a very less wasteland area is present.

Main / Marginal Workers Ratio: 8.75

• Main workers refers to the workers that work throughout the year, while marginal workers refer to those that work of less than 183 days a year.
• This ratio defines the no. of workers that work throughout the year to those that work for nearly half the year.
• This parameter is of great significance because more the no. of main workers more will be their contribution towards the rural economy throughout the year. If in a village there are more no. of marginal workers then they will remain unemployed for nearly half the year and won't contribute much towards the village economy.
• This also defines the type of population and how much capacity they have to use alternative sources for their production rather than being dependent only on the natural resources.
• Because of their high contribution towards the development of the rural area, this parameter is assigned a high weight.

Sex Ratio: 4

• Sex ratio of an area is defined as the ratio of total female population to total male population of an area.
• In most parts of the world a higher sex ratio signifies an urban population, educated and aware population.
• Ideally this ratio should be equal to 1, but in most part of the India its less than one.
• Though higher sex ratio defines an educated urban population in rest of the world, in India a different trend can be seen according to recent surveys. In India it is seen that in most developed areas the sex ratio is significantly lower than that of many rural areas.
• Also the sex ratio alone does not play a very important role in village economy.
• Due to these reasons it is assigned a very low weight in economic parameters.

Literate / Illiterate Population Ratio: 7.75

• This ratio defines the total literate to illiterate population in a village.
• It is significant because higher the literate population, higher will be the human capital and thus higher intangible resources associated with it.
• A literate population can take wise decisions both personally and professionally. They have a knowledge of advanced techniques and are aware of current technology being used.
• A literate population open the doors for employment opportunities other than traditional agricultural jobs.
• Through their knowledge they can increase the yield, get better and fair prices for their products and can make informed decisions.
• Also a literate family inspires the next generation to be literate and they are more open to innovations and other opportunities.
• A literate population can also bring in other jobs and services to the village itself, which can highly contribute to village economy.
• High development of urban areas can be attributed to its large literate population. That is why this factor is assigned a high weight as it can also help a lot in agricultural development.

Analysis and Results

Using AHP method we compared villages for the level of economic development on the basis of thirteen parameters that were taken into consideration. The data for the two talukas for all the parameters were not available, so we had used only the data that was available. Rest all other parameters were allotted equal weight as parameters in AHP must have some weight allotted to them.

Using AHP an index value was generated for the analysis of the data. The sum of the index values for all the entities being compared sum up to one, as it becomes easier to compare them.

Initially we have compared the villages within the same taluka and then all the villages of both talukas combined were compared together. In comparison within the same taluka we could identify the backward areas of that talukas but it will not serve the purpose we are seeking fully. So both the talukas were compared together and comparisons were made and results were almost same as we expected.

The AHP index values along with the fraction of area irrigated for Anand taluka.

Table 2: AHP value for Anand

	1	2	3	4	5	6	7
1	TALUKA	Village name	Village_Id	Ahp Index	Irrigated A	Total Area	irrigated/totalarea
2	ANAND	Rajupura	1.5004E+14	0.014457	2.544	3.557682	0.715072376
3	ANAND	Vans Khiliya	1.5004E+14	0.014768	2.321	2.45381	0.945876021
4	ANAND	Lambhvel	1.5004E+14	0.016309	3.964	5.206395	0.761371307
5	ANAND	Gopalpura	1.5004E+14	0.016765	2.703	2.881831	0.937945264
6	ANAND	Meghva Gana	1.5004E+14	0.016793	2.562	2.673969	0.9581262
7	ANAND	Anklavdi	1.5004E+14	0.01702	4.998	6.15145	0.812491351
8	ANAND	Bedva	1.5004E+14	0.01743	3.923	4.182287	0.93800345
9	ANAND	Khandhali	1.5004E+14	0.017488	2.694	3.069558	0.877650889
10	ANAND	Ramnagar	1.5004E+14	0.017775	4.434	4.588004	0.966433254
11	ANAND	Vaghasi	1.5004E+14	0.017862	4.962	5.949934	0.833958799
12	ANAND	Sundan	1.5004E+14	0.018098	4.924	5.325553	0.924598794
13	ANAND	Hadgood (CT)	1.5004E+14	0.018202	3.726	4.606954	0.808777345
14	ANAND	Gana	1.5004E+14	0.018384	3.213	3.514529	0.914204884
15	ANAND	Kasor	1.5004E+14	0.0187	8.598	9.002161	0.955103956
16	ANAND	Valasan	1.5004E+14	0.018965	5.733	6.565022	0.873264345
17	ANAND	Mogri (OG) WARD NO.-0015 (Ru	1.5004E+14	0.019184	6.199	8.397138	0.738227754
18	ANAND	Jol	1.5004E+14	0.019319	6.897	7.457687	0.924817531
19	ANAND	Mogar	1.5004E+14	0.019749	9.359	10.92314	0.856804726
20	ANAND	Sandesar	1.5004E+14	0.020128	6.569	7.210549	0.911026331
21	ANAND	Jitodiya (Part)	1.5004E+14	0.020332	2.435	3.190696	0.763156393
22	ANAND	Tarnol	1.5004E+14	0.020566	8.761	8.962055	0.977565993
23	ANAND	Kherda	1.5004E+14	0.020685	5.934	7.422209	0.799492473

From the above image it can be seen that the villages with low AHP index values have lower percentage of irrigated area as compared to the villages with high AHP index. There are a few exceptions where the level of irrigation is high but it have lower AHP index value. We may accrue this discretion in the results to the unavailability of data for various high weight parameters or to other factors other than level of irrigation. But result for most of the villages is consistent with the objective of the project.
The AHP index values along with the fraction of area irrigated for Limbdi taluka.

The same analysis was done for Limbdi also and results here were more consistent than Anand because Limbdi has very less irrigated area as compared to Anand. For the low index values its about 2-10 % of total area, whereas most of the villages in Anand taluka had more than 70% of their total area irrigated.

Table 3: AHP value for Limbdi

	1	2	3	4	5	6	7
1	TALUKA	Village Name	Village_Id	Ahp index	Irrigated area	Total Area	Irr/Are
2	Limbdi	Ghaghosar	8.01001E+13	0.009504175	0.10522	4.978377368	0.021135401
3	Limbdi	Jaliyala	8.01001E+13	0.010318355	0.2856	4.747156749	0.060162328
4	Limbdi	Dhalwana	8.01001E+13	0.010565814	0.8276	12.88258032	0.064241788
5	Limbdi	Gadthal	8.01001E+13	0.010834485	1.039	11.15031583	0.093181217
6	Limbdi	Parali	8.01001E+13	0.011003585	0.3832	15.61776903	0.024536155
7	Limbdi	Choraniya	8.01001E+13	0.01130007	1.466	6.943142639	0.211143581
8	Limbdi	Raska	8.01001E+13	0.011405713	0.5468	13.29417187	0.041130806
9	Limbdi	Natwargadh	8.01001E+13	0.011545353	1.548	10.75351285	0.14395296
10	Limbdi	Samla	8.01001E+13	0.011569848	0.3774	16.8600425	0.022384285
11	Limbdi	Jakhan	8.01001E+13	0.011573884	0.97517	9.981721949	0.097695568
12	Limbdi	Ghanshyampar	8.01001E+13	0.011879378	0.01502	13.85470527	0.001084108
13	Limbdi	Ghaghretiya	8.01001E+13	0.011901878	0.3217	6.262682847	0.051367762
14	Limbdi	Bhathan	8.01001E+13	0.01196059	1.987	14.89950535	0.133360132
15	Limbdi	Bhojpara	8.01001E+13	0.011967082	0.6732	9.897339536	0.068018279
16	Limbdi	Pandri	8.01001E+13	0.012000792	0.304	4.784273859	0.063541513
17	Limbdi	Bhagwanpar	8.01001E+13	0.012006758	1.89	7.744108147	0.244056509
18	Limbdi	Bodiya	8.01001E+13	0.012234963	2.314	8.623199524	0.268345872
19	Limbdi	Ramrajpar	8.01001E+13	0.012362213	1.593	13.77725803	0.11562533
20	Limbdi	Bhoika	8.01001E+13	0.012589346	0.82422	35.58002194	0.023165247
21	Limbdi	Untadi	8.01001E+13	0.012811777	2.393	15.24011129	0.157019851
22	Limbdi	Nana Timbla	8.01001E+13	0.0131633	1.08	7.941234008	0.135999015
23	Limbdi	Jasmatpar	8.01001E+13	0.013201008	1.585	8.651091313	0.183213879

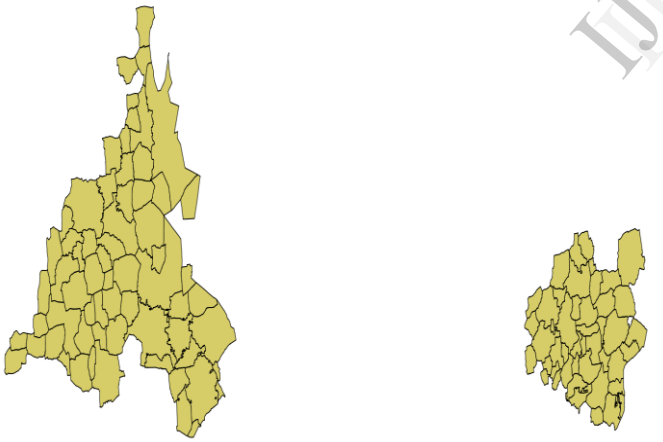


FIG3: image showing Limbdi and Anand talukas together for combined analysis.

Here is the analysis of villages of Anand and Limbdi combined. (Calculations Shown in Appendix)

Table 4: Comparison of Anand and Limbdi

	1	2	3	4	5	6	7
1	Taluka	Name	Village_id	Ahp Index	irrigated area	Total Area	irrigated/total
2	Limbdi	Ghaghosar	8.01001E+13	0.005239116	0.10522	4.978377368	0.021135401
3	Limbdi	Jaliyala	8.01001E+13	0.005626149	0.2856	4.747156749	0.060162328
4	Limbdi	Dhalwana	8.01001E+13	0.005839615	0.8276	12.88258032	0.064241788
5	Limbdi	Jakhan	8.01001E+13	0.006023867	0.97517	9.981721949	0.097695568
6	Limbdi	Gadthal	8.01001E+13	0.00608863	1.039	11.15031583	0.093181217
7	Limbdi	Samla	8.01001E+13	0.006202935	0.3774	16.8600425	0.022384285
8	Limbdi	Parali	8.01001E+13	0.006258517	0.3832	15.61776903	0.024536155
9	Limbdi	Choraniya	8.01001E+13	0.006334866	1.466	6.943142639	0.211143581
10	Limbdi	Ramrajpar	8.01001E+13	0.006363485	1.593	13.77725803	0.11562533
11	Limbdi	Raska	8.01001E+13	0.006451587	0.5468	13.29417187	0.041130806
12	Anand	Rajupura	1.5004E+14	0.006519723	2.544	3.557681829	0.715072376
13	Limbdi	Natwargadh	8.01001E+13	0.006526171	1.548	10.75351285	0.14395296
14	Limbdi	Bhathan	8.01001E+13	0.006538856	1.987	14.89950535	0.133360132
15	Limbdi	Bhagwanpar	8.01001E+13	0.006597572	1.89	7.744108147	0.244056509
16	Limbdi	Pandri	8.01001E+13	0.006603029	0.304	4.784273859	0.063541513
17	Limbdi	Bodiya	8.01001E+13	0.006635269	2.314	8.623199524	0.268345872
18	Limbdi	Bhojpara	8.01001E+13	0.006689125	0.6732	9.897339536	0.068018279
19	Limbdi	Ghaghretiya	8.01001E+13	0.006698399	0.3217	6.262682847	0.051367762
20	Anand	Vans Khiliya	1.5004E+14	0.006781714	2.321	2.453809959	0.945876021
21	Limbdi	Bhoika	8.01001E+13	0.006837504	0.82422	35.58002194	0.023165247
22	Limbdi	Untadi	8.01001E+13	0.0068975	2.393	15.24011129	0.157019851
23	Limbdi	Rojasar	8.01001E+13	0.006942637	1.14	16.26956098	0.0700695

The Excel sheet above describes the AHP analysis when all the villages of Anand and Limbdi talukas were combined. From the irrigated area calculated using QGIS it is clear that most of the area in Anand is irrigated while Limbdi has very less area irrigated as compared to Anand and large wastelands are present in Limbdi. As per the objective of the project a rural area with high level of irrigation should be far well off than the area with very low level of irrigation.
Above analysis clearly shows that for the lowest 22 AHP index values for development, only two villages of Anand taluka are present while rest 20 villages belong to Limbdi taluka, accruing its low level of development because of lack of irrigation facilities which in turn had led to its poor economic conditions.

Not only this, among the next 23 AHP index values only 6 villages belong to Anand, while rest 17 belong to Limbdi. Out of the 59 villages of Limbdi taken into consideration 37 of them belong to the lowest 46 AHP index values, clearly showing the poor economy in the villages of Limbdi. Also along with their AHP values their percentage of irrigated areas can be clearly seen which is very high for Anand while very low for Limbdi.

AHP index values showing poor economic conditions of villages of Limbdi.

Table5: Comparison of Anand and Limbdi

	1	2	3	4	5	6	7
24	Limbdi	Ghanshyampar	8.01001E+13	0.006998623	0.01502	13.85470527	0.001084108
25	Limbdi	Katariya	8.01001E+13	0.007008775	1.721	15.35671344	0.11206825
26	Limbdi	Borna	8.01001E+13	0.007107732	3.335	18.10203746	0.184233405
27	Limbdi	Devpara	8.01001E+13	0.007109868	4.591	22.85241068	0.200897842
28	Limbdi	Nana Timbla	8.01001E+13	0.007128595	1.08	7.941234008	0.135999015
29	Limbdi	Mota Timbla	8.01001E+13	0.007158786	0.2764	18.17962354	0.015203835
30	Limbdi	Mulbavla	8.01001E+13	0.007242435	1.537	17.92492563	0.08574652
31	Limbdi	Jasmatpar	8.01001E+13	0.007348816	1.585	8.651091313	0.183213879
32	Limbdi	Ankewaliya	8.01001E+13	0.007378014	0.2024	20.32259455	0.009959358
33	Limbdi	Choki	8.01001E+13	0.007424759	2.748	7.744802545	0.3548186
34	Limbdi	Bhalgamda	8.01001E+13	0.00749259	0.51936	23.93100431	0.02170239
35	Limbdi	Pamala	8.01001E+13	0.007633915	1.07	34.85762593	0.030696296
36	Limbdi	Ughal	8.01001E+13	0.00764316	4.043	7.561309118	0.53469577
37	Limbdi	Borana	8.01001E+13	0.007747602	4.234	12.8820344	0.328674794
38	Anand	Anklavdi	1.5004E+14	0.007769565	4.998	6.151450094	0.812491351
39	Anand	Meghva Gana	1.5004E+14	0.007793708	2.562	2.673969255	0.9581262
40	Limbdi	Tokrala	8.01001E+13	0.007840146	2.908	14.22789876	0.204387173
41	Anand	Lambhvel	1.5004E+14	0.007920369	3.964	5.206395306	0.761371307
42	Anand	Gopalpura	1.5004E+14	0.00794227	2.703	2.881831279	0.937945264
43	Anand	Khandhali	1.5004E+14	0.007952894	2.694	3.069557648	0.877650889
44	Limbdi	Jambu	8.01001E+13	0.008124992	5.196	31.64554494	0.164193728
45	Limbdi	Khambhlav	8.01001E+13	0.008203085	3.556	19.42265617	0.183085154
46	Anand	Bedva	1.5004E+14	0.00828547	3.923	4.182287388	0.93800345

The analysis above shows development index correctly can also be verified by the fact that the municipalities have got higher AHP values than most of the other villages as municipalities are far more developed than the villages, in terms of education, connectivity, infrastructure, healthcare facilities etc.

Analysis shows that most municipalities got the highest AHP index values.

Table6: Comparison of Anand and Limbdi

	1	2	3	4	5	6	7
1	Taluka	Name	Village_id	Ahp Index	irrigated area	Total Area	irrigated/total
93	Anand	Jakhariya	1.5004E+14	0.013720936	3.289	3.466514632	0.94879161
94	Anand	Vallabh Vidyanagar (M)	15004V	0.013766706	0.282	1.244694114	0.226561688
95	Limbdi	Gedi	8.01001E+13	0.014006544	1.579	24.07808511	0.065578305
96	Anand	Vasad	1.5004E+14	0.014346827	9.949	13.00285363	0.765139736
97	Anand	Samarkha	1.5004E+14	0.014620826	19.081	21.27300978	0.896958174
98	Limbdi	Hadala	8.01001E+13	0.014707888	32.22	45.15272375	0.713578215
99	Anand	Sarsa	1.5004E+14	0.014830226	21.047	23.02068709	0.914264632
00	Limbdi	Ralol	8.01001E+13	0.015249774	3.502	71.50171887	0.048977844
01	Anand	Karamsad (M)	15004VI	0.015494927	11.47	18.25394049	0.628357477
02	Anand	Boriavi (M)	15004II	0.015588426	14.568	15.64213003	0.931330961
03	Anand	Anand (M)	15004IV	0.015739007	7.048	21.21597513	0.332202501
04	Limbdi	Balol	8.01001E+13	0.0172827	16.282	49.29882009	0.330271596
05	Limbdi	Limbdi (M)	08010VII	0.018887687	4.455	31.3119449	0.142277971
06	Anand	Ode (M)	15004III	0.019087946	31.851	33.68920653	0.945436336
07							
08							

Suggestions for Proper Utilization of Wasteland

Most of the wasteland in our analysis is present in the villages of Limbdi taluka, while almost all the area of the villages of Anand Taluka is irrigated. As we can see from the analysis done using AHP method that most of the villages of Anand are more developed in terms of number of schools, healthcare units, population density etc. Because Limbdi has lack of proper irrigation structure and water bodies it is economically backward than Anand as irrigation plays a very crucial role in rural development.

The economic structure of Limbdi can be improved by proper utilization of waste land for various purposes. Our analysis suggest following measures that can be taken:-

1. Setting up small scale industries or cottage industries in these areas which will require manual and unskilled labour so as to provide employment in these areas and improve the living conditions.
2. In most of the areas there is no proper utilization of large flocks of cattle that is present in these villages. Cattle provide an alternative source of income to farmers. These wastelands can be used to set up small dairies which can properly utilize the large number of cows present in these areas.
3. As this area remains dry most of the time, small scale industries which require less or no water to operate would be the best option for utilization of these wastelands. Example setting up of bag industry.

4. One aspect that we analyzed is that the number of water bodies present in the area are not sufficient for the proper irrigation. During our visit, we have seen that all lands we sowed but farmers were waiting for the rain. If the total rainfall is less or delayed then most of the crops will be destroyed and it will economically hit these villages.
So we suggest the building of canals to these areas so as to provide an alternative source of irrigation.
Also because there is a restriction on tube wells due to low level of ground water, construction of canals or proper construction for rain water harvesting systems is extremely important. Also wastelands can be effectively used for this purpose.
5. Since Villages have a large number of cattle, biogas plants could be setup to support household and small scale industries.
6. Building up of warehouses to store grains and protect it from pest and rains.
7. Development of grazing lands.
8. Farmers Training Centre could be developed in villages presented at a location easily accessible to nearby villages. For example near Jambu, Parnala etc.
9. Setting up of seasonal industries to provide employment at times when no crop is being grown as these lands are cultivated only once and remain unemployed for rest of the months.
10. Setting up of schools and dispensaries.

CONCLUSION

This project highlights the role of irrigation and economic conditions necessary for the socio-economic development of rural areas using Geo-Informatics technology and satellite images. The objective of doing this project was to analyze how highly irrigated areas are more developed than that of sparsely irrigated areas and suggestion for the proper utilization of wasteland for the development of these areas were given.

Economic indicator using the AHP was developed. When only villages in Anand taluka and villages only in Limbdi taulka were compared no major conclusions could be drawn. However when both were compared together it was found that that Limbdi village had low value calculated by the AHP method and Anand village in general had a higher value compared to Limbdi.

However there were some exceptions. These could be possibly because some places were not villages but had developed into small towns that is they were Municipals. Some other reasons could be that people in that villages had got more support from the government or were literate. It could also be because of many other factors that affect development like number of schools, hospitals, operation land holdings etc. Also due to unavailability of some data and by putting dummy variable by assigning all the villages an equal value the result would have been affected.

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