

“SUSTAINABLE DEVELOPMENT OF A HISTORICAL INDIAN CITY”

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The objectives of this paper is to explain qualitatively the expansion – Geographical & Demographical, the consequences and aftermaths of a beautifully located Historical valley city of Udaipur.

This city which is now into its 500th year of its existence is craving for sustainable development and is under tremendous pressure of the very forces which has led to this developmental stage.

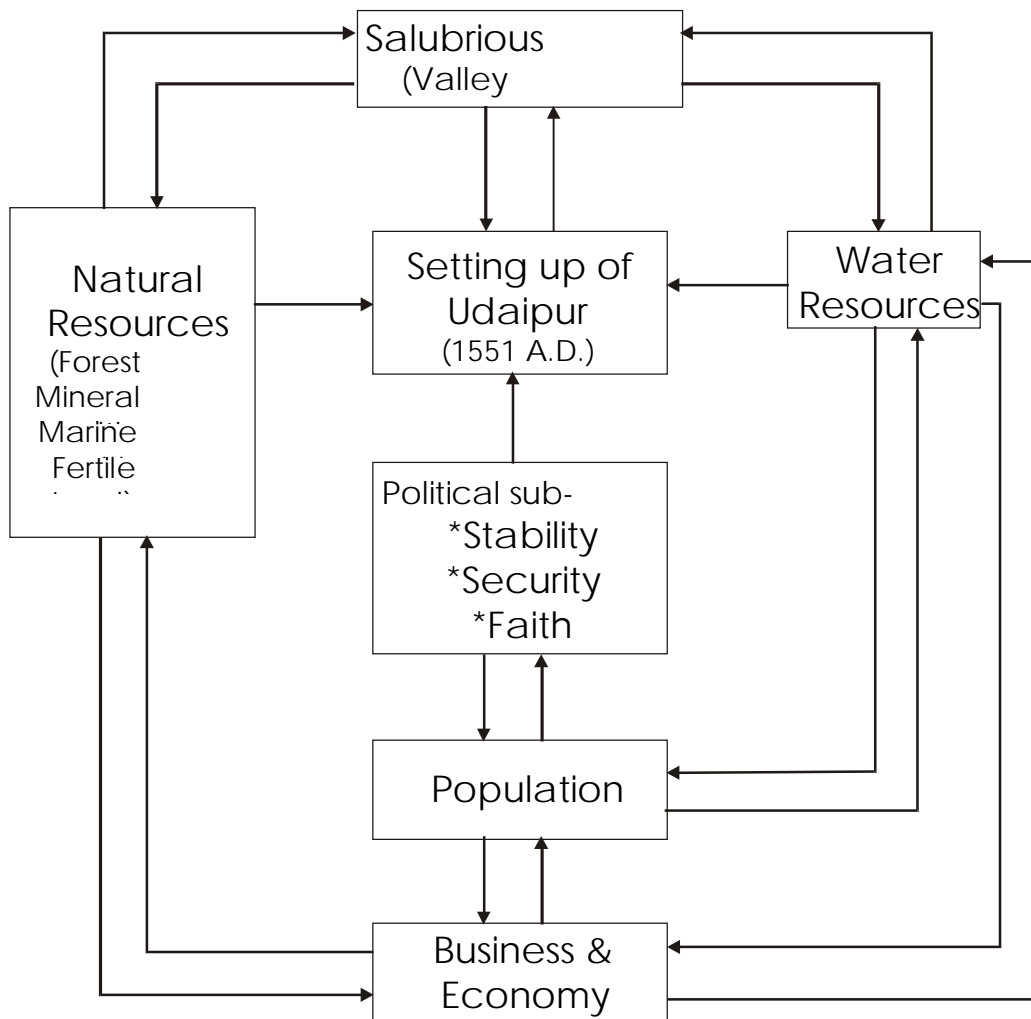
Udaipur is a unique example in sustainable development. The city of Udaipur was established in the year 1551 by the then Manarana Udai Singh Ji of Mewar State. He established this city owing to certain political reasons, and the location of this city - which is a valley and had a large number of water catchment areas around it - was conducive into the settlement of this habitat.

The city is a unique example of sustainability because the very concept of balance development was embedded in the system of this habitat right since centuries. The present write up intends to include the elements which provides the sustainability right since its inception and also to understand the systemic forces which are threatening this very sustainability.

The city which down the ages had witnessed the construction of men made lakes which were built around 200 years back, conservation of all the natural resources and the strong political will to maintain the natural balance along with the co-existence of its people has a large no. of unique examples showing the way in which this balance development was brought about. It was the foresightedness of the erstwhile rulers of this city that they

foresaw water requirement needs of this region 200 years in advance and built a network of water resources which is sufficient even for the next 25 years to come from today.

"The factors in the system which Udaipur a Conducive place to



In the past men in his quest for better standard and quality of life has laid all other considerations to take back seat and this accelerated the process of environmental degradation which began to threaten the earth's delicate ecological balance through which life of this planet survives. It is also true that we can never allow the process of development but stall it if the millions of inhabitants are to lead to the reasonable state of life. It is, therefore, necessary that the environment, economy and policy making are the real basis for sustainable development of this planet if life on our planet is to survive forever. In fact none of these considerations can be ignored in the process of development for future, security and prosperity. This is the only alternative we are left with today.

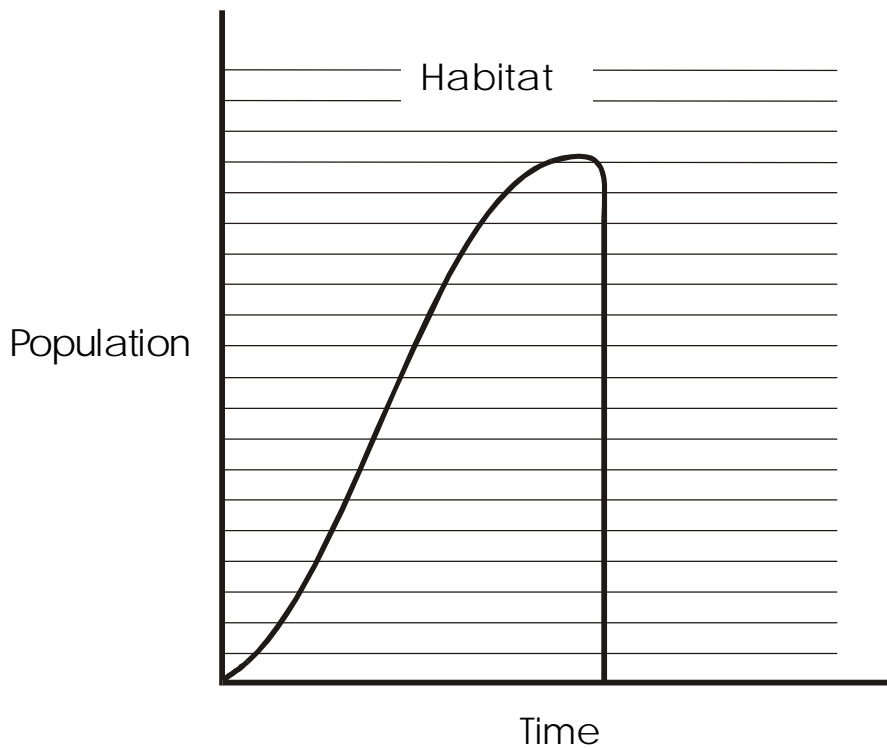
This is an established fact that our earth's physical limits are now being reached and if we are pushed beyond these limits, the earth's environment would break down and it will lose its ability to sustain us, our industry and our agriculture.

Eventually we would lose everything. What was once considered as infinite by human beings was actually alarmingly finite. There are indeed limits to growth. On one hand with the advances of modern medicines and with the better means of transportation of food, the population had increased but on the other hand, the level was over worked and famine was taking its toll. With the fast technological advancement and economic growth, the population of Udaipur City too started growing rapidly and there has been manifold increase in the population of this city since its inception. It has to be seen that the carrying capacity of any habitat has its own limitations. The growth, if not working in consonance with the environment, is not a sustainable development. As we know the sustainable development will be the foundation of economical and social planning of habitats in the IIIrd millenium. If this does not happen Malthusian principle will take over which according to Thomas Malthous, the originator of the principle (1798) says that "**the growth of human population would outstrip the earth's food producing capacity**".

It is also a fact that the human interaction with its environment is far more complex and earth's capacity to support humanity is not determined just by its basic food requirements but also by level's of consumption of the whole range of resources by the amount of waste generated and by technologies in application. Consequently due to unchecked growth of population, unplanned growth of habitats, consumption patterns and change of technologies, the day is not far when we would have surpassed our habitat's carrying capacity

Carrying capacity of a Habitat :

A Habitat can sustain population pressures only upto certain extent, after which it gives up.



The spirit of sustainability in the denizens of Udaipur since ages:

This region had a tradition of the spirit of conservation of natural resources amidst its people. There is an occupational community which resides in this city called KHAIRADIS who are traditionally into generation-wise business of manufacturing hand made wooden toys and articles. The factor which puts them apart is the fact that they do not cut trees and obtain wood thus disturbing the natural balance, rather they pick up the wood which has fallen from the trees as per their natural aging process. The word KHAIRADI also literally means one who deals with the 'picked up' woods. In this way, they have been for generations thriving upon the bounties of nature without disturbing the delicate balance of the same.

This very city is also a noteworthy example in yet another step towards maintaining this equilibrium where a large part of its tribal population – one of the oldest tribal species in the world deriving their employment from picking up the fallen forest leaves and converting them into their economic uses. Here also they are not disturbing the ecological balance rather they are contented with what nature feel apt to part with and thus they depend on it.

This is a historical city which has witnessed great political turmoil in the last five centuries has till recently been totally protected from the hazards of ecological disasters. The world famous battle of Haldighati was fought in this region. The Maharanas, the rules of this region had set a unique example in warding off the forces of imperialism without going into the historical aspects of this political turmoil. I would like to state that all these political disturbances did not make an iota of impact on the sustainability of this region. The annals and all the records pertaining to this city and state are witnessed to the fact that given to all other conducive situations a large number of people belonging to neighbouring states had migrated to this city to look forward for prosperous future for themselves.

The denizens of Udaipur celebrate a traditional festival “ Hariyali Amavasya”. This festival is perhaps the only of its kind in India which is celebrated on the occasion of onset of rainy season. Hariyali means greenery and Amavasya is no moon day. As per the Hindu Vikram Samvat calendar this festival – which is a public festival- falls on the no moon day of the Sawan Month i.e. the month in which the rains start. Nowhere in India the public at large observe this festival on the banks of lakes and rivers and on the hills of the city. Similarly to drive home the message of conservation of trees, the women folk of the city perform a ritual every year called “ Dashamata” in which they worship the trees for the longevity of the lives of their husbands. The trees are considered holy and sacred. This is a unique way of communicating the message that the trees are vital for the sustenance of humanbeings.

In the same way, there is one more distinct festival in which all the four Mondays of the Hindu month of Sawan are celebrated publicly with all gaiety and fervor by the people of Udaipur. These Mondays are celebrated for the longevity of vegetation and natural wealth of the city - something unique in the world.

This shows that the people of Udaipur have for generations been living sustainably with the environment. All these festivals are a medium to manifest this message and pass on the same to the next generations.

The City of Udaipur has in its midst a beautiful botanical and zoological park where a large number of plant and tree varieties co-exist in the hustle and bustle of City Life. The part popularly known as Gulab Baug which is spread on around 30 acre of lands was conceived by the erstwhile rulers of the state and was planned with a conscious belief of ecological balance of the City.

Even today with an increase in the population, vehicular emissions and other pollution, the Gulab Baug is a shining example of the spirit of sustainable development in the inhabitants of Udaipur.

BAWRIS: A unique concept in water resource management:

While discussing the concept of inherent sustainability in the city since ages, we had discussed the construction of water reservoirs which were man made. The erstwhile policy makers did not remain concerned with just the construction of these lakes, which survived Udaipur, but they also developed a unique network of water resources which would co-exist with these lakes. Parallels can only be drawn from the ancient civilisation of Indus Valley and Roman Empires where the concept of man made smaller water reservoirs built within the city dwelling areas were built ranging from the last 500 to 100 years, Udaipur had a unique gift in the form of water reservoirs called BAWRIS which were spread over the dwelling areas of the city and were being recharged by availability of ample water of the lakes of the region. The Bawris which were around 50 in numbers are a unique architectural marvel. These water reservoirs are slightly different in final details, depth and sizes. Water is found in an open square or rectangular tank reach down with a flight of broad step. This passes through an ornamental arch before reaching up the platform which runs around the tank areas and there are usually several narrow flights of steps zigzagging down the sides of tank to enable water bearers to collect water as the level recedes. The entire structure is of stone. Sheer walls rise on other three sides invariably related by small niches containing statues. For Bawris also have religious significance. To the Hindus, the element of fire, air, earth and water are sacred. It would have been regarded as a great status symbol for a family to construct a Bawri and many of the local noble families had them constructed within their property. This is the shining example of the spirit of sustainable development. Many of Udaipur's queens commissioned the construction of Bawris as gifts to the populace and it was considered

that by donating good water (one of life's necessity) one would have assured of a privilege reincarnation. Today out of Udaipur's previously large number of Bawris very few exists and of those even fewer are unused.

The city because was developed and settled around the Ayad river. The river's life was also an important concern of the people and rulers. Erstwhile policy makers and the populace ensured that the growth of the city should not come to the detriment of the existence of this vital source of sustenance. It is a natural consequence that when a city grows geographically and demographically, the pressure is on the natural resources and water resources. Ayad river was no exception but for the commonsensical and futuristic outlook and actions of the earlier generations. They were aware of the fact that if the river undergoes a disastrous transformation, the existence of Udaipur City will be in question. The history has witnessed the fact that large number of recharge basins were built along the bank of the river so as to ensure the free flow of clean water perennially. The perennial water flow took care of all the other aspects of growth, development and existence of the city including irrigation, drinking water, existence of Bawris, maintaining the water level of lakes, maintaining the conducive climatic conditions, conservation of forests and development of commerce and trades in the region.

Forces operating in the system of a habitat – Udaipur:

In my view there are six forces in the habitat system of this city and these are :

- 1. Salubrious climate;**
- 2. Water resources;**
- 3. Natural resources;**
- 4. Political climate**
- 5. Population; and**

6. **Business and economy**

These forces are not unique for setting up this city but what is unique is the understanding of these forces in the context of this city which is supposed to be an oasis in this otherwise arid state of Rajasthan. And this very understanding drawing certain conclusions from the development till now and the futuristic outlook makes this study distinct from the otherwise studies of habitats.

Certain simple qualitative models of typicality of these forces are presented in this study. Their understanding will allow the people concerned to avoid the imminent fatal pit falls which are not too far away, if no preventive measure are adopted today.

1. **Salubrious climate:**

As discussed earlier, one of the reasons for setting up of this city was that it had a very healthy climate owing to its being situated amongst the Arawali Mountains where the ancient river AYAD was available as a natural resource for water. The forest cover and other natural resources, which shall be discussed later on, provided all the facilitating climatic conditions for the people to choose this city as a habitat for themselves. In the later part of the paper it shall be discussed how the river AYAD is now dying a slow death and thus will become an example of mindless and ruthless unbalanced development of any modern city.

2. **Water resources:**

One of the natural outcome of conducive climatic conditions is the availability of water resources in abundance in that geographical region and Udaipur is no exception to that. There are several water catchment areas around the region given to its location

which is a valley. World over there have been examples of civilisation thriving on the banks of rivers and here again the Udaipur was no exception.

3. Natural resources:

The natural resources, in terms of forest cover, mineral wealth, fertile land and marine wealth contributed to yet another powerful forces in setting up of these habitats. There are a large number of natural forests surrounding Udaipur which are of course now under serious threat of extinction. The nature has also provided its boon in the form of mineral wealth where the region boasts of world's largest zinc, rock phosphate and marble reserves, apart from many other natural mineral reserves. Owing to the climate and water resources, the availability of fertile land is plenty.

4. Political climate:

As discussed, in 1551 AD, the then Maharana Udai Singh Ji chose Udaipur as its new capital only to provide its subjects a stable and secure political system in which the people can repose their faith and the political system was successful in providing that.

5. Business and economy:

Once the people choose a particular habitat owing to all other conducive forces they look forward for quality of life which can come from there being developing economically, thus creating wealth for themselves and Udaipur had set up an example where business and economy had co-existed with the existence of the people of this region.

In the later part of the paper with the help of a preliminary system dynamics models, it will be depicted how the balance of these very systemic forces is being disturbed and how to undo the same.

The economical sustenance of the people of Udaipur:

Traditionally the sources of income of this city had been agriculture, trading and commercial activities. With the advent of technology and new wave of awareness in the last 50 years, the occupational pattern of the people of this region has undergone tremendous change. The thrust areas for economical sustenance today are:

1. **Tourism**
2. **Mining Industry**
3. **Agriculture**
4. **Service sector**

The qualitative system dynamics models depicts two very important elements of this economic sustenance i.e. tourism and industry. It will be attempted to analyse whether this hitherto new areas or new occupational areas are in tandem with the concept of sustainable development or not.

1. Tourism:

Tourism opened new vistas for employment of the people of this region. Tourism is a thriving occupation and a number of tourists have been increasing in Udaipur. In Udaipur whereas there were 36000 tourists visiting this city in 1961, the number has increased to around 8.25 lacs in till 1999. Nobody before 1950 imagined that world over Udaipur will become a great tourist attraction but as the events unfolded and the people

of the region started looking towards tourism as a good source of sustenance. One more unique feature had added to the increase in the number of tourists visiting Udaipur over years and i.e. certain systematic initiatives undertaken by government and its related agencies to attract tourists to Udaipur. An organisation called West Zone Cultural Centre (WZCC) was established with the reasonable capital outlay, in order to promote cultural tourism in the region. Similarly, the government agencies in collaboration with many other non government agencies took serious steps to promote promotional campaigns for tourists in terms of certain handicraft festivals, artisan festivals and bringing about the policy change in providing comfortable stay for the tourists in city. The following areas emerged for economic activities based on tourism:

- a. **Handicrafts**
- b. **Hotel industry**
- c. **Travel business**
- d. **Excursion groups**

Let us try to understand just one major aspect of the tourism industry and i.e. hotels and how do the proliferation of hotels has its impact on the other systemic elements related to tourism.

Hotels:

The factors relevant to this area are :

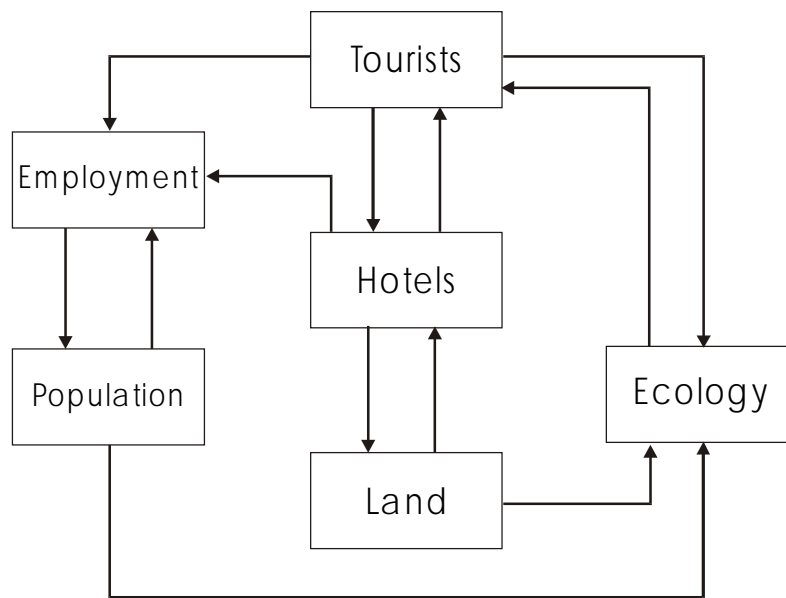
1. **Economy for the tourists**
2. **Construction and illegal construction of hotels**
3. **Encroachment**
4. **Waste disposal system**
5. **Water pollution**

6. **Pressure on land for coming up of new hotels.**

With the proliferation of hotel industry as a direct offshoot of increase in the number of tourists, there have been many consequences related to the factors mentioned above. A unique hotel situated amidst the lake Pichola is in existence in Udaipur which has a very few parallels in the entire world. This hotel has been into existence for many years down line. People have been raising apprehensions about the existence of this hotel and factors like waste disposal system and the increase in water pollution etc. Whereas these apprehensions are genuine probably the hotel management is doing its best. It is a question of in depth analysis whether a sincere effort is really being made or not to allay the fears of the concerned people of the region. Similarly, there have been many controversial constructions where the land reserved as green belt i.e. conserved for natural wealth and vegetation have been used to construct hotels by certain influential people in the system. There have also been examples where these very influential groups have encroached upon the lands surrounding the lakes and have been using the lakes very conveniently as their hotels' disposal conduits. Of course action has been coming from the government machinery and the non-government conservation organisations but the visibility of these actions is yet to be perceived.

Tourism based model:

"Sectoral overview network for Udaipur's tourism based model"

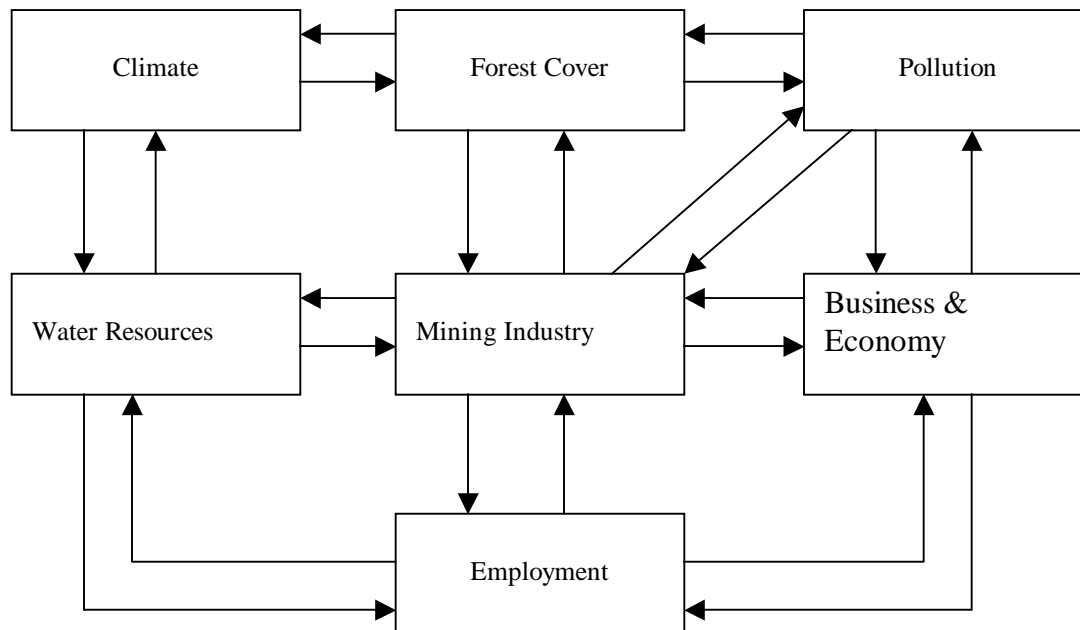


With an increase in the number of tourists over the years, the Udaipur City has witnessed the proliferation in the number of Hotels. The burgeoning of Hotels has a multiprogressed relationship with the tourism system of Udaipur. On one hand where the demand for land increases – which in turn sends the real estate prices spiraling – on the other hand it is also an avenue for employment of many.

But the development of hotel industry has other dimensions two and here comes the moot question of sustainable development. The hotels when are constructed flouting the policy norms, thus encroaching the lake bads and riverbanks or a? on sustainability. Because if by the existence of the hotels the lakes and rivers are polluted then once again the ecological balance gets disturbed. Udaipur is witnessing such dilemmas for such development and it has to be seen how such issues are tackled.

Because hotels can exist only when tourists keep on coming in large numbers. The influx of tourists depends on the serene, salubrious historical surroundings of Udaipur. If ecological disturbances occur then this whole balance will be in jeopardy. Then development and employment for whom and till when?.

2. Mining industry:



“The Emergence of Mining industry generates employment but is also closely interrelated to the other systemic elements”

With the exploration of mineral wealth of the region, this industry has developed into a money-spinner for its reason. The factors related to development of mining industry are as follows:

- i. **Excavation of mineral resources**
- ii. **Trading**
- iii. **Transportation**

- iv. Role of labour**
- v. Ecological consequences**
- vi. The systemic policies towards this industry**

The mining industry and specially the marble mining industry is a source of employment of a large number of people in the region. The salient factor of marble mining industry is that it is in the unorganised sector, uses very basic technology for excavation, cutting, polishing and transportation. It is semi mechanised.

With the generation of employment it also poses serious hazards to the forest cover and adds to the environmental pollution including air, water and sound. The increase in average atmospheric temperature in the last recent years in Udaipur area can be attributed to these developments. Water resources' deterioration has also been caused by the same. The qualitative model makes an attempt to depict the systemic relationships between all these factors.

The increase in population which is a resultant of growing opportunities for employment in Udaipur has put pressure on the land available for cultivation, forests and the beautiful hills surrounding Udaipur. The hills have been encroached upon, not to talk of the vegetation which has already been destroyed in the process.

The ground water level has also receded remarkably with the increase in general demand for water. Indiscriminate under ground boring for water is a common phenomenon. As discussed the Bawris have been destroyed and the river is dying slowly. This has again had its impact on the over all ecological balance of the region and it is not difficult to contemplate what will be the nature of existence of people of Udaipur without lakes, forests, beautiful hills and a vibrant river.

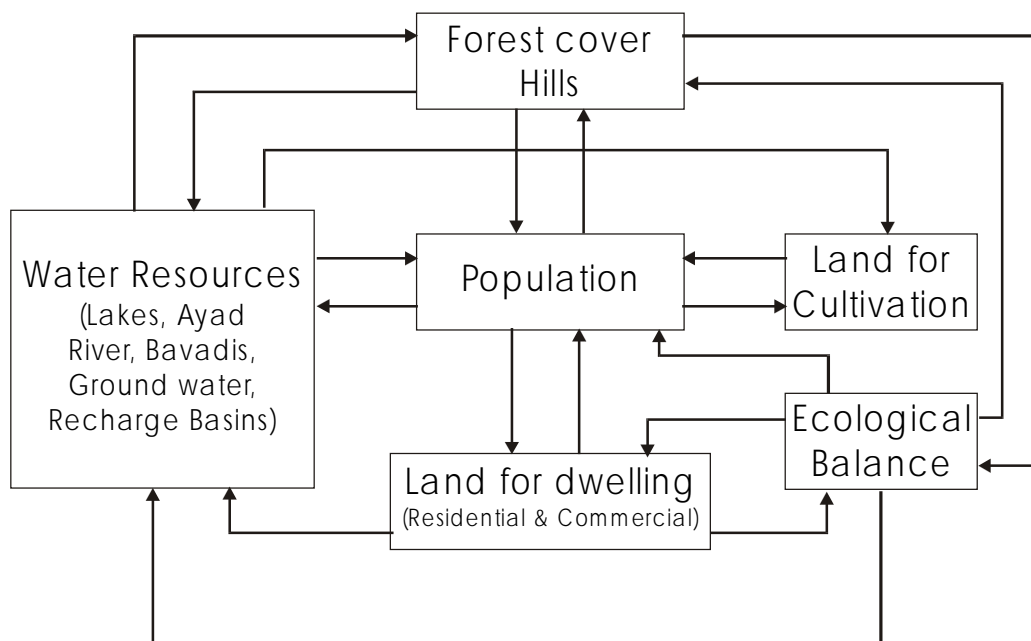
3. Agriculture:

As is depicted in the model, agriculture as an occupation is coming under serious threat due to the non availability of cultivable land as the land is now being increasingly used for residential colonies, tourist resorts, marble mining, the construction of hotels and various other amusement parks.

It has been observed that agriculture has relatively long gestation periods whereas other business opportunities can pay back relatively quicker. Since the land for cultivation came in pressure the cultivators looking for short term gains have become proverbial killers of the golden goose. Fertile land which was the source for sustainable employment for a large number of families and also it was maintaining the demand and supply equilibrium of foodgrains and vegetables and now being used indiscriminately for non agricultural purposes.

4. Population:

"Population is intrinsically linked with the other systemic elements of this historical city"



Other factors relevant to this systemic element are as follows:

- i. Quality of life and lure of money attracting people to settle in Udaipur.**
- ii. Emerging occupations have attracted large number of settlers**
- iii. There has been an increase in the migrant population due to certain economical disturbances elsewhere.**

The dangers lying ahead:

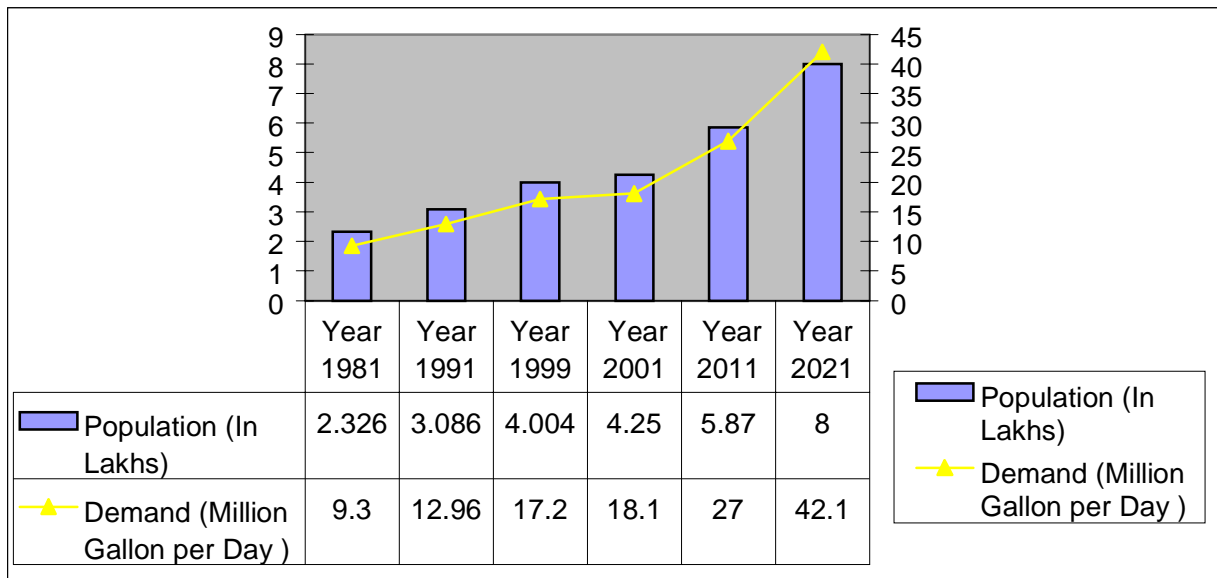
My submission here is that it was only and only the natural factors which had kept this city throbbing with life till today. I feel that if now whatsoever forces are responsible for tearing apart this delicate natural and ecologically sustainable fabric of this beautiful historical city, the city will have to forget and forego the gift of the set example of sustainable development which it had been enjoying since ages.

The conventional wisdom of living in co-existence with the nature's gifts has been lost of sight today and as the system dynamics model depicts, the development of the city is becoming a serious threat to the existence of the river and lakes along with the beautiful hilly surroundings of Udaipur. The river Ayad has now become convenient conduit for the disposal of industrial wastes, sewerage and also other types of men made wastes. The river carries with its a great quantity of silt which is at one hand killing the river slowly and on the other hand filling up the lakes in which it flows down. The other consequences of the dying out of this life line are not too difficult to understand. The people of this city may boast of modern development, they may have used the embankments for residential settlements at the cost of recharge basins and they may have attained industrial development by using Ayad river as one of the conduits for waste disposal. They may have been basking in the reflected glory of short term quality of life but what they are missing is the aspect of existence of the very next generations.

The sad point is that the people of Udaipur are turning a blind eye to all these aspects although they are very well aware of the fate of their very neighbours of Marwar and Shekhawati regions of Rajasthan state, India. These two regions have a history of perennial famines and the process of desertification of these areas allows no significant agriculture and trading activities.

These regions also had natural water resources in the form of full flowing rivers several hundred years back. But once these resources depleted, the populations of these regions had no alternative but to flee and settle in other parts of the country for sustenance. The degeneration of ecological balance which took relatively larger period to materialise in these two regions may perhaps not be the case with Udaipur. Rather the disaster for Udaipur may come at faster rate as compared to these regions because the concept of "**CARRYING CAPACITY OF A HABITAT**" is applicable in its worst situation these days. If an enlightened public is not geared up to conserve the lifeline of the region, disaster is not too far.

I shall discuss an important aspect in this connection and that is relationship of population and water demand of Udaipur City. It is an established fact that the relationship of population and water demand is not linear in nature and so is the case with Udaipur city also. Whereas in 1981 with a population of 2.32 lacs, the demand in million gallons per day of water was 9.3, the same figure has grown to 18.1 with a population of 4.25 lacs in the year 2001 and it is projected to be 42.1 in the year 2021 with a population of 8.00 lacs.



Under the circumstances, instead of providing for newer sources of water, if the population system is heel bent on killing, the existing water resources then what will be the consequences, it is not too difficult to understand.

Vehicular exhaust:

Transport sector plays a major and important role in the economic life of the modern civilisation whereas it accounts for 4 to 8% of GDP and 2 to 4% with jobs. In comparison to the industrialised countries the ratio in a country like ours may not be that high but all other aspects related to transport sector and its relationship with sustainable development apply to our country and Udaipur City in particular.

The vehicular exhaust which is responsible have added much more to the pollution and it is continuously increasing in Udaipur city. The extent of this increase in the air pollution can be guessed by an increase in the number of vehicles in use and in Udaipur in the last 10 years alone, they have witnessed manifold increase. Not going into the details of the number of four wheelers and two wheelers plying in city, I would here like to present an

alarming vehicular exhaust situation by citing just one example which will show the limits to which the city can grow.

With the geographical expansion of the city now the settlement cropped up at distant places and with no perspective planning to address the problems of the commuting population. No provisions to have an environment friendly and economical public transport system were envisaged. The result of this was that a large number of private vehicles manufactured with obsolete emission technology are being used for public transportation which has increased the level of air pollution to intolerable levels. In a country like India where already there is laxity in the availability of Eco-friendly fuel, the equal amount of laxity in ignoring the existence of ecologically disastrous transport system is alarming. In a city like Udaipur, if this sort of vehicular pollution phenomenon goes unchecked then what will be the quality of life of the people is easy to imagine.

The phenomena of desertification which is not un common for other parts of the state of Rajasthan was never a cause of concern for a city like Udaipur. But with the increasing pressure on these habitats of these forces as discussed , this problem is slowly getting its foot hold. Although at its preliminary stage very small tracts of deserts are manifesting themselves and also visible in the form of dusty storms, the day is not far when this will become a serious cause of concern if the environmental aspects of the reason are ignored.

I presume that the present stage of an alarming question mark on the sustainable development of Udaipur city has also arisen from the fact that the people and the system used to treat air, land and water as free commodities and anything which is free immediately loses the attention howsoever important it may be. But the time has come when inhabitants of Udaipur understand the concept of cost of ignoring vitality of this important resources and which can come only by understanding the systemic aspects of habitat. Sooner the understanding comes the better it is for sustainable development of this historical Indian City.

Some Steps in maintaining sustainability :

Having understood the systemic relationships in the interplay of various factors in tourism, mining, population and water resources etc., the following initiatives can be thought of to avert the imminent dangers lying ahead.

Promotion of scientific mining by policy makers, the government must initiate actions in making the mining industry cost competitive by way of rationalisation of tax structure and incentive for technological upgradation of the same. Unless this is done and the industry if continues to be looked upon as polluting, being operated with basic minimum technological inputs but providing employment to a large number of people, there is no ray of hope for the upgradation of this industry. The hazardous impacts on the ecology and sustainable development of this region will continue.

The government must initiate steps to promote the concept of afforestation of areas surrounding quarries and also afforestation and rehabilitation of abandoned mines. It should be laid down in the policy settlement itself to provide for afforestation along with the exploration of mining wealth. Incidentally it is a healthy development that judicial activism in the country has ensured that the people related to this industry cannot get away with what they have been doing for years while disturbing the ecological structure. Certain recent judicial decisions have triggered a lot of activities and there have been instances whether forest reserved for natural wealth is being stopped from the mining activities.

The people of Udaipur must do the needful in active movement with the policy makers to restore the lost glory of this historical city. Improvement in the marble mining industry is just one of the examples. Same initiatives are required in the areas of rejuvenating the life line of this city i.e. the river Ayad and the network of lakes. I shall not discuss the

specific ways in which this can be done but an insight into the same can be understood from the various qualitative models discussed earlier.

The public action to maintain sustainability of the region has no parallel and as no alternative. Any amount of government action and seriousness is meaning less without the active participation and initiatives of the very people who constituted 99.5% of this habitat along the years. Although there has been apathy towards this cause but the awareness now is growing and the day the public concerned gathers momentum and takes a concrete shape, the entire question mark on sustainable development will be erased.

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