

Observations along the Sabarmati



Landscape Environment Advancement Foundation
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Forgotten legacy

Many aspects of our environment we take for granted. Oft traveled and traversed, they soon become a blur that cease to register except as a component of a larger composition.

Seminal landscape occurrences that shaped civilization are no different. In the past, features such as mountains, valleys, forests, lakes or rivers formed the anchor that determined how development of human settlements would occur. Settlements found their locations because the landscape provided protection, or succor.

Both these ideas, of protection and sustenance, have undergone a change, to an extent where the very reason why a settlement chose to exist , has ceased to be even registered. Gradually settlements turn their backs to these landscape events. Rivers become drains, mountains are flattened or leavened, and lakes are filled up. The gradual distancing of this dependence and obliteration from the consciousness, is not an urban phenomenon, but is simply a function of the fact that other support systems replace the original ones.

It is a tragedy that the new systems are concealed, and well cloaked, never revealing their character. Water neatly fed through pipes to irrigate the fields is soon taken for granted. Little does it even express the fury of a river in spate, or rarely does it satiate the soul like a gentle river filled from edge to edge. This is unfortunately the truth, and the only way to counter it is to consciously force ourselves to observe such actors in nature.

Ritesh Kamdar, a student of landscape Architecture, chose to travel to selected locations along the river Sabarmati. That it was summer, and hence the seasonal river was dry, did not in any way reduce the value of the exercise.

He selected ten locations along the 371 kms of the river and made simple recordings of the river bed, the soil , crops and birds.

So strong is our pre-occupation to find a conclusive meaning for every effort we undertake, that one is likely to go through the text and question the reason for doing such an effort.

The earlier paragraphs of this text should help ally such doubts. There are lessons learnt in the text; many of them, about the course of the river, the quality of its bed, its edges, the variety of soils and crops.

But more importantly it a reminder to re- look at such landscape features that shaped our civilizations; perhaps a mature contemplation of their nature and fate may allow us to reinterpret their values in our lives again.

Aniket Bhagwat

July 2009

Rivers

By definition, a river is a “natural watercourse which flows towards an ocean, a sea, a lake or towards another river or in some cases it flows into the ground or dries up completely before merging with any other water body”. It is however, part of a larger cycle that includes precipitation, topography, surface run off and catchment areas. Surface run off and topography together, determine a river's catchment area. Topography and geology play an important part in determining the rate of flow of the river. While the shape of a river is determined by the regions it flows through, the river in turn also leaves an imprint on these areas. Amount of water in the river, rate of flow, seasonal variations and flooding all affect the banks of the river and the adjacent areas. For example, a river flowing in a steep, mountaineous region cuts a sharp channel. The same river downstream in the plains will form a meandering course due to the shallow gradient. The river thus, at times becomes the most visible and identifiable element of the natural drainage and hydrological cycle of a region. The river system nurtures special flora and fauna and together they form another ecological entity.

Rivers of India

Major rivers of India Includes Brahmaputra, Narmada, Tapti, Godavari, Krishna, Kaveri, Mahanadi, Ganga, Indus, Yamuna and Sutlej, these rivers along with their numerous tributaries make the river system of India. Most of the rivers empty into the Bay of Bengal. Some of the rivers whose courses take them through the western part of the country empty into the Arabian Sea. Some parts of Ladakh, northern parts of the Aravalli range and the arid parts of the Thar Desert have inland drainage.

All major rivers of India originate from one of the three main watersheds.

- 1. The Himalaya and the Karakoram ranges
- 2. Vindhya and Satpura ranges and Chotanagpur plateau in central India
- 3. Sahyadri or Western Ghats in western India

The rivers of India can be divided into Himalayan Rivers and Peninsular Rivers.

Himalayan Rivers

The main Himalayan river systems are the Ganges river, the Indus and the Brahmaputra river systems.

Many rivers pass through the Himalayas. The Himalayan rivers form large basins. They perform intense erosional activity up the streams and carry huge loads of sand and silt. In the plains, they form large meanders, and a variety of depositional features like flood plains, river cliffs and levees.

Himalayan rivers are perennial as they get water from the rainfall as well as the melting of ice. These rivers create huge plains and are navigable over long distances of their course. As these rivers are perennial, they benefit the cities which are located on their banks. They provide rich fertile plains for agriculture and endow water for irrigation.

Peninsular Rivers

The peninsular river systems include the Narmada, the Tapti, the Godavari, the Krishna, the Kaveri, the Mahanadi river systems and their tributaries.

The Peninsular rivers mainly flow through shallow valleys. Majority of them are seasonal as their flow is dependent on rainfall. These rivers mainly have straight and linear courses. The intensity of erosion is comparatively low because of the hard rock bed. Lack of silt and sand does not allow any significant meandering.

The Sabarmati River

Sabarmati River originates from the Aravalli mountain range in the Udaipur District of Rajasthan of Western India. It is the west flowing river of Gujarat and is approximately 371km. in length. Sabarmati is a seasonal river and gets most of its water during monsoon and remains dry in summer for almost six months. In its initial course Sabarmati is also known as 'Wakal' river.

A major part of the Sabarmati's course flows through the state of Gujarat. The river travels from the Aravalli range towards the westward sloping Mehasana and Sabarkantha districts, and then flows through the south ward sloping Kheda & Ahmedabad districts of Gujarat before emptying in to the Gulf of Khambhat.

Sabarmati River Basin

Sabarmati river basin falls in the hot arid region in the mid-southern part of Rajasthan and Gujarat, between latitudes 23 degree 25' and 24 degree 55' and longitudes 73 degree 00' and 73 degree 48'. The total catchment area of the basin is 21,674 sq.km. out of which 4,124 sq.km. lies in Rajasthan and remaining18,550 sq.km. lies in Gujarat state. The Sabarmati basin in Gujarat state covers parts of the districts of Banaskantha, Sabarkantha, Mehsana, Gandhinagar, Ahmedabad and Kheda. The Banas and Mahi basins lie to the east of the Sabarmati basin, Luni Basin lies to the north and west and Banas basin lies to the west of the Sabarmati basin. The Sabarmati river basin extends in the regions of Udaipur, Sirohi, Pali and Dungarpur districts of Rajasthan. The western part of the basin is surrounded by hilly topography belonging to the Aravali range. The rainfall pattern within the basin is uneven and erratic with nearly 95% of the average rainfall occurring during monsoon months from July to October.

History

The earliest settlement along the banks of Sabarmati river is said to have taken place around 1 to 1.5 lakh years B.C. The settlements along the Sabarmati river in ancient times have been discussed in the sanskrit literature named 'Padmapuran' and 'Sabhramati Mahatmay'. We can find the reference of the river in Hemchandracharya's Dayashray and Rajshekhar's Kavyamimansa, written during 12th century. Voluminous books called Hammirmadmardan and Prabandhchintamani also give the reference of Sabarmati river.

Sultan Ahmed Shah founded Ahmedabad city on the serene banks of Sabarmati river in 1411 AD. Mahatma Gandhi established Sabarmati Ashram as his home on the banks of the river during India's independence struggle. Many famous folk songs on Sabarmati river were written during Mahatma Gandhi's era.

Methodology for Study

Sabarmati river acts as a lifeline for number of villages located on her banks. The aim of the exercise was to understand the natural system of the Sabarmati river through various parameters. The study also aimed at documenting the nature and behavior of the river course and to observe the various activities taking place along the banks of Sabarmati river.

The study identified ten villages located at the banks of the Sabarmati river dispersed at nearly regular intervals. The idea was to record the river bank, agriculture pattern, existing vegetation, settlements and character of river banks at each of these locations. The documentation is through photographs, collection of soil samples and interviews of local people.

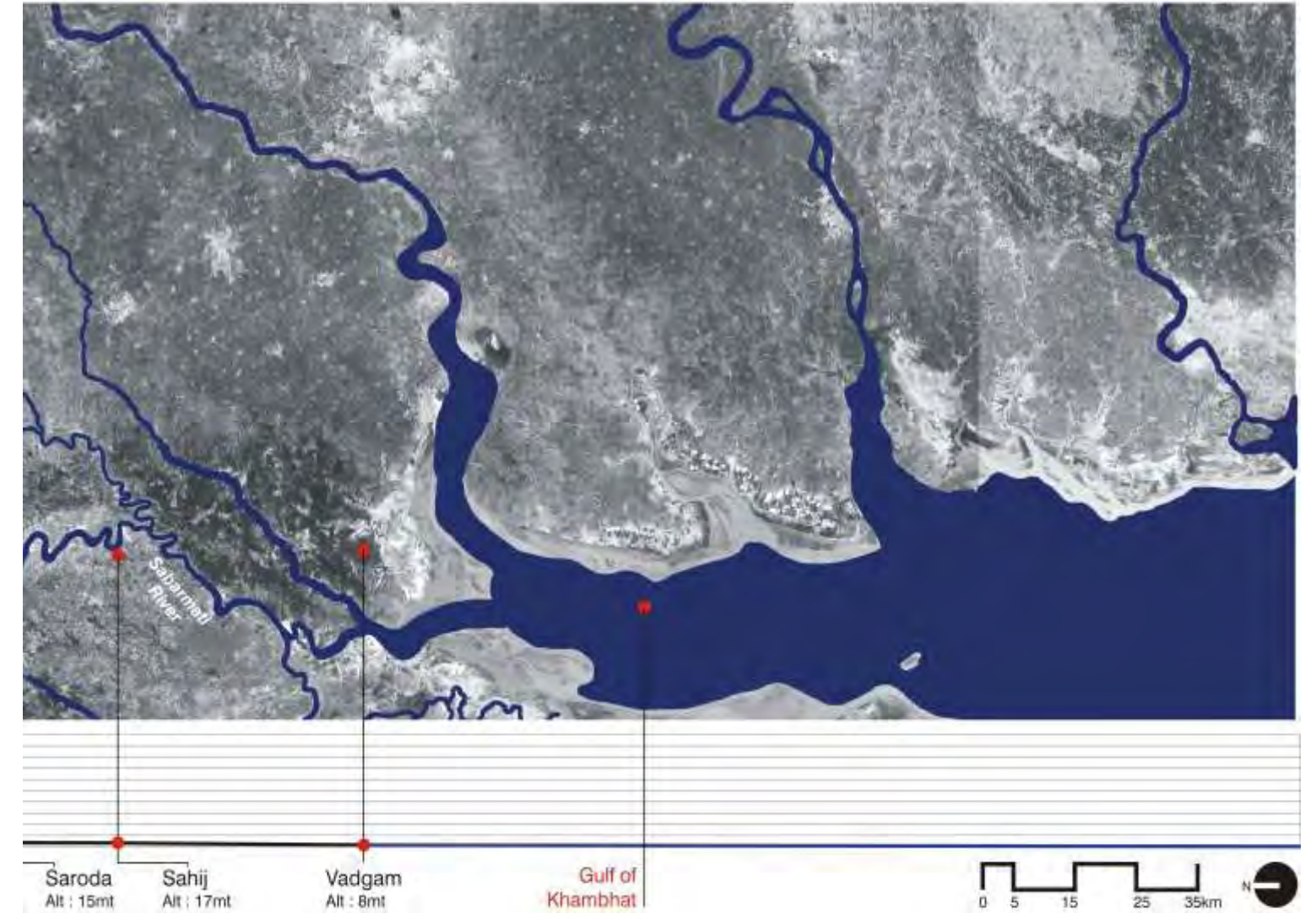
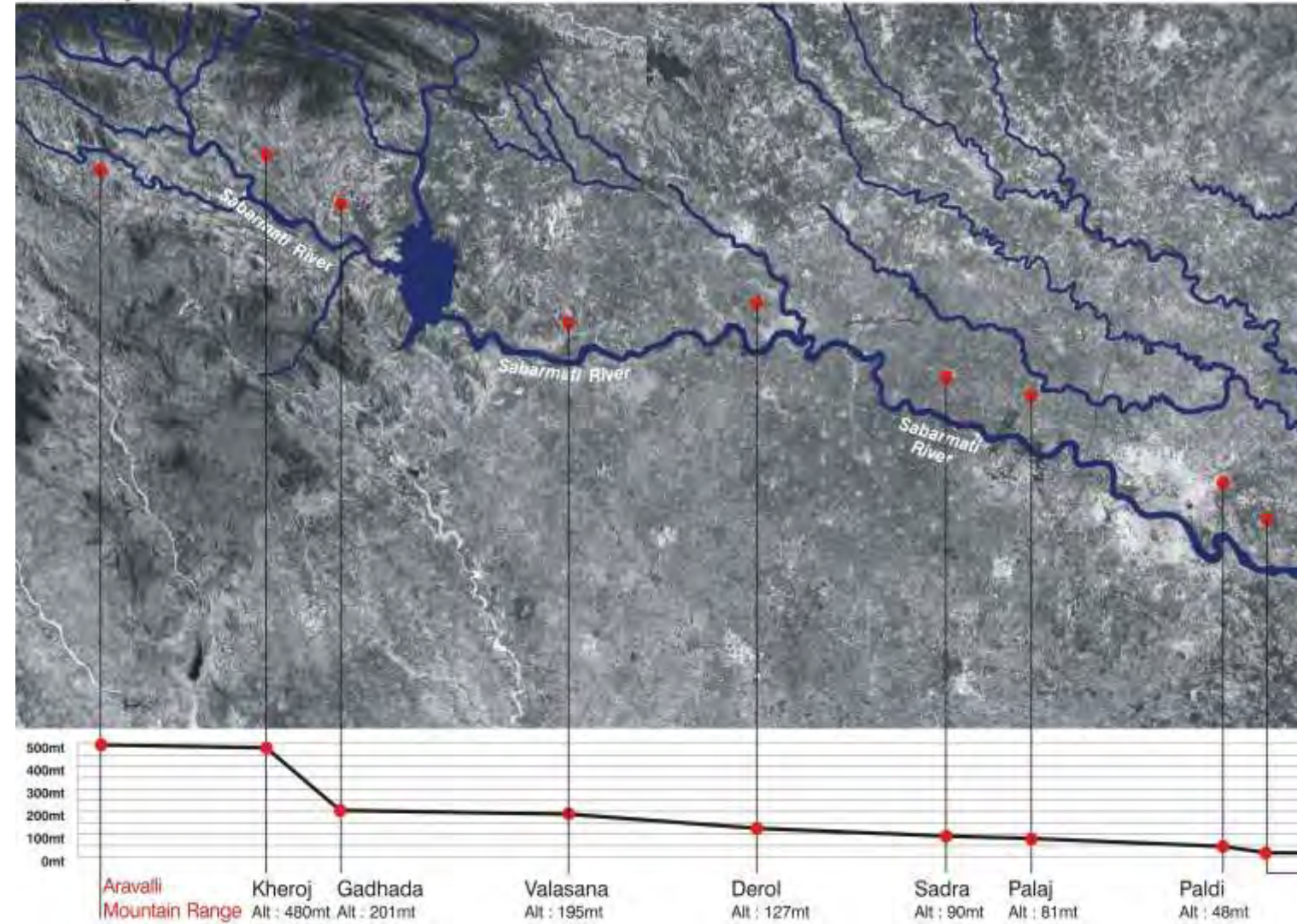
The study material collected from ten villages is represented in this book in a manner in which one can understand the overall nature of the Sabarmati river. District rainfall data, soil key map and crop chart is included in the appendix for the better understanding of natural system along the Sabarmati river.

Ritesh J. Kamdar
July 2009

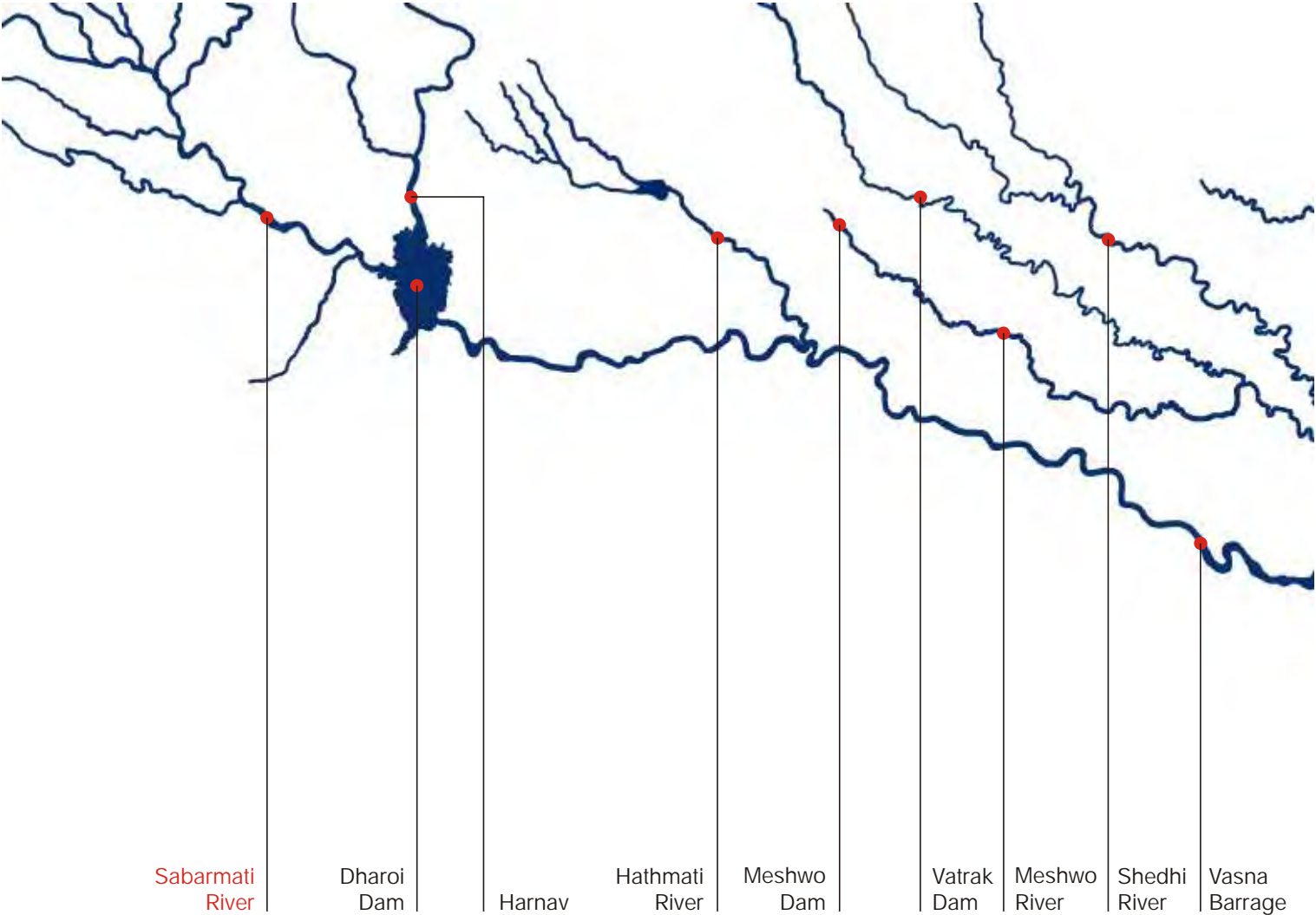
Along the Sabarmati

- 01. Places observed
- 02. Tributaries and dams

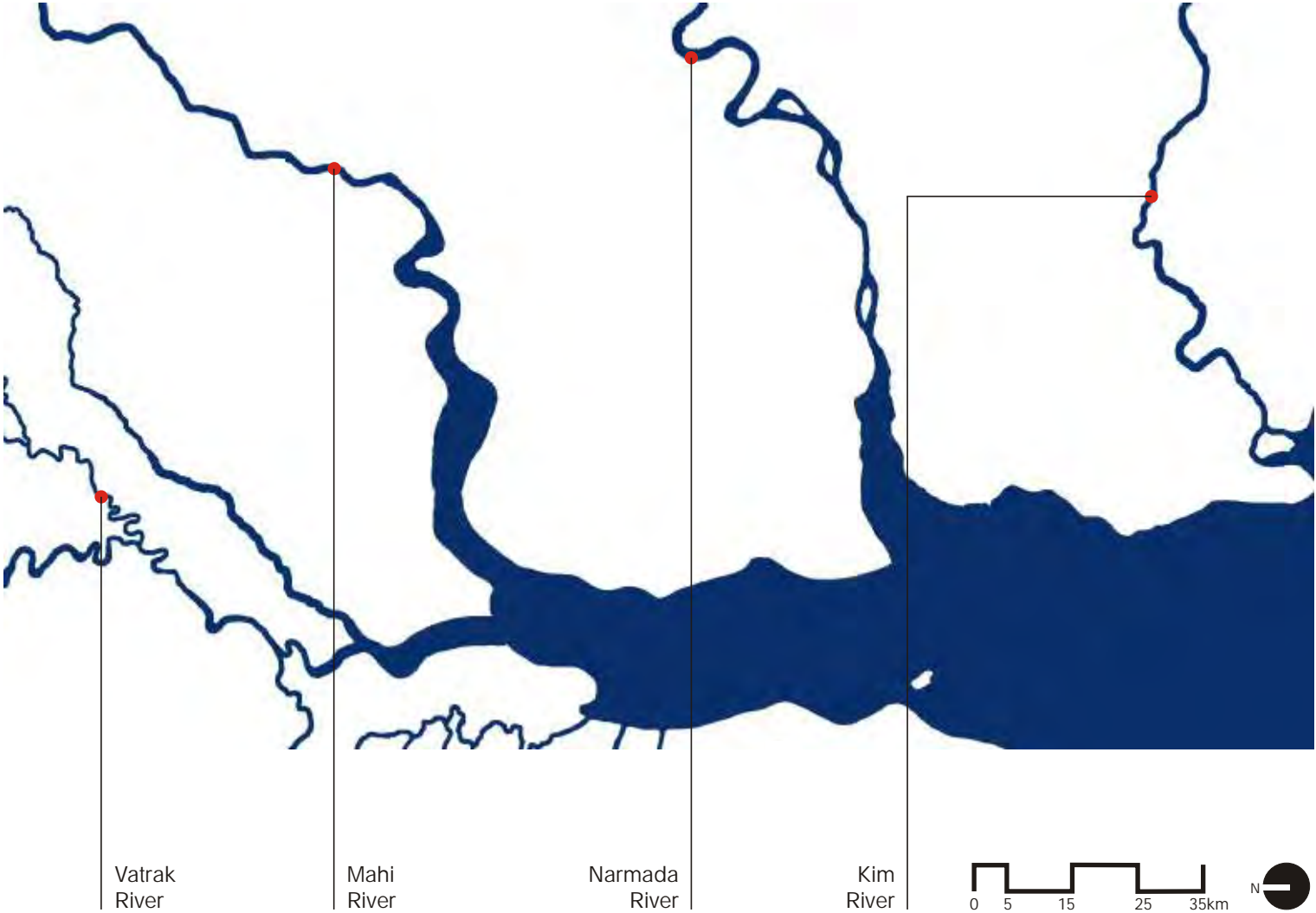
Route Map



Dams and Tributaries along the Sabarmati River



* Mahi, Narmada and Kim are not tributaries. Like Sabarmati, they also drain into the Gulf of Khambhat



Edges of the River

- 01. Kheroj; Ambaji
- 02. Gadhada; Khedbrahma
- 03. Valasana; Idar
- 04. Derol; Himmatnagar
- 05. Sadra; Gandhinagar
- 06. Palaj; Gandhinagar
- 07. Paldikankrej; Ahmedabad
- 08. Saroda; Bavla
- 09. Sahij; Dholka
- 10. Vadgam; Khambhat

Kheroj; Ambaji



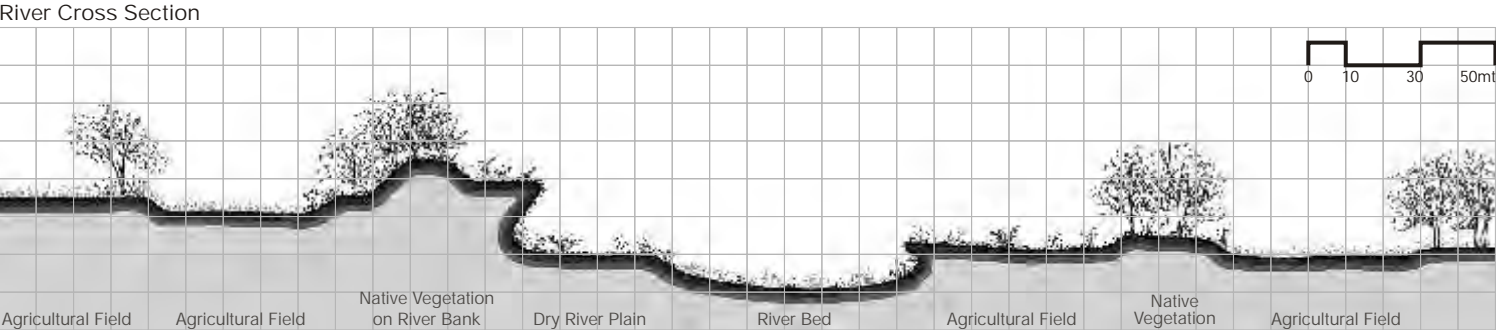
View taken from the over bridge looking downstream towards Khedbrahma



View taken from the river bank looking at agricultural fields marked on the river bed



View taken from the over bridge looking upstream towards Ambaji



The river course meanders towards the left side while flowing downstream towards Khedbrahma. Because of this, the left river bank faces heavy erosion in the monsoon.

There is abundant stunted vegetation on the left bank of the river course; but it seems to give very little resistance to erosion during the monsoon.

In summer, all the water from the surface of the river evaporates because of the excessive heat, leaving the river bed completely dry. This enables the people living in the area to do farming in the river bed, which is very fertile.

Cash crops are predominantly grown in the river bed. During the dry season, one can see the agricultural fields marked in the river bed.

There are fields adjacent to the river bed as well. However, these get flooded in the rainy season and the surface is getting eroded gradually every year.

The soil type in the region is loamy-skeletal, well drained, loose in structure and severely prone to erosion.



Agricultural field in the river bank



Agricultural field in the river bed



Complete dry river bed



Vasantbhai

“અંબાજીનો વિસ્તાર ડુંગરાળ છે અને સાબરમતી નદીમાં પાણી ઓછું હોવાથી ખેતી માટે આ જગ્યા નો ઓછો ઉપયોગ થાય છે. હું અહીં પાચથા પર રહું છું, ખેતી માટે કુંવાનું પાણી અને વરસાદ પર નિર્ભર રહું છું. હું ખેતી મોટે ભાગે ડુંગર પર કરું છું અને આ કામ બહું મેહનત માગી લે છે, જેના ધાર્યા પરિણામો પણ બહું ઓછા જોવા મળે છે. હું આ વિસ્તારમાં નાના બંધ તૈયાર કરું છું અને કટકા કટકામાં પાક ઉગાડું છું. વરસાદની ઋતુમાં જમીન ધોવાઈ જાય છે અને આખી મેહનત ફરી કરવી પડે છે. સાબરમતી નદીના કિનારે આવી કોઈ તકલીફ નથી, પણ પાણીના અછતના કારણે કિનારા પાસે ખેતીનું પ્રમાણ ઓછું થઈ રહ્યું છે, તમે મારો ફોટો લઈને બધું છાપવાના છો?”

“Ambaji is a hilly area and as the Sabarmati carries less water, the fields are not much used for farming. I stay at the base of the mountain and I am dependent on wells and rainwater for agriculture. I do farming on the hilly region; it is a lot of hard work and I rarely get desired results. I make small bunds and grow crops in small patches. In rainy season everything gets washed off and I have to do all the hard work again. There is no such problem for farmers who are practicing agriculture near the banks of the Sabarmati River, but because of scarcity of water there, farming is reducing. Are you going to take my photo and publish it in newspaper?”



• Altitude - 480mt (1600.0ft.)							
• Average annual rainfall - 625mm							
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>							
400	450	500	550	600	650	700	750
•Temp		In Summer			In Winter		
Min.		20 - 23°C			8 - 10°C		
Max.		42 - 44°C			34 - 36°C		

Gadhada; Khedbrahma



View taken from the over bridge looking downstream towards Idar

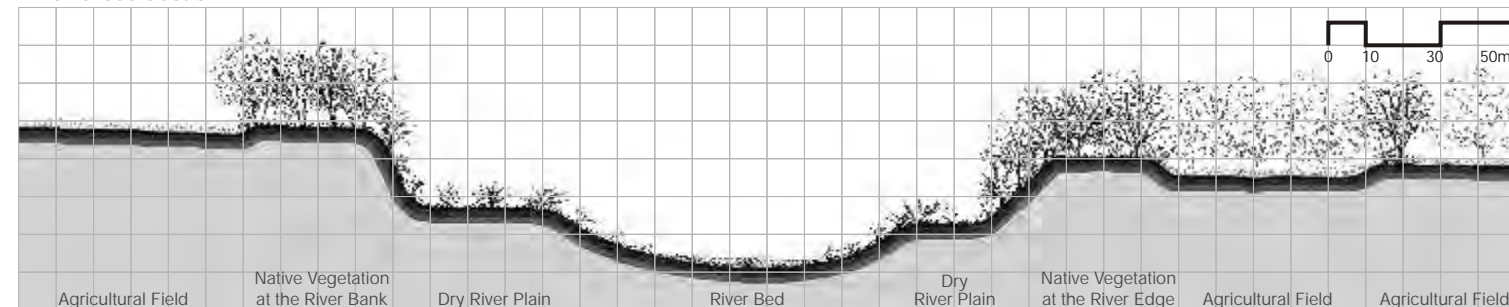


View taken from one river bank looking towards the other one



View taken from the over bridge looking upstream towards Ambaji

River Cross Section



River banks in this region are very sharp and because of the underlying hard, rocky stratum they are less prone to erosion during monsoon.

Dense natural vegetation at the river banks protect the boundary of the river course from getting heavily eroded during monsoon.

The hard banks make the river course deep and hence, water is present in ample amount in this region. Portions of the river bed are water logged and occasionally farming is practiced there. It is mainly cash crops which are grown on this marshy land.

The river bed is very fertile. People practicing farming on the river bank manage to grow good amount of crops. Even though the fields on the river bank get flooded during the rains; the hard rocky stratum below prevents them from getting eroded substantially.

The soil here is very shallow, loamy-skeletal, well drained and at places, it is clayey.



River bank



Vegetation cover at river bank



Water logged area land



Kishanbhai

“અમારી બે પેઢીએ સાબરમતી પરજી જીવન વિતાવ્યું છે, સાબરમતી નદીજો તો અમારી જીવનજનનનો છે. અમે ખેતી કરીયે છીએ અને અમારો બધો આધાર નદી પર છે. અહીં સાબરમતીના પટ પર ગેરકાયદેસર ખોદકામ ચાલે છે અને અહીંની માટી કોન્ટ્રાક્ટર વેચી આવે છે, તમે પત્રકાર છો? તો અમારી ફરીયાદ છાપજો! અમે અહીં ઋતુ ના હિસાબે પાક ઉગાડીયે છીએ, ગરમી માં અલગ, વરસાદમાં અલગ. ઉનાળામાં તો નદીના પટ પર ખેતી કરીયે છીએ જેથી આર્થિક રીતે થોડી સહાય થઈ રહે છે. સરકારે બનાવેલા સાબરમતી નદી પરના પુલ ના વિધે વરસાદમાં પાણીનો પ્રવાહ અવરોધાય છે જેથી પાણી ત્યાંથી ફુવારોની જેમ બહાર આવે છે અને એની આસપાસ ના વિસ્તારમાં મોટા ખાડા પાડી દે છે જેના વિધેના પ્રવાહ ની દિશા ધીરે ધીરે બદલાઈ રહી છે, લખજો ને!”

"We have spent two generations on the banks of Sabarmati River; she is our only life line. We do farming here and are completely dependent on the river. There is illegal mining going on in the river bed and the contractors are selling the river sand illegally; are you a reporter? Then please write about it! We grow different crops in different seasons; in summer we do agriculture in the river bed which helps us financially. Government has built a bridge across the river because of which water comes out of it with tremendous pressure in monsoon and erodes the surrounding area and forms large pits. Due to this, slowly the flow of river is changing, please write all this!"



- Altitude - 201mt (670.0ft.)
 - Average annual rainfall - 625mm
- | | | | | | | | | |
|-------|-----------|-----|-----|-----|-----------|-----|-----|-----|
| | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 |
| •Temp | In Summer | | | | In Winter | | | |
| Min. | 22 - 26°C | | | | 10 - 12°C | | | |
| Max. | 40 - 43°C | | | | 24 - 29°C | | | |



View taken from the over bridge looking downstream towards Himmatnagar

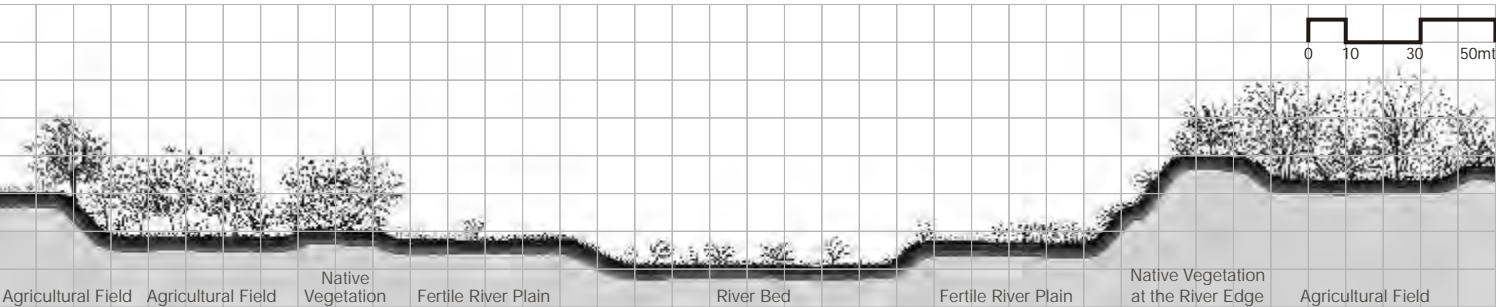


View taken from the river bank looking towards agriculture fields on the bed



View taken from the over bridge looking upstream towards Khedbrahma

River Cross Section



The river bed here is wide. Because of the very mild slope in this region, the river deposits its silt on the banks.

There is very little water present in the river. However, the bed is extremely fertile and almost half of the total width of it is used as agriculture fields to grow cash crops. The agricultural fields are marked on the river bed in linear pattern just next to the river bank.

Many types of seasonal crops are grown in the river bed for almost six months during summer. The small amount of water present in the river is used for irrigating these fields.

In this region, a major portion of agricultural fields next to the river banks have been washed away by surface erosion during monsoon due to heavy rains. Hence, people are doing farming on the river bed in summer. Some farming is also done on the river banks.

The soil here is excessively drained, calcareous, coarse, loamy type and moderately prone to erosion.



Manekbhai

“ મારે તો આ સાબરમતી ના કિનારાનું મંદિર અને સાબરમતી સિવાય બીજું કંઈ નહીં. મને અહીં રહેવાને ચાલીસ ની ઉપર વર્ષો થયા, મારી આખી જીંદગી મેં સાબરમતી નદીના કિનારે વિતાવી છે અને એને બદલાતી જોઈ છે. શું તમે પત્રકાર છો? વિદ્યાર્થી લાગે છે! વીસ થી બાવીસ વર્ષ પહેલાં નદીનો કિનારો મંદિર થી ખુબજ દુર હતો પણ છેલ્લા બે દાયકા માં નદી નો પટ વિશાળ થતો ગયો છે અને નદીનો કિનારો નજીક આવતો ગયો છે. કિનારાની જમીન બહુજ ઢીલી હોવાને લીધે દર વર્ષે વરસાદમાં જમીન નું ખુબ વધારે પ્રમાણમાં ધોવાણ થઈ જાય છે. પહેલા તો મંદિરથી અડધો કિ.મી. દુર સુધી જાઓ તેટલી બધી જમીન પર ખેતીવાડી થતી પણ નદીનો પ્રવાહ દર વરસે થોડો થોડો મંદિરની તરફ સરકવાને લીધે આ બાજુની બહુ ઓછી જમીન ખેતી માટે રહી ગઈ છે અને કિનારો ખુબજ નજીક આવી ગયો છે.”

“I am staying here for last forty years. Sabarmati River and this temple on the bank of the river is everything for me. I have spent my entire life on the banks of Sabarmati and have seen her changing. Are you a reporter? You look like a student. Twenty-two years before, the bank of the river was far away but in the last two decades, the river bed has increased in width and the bank has come closer to the temple. The soil at the bank of the river is loose, it gets eroded during monsoon. Earlier people used to practice agriculture till about five hundred meters from this temple towards the river, but now the course of the river has changed and it has come very close to the temple leaving very little land for agriculture.”



Agricultural field on river bed



River bed



Fields in linear pattern on river bed



• Altitude - 195mt (650.0ft.)							
• Average annual rainfall - 700mm							
400	450	500	550	600	650	700	750
•Temp		In Summer			In Winter		
Min.		24 - 26°C			10 - 12°C		
Max.		40 - 45°C			27 - 30°C		

Derol; Himmatnagar



View taken from Derol village looking at the turn of the river course downstream towards Sadra

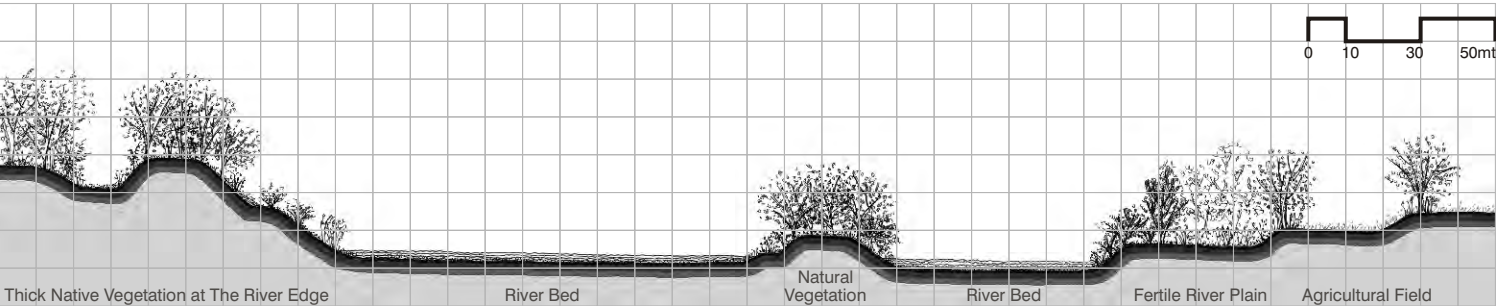


View taken from Derol village looking closely at the sharp turn of the river



View taken from one bank of the river looking towards the other bank

River Cross Section



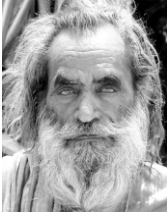
In this region, the river meanders slightly towards right bank as the right bank has flat terrain. But the left bank has a very hard rocky stratum. The left bank has thick native vegetation adjacent to it and the right bank supports scrub vegetation.

The river is deep in the central portion which supports fishing activity. Due to hard stratum towards left bank, water accumulation is seen in that part.

During monsoon water gets filled up nearly up to the upper level of the rocky stratum on the left bank of the river course.

During monsoon, many times pieces of rock from the banks fall off and the bank gets heavily eroded. This has increased the width of the river bed.

Soil here is somewhat excessively drained, coarse loamy-type and severely prone to erosion.



Suryakantbhai

“મને અહિયાં વસ્યાને સાડત્રીસ વર્ષ થયા. દેરોલ ગામ ઘણું ખરૂં એક બાજુ ડુંગરાળ છે અને બીજી બાજુ સપાટ જમીન થી ઘેરાયેલું છે. અહીં સાબરમતી નદીનો વિસ્તાર ઉડો છે અને અમે અહીંયા કિનારા ઉપરજ ખેતી કરીએ છીએ, થોડી બહુ ખેતી ડુંગરાળ વિસ્તારમાં પણ થાય છે. અહીં બે વ્યવસાય એક સાથે ચાલે છે ખેતીવાડીનો અને માછીમારીનો નદીની એક બાજુ વિશાળ પથરાળ વિસ્તાર હોવાથી પાણી નું આખું દબાણ સપાટ જમીનની બાજુ રહે છે જેથી એ બાજુની જમીન વરસાદ માં દર વર્ષે ધોવાતી જાય છે અને નદીનો પટ મોટો થતો જાય છે. મારા બન્ને છોકરાઓ વધુ પૈસા કમાવવા શહેર જતા રહ્યા છે અને આવી સ્થિતિ બીજા ઘણા એવા ખેડુતો અનુભવી રહ્યા છે જેથી ખેતીવાડીનું કામ આવતા થોડા વર્ષોમાં બહું ઓછું થઈ જવાની શક્યતા છે.”

“I have been staying here for the last thirty seven years. Village is surrounded by hilly region on one side and a flat terrain on the other side. The river is deep here and we do agriculture next to the river bed, some farmers do farming on the hilly areas. People here have two main occupations agriculture and fishing. On the left bank of the river there is a high rocky stratum so the pressure of water remains on the flatter side. In rainy season due to excessive pressure of water, soil erosion takes place on the flatter side because of which the width of the river bed is increasing. Both my sons have gone to the city in search of better employment. Many farmers are facing this problem and hence, in coming years the practice of agriculture will get reduced.”



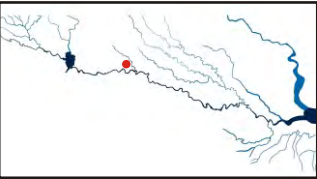
Meandering of the river



River course



High rocky stratum at the bank



• Altitude - 127mt (423.30ft.)									
• Average annual rainfall - 630mm									
	400	450	500	550	600	650	700	750	
•Temp	In Summer			In Winter					
Min.	23 - 25°C			7 - 10°C					
Max.	40 - 44°C			32 - 36°C					

Sadra; Gandhinagar



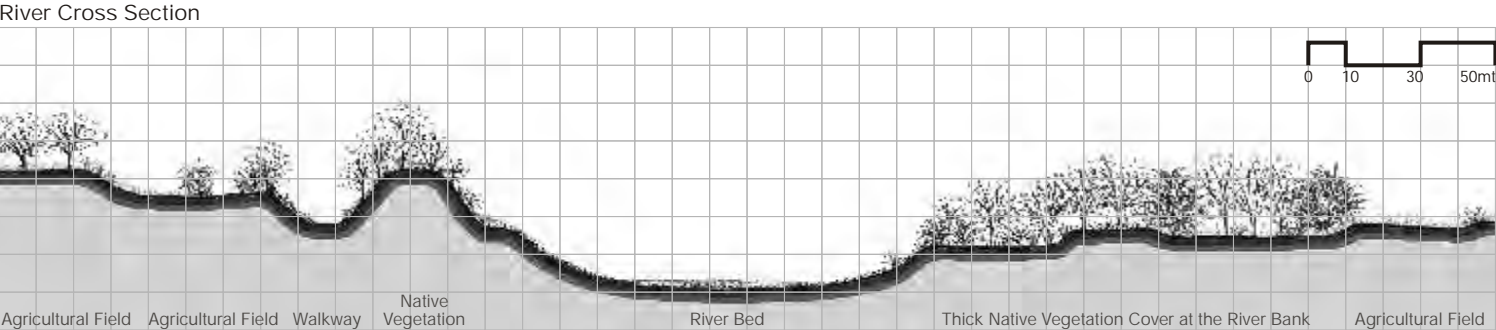
View taken from one of the old forts at the river bank looking towards the river course



View taken from the river bed looking upstream towards Sadra village



View taken from the river bed looking downstream towards Palaj village.



As the river banks are not very high in this region, Sabarmati river dries up completely during summer.

The right bank of the river along Sadra village is much higher than the bank on the left side.

Agricultural fields are thus, located on the higher, right bank of the river. River banks are very steep on this side and gentler on the opposite, left bank of the river.

Illegal mining of river sand occurs in the river bed. Because of this mining the soil of the river bed loosens up and becomes severely prone to erosion.

The native vegetation on the river banks has reduced a lot due to excessive erosion in the monsoon.

In the rainy season because of the loose soil structure, the river bank gets highly eroded and hence, the width of the river course increases which adversely affects the agricultural fields along the river.

The soil type of the region is somewhat excessively drained and coarse-loamy type.



Nitinbhai

“સાદરા ગામમાં સાબરમતી નદીના કિનારાનો વિસ્તાર મોટા ભાગે પથરાળ છે જેથી સાબરમતી નદીને અડીને ખેતી ઓછી થાય છે. અહીં થતા પાકોમાં શાકભાજી અને અન્ય ખેતી થાય છે પણ પ્રમાણમાં બહુ ઓછું. ગરમીની ઋતુમાં અહીં કુલોનો વ્યાપાર થાય છે, ઘણાં ખેડુતો કુલો ઉગાડીને નજીકના શહેરમાં વેચે છે જેમાં તેમને સારા એવા પૈસા મળી રહે છે. ગરમીની ઋતુમાં સાબરમતીના પટ પર પણ ખેતી થાય છે. હવે પટ ઉપર છંદલા થોડા વર્ષથી ગેરકાયદેસર ખોદકામ થાય છે, જેથી જમીનની ફળદ્રુપતા ઓછી થતી જાય છે માટે ખાતરનો વધુ ઉપયોગ કરવો પડે છે, બીજુ કે જમીન ઢીલી પડી જવાથી વસ્સાદમાં એનું ખાસા પ્રમાણમાં ઘોવાણ પણ થઈ જાય છે જે ખેતીવાડી પર બહુ માઠી અસર કરે છે.”

“In Sadra village the Sabarmati River flows through a rocky area due to which farming is not possible along the river bed. Most of the fields are far from the river. We grow vegetables here but the production is very low. In summer, many farmers grow flowers and sell them to the nearby city. They make good money out of it. We also do agriculture in the river bed but in last few years because of illegal mining on the river bed, the fertility of the soil has decreased and we are forced to use more fertilizer. Secondly, because of mining the soil loosens up and thus, erosion increases during the monsoon which adversely affects the agricultural practice.”



River course



Left river bank



Right river bank



• Altitude - 90mt (300.0ft.)		• Average annual rainfall - 675mm	
•Temp			
Min.	In Summer	In Winter	
Max.	20 - 24°C	8 - 11°C	
	35 - 43°C	26 - 30°C	

Palaj; Gandhinagar



View taken from the river bed looking upstream towards Palaj

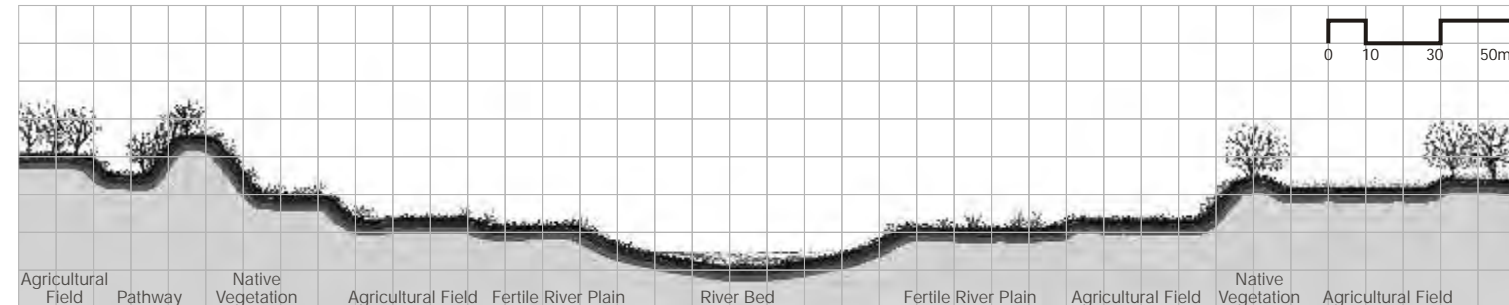


View taken from the river bed looking downstream towards Dholka



View taken from the river bed looking at the left bank of the river

River Cross Section



The river banks here are very high. The river bed thus, appears deep and there are small water bodies present in the river bed.

A part of the river bed is filled up with some water; otherwise the river is completely dried up.

Agricultural fields are present on both the side of the river banks.

Industries discharge their polluted liquids in the river. The stream of the water here stinks and has high level of fluoride content. People use the contaminated water for irrigation, unaware of the fact that this water is adversely affecting the fertility of the soil.

Most part of the river banks is highly prone to the erosion because of the very loose soil structure.

The river bed is severely eroded. The situation is getting worse because of illegal mining and transportation of river sand. Because of this, the river bed has further loosen up and is prone to severe erosion during monsoon.

The soil here is of calcareous, coarse loamy type and prone to erosion.



Water bodies at the river bank



River bed



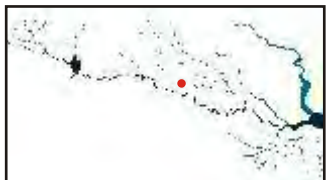
Eroded part on the river bed



Ranchhodbhai

“મને પાલજમાં રહેતા સત્યાવીસ વર્ષ થઈ ગયા અને અહીંયા માડ મુખ્ય કામ ખેતીવાડી છે. છેલ્લા સત્યાવીસ વર્ષમાં જોઈએ તો સાબરમતી નદીમાં પાણીનું પ્રમાણ ખાસ એવું ઓછુ થયેલ છે, પહેલા સાબરમતી નદીના આ ભાગમાં વર્ષમાં છ થી આઠ મહિના પાણી રહેતું જેથી ખેતીમાં અમે સારો એવો પાક ઉગાડી શકતા હતા. સારા પ્રમાણમાં પાક થવાને લીધે અમને સારા એવા પૈસા મળી રહેતા જેથી અમારૂં જીવન યાપન થઈ રહેતું. હવે તો નદીમાં માંડ ત્રણ મહિના પાણી રહે છે, જેથી ખેતીના ઉત્પાદનમાં બહુ ઘટાડો થયો છે જે જીવન યાપન માટે પૂરતું નથી. ખેતીવાડીમાં પૈસા પૂરતાં ના મળવાથી ગામનાં યુવાનો શહેર તરફ જઈ રહ્યા છે જેને લીધે ખેતી વ્યવસાય ધીરે-ધીરે ઓછો થઈ રહ્યો છે.”

"I have been staying in Palaj for last twenty seven years and agriculture is our main occupation. Earlier there used to be water in Sabarmati river for six to eight months because of which we were able to grow good amount of crop, but in the last twenty seven years water level of Sabarmati river has decreased substantially. Earlier because of the production of good amount of crop we faced no financial problems but as now Sabarmati dries up in three months and remains dry for the rest of the year, production of crop has become very less and therefore the money we get from that is not sufficient to run our family. Youngsters are heading towards the city in search of the better employment, which is adversely affecting livelihood from agriculture".



- Altitude - 81mt (270.ft.)
 - Average annual rainfall - 700mm
-
- | Temp | In Summer | In Winter |
|------|-----------|-----------|
| Min. | 19 - 25°C | 7 - 10°C |
| Max. | 36 - 42°C | 29 - 31°C |

Paldikankrej; Ahmedabad



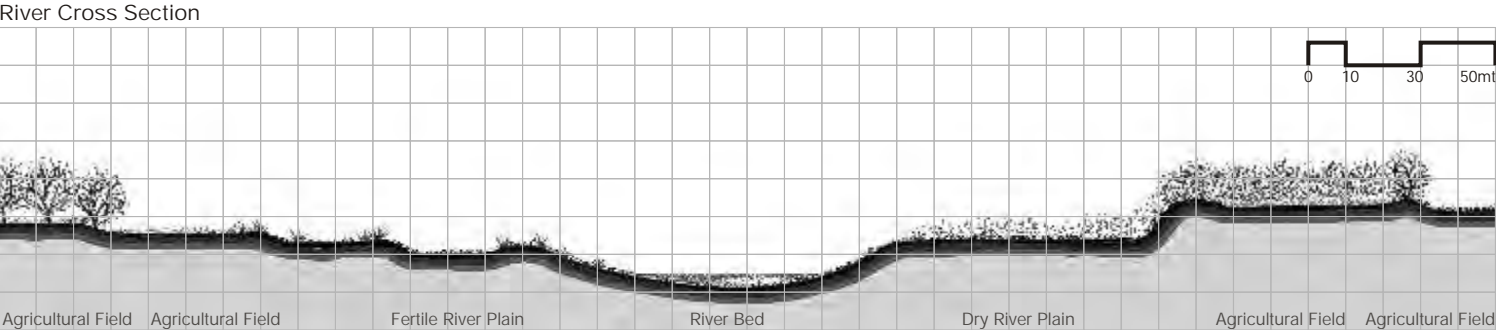
View taken from the over bridge looking upstream towards Ahmedabad



View taken from a bank of the river covering agriculture fields on both banks



View taken from the over bridge looking downstream towards Dholka



There is a small continuous stream of Sabarmati river in the region. Water from the stream is used for irrigating fields in the river bed.

The river bed on both side of the stream is extremely fertile and hence, people use the river bed to grow crops.

Farming is also done on the banks of the river. The field seen is only one-third of the total field. The other two-thirds has been washed away during monsoon.

The water in the river is however not good for irrigation because industries discharge their polluted liquid in it.

Farmers have cut a stream from the river course and have directed it to the agricultural fields. Because of this, farmers don't have to pump water from the main stream and hence, they save on energy.

The soil here is well drained, calcareous fine loamy type, has slight salinity and is moderately prone to erosion.



Small stream of Sabarmati river



Agricultural field on the river bank



Fertile river bed



Savjibhai

“ અમારો પરિવાર પાત્રીસ વર્ષથી સાબરમતી નદીના કિનારે રહે છે. સાબરમતી નદીએ અમને આટલા વર્ષોમાં જેટલુ આપ્યુ છે એથીએ વધુ અમારી પાસેથી ઝુંટવી લીધુ છે, હમણા તમે જ્યાં ઉભા છો એ અમારી આખી જમીનનો ફક્ત એક તૃતિયાંશ ભાગ છે બાકીનો બે તૃતિયાંશ ભાગ દર વર્ષે વરસાદમાં જમીનના ધોવાણને લીધે નદીમાં વહી ગયો છે. જમીન ઓછી થવાને લીધે હવે ઉનાળામાં અમે નદીના પટ ઉપર પણ ખેતી કરીએ છીએ. એ જમીન ફળદ્રુપ હોવાથી ત્યાં સારો એવો પાક થઈ રહે છે પણ એ ફક્ત ઉનાળામાં ચાર થી છ મહિના બાકીના છ મહિના નદીમાં પાણી રહેતું હોવાથી પછી એ શક્ય બનતું નથી. ઓછી જમીન અને ઓછો પાક થવાને લીધે અમને વ્યવસ્યામાં આર્થિક મુશ્કેલીઓનો સામનો કરવો પડે છે. સરકારે ગામના વિકાસ માટે યોજના અમલમાં લાવી જરૂરી છે.”

“Our family is staying on the bank of Sabarmati River for last thirty five years. Sabarmati has given us many things but in return has taken major part of our land. Where you are standing right now is only one-third of our total land, the other two-third has been washed out due to soil erosion in rainy season. Because of less availability of land we do agriculture in the river bed. As it is more fertile we grow good quantity of crops on it. This is possible only for four to six months during summer season because the river remains filled up with water for rest of the year. Because of the lack of sufficient land and less crop we are facing financial problems. Government needs to make some plans for the betterment of the village.”



• Altitude - 48mt (160.0ft.)		• Average annual rainfall - 625mm	
Temp Min.	In Summer 23 - 25°C	In Winter 12 - 15°C	
Temp Max.	43 - 45°C	32 - 35°C	



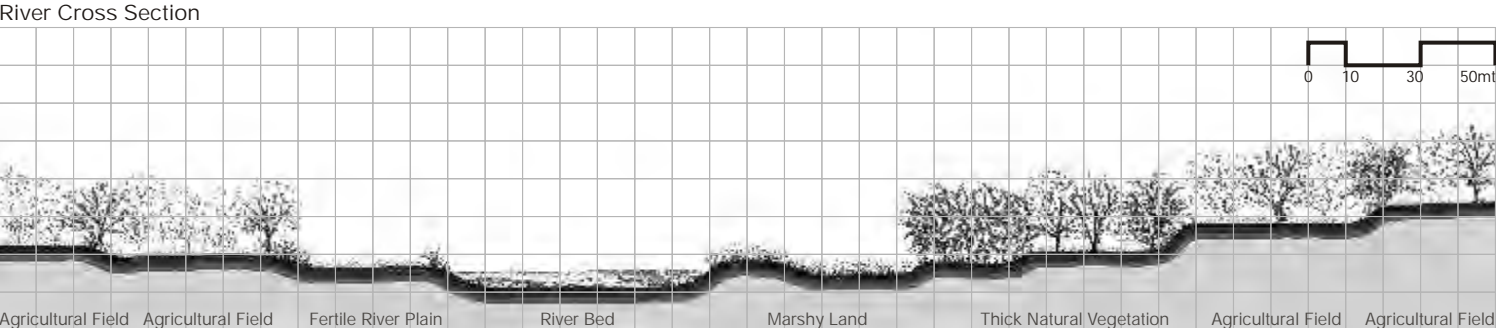
View taken from the over bridge looking downstream towards Khambhat



View taken from the over bridge looking upstream towards Paldikankrej



View showing the river bank



The irregular shaped terrain seen here was earlier a vast agricultural field which has almost been washed away because of the heavy erosion. River bed has increased in width because of which water percolates, spreads and evaporates faster.

Thick vegetation is present on the river bank. Vegetation cover helps in decreasing the erosion but is not able to stop it completely. Just adjacent to the vegetation cover there are agriculture fields which get filled with water during monsoon and are prone to erosion.

Part of the land here has a hard stratum below. Because of this, the land gets submerged during monsoon but does not get washed away.

As the upper layer of the soil is fertile and deep enough for farming, farmers grow cash crops on it for almost six months in summer.

The soil type here is well drained, calcareous, with moderate salinity and is moderately prone to erosion.



Jethabhai

“ મે અહીયાં મારી જિંદગીની ત્રણ પેઢી જોઈ છે. હું સાબરમતી નદીના કિનારા પાસેજ ખેતીવાડી કરું છું. સાબરમતી નદીનો અહીયાં નો ભાગ ઉડો હોવાથી નદીમાં પાણી બારેમાસ રહે છે. ખેતીવાડીની જમીન નદીને એકદમ અડીને હોવાને લીધે વરસાદની ઋતુમાં મોટા ભાગે તેમાં પાણી ભરાઈ જાય છે. જમીન ફળદ્રુપ હોવાથી તેમાં અમે શાકભાજી સાથે બાકી ધણી વસ્તુઓનો પાક લઈએ છીએ, પાણીની અછત રહેતી નથી પણ વરસાદમાં પાણીનો પ્રવાહ વધારે હોવાથી જમીન ધોવાતી જાય છે અને ખેતીમાટે ઉપયોગમાં લેવાતી જમીન ઓછી થતી જાય છે. સરકારે અહીં કેમ બનાવવાની જરૂર છે જેથી નદીનો પ્રવાહ નિયંત્રણમાં લાવી શકાય અને તેનું પાણી ખેતીવાડીમાં વાપરી શકાય.”

“I stay at the banks of Sabarmati River and do farming. I have seen three generations here. This part of Sabarmati is very deep and marshy, water remains in the river round the year. As the agricultural fields are just adjacent to the river they get filled up in monsoon. Because of the good fertility of the soil we grow vegetables along with many other crops. There is no scarcity of water but in rainy season due to soil erosion we are losing a part of our fertile land every year. Government needs to build dam here so that the flow of the river can be regulated and the water can be used for agriculture.”



River bank prone to high erosion



Thick native vegetation at the bank



Agricultural field on the river bank



• Altitude - 15mt (50.0ft.)		• Average annual rainfall - 600mm	
Temp	In Summer	In Winter	
Min.	25 - 27°C	11 - 13°C	
Max.	43 - 45°C	20 - 22°C	

Sahij; Dholka



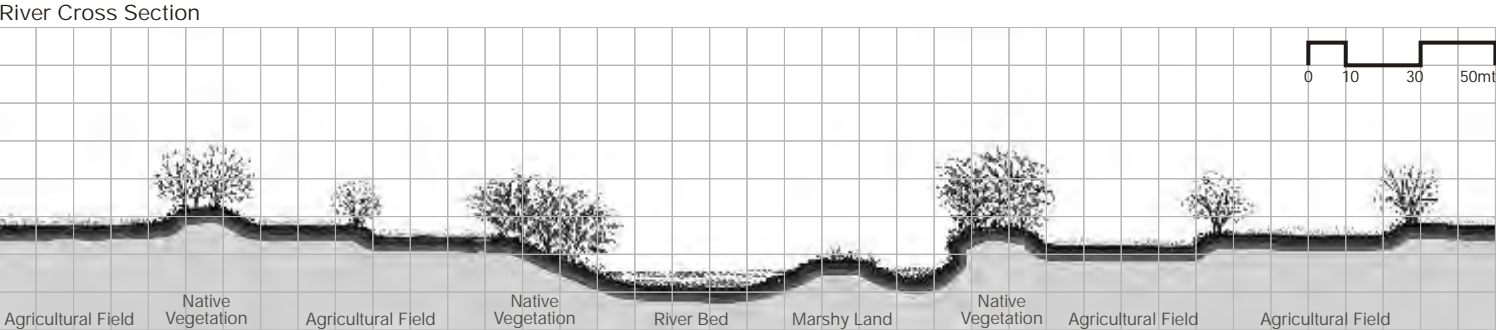
View taken from the over bridge looking downstream towards Khambhat



View taken from the one river bank looking towards the other one



View taken from the over bridge looking upstream towards Ahmedabad



The river banks here are very steep and less eroded. Thick vegetation cover at the river banks protect the bank from getting heavily eroded.

This part of the river is deep and hence, it has ample amount of water for irrigation.

Agricultural fields are present on both the river banks. These fields faces surface erosion and get heavily eroded during the monsoon.

Because of the continuous draining of water from the adjacent agriculture fields, the part from where water joins the river course, has got heavily eroded over a period of time. The vegetation cover of that area is gradually reducing and this might affect the river banks.

As the soil here is sandy, farming is not practiced on the river bed. The soil structure of the surrounding area is also loose and is prone to erosion.

The soil type here is well drained, calcareous, fine and is severely prone to erosion.



River bank



Eroded part of the river bank



Eroded agricultural field



Ramnikbhai

“ હુ જ્યારે સાહિજ આવ્યો ત્યારે અહીં માંડ પંદર ઘરો હતા અને મોટા ભાગે બધાનો વ્યવસાય ખેતીવાડી હતો. અહીંની જમીન એ વખતે બહુજ ફળદ્રુપ હતી અને ઘણાં જાતનાં પાકો અહીં થતા હતા. ખેતીના જોર પર ગામનો ખુબ વિકાસ થયો છે. આજે પણ નદીની બન્ને બાજુ ખેતી થાય છે પણ હવે જમીનની ફળદ્રુપતામાં નોંધપાત્ર ઘટાડો આવ્યો છે. સાબરમતી માં પાણીનું પ્રમાણ બહુ ઓછુ થઈ ગયું છે જે ખેતીવાડી ઉપર માઠી અસર કરે છે. વર્ષના છ મહિના તો નદીમાં પાણી નજીવું હોય છે અને ઉનાળામાં સાબરમતી નદી પુરી રીતે સુકાઈ જાય છે. આવા સંજોગોમાં હવે પહેલાની જેમ જીવન ચાપન માટે પુરી રીતે સાબરમતી નદી પર આશ્રીત રહી શકાતું નથી અને પૈસા કમાવવા માટે સાથે - સાથે બીજી મજૂરી પણ કરવી પડે છે.”

“When I came to Sahij, there were hardly fifteen houses and most of the people used to practice farming. At that time the land was very fertile and we use to grow many types of crop on it. Village has progressed very much over the years because of the farming practice. Today people are still doing agriculture on both the sides of the river but the fertility of the soil and water level of the river has decreased substantially which has severely affected the crop yield. Water level remains very low for six months and in summer the river dries up completely. Now we cannot depend only on the river for livelihood hence, to earn money we are forced to do other labor.”



• Altitude - 17mt (56.60ft.)		• Average annual rainfall - 562mm	
Temp	In Summer	In Winter	
Min.	23 - 25°C	10 - 11°C	
Max.	43 - 45°C	20 - 22°C	

Vadgam; Khambhat



View taken from the river bank looking towards Arabian Sea

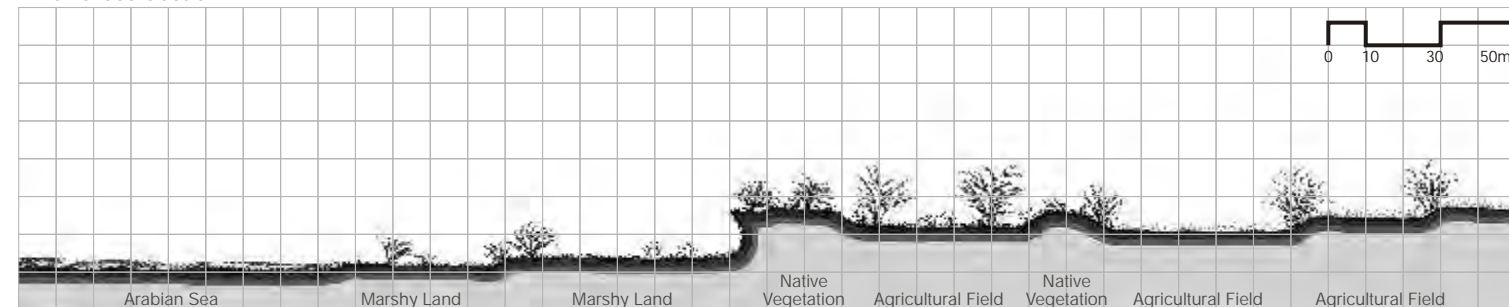


View taken from the middle of the sea looking towards the heavily eroded river bank of vadgam



View taken from the terrace of the temple located at the bank, looking towards the sea and the agriculture fields

River Cross Section



The stretch along the river here is very fertile & very useful for farming.

Because of the loose soil structure & heavy rainfall, river banks are getting heavily eroded during monsoon. The river bank here has already eroded by about five hundred meters. Due to heavy erosion, the size of the river bed has increased and it has eaten into the adjacent fields making them smaller.

The soil structure of the river bank here is so loose that if we stand on it and give a slight push the whole portion will fall down immediately.

There is a stretch of a water logged land at the bank of the river. As the Sabarmati empties into the Arabian Sea it deposits large amount of silt here.

This soil is also taken away to be used as a fertilizer in the fields farther away.

The soil here is imperfectly drained, calcareous, coarse-loamy type with moderately prone to erosion.



Shrenikbhai

“ ખંભાત ની ખાડી માથી સાબરમતી નદી અચ્છી સમુદ્રમાં ભળી જાય છે. મને અહિંયાં સોળ વરસ થયા છે અને આ સોળ વર્ષમાં મને કોઈપણ જાતનો મોટો ફેર નદીમાં જોવા મળ્યો નથી. અહીં જમા થતો નદીનો કોંપ ખુબજ ફળદ્રુપ હોવાથી અહીં ખેતી તો થાયજ છે અને સાથે અહીંની માટી દુરના ખેતરો માં લઈ જઈને એનો ખાતર તરીકે પણ ઉપયોગ કરાય છે, અહીં કોંપનો ગેરકાયદેસર ધંધો પણ થાય છે. ખંભાતની જળવાયુ વણકારા પાકોને મદદરૂપ થાય છે. સરકાર દ્વારા અમલમાં લેવાયલી પાણી સંચાલિત યોજનામાં ગામના લોકોએ ઉમેડકાબેર ભાગ લીધો હોવાથી વરસાદનું પાણી મોટા પ્રમાણમાં ભેગુ કરાય છે અને એનો ઉપયોગ ખેતીમાં અને બાકી ઘણી વસ્તુઓ માં લેવાય છે. કોઈ પણ ઋતુમાં અહીં એવી કોઈ ગંભીર પ્રકારની પરિસ્થિતી સર્જાતી નથી. સાબરમતી નદી લીધે આ ગામનો ઘણો વિકાસ થયો છે.”

"Sabarmati River empties into Arabian Sea through Gulf of Khambhat. In my last sixteen years of staying here I have not observed any kind of major change in the river. As the soil here is very fertile, most of the people do farming practice here. The soil is also taken away to be used as manure in fields further away. Illegal transportation of river silt also happens here. Climate of Khambhat is ideal for many types of crop production. People have readily participated in the government initiated project of rain water harvesting. Water which is accumulated is mostly used in agriculture and also for other purposes. Any kind of serious problem never arises in any season. Village has developed a lot because of Sabarmati River."



Severely eroded river bank




Bank as seen from Arabian sea



Water logged land



- Altitude - 8mt (26.60t.)
- Average annual rainfall - 700mm
- 
- | Temp | In Summer | In Winter |
|------|-----------|-----------|
| Min. | 20 - 22°C | 10 - 12°C |
| Max. | 36 - 38°C | 25 - 30°C |

Soil types

- 01. Kheroj; Ambaji
- 02. Gadhada; Khedbrahma
- 03. Valasana; Idar
- 04. Derol; Himmatnagar
- 05. Sadra; Gandhinagar
- 06. Palaj; Gandhinagar
- 07. Paldikankrej; Ahmedabad
- 08. Saroda; Bavla
- 09. Sahij; Dholka
- 10. Vadgam; Khambhat

Kheroj; Ambaji



Clayey loam Silty Fine sand Fine loam Coarse loam

Soil Type Description

Type - 004
Shallow, well drained, loamy-skeletal soils on undulating piedmont with severe erosion and moderate stoniness; associated with very deep, well drained, coarse-loamy soils on very gently sloping lands with moderate erosion.

Type - 008
Very deep, well drained, fine loamy soils on very gently sloping piedmont plain with moderate erosion; associated with very deep, well drained, coarse-loamy soils with moderate erosion.

Gadhada; Khedbrahma



Silty Clayey loam Coarse sand Coarse sand Coarse sand

Soil Type Description

Type - 012
Shallow, well drained , loamy soils on very gently sloping piedmont plain with narrow valleys with severe erosion; associated with shallow, well drained, clayey soils with moderate erosion.

Type - 004
Shallow, well drained, loamy-skeletal soils on undulating piedmont with severe erosion and moderate stoniness; associated with very deep, well drained, coarse-loamy soils on very gently sloping lands with moderate erosion.

Valasana; Idar



Fine sand Coarse sand Clayey Clayey loam Coarse loam

Soil Type Description

Type - 007
Very deep, somewhat excessively drained, calcareous coarse loamy soils on very gently sloping piedmont plains with narrow valleys with moderate erosion; associated with very deep, somewhat excessively drained, coarse loamy soils with moderate erosion.

Type - 013
Moderately deep, well drained, fine soils on very gently sloping piedmont plain with moderate erosion; associated with very deep, well drained coarse loamy soils with moderate erosion.

Derol; Himmatnagar



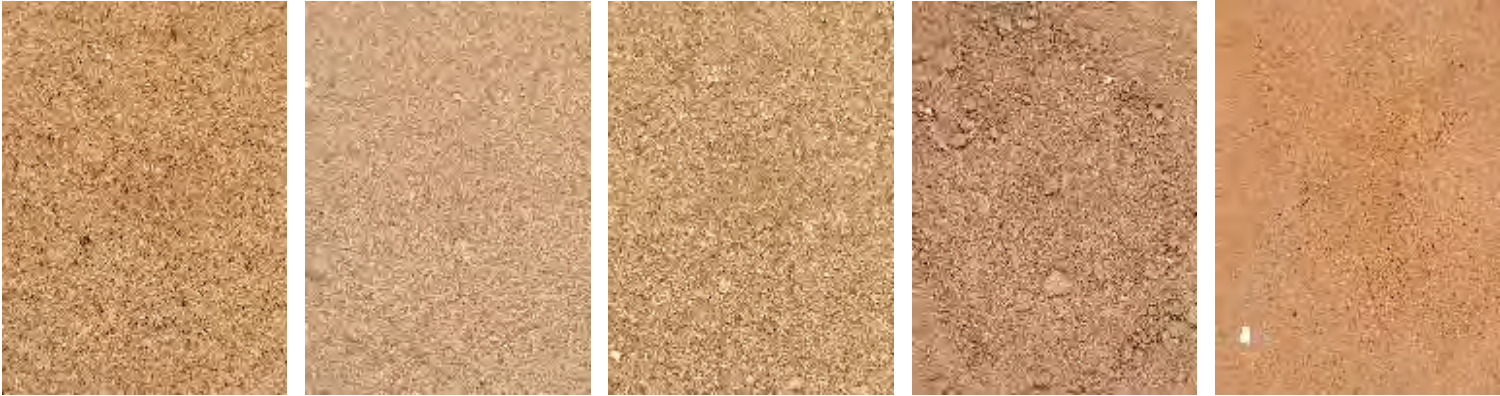
Coarse loam Coarse sand Fine loam Coarse loam Clayey loam

Soil Type Description

Type - 074
Very deep, somewhat excessively drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with severe erosion; associated with very deep, well drained, calcareous, fine-loamy soils with moderate erosion.

Type - 089
Very deep, somewhat excessively drained, coarse-loamy soils on very gently sloping alluvial plain with moderate erosion; associated with very deep, excessively drained calcareous, sandy soils with moderate erosion.

Sadra; Gandhinagar



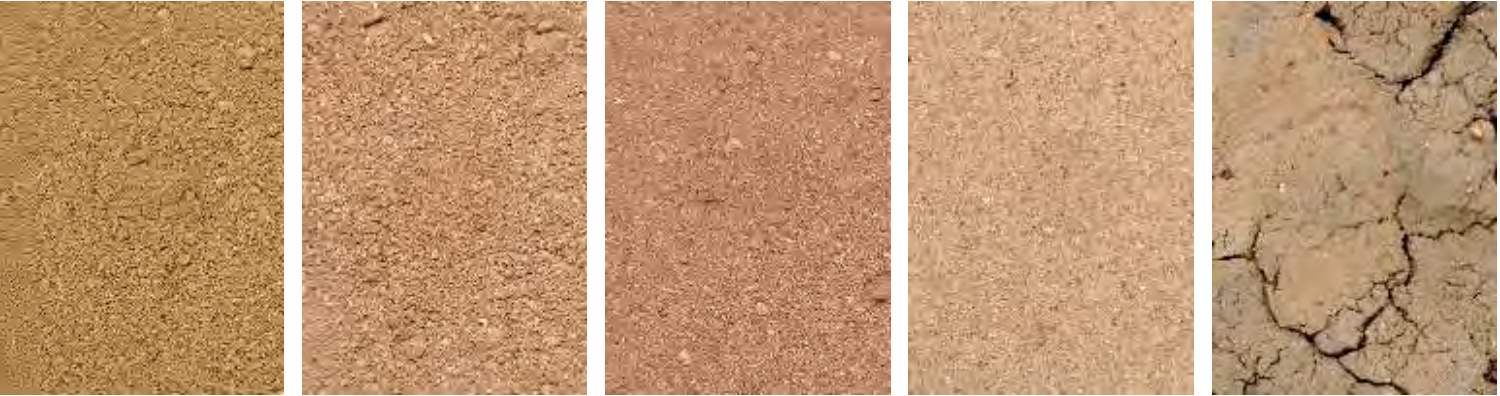
Fine sand Clayey loam Coarse sand Coarse loam Fine loam

Soil Type Description

Type - 074
Very deep, somewhat excessively drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with severe erosion; associated with very deep, well drained, calcareous, fine-loamy soils with moderate erosion.

Type - 097
Very deep, well drained, fine-loamy soils on very gently sloping alluvial plain with moderate erosion, associated with very deep, moderately well drained calcareous, fine-loamy soils with moderate erosion.

Palaj; Gandhinagar



Fine loam Sandy loam Fine sand Coarse sand Clayey loam

Soil Type Description

Type - 088
Very deep, somewhat excessively drained, coarse-loamy soils on nearly level alluvial plain with slight erosion; associated with very deep, excessively drained, calcareous sandy soils with moderate erosion.

Type - 074
Very deep, somewhat excessively drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with severe erosion; associated with very deep, well drained, calcareous, fine-loamy soils with moderate erosion.

Paldikankrej; Ahmedabad



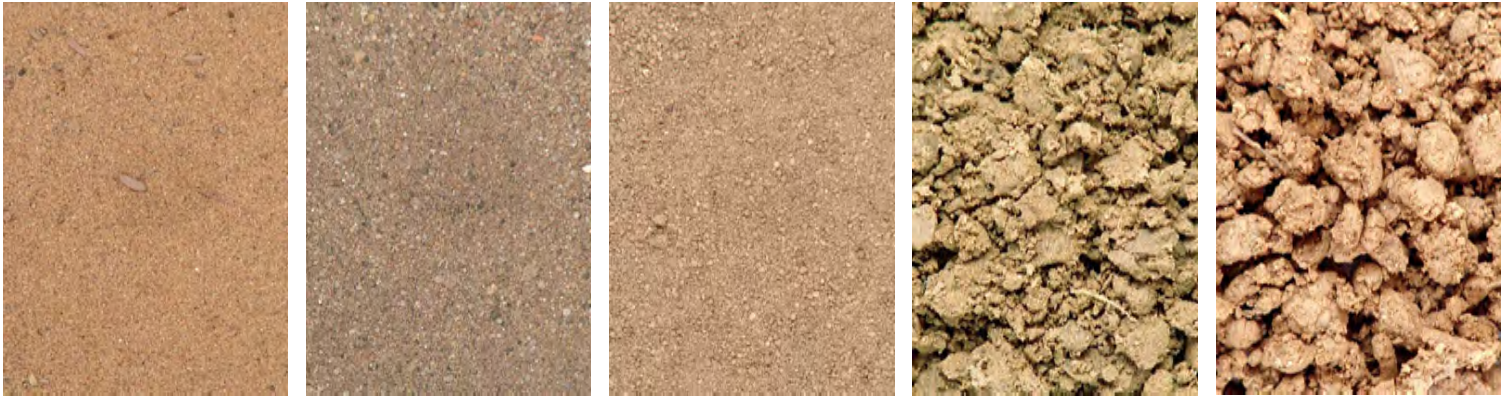
Silty Fine loam Clayey Clayey loam Coarse sand

Soil Type Description

Type - 079
Very deep, moderately well drained, calcareous fine loamy soils on very gently sloping flood plain with slight erosion and slight salinity; associated with deep, moderately well drained, calcareous fine soils with slighter erosion and slighter salinity.

Type - 100
Deep well drained, fine loamy soils on very gently sloping alluvial plain with slight erosion and slight salinity; associated with deep moderately well drained, calcareous, fine soils on gently sloping lands with moderate erosion.

Saroda; Bavla



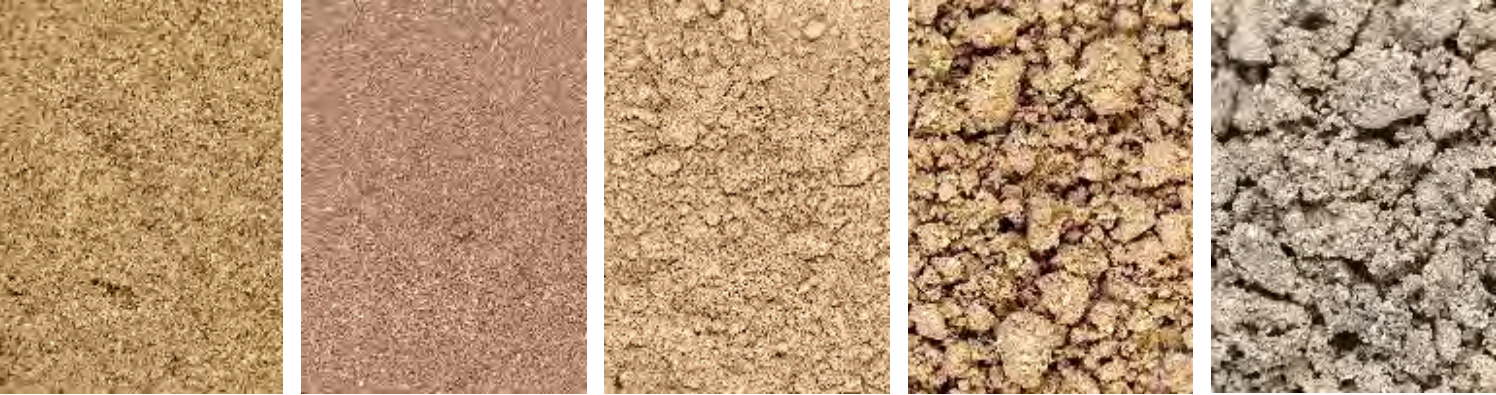
Silty Fine sand Coarse loam Clayey loam Coarse loam

Soil Type Description

Type - 115
Moderately deep, moderately well drained, calcareous, fine soils on very gently sloping alluvial plain with slight erosion and slight salinity; associated with deep, moderately well, drained, calcareous, fine soils with moderate erosion.

Type - 079
Very deep, moderately well drained, calcareous fine loamy soils on very gently sloping flood plain with slight erosion and slight salinity; associated with deep, moderately well drained, calcareous fine soils with slighter erosion and slighter salinity.

Sahij; Dholka



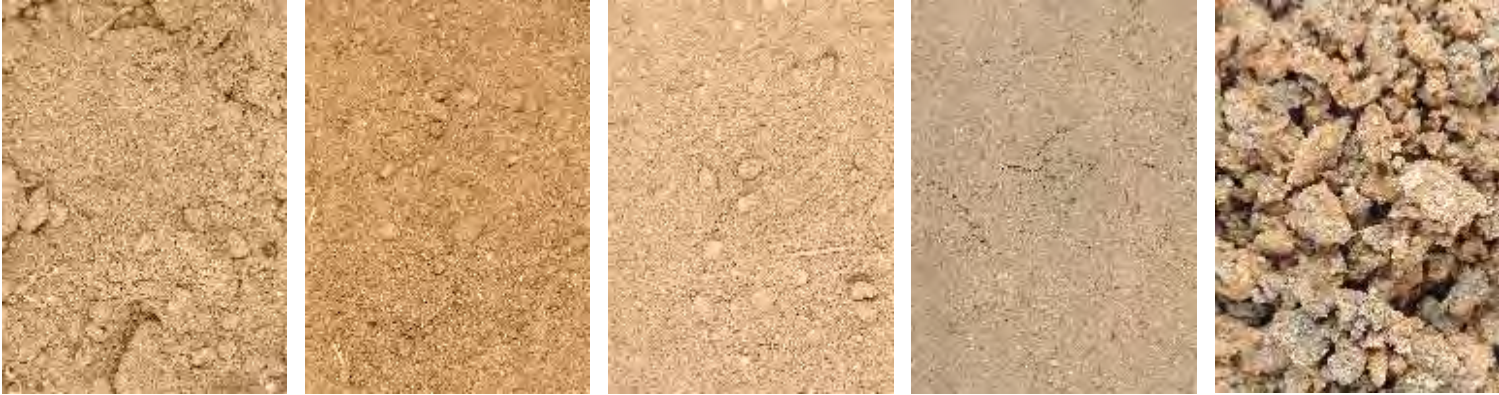
Coarse sand Coarse loam Fine loam Clayey loam Coarse loam

Soil Type Description

Type - 079
Very deep, moderately well drained, calcareous fine loamy soils on very gently sloping flood plain with slight erosion and slight salinity; associated with deep, moderately well drained, calcareous fine soils with slighter erosion and slighter salinity.

Type - 098
Very deep, well drained, fine loamy soils on very gently sloping alluvial plain with moderate erosion; associated with very deep, well drained, coarse-loamy soils with moderate erosion.

Vadgam; Khambhat



Silty loam Silty Fine sand Clayey loam Coarse loam

Soil Type Description

Type - 078
Very deep, imperfectly drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with moderate erosion and strong salinity; associated with moderately deep, imperfectly drained, calcareous fine soils with slight erosion and moderate salinity.

Type - 116
Moderately deep, well drained, calcareous, fine soils, on very gently sloping alluvial plain with slight erosion and moderate salinity; associated with deep, moderately well drained, calcareous, fine soils with moderate erosion.

Landscape Vignettes

- 01. Kheroj; Ambaji
- 02. Gadhada; Khedbrahma
- 03. Valasana; Idar
- 04. Derol; Himmatnagar
- 05. Sadra; Gandhinagar
- 06. Palaj; Gandhinagar
- 07. Paldikankrej; Ahmedabad
- 08. Saroda; Bavla
- 09. Sahij; Dholka
- 10. Vadgam; Khambhat



Bubulcus ibis
Linnaeus
Cattle Egret



Alba Egretta
garzetta
Linnaeus
Large Egret



Dicrurus
adsimilis
Bechstein
Black
Drongo or
King Crow



Himantopus
Linnaeus
Black winged
stilt



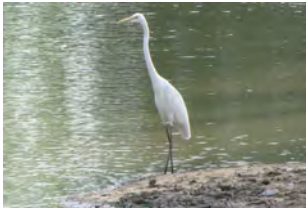
Saxicola
torquata
Linnaeus
Collard
Bushchat



Himantopus Linnaeus
Black winged Stilt



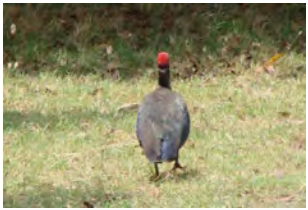
Bubulcus ibis Linnaeus
Cattle Egret



Alba Egretta garzetta Linnaeus
Large Egret



Pseudibis Papillosa Temminck
Black Ibis



Pseudibis Papillosa Temminck
Black Ibis



Pavo cristatus
Linnaeus
Common
Peafowl



Bubulcus ibis
Linnaeus
Cattle Egret



Alba Egretta
garzetta
Linnaeus
Large Egret



Alba Egretta
garzetta
Linnaeus
Large Egret



Corvus
splendens
Viellot
House Crow



Vanellus indicus
Boddaert

Red wattled
Lapwing



Nectarinia asiatica
Latham

Purple
Sunbird



Halcyon smyrnensis

Whitebreasted
Kingfisher



Acridotheres ginginianus
Latham

Bank Myna



Acridotheres ginginianus
Latham

Bank Myna



Pavo cristatus
Linnaeus
Common
Peafowl



Himantopus
Linnaeus
Black winged
Stilt



Vanellus
indicus
Boddaert
Red wattled
Lapwing



Alba Egretta
garzetta
Linnaeus
Large Egret



Columba livia
Gmelin
Blue Rock
Pigeon



Bubulcus ibis
Linnaeus
Cattle Egret



Egretta garzetta
Linnaeus
Little Egret



Himantopus
Linnaeus
Black winged Stilt



Little Egret

Black winged Stilt



Himantopus
Linnaeus
Black winged Stilt



Bubulcus ibis
Linnaeus
Cattle Egret



Bubulcus ibis
Linnaeus
Cattle Egret



Sarus
Cranes
Spoonbill
White Ibis



Grus antigone
Linnaeus
Sarus
Cranes



Phoenicopterus roseus
Pallas
Flamingo



Bubulcus ibis
Linnaeus
Cattle Egret



Bubulcus ibis
Linnaeus
Cattle Egret



Himantopus
Linnaeus
Black winged
Stilt



Himantopus
Linnaeus
Black winged
Stilt



Little Egret

Black winged
Stilt



Bubulcus ibis
Linnaeus
Cattle Egret



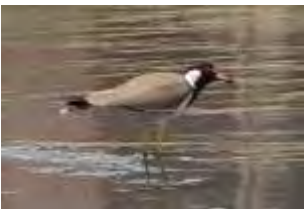
Cattle Egret



Large Egret



Alba Egretta
garzetta
Linnaeus
Large Egret



Pseudibis
Papillosa
Temminck
Black Ibis



Vanellus
indicus
Boddaert
Red wattled
Lapwing



*Alba Egretta
garzetta
Linnaeus*

Large Egret



*Anastomus
oscitans
Boddaert*

Open billed
stork



*Pseudibis
Papillosa
Temminck*

Black Ibis



*Alba Egretta
garzetta
Linnaeus*

Large Egret



*Alba Egretta
garzetta
Linnaeus*

Large Egret

Appendix

- 01. Rainfall data
- 02. Soil key chart
- 03. Crop chart
- 04. Native Flora

Rainfall Data

- Sabarmati River flows through six districts of Gujarat state before emptying into the Gulf of Khambhat
- Standard week number is the total number of week of the year in continuation, counting first week of the year from first of January
- Rainfall data of four districts is as follows
- Reference is taken from the Agroclimatic Atlas of India

Ahmedabad and Gandhinagar

The normal rainfall of Ahmedabad is 617.4 mm and number of rainy days are 28. Within the district the annual rainfall vary between 500 to 750 mm. The time series of annual rainfall data of the district does not indicate any increasing or decreasing trend in 90 years period. The highest rainfall (1444.5 mm) in the district was recorded in 1927, while the lowest (201 mm) was recorded in 1918. Ahmedabad district experienced drought every 20 years, while district experienced excessive rainfall every 17 years.

About 95% of annual rainfall is received in four months period (June to September) of which July contributes maximum (38.3% of annual rainfall) followed by August (26.8%). June and September contribute about 13% and 16% respectively. January though may altogether contribute only 2% to annual rainfall, while October and November contribute more than 3% of annual rainfall.

During June, the weekly rainfall ranges between 12 to 36 mm, however the sufficient rainfall for sowing is received only in the last week i.e. standard week 26 (June 25 - 1 July). The weekly rainfall increases during June and July and reaches to its maximum value (72 mm) in standard week 30 (July 23-29) thereafter, weekly normal rainfall is less than 10mm.

Kheda

The normal annual rainfall of Kheda district is 808.5 mm in 35 rainy days. The spatial variation of rainfall in the district is observed between 700 to 900mm. The highest rainfall (1946 mm) was observed in 1927, while the lowest was (128mm) in 1973. During last 88 years, the district experienced droughts every 22 years, while excessive rainfall in every 23 years. More than 95 % of annual rainfall is received during June to September months. In Kheda district the maximum monthly rainfall is received in July (319mm) followed by August (225 mm), September (131.5 mm) and June (98.3 mm). October and November contribute 2.8% to annual rainfall.

The weekly rainfall during standard week 25 (June 18-24) is insufficient for sowing purpose. Adequate amount is received only in standard week 26 (June 25-July 1). The highest weekly rainfall (89 mm) is received in standard week 30 (July 23-29). The monsoon rain ceases in the third week of September.

Mehsana

In Mehsana district, the rainfall records are available only after 1927. The normal rainfall of the district is 603.4 mm which is received in 28 rainy days. The lowest rainfall (258 mm) was recorded in 1929, while the highest (1253 mm) was recorded in 1927. The spatial rainfall variation in the district is between 450-700 mm. Out of 60 years of rainfall data, about 23% of years experienced drought and equal percentage of years experienced excessive rainfall.

About 96 % of annual of the district is received during June- September months. July receives the maximum monthly rainfall (235.7 mm) followed by August (181.7 mm). June and September contribute about 10 % and 16 % respectively to the annual rainfall. October and November

altogether contribute about 2.2% to annual rainfall.

The sowing rains are received in standard week 26 (June 25 to July 1). The weekly rainfall increases with the advancement of monsoon and reaches to the maximum (62.4 mm) in standard week 30 (July 23-29), then decreases continuously during rest of the monsoon. After second week of September the weekly rainfall is less than 25mm which further decreases continuously during rest of the months.















Sabarkantha

















The normal rainfall of Sabarkantha district is 807.4mm in 35 rainy days. The annual rainfall varies between 675 mm to 950 mm in the different parts of the district. Modasa and Idar records highest rainfall. The past rainfall records do not indicate any trend in annual rainfall in the district. The highest rainfall (1543 mm) was received in 1937 while the lowest (273 mm) was received in 1911. Out of 86 years, drought occurred in 25 years, while excessive rainfall (25% above normal) occurred in 26 years.

About 96% of annual rainfall of Sabarkantha district is received due to South-West monsoon rains. July receives (309 mm) rainfall followed by August (251.6 mm) rainfall and September contributes 15.8 % respectively. Only 12.3mm of rainfall is received during October. The highest weekly rainfall (82 mm) is received in standard week 30 (July 23-29). The monsoon rain ceases after standard week 38 (September 17-23).

Types of soil along the Sabarmati River

- Codes and descriptions of the soil types are identified from the Soil map of Gujarat.
- Soil samples collected from the river side has more silt content and samples collected from the agriculture fields has more clay content.
- Variation in colour of similar soil types is because of the amount of humus content present in it.
- In total 15 soil types are identified along the stretch, whose description is as given below.

Type - 004 Shallow, well drained, loamy-skeletal soils on undulating piedmont with severe erosion and moderate stoniness; associated with very deep, well drained, coarse-loamy soils on very gently sloping lands with moderate erosion.		
Type - 007 Very deep, somewhat excessively drained, calcareous coarse loamy soils on very gently sloping piedmont plains with narrow valleys with moderate erosion; associated with very deep, somewhat excessively drained, coarse loamy soils with moderate erosion.		
Type - 008 Very deep, well drained, fine loamy soils on very gently sloping piedmont plain with moderate erosion; associated with very deep, well drained, coarse-loamy soils with moderate erosion.		
Type - 012 Shallow, well drained , loamy soils on very gently sloping piedmont plain with narrow valleys with severe erosion; associated with shallow, well drained, clayey soils with moderate erosion.		
Type - 013 Moderately deep, well drained, fine soils on very gently sloping piedmont plain with moderate erosion; associated with very deep, well drained coarse loamy soils with moderate erosion.		
Type - 074 Very deep, somewhat excessively drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with severe erosion; associated with very deep, well drained, calcareous, fine-loamy soils with moderate erosion.		
Type - 078 Very deep, imperfectly drained, calcareous, coarse-loamy soils on very gently sloping dissected flood plain with moderate erosion and strong salinity; associated with moderately deep, imperfectly drained, calcareous fine soils		

Type - 079 Very deep, moderately well drained, calcareous fine loamy soils on very gently sloping flood plain with slight erosion and slight salinity; associated with deep, moderately well drained, calcareous fine soils with slighter erosion and slighter salinity.		
Type - 088 Very deep, somewhat excessively drained, coarse-loamy soils on nearly level alluvial plain with slight erosion; associated with very deep, excessively drained, calcareous sandy soils with moderate erosion.		
Type - 089 Very deep, somewhat excessively drained, coarse-loamy soils on very gently sloping alluvial plain with moderate erosion,; associated with very deep, excessively drained calcareous, sandy soils with moderate erosion.		
Type - 097 Very deep, well drained, fine-loamy soils on very gently sloping alluvial plain with moderate erosion, associated with very deep, moderately well drained calcareous, fine-loamy soils with moderate erosion.		
Type - 098 Very deep, well drained, fine loamy soils on very gently sloping alluvial plain with moderate erosion; associated with very deep, well drained, coarse-loamy soils with moderate erosion.		
Type - 100 Deep well drained, fine loamy soils on very gently sloping alluvial plain with slight erosion and salinity; associated with deep moderately well drained, calcareous, fine soils on gently sloping lands and moderate erosion.		
Type - 115 Moderately deep, well drained, calcareous, fine soils on very gently sloping alluvial plain with slight erosion and slight salinity; associated with deep, moderately well, drained, calcareous, fine soils with moderate erosion.		
Type - 116 Moderately deep, well drained, calcareous, fine soils, on very gently sloping alluvial plain with slight erosion and moderate salinity; associated with deep, moderately well drained, calcareous, fine soils with moderate erosion.		

List of crops

Vegetables	(L) <i>Solanum melongena</i>	(R) Ringna, Baigan	(E) Eggplant, Aubergine
	(L) <i>Solanum lycopersicum</i>	(R) Tamatar, Tameta	(E) Tomato
	(L) <i>Solanum tuberosum</i>	(R) Alu, Bateta	(E) Potato
	(L) <i>Trigonella foenum-graecum</i>	(R) Methi	(E) Fenugreek, Greekhay
	(L) <i>Spinacia oleracea</i>	(R) Palak	(E) Spinach
	(L) <i>Brassica oleracea</i> var. <i>Totrytis</i>	(R) Phoolgobi	(E) Cauliflower
	(L) <i>Brassica oleracea</i> var. <i>Capitata</i>	(R) Pattagobi, Gobi	(E) Cabbage, Colewart
	(L) <i>Lagenaria Siceraria</i>	(R) Doodhi, Karu, Indrajau	(E) Dyer’s Oleander, Pala indiago
	(L) <i>Cucumis sativus</i>	(R) Kakdi	(E) Cucumber
	(L) <i>Allium cepa</i>	(R) Kanda, Dungdi, Pyaz	(E) Onion
Fruits	(L) <i>Raphanus sativus</i>	(R) Mudo, Muli	(E) Radish
	(L) <i>Zingiber officinale</i>	(R) Adoo, Adrak, Alay	(E) Ginger
	(L) <i>Citrullus lanatus</i>	(R) Tarbuj, Kaling, Kalingad	(E) Watermelon
	(L) <i>Syzigium cumini</i>	(R) Jamun, Jaman, Jamoa, Jambolan	(E) Jara/Malbar/Blackplum/Indian black berry
	(L) <i>Musa spp.</i>	(R) Keda, Kela, Ked	(E) Banana
	(L) <i>Manilkarna zapota</i>	(R) Chikoo	(E) Sapodilla, Chicle, Sapote, Naseburry
	(L) <i>Psidium guajava</i>	(R) Jam, Amrood	(E) Guava, Yellow Guava. Apple Guava
	(L) <i>Punica granatum</i>	(R) Dadam, Anar, Anardana	(E) Pomegranate, Chinese apple, Granada
	(L) <i>Mangifera indica</i>	(R) Aam, Amri, Ambi, Aamba, Ambo	(E) Mango

Grains	(L) <i>Citrus sinensis</i>	(R) Santra, Narangi	(E) Orange
	(L) <i>Carica papaya</i>	(R) Pappaiyu, Papitu, Papita	(E) Papaya
	(L) <i>Ziziphus mauritiana</i>	(R) Ber, Bera, Beri, Bor, Bordi	(E) Desert apple, Indian jujube/Plum/Cherry
	(L) <i>Tritium vulgare</i>	(R) Gahu, Gehu	(E) Wheat
	(L) <i>Sorghum vulgare</i>	(R) Jawar, Jawari	(E) Jowar
	(L) <i>Pennisetum glacecum</i>	(R) Bajro, Bajri	(E) Bajra
	(L) <i>Oryza sativa</i>	(R) Chaval, Bhat	(E) Rice, Paddy
	(L) <i>Zea mays</i>	(R) Makai, Bhutta	(E) Maize
	(L) <i>Phaseolus aureus</i>	(R) Mag, Mug	(E) Green-gram
	(L) <i>Phaseolus mungo</i>	(R) Adad, Udad, Urd	(E) Black-gram
Cash Crops	(L) <i>Cicer arietinum</i>	(R) Chana	(E) Bengal-gram
	(L) <i>Nicotiana tabacum</i>	(R) Tambakhu	(E) Tobacco
	(L) <i>Emblica officinalis</i>	(R) Amda, Amla, Aonla, Amalki, Aunra	(E) Emblic myrobalan, Indian gooseberry
	(L) <i>Arachis hypogaea</i>	(R) Falli, Fallidana, Mungfalli, Sing	(E) Groundnut

(L) - Latin names
(R) - Regional names
(E) - English names

Native Flora in and around regions of the Sabarmati River

Trees	Adina cordifolia	Shrubs	Tamarindus indica
	Acacia chundra		Ficus religiosa
	Bambusa arundinacea		Prosopis cineraria
	Dalbergia latifolia		Balanites aegyptia
	Tectona grandis		Moringa oleifera
	Albizia lebbeck		Pithecelobium dulce
	Anogeissus latifolia		
	Lagestroemia lanceolata		Clerodendrum inerme
	Terminalia bellerica		Euphorbia nerifolia
	Tamarix ericoides		Jatropha curcas
	Vitex negundo		Anisomeles indica
	Salvadora oleoides		Barleria priontis
	Acacia nilotica		Caesalpinia crista
	Annona squamosa		Capparis sepiaria
	Azadirachta indica		Kirganelia reticulate
	Emblica officinalis		Maytenus emarginata
	Delonix regia		Sesbania bispinosa
	Kigelia pinnata		Cassia occidentalis
	Millingtonia hortensis		Cassia angustifoilia
	Mimusops elengi		Cassia auriculata
	Peltophorum pterocarpum		Cassia tora
	Pongamia pinnata		Saccharum spontaneum

	Plumbago capensis	Herbs	Sida cordifolia
	Plumbago zeylanica		Sida rhombifolia
	Ocimum canum		Sida alba
	Ocimum basilicum		Oxalis acetosella
	Ocimum gratissimum		Oxalis corniculata
	Acalypha indica		Fagonia cretica
	Phyllanthus fraternus		Aeschynomone indica
	Alhagi pseudalhagi		Psoralea corylifolia
	Tamarix ericoides		Neptunia oleracea
			Ammannia baccifera
	Argemone mixicana		Vahilia digyna
	Peristrophe bicalyculata		Ludwigia adscendens
	Cardamine trichocarpa		Mollugo cerviana
	Polygala chinensis		Ageratum conyzodes
	Cleome viscosa		Blumea oblique
	Portulaca oleracea		Blumea fistulosa
	Portulaca pilosa		Caesulia axillaris
	Portulaca quadrifida		Cyathocline purpurea
	Bergia suffruticosa		Eclipta prostrata
	Bergia ammannioides		Sphaeranthus senegalensis
	Sida acuta		Tridax procumbeans
	Vernonia anthelmintica		Tragus biflorus

Vernonia cinerea
Xanthium strumarium
Borreria articulate
Heydyotis corymbosa
Bacopa monnieri
Limnophila indica
Utricularia gibba
Utricularia inflexa
Hydrolea zeylanica
Coldenia procumbens
Physalis minima
Physalis peruviana
Solanum nigrum
Solanum jasminoides
Canscora diffusa
Hygrophila auriculata
Strobilanthes heyneanus
Phyla nodiflora
Boerhavia diffusa
Achyranthes aspera
Alternanthera sessilis
Amaranthus arvensis

Amaranthus lividus
Amaranthus oleraceous
Amaranthus spinosus
Amaranthus viridis
Digera muricata
Polygonum glabrum
Aristolochia bracteolata
Chrozophora rottleri
Ceratophyllum demersum
Asphodelus tenuifolius
Commelina benghalensis
Wolffia arrhiza
Wolffia microscopia
Najas graminea
Limnophyton obtusifolium
Sagittaria sagittifolia
Potamogeton crispus
Juncus maritimus
Juncus bufonius
Cyperus aernarius
Cyperus bulbosus
Cyperus conglomeratus

Climber

Fimbristylis cymosa
Remirea maritime
Scirpus tuberosus
Aeluropus lagopoides
Bothriochola pertusa
Andropogon pumilus
Chloris barbata
Cynodon dactylon
Echivnocloa crus-galli
Melanocenchris jacquemontii
Pennisetum purpureum
Setaria glauca
Setaria verticellata

Ipomoea aquatic Forsk
Ipomoea carica
Ipomoea aquatic Forsk
Ipomoea carica
Ipomoea pes - caprae
Clitoria ternatea
Cardiospermum halica-cabum

Aquatic
Plants

Vallisneria spiralis
Trapa natans
Nymphaea pubescens
Hydrilla verticillata
Typha angustata
Lemna gibba

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