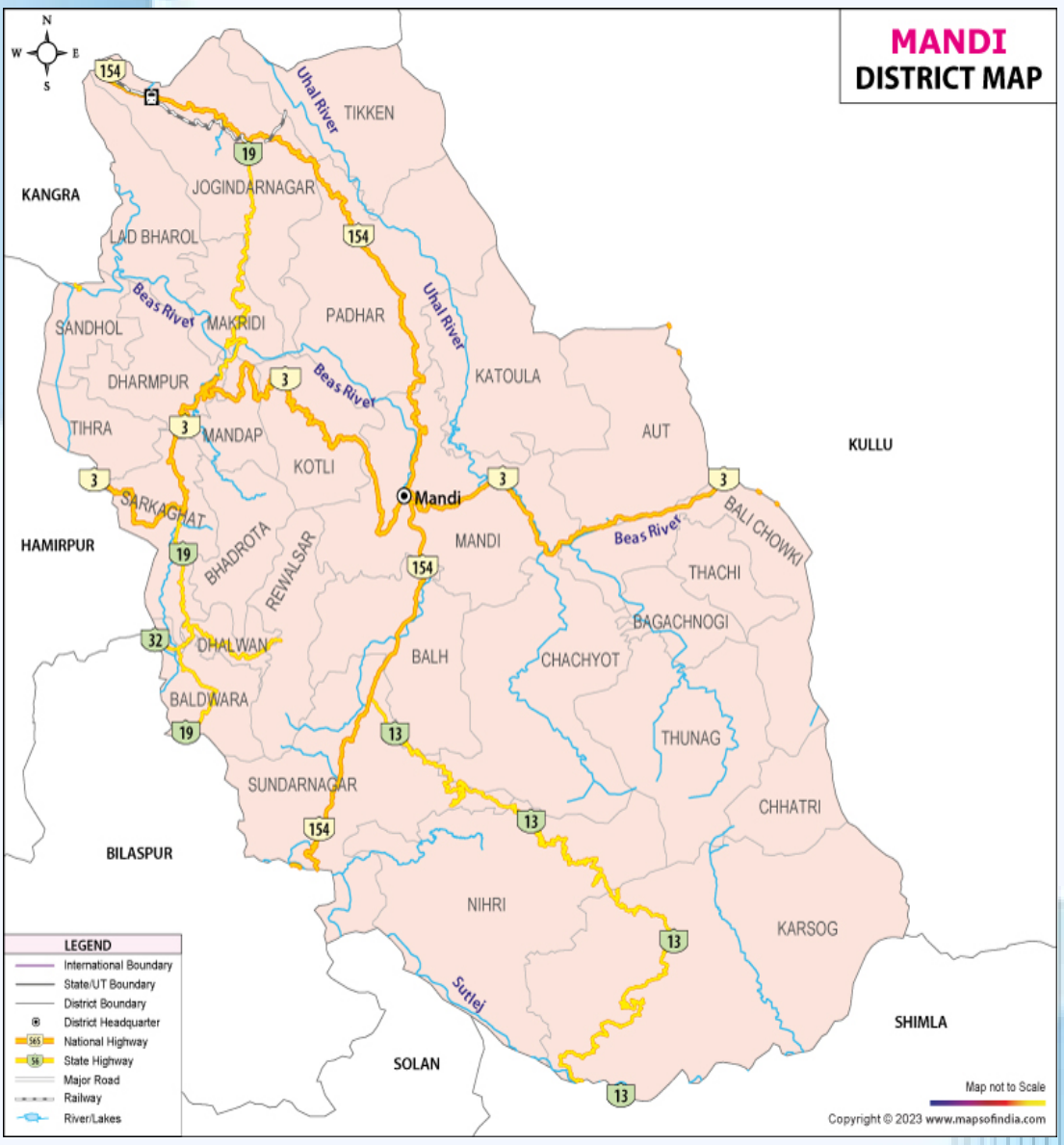
DISTRICT SURVEY REPORT - 2024
MANDI DISTRICT, HIMACHAL PRADESH



DISTRICT SURVEY REPORT FOR SAND MINING OR RIVER BED MINING AND OF MINOR MINERALS OTHER THAN SAND MINING OR RIVER BED MINING

Prepared and submitted by Department of Industries, Himachal Pradesh

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Finalized & approved by SEIAA, Himachal Pradesh in its 69th (A) meeting held on dated 20th August, 2024 vide Agenda Item No. 1.

Executive Summary DSR

District Survey Report (DSR) is a comprehensive document prepared to regulate riverbed and hill slope mining activities within the district. This report is essential for sustainable management of riverbed mining, ensuring that the extraction of minerals is conducted in an environmentally sound and socially responsible manner. The preparation of DSRs is mandated under the Sustainable Sand Mining Management Guidelines, 2016.

District Survey Report of riverbed mining are indispensable tools for the sustainable management of riverine mineral resources. They offer a structured approach to resource assessment, environmental protection, regulatory compliance, and stakeholder engagement. By fostering sustainable mining practices, DSRs contribute significantly to environmental conservation, socio-economic development, and the overall well-being of communities dependent on river ecosystems.

As per the EIA Notification, 2006 and its subsequent amendment vide S.O. 3611(E) dated 25th July, 2018 issued by MoEF&CC, GoI, the main objective of the preparation of District Survey Report (as per the Sustainable Sand Mining Guideline) is to ensure the identification of areas of aggradations or deposition where mining can be allowed; and identification of areas of erosion and proximity to infrastructural structures and installations where mining should be prohibited and calculation of annual rate of replenishment and allowing time for replenishment after mining in that area.

- Key Aspects of District Survey Report

1. Assessment of Resources: DSR provide a detailed assessment of available mineral resources in the riverbeds within the district. This includes data on the quantity, quality, and distribution of sand and other minor minerals. By accurately estimating these resources, the report aids in preventing over-extraction and depletion of minerals.
2. Environmental Impact Analysis: The report include an analysis of the environmental impact of riverbed mining. This encompasses the effects on river morphology, hydrology, aquatic ecosystems, and biodiversity. Understanding these impacts is crucial for mitigating adverse environmental effects and preserving riverine ecosystems.
3. Regulation and Compliance: DSR serve as a regulatory framework for riverbed mining operations. They outline guidelines and standards for mining practices, ensuring compliance with national and state environmental laws. This helps in curbing illegal mining activities and promoting legal and regulated mining.
4. Sustainable Mining Practices: By recommending sustainable mining practices, DSR help in minimizing environmental degradation. These practices may include controlled mining depths, restricted extraction zones, and periodic replenishment studies to maintain the ecological balance of river systems.
5. Socio-Economic Considerations: The report also takes into account the socio-economic aspects of riverbed mining, including the impact on local communities. This includes evaluating benefits such as employment generation and revenue for local governments, as well as addressing negative consequences like displacement and loss of livelihoods.
6. Data-Driven Decision Making: DSR provide a scientific basis for decision-making regarding riverbed mining. The inclusion of geospatial data, remote sensing images, and field surveys enhances the accuracy and reliability of information. This data-driven approach supports informed policy-making and resource management.
7. Stakeholder Involvement: The preparation of DSR involves consultation with various stakeholders, including government agencies, local communities, environmentalists, and industry representatives. This inclusive process ensures that multiple perspectives are considered, leading to balanced and equitable mining practices.

- Benefits of District Survey Report

1. Environmental Protection: By identifying and mitigating the environmental impacts of riverbed mining, DSR play a crucial role in protecting river ecosystems, reducing erosion, and maintaining water quality.
2. Resource Management: Effective management of mineral resources is achieved through regulated extraction, preventing over-exploitation and ensuring the longevity of resources for future use.
3. Legal Compliance: DSR help in ensuring that mining activities adhere to legal requirements, reducing the incidence of illegal mining and associated environmental damage.
4. Community Welfare: By considering the socio-economic impacts, DSR help in safeguarding the interests of local communities, ensuring that they benefit from mining activities without suffering undue harm.
5. Sustainable Development: The integration of sustainable practices in mining operations contributes to the broader goals of sustainable development, balancing economic growth with environmental stewardship.

- While issuing any fresh permission for mining activity in the district the same is permissible only when the identified stretch is reflected in the DSR with its geo coordinates, quantity and geological profiling.
- The SEIAA/ SEAC while considering the cases for grant of EC need to assess with the help of DSR the proposed mining activity is within the identified stretches of river/ streams/ khads, matching the geo coordinates of proposed site and river stretch where the mineral is available by using ***kml*** files.
- In the DSR 'No Mining Zones' are also listed which clearly give a view of stretches where no mining activity will be allowed and remain restricted.

"*No Mining Zones*" (NMZs) are critical areas identified within riverbeds where mining activities are strictly prohibited. These zones are delineated based on various environmental, ecological, and social criteria to ensure the protection of sensitive areas. The identification of NMZs is a key component of District Survey Report (DSR) for riverbed mining in India, aimed at promoting sustainable and responsible mining practices.

Criteria for Identifying No Mining Zones in DSR

1. Ecological Sensitivity: Areas with high ecological value, such as habitats for endangered species, breeding grounds for aquatic life, and regions with significant biodiversity, are designated as NMZs. Protecting these areas is crucial for maintaining ecological balance and biodiversity.
2. Hydrological Importance: Zones critical for maintaining river flow and groundwater recharge are marked as NMZs. This includes regions near riverbanks, floodplains, and areas prone to erosion. Preserving these areas helps in sustaining water quality and quantity.
3. Proximity to Infrastructure: Areas close to infrastructure such as bridges, roads, dams, and human settlements are identified as NMZs to prevent structural damage and ensure the safety of human life and property.
4. Cultural and Archaeological Significance: Regions with cultural, historical, or archaeological importance are protected as NMZs to preserve heritage sites and prevent any damage due to mining activities.
5. Community Dependence: Areas that are vital for the livelihood of local communities, such as regions used for fishing, agriculture, and other traditional activities, are designated as NMZs. This ensures the sustenance of community livelihoods and social well-being.

Basis for appraisal of EC (River Bed Mining Projects)

Sl. No.	PP Details	Location with khasra Nos.	River/ Stream location	Coordinates (Lat Long)	Area of Mining lease (ha)	Period of Mining lease (Initial)		Period of Mining lease	
						From	To	Form	To
1	2	3	4	5	6	7	8	9	10

Details of River/ Stream

S. No.	Name of the River or Stream	Total Length in the District (in Km)	Place of origin	Altitude at Origin
(1)				
(2)				

Portion of the River or Stream Recommended for Mineral Concession	Length of area recommended for mineral concession (in kilometer)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in square meter)	Mineable mineral potential (in metric tonne) (60% of total mineral potential)

Mineral Potential

Boulder (MT)	Bajari (MT)	Sand (MT)	Total Mineable Mineral Potential (MT)

S. No.	River or Stream	Portion of the river or stream recommended for mineral concession	Length of area recommended for mineral concession (in kilometer)	Average width of area recommended for mineral concession (in meters)	Area recommended for mineral concession (in square meter)	Mineable mineral potential (in metric tonne) (60% of total mineral potential)
(1)						
(2)						
Total for the District						

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PART I
DISTRICT SURVEY REPORT OF DISTRICT MANDI H.P
(River Bed Sand Mining and Other Minor Minerals)

1. INTRODUCTION

Minerals are valuable natural resources being finite and non-renewable. They constitute the vital raw materials for many basic industries and are a major resource for development. The history of mineral extraction in India dates back to the days of the Harappan civilization. The wide availability of minerals in the form of abundant rich reserves made it very conducive for the growth and development of the mining sector in India. The country is endowed with huge resources of many metallic and non-metallic minerals. The mining sector is an important segment of the Indian economy. Since independence, there has been a pronounced growth in mineral production both in terms of quantity and value. India produces as many as 87 minerals, which include 4 fuel, 10 metallic, 47 non-metallic, 3 atomic and 23 minor minerals (including building and other materials).

Minerals are classified into two groups, namely (i) Major minerals and (ii) Minor minerals. Amongst these two groups, minor minerals have been defined under section 3(e) of the Mines and Minerals (Regulation and development) Act, 1957. The minor minerals are further governed by "The Himachal Pradesh Minor Minerals (concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015". The Minor minerals include building stones, gravel, ordinary clay, ordinary sand, limestone used for lime burning, boulders, kankar, murum, brick earth, bentonite, road metal, slate, marble, stones used for making household utensils etc. and other minerals not defined as minor minerals in the said Act are treated as major minerals. They include coal, kyanite, sillimanite, barites, chromite, fluorite, quartz, sand used for stowing purposes in coal mines and many other minerals used for industrial purposes.

The mining activities in the state of Himachal Pradesh can basically be categorized as in the large sector and in the small sector. The large sector comprises of limestone projects for manufacturing cement and other lime products while the small mining sector comprises the mining of minor minerals like sand, stone, bajri, slate, shale and clay etc. which are basically building materials to meet up the demand for infrastructure development of the state.

In pursuance to the orders of the Hon'ble Supreme Court dated 27.02.2012 in the matter of Deepak Kumar etc. vs State of Haryana and Others, prior environment clearance has now become mandatory for mining of minor minerals irrespective of the area of mining lease. In order to comply with the judgment of the Hon'ble Supreme Court, the Ministry issued S.O.141 (E) dated 15.01.2016 vide which the District Level Environment Assessment Committee (DEAC) and District level Environment Impact Assessment Authority (DEIAA) were constituted. In the said Notification at point No.7 (iii) the procedure to prepare the District Survey Report (DSR) was laid down providing that a survey shall be carried out by the DEIAA with the assistance of Geology/Irrigation/Forest/PWD etc. departments. As, per the aforesaid, Notification dated 15.01.2016 the Geological Wing, assisted the DEIAA in the preparation of the District Survey Report during the year 2016 and the said District Survey Report prepared for District Mandi was approved by the DEIAA, after following the procedure laid down in the aforesaid Notification. It is also provided in the Notification No. S.O. 141 (E) dated 15th January 2016 that the District Survey Report (DSR) shall form the basis for the application for environmental clearance, preparation of reports and appraisal of Projects. The report shall be updated once every 5 years.

In the aforesaid notification dated 15.01.16, the Hon'ble High Court of Jharkhand at Ranchi in its orders dated the 11th April 2018 and 19th June 2018 in W.P. (PIL) No. 1806 of 2015, in the matter of Court on its Own Motion Versus the State of Jharkhand & Others with W.P. (PIL) No. 290 of 2013, in the matter of Hemant Kumar Shilkarwar Versus the State of Jharkhand & Others, has inter-alia directed the

preparation of District Survey Report for the Sand mining or riverbed mining and for minor minerals other than Sand and bajri or delegation of the powers for preparation of format of District Survey Report of minor minerals other than sand and bajri to the State Government and/or District Environment Impact Assessment Authority and District Expert Appraisal. Thereafter, the Ministry of Environment, Forests and Climate Change (MoEF & CC) vide notification dated 25.07.2018 provided the procedure for the preparation of the District Survey Document. Accordingly, the survey report for district Mandi has been updated. This District Survey Report has been updated by covering the mineral-bearing areas and overviews of mining activities in the district with all the relevant features pertaining to geology and mineral wealth in replenish-able and non-replenish-able areas of rivers, streams and other sources. The mineral potential has been calculated based on field investigations taking into consideration the geology of the catchment area of the river/streams and other sources.

The District Survey Report (DSR) of District Mandi comprises secondary data on geology, mineral resources, climate, topography, landform, forest, rivers, soil, agriculture, road, transportation, irrigation etc of the district collected from various published and unpublished literature and reports as well as various websites. The data of deposition or replenishment, the distance of deposits from the river banks, chances of erosion and other geomorphological features of rivers may vary due to floods, heavy rains and other natural calamities.

2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT

Himachal Pradesh is situated in the western Himalayas covering an area of 55,673 kilometres (34,594 mi). Himachal Pradesh is almost wholly mountainous with altitudes ranging from 350 meters to 6,975 meters above the mean sea level. It is located between Latitude $30^{0}22'40"$N to $33^{0}12'20"$N and Longitude $75^{0}45'55"$ E to $79^{0}04'20"$ E. It has a deeply dissected topography, complex geological structure and a rich temperate flora in the sub-tropical latitudes. The drainage system of Himachal is composed both of rivers and glaciers. Himalayan rivers criss cross the entire mountain chain. Himachal Pradesh provides water to both the Indus and Ganges basins. The drainage systems of the region are the Chandra Bhaga or the Chenab, the Ravi, the Beas, the Sutlej and the Yamuna. These rivers are perennial and are fed by snow and rainfall. They are protected by an extensive cover of natural vegetation. Due to extreme variation in elevation, there is great variation in the climatic conditions of Himachal. The climate varies from hot and sub-humid tropical in the southern tracts to, with more elevation, cold, alpine and glacial in the northern and eastern mountain ranges. The state has areas like Dharamsala that receive very heavy rainfall, as well as those like Lahaul and Spiti that are cold and almost rainless.

The ***Mandi district*** falls in the central portion of Central Himachal Pradesh which is one of the four micro-regions of the State. It lies between 31^{o} 13' 30" and 32^{o} 04' 22" north latitudes and 76^{o} 36' 08" and 71^{o} 23' 26" east longitudes and is bounded by Kangra district in the north and north-west, Hamirpur and Bilaspur districts in the west, by Solan and Shimla districts in the south and by Kullu district in the east. The district has an area of 3950 km.2 out of the total area of 55673 km^2 of Himachal Pradesh according to the Surveyor General of India. It occupies seventh rank among the districts in terms of area which constitutes 7.10 per cent area of the state.

Mainly three types of minor mineral constituents such as sand, stone and bajri are required for any type of construction apart from other materials like cement and steel. In earlier times, the houses/ buildings were constructed in the form of small dwellings with walls made up of mud plaster, stone and interlocking provided with wooden frames and there were negligible commercial as well as developmental activities resulting in less demand for building materials. However, with time, new vistas of developmental activities were started. In district Mandi, there is a boom in construction activities especially in roads and Hotel industries, as such the demand for minor minerals in the District started to increase trend.

The minor minerals available in the district are Boulder, Bajri (Gravels), Sand, Clay etc. from the river bed as well as Slate and Rough Stone, Project Stone, and Terrace mineral deposits from the hill slope. However, there are no major mineral industrial enterprises that can be set up in the district. Other minerals like semi-precious stones, Beryl-bearing pegmatites, China clay, Garnet crystals, Bands of haematite-quartzite etc. are also present in very small quantities which are not of much economic value.

The Mandi district does not have any large mines. At present, the Collection of in-situ stone from the hilly terrain is the main minor mineral source. These materials are primarily utilized for construction purposes. In order to meet the requirement of raw construction materials, the extraction of stone is being carried out exclusively from the Hill slopes. The demand for sand and grit is mainly met by the broken rock material from the hill slope which is manufactured by stone crushers. The local residents used to lift gravel etc. from the river beds to meet their bonafide requirement, however after coming into the Himachal Pradesh Minor Minerals (Concession) Rules 1971 Repealed as Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of illegal Mining, Storage and Transportation) Rules 2015, the mining is regulated.

The minor mineral from the Riverbed and its tributaries as well as from the Hill slope are also granted through the concessions for the exploitation of minor minerals by tender cum e-auction method for specific quantities and periods in the district. The contract period of auction/tender is up to 15 years in the case of forest land and the auctioned land is granted for extraction of minor minerals only after completing all the codal formalities.

3. LIST OF GRANTED MINING LEASES/AUCTIONED AREAS IN THE DISTRICT WITH LOCATION, AREA AND PERIOD OF VALIDITY

At present about 40 Nos of mining leases (Pvt./Govt. Land) have been granted/executed and are under operation and the demand for furnished material is still high. The details of the Mining lease are as follows:

Sr. No.	Name of the Leases	Address & Contact No. of Lessee	Area of Mining Lease	Period of Mining Lease		Location of the mining lease Latitude &
1	Om Chand S/o Sh. Govind Ram,	Village- Sari, PO-Majhwar, Tehsil Sadar, Distt. Mandi H.P	7-4-1 Bighas	10-08-2022	09-08-2027	31˚39'53.7"N 76˚59'04.5"E
2	Sh. Yog Raj, S/o Sh Chet Ram,	Village-Rakhoon, PO-Kotmoras, Tehsil Sadar, District Mandi H.P.	04-10-10 Bighas	28-08-2021	27-08-2026	31˚39'17.36" N 71˚39'14.97" E
3	General Manager M/s Hindustan Salt Ltd. A Govt. of India Enterprises.	Village Bhatog PO-Drang, Tehsil Sadar Distt. MandiH.P.	100-07-16 Bighas	26-09-2016	25-09-2066	31˚48'19"N 76˚56'51."E
4	Sh. Subhash Chand S/o Sh. Bhikam Ram,	Village Sambal PO Pandoh Tehsil Sadar Distt. Mandi H.P.	08-10-02 Bighas	14-01-2022	13-01-2027	31˚40'29.78"N 76˚59'4.16"E

5	Sh. Vijay Kumar Desh RaJ & Sh. Yadvinder Kumar	Village Padhar PO-Majhwar Tehsil Sadar Distt. Mandi H.P.	27-11-06 Bighas	20-07-2022	19-07-2027	31˚41'19.9"N 76˚59'38.8"E
6	Sh. Deepak Pathania,	Village- Nasel, PO-Dudar, Tehsil Sadar, Distt. Mandi H.P.	06-08-14 Bighas	22-06-2023	21-06-2028	31˚41'46.57"N 76˚59'1.44"E
7	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO-Galama, Tehsil Balh, Distt. Mandi H.P.	07-05-12 Bighas	10-01-2018	09-01-2028	31˚38'24.0"N 76˚55'50.1"E
8	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO-Galama, Tehsil Balh, Distt. Mandi H.P.	08-05-13 Bighas	11-10-2022	10-10-2027	31˚37'14.1"N 76˚56'52.2"E
9	Sh. Jitender Kapoor S/o Sh. Subhas Chand Kapoor,	Village-Dadanu, PO-Sidhyani, Tehsil –Balh, Distt. Mandi H.P.	03-19-07 Bighas	23-11-2023	22-11-2028	31˚37'01.6"N 76˚50'51.8"E
10	Sh. Muni Lal S/o Late Sh. Jagesher Ram,	Village & PO-Kathyaun, Teshil- Balh, Distt. Mandi HP	04-05-16 Bighas	09-10-2020	08-10-2025	31˚32'44.8"N 76˚50'46.4"E
11	Sh. Vijay Kumar S/o Sh Chint Ram	Vilalge Maggar Padhru PO Baggi Tehsil Balh Distt. Mandi H.P.	12-00-14 Bighas	14-01-2022	13-01-2027	31˚34'29.5"N 76˚59'8.6"E
12	Sh. Shiv Dayal S/o Sh. Dila Ram	Village Tarwai P.O. Gurkotha Tehsil Sadar, Distt. Mandi, H.P.	8-17-17 Bighas	07-02-2022	07-02-2022	31˚33'01.26"N 76˚50'46.45"E
13	Sh. Soyab Akhtar, Sh.Mohammad Shoyab Akhtar,	Village- Dinak, PO-Kanaid, Tehsil Sundernagar District Mandi (H.P.)	11-11-14 Bighas	05-03-2022	04-03-2027	31˚38'08.91"N 76˚55'50.60"E
14	Sh. Sandeep Kumar S/o Sh.Kuram Chand,	Village Manjeholi, P.O. Rieur, Tehsil Sadar, Distt. Mandi, H.P.	12-15-16 Bighas	05-03-2022	04-03-2027	31˚35'54.61"N 76˚51'01.51"E
15	Sh. Gangvir alias Ganga Ram, S/o Late Sh. Sant Ram, Prop: M/s Baba Balak Nath Stone Crusher & Sh Kishan Chand, S/o Late Sh. Rattan Chand, Prop. M/s Sheetla Stone Crusher,	Village Dadaur, PO-Dhaban, Tehsil Sadar, Distt. Mandi H.P.	08-03-18 Bighas	16-11-2021	15-11-2025	31˚41'13.1"N 76˚51'22.2"E

16	Sh. Santosh Kumar S/o Sh. Tulsi Ram,	Village Dhar, Post Office Darpa, Tehsil Sarkaghat, Distt. Mandi, H.P. M/s Negi Stone	1-12-23 Hectare	18-06-2009	17-06-2024	31˚38'34.0"N 76˚43'04.7"E
17	Smt. Ruma Devi W/o Sh. Ramesh Chand,	Village Parchoo, P.O. Sajaopiplu, Tehsil Sarkaghat, Distt. Mandi, H.P.Prop. Ruma Stone Crusher	2-00-00 Hectare	10-03-2010	09-03-2025	31˚46'56.09"N 76˚44'39.61"E
18	Sh. Abhishek Thakur, Anshul Thakur, Sons of Sh. Roop Singh Thakur & Sh. Vihsal Sen,	M/s R.B Traders, Destination The Mall, Lalit Chowk, Sunderngar, District Mandi H.P.	10-03-05 Bighas	23-09-2021	22-09-2031	31˚43'22.3"N 77˚13'21.5"E
19	Sh. Amar Singh Thakur, Prop. M/s Ghangal Stone Crusher,	Village & PO- Kalahod, Tehsil Sundernagar, Distt. Mandi H.P.	05-00-01 Bighas	11-12-2020	10-12-2025	31˚35'00.7"N 76˚53'42.7"E
20	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	19-19-05 Bighas	20-11-2016	19-11-2031	31˚28'59.1"N 76˚52'56.8"E
21	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	8-10-00 Bighas	20-12-2021	19-12-2036	31˚28'59.1"N 76˚52'56.8"E
22	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	07-00-00 Bighas	23-07-2022	22-07-2037	31˚28'58.0"N 76˚53'01.6"E
23	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar, Distt Mandi H.P.	05-12-01 Bighas	18-07-2023	17-07-2027	31˚24'47.30"N 76˚52'30.16"E
24	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar, Distt Mandi H.P.	06-11-05 Bighas	17-07-2023	16-07-2027	31˚24'47.66"N 76˚52'31.6"E
25	Smt. Dromti Devi, W/o Sh. Man Singh,	Village- Banshodha, PO-Bagsaid, Tehsil-Thunag, Distt. Mandi H.P.	10-07-02 Bighas	17-07-2021	16-07-2026	31˚32'44.9"N 77˚07'43.3"E

26	Mohan Singh S/o Sh. Hari Singh,	VPO Bagsaid, Tehsil Thunag Distt. Mandi H.P.	04-04-01 Bighas	27-09-2021	26-09-2026	31˚37'45.73"N 77˚12'34.09"E
27	Sh. Amar Singh S/o Sh. Keshav Ram	Village Bhajnar PO Jarol Tehsil Thunag Distt Manid H.P.	02-19-09 Bighas	05-03-2022	04-03-2027	31˚37'18.13"N 77˚06'51.98"E
28	Sh. Indresh Sharma S/o Sh. Gopal Sharma,	Village Taraur, P.O. Shaigali, Tehsil Chachyot, Distt. Mandi, H.P.	9-16-08 Bighas	23-01-2009	22-01-2024	31˚35'03.98"N 76˚59'47.63"E
29	Sh. Sitender Kumar S/o Late Sh. Lal Singh authorized signatory-cum partner M/s L.N. Stone Crusher,	Village Khalwan, PO Thachi, Tehsl Bali Chowki Distt. Mandi H.P.	6-18-12 Bighas	02-02-2019	01-02-2024	31˚38'23.3"N 77˚05'34.3"E
30	Sh. Vijay Kumar & Sh. Ravinder Rana, Partners of M/s Sianj Valley Sand & Stone Crusher,	Village-Kasan, PO-Sianj, Tehsil-Chachyot, Distt. Mandi H.P.	28-11-03 Bighas	14-12-2020	13-12-2025	31˚36'57.38"N 77˚02'16.4"E
31	Sh. Thakar Dass S/o Sh. Uttam Chand & Sh. Bhisham Kumar S/o Sh. Devinder Nath, Partners of M/s Bala Tikka Associates,	Village Sakohar, PO-Movi Seri, Tehsil Chachyot, Distt. Mandi H.P.	07-00-03 Bighas	16-09-2021	15-09-2026	31˚37'3.00"N 77˚1'22.00"E
32	Sh. Ram Singh Saini, S/o Sh. Mangal Ram,	Vilalge-Sayanh, PO-Lohara, Tehsil- Balh, Distt. Mandi H.P.	12-17-05 Bighas	23-03-2023	22-03-2028	31˚35'56.13"N 77˚01'51.18"E
33	Sh. Rajeev Kumar S/o Sh. Kundan Lal,	Village & PO-Sukki Tehsil Chachyot Distt. Mandi H.P.	03-14-10 Bighas	22-08-2023	21-08-2028	31˚30'37.84"N 77˚0'20.23"E
34	Sh. Beli Ram S/o Tholu Ram,	VPO & Tehsil Sainj Distt. Kullu, H.P.	02-03-12 Bighas	05-03-2022	04-03-2027	31˚40'48.75"N 77˚09'06.54"E
35	Sh. Mani Ram, S/o Sh. Bhime Ram,	VPO- Shehnu, Tehsil Balichowki, Distt. Mandi H.P.	04-16-06 Bighas	11-01-2023	10-01-2027	31˚40'25.90"N 77˚06'49.70"E
36	Chuni lal & Mohinder Pal, M/s Verma Stone Crusher,	Village & PO Kumarsain Tehsil Kumarsain Distt. Mandi H.P.	36-00-16-Bighas	03-09-2016	02-09-2031	31˚21'13.0"N 77˚21'20.3"E

37	Sh. Kuldeep Mehta, S/o Sh. Dwarka Dass Mehta,	Village- Firnoo, PO- Sarahan, Tehsil Karsog, Distt. Mandi H.P.	04-18-11 Bigha	18-08-2021	17-08-26	31˚21'25.0"N 77˚21'31.1"E
38	Smt.Kaushalya Devi, W/o Sh. Hima Ram,	Village- Khanoch, Parlog, PO- Ogli, Bya Basantpur, Tehsil- Sunni, Distt. Shimla H.P.	08-17-10 Bighas	22-04-2021	21-04-2025	31˚16'05.5"N 77˚16'35.9"E
39	Sh. Puran Dass Mahant Prop M/S Kamaksha Stone Crusher	Village and PO Hurla Tehsl Bhunter Distt. Mandi H.P.	10-0-00 Bighas	10-01-2020	09-01-2025	31˚21'37.1"N 77˚22'22.5"E
40	Hem Singh S/o Sh. Tula Ram	Village- Malgi, PO Pandoha, Tehsil Sunni, Distt. Mandi H.P.	06-14-16 Bighas	21-04-2023	20-04-2028	31˚15'59.12"N 77˚17'5.41"E

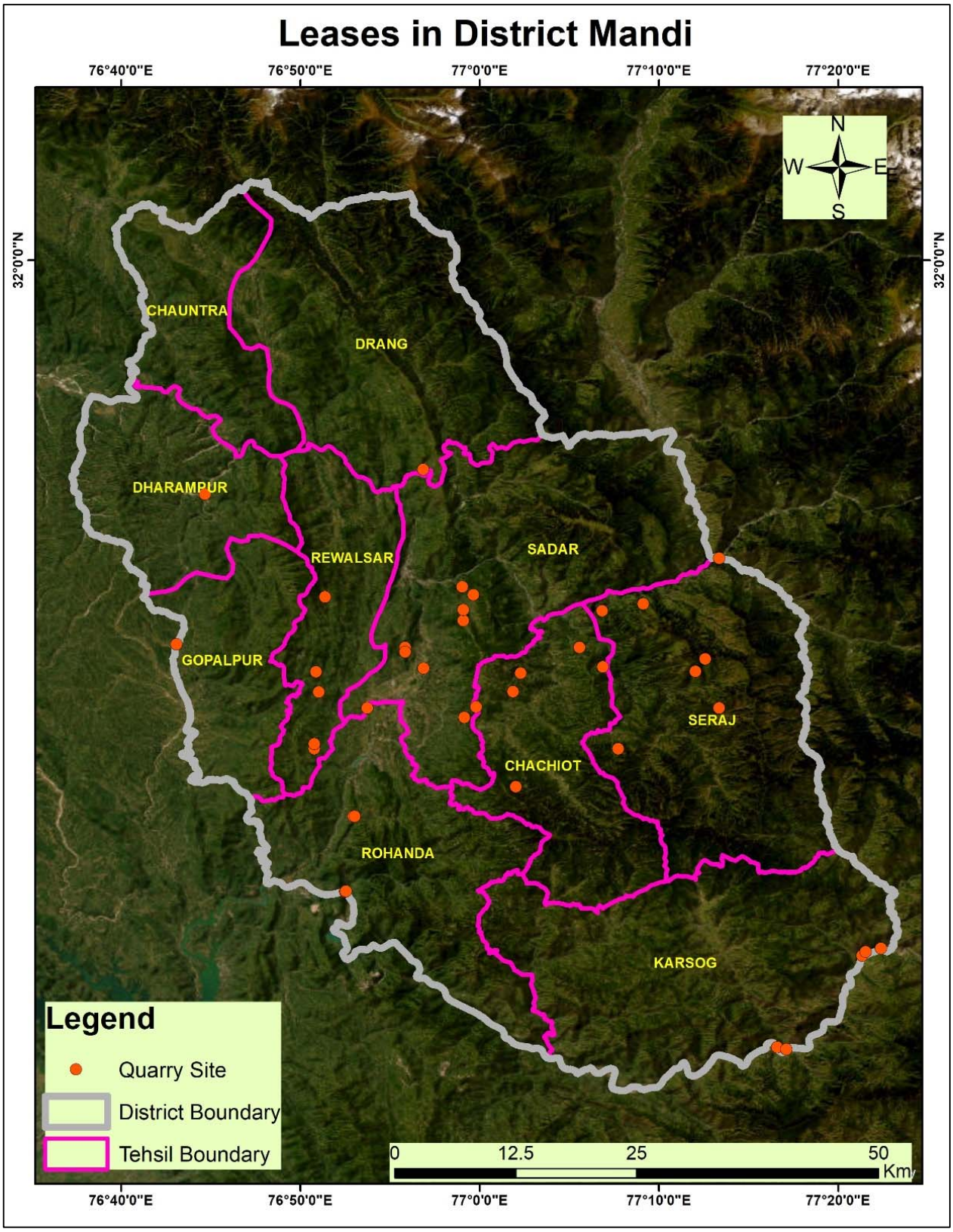


Image showing the location of the mining leases

4. DETAILS OF ROYALTY OR REVENUE RECEIVED IN THE LAST THREE YEARS

Detail of Revenue Collected by Mining Office Mandi H.P. in Last 03 Years.				
Sr. No.	Financial Year	Revenue collected Offline (In Rs)	Revenue Collected Online (In Rs)	Total Revenue Collected (In Rs)
1	2020-21	56763981	24062120	80826101/-
2	2021-22	12879017	42970740	55849757/-
3	2022-23	51996827	49088240	101085067/-
4	2023-24	27860828	21814720	49675548/-

5. DETAIL OF PRODUCTION OF MINOR MINERAL IN LAST THREE YEARS:

Mineral	2019-20	2020-21	2021-22	2022-23
aggregate	321808	4259.5	46593	94242
Clay/ Muck	80255	634168.6	0	0
Bajri	82628	94820	199547	171623.155
Sand	26500	55278	56533	93448
Rough stone	81553.8	96036.3	340529	285298
Building stone	12608	12781	18872.66	15979
Slate	990	1060	526	1127

6. PROCESS OF DEPOSITION OF SEDIMENTS IN THE RIVERS OF THE DISTRICT

Many rivers originate from the Himalayan and Shivalik regions which supply water in down streams. The greatest sediment yields are generally associated with rivers draining areas of intensive tectonic activity therefore, Himalayan rivers cause tremendous erosion and carry large amounts of sediment. The sediment load of a river is commonly considered to be a pollutant that is aesthetically displeasing and environmentally degrading. Sediment load can be divided into bed load and suspended load based on the mode of transport. Bed load is transported close to the bed where particles move by rolling, sliding, or jumping transport in natural rivers is a complicated phenomenon. Its movement is quite uneven in both the transverse and longitudinal directions, which varies considerably. Some sediment particles roll or slide along the bed intermittently and some others saltate (hopping or bouncing along the bed).

The material transported in one or both of these modes is called 'bed load'. Finer particles (with low fall velocities) are entrained in suspension by the fluid turbulence and transported along the channel in suspension. This mode of transport is called 'suspended load'. Sometimes finer particles from upland catchment (sizes which are not present in the bed material), called 'wash load', are also transported in suspension. The combined bed material and wash .load is called 'total load'. Bed load ranges from a few percent of the total load in lowland rivers to perhaps 15% in Mountain Rivers to over 60% in some arid catchments. Although a relatively small part of the total sediment load, the arrangement of bed load sediment constitutes the architecture of sand bed and gravel-bed channels. The rate of sediment transport typically increases as a power function of flow; that is, a doubling of flow typically produces more than a doubling in sediment transport and most sediment transport occur during floods.

Rivers can be called open as well as underground circulatory systems of a continent and in the case of the Mandi district of Himachal Pradesh River Beas and River Parvati are the main aortae which are the main conduits for carrying water, minerals and load to nurture and to shape the life and the land.

History has shown us that rivers have provided us with drinking water, agricultural lands, building materials, means of transportation and a habitable ecosystem. In northern India, the main drinking water source direct or indirect comes from rivers only but as human activities are profoundly increased a systematic and scientific utilization of the system is very important.

Natural processes shape the land by various means i.e. fluvial, erosional and Aeolian are slow and steady but any slight change to these processes can imbalance the process and resultant is the catastrophe. Deforestation, industrialization, urbanization, floodplain cultivation, dam and levee construction, and channelization have altered dramatically natural flow regimes. These changes have contributed to flooding, erosion, channel incision, contamination, non-native species introductions, and loss in ecological diversity. Although well-organised techniques to harvest natural resources can sustain the changes still slow and steady.

The multiple and sometimes incompatible services we demand from rivers often lead to social conflicts. The policy and management decisions that surround these conflicts increasingly require the integration of science-based information that crosses traditional disciplines. Unfortunately, gaps in our understanding of river processes often limit our ability to manage rivers optimally.

6.1 River Science

River Science is the study of processes affecting the river system. River science integrates multiple disciplines; it includes the study of how hydrological, geological, chemical, and ecological processes interact to influence the form and dynamics of riverine ecosystems and how riverine ecosystems in turn influence these processes across multiple spatial and temporal scales.

River science seeks to understand the linkages between river-related processes and patterns at multiple scales, from small streams to large rivers, from pristine to heavily urbanized watersheds, and from daily- to century-scale dynamics. Watersheds range in size from under one to thousands of square kilometres, and a river's physical and biological environment changes as water moves downstream. Small-scale or short-term physical processes may influence reach-scale habitat features that in turn influence ecological processes at broader scales and over longer periods. River science includes the study of relationships between watersheds, riparian zones, floodplains, groundwater, headwaters and downstream Rivers. Thus, river science is not constrained by any arbitrary spatial scale or physical boundaries defined by the morphology of channels, floodplains, or terraces. Rather, its domain and bounds are defined by the scales necessary to understand and predict river processes.

6.2 Major Rivers of Mandi District

The Beas and Satluj rivers form the major drainage system in the district. The river Beas and its tributaries, drain about 70% of the district area in the northern part, whereas the area in the south is drained by the river Satluj(30%). Suketi khad and its tributaries, chiefly drain Balh Valley. The Suketi khad maintains a perennial flow, because of effluent seepage from groundwater. The Annun khad and Chainra khad are the major tributaries of the Staluj River in the district.

6.2.1 River Beas

The Beas River rises in the Himalayas in central Himachal Pradesh, India, and flows for some 470 kilometres (290 mi) to the Sutlej River in the Indian state of Punjab. Its total length is 470 kilometres (290 mi) and its drainage basin is 20,303 square kilometres (7,839 sq mi) large. The river rises 4,361 metres (14,308 ft) above sea level on the southern face of Rohtang Pass in Kullu district. It traverses the Mandi District and enters the Kangra District at Sandhol, 590 metres (1,940 ft) above sea level. During its lower course, the Beas is crossed by numerous ferries, many of which consist of inflated skins (darais).

Near Reh in Kangra District it divides into three channels, which reunite after passing Mirthal, 300 metres (980 ft) above sea level. On meeting the Sivalik Hills in Hoshiarpur, the river sweeps sharply northward, forming the boundary with Kangra District. Then bending around the base of the Sivalik Hills, it takes the southerly direction, separating the districts of Gurdaspur and Hoshiapur. After touching the Jullundur district for a short distance, the river forms the boundary between Amritsar and Kapurthala. Finally, the Beas joins the river Sutlej at the south-western boundary of Kapurthala district of Punjab after a total course of 470 kilometres (290 mi). The chief tributaries are Bain, Banganga, Luni and Uhal. The Sutlej continues into Pakistani Punjab and joins the Chenab River at Uch near Bahawalpur to form the Panjnad River; the latter in turn joins the Indus River at Mithankot. The waters of the Beas and Sutlej rivers are allocated to India under the Indus Waters Treaty between India and Pakistan.

The Beas River enters the district from the eastern side near the village Largi where the Sainj and Tirthan streams Join it and flow to the north-western direction. The river beas leaves the district in the western part near the village of Sandhol and enters the Harpur district. Some mall streams like Uhal, Rana Khad, Luni Khad, Binno Khad and many small streams join the river beas in the district.

6.2.2 Satluj River

Satluj or Sutlej river rises from beyond Indian borders on the Southern slopes of the Kailash mountain near Mansarover lake from Rakas lake, as Longcchen Khabab river (in Tibet). It is the largest among the five rivers of Himachal Pradesh. It enters Himachal at Shipki (altitude = 6,608 metres) and flows in the South-Westerly direction through Kinnaur, Shimla, Kullu, Solan, Mandi and Bilaspur districts. Its course in Himachal Pradesh is 320 km. from Rakastal, with famous tributaries viz. the Spiti, the Ropa, the Taiti, the Kashang, the Mulgaon, the Yula, the Wanger, the Throng and the Rupi as right bank tributaries, whereas the Tirung, the Gayathing, the Baspa, the Duling and the Soldang are left bank tributaries. It leaves Himachal Pradesh to enter the plains of Punjab at Bhakhra, where the world's highest gravity dam has been constructed on this river. Its total catchment area in Himachal Pradesh is 20,000 sq. km

The river Satluj forms the southern boundary and separates it from the Shimla and Solan districts. The river Satluj enters in the Mandi district near the village Firnu near the Rampur area and flows towards the south-west direction. It leaves the district near Dehar and enters into the Bilaspur district, Behna, Ropri Bagri, Chanod and Alsed are the important streams that fall into the Satluj from the Northern direction of the district.

6.2.3 Suketi Khad

The Suketi River (which is a major tributary of the river Beas) is a small basin in the district Mandi. The Suketi River Basin is drained by the Suketi River and its numerous tributaries, the main among these are Umli Khar Jatla Nallah, Bonyat Nallah, Gambhar Khad, Bhadyal Nallah, Gagal Nallah and Chadyam Nallah etc. Most of the tributaries of the Suketi Valley rise from the permanent glacier melt water and the Perennial Spring of the Valley receives a considerable amount of water throughout the year.

6.3 Drainage Pattern

The river Beas and its tributaries mainly drain about 70% of the district and the remaining 30 % is drained by the Satluj River. Beas River originates in the Pir-Panjal range, at an elevation of about 4000 AMSL and enters Mandi District at Bajaura at an elevation of 1070 AMSL. Major tributaries of Beas in Mandi District are Suketi Khad and Uhl River. All the tributaries are perennial in nature. The Beas River flows towards a south-southwest direction up to Mandi and flows north-northwest towards Dharampur and Sandhol. Besides Beas, the Sutlej river forms a border of District Mandi with Shimla and later on with

Bilaspur district and flows from south-east North West direction. Both the rivers are flowing in their youth stages as indicated by the 'V' shaped river profile and deeper river channels. The Beas River maintains a longitudinal and consequent relationship in its upper course and after Larji it takes a knee-bend-type turn towards the west. The river is joined by subsequent rivers i.e. Uhl, Suketi, Tirthan, Hurla, and Sainj on its left and right banks. Several streams on their southern side in the Kullu district join these subsequent rivers.

S.No.	Basin	Area (Sq. Km)	Percentage Area
1	Rana Watershed	604.37	15.31
2	Jangled Watershed	60.17	1.52
3	Suketi Watershed	467.95	11.85
4	Son Watershed	229.26	5.81
5	Tirthan Watershed	102.04	2.58
6	Hurla Watershed	79.33	2.01
7	Jiuni Watershed	707.98	17.93
8	Uhl Watershed	404.95	10.26
9	Binwa Watershed	70.93	1.80
10	Satluj Watershed	1221.16	30.93
Total		3948.13	100.00

The drainage pattern of River Beas is mostly dendritic to sub-dendritic i.e. the tributaries meet at low angles and branch at random, like a tree pattern. A dendritic drainage pattern indicates comparatively low permeable rocks which allow high drainage density in the district.

The relation of the drainage density (D) and the runoff (R) can be expressed as:

$$Percolation = 1/D \; X \; R$$

This means lower the D (Drainage density) lower the runoff (R) and the higher the percolation and vice versa.

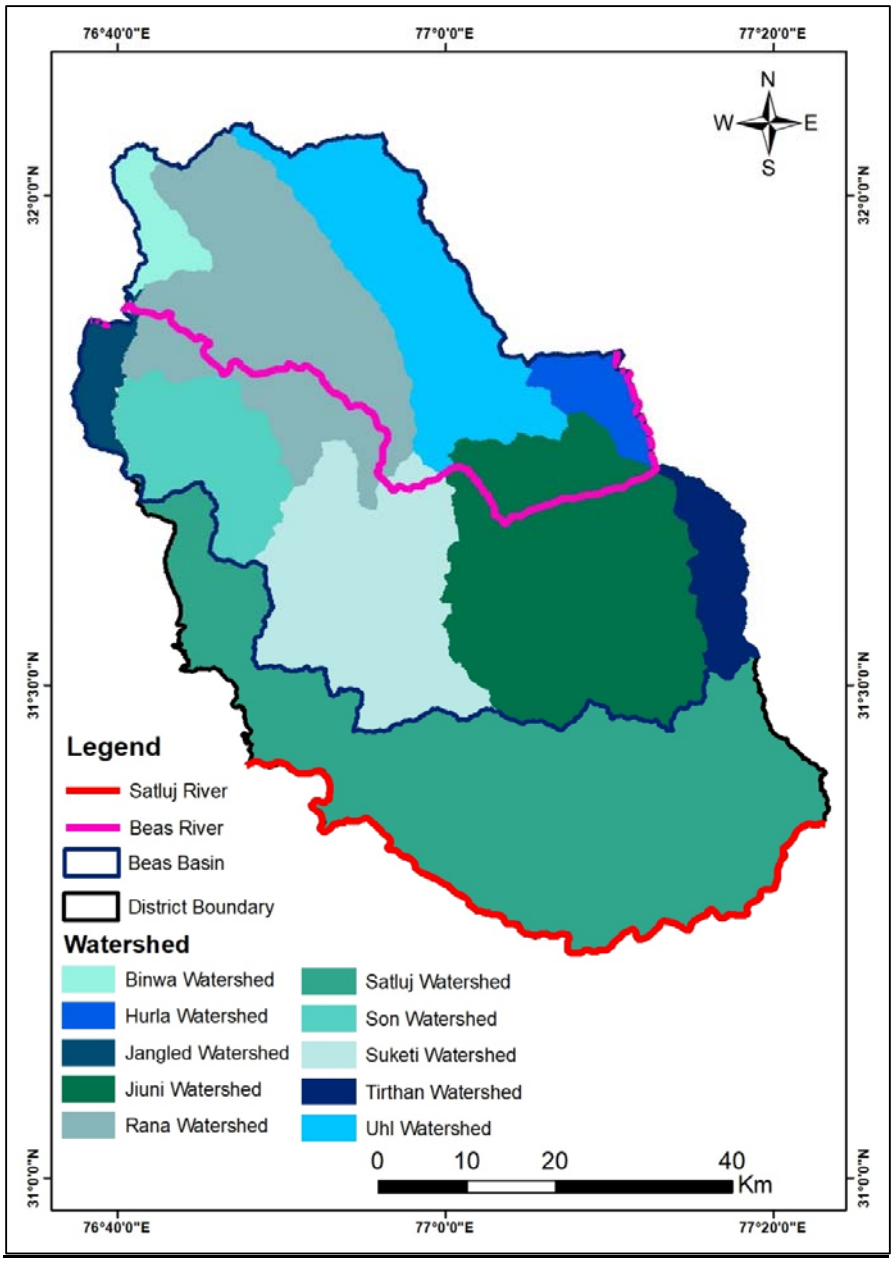


Fig showing Watershed Map of Mandi District

Further, the dendritic pattern in the Mand district i.e., in the Himalayas System is mainly controlled by the structural influences which further limit the percolation of rainwater to groundwater reserve at the structural contacts.

Drainage density can affect the shape of a river's hydrograph during a rain storm. Rivers that have a high drainage density will often have a 'flashier' hydrograph with a steep falling limb. High densities can also indicate a greater flood risk which leads to damage of roads and habitats. In the Mandi district, the drainage density ranges from 0.004 to 1.705 KM/KM2. The areas with high drainage density lead to flooding in the lower areas and deposit the RBM (River Borne Material) when the hydrograph limb falls steeply as shown in the image.

6.4 Stream ordering

The stream order hierarchy was officially proposed in 1952 by Arthur Newell Strahler, a geoscience professor at Columbia University in New York City, in his article "Hypsometric (Area Altitude) Analysis of Erosional Topology." The article, which appeared in the Geological Society of America Bulletin outlined the order of streams as a way to define the size of perennial (a stream with water in its bed continuously throughout the year) and recurring (a stream with water in its bed only part of the year) streams.

When using stream order to classify a stream, the sizes range from a first-order stream all the way to the largest, a 12th-order stream. A first-order stream is the smallest of the world's streams and consists of small tributaries. These are the streams that flow into and "feed" larger streams but do not normally have any water flowing into them. In addition, first and second-order streams generally form on steep slopes and flow quickly until they slow down and meet the next-order waterway.

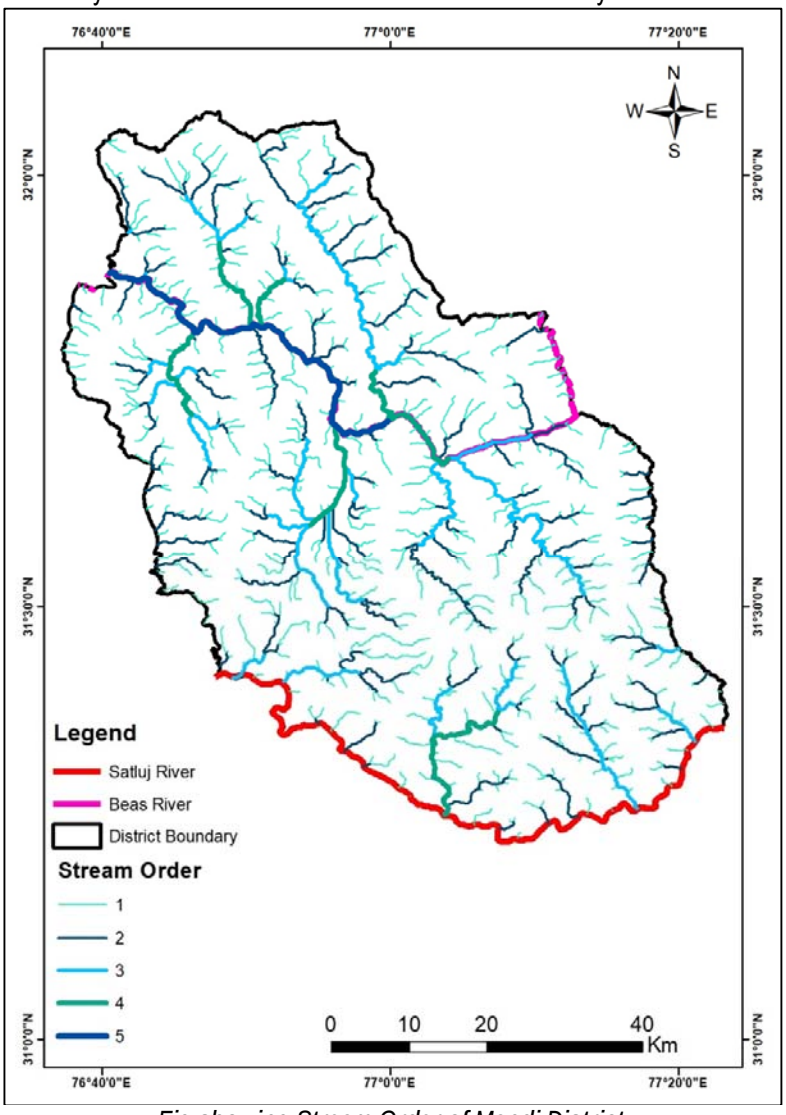


Fig showing Stream Order of Mandi District

First through third-order streams are also called headwater streams and constitute any waterways in the upper reaches of the watershed. It is estimated that over 80% of the world's waterways are these first through third-order, or headwater streams.

Going up in size and strength, streams that are classified as fourth through sixth order are medium streams while anything larger (up to 12th order) is considered a river. For example, to compare the relative size of these different streams, the Beas River in the Mandi district is a 5th-order stream. The world's largest river, the Amazon in South America, is considered a 12th-order stream.

Unlike the smaller order streams, these medium and large rivers are usually less steep and flow slower. They do however tend to have larger volumes of runoff and debris as it collects in them from the smaller waterways flowing into them.

6.4.1 Going Up in Order

When studying stream order, it is important to recognize the pattern associated with the movement of streams up the hierarchy of strength. Because the smallest tributaries are classified as first order, they are often given a value of one by scientists It then takes a joining of two first-order streams to form a second-order stream. When two second-order streams combine, they form a third-order stream, and when two third-order streams join, they form a fourth and so on.

If however, two streams of different order join, neither increases in order. For example, if a second-order stream joins a third-order stream, the second-order stream simply ends by flowing its contents into the third-order stream, which then maintains its place in the hierarchy.

6.4.2 The Importance of Stream Order

This method of classifying stream size is important to geographers, geologists, hydrologists and other scientists because it gives them an idea of the size and strength of specific waterways within stream networks- an important component of water management. In addition, classifying stream order allows scientists to more easily study the amount of sediment in an area and more effectively use waterways as natural resources. Stream order also helps people like biogeographers and biologists in determining what types of life might be present in the waterway. This is the idea behind the River Continuum Concept, a model used to determine the number and types of organisms present in a stream of a given size. Different types of plants for example can live in sediment-filled, slower-flowing rivers like the lower Ganges than can live in a fast-flowing tributary of the same river

Whether it is used by a GIS, a biogeographer, or a hydrologist, stream order is an effective way to classify the world's waterways and is a crucial step in understanding and managing the many differences between streams of different sizes.

6.5 Water Basin Geometric Analysis

The total area of District Mandi is 3948 sq. Km out of which the water basin of River Beas covers an area of 2727 sq. Km which is about 69 percent of the out area rests 31 percent is the Satluj basin which lies south of the district. The water basin covers important tourist spots namely Pandoh, Mandi, and Sundernagar and encompasses the beautiful valleys of Hurla, Uhl, Suketi and Tirthan.

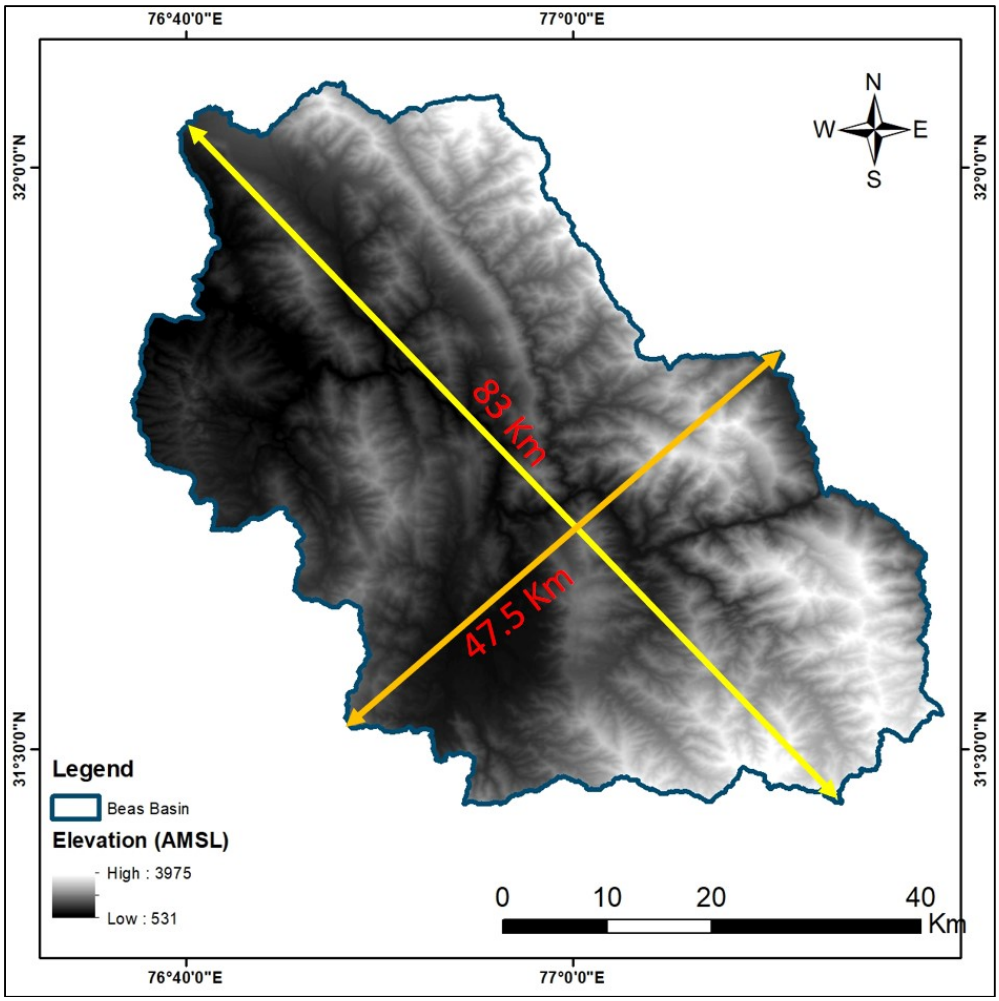


Figure showing the Water Basin of the district Mandi

The highest point of the water basin is about 3975 meters and the lowest point is 531 meters and entire water basin has an asymmetric geometry having an average length (L) along the main stream of about 83 Km. The breadth (B) of the said area then can be calculated as:

B = Area/ L

Hence the breadth is about 47.5 Km.

The length-breadth ratio of the Beas River basin in the Mandi district comes out to about 1.75 which means higher asymmetry. Further, the higher the ratio higher the asymmetry.

6.6 Relief

Terrain, or land relief, is the vertical and horizontal dimension of the land surface. When relief is described underwater, the term bathymetry is used. Terrain is used as a general term in physical geography, referring to the lay of the land. This is usually expressed in terms of the elevation, slope, and orientation of terrain features. Terrain affects surface water flow and distribution. Over a large area, it can affect weather and climate patterns.In terms of environmental quality, agriculture, and hydrology, understanding the terrain of an area enables the understanding of watershed boundaries, drainage characteristics, water movement, and impacts on water quality. Complex arrays of relief data are used as input parameters for hydrology transport models (such as the SWMM or DSSAM Models) to allow the prediction of river water quality.

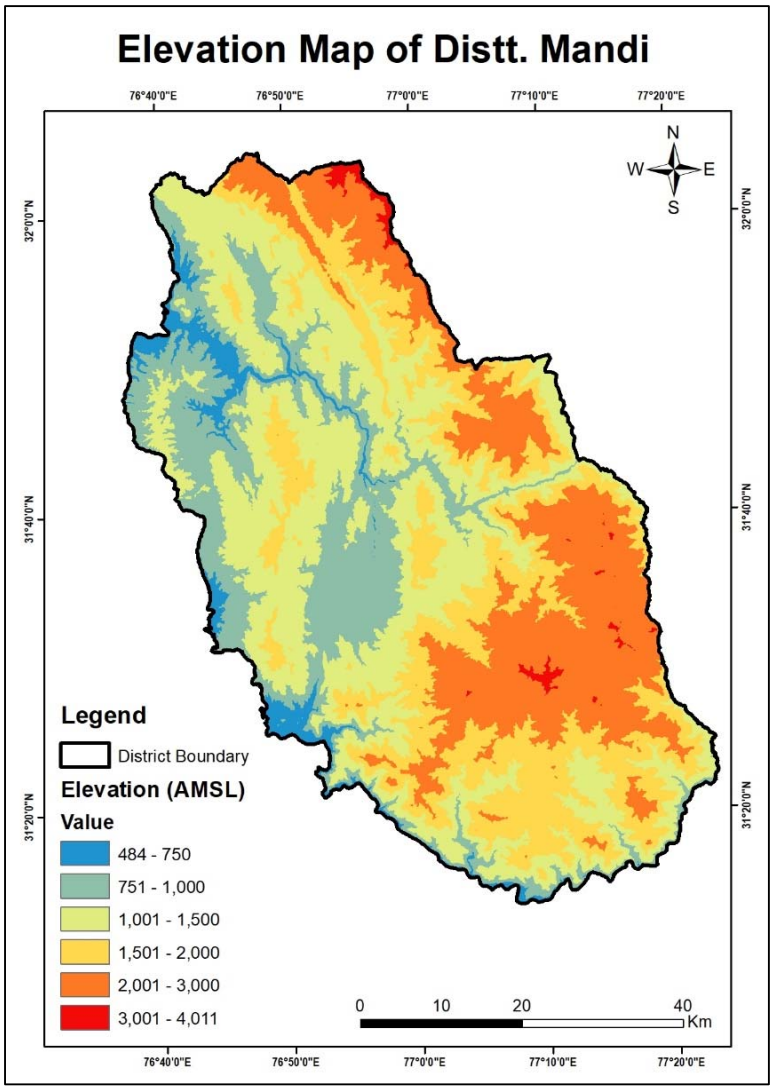


Figure showing elevation map of the district

6.7 Reserve Calculation

The reserve calculations are based on the following expression:

Total reserve = Volume X Tonnage Factor

Where the volume of the deposit is approximated by Length, Breadth and height parameters.

6.7.1. Tonnage Factor

The tonnage factor is the parameter that directly converts the volume of the mineral to the weight of the mineral. In the metric system, the tonnage factor is the specific gravity of the ore and the specific gravity is a function of the mineral composition of the ore. The most accurate method of determination of the specific gravity of the ore is to determine the average specific gravity of the individual mineral of the ore provided with the accurate relative percentages.

The relative percentage of minerals in the Beas River System in the Mandi district is as below

Granite = 35 %
Quartzite = 20 %
Phyllite = 15 %
Limestone = 7 %
Dolomite = 10 %

Slate = 3 %

Therefore the total specific gravity of the mineral in the Mandi district is calculated by

Granite => 2.7 ×0.35 = 0.945
Quartzite => 2.8 × 0.20 = 0.560
Phyllite => 2.6 × 0.15 = 0.390
Limestone => 2.7 × 0.07 = 0.189
Dolomite => 2.7 × 0.10 = 0.270
Slate => 1.8 × 0.03 = 0.054
Total Specific Gravity = 2.4

The average height of the deposit in any mining spot is taken (i.e. 1 meter) by considering the annual replenishment factor.

6.7.2 Annual Replenishment Factor

Replenishment of river bed material takes place is the deposition of the sediments of different sizes carried by the stream. Many factors such as topography, soil type, bedrock type, climate and vegetation cover influence the input, output and transport of sediment and water in a drainage basin (Charlton; 2008). Sediment transport knowledge is important in river restoration, ecosystem protection, navigation, watershed studies and reservoir management. These factors also influence the natural pattern and carrying capacity of water bodies (Twidale, 2004). Di-siltation (removal of .excess sand and stone from river bed) of the river helps to maintain the carrying capacity and provides protection from flooding during monsoon season. However, in the subsequent rainy season grain/particle size distribution analysis of bed load samples must be done to define the size composition of the material in transit.

The elevation of Mandi district ranges from 484m to 4011 m above mean sea level with varied agro-climatic conditions. Geomorphologically the Mandi district can be broadly divided into two regions i.e. the Beas catchment area and the Staluj Catchment area which plays an important role in deciphering the sub-surface and surface hydrogeological conditions. On the basis of hydro-geomorphological and geological set-up, the study area can be divided into the following geomorphic units.

I) *Mountainous area*- Mandi district lies in the lesser Himalayas region and as such presents rugged mountainous terrain. Between the steeply rising hill region lays the beautiful valleys of Balh (Sundernagar) and Kullu (Partly) The Bara Bhangal in the north and the Satluj with its tributaries, Beas, Uhl and Suketi Khad of Indus drainage system are the main rivers in the district.

II) *Snow-covered area*- Northern and northeastern parts of the Mandi district receive snowfall. Seraj Valley & Shikari Wildlife Sanctuary which lies in the central part of Mandi receives Snowfall during the winters. There is no presence of a permanent snowline in the district

III) *Denuded hills*- The presence of residual ridges along the intermontane valleys suggests that these ridges are the remnants of high-relief mountains and formed active erosion.

IV) *Valley area* - Fluvial processes and structural disturbances in the area form intermontane valleys. Mandi lies in the Beas basin which is v-shaped in cross-section and denuded hills along the sides.

V) *Terrace area*- A number of terraces are formed along the river valleys in Mandi district. Terraces are generally noticed on the western bank of the Beas River as well as on the Eastern banks of the Satluj River.

Sedimentation in any river is dependent on sediment yield which depends on erosional factors in the river's catchment area. Annual replenishment is based on the location of the depositional spot in the river bed, meandering of the river, geology, weathering conditions and height of the rainfall in the area. The annual replenishment is determined here by the average of the various heights of deposition per year in a specific location.

The Sediment load deposition in a river is dependent on the catchment area, weathering index of the various rock types of the catchment area, land-use pattern of the area, rainfall data and grain size distribution of the sediments. Again, the sediment load estimation is not a dependent variable of the district boundary, but it largely depends upon the aerial extents of the catchment areas, which cross the district and state boundaries.

6.8 Mineral Deposits due to heavy floods in the Rivers

Himachal Pradesh witnessed severe monsoon seasons every year characterized by massive landslides, slope failures, rockfalls, cloudbursts, and flash floods. This monsoon has been unusually intense, with most areas experiencing significantly higher rainfall than the average. The continuous heavy rainfall reduced the land's moisture retention capacity to its minimum level, while the water levels of the rivers reached all-time high flood levels in the various rivers like Beas, Satluj and its tributaries including the Parvati River, Sainj River, and Tirthan River etc. The river beds of the various rivers are very wide and change in river course is a natural phenomenon during floods. The formation of islands due to heavy deposition which is up to 3-4 meters in height, has been a dominant factor for river course changes. In many places, the river course change has been seen at the point of confluence too wherein the primary factor is the deposit of huge debris and boulders by the tributary stream.

6.9 Mineral Deposits Stretches

In the Mandi district some Mineral Deposit Stretches and some other locations have been observed and discovered in the River Beas and Satluj basin by a team of Geologists, the Mining officer of the concerned District and other officials from the department.

The purpose of carrying out this study is to understand the behaviour and quantity of deposition in the River Beas and Satluj and its tributaries. In these rivers river bed material extraction activities have been carried out. In this scenario, it is important to study the replenishable material and amount of deposition taking place before and after monsoon. This study will help in determining the deposition at the mining sites and also the extent of extractable amount of river bed material from the river if any. Furthermore, the continuous flow of rivers is essential for ecological and economic needs such as irrigation and biodiversity etc. Therefore, a replenishment study of the river helps to understand the potential carrying capacity of water during monsoon season.

6.10 MINERAL DEPOSITS OF STRETCHES

Stretch 1: Dated Khad – tributary Binnu Khad

This mineral stretch encompasses a maximum length of 3.5km and a width of 20-25m. The total deposition in this length is calculated at about 492187.50 MT under an area of 08-75-00 hectares. The dated khad tributary of Binnu khad passes through the formation of lower Dharamsala comprising sandstone, upper Shivalik consisting of boulder conglomerate, and alluvium (gravel, sand coarse and clay). No mineral concession has been granted in this khad. The prominent deposits found during the survey in Stretch 1 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
3500	25	2.5	2.25	492187.50

Stretch 2: Allain Khad – a tributary of Beas-Sun Khad

This mineral stretch encompasses a maximum length of 15 km and a width of 30-40m. The total deposition in this length is calculated at about 2531250 MT under an area of 45-00-00 hectares. The Allain Khad – tributary of Beas-Sun Khad passes middle Shivalik comprising of sandstone and clay. No mineral concession has been granted in this khad. The prominent deposits found during the survey in Stretch 2 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
15000	30	2.5	2.25	2531250

Stretch 3: Baliyana Khad – a tributary of Allian Khad

This mineral stretch encompasses a maximum length of 3 km and a width of 50m. The total deposition in this length is calculated at about 843750 MT under an area of 15-00-00 hectares. The Baliyana Khad passes through the formation of middle Shivalik comprising sandstone with clay of upper Miocene to Pliocene age. No mineral concession has been granted in this khad. The prominent deposits found during the survey in Stretch 3 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
3000	50	2.5	2.25	843750

Stretch 4: Jhangi Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 7 km and a width of 50m. The total deposition in this length is calculated at about 1968750 MT under an area of 35-00-00 hectares. The Jhangi Khad passes through the formation upper Shivalik Pleistocene age basically boulder and conglomerate. No mineral concession has been granted in this khad. The prominent deposits found during the survey in Stretch 4 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
7000	50	2.5	2.25	1968750

Stretch 5 : Nagluni Khad – tributary of Bakar Khad

This mineral stretch encompasses a maximum length of 5 km and a width of 25-50m. The total deposition in this length is calculated at about 1265625 MT under an area of 22-50-00 hectares. The Nagluni Khad – tributary of Bakar Khad and No mineral concession has been granted in this khad in district Mandi. The prominent deposits found during the survey in Stretch 5 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
5000	45	2.5	2.25	1265625

Stretch 6: Nalad Khad – a tributary of Allian Khad

This mineral stretch encompasses a maximum length of 7 km and a width of 50m. The total deposition in this length is calculated at about 1968750 MT under an area of 35-00-00 hectares. The Nalad Khad – tributary of Allian Khad and No mineral concession has been granted in this khad. The prominent deposits found during the survey in Stretch 6 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
7000	50	2.5	2.25	1968750

Stretch 7: Binnu Khad – Right tributary of Beas River

This mineral stretch encompasses a maximum length of 17 km and a width of 30-70m. The total deposition in this length is calculated at about 4781250 MT under an area of 85-00-00 hectares. The Binnu Khad cuts the formation of Lower Dharamsala comprising sandstone and upper Shivalik consisting of boulder conglomerate and alluvium (gravel, sand coarse and clay). No mineral concession has been granted in the Binnu Khad. The prominent deposits found during the survey in Stretch 7 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
17000	50	2.5	2.25	4781250

Stretch 8: Sun Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 28 km and a width of 50-150m. The total deposition in this length is calculated at about 19687500 MT under an area of 350-00-00 hectares. No mineral concession has been granted in the Sun Khad. The prominent deposits found during the survey in Stretch 8 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
28000	125	2.5	2.25	19687500

Stretch 9: Bakkar Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 27 km and a width of 25-150m. The total deposition in this length is calculated at about 20503125 MT under an area of 364-50-00 hectares. No mineral concession has been granted in the Bakkar Khad. The prominent deposits found during the survey in Stretch 9 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
27000	135	2.5	2.25	20503125

Stretch 10: Uhl River – Right tributary of Beas River

This mineral stretch encompasses a maximum length of 50 km and a width of 30-80m. The total deposition in this length is calculated at about 18281250 MT under an area of 325-00-00 hectares. The Uhl river passes through the rocks of the Kullu group–Khokan–Khanmrada formation comprising mainly phyllite and schist. No mineral concession has been granted in the Uhl River. The prominent deposits found during the survey in Stretch 10 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
50000	65	2.5	2.25	18281250

Stretch 11 : Bajgar Khad

This mineral stretch encompasses a maximum length of 9 km and a width of 100-150m. The total deposition in this length is calculated at about 5062500 MT under an area of 90-00-00 hectares. The Bajgar Khad consist of Alluvium of quaternary age mainly comprising sand and silt. No mineral concession has been granted in the Bajgar Khad. The prominent deposits found during the survey in Stretch 11 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
9000	100	2.5	2.25	5062500

Stretch 12: From Jhakwan Khad – a tributary of Uhl River

This mineral stretch encompasses a maximum length of 8 km and a width of 50-100m. The total deposition in this length is calculated at about 4500000 MT under an area of 80-00-00 hectares. No mineral concession has been granted in the Jhakwan Khad. The prominent deposits found during the survey in Stretch 12 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	100	2.5	2.25	4500000

Stretch 13: Luni Khad – a tributary of Rana Khad

This mineral stretch encompasses a maximum length of 10 km and a width of 20-50m. The total deposition in this length is calculated at about 1968750 MT under an area of 35-00-00 hectares. The Luni khad which is a tributary of Rana Khad comprises Alluvium sand and silt-dominant formation of quaternary age Luni khad also passes from the lower Dharamsala group consisting of sandstone with shale siltstone. No mineral concession has been granted in the Luni Khad. The prominent deposits found during the survey in Stretch 13 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
10000	35	2.5	2.25	1968750

Stretch 14: Rana Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 25 km and a width of 60-70m. The total deposition in this length is calculated at about 8437500 MT under an area of 150-00-00 hectares. The Rana khad which is a tributary of the Beas River comprises Alluvium sand and silt-dominant formation of quaternary age and also passes from the lower Dharamsala group consisting of sandstone with shale siltstone. No mineral concession has been granted in the Rana Khad. The prominent deposits found during the survey in Stretch 14 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
25000	60	2.5	2.25	8437500

Stretch 15: Arnodi Khad – a tributary of Rana Khad

This mineral stretch encompasses a maximum length of 17 km and a width of 20-70m. The total deposition in this length is calculated at about 4303125 MT under an area of 76-50-00 hectares. The Arnodi khad which is a tributary of Rana Khad passes through the formation of the lower Dharamsala group consisting of sandstone with shale siltstone. No mineral concession has been granted in the Arnodi Khad. The prominent deposits found during the survey in Stretch 15 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
17000	45	2.5	2.25	4303125

Stretch 16: Dev Ki Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 9 km and a width of 20-35m. The total deposition in this length is calculated at about 1670625 MT under an area of 29-70-00 hectares. The Dev Ki khad which is a tributary of the Beas River comprises Hill terrace deposits of boulders. No mineral concession has been granted in the Dev Ki Khad. The prominent deposits found during the survey in Stretch 16 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
9000	33	2.5	2.25	1670625

Stretch 17: Kasoni Ki Khad – a tributary of Beas River

This mineral stretch encompasses a maximum length of 9 km and a width of 20-45m. The total deposition in this length is calculated at about 1670625 MT under an area of 29-70-00 hectares. The Kasoni Ki khad which is a tributary of the Beas River comprises Hill terrace deposits of boulders. No mineral concession has been granted in the Kasoni Ki Khad. The prominent deposits found during the survey in Stretch 17 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
9000	33	2.5	2.25	1670625

Stretch 18: Bhubu Nala – a tributary of the Uhl River

This mineral stretch encompasses a maximum length of 9 km and a width of 50-100m. The total deposition in this length is calculated at about 5062500 MT under an area of 90-00-00 hectares. The Bhubu Nala which is a tributary of the Uhl River however no mineral concession has been granted in the Bhubu Nala.

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
9000	100	2.5	2.25	5062500

Stretch 19: Shagnal Nala – a tributary of the Uhl River

This mineral stretch encompasses a maximum length of 8 km and a width of 50-100m. The total deposition in this length is calculated at about 4500000 MT under an area of 80-00-00 hectares. The Shagnal Nala which is a tributary of the Uhl River and no mineral concession has been granted in the Shagnal Nala. The prominent deposits found during the survey in Stretch 19 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	100	2.5	2.25	4500000

Stretch 20: Baroh Nala – a tributary of the Uhl River

This mineral stretch encompasses a maximum length of 4 km and a width of 90-110m. The total deposition in this length is calculated at about 2250000 MT under an area of 40-00-00 hectares. The

Baroh Nala which is a tributary of the Uhl River. The prominent deposits found during the survey in Stretch 20 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
4000	100	2.5	2.25	2250000

Stretch 21: Katauli Khad – a tributary of the Uhl River

This mineral stretch encompasses a maximum length of 10 km and a width of 50-150m. The total deposition in this length is calculated at about 8437500 MT under an area of 150-00-00 hectares. The Katauli Khad which is a tributary of the Uhl River. The prominent deposits found during the survey in Stretch 21 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
10000	150	2.5	2.25	8437500

Stretch 22: Kadevi Khad – tributary of Rissa Khad

This mineral stretch encompasses a maximum length of 7 km and a width of 25-100m. The total deposition in this length is calculated at about 3937500 MT under an area of 70-00-00 hectares. The Kadevi Khad which is a tributary of Rissa Khad and No mineral concession has been granted in the Kadevi Khad. The prominent deposits found during the survey in Stretch 22 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
7000	100	2.5	2.25	3937500

Stretch 23: Neri Khad – Left tributary of Rana Khad

This mineral stretch encompasses a maximum length of 8 km and a width of 25-55m. The total deposition in this length is calculated at about 1665000 MT under an area of 29-60-00 hectares. The Neri Khad which is a tributary of Rana Khad passes through alluvium sand and silt-dominant formation of quaternary age and also passes from the lower Dharamsala group consisting of sandstone with shale siltstone. No mineral concession has been granted in the Neri Khad. The prominent deposits found during the survey in Stretch 23 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	37	2.5	2.25	1665000

Stretch 24: Suketi Khad – a tributary of Beas

This mineral stretch encompasses a maximum length of 23 km and a width of 20-100m. The total deposition in this length is calculated at about 7762500 MT under an area of 138-00-00 hectares. The Suketi Khad which is a tributary of Beas comprises Mandi Darla volcanics of the Shali and Larzi formation of the Deoban group (meta volcanics). No mineral concession has been granted in the Suketi Khad. The prominent deposits found during the survey in Stretch 24 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
23000	60	2.5	2.25	7762500

Stretch 25: Ratti Khad – a tributary of Suketi Khad

This mineral stretch encompasses a maximum length of 20 km and a width of 25-30m. The total deposition in this length is calculated at about 2812500 MT under an area of 50-00-00 hectares. The Ratti Khad which is a tributary of Suketi Khad comprises Mandi Darla volcanics of the Shali and Larzi formation of the Deoban group (meta volcanic). No mineral concession has been granted in the Ratti Khad. The prominent deposits found during the survey in Stretch 25 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
20000	25	2.5	2.25	2812500

Stretch 26: Chel Khad – a tributary of Suketi Khad

This mineral stretch encompasses a maximum length of 15 km and a width of 20-70m. The total deposition in this length is calculated at about 3796875 MT under an area of 67-50-00 hectares. The Chel Khad which is a tributary of Suketi Khad comprises and no mineral concession has been granted in the Chel Khad. The prominent deposits found during the survey in Stretch 26 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
15000	45	2.5	2.25	3796875

Stretch 27: Kansa Khad – Right tributary of Suketi Khad

This mineral stretch encompasses a maximum length of 24 km and a width of 20-55m. The total deposition in this length is calculated at about 4995000 MT under an area of 88-80-00 hectares. The Kansa Khad which is a tributary of Suketi Khad comprises of Mandi Darla volcanics of Shali and Larzi formation of the deoban group (meta volcanic). No mineral concession has been granted in the Ratti Khad. The prominent deposits found during the survey in Stretch 27 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
24000	37	2.5	2.25	4995000

Stretch 28: Galma Khad

This mineral stretch encompasses a maximum length of 5 km and a width of 50m. The total deposition in this length is calculated at about 1406250 MT under an area of 25-00-00 hectares. The Galma Khad passes through the quaternary deposits of sand and silt-dominant formation. No mineral concession has been granted in the Galma Khad. The prominent deposits found during the survey in Stretch 28 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
5000	50	2.5	2.25	1406250

Stretch 29: Rissa Khad

This mineral stretch encompasses a maximum length of 12 km and a width of 50-150m. The total deposition in this length is calculated at about 6750000 MT under an area of 120-00-00 hectares. The Rissa Khad passes through the hill-cut terrace deposits of Middle Shivaliks of Pleistocene to mid, Miocene mainly sandstone and clay also the presence of the lower Dharamsala group consisting of sand stone with siltstone and clay. No mineral concession has been granted in the Rissa Khad. The prominent deposits found during the survey in Stretch 29 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
12000	100	2.5	2.25	6750000

Stretch 30: Jabothi Khad – a tributary of Seer Khad

This mineral stretch encompasses a maximum length of 12 km and a width of 50-150m. The total deposition in this length is calculated at about 5062500 MT under an area of 90-00-00 hectares. The Jabothi Khad comprises highly of alluvium (sand & silt dominant) and the upper Dharamsala group consists of sandstone with shale. No mineral concession has been granted in the Jabothi Khad. The prominent deposits found during the survey in Stretch 30 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
12000	75	2.5	2.25	5062500

Stretch 31: Umli Khad – a tributary of Suketi Khad

This mineral stretch encompasses a maximum length of 7 km and a width of 50-100m. The total deposition in this length is calculated at about 2953125 MT under an area of 52-50-00 hectares. No mineral concession has been granted in the Umli Khad. The prominent deposits found during the survey in Stretch 31 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
7000	75	2.5	2.25	2953125

Stretch 32: Sukkar Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 8 km and a width of 20-35m. The total deposition in this length is calculated at about 1170000 MT under an area of 20-80-00 hectares. No mineral

concession has been granted in the Sukkar Khad. The prominent deposits found during the survey in Stretch 32 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	26	2.5	2.25	1170000

Stretch 33: Seer Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 20 km and a width of 50-200m. The total deposition in this length is calculated at about 16875000 MT under an area of 300-00-00 hectares. No mineral concession has been granted in the Seer Khad. The prominent deposits found during the survey in Stretch 33 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
20000	150	2.5	2.25	16875000

Stretch 34: Balohi Khad – a tributary of the Satluj River

This mineral stretch encompasses a maximum length of 16 km and a width of 20-35m. The total deposition in this length is calculated at about 2430000 MT under an area of 43-20-00 hectares. No mineral concession has been granted in the Balohi Khad. The prominent deposits found during the survey in Stretch 34 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
16000	27	2.5	2.25	2430000

Stretch 35: Alsed Khad – tributary of Satluj River

This mineral stretch encompasses a maximum length of 17.5 km and a width of 20-40m. The total deposition in this length is calculated at about 2953125 MT under an area of 52-50-00 hectares. No mineral concession has been granted in the Alsed Khad. The prominent deposits found during the survey in Stretch 35 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
17500	30	2.5	2.25	2953125

Stretch 36: Baharari Khad

This mineral stretch encompasses a maximum length of 9 km and a width of 50-100m. The total deposition in this length is calculated at about 2784375 MT under an area of 49-50-00 hectares. No mineral concession has been granted in the Baharari Khad. The prominent deposits found during the survey in Stretch 36 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
9000	55	2.5	2.25	2784375

Stretch 37: Thirish Khad – drain into Seri & Gades Khad

This mineral stretch encompasses a maximum length of 14 km and a width of 20m. The total deposition in this length is calculated at about 1575000 MT under an area of 28-00-00 hectares. No mineral concession has been granted in the Thirish Khad. The prominent deposits found during the survey in Stretch 37 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
14000	20	2.5	2.25	1575000

Stretch 38: Soli Khad

This mineral stretch encompasses a maximum length of 19 km and a width of 50-150m. The total deposition in this length is calculated at about 13359375 MT under an area of 237-50-00 hectares. No mineral concession has been granted in the Soli Khad. The prominent deposits found during the survey in Stretch 38 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
19000	125	2.5	2.25	13359375

Stretch 39: Satwari Khad

This mineral stretch encompasses a maximum length of 15 km and a width of 25m. The total deposition in this length is calculated at about 2109375 MT under an area of 37-50-00 hectares. The Satwari Khad comprises the rocks of Salkhala, Vaikrata group near the origin and alluvium gravel dominant near confluence is encountered. No mineral concession has been granted in the Satwari Khad. The prominent deposits found during the survey in Stretch 39 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
15000	25	2.5	2.25	2109375

Stretch 40: Satiyar Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 8 km and a width of 20m. The total deposition in this length is calculated at about 900000 MT under an area of 16-00-00 hectares. The Satiyar Khad comprises the rocks of the Bhalai formation of Salkhala, Vaikrata group near the origin and alluvium gravel dominant deposits are found in Khad. No mineral concession has been granted in the Satiyar Khad. The prominent deposits found during the survey in Stretch 40 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	20	2.5	2.25	900000

Stretch 41: Gurahan Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 8 km and a width of 20-30m. The total deposition in this length is calculated at about 1125000 MT under an area of 20-00-00 hectares. The Gurahan Khad comprises alluvium of the Salkhala group and the rock formation of Chamba formation also exhibits their presence. No mineral concession has been granted in the Gurahan Khad. The prominent deposits found during the survey in Stretch 41 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	25	2.5	2.25	1125000

Stretch 42: Chul Nalla – a tributary of Beas River

This mineral stretch encompasses a maximum length of 6 km and a width of 10-20m. The total deposition in this length is calculated at about 438750 MT under an area of 7-80-00 hectares. The Chul Nalla comprises geologically rocks of alluvium and the rock formation of Chamba formation also found. No mineral concession has been granted in the Chul Nalla. The prominent deposits found during the survey in Stretch 42 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
6000	13	2.5	2.25	438750

Stretch 43: Bakhli Khad – tributary of Beas River

This mineral stretch encompasses a maximum length of 27km and a width of 15-35m. The total deposition in this length is calculated at about 5315625 MT under an area of 94-50-00 hectares. The Bakhli Khad comprises of Salkhala group of chamba formation and Haimanta group comprises phyllite slate of Batal formation. No mineral concession has been granted in the Bakhli Khad. The prominent deposits found during the survey in Stretch 43 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
27000	35	2.5	2.25	5315625

Stretch 44: Bakalwara Khad – a tributary of Beas River

This mineral stretch encompasses a maximum length of 10km and a width of 50m. The total deposition in this length is calculated at about 2812500 MT under an area of 50-00-00 hectares. No mineral concession has been granted in the Bakalwara Khad. The prominent deposits found during the survey in Stretch 44 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
10000	50	2.5	2.25	2812500

Stretch 45: Surah Khad

This mineral stretch encompasses a maximum length of 6km and a width of 50m. The total deposition in this length is calculated at about 1687500 MT under an area of 30-00-00 hectares. No mineral concession has been granted in the Surah Khad. The prominent deposits found during the survey in Stretch 45 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
6000	50	2.5	2.25	1687500

Stretch 46: Thirthan Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 13km and a width of 150m. The total deposition in this length is calculated at about 10968750 MT under an area of 195-00-00 hectares. No mineral concession has been granted in the Thirthan Khad. The prominent deposits found during the survey in Stretch 46 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
13000	150	2.5	2.25	10968750

Stretch 47: Juni Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 40km and a width of 20-55m. The total deposition in this length is calculated at about 10125000 MT under an area of 180-00-00 hectares. The Juni Khad comprises the rocks of Salkhala, Viakrata group and Balai formation comprised mainly of phyllite and schist. No mineral concession has been granted in the Juni Khad. The prominent deposits found during the survey in Stretch 47 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
40000	45	2.5	2.25	10125000

Stretch 48: Annun Ki Khad – a tributary of Satluj River

This mineral stretch encompasses a maximum length of 33km and a width of 25m. The total deposition in this length is calculated at about 4640625 MT under an area of 82-50-00 hectares. No mineral concession has been granted in the Annun Ki Khad. The prominent deposits found during the survey in Stretch 48 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
33000	25	2.5	2.25	4640625

Stretch 49 : Bazri Khad

This mineral stretch encompasses a maximum length of 5km and a width of 20m. The total deposition in this length is calculated at about 562500 MT under an area of 10-00-00 hectares. No mineral concession has been granted in the Bazri Khad. The prominent deposits found during the survey in Stretch 49 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
5000	20	2.5	2.25	562500

Stretch 50: Katocha Khad

This mineral stretch encompasses a maximum length of 4km and a width of 20m. The total deposition in this length is calculated at about 450000 MT under an area of 08-00-00 hectares. The Katocha Khad passes through the Bhallan formation. No mineral concession has been granted in the Katocha Khad. The prominent deposits found during the survey in Stretch 50 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
4000	20	2.5	2.25	450000

Stretch 51 : Sangroi Khad

This mineral stretch encompasses a maximum length of 8km and a width of 15-20m. The total deposition in this length is calculated at about 720000 MT under an area of 12-80-00 hectares. No mineral concession has been granted in the Sangroi Khad. The prominent deposits found during the survey in Stretch 51 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
8000	16	2.5	2.25	720000

Stretch 52: Aidan Khad

This mineral stretch encompasses a maximum length of 5km and a width of 100m. The total deposition in this length is calculated at about 2812500 MT under an area of 50-00-00 hectares. The Aidan Khad passes through the hillcut terrace deposits of the Viakrata group dominantly schist of proterozoic age. No mineral concession has been granted in the Aidan Khad. The prominent deposits found during the survey in Stretch 52 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
5000	100	2.5	2.25	2812500

Stretch 53 : Pangna Khad

This mineral stretch encompasses a maximum length of 7.5km and a width of 50m. The total deposition in this length is calculated at about 2109375 MT under an area of 37-50-00 hectares. The Pangna Khad passes through the hill-cut terrace deposits of the Viakrata group dominantly schist of proterozoic age. No mineral concession has been granted in the Pangna Khad. The prominent deposits found during the survey in Stretch 53 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
7500	50	2.5	2.25	2109375

Stretch 54 : Sanarli Khad

This mineral stretch encompasses a maximum length of 6.5km and a width of 50m. The total deposition in this length is calculated at about 1828125 MT under an area of 32-50-00 hectares. The Sanarli Khad passes through the hill-cut terrace deposits of the Viakrata group dominantly schist of proterozoic age. No mineral concession has been granted in the Sanarli Khad. The prominent deposits found during the survey in Stretch 54 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
6500	50	2.5	2.25	1828125

Stretch 55: Kau Khad

This mineral stretch encompasses a maximum length of 3km and a width of 50m. The total deposition in this length is calculated at about 843750 MT under an area of 15-00-00 hectares. No mineral concession has been granted in the Kau Khad. The prominent deposits found during the survey in Stretch 55 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
3000	50	2.5	2.25	843750

Stretch 56: Mahaul Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 11km and a width of 25-60m. The total deposition in this length is calculated at about 2784375 MT under an area of 49-50-00 hectares. No mineral concession has been granted in the Mahaul Khad. The prominent deposits found during the survey in Stretch 56 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
11000	45	2.5	2.25	2784375

Stretch 57: Mahaul Khad – a tributary of the Beas River

This mineral stretch encompasses a maximum length of 95km and a width of 250m. The total deposition in this length is calculated at about 133593750 MT under an area of 2375-00-00 hectares. The prominent deposits found during the survey in Stretch 57 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
95000	250	2.5	2.25	133593750

Stretch 58: Satluj River in Mandi District

This mineral stretch encompasses a maximum length of 80km and a width of 70-400m. The total deposition in this length is calculated at about 112500000 MT under an area of 2000-00-00 hectares. The prominent deposits found during the survey in Stretch 58 are as follows:-

Average Length (M)	*Average Breadth (M)*	*Average Depth(M)*	*Tonnage Factor*	*Material (MT)*
80000	250	2.5	2.25	112500000

7.0 GENERAL PROFILE OF THE DISTRICT

7.1 Introduction

The district is situated between 31^{o}-13'-50" and 32^{o}-04'-30" north latitude and 76^{o}-37"-20" and 77^{o}-23'-15" east longitude. It is bounded by Kangra on the northwest, Hamirpur & Bilaspur in the west, Arki tehsil of Solan district in the south, Shimla district in the southwest and Kullu district in the east. The district has 2 main rivers viz. the Beas and the Satluj. The river Beas enters the district from close to Bajaura, at the boundary of Kullu and leaves the district at Sandhol. The Mandi town is also located on the banks of this river. For the greater part of its length, it runs between high banks and as it is of never great breadth, the current is swift, especially during the rains.

Practically the whole of the district drains into the Beas with only the south-east corner situated on the Satluj watershed. Within the district the principal tributaries of the Beas on the north bank are Uhl, Luni, Rana and Binu and on the south bank are the Hanse, Tirthan, Bakhli, Jiuni, Suketi, Ranodi, Son and Bakar.

Location:

Mandi district covers an area of 3950 sq kms and lies in the middle portion of H.P and is bounded in the north by district Kangra, Kullu in the West. In the south are the districts of Shimla & Solan, Bilaspur in the south West and Hamirpur in the North West. Major part of the district lies in the lesser Himalayan region, which presents a rugged mountainous terrain. The mountains are composed of crystalline, metamorphic and unfossiliferous sedimentary rocks of the oldest system. Mountains are developed in different stages. Initially, a Geosyncline was formed which was gradually filled up with sediments, after this the Geosynclinal deposits were subjected to folding and thrusting etc. Finally the Geosynclinal sediments were pushed up gradually to form the mountains. In the Mandi district between the steeply rising mountains are the valleys. Bahl, partly Kullu Valley lies between the steeply rising mountains which remain mostly under snow for the most of the year. The valleys are the result of age-long erosion along the medial part of elevated tracts. These valleys are known as erosional valleys which have resulted because of glacial and stream erosion. Sutlej, Beas, Uhl and Suketi are the main rivers in the district.

DISTRICT PROFILE

a. Demographic Profile-table-

Area	3, 950 sq,kms
Height from main sea level	754 mtrs.
Distance from State capital	158 Kms
No. of hebetated villages	2,833
Population	9,01,344
Urban	60,982
Rural	8,40,362

No. of Male	4,47,872
No. of Female	4,53,472
No. S.C. Population	2,61,233
No. S.T. Population	10,564
Population density	228
Population growth	17.54
Literacy Rate	75.24
Male literacy	85.94
Female literacy	64.82

b. Administrative Profile-table-

No. of Sub-division	12
No. of Development Blocks	14
No. of Tehsil:	17
No. of Sub- Tehsil :	15
No. of Local Urban Bodies	07
No. Zila Parishad	01
No. of Panchayats Samities	10
No. of Panchayat	473
No. of Backward Panchayats	143
No. of Villages	3374

c. Road-table-

Total Road length in the district as of 1/09	4150 K.M
Kachha Road length	2269 K.M.
Pachha Road length	1881 K.M.
Total Panchayat connected with road	405
Total villages connected with road	1852

d. Forest -table-

Area under forests	3,951 Hec.

e. Irrigation-table-

Area under irrigation	140.76 Sq.km

f. Agriculture-table-

Major crops grown	Wheat, Maize, Rice & Potato
Area under agriculture	16000 Hect.
Fertilizer consumption (per hectare)	30 Kgs.
Per capita food grain production	228 Kgs.

g. Horticulture -table-

Area under horticulture	31515 Hect.
Type of fruits produce	Apple, Mango, Lichi,

Total fruits production	55000 Metric tonnes

h. Electricity-table-

No. of Electrified villages	2833

i. Health-table-

No. of Health institutions	558
Zonal Hospital	1
Civil Hospitals	5
CHC	11
PHCs	58
Sub Centres	311
FRUs	5
Regional Ayurvedic Research Centre	1
Ayurvedic health institutions	166

j. Education-table-

No. of Colleges :	8 (Govt.) 3 (Private)
Dental College	1
Engineering College	1 (Govt.) 1 (Private)
Polytechnic College	1 (Govt.) 1 (Private)
No. of Sr. Sec. Schools	202 (Govt.) 65 (Private)
No. of High Schools	115 (Govt.) 91 (Private)
No. of Middle Schools	361(Govt.) 63 (Private)
No. of Primary schools	1741(govt.) 83 (Private)
No. of BE.d College	12
No. of ITI	9
No. of ITC	8
No. of SCVT	57

8. LAND UTILIZATION PATTERN IN THE DISTRICT: FOREST, AGRICULTURE, HORTICULTURE, MINING ETC.

The economy of Mandi district is predominately agrarian as around 79 per cent of the total population is dependent on agriculture and activities allied to it for earning their livelihood. The moisture retention capacity of the area is poor due mainly to the fact the bedrock are argillaceous and the land the uneven. The crops usually face moisture stress during the remaining period of the year due to inadequate and irregular rainfall. The irrigation facilities are provided by lifting water from streams, shallow dug wells and medium to deep tube wells in the valley area.

8.1 Agriculture

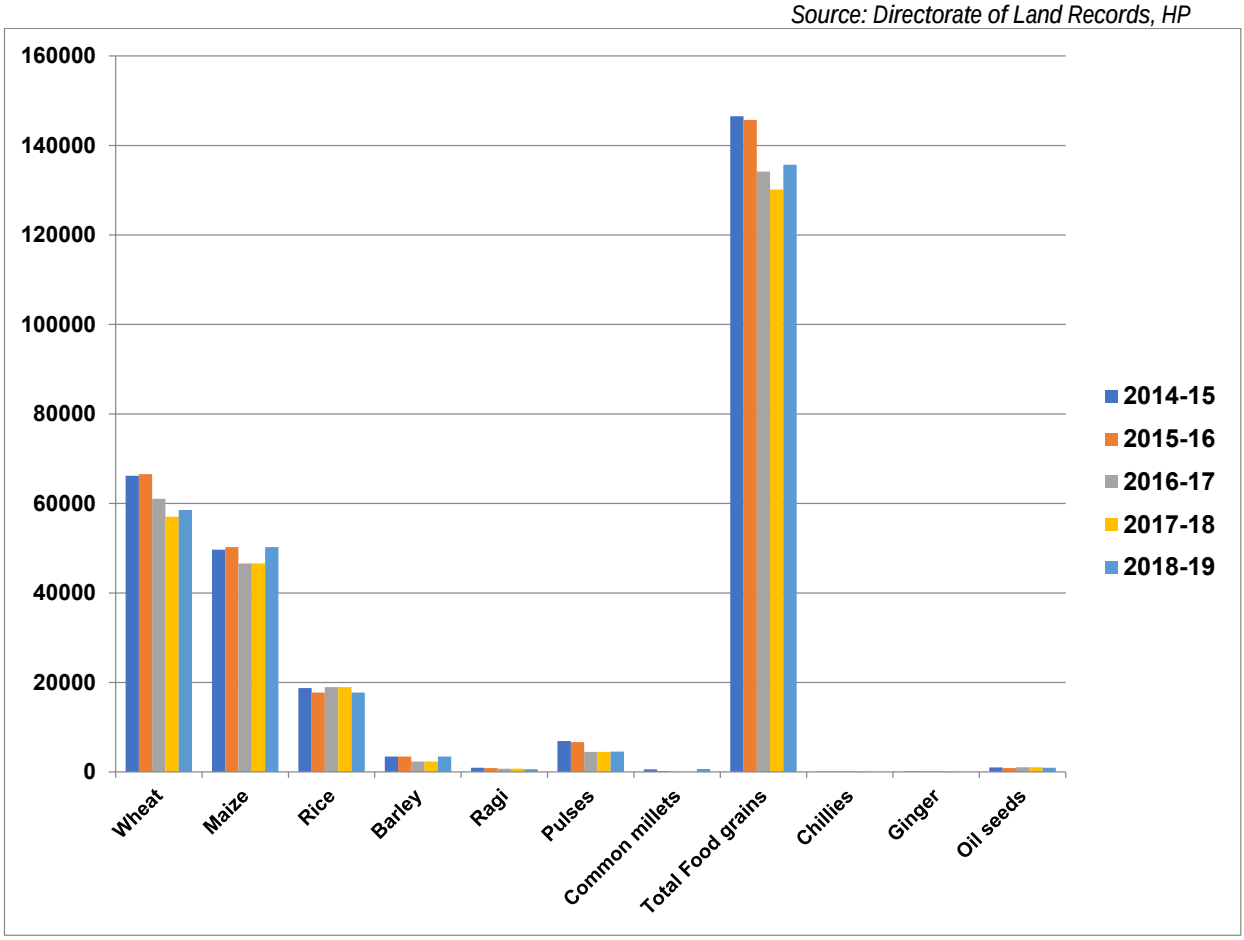
There is no involvement of agricultural land where mining is proposed, however, in the district, the agricultural and horticultural practices of the region vary from other parts of India due to a variety of factors. The most important one is, of course, the unique climate and landscape of the Himalayas. The mountainous territory strongly influences both techniques and crops. Most agriculture takes place in the form of terrace cultivation, with small strips of mountain slopes that had been more or less levelled out to allow cultivation. The quality of the soil is less than optimal with few nutrients and many small stones and rocky patches. Further, the altitude leads to a harsh climate. While in the valleys with an altitude of around

1500 m above sea level, the cultivation can still take place most of the year; it is reduced in the summer months in regions above 2500 m. Yet, the people there particularly depend on agriculture for survival, largely because the remote locality of their villages denies opportunities in other fields. The area is purely rain-fed, which creates difficulties if the monsoon and snowfall turn out weak. Problems of accessibility and transport are further crucial aspects of the farming in Mandi district.The main cereals grown are wheat, maize, rice, and barley in the district.

Table showing area under Different Crops in Hectares

Table showing Area under Different Crops (in Hectares) at District Mandi											
Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Food grains	Chillies	Ginger	Oil seeds
2014-15	66211	49678	18740	3439	953	6903	589	146513	79	96	997
2015-16	66531	50222	17717	3447	892	6658	254	145721	92	100	868
2016-17	61043	46587	18950	2339	701	4471	42	134133	101	110	1055
2017-18	57043	46587	18950	2339	701	4471	42	130133	101	110	1055
2018-19	58531	50222	17717	3447	608	4537	646	135708	0	0	960

Source: Directorate of Land Records, HP

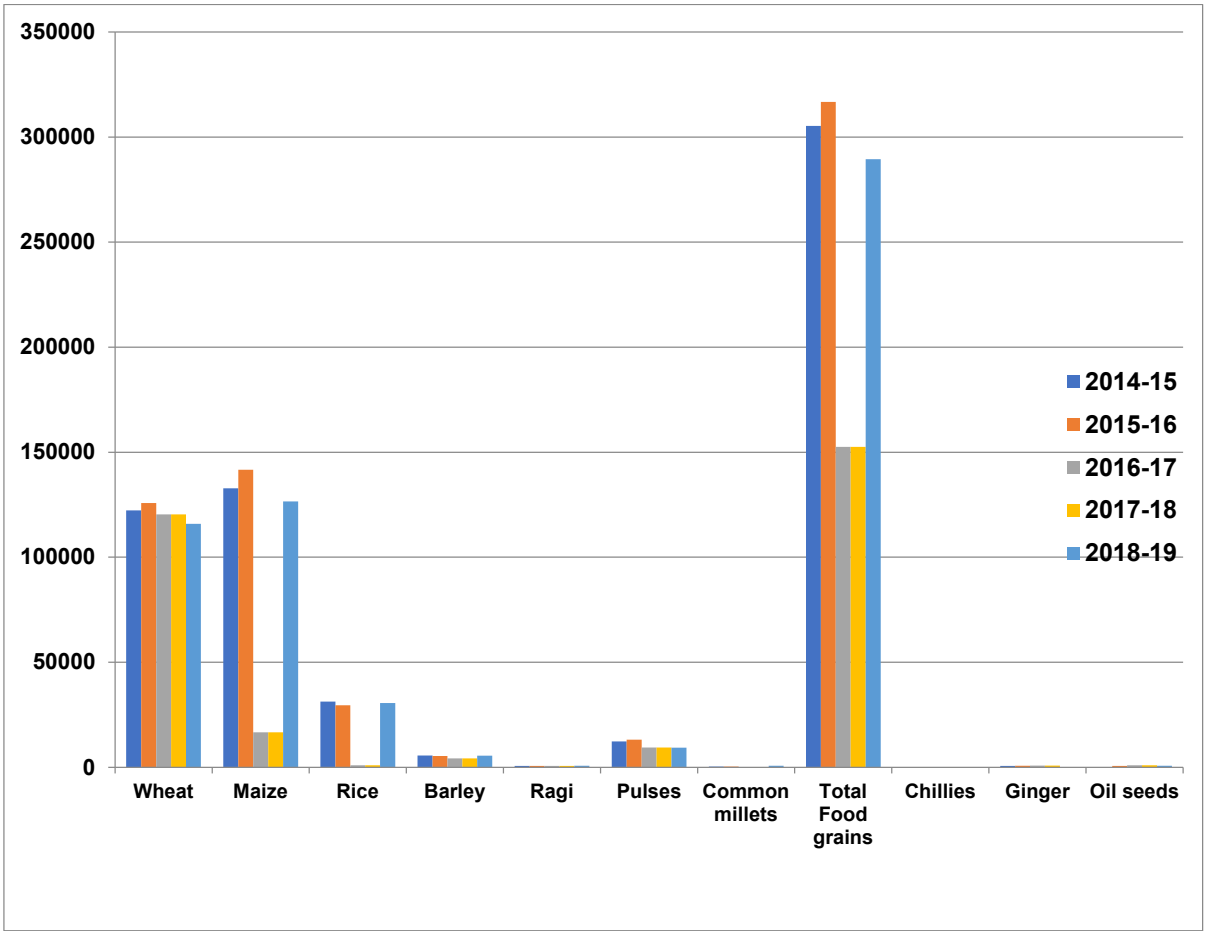


Graph showing Area under Different Crops in Hectares

Table showing production under Different Crops in Hectares

Table showing Production of Different Crops (in MT) at District Mandi											
Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Food grains	Chilies	Ginger	Oil seeds
2014-15	122315	132786	31288	5581	662	12306	371	305309	16	673	104
2015-16	125847	141665	29528	5400	671	13224	330	316665	23	701	670
2016-17	120395	16701	1042	4208	686	9469	47	152548	26	771	1042
2017-18	120395	16701	1042	4208	686	9469	47	152548	26	771	1042
2018-19	115891	126568	30630	5540	710	9380	757	289476	0	0	729

Source: Directorate of Land Records, HP



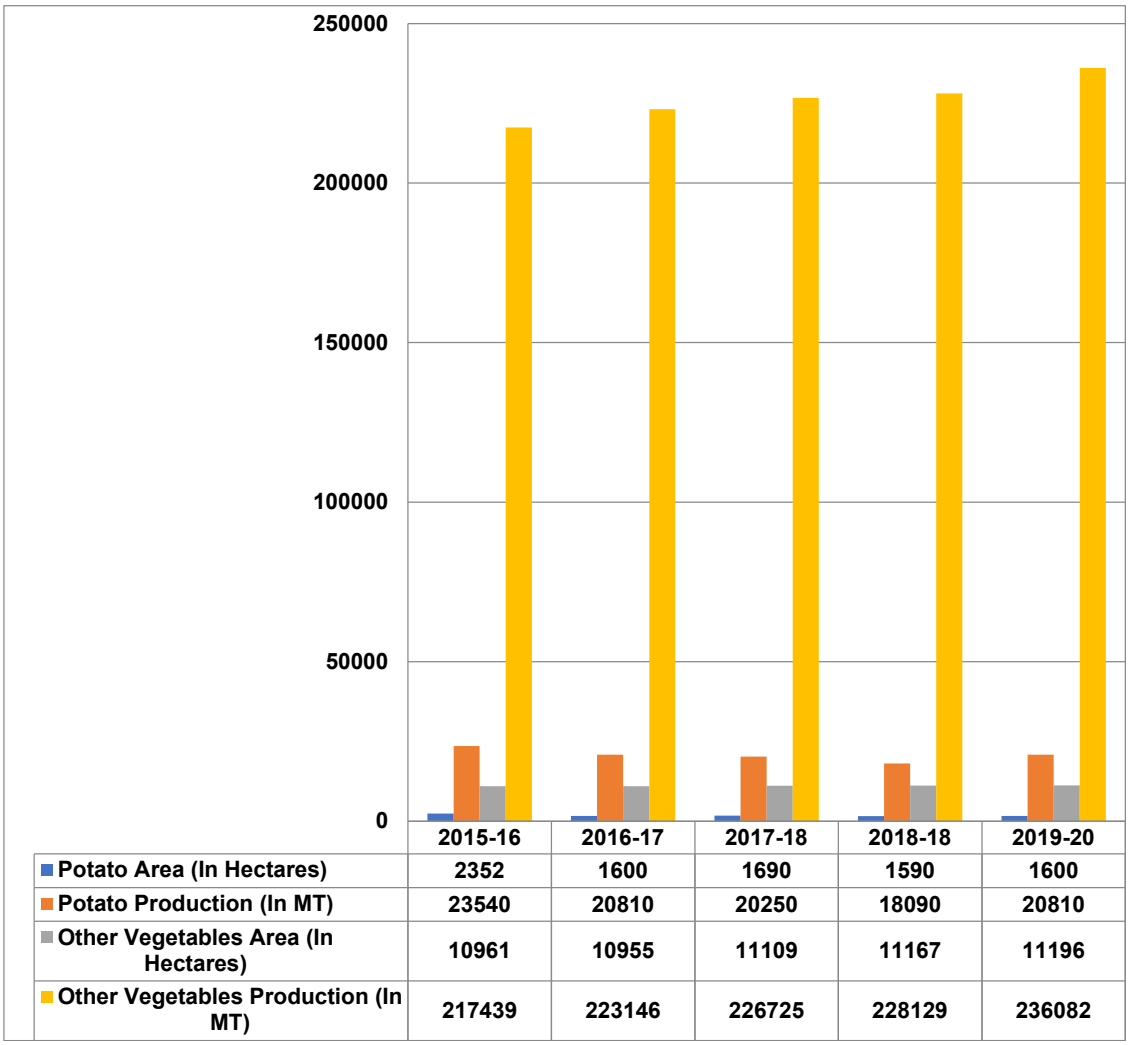
Graph showing Production under Different Crops in Hectares

Table showing Area in Hectares& Production in Tonnes of Vegetables

Table showing Area & Production of Vegetables (Distt Mandi)

Year	Potato		Other Vegetables	
	Area (In Hectares)	Production (In MT)	Area (In Hectares)	Production (In MT)
2015-16	2352	23540	10961	217439
2016-17	1600	20810	10955	223146
2017-18	1690	20250	11109	226725
2018-18	1590	18090	11167	228129
2019-20	1600	20810	11196	236082

Source: Directorate of Land Records, HP



	2015-16	2016-17	2017-18	2018-18	2019-20
Potato Area (In Hectares)	2352	1600	1690	1590	1600
Potato Production (In MT)	23540	20810	20250	18090	20810
Other Vegetables Area (In Hectares)	10961	10955	11109	11167	11196
Other Vegetables Production (In MT)	217439	223146	226725	228129	236082

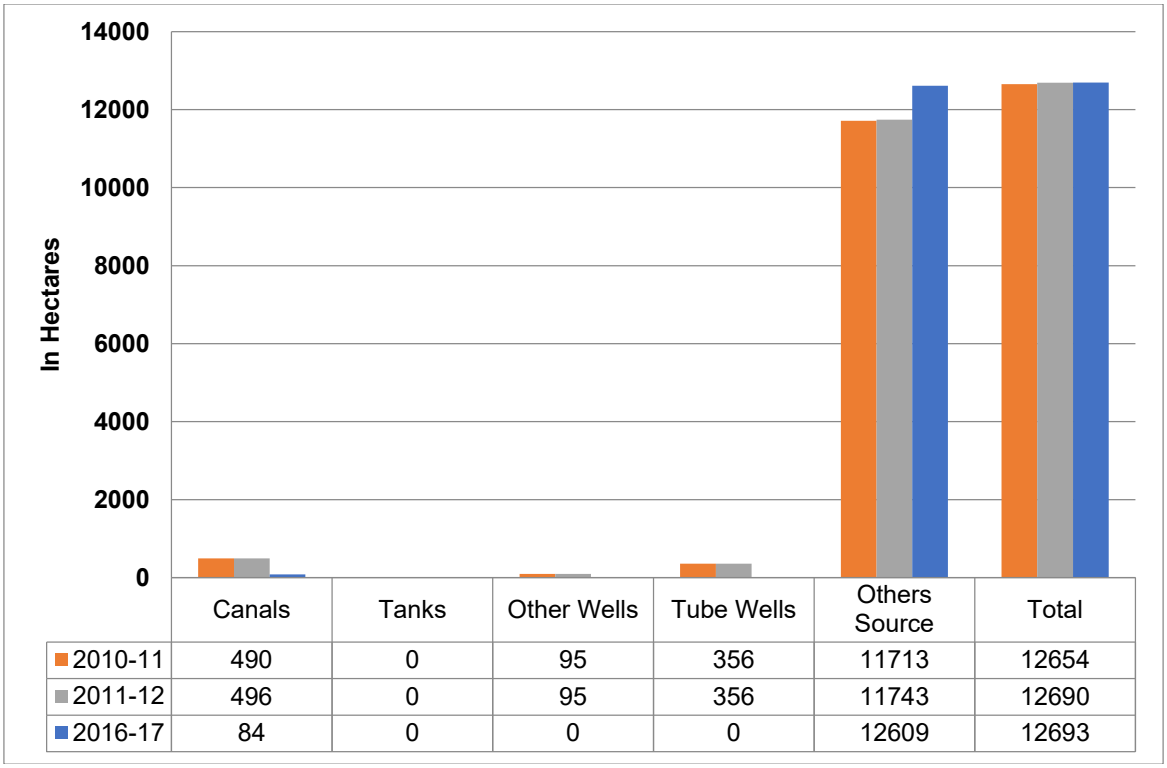
Graph showing the area &production of vegetables in District Mandi

Table showing Net Irrigated Area of Mandi District by source in Hectares

Table showing Net Irrigated Area of Mandi by source (in Hectares)

Year	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	490	…	95	356	11713	12654
2011-12	496	…	95	356	11743	12690
2016-17	84	…	…	…	12609	12693

Source: Directorate of Land Records, HP



	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	490	0	95	356	11713	12654
2011-12	496	0	95	356	11743	12690
2016-17	84	0	0	0	12609	12693

Graph showing the Net Irrigated Area of the District Mandi from2010 to 2017

8.2 HORTICULTURE

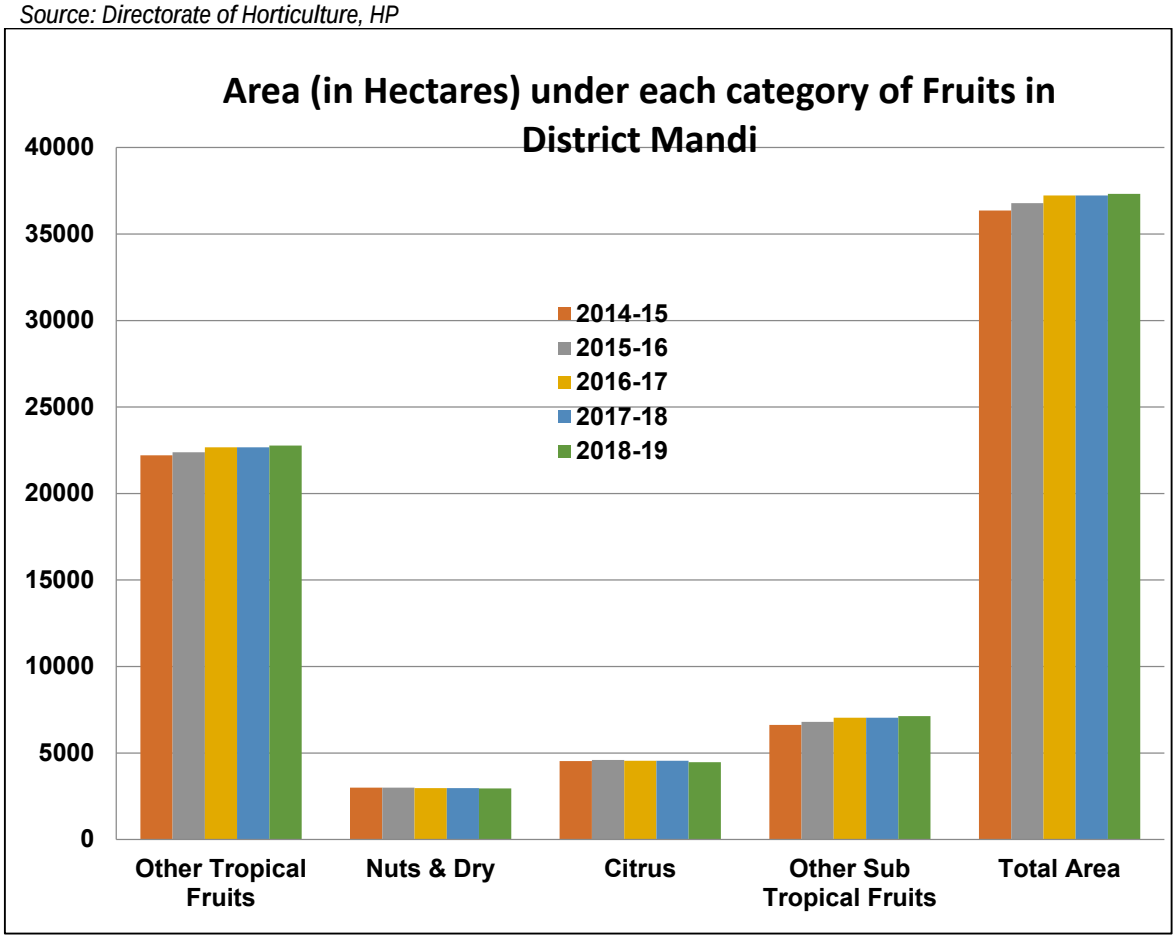
Horticulture plays an important role in the economic life and prosperity of the people of Mandi. During the last three decades, Mandi has made tremendous progress in the field of Horticulture. Greater emphasis is being laid on this sector because the geographical features and climatic conditions prevailing in the district are ideally suited for fruit farming. Among all the fruits grown in Mandi, apples are the most widely grown and represent commercially the most important fruit crop. The cultivated apple area is 15400 hectares. The annual apple production usually lies between 30,000 to 46,000 metric tons. This represents about 4,600 truckloads of apples every year. Apart from apples, the other varieties of fruits grown in Mandi are stone fruits, citrus fruits, Mango, guava, litchi, walnuts, and papaya as well as nuts, especially almonds. These fruit plantations cover an area of 27130 hectares and the annual production is approximately 56710 metric tonnes.

Table showing area under Each Category of Fruits in District Mandi

Table showing Area (In Hectares) under Each Category of Fruits in District Mandi

Year	Other Tropical Fruits	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Area
2014-15	22209	2992	4531	6627	36359
2015-16	22385	2999	4599	6797	36780
2016-17	22672	2971	4550	7036	37229
2017-18	22672	2971	4550	7036	37229
2018-19	22771	2949	4466	7127	37313

Source: Directorate of Horticulture, HP



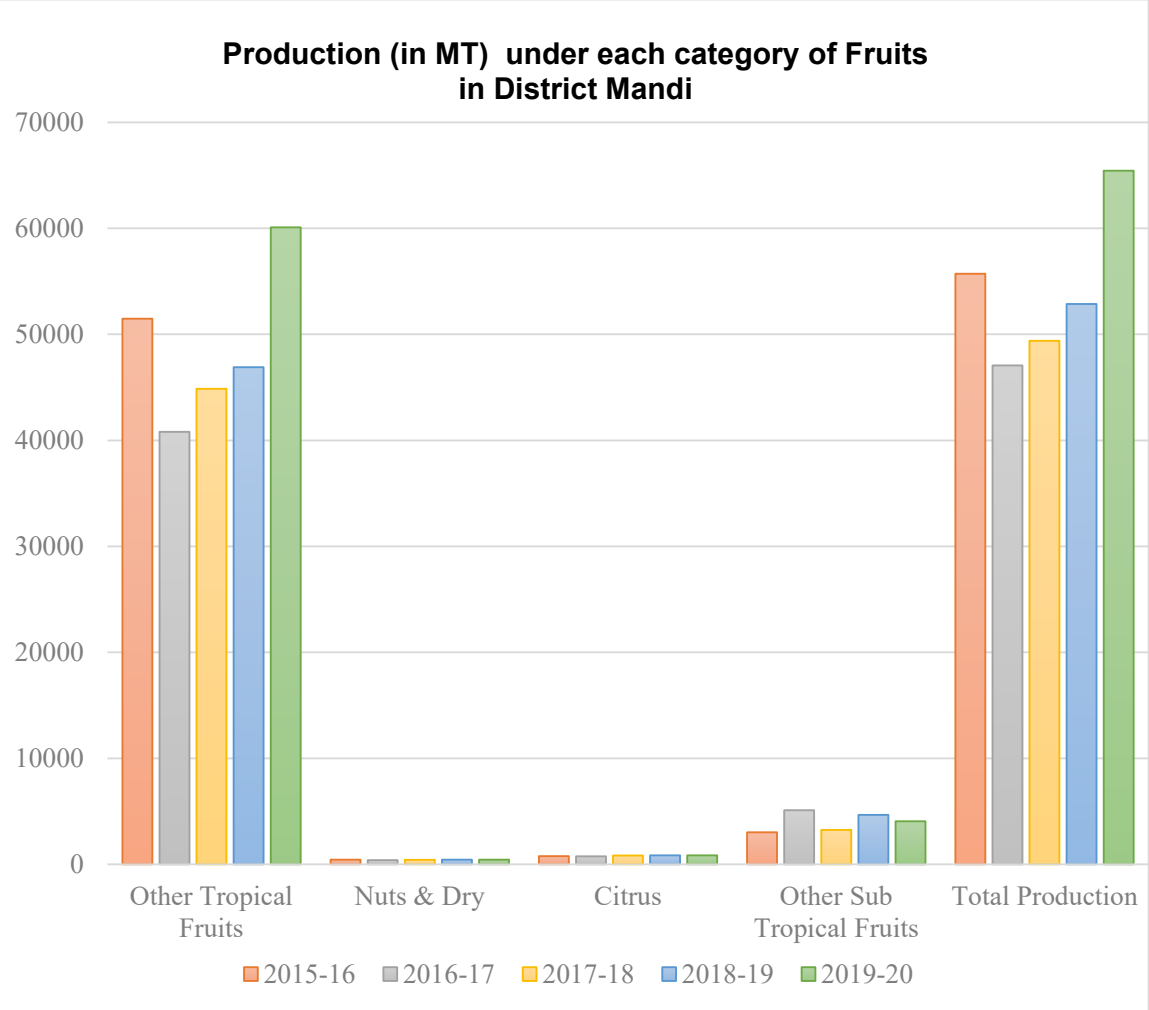
Graph showing Area under Each Category of Fruits in District Mandi

Table showing production under Each Category of Fruits in District Mandi

Table showing Production (In MT) under Each Category of Fruits in District Mandi					
Year	Other Tropical Fruits	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Production
2015-16	51476	435	779	3029	55719
2016-17	40806	403	752	5105	47066
2017-18	44870	430	841	3248	49389
2018-19	46898	447	845	4671	52861

2019-20	60088	447	845	4059	65439

Source: Directorate of Horticulture, HP



Graph showing Production under Each Category of Fruits in District Mandi

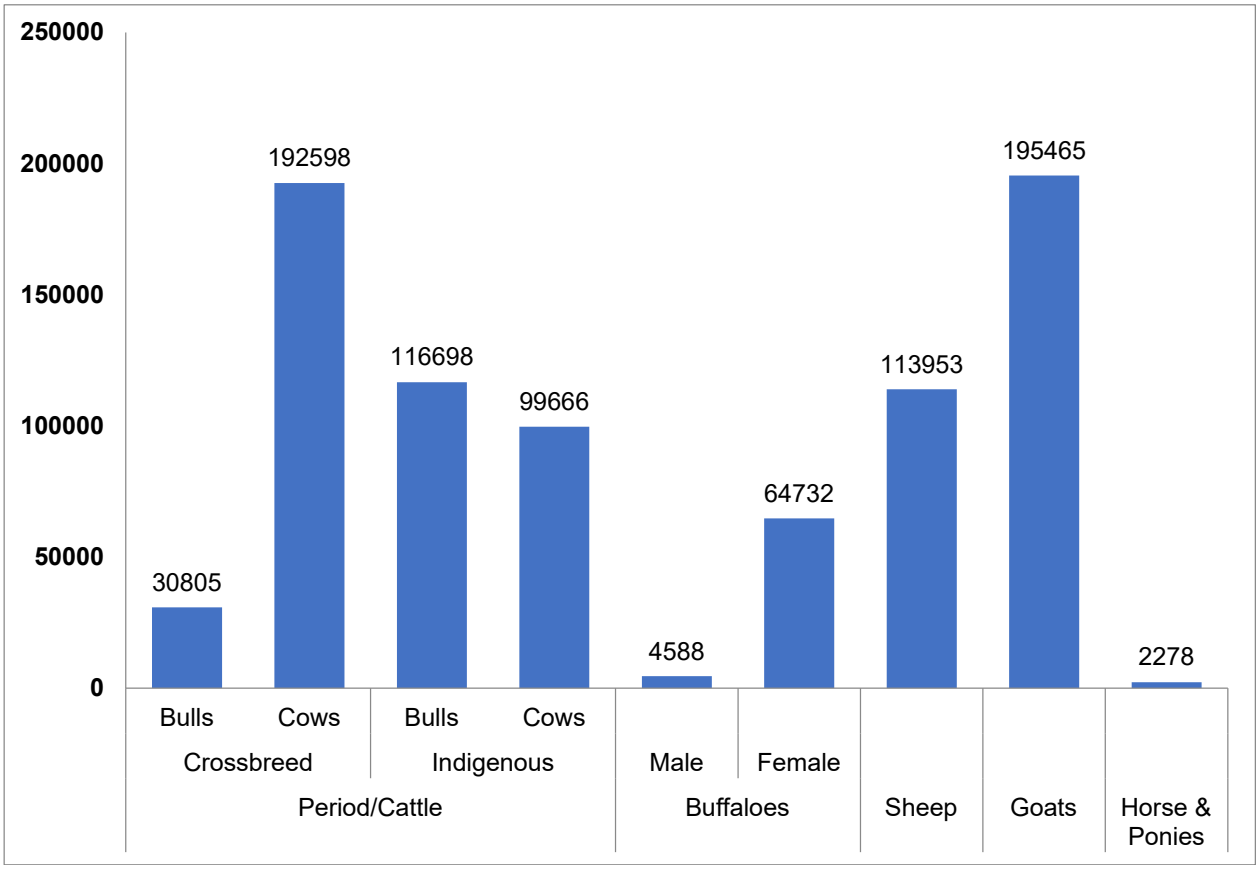
8.3 ANIMAL HUSBANDRY

Animal husbandry plays a very important role in the lives of farmers. They depend upon animals to sustain their day-to-day lives. Large numbers of farmers have adopted animal husbandry as a livelihood activity along with agriculture and horticulture. The animals reared by the farmers are mainly for milk, farm yard manure, and meat purposes. Most of the farmers rear animals for milk production which is mainly used for self-consumption. The livestock kept by the farmers includes cows (local and Jersey) buffaloes, goats and bullocks, etc. Most of the animals are indigenous (local breed) having very low milking capacity.

Table showing Livestock census of District Mandi

Table showing Livestock census in District Mandi										
Year	Status	Period/Cattle				Buffaloes		Sheep	Goats	Horse & Ponies
		Crossbreed		Indigenous		Male	Female			
		Bulls	Cows	Bulls	Cows					
2012	At Mandi	30805	192598	116698	99666	4588	64732	113953	195465	2278

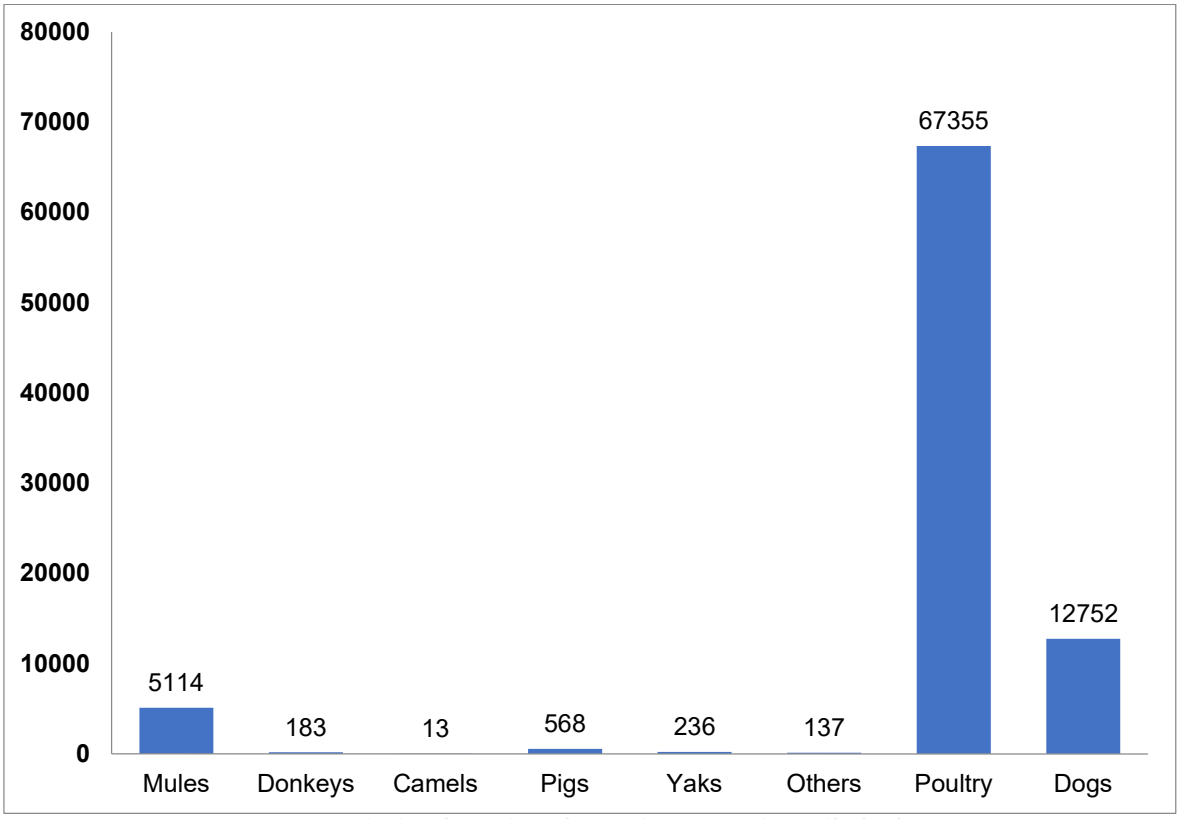
Source: Directorate of Animal Husbandry, HP



Graph showing Livestock census of theMandi District

Table showing OtherLivestock census of District Mandi

Table showing Other Livestock censuses in District Mandi							
Other Livestock							
Mules	Donkeys	Camels	Pigs	Yaks	Others	Poultry	Dogs
5114	183	13	568	236	137	67355	12752
Source: Directorate of Animal Husbandry, HP							



Graph showing Other Livestock census of Mandi District

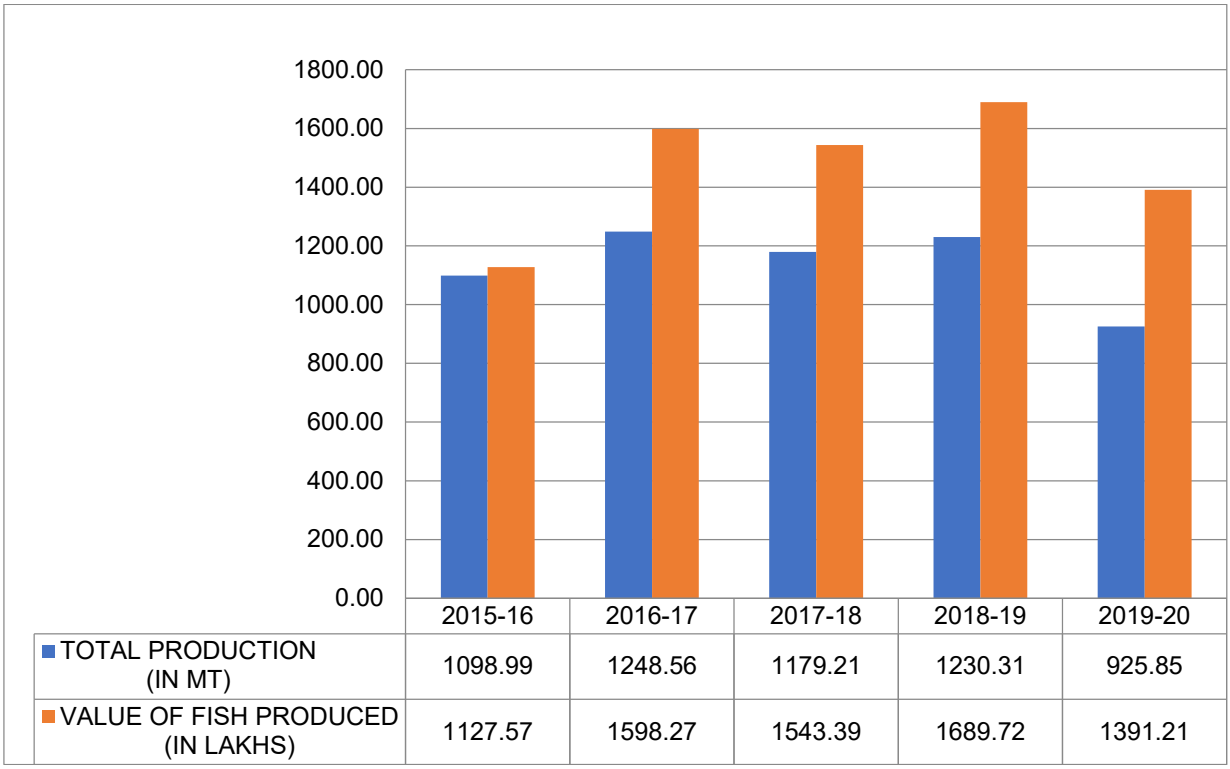
8.4 FISHERIES

Reported Fish species in River Beas (district Mandi) is Salma gairdneriigairdnerii (Rainbow Trout), Salma truffafario (Brown Trout), Tor Pitutora (Mahaseer), Catlacatla, Labeorohita, Labeo batu, Labeodero, Labeodyochelus, Cirrhinamrigala, Notopteruschitala, Wallgoattu, Nemachilusbotio, Pontius ticto, Pontius sarana, Silver Carp, Mastacimballusarmatus. Annual production of trout is about 5 tons as per the reports from the Barot fish farm.

Table showing Annual Production of Fisheries and Its Value of Catch in District Mandi

Table showing Annual Production of Fisheries at District Mandi		
YEAR WISE	TOTAL PRODUCTION (IN MT)	VALUE OF FISH PRODUCED (IN LAKHS)
2015-16	1098.99	1127.57
2016-17	1248.56	1598.27
2017-18	1179.21	1543.39
2018-19	1230.31	1689.72
2019-20	925.85	1391.21

Source: Fisheries Department, HP



	2015-16	2016-17	2017-18	2018-19	2019-20
TOTAL PRODUCTION (IN MT)	1098.99	1248.56	1179.21	1230.31	925.85
VALUE OF FISH PRODUCED (IN LAKHS)	1127.57	1598.27	1543.39	1689.72	1391.21

Graph showing Annual Production of Fisheries and Its Value of Catch in District Mandi

8.5 FOREST

Because of its complex geography and its great variations in altitude, Mandi is home to an enormous range of species, which span the subtropical to the alpine. The common trees in the Mandi hills belong to the conifer species (deodar, pine, spruce, fir). Several species of medicinal plants like Hath Panja (Dactylorhizahatageria) and Brahma Kamal (Saussureaobvallata) grow luxuriously in the valley. The valley is known for the presence of the majestic snow leopard, the Himalayan brown bear and the Himalayan Tahr. The Western Tragopan (the state bird of Himachal Pradesh) and the Monal pheasant are the prominent bird species found in the region.

Flora

Species/ Botanical Name	Common Name	Elevation Range (m)
Abies spectabilis (D.Don.) Mirbel	Himalayan high-altitude fir	3,000-4,000
Abies pindrowRoyle	Silver fir/ Tosh	2,500-3,200
Acer acuminatum Wall. ex D.Don.	Maple	2,500-3,200
Acer caesium Wall. ex Brandis	Maple	2,200-3,000
Aesculus indica Kk. f. & Th.	Horse chestnut/ Khnor	1,800-3,000
Alnus nepalensis D. Don.	Alder	1,500-2,000
Betula utilis D. Don.	Birch/ Bhojpatra	3,000-4,000
Buxus wallichianaBaillon	Boxwood/ Shamshad	2,500-3,000
Cedrus deodara G. Don.	Deodar/ Cedar	2,000-3,000
Cornus capitata Wall.	Dogwood	1,800-2,800
Corylus jacquemontiiDecne.	Hazelnut/ Bhutibadam	2,500-3,200
Cupressus torulosaD.Don.	Pencil cedar	1,800-3,000

Ilex dipyrena Wall.	Holly/ Kaluchha	2,000-2,800

Shrubs

Species	Altitude (m)
Aconitum heterophyllum Wall. ex Royle	3,300-4,200
Atropa acuminata Royle	1,500-3,000
Dactylorhizahatageria (D. Don.) Soo	2,800-4,000
Jurineamacrocephala (DC.) Benth.	3,000-4,300
Meconopsis aculeata Royle	3000-4,300
PicrorhizakurroaRoyle ex Benth.	3,200-4,200
SaussureagossipiphoraD.Don	3,800-4,500
Angelica glauca Edgew.	2,000-2,800
Arnebiabenthami (Wall. ex G. Don) I. M. Johnston	3,300-4,000
Arnebiaeuchroma (Royle) Johnston	3,500-4,400
Berberis aristata DC.	1,200-1,500
Betula utilis D.Don.	3,300-4,000
Dioscoreadeltoidea Wall.	2,000-3,000
Fritillaria roylei Hook.	2,800-4,000
Malaxismuscifera Lind.	2,000-3,000
Nardostachys grandiflora DC.	3,600-4,300
Paris polyphylla Smith	2,000-3,000
Podophyllum hexandrumRoyle	2,400-4,000
PolygonatumcirrhifoliumRoyle	1,500-3,000
Polygonatummultiflorum (L.) All	2,500-3,500
Polygonatumverticillatum (L.) All.	1,500-3,300
Saussureaobvallata (DC.) Edgew.	3,600-4,500
Taxus wallichianaZucc.	2,100-3,300
Zanthoxylum armatum DC.	1,200-1,800
Aconitum violaceum Jacq. ex Stapf	3,300-4,200
Ephedra gerardiana Wall. ex Stapf.	3,300-4,500
Hypericum perforatum L.	2,000-3,000
Juniperus communis L.	2,800-4,000
Rheum australe D. Don	3,000-4,200

Rheum webbianumRoyle	3,000-4,000
Roscoea alpine Royle	2,400-3,500
Roscoeaprocera Wall. ex Bak.	2,000-3,000
Selinumconnifolium	2,500-3,500
Selinumvaginatum Clarke	2,500-3,500
SkimmialaureolaSieb. &Zucc.	2,200-3,200
Symplocospaniculata (Thumb.) Miq.	1,500-2,500

Fauna

Common Name	Scientific Name
Asiatic Black Bear	*Ursus thibetanus*
Blue Sheep	*Pseudoisnayaur*
Common Leopard	*Panthera pardus*
Himalayan Brown Bear	*Ursus arctos*
Himalayan Ghoral	*Naemorhedus goral*
Himalayan Musk Deer	*Moschus chrysogaster*
Himalayan Tahr	*Hemitragusjemlahicus*
Red Fox	*Vulpes vulpes*
Serow	*Nemorhaedussumtraensis*
Snow Leopard	*Uncia uncia*

Birds

Little Forktail, Tirthan Valley
Crested Kingfisher, Tirthan Valley (2,700 m)
Blue Whistling Thrush, Sainj 2,000 m
Western Tragopan Male
Monal Male
Koklash Pheasant (Male)
White-crested Kaleej

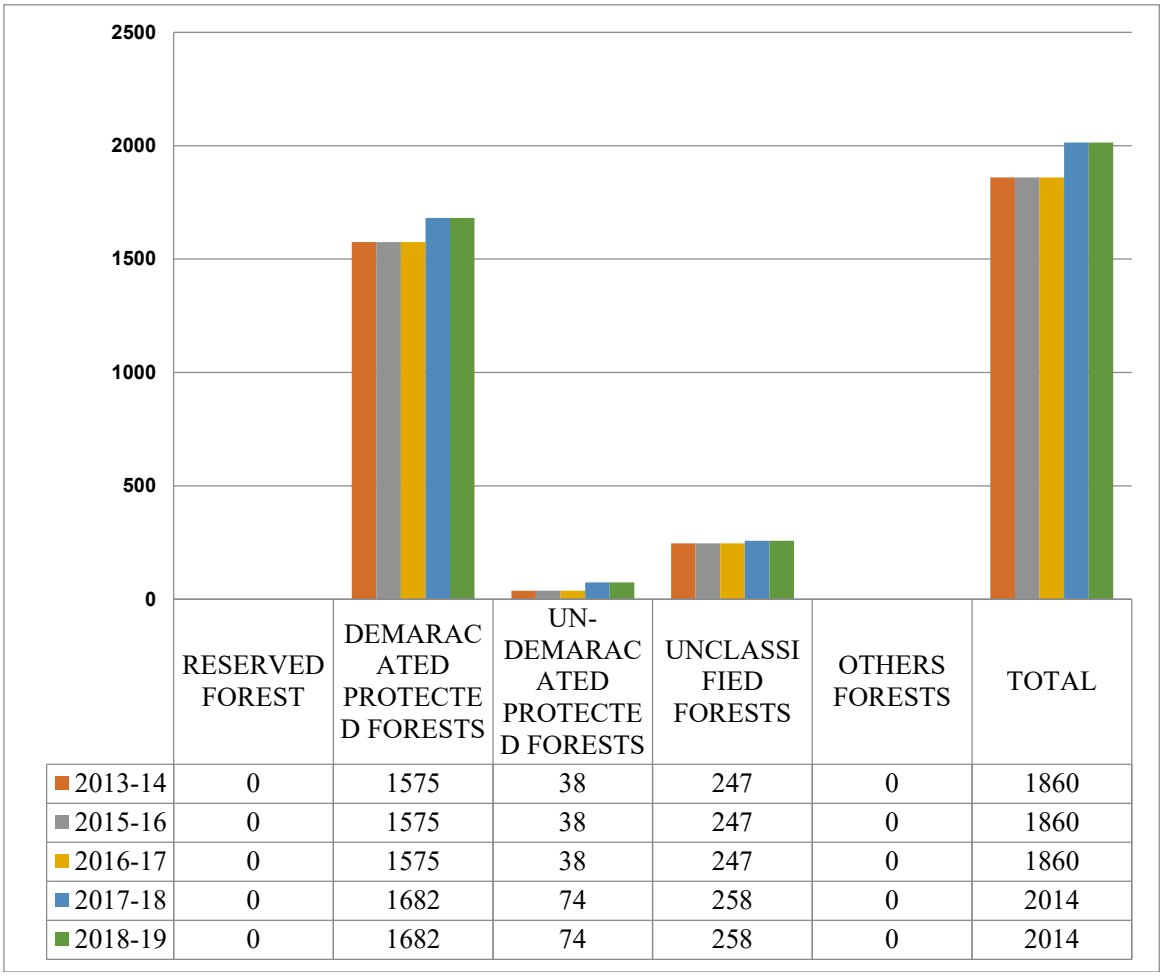
Insects

Blue Pansy, Junoniaoenone
The Paris Peacock, Papilioparis

Table showing Classification of Forest Area (in sqkm) of District Mandi						
YEAR	RESERVED FOREST	DEMARCATED PROTECTED FORESTS	UN-DEMARCATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL

2013-14	…	1575	38	247	…	1860
2015-16	…	1575	38	247	…	1860
2016-17	…	1575	38	247	…	1860
2017-18	…	1682	74	258	…	2014
2018-19	…	1682	74	258	…	2014

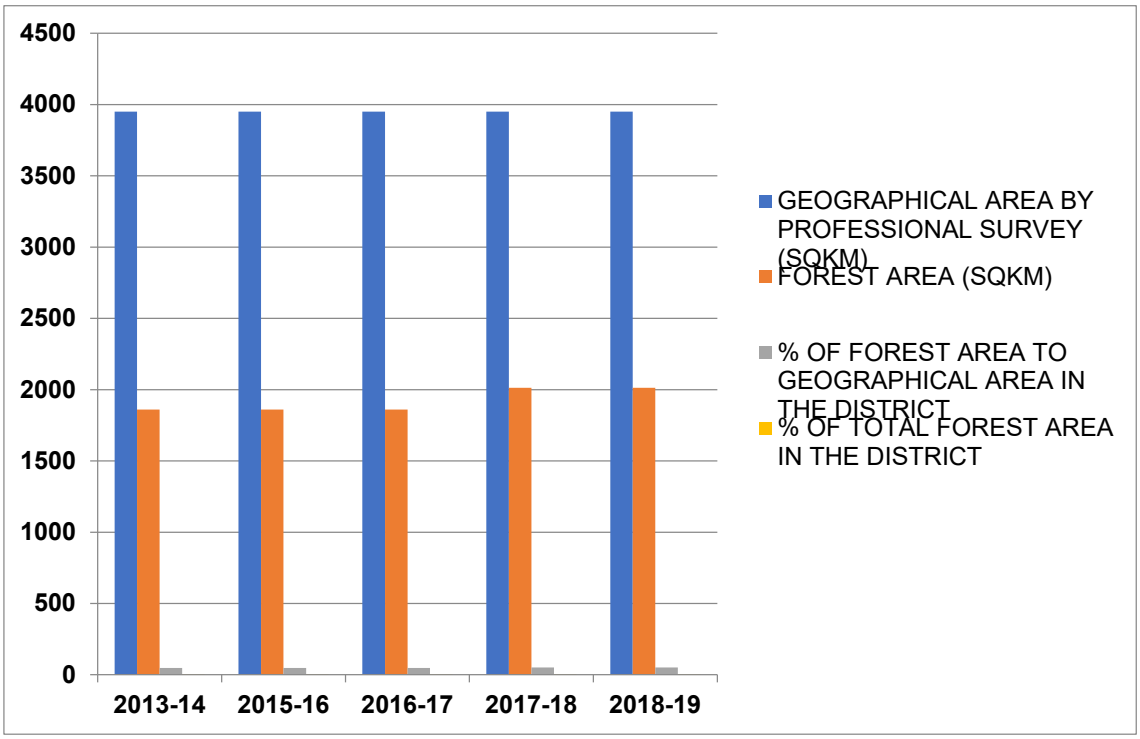
Source: Forest Department, HP



	RESERVED FOREST	DEMARACATED PROTECTED FORESTS	UN-DEMARACATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL
2013-14	0	1575	38	247	0	1860
2015-16	0	1575	38	247	0	1860
2016-17	0	1575	38	247	0	1860
2017-18	0	1682	74	258	0	2014
2018-19	0	1682	74	258	0	2014

Table showing Forest Area of District Mandi				
YEAR	GEOGRAPHICAL AREA BY PROFESSIONAL SURVEY (SQKM)	FOREST AREA (SQKM)	% OF FOREST AREA TO GEOGRAPHICAL AREA IN THE DISTRICT	% OF TOTAL FOREST AREA IN THE DISTRICT

2013-14	3950	1860	47.1	5
2015-16	3950	1860	47.1	5
2016-17	3950	1860	47.1	5
2017-18	3950	2014	50.99	5.31
2018-19	3950	2014	50.99	5.31



9 PHYSIOGRAPHY OF THE DISTRICT

The Mandi district lies in the central part of Himachal Pradesh bordered by the district of Kangra in the North, Kullu in the East, Shimla & Solan in the South, and Bilaspur in the South-West. Besides Mandi, the district headquarters, Karsog, Sundernager, and Jogindernager are important localities in the district. Mandi can be approached either by Chandigarh-Bilaspur-Mandi (National highway-21) or by Pathankot-Jogindernager-Mandi Highway. The number of all-weather and fair-weather roads connects the other localities. Physiographic ally, Mandi district lies in the lesser Himalayas region and as such presents rugged mountainous terrain. Between the steeply rising hill region lays the beautiful valleys of Balh (Sundernagar) and Kullu (Partly) The Bara Bhangal in the north and the Satluj with its tributaries, Beas, Uhl and SaketiKhad of Indus drainage system are the main rivers in the district.

Mostly the terrain is rough. The prevalence of interlocking spurs narrow and steep-sided valleys with high peaks and thick forests of Deodar and Kail. On the whole, the soils are young and thin, however, these get heavier and comparatively acidic with an increase in altitude. In general, the average altitude of the valleys varies from 800 to 1800 meters above mean sea level this great difference between the elevation of the beds of the rivers and the height of the ridges suggests a very young and immature topography and indicates a very young uplift conforming to a late morphogenic phase of the Himalayan range.

The river Satluj which flows on the southern side has carved out a deep and narrow valley between Sarahan&Luhri where it flows in the northeast - south-west directions across the general trend

of the rocks. It is joined in this area by several small tributaries such as the Nogli gad the Kurpan gad, the Machhada gad and the Anni gad, all of which flow along or nearly along the strike of the rocks and thus appear in subsequent streams. The Satluj which follow a meandering course, have left thick terrace deposits more than 1000 meters above the antecedent river, while its tributaries represent the subsequent streams.

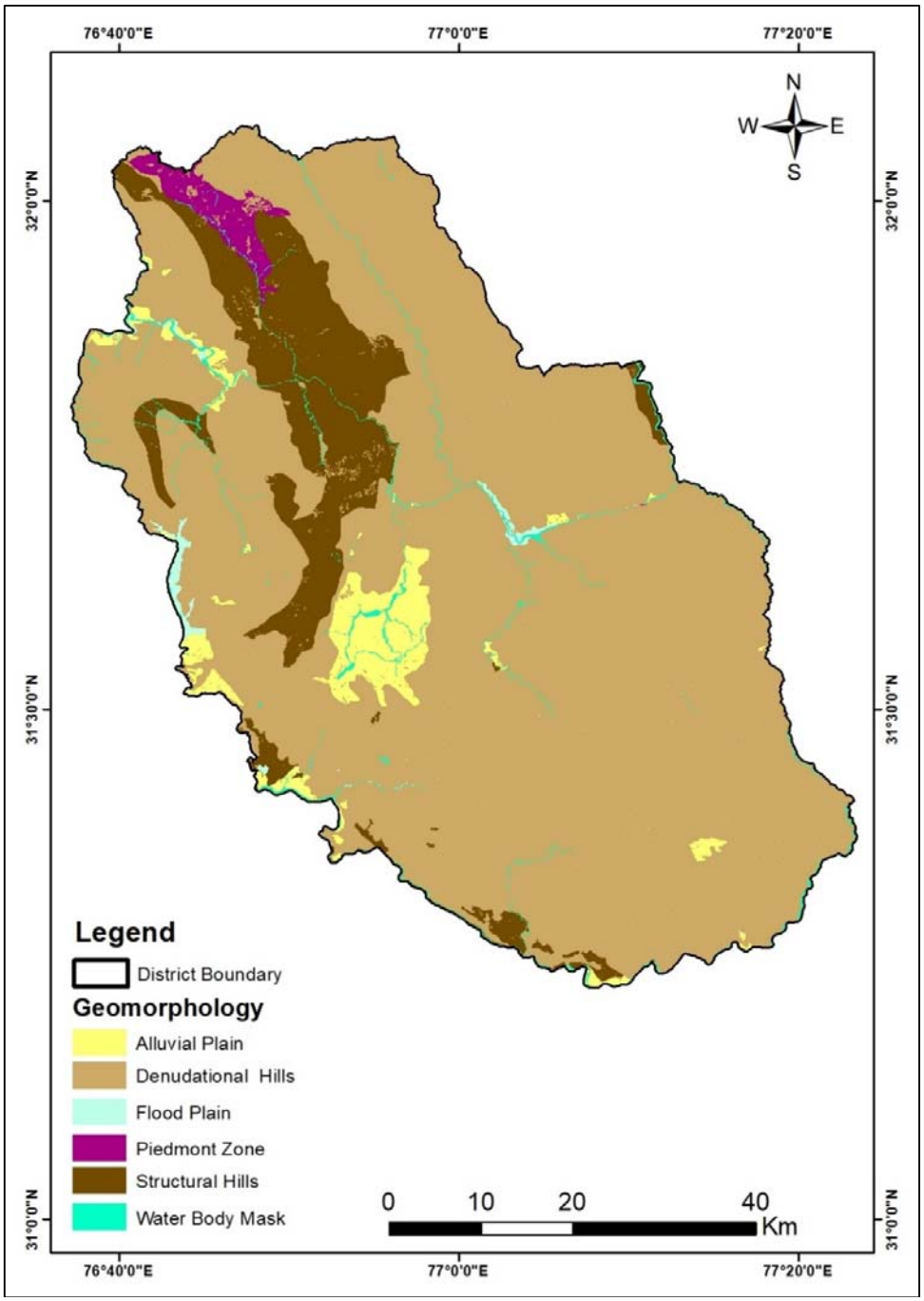


Image showing physiography and drainage of the district

Further, Mandi district presents an intricate mosaic of mountain ranges, hills and valleys. It is primarily a hilly district with altitudes ranging from 550 m MSL near Sandhol where the Beas River leaves the district, to about 3960 m MSL near the Kullu border. There is a general increase in elevation from west to east and from south to north. The master slope is southwesterly. The southwestern part consists of the Siwalik ranges having scarped slopes. There are a few small intermontane valleys; prominent among them is the Balh Valley, located in the lesser Himalayan ranges, having an average altitude of

about 790 m amsl and a general slope towards NNE. The valley floor is undulating and is marked by low hillocks and terraces fringing the hills and intervening low alluvial plain. The Beas and Satluj rivers form the major drainage system in the district. The river Beas and its tributaries, drain about 70% of the district area in the northern part, whereas the area in the south is drained by the river Satluj. Suketikhad and its tributaries, chiefly drain Balh Valley. The Suketikhad maintains a perennial flow, because of effluent seepage from groundwater. There are three important lakes in the district, namely Rewalsar, Prasher and Kamrunag. Hydrogeological, the district is divided into two distinct and well-defined units viz. porous formations constituted by unconsolidated sediments and the fissured formations or hard rock formations constituted mainly by semi-consolidated to consolidated rocks. The fissured formations include the semi-consolidated to consolidated (hard) rocks exposed in the district and are of sedimentary, metamorphic and igneous origin. These form low and high hill ranges throughout the district. Fractured and jointed sandstone, and siltstone forms low-potential aquifers in the area. In general, weathered and fractured hard rocks are favourable for groundwater aquifers. Fracture zones and contact zones form the important aquifers in the topographic low areas, with poor to moderate yields. These fracture or fault zones form potential groundwater zones. Groundwater in these hilly areas oozes in the form of seepages, and springs and is utilized for domestic and other uses. At places, shallow boreholes fitted with hand pumps have been constructed to develop groundwater. The yield of the bore wells constructed along the fault/fracture/contact zones varies from less than 1 to 30 m3 / hour. Weathered mantles in low topographic areas, also form poor aquifers. Bowris are constructed in oozing-out spring/seepage zones for collecting water to fulfil domestic water needs.

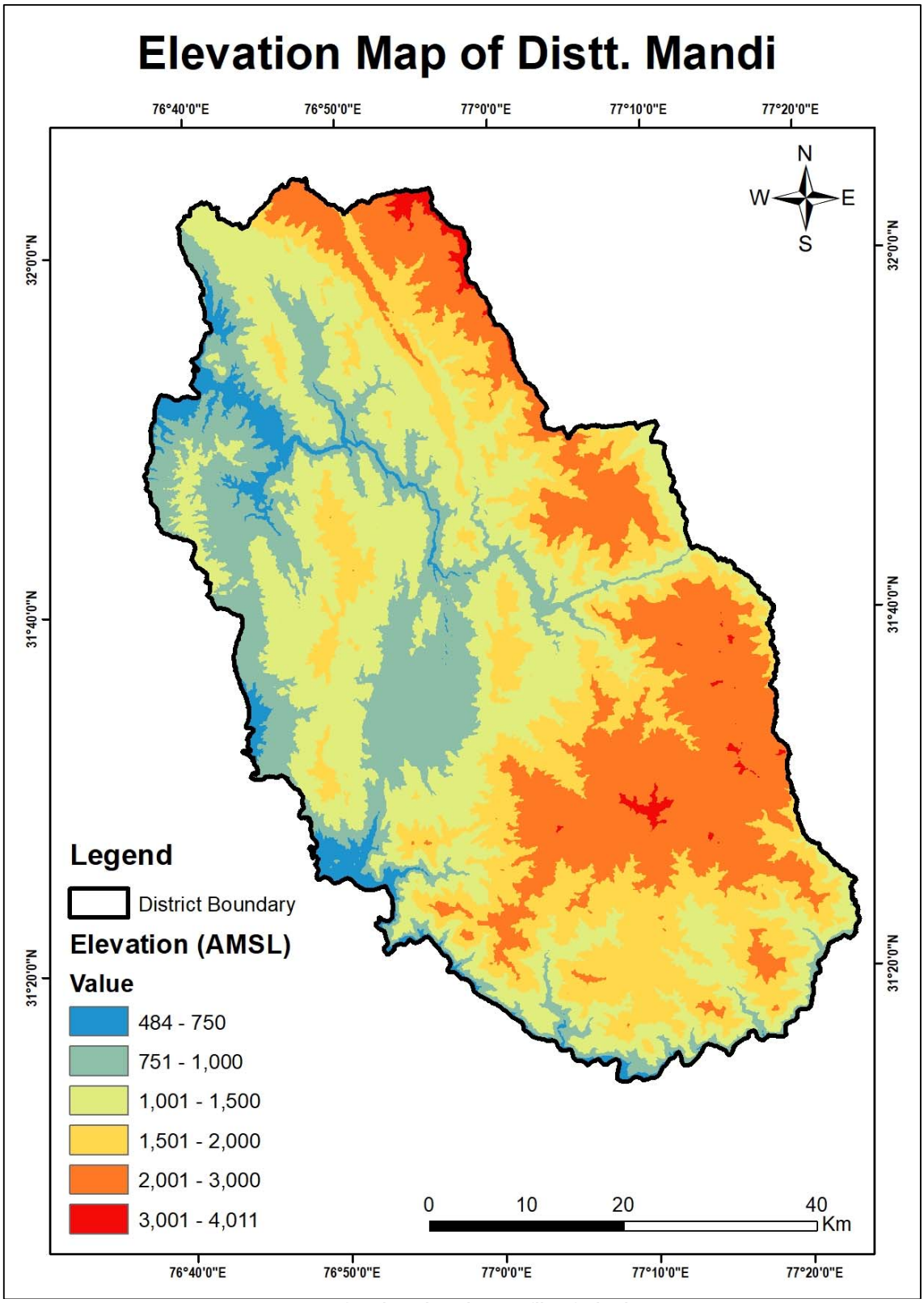


Image showing elevation profile of District

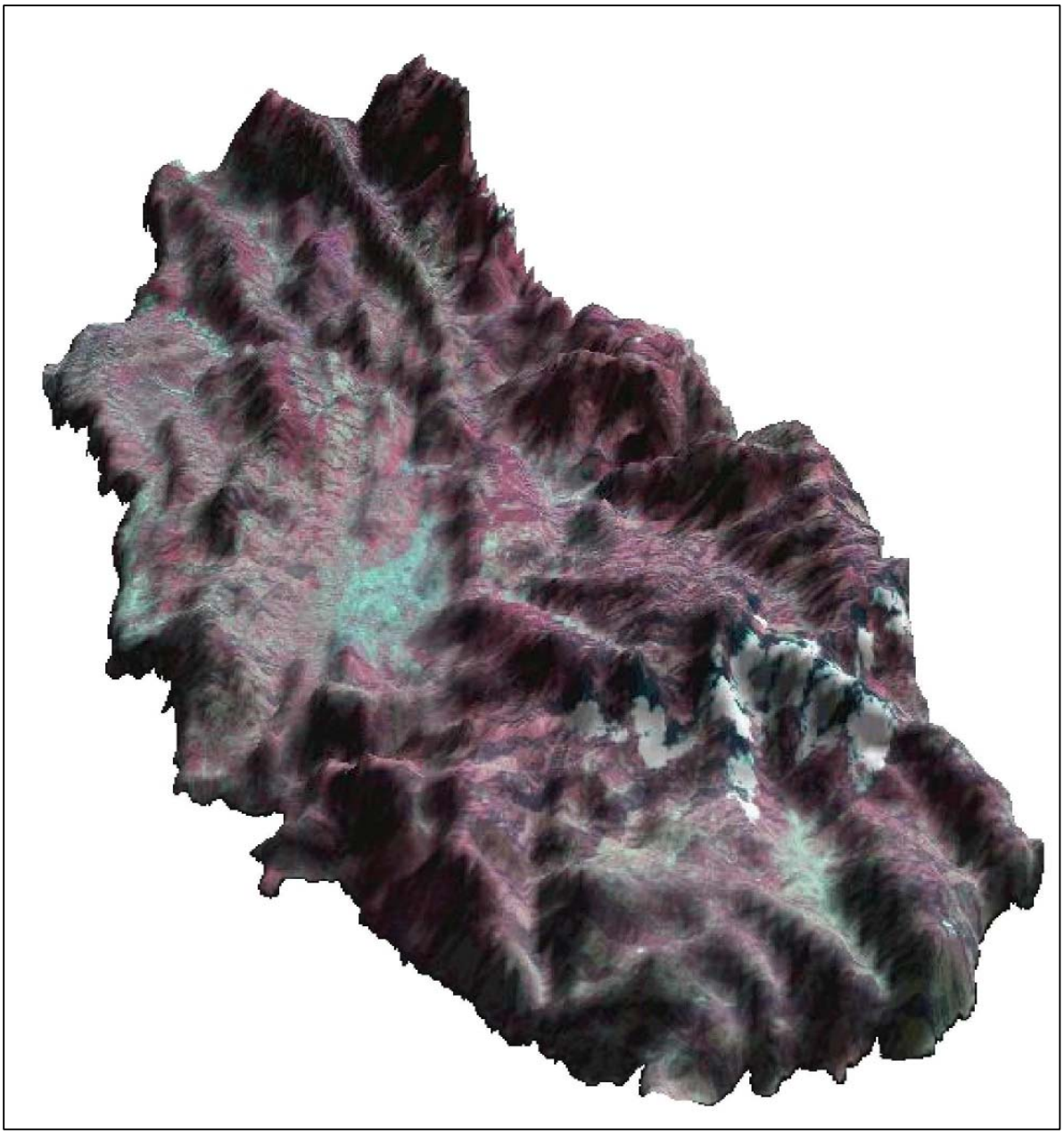


Image showing 3-D Surface View of District

10 RAINFALL

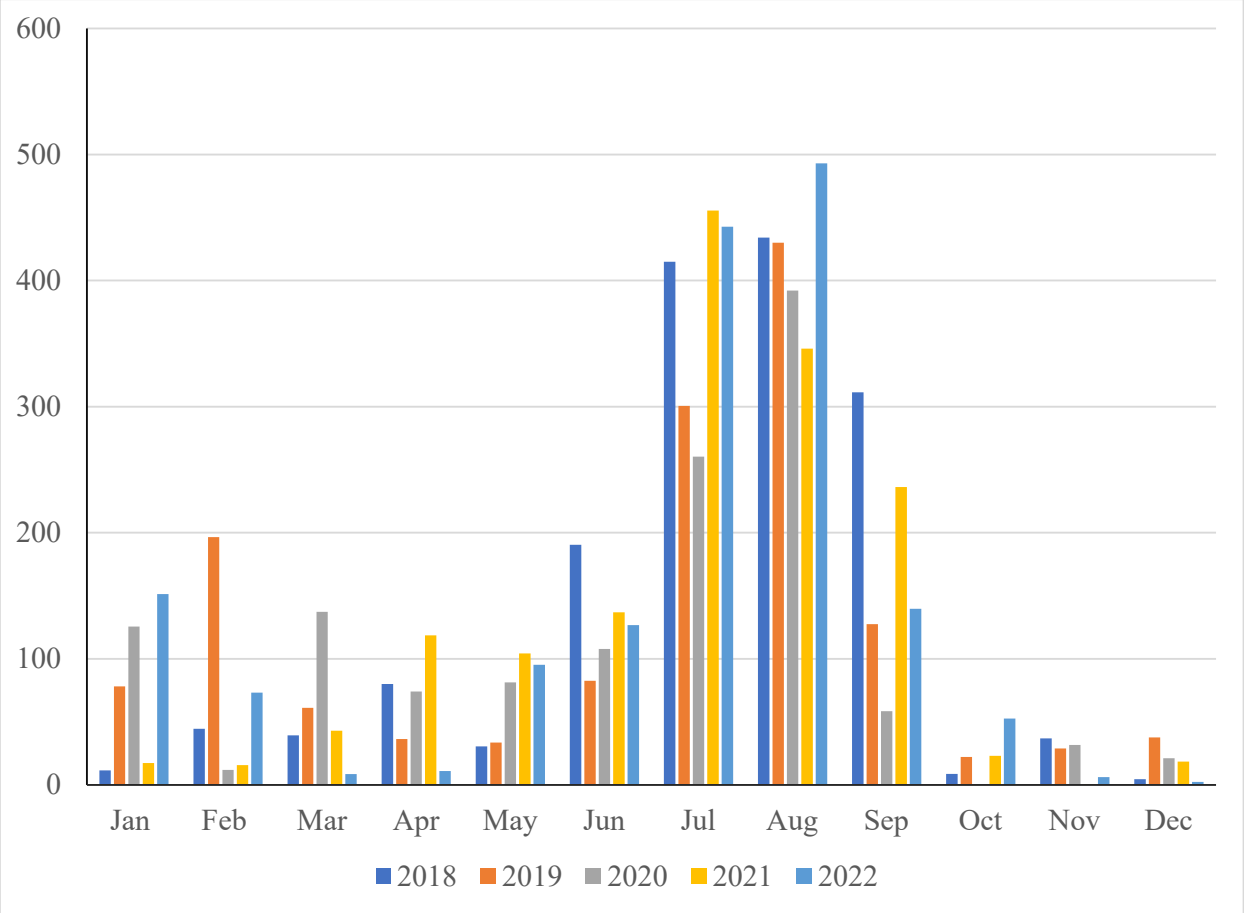
Rainfall varies significantly with the altitude of the area. The catchment area receives rainfall due to western disturbances that pass over the northwestern part of the country during the winter months. Significant precipitation in the form of snow is received at higher altitudes and rainfall in valleys is received during the winter month. The rainy season generally starts in mid-July and extends up to mid-September. During winter the rains are scarce and extend from 15th December to 15th February. The following Table shows the quantum of rainfall from the year 2016 to 2020 in the district as per IMD.

Table showing rainfall data in millimetres of district Mandi

MANDI DISTRICT RAINFALL IN MILLIMETERS (R/F)												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

	RAINFALL (in mm)											
2018	11.5	44.5	39.3	80.1	30.5	190.4	414.9	434	311.3	8.7	36.8	4.5
2019	78.1	196.4	61.1	36.4	33.6	82.5	300.6	430	127.4	22.1	28.8	37.7
2020	125.5	11.9	137.2	74.1	81.2	107.8	260.3	392.1	58.4	0	31.7	21.2
2021	17.4	15.7	42.9	118.6	104.3	136.9	455.5	346.1	236.2	23	0.7	18.5
2022	151.3	73.1	8.5	11	95.2	126.7	442.7	493	139.6	52.6	6.2	2.3

Source: Meteorological Department, Govt. of India



Graph showing annual rainfall data of district Mandi from the Year 2018 to 2022

11. GEOLOGY AND MINERAL WEALTH

The Regional Geology of the Area

The various types of rocks in the district have been classified into certain groups based on their physical characteristics and mode and period of formation. These groups are generally named after the places where the set of rocks was studied first or the period of formation. These groups are Jutogh, Chail, and Shali& Tertiary. The oldest rocks in the area belong to the Jutogh group and the youngest are the unconsolidated valley fills of recent age comprising clay, sand and gravel beds.

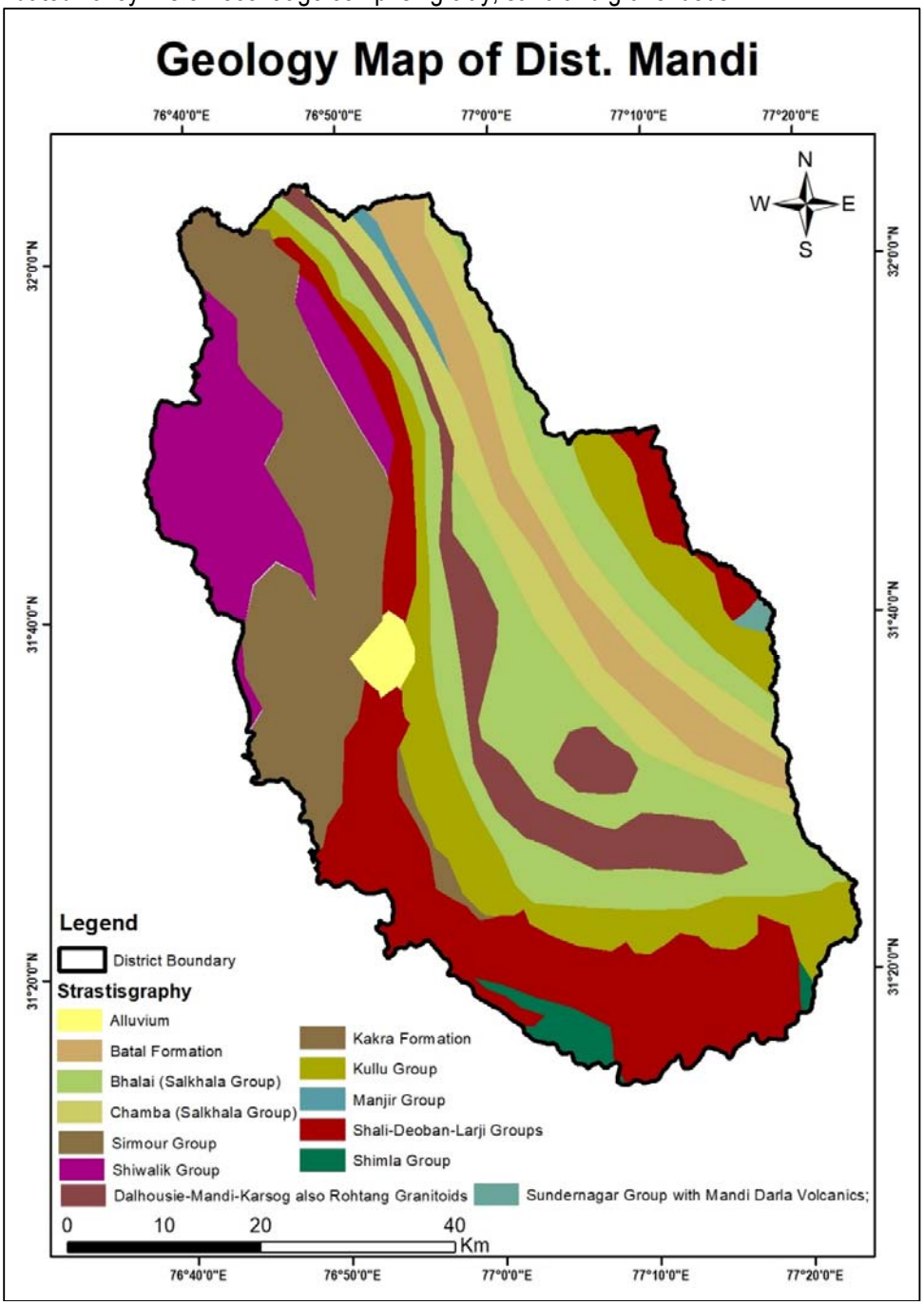


Image showing Geological map of District Mandi

The rock types generally seen are shale, slate, Sandstone, quartzite, schist limestone dolomite granite etc. The rock group with an abundance of limestone, dolomite and salt beds is known as the Shali Formation. The rocks with the phyllites gneisses quartzite with hematite and magnetite bands are

included in the Chail Formation. The granitic rocks occurring around the Karsog area are known as Karsog granite. A group of rocks represent lavas in the flows in the part known as Mandi Darla volcanic.

The stratigraphic sequence, established on the basis of lithology around the study area is given below:

Central Gneisses and schists

The central gneisses and schists comprise inter-banded gneisses and schists with bands of quartzite, stratified migmatites, injection gneisses and pegmatites which range from very fine-grained to very coarse-grained. The gneisses migmatites and pegmatite invariable carry grains of ruby garnet which is one of the most important distinguishing characteristic features of these rocks Pegmatite comprise quartz, large crystals of buff as well as white feldspars, books of biotite and microsite and sizeable crystal of black tourmaline and translucent ruby garnet. The gneisses are most intricately folded into flexure slip-type recumbent refolded folds suggesting several phases of folding under highly mobile and ductile conditions, most probably due to (i) the great depth of burial (ii) the granite intrusions (iii) due to the proximity to the central crystalline axis which has been the area of intense activation. Intimately associated and interbedded with the gneisses occurs crenulated chlorite-biotite schists which are highly puckered and invariably carry grains of garnet. In the lower part of this member, bluish kyanite is developed in these quartzite biotitic schists. The central gneisses and schists which are extensively introduced by injection gneisses, granites and pegmatite are the oldest rocks of the area as they form the common basement for the subsequent rock formation of Tethyan and Himalayan basins. These rocks show the highest grade of metamorphism as indicated by the presence of migmatites kyanite sillimanite and represent alternating bands of pelitic and arenaceous met sediments.

Shali Structural Belt

The Shali structural Belt comprises the Sunder Nagar Group and the Shali Group (Srikantia and Sharma, 1976). It occurs in two structural belts Viz. the main Shali structural Belt and the Shali Subsidiary belt of the Bandla range. The main Shali structural belt extends over a length of 260 Km. in a sigmoidal shape between the river Ravi in the NW and Nag Tikar ridge in the SE. Beyond the Ravi, it extends into the Kashmir Lesser Himalaya where it was earlier referred to as the "Autonomous folded belt" by the Walia(1931. The main Shali structural belt bifurcates into two sub belts respectively the northern Alsindi-Nag-Tikkar sub-belt and Tattapani sub-belt merges along the cruse of BhahariKhad and the Satluj in the Slapper area. The main Shali structural belt is nearly 23 Km. broad across the Satluj valley and the Shali range whereas in the Alsindi sector, it is only 2.81 Km. broad along its NW extension towards Mandi and into Jammu and Kashmir it becomes extremely narrow and constricted with the development of thrust imbricates.

The Shali subsidiary belt of the Bandla range is restricted to a zone between the Siwalik Belt and the Paleocene par autochthon belt. It extends from Behind Tibba in the north to Khadli in the south and beyond it turned into discontinuous strips as Tundapathar, Malla, Sataun and other areas This belt is apparently independent of the main Shali structural Belt and comprises mainly of younger formation of the Shali Group.

Sundernagar Group.

The Sundernagar Group (Srikantia, 1977) is restricted to the main Shali Belt, The type area located 2 Kms. south of Sundernager and the western side, to volcanic, have a cover of Shimla Group with involutions of PaleoceneKakara on the western side. Towards the north the volcanic lie beneath the Tattapani formation of the main Shali structural belt along a thrust contact. The volcanic continued towards Tattapani and again reappeared in the Batawara syncline.

The volcanic appearing at Darla is hard and compact, fine to medium-grained, generally grey to green in colour and includes both fine-gained massive and amygdaloidal varieties.

In thin section altered albite and clinopyroxene with accessories of appetite and spinal are present. Minerals are set in a glassy base with iron oxides as opaque granules, masses and skeletal bodies. The amygdalas are rounded ovoid ellipsoids and even elongated. The vesicular filling includes quartz, chalcedony zeolite and chlorite. Most of the amygdules have a core of quartz, surrounded by pinkish chalcedony, characterized by fibrous or radiating sheathes grading into the inner core and lined by a chlorite layer. Zeolites are common Veins of actinolite epidote and carbonate that occur as alternating products in the lavas. The porphyritic types contain plagioclase feldspar, diopside, augite, hornblende, quartz, opaque and palagonite glass. Chlorite and epidote are the common alteration products. The non-porphyritic lavas are fine to medium-grained. In this section abundant feldspar microclimates, altered clinopyroxene, epidote, and opaque and palagonitised glass are present.

The Mandi Dalra volcanic are tholeiitic lavas and appear in the following structural positions within the Mandi Shali Structural Belt(i) in the Sundergnager, the volcanic are closely associated with the sediment of the Sundernager Group and occur Beneath the Shali Group(ii) In the Darla area the volcanic occur uncomfortably beneath the Shimla Group and the Kakara Formation. It is overthrusted by the Shali belt along the Tattapani sub-belt. It again reappears along both the limbs of the Batawarasynform of the Shimla Group. In the Darla Tattapani sector, the volcanic are considered by Ranga Rao and Bhan (1969) as younger than Shali (iii) In the Gairu-Pawalo ridge, the volcanic appear as a thrust-sheet (sub-nappe) over the Shali sedimentary beneath the crystalline thrust sheet (iv) From Mandi in SE to the Ravi NW for a distance of about 200 Km, the volcanic appears as a thrust sheet (Mittithar sub nappe) beneath the crystalline thrust sheet overriding the Shali sedimentary and even the Tertiaries along the Mandi Thrust. In this sector, the overthrust Mandi Darla volcanic thrust sheet also carries outliers of the Shali. The main significance of this sub-nappe lies in the fact that it extends in the southern slope of the Pir-Panjal range of the Kashmir Himalayas where the "Autochthonous Folded Belt" of the Wadia (1931) is actually in the NW extension of the Main Shali structural Belt.

Sedimentation

The Sundernager Group is characterized by an abundance of clastic sediments which constitute an almost equal proportion of white quartzarenite and red quartzite sandstone. The Sundernagar basin actually represents an area of paralic sedimentation peripheral to the continental Platform.

Shali Group

The term Shali limestone was first used by Palameer (1921) to a bluish limestone that covers the southern flank of the Shali ridge north of Shimla. The classification of the Shali was first attempted by West (1939) who divided it into Khaira Quartzite, Lower Shali Limestone, Shali Slates, Upper Shali Limestone and Shali Quartzite.

Ropri Formation

This basal formation is made up of three dominant litho units as follows in ascending order.

I. Red shale and siltstone

II. Earthy dolomite

III. Salt, limestone and marly litho-complex are called lokan.

The occurrence of salt in the Shali structural Belt is mainly restricted to the area between Mandi and Basalda. The salt belt does not crop out on the surface anywhere along the belt, but its presence is indicated by the occurrence of a peculiar heterogeneous marly with a complex that is locally called Lokhan. Lokhan generally caps the salt bed. The occurrence of salt at Darang. Guma and Mugal have been known for four centuries and form an important evaporate deposit in the Himalayas next only to the Salt range in Pakistan Salt occurs as the massive bed. In a vertical hole drilled at Drang, the thickness of the salt beds was 236 meters (the hole was abandoned in the salt itself) Although this does not represent the true thickness of the Salt bed, it's persistent occurrence down to a great vertical depth is significant. Salt is pale purple in colour and semi-crystalline. It has certain dark green bands and bands of thick red shale with grey limestone fragments. Salt is tough and compact and generally dry with low moisture content as observed in an underground mine at Drang.

In thin sections, grains of quartz and calcite also fragments of quartzite clay minerals fragments of shale are seen dispraised in the halite matrix Carbonate matter is fine-grained and is widely dispersed. Quartz shows the effects of stain. There are several idiomorphic calcite rhombohedra or small. Rounded to angular anhedral grains of calcite scattered in the mosaic of hate. Some of the quartz grains of quartzarenite show pale red pigmentation. Sporadic gypsum grains are seen. In some sections, besides the afore-cited minerals. The carbonaceous matter is dispersed in the halite matrix. Clay minerals show carbon coating X-ray analyses of salt- have indicated the presence of the following minerals: halite - major, calcite considerable amount. Sylvite and quartz have small amountsLengebeinite traces Dolomite Minute traces Kaolinite and illite traces.

Lokahn is a marly litho complex that is immediately associated with the salt and is purple and white in colour occurring as a loose, Friable heterogeneous mass. It comprises clay and silica mixed with carbonate matter. Within the lokhan, there are also fragments of limestone dolomite, quartzite chert and even basic rocks. There are no salt beds within the lokhan though it commonly tests saline there are also a places thin bands of red shale and lenticular bends of recemented limestone breccia associated with the lokhan. Weathered volcanic rocks and Lokhan alternate along the thrust contact. With the overthrust Mandi volcanic of the Mittidhar sub-nappe. North of Megal along a stream course a slice of black cherty siltstone is found lodged within the lokhan. In thin sections,lokhan comprises clay and carbonate matter in which there are fragments of calcite, quartz and clay. Calcite shows zoning and also the effects of rotation. It forms the predominant type among the larger fragments and shows authigenic growth Quartz is the next most common mineral. There are also some grains of untwined potash feldspar embedded in clay and carbonate matrix. There are angular fragments of quartzite, red shale some carbonaceous trail and stray gypsum grains.

In the field,lokhan stands out as highly weathered outcrops and earth pillars presenting typical bad land topography. These are prone to landslips which further complicate their structural relationship with other rocks, place lokhan with thickness ranging between 10 to 170 Meters shows pseudo-stratification of white and purple clay bands. Sporadic seepages of saline springs are observed.

Regarding the origin of lokhan, there could be a few possible assumptions. It may represent the insoluble left behind after the salt was leached out since insoluble represents 34% of the salt bed. Alternatively, it could be partly a tuffite. formed during the course of the submarine eruption of the Mandi DalraVolcanics. Or it could be a marly rock associated with salt lokhan imparts a look of tectonic mélange.

The dolomite lithounit of the Ropri Formation is a conspicuous bed and occurs at the base of the red shale lithounit. It varies in thickness from 10 to 60 meters. The best development of this dolomite can be seen SW of Mandi and also south of Sundernager where it directly overlies the Sundernagar Group and Mandi Darla Volcanic. It is also exposed along the Gairu-Pawalo ridge where it occurs in the Gairu sub-nappe.

Dolomites are greyish-blue in colour but have a characteristic yellow-weathered surface. They are massive and contain sporadic shale parting. near Maloh Pass, dolomite contains stromatolite, which is mound-shaped and also contains discrete and KussiellaKussiensis (Raha and Das 1989)

Khaira Formation:

A good section of the Khaira Formation is along the road section leading to the Slapper Bridge across the Satluj above the left bank of the river. The quartz arenites pink, and the flesh red. Purple and white in colour. There are medium to coarse-grained and places contain thin purple and grey argillite partings. Ripple marks cross beddings mud-cracks and worm trails are commonly seen. Both current and oscillation ripples are present. In this section. Quartz/grains appear surrounded by subangular well-sorted and contain pink garnets as heavy minerals.

Khatpul Formation

A typical section is exposed along the road between Barman and the Slapper Bridge across the Satluj. At the base of the dolomite Lithounit, there is a thin but persistent bed of red shale. Dolomite is generally massive though and compact and greyish blue in colour in the lower part it contains grains of detrital quartz and carbonate pellets. Profuse growth of stromatolites BaicaliaColonella discrete and other indeterminable types are observed.

Sorgharwari Formation

The limestone unit succeeds the Kathpul dolomite and often the contact between the two is sharp and distinct though at places gradational passage is also observed. A typical section of this formation can be seen in the Sorgharwari area and also along the road section near the southern entry of the Slapper Bridge. The formation is divisible into two members (I Upper Grey limestone and (II) Lower Purple Limestone.

The limestone member of the Sorgharwari formation shows Baicalia. Colonella and other undifferentiated columnar forms of stromatolites.

Tattapani Formation

The best development of the Tattapani Formation is at Tattapani along the banks of the Satluj River. The Tattapani Formation is divisible into three members

C. Mainly black shale and siltstone

B. Bedded yellow weathering dolomite limestone with shale parting

A. Massive Cherty structure is less dolomite.

The best development of the Tattapani is seen in the main Shali structural Belt. It is also present in the eastern part of the Shali subsidiary belt of the Bandla range. ColonellaRiasiensis, ConophytonCylindricusC.GarganicusKussiella magna (Radha & Das 1989) are some of the important stromatolites from this formation.

Makri Formation

The best development of the Makri Formation is in the Shali subsidiary belt of the Bandla range. It was earlier referred to as the Shali slates by West (1939). This has a protean association and comprises shales of slate quartzarenite and thin-bedded dolomite and limestone. The shales are purple pale green grey and black There are interbedded thin bands of cherty dolomite and pale pink quartzarenite. However, in some places, particularly in the Mmgrani forest area dolomite is more prominent Quartzarenite has well-provided triple marks and shales are highly incompetent and show incongruous folding.

Parnali Formation

This is the last major carbonate unit of the Shali Group and is exposed on the western part of the Shali subsidiary belt of the Bandla range of the southern slope of the Shali Range in the main Shali structural Belt. This formation roughly corresponds to the upper Shali Limestone of West (1939)Dolomites form the dominant lithounit. They are greyish in colour are largely massive and contain parallel bands of thin-bedded grey and black chert. Limestone interbeds show Baicaliabaicalica B prima andharia radialis.

Bandla Formation

This is the youngest formation of the Shali Group and corresponds to the Mandhan Slates and Shali Quartzite of West (1939). It comprises green and purple shales of Siltstone, Sandstone, quartzarenite and cherty breccia. Quartzarenite shows well-developed ripple marks and cross-bedding. Quartzarenite is closely associated with a peculiar greenish-looking cherty breccia cemented with siliceous material. In the Shali range a thin bed of brown earthy limestone im persistently occurs at the junction of white quartzarenite shale.

Sedimentation

The Shali Group represents a typical shallow stable platform type of sedimentation. This is amply substantiated by the presence of Stromatolites, sedimentary structures like mud cracks as oscillation ripple marks, and also the occurrence of salt beds and red shale facies in the basal formation of the Shali Group implies the prevalence of an arid climate in the early phase of Shali sedimentation. In addition to signifying aridity, the evaporate indicates "a delicate adjustment to still requiring a critical depth for a time long enough to precipitate a considerable thickness of salt" (Pettijohn, 1957). This type of delicate adjustment would be possible only in a comparatively stable basin. The restricted nature of salt occurrence in the Shali belt suggests the isolated nature of the evaporate segment in a larger basin.

The profuse development of stromatolites in the Shali carbonate rocks indicates the prevalence of intertidal shallow subtidal and supratidal conditions. The mud-cracked arenites also support an occasional sub-aerial condition of the basin. Cross-bedding which is extensively seen in the arenite of the Khaira Formation points to a high energy condition.

➢ MINERAL WEALTH OF DISTRICT MANDI

Limestone

Limestone is a calcareous sedimentary rock composed of the mineral calcite (CaCO3) which upon calcination yields lime (CaO) for commercial use. Cement and Iron & Steel industries are the major consumers of limestone. It is also consumed in chemical industries like calcium carbide, bleaching powder, soda ash, precipitated calcium carbonate, etc. Besides, it is used as fluxing material in Ferro-alloys, pelletization plants, foundries and in the production of sponges from iron, as refining materials in the production of sugar; as an additive in the glass industry; as a coating material in the fertilizers industry etc.

Details of Limestone Reserve (In Million tonnes)				
District	Proved	Probable	Possible	Total
Mandi	500	20	600	1120

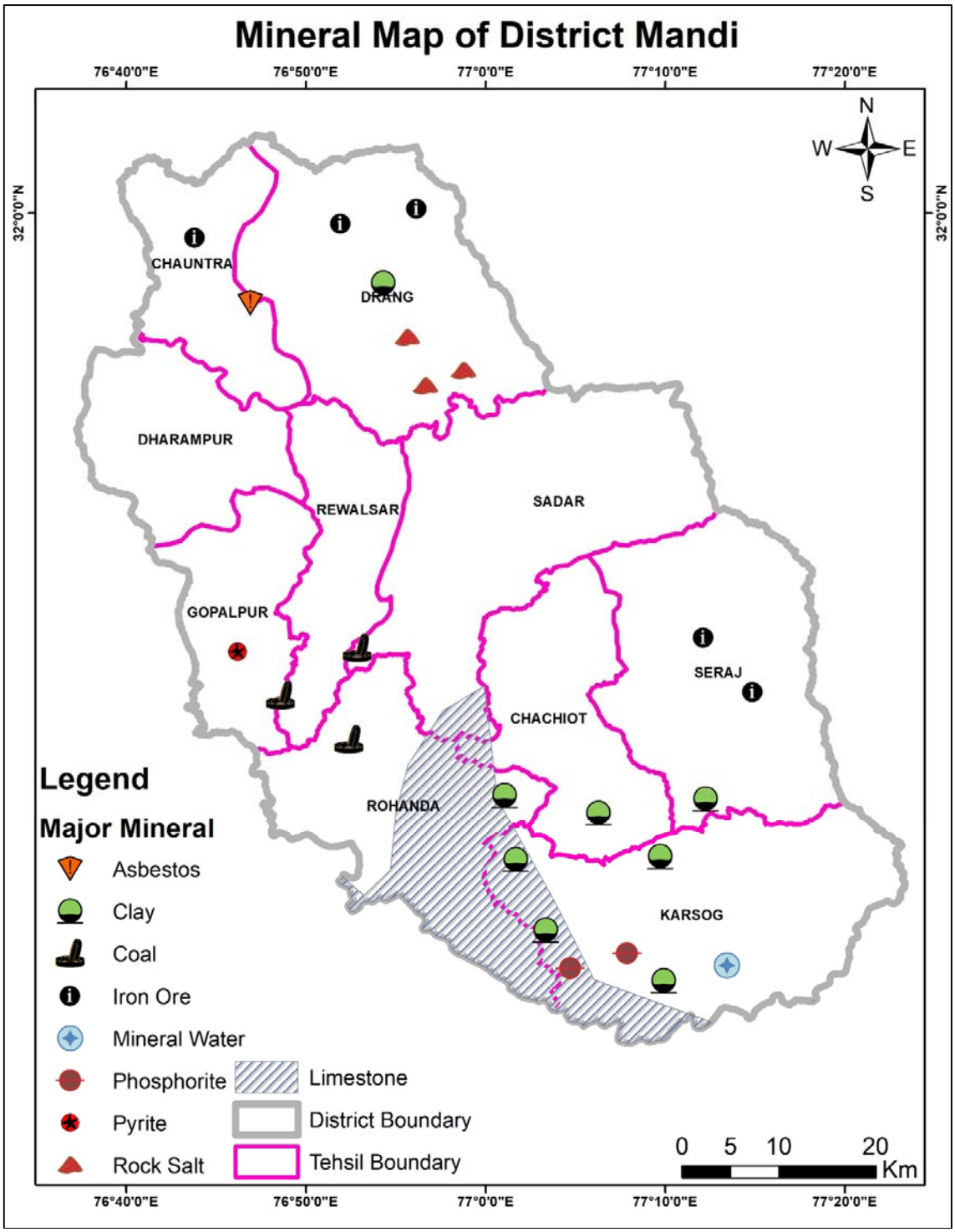
Alsindi Limestone Deposit:

Cement grade limestone belonging to the Sorgharwari Formation of the Shali Group occurs between Alsindi (31^0 17' 45': 77^0 07'45") in Mandi district in the west and Jaunrog (31^0 18'00": $77^0$20'30") in Shimla district in the east. The limestone was investigated along a strike length of 15 km by the Geological Survey of India. The estimated reserves are of the order of 550 million tonnes. The limestone has been investigated by the Geological Wing, Department of Industries and has proven about 200 million tonnes of limestone in approximately 1.5 Sq Km of area. It is pink to grey in colour and contains thin shale partings. The limestone contains CaO varying from 44.40 to 52.00% and MgO trace to 9.80%.

It is situated at a distance of about 70 Km from Shimla (State Capital) on Shimla- Basantpur – Tattapani-Karsog State Highway No 13. The area forms part of the Lesser Himalayas and shows typical mountainous topography. Physiographically, the area is bounded in the east and southeast by Badeog Dhar and in the south by Rista-Ki-Dhar. The terrain ranges in height between 1200 metres to 1992 metres above mean sea level. The drainage pattern is mostly dendritic. The limestone deposits of the area belong to the Sorgharwari Formation of the Shali Group which is fine-grained, dense, homogeneous and exhibit conchoidal to subconcoidel fractures. The colour varies from pink to grey. The pink limestone at places contains purple to green shale partings.

Group	Formation	Lithology	Thickness (In Metres)

Shali	Bandla	Green and purple coloured shale, slate, siltstone, sporadic earthy limestone, thin-bedded orthoquartzite and a fairly persistent band of white quartzarenite at the base.	250
	Parnali	Cherty dolomite, grey limestone and white quartzarenite.	700
	Makri	Grey, green, black and purple shales and slates, thinly bedded limestone, thin bedded quartzarenite with or without dolomite.	180
	Tattapani	Cherty dolomite, grey and pink in colour with grey phyllitesed shales.	610
	Sorgharwari	Pink and grey cream textured limestone with shale partings.	460
	Khatpul	Massive dolomite with sporadic quartzarenite, and a thin red shale band at the base.	300
	Khaira	Mainly pink and purple, as well as white quartzarenite.	380
	Ropri	Brick red shale and siltstone with grey dolomite in the lower horizon; local development of salt, salt grit and the marly lithocomplex “Lokhan”	400



Rock Salt

The rock salt occurs in Guma (31° 58':76°51') and Drang (31° 46': 76° 56') areas. The total reserves of rock salt are about 75 million tonnes. Chemical analysis indicates on average insoluble impurities at 21%, KCL at 3 % NaCl at about 70.40% and the rest consisting of CaO, CaSO4and MgO. Detailed geological work and drilling have been carried out to assess the grade and reserves. Drilling data shows that except for minor intercalation of non-productive beds(clay, quartzite, etc.), the cores are composed of salt throughout the area investigated. Chemical analyses show that the average salt content is over 70% and with depth no regular change in the salt content is indicated. Besides Drang, saline grits

occur intermittently in discontinuous patches over a linear distance of 18 kms northwest of Mandi The important occurrences of this salt grit are; Megal (31°45': 76°57'), Drang, 9310 480 20"; 760 570 00") Herkalan (31° 56': 76° 52'), Guma (31° 56': 76° 51'), Dewalkhas (32° 05': 76° 40')and Kandbad (32° 071: 75° 35').

Drang -Gumma Rock Salt deposit

Rock Salt has been extracted for a long in Mandi Hills at two locations namely Drang and Gumma. These mines were transferred to M/s Hindustan Salts Ltd. in 1963, after acquiring these from the erstwhile Mandi State by Govt. of India. Mandi Salt belt extends from Mandi to Jogindernagar and even further but three places viz. Megal, Drang and Gumma where Salt is known to occur, lie along N.H.-20. Drang is at a distance of about 40 Kms from Jogindernagar and about 17 kms. ahead of Mandi. The geographical location of Drang which is included in Topo-Sheet No. 53A/13 is as follows:

Latitude 31^0 48' 20"
Longitude 76^0 57, 00"

Drang can be approached from Pathankot by the National Highway, connecting Pathankot with Mandi via Shahpur, Palampur, Baijnath and Jogindernagar. Jogindernagar is also connected by a narrow gauge railway with Pathankot.

Physiography

The area forms a transitional zone between the foothills and the lesser Himalayas. The altitude varies from 1000 to 1400 m above M.S.L. The ridges trending in the NW-SE direction are the main topographical features and these are dissected by nallahs which on joining each other form the tributary of river Beas flowing in the NW-SE direction.

Slate

Slate is a fine-grained, hard, compact, cleavable rock derived from microcrystalline metamorphic rocks of clays and shale and possesses a cleavage that permits it to split readily into thin smooth sheets. The thin layers split along the cleavage planes may cut across bedding planes. The metamorphism of shale by pressure produces slates that are characterized by the presence of close-set planes of cleavage along which they can be split easily into thin sheets. The cleavage plane is related to the direction of pressure to which the material was subjected and not to the bedding plane. Slate has emerged as an alternative to granite and marble which are comparatively costly. Slate has the aesthetic value like other dimension stones i.e. granite and marble. Slate is cut and fabricated into dimensional form. Slate is categorized into minor and major minerals in the country depending on its end use. The slate industry has received a boost in recent years due to increased interest in architecture. The export of slate has increased, over the years. The major use of slate in foreign markets is in roofing tile, but other uses as flooring tile and cladding are also picking up.

Occurrences

Himachal Pradesh is known in the country for its good quality of slate, which finds its place in foreign markets also because of its pleasing colour, durability and uniformity in thickness. The art of extraction of slates has been known to the local people of the area for generations. The good quality thick bands of slates occur in Mandi. Slates are confined to Kullu Group, Shimla Formation, Chamba Formation, Jaunsaur Formation & Katargali Formation.

Asbestos

The highly weathered basaltic rocks of Darla volcanics exposed along the right bank of a small nala flowing between Ardhi and Badsar contain very thin fibres of asbestos.

Clays

Clay occurrences in Himachal Pradesh can be broadly classified into (i) lacustrine and fluvial, (ii) residual associated with granite and (iii) associated with the Middle and Upper Siwaliks.

Small irregular pockets and lenses of clay are found within the weathered muscovite granite, tourmaline -muscovite granite, porphyritic granite and pegmatite of Mandi -Karsog granite complex at Mohi (31° 35':76° 55'), Seri Chak (31° 06' 54": 76° 55' 45"), Seul (31° 40' 36": 76° 55' 36"), Saul Khad (31° 40'28': 76° 53J'27"), Dhalar (31° 35' 24": 76° 55' 30"), Batala Beh (31° 15'50": 77° 13'20"), Karsog (31° 23' 00": 77° 12' 00"), Chichot (31° 33' 00": 77°01'00"), Garaich (31° 24'30": 77° 14'45"), Negi Nal (31°26' 00': 77° 11' 00"), Bashaich (31° 26'15": 77° 13' 30"), Phaish (31° 27' 00": 77° 05'15"), Tarai (31° 35'09": 76° 59'56"), Dopha (31° 31' 33": 77° 01' 22"), Nid (31° 32'20"; 77°01'00"), Oangthar (31° 32'37": 77° 06'15'). Seri,(30° 36' 55": 77° 00'06"), Raipri (31° 37' 34": 77° 00' 30'), Burahata (31° 36' 09": 77° 01'59"), Balhari (31°39' 03": 77° 00'45", Pingla (31° 35' 16"; 770 01' 23"), Rakbnun (31° 47' 30": 77° 17'30"), Tarapur (31° 38' 00": 76° 59'37"), Kohlu, Dalikar (31° 37'38" 77° 01'00"), and Rackchui (31° 39'05': 76° 59' 43").

The clay pockets in the above areas range in length from 10 metres to 220 metres and only the clay pocket at Phaish extends for about one kilometre. The width of the clay pockets varies from one metre to 1040 metres. Physical tests of the clay samples from Garaich and Negi Nal have revealed that the clay is suitable for the manufacture of stoneware. The cumulative reserves of clay pockets at Karsog, Chichot, Batala-Beli, Garaich, Negi nal, Bashaich and Phaish have been estimated at 1, 05,330 tonnes. The tentative reserves of the clay pockets at Tarai, Dopha and Nid are of the order of 5, 14,400, 17,172.02 and 17,714 tonnes, respectively. The clay from all the aforementioned pockets is used by the local inhabitants for whitewashing and plastering their houses.

Coal

A carbonaceous horizon is traceable for about 90 metres near Mansai (31° 34/: 76° 51'). There is another 91 centimetre thick seam traceable for 45m, 750m to the south of the earlier one. A coal seam near Dehar (31° 251: 76° 491) crops out in and near the steep right bank of Sutlej River about 280m upstream of the suspension bridge. The carbonaceous horizon is interbedded with limestone with almost vertical dips. Two carbonaceous seams, 180cm and 90cm thick could be traced for a distance of about 90m. Small discontinuous patches of coal outcrops are noted near Kaphai (31° 32': 76° 51'). An outcrop of coal is seen on the right bank of a small stream about 600m southeast of Arthi (31° 32': 76° 52'). The coal is sheared and stained dull greyish yellow, rusty on the surface.

Gold

A small quantity of Gold had been reported in the bed of the Satluj river at Jauri (310 19' N -77 002' E). The detailed analysis of the area between Dharampur & Sarkaghat (lying between 310 41' N & 310 52' N -76039' & 76047' E) shows poor concentration of Gold value ranging from less than 20 ppb to 100 ppb. Flakes of Gold are frequently seen in the sediments of the Sun and Alian Khads, particularly between Hukal and Kandewale and the average concentration is < 6 ppb to 20 ppb.

Iron Ore

Magnetite associated with hematite occurs in schist and phyllite in a belt extending intermittently from Rama Bhet (310 3'1: 77006') up to the vicinity of Sangalwaro (31 º 30': 77 º 13'). Sparsely disseminated magnetite and hematite occur around Jhungi (31 º 25': 77 º 06') in the phyllites. Magnetite occurs as disseminated grains in quartzite and as the concentration in thin bands near Kohar Khas (320 06': 760 48'). The iron-bearing quartzites have been traced from about one and a half kilometres north of Baragoran (32º05': 76 º 00') to Multhan (31º 31': 76 º 05,).

Mineral water

Ten springs occur on the right bank of the Satluj river near Tattapani (31° 14: 77° 50'). The temperature of the water is 57°0. The water is strongly sulphurous with a disagreeable saline taste. It contains chloride and sulphate of soda.

PART II

DISTRICT SURVEY REPORT FOR MINOR MINERALS OTHER THAN SAND MINING OR RIVER BED MINING

(Hill Slope Mining)

1. INTRODUCTION:

Minor Minerals (Hill Slopes or riverbeds) are valuable natural resources being the vital raw material for infrastructure, capital goods and basic industries. As a major resource for development, the extraction and management of minerals have to be integrated into the overall strategy of the country's economic development. The exploitation of minerals has to be guided by long-term state goals and perspectives. Just as these goals and perspectives are dynamic and responsive to the changing global economic scenario so also the state minor mineral protection policy has to be dynamic taking into consideration the changing needs of industry in the context of the domestic and global economic environment. To exploit the country's geological potential it is important that scientific and detailed prospecting is carried out in search of its mineral resources.

Mineral deposits in the Mandi District occur largely in the form of rocks (Hill Slope) or River bed material such as Granite, Gneiss, Quartzite, Phyllite, Schist, pegmatite etc. They constitute the vital raw materials for many construction activities (roads and building projects) and hence are a major source for the development of infrastructure in the District and in the nearby towns and villages of the neighbouring State. The Government of India through the Ministry of Environment, Forest & Climate Change (MoEF& CC) has brought out a Notification on 25" July 2018, further amending the Erstwhile Environment Impact Assessment Notification 2006. Based on the amendment introduced by the Ministry, a District Survey Report for minor minerals available in the District is to be prepared separately which shall form the basis for application of environmental clearance and appraisal of projects. Such a Report shall be updated once every five years. A Task Force comprising of team of Geologists, the Mining officer of the concerned District and other officials from the department was constituted for the purpose of preparation of the District Survey Report (DSR).

The need for a District Survey Report (DSR) has been necessitated by the Ministry of Environment, Forest and Climate Change (MoEF& CC) vide there Notification No. 125 (Extraordinary, Part II Section 3, Sub-section ii), S.O. 141 (E), dated 15th January 2016. The notification was addressed to bring certain amendments with respect to the EIA notification 2006 and in order to have better control over the legislation. As a part of this notification, the preparation of District Survey Reports has been introduced. Subsequently, MOEF& CC has published Notification No. 3611 (E), dt. 25th July 2018 regarding the inclusion of the *"Minerals Other than Sand"* and the format for preparation of the DSR has been specified. Enforcement & Monitoring Guidelines for Sand Mining (EMGSM) January 2020, Issued by MoEF& CC is prepared in consideration of various orders/directions issued by Hon'ble NGT in matters pertaining to illegal sand mining and also based on the reports submitted by expert committees and investigation teams. This DSR has been prepared in conformity with the S O 141 (E), S O 3611 (E) and other sand mining guidelines published by MOEF& CC from time to time as well as the requirement specified in Himachal Pradesh Minor Mineral Concession Rule, 2015.

The purpose of the District Survey Report (DSR) is to identify the mining potential areas where mining can be allowed; and also to distinguish areas where mining will not be allowed due to proximity to infrastructural structures and installations, areas of erosion. The Preparation of this District Survey Report (DSR) involved both primary and secondary data generation. The primary data generation involved the site inspection, survey, ground truthing etc. while secondary data has been acquired through various authenticated sources and satellite imagery studies. The district survey report of Murshidabad district also describes the general geographical profile of the district, distribution of natural resources, livelihood, climatic condition and sources of revenue generation.

To ensure systematic mining by way of proper planning, replenishment and reclamation of the area, the period of lease shall be 5 years. Extension can be considered only after Joint Inspection by Sub-Divisional Committee and keeping in view its recommendations, depending upon

the availability of raw material and requirement of mineral based industry under Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal. Mining, Transportation and Storage) Rules, 2015.

2. OVERVIEW OF MINING ACTIVITY IN THE DISTRICT

Hillslopes are one of the dominant landform features on Earth. Many types of processes act to create, modify, and attenuate slopes. Most of the districts of Himachal Pradesh have the mightiest mountain ranges having the Highest elevation of 6,813 m (22,352 ft) and the Lowest elevation of 232 m (761 ft). The Mandi district falls in the central portion of Central Himachal Pradesh which is one of the four micro-regions of the State. It lies between 31° 13' 30" and 32° 04' 22" north latitudes and 76 ° 36' 08" and 71° 23' 26" east longitudes and is bounded by Kangra district in the north and north-west, Hamirpur and Bilaspur districts in the west, by Solan and Shimla districts in the south and by Kullu district in the east. The district has an area of 3950 km.2 out of the total area of 55673 km^2 of Himachal Pradesh according to the Surveyor General of India. It occupies seventh rank among the districts in terms of area which constitutes 7.10 per cent area of the state.

Surface Hillslope mining makes up a huge percentage of mining projects in the Mandi district. Surface mining refers to the removal of the surface minerals to access minerals underneath. In particular, surface mining is used to retrieve minor minerals like stone, sand, gravels etc. or major minerals like Limestone coal, iron and other metals. There is no major mineral available in the district. The minor minerals available in the district are sand, clay, slate and Rough Stone/Project Stone. Hence on the basis of available minerals no major industrial enterprises can be set up in the district.

Hill slope mining and terrace mining are two methods employed in the extraction of minerals and resources from sloped or hilly terrain. Here's a brief note on each:

Hill Slope Mining:

Hill slope mining involves the extraction of minerals or resources from the sides of hills. This method is commonly used when the mineral deposit extends horizontally along the slope.

The process usually includes the following steps:

1. Exploration: Identifying the location and extent of the mineral deposit.
2. Excavation: Breaking the rock into manageable fragments. Mining activities are carried out after the formation of benches of usually 6mX6m, with an angle of repose of 45^0.
3. Transportation: Moving the extracted material down the slope, often using conveyors or trucks.
4. Processing: Refining and processing the raw material to extract the desired minerals. The extracted raw material i.e., stone can be directly sold in the open market or can be used as a captive use for stone crusher units which are crushed in the form of angular grit.

Hill slope mining can be challenging due to issues such as soil erosion, landslide risks, and environmental concerns. Proper planning and environmental safeguards are essential to mitigate the negative impacts on the ecosystem.

Terrace deposits, in a geological context, refer to accumulations of sediments, minerals, or other materials that have been deposited on flat, elevated surfaces known as terraces. Terraces are often formed by the erosion and weathering of landscapes over time, and they can be found along river valleys, coastal areas, or on the slopes of hills and mountains. These deposits can be of various types, including sediments, alluvium, or even mineral deposits, depending on the geological processes that led to their formation. Here are a few examples:

Fluvial Terraces:

These terraces form along river valleys and are the result of river downcutting and lateral erosion over time. The sediments deposited on these terraces can include gravel, sand, and silt. Fluvial terraces

are often indicative of changes in the river's course or base level.

Alluvial Terraces:

Alluvial terraces are associated with the floodplains of rivers. As rivers meander and change their course, they leave behind elevated terraces with deposits of alluvial materials. These terraces can contain valuable minerals and are often targeted in mining operations.

Mineral Deposits on Terraces:

In a mining context, terrace deposits specifically refer to mineral accumulations found on terraced slopes or elevated flat surfaces. These deposits can include valuable minerals like gold, silver, copper, or others. Terrace mining may be employed to extract these minerals from the flat benches or terraces created on the slopes.

Understanding terrace deposits is crucial in geological and mining studies, as they provide insights into past environmental conditions, sedimentation processes, and the history of the landscape. Geologists and mining professionals analyse terrace deposits to determine the potential for valuable resources and to plan appropriate extraction methods while considering environmental and safety factors.

Terrace Mining:

Terrace mining, also known as bench mining, is a method of extracting minerals from a series of flat benches or terraces created on the sides of a hill or mountain. This technique is employed when the mineral deposit is found in layers parallel to the surface. The process typically involves the following stages:

Cutting Benches:

Creating a series of flat, horizontal steps or benches on the slope. Mining activities are carried out after the formation of benches of usually 6mX6m, with an angle of repose of 45^0.

Excavation: The excavation process is done manually or semi-mechanical methods may be applied such as poclain or JCB after taking permission from the competent authorities.

Hauling: Transporting the mined material from each terrace to a collection point.

Processing: Refining and processing the extracted material to obtain the desired minerals.

Terrace mining helps minimize the environmental impact compared to some other methods as it reduces the risk of soil erosion and landslide occurrences. However, proper land reclamation measures must be implemented to restore the landscape post-mining.

Both hill slope mining and terrace mining have environmental and safety considerations. Sustainable practices and adherence to regulations are crucial to minimize the ecological footprint and ensure the safety of workers and surrounding communities. Additionally, community engagement and consultation are essential to address concerns and incorporate local perspectives into the mining operations.

3. GENERAL PROFILE OF THE DISTRICT

The configuration of the district is mountainous interspersed with many flat and undulating valleys formed by the Beas river and its tributaries. The Mandi district between 31^0 13' 30" and 32^0 04' 22" north latitudes and 76^0 36' 08" and 71^0 23' 26" east longitudes. It is bounded by Kangra on the northwest, Hamirpur & Bilaspur in the west, Arki tehsil of Solan district in the south, Shimla district in the southwest and Kullu district in the east. The district has 2 main rivers viz. the Beas and the Satluj. The river Beas enters the district from close to Bajaura, at the boundary of Kullu and leaves the district at Sandhol. The Mandi town is also located on the banks of this river. For the greater part of its length, it runs between high banks and as it is of never great breadth, the current is swift, especially during the rains.

Practically the whole of the district drains into the Beas with only the south-east corner situated on the Satluj watershed. Within the district the principal tributaries of the Beas on the north bank are Uhl, Luni, Rana and Binu and on the south bank are the Hanse, Tirthan, Bakhli, Jiuni, Suketi, Ranodi, Son and Bakar.

Mandi district covers an area of 3950 sq kms and lies in the middle portion of H.P and is bounded in the north by district Kangra, Kullu in the West. In the south are the districts of Shimla & Solan, Bilaspur in the south West and Hamirpur in the North West. Major part of the district lies in the lesser Himalayan region, which presents a rugged mountainous terrain. The mountains are composed of crystalline, metamorphic and unfossiliferous sedimentary rocks of the oldest system. Mountains are developed in different stages. Initially, a Geosyncline was formed which was gradually filled up with sediments, after this the Geosynclinal deposits were subjected to folding and thrusting etc. Finally, the Geosynclinal sediments were pushed up gradually to form the mountains. In the Mandi district between the steeply rising mountains are the valleys. Bahl, partly Kullu Valley lies between the steeply rising mountains which remain mostly under snow for most of the year. The valleys are the result of age-long erosion along the medial part of elevated tracts. These valleys are known as erosional valleys which have resulted because of glacial and stream erosion. Sutlej, Beas, Uhl and Suketi are the main rivers in the district.

4. GEOLOGY OF THE DISTRICT

The Regional Geology of the Area

The various types of rocks in the district have been classified into certain groups based on their physical characteristics and mode and period of formation. These groups are generally named after the places where the set of rocks was studied first or the period of formation. These groups are Jutogh, Chail, and Shali& Tertiary. The oldest rocks in the area belong to the Jutogh group and the youngest are the unconsolidated valley fills of recent age comprising clay, sand and gravel beds.

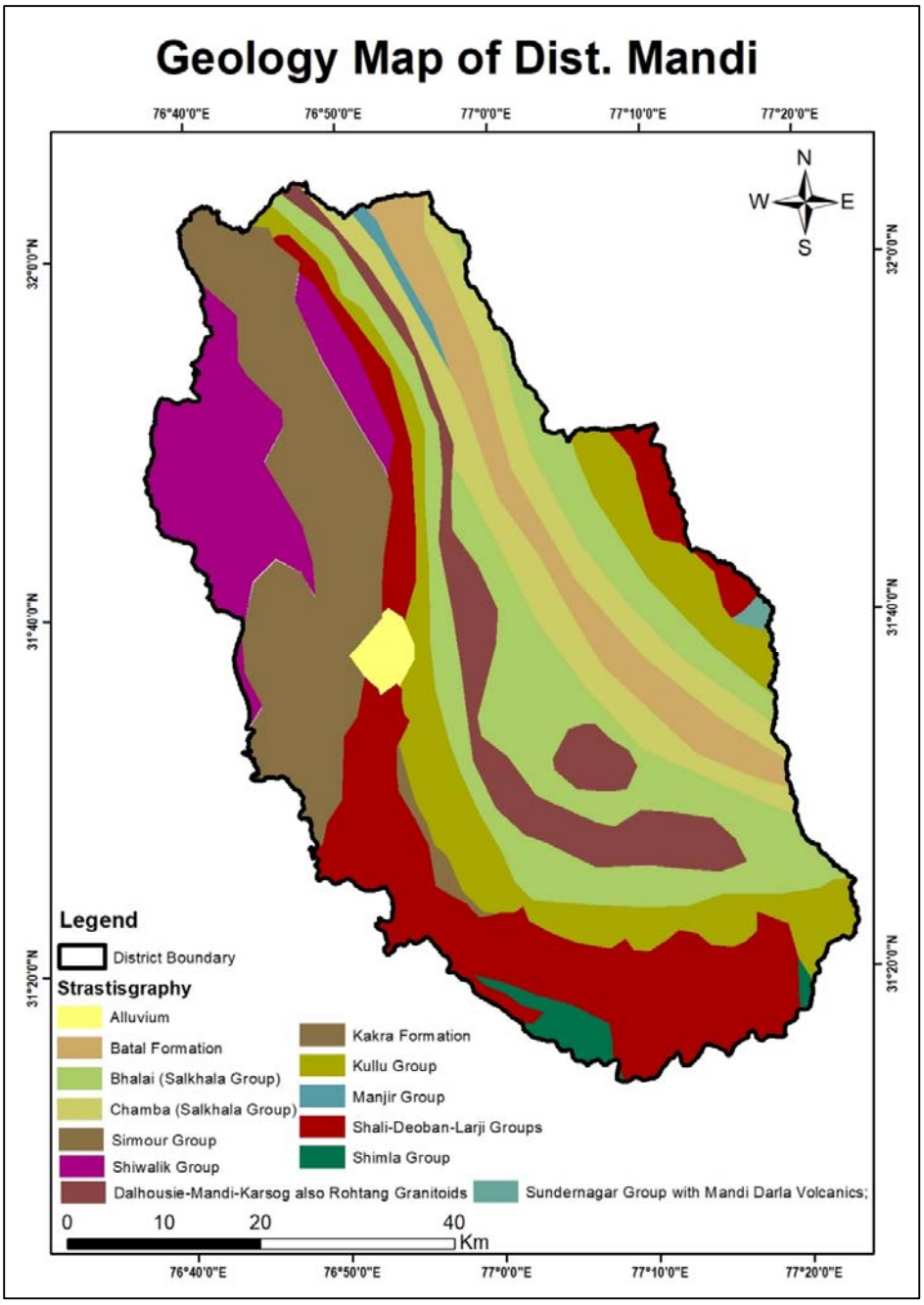


Image showing Geological map of District Mandi

The rock types generally seen are shale, slate, Sandstone, quartzite, schist limestone dolomite granite etc. The rock group with an abundance of limestone, dolomite and salt beds is known as the Shali Formation. The rocks with the phyllites gneisses quartzite with hematite and magnetite bands are included in the Chail Formation. The granitic rocks occurring around the Karsog area are known as Karsog granite. A group of rocks represent lavas in the flows in the part known as Mandi Darla volcanic.

The stratigraphic sequence, established on the basis of lithology around the study area is given below:

Central Gneisses and schists

The central gneisses and schists comprise inter-banded gneisses and schists with bands of quartzite, stratified migmatites, injection gneisses and pegmatites which range from very fine-grained to very coarse-grained. The gneisses migmatites and pegmatite invariable carry grains of ruby garnet which

is one of the most important distinguishing characteristic features of these rocks Pegmatite comprise quartz, large crystals of buff as well as white feldspars, books of biotite and microsite and sizeable crystal of black tourmaline and translucent ruby garnet. The gneisses are most intricately folded into flexure slip-type recumbent refolded folds suggesting several phases of folding under highly mobile and ductile conditions, most probably due to (i) the great depth of burial (ii) the granite intrusions (iii) due to the proximity to the central crystalline axis which has been the area of intense activation. Intimately associated and interbedded with the gneisses occurs crenulated chlorite-biotite schists which are highly puckered and invariably carry grains of garnet. In the lower part of this member, bluish kyanite is developed in these quartzite biotitic schists. The central gneisses and schists which are extensively introduced by injection gneisses, granites and pegmatite are the oldest rocks of the area as they form the common basement for the subsequent rock formation of Tethyan and Himalayan basins. These rocks show the highest grade of metamorphism as indicated by the presence of migmatites kyanite sillimanite and represent alternating bands of pelitic and arenaceous met sediments.

Shali Structural Belt

The Shali structural Belt comprises the Sunder Nagar Group and the Shali Group (Srikantia and Sharma, 1976). It occurs in two structural belts Viz. the main Shali structural Belt and the Shali Subsidiary belt of the Bandla range. The main Shali structural belt extends over a length of 260 Km. in a sigmoidal shape between the river Ravi in the NW and Nag Tikar ridge in the SE. Beyond the Ravi, it extends into the Kashmir Lesser Himalaya where it was earlier referred to as the "Autonomous folded belt" by the Walia(1931. The main Shali structural belt bifurcates into two sub belts respectively the northern Alsindi-Nag-Tikkar sub-belt and Tattapani sub-belt merges along the cruse of BhahariKhad and the Satluj in the Slapper area. The main Shali structural belt is nearly 23 Km. broad across the Satluj valley and the Shali range whereas in the Alsindi sector, it is only 2.81 Km. broad along its NW extension towards Mandi and into Jammu and Kashmir it becomes extremely narrow and constricted with the development of thrust imbricates.

The Shali subsidiary belt of the Bandla range is restricted to a zone between the Siwalik Belt and the Paleocene par autochthon belt. It extends from Behind Tibba in the north to Khadli in the south and beyond it turned into discontinuous strips as Tundapathar, Malla, Sataun and other areas This belt is apparently independent of the main Shali structural Belt and comprises mainly of younger formation of the Shali Group.

Sundernagar Group.

The Sundernagar Group (Srikantia, 1977) is restricted to the main Shali Belt, The type area located 2 Kms. south of Sundernager and the western side, to volcanic, have a cover of Shimla Group with involutions of PaleoceneKakara on the western side. Towards the north the volcanic lie beneath the Tattapani formation of the main Shali structural belt along a thrust contact. The volcanic continued towards Tattapani and again reappeared in the Batawara syncline. The volcanic appearing at Darla is hard and compact, fine to medium-grained, generally grey to green in colour and includes both fine-gained massive and amygdaloidal varieties.

In thin section altered albite and clinopyroxene with accessories of appetite and spinal are present. Minerals are set in a glassy base with iron oxides as opaque granules, masses and skeletal bodies. The amygdalas are rounded ovoid ellipsoids and even elongated. The vesicular filling includes quartz, chalcedony zeolite and chlorite. Most of the amygdules have a core of quartz, surrounded by pinkish chalcedony, characterized by fibrous or radiating sheathes grading into the inner core and lined by a chlorite layer. Zeolites are common Veins of actinolite epidote and carbonate that occur as alternating products in the lavas. The porphyritic types contain plagioclase feldspar, diopside, augite, hornblende, quartz, opaque and palagonite glass. Chlorite and epidote are the common alteration

products. The non-porphyritic lavas are fine to medium-grained. In this section abundant feldspar microclimates, altered clinopyroxene, epidote, and opaque and palagonitised glass are present.

The Mandi Dalra volcanic are tholeiitic lavas and appear in the following structural positions within the Mandi Shali Structural Belt(i) in the Sundergnager, the volcanic are closely associated with the sediment of the Sundernager Group and occur Beneath the Shali Group(ii) In the Darla area the volcanic occur uncomfortably beneath the Shimla Group and the Kakara Formation. It is overthrusted by the Shali belt along the Tattapani sub-belt. It again reappears along both the limbs of the Batawarasynform of the Shimla Group. In the Darla Tattapani sector, the volcanic are considered by Ranga Rao and Bhan (1969) as younger than Shali (iii) In the Gairu-Pawalo ridge, the volcanic appear as a thrust-sheet (sub-nappe) over the Shali sedimentary beneath the crystalline thrust sheet (iv) From Mandi in SE to the Ravi NW for a distance of about 200 Km, the volcanic appears as a thrust sheet (Mittithar sub nappe) beneath the crystalline thrust sheet overriding the Shali sedimentary and even the Tertiaries along the Mandi Thrust. In this sector, the overthrust Mandi Darla volcanic thrust sheet also carries outliers of the Shali. The main significance of this sub-nappe lies in the fact that it extends in the southern slope of the Pir-Panjal range of the Kashmir Himalayas where the "Autochthonous Folded Belt" of the Wadia (1931) is actually in the NW extension of the Main Shali structural Belt.

Sedimentation

The Sundernager Group is characterized by an abundance of clastic sediments which constitute an almost equal proportion of white quartzarenite and red quartzite sandstone. The Sundernagar basin actually represents an area of paralic sedimentation peripheral to the continental Platform.

Shali Group

The term Shali limestone was first used by Palameer (1921) to a bluish limestone that covers the southern flank of the Shali ridge north of Shimla. The classification of the Shali was first attempted by West (1939) who divided it into Khaira Quartzite, Lower Shali Limestone, Shali Slates, Upper Shali Limestone and Shali Quartzite.

Ropri Formation

This basal formation is made up of three dominant litho units as follows in ascending order.

I. Red shale and siltstone

II. Earthy dolomite

III. Salt, limestone and marly litho-complex are called lokan.

The occurrence of salt in the Shali structural Belt is mainly restricted to the area between Mandi and Basalda. The salt belt does not crop out on the surface anywhere along the belt, but its presence is indicated by the occurrence of a peculiar heterogeneous marly with a complex that is locally called Lokhan. Lokhan generally caps the salt bed. The occurrence of salt at Darang. Guma and Mugal have been known for four centuries and form an important evaporate deposit in the Himalayas next only to the Salt range in Pakistan Salt occurs as the massive bed. In a vertical hole drilled at Drang, the thickness of the salt beds was 236 meters (the hole was abandoned in the salt itself) Although this does not represent the true thickness of the Salt bed, it's persistent occurrence down to a great vertical depth is significant. Salt is pale purple in colour and semi-crystalline. It has certain dark green bands and bands of thick red shale with grey limestone fragments. Salt is tough and compact and generally dry with low moisture content as observed in an underground mine at Drang.

In thin sections, grains of quartz and calcite also fragments of quartzite clay minerals fragments of shale are seen dispraised in the halite matrix Carbonate matter is fine-grained and is widely dispersed. Quartz shows the effects of stain. There are several idiomorphic calcite rhombohedra or small. Rounded to angular anhedral grains of calcite scattered in the mosaic of hate. Some of the quartz grains of quartzarenite show pale red pigmentation. Sporadic gypsum grains are seen. In some sections, besides the afore-cited minerals. The carbonaceous matter is dispersed in the halite matrix. Clay minerals show

carbon coating X-ray analyses of salt- have indicated the presence of the following minerals: halite - major, calcite considerable amount. Sylvite and quartz have small amountsLengebeinite traces Dolomite Minute traces Kaolinite and illite traces.

Lokahn is a marly litho complex that is immediately associated with the salt and is purple and white in colour occurring as a loose, Friable heterogeneous mass. It comprises clay and silica mixed with carbonate matter. Within the lokhan, there are also fragments of limestone dolomite, quartzite chert and even basic rocks. There are no salt beds within the lokhan though it commonly tests saline there are also a places thin bands of red shale and lenticular bends of recemented limestone breccia associated with the lokhan. Weathered volcanic rocks and Lokhan alternate along the thrust contact. With the overthrust Mandi volcanic of the Mittidhar sub-nappe. North of Megal along a stream course a slice of black cherty siltstone is found lodged within the lokhan. In thin sections,lokhan comprises clay and carbonate matter in which there are fragments of calcite, quartz and clay. Calcite shows zoning and also the effects of rotation. It forms the predominant type among the larger fragments and shows authigenic growth Quartz is the next most common mineral. There are also some grains of untwined potash feldspar embedded in clay and carbonate matrix. There are angular fragments of quartzite, red shale some carbonaceous trail and stray gypsum grains.

In the field,lokhan stands out as highly weathered outcrops and earth pillars presenting typical bad land topography. These are prone to landslips which further complicate their structural relationship with other rocks, place lokhan with thickness ranging between 10 to 170 Meters shows pseudo-stratification of white and purple clay bands. Sporadic seepages of saline springs are observed.

Regarding the origin of lokhan, there could be a few possible assumptions. It may represent the insoluble left behind after the salt was leached out since insoluble represents 34% of the salt bed. Alternatively, it could be partly a tuffite. formed during the course of the submarine eruption of the Mandi DalraVolcanics. Or it could be a marly rock associated with salt lokhan imparts a look of tectonic mélange.

The dolomite lithounit of the Ropri Formation is a conspicuous bed and occurs at the base of the red shale lithounit. It varies in thickness from 10 to 60 meters. The best development of this dolomite can be seen SW of Mandi and also south of Sundernager where it directly overlies the Sundernagar Group and Mandi Darla Volcanic. It is also exposed along the Gairu-Pawalo ridge where it occurs in the Gairu sub-nappe.

Dolomites are greyish-blue in colour but have a characteristic yellow-weathered surface. They are massive and contain sporadic shale parting. near Maloh Pass, dolomite contains stromatolite, which is mound-shaped and also contains discrete and KussiellaKussiensis (Raha and Das 1989)

Khaira Formation:

A good section of the Khaira Formation is along the road section leading to the Slapper Bridge across the Satluj above the left bank of the river. The quartz arenites pink, and the flesh red. Purple and white in colour. There are medium to coarse-grained and places contain thin purple and grey argillite partings. Ripple marks cross beddings mud-cracks and worm trails are commonly seen. Both current and oscillation ripples are present. In this section. Quartz/grains appear surrounded by subangular well-sorted and contain pink garnets as heavy minerals.

Khatpul Formation

A typical section is exposed along the road between Barman and the Slapper Bridge across the Satluj. At the base of the dolomite Lithounit, there is a thin but persistent bed of red shale. Dolomite is generally massive though and compact and greyish blue in colour in the lower part it contains grains of detrital quartz and carbonate pellets. Profuse growth of stromatolites BaicaliaColonella discrete and other indeterminable types are observed.

Sorgharwari Formation

The limestone unit succeeds the Kathpul dolomite and often the contact between the two is sharp and distinct though at places gradational passage is also observed. A typical section of this formation can be seen in the Sorgharwari area and also along the road section near the southern entry of the Slapper Bridge. The formation is divisible into two members (I Upper Grey limestone and (II) Lower Purple Limestone.

The limestone member of the Sorgharwari formation shows Baicalia. Colonella and other undifferentiated columnar forms of stromatolites.

Tattapani Formation

The best development of the Tattapani Formation is at Tattapani along the banks of the Satluj River. The Tattapani Formation is divisible into three members

C. Mainly black shale and siltstone
B. Bedded yellow weathering dolomite limestone with shale parting
A. Massive Cherty structure is less dolomite.

The best development of the Tattapani is seen in the main Shali structural Belt. It is also present in the eastern part of the Shali subsidiary belt of the Bandla range. ColonellaRiasiensis, ConophytonCylindricusC.GarganicusKussiella magna (Radha & Das 1989) are some of the important stromatolites from this formation.

Makri Formation

The best development of the Makri Formation is in the Shali subsidiary belt of the Bandla range. It was earlier referred to as the Shali slates by West (1939). This has a protean association and comprises shales of slate quartzarenite and thin-bedded dolomite and limestone. The shales are purple pale green grey and black There are interbedded thin bands of cherty dolomite and pale pink quartzarenite. However, in some places, particularly in the Mmgrani forest area dolomite is more prominent Quartzarenite has well-provided triple marks and shales are highly incompetent and show incongruous folding.

Parnali Formation

This is the last major carbonate unit of the Shali Group and is exposed on the western part of the Shali subsidiary belt of the Bandla range of the southern slope of the Shali Range in the main Shali structural Belt. This formation roughly corresponds to the upper Shali Limestone of West (1939)Dolomites form the dominant lithounit. They are greyish in colour are largely massive and contain parallel bands of thin-bedded grey and black chert. Limestone interbeds show Baicaliabaicalica B prima andharia radialis.

Bandla Formation

This is the youngest formation of the Shali Group and corresponds to the Mandhan Slates and Shali Quartzite of West (1939). It comprises green and purple shales of Siltstone, Sandstone, quartzarenite and cherty breccia. Quartzarenite shows well-developed ripple marks and cross-bedding. Quartzarenite is closely associated with a peculiar greenish-looking cherty breccia cemented with siliceous material. In the Shali range a thin bed of brown earthy limestone in persistently occurs at the junction of white quartzarenite shale.

Sedimentation

The Shali Group represents a typical shallow stable platform type of sedimentation. This is amply substantiated by the presence of Stromatolites, sedimentary structures like mud cracks as oscillation ripple marks, and also the occurrence of salt beds and red shale facies in the basal formation of the Shali Group implies the prevalence of an arid climate in the early phase of Shali sedimentation. In addition to signifying aridity, the evaporate indicates "a delicate adjustment to still requiring a critical depth for a time long enough to precipitate a considerable thickness of salt" (Pettijohn, 1957). This type of delicate

adjustment would be possible only in a comparatively stable basin. The restricted nature of salt occurrence in the Shali belt suggests the isolated nature of the evaporate segment in a larger basin.

The profuse development of stromatolites in the Shali carbonate rocks indicates the prevalence of intertidal shallow subtidal and supratidal conditions. The mud-cracked arenites also support an occasional sub-aerial condition of the basin. Cross-bedding which is extensively seen in the arenite of the Khaira Formation points to a high energy condition.

5. DRAINAGE OF IRRIGATION PATTERN

The district is criss-crossed by many hill ranges or dhar, prominent of which are Dhauladhar, Ghogardhar, Sikandar dhar and Vairkot dhar which generally run in the district from northwest to south-easterly direction. The altitude of the district varies between 503 metres and 4,034 metres above the mean sea level. Beas and Satluj are the main rivers that pass through the district with several small rivulets/streams as their tributaries. The Beas enters the district from the eastern side near Largi village where the Sainj and Tirthan streams join it and flows east to north-west direction. It leaves the district in the west near Sandhol and enters into Kangra district. Uhl, Rana Khad, Luni Khad and Binno Khad join it from the north and other rivers/Khads that join it from the south are Bakar, Masant, Jhangi, Chaned, Sakrain, Soan, Arnodi, Kasani, Junisuketi, Bakhli, Tirthan, and Hansa. The river Satluj which forms its southern boundary and separates it from Solan and Shimla districts is another major river in the district. River Satluj enters the district near Firnu village in the Chawasigarh area and flows towards the southwesterly direction. It leaves the district near Dehar and enters into Bilaspur district. Behna, Ropri, Bagri, Chanod and Alsed etc. are important streams/khads, that fall into Satluj from the northern side. Rawalsar, Prashar and Kamrunag are the important natural lakes in the district. On the basis of physiography, climate, soils, natural vegetation and geology the district is divided into four sub-microregions of (i) Dhauladhar, (ii) Beas Basin, (iii) Satluj Basin and (iv) Mandi Lesser Himalaya.

The exploitation of irrigation potential (lift and groundwater) will provide irrigation to an area of 29,344 hectares in the district. Available water potential shall be exploited and thereby 29,344 hectares of land shall be brought under protective and assured irrigation. The groundwater availability for future irrigation will be around 2,458 ha m. The main irrigation sources in the district are lifts, tanks, bore wells, wells and flow irrigation/canals. The percentage of area under rainfed is high in all the blocks while there is a potential for medium and minor irrigation. Though lift irrigation exists in all the blocks, the area covered is negligible except in Sundernagar and Chauntra. There is vast potential for bore well irrigation in Sundernagar The projected area to be irrigated will be 1,400 hectares after the completion of on going irrigation projects in the district.

6. LAND UTILIZATION PATTERN IN THE DISTRICT

Analysis of land use patterns assumes significance for developing proper land use strategies for the selection of enterprises and optimal resource allocations. Effective use of scarce agricultural land resources has repercussions on human development. The Land use pattern in the district shows that of the total geographical area, the area under forest comprised of 44.08 per cent. The land put to non-agricultural uses and barren land together accounted for 6.29 per cent of the total geographical area. The area under culturable wasteland, permanent pastures and miscellaneous trees, crops and grooves comprised of 1.13, 24.23 and 0.06 per cent respectively. So far as the net area sown and total cropped area are concerned, the district seems to have 22 enough scope for incorporating new technologies and high pay-off enterprises in the crop and livestock sectors for enhancing the income status of the farming community in the district

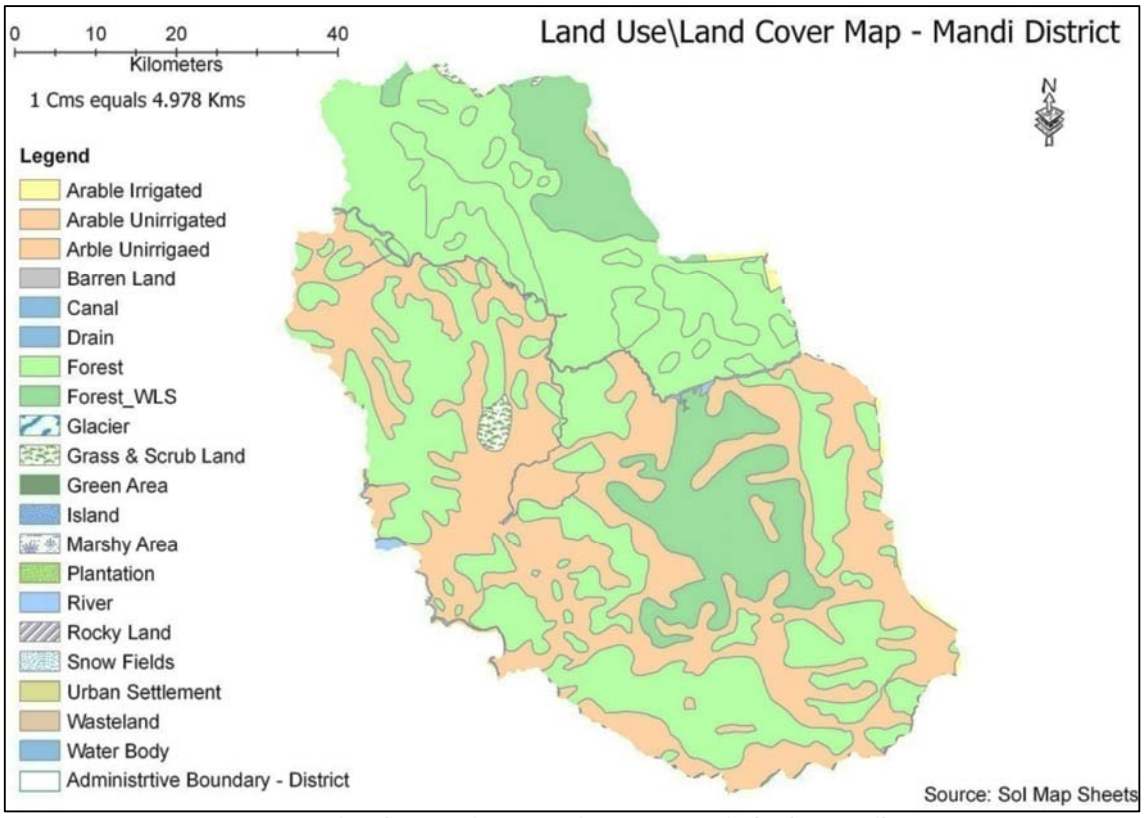


Image showing Land use Land cover map of District Mandi

The district is comprised of many fertile valleys as well as high-elevation areas. The cultivation is possible in small terraces of holdings in the high hills and the stream/khad basins in most parts of the district.

The economy of Mandi district is predominately agrarian as around 79 per cent of the total population is dependent on agriculture and activities allied to it for earning their livelihood. The moisture retention capacity of the area is poor due mainly to the fact the bedrock are argillaceous and the land the uneven. The crops usually face moisture stress during the remaining period of the year due to inadequate and irregular rainfall. The irrigation facilities are provided by lifting water from streams, shallow dug wells and medium to deep tube wells in the valley area.

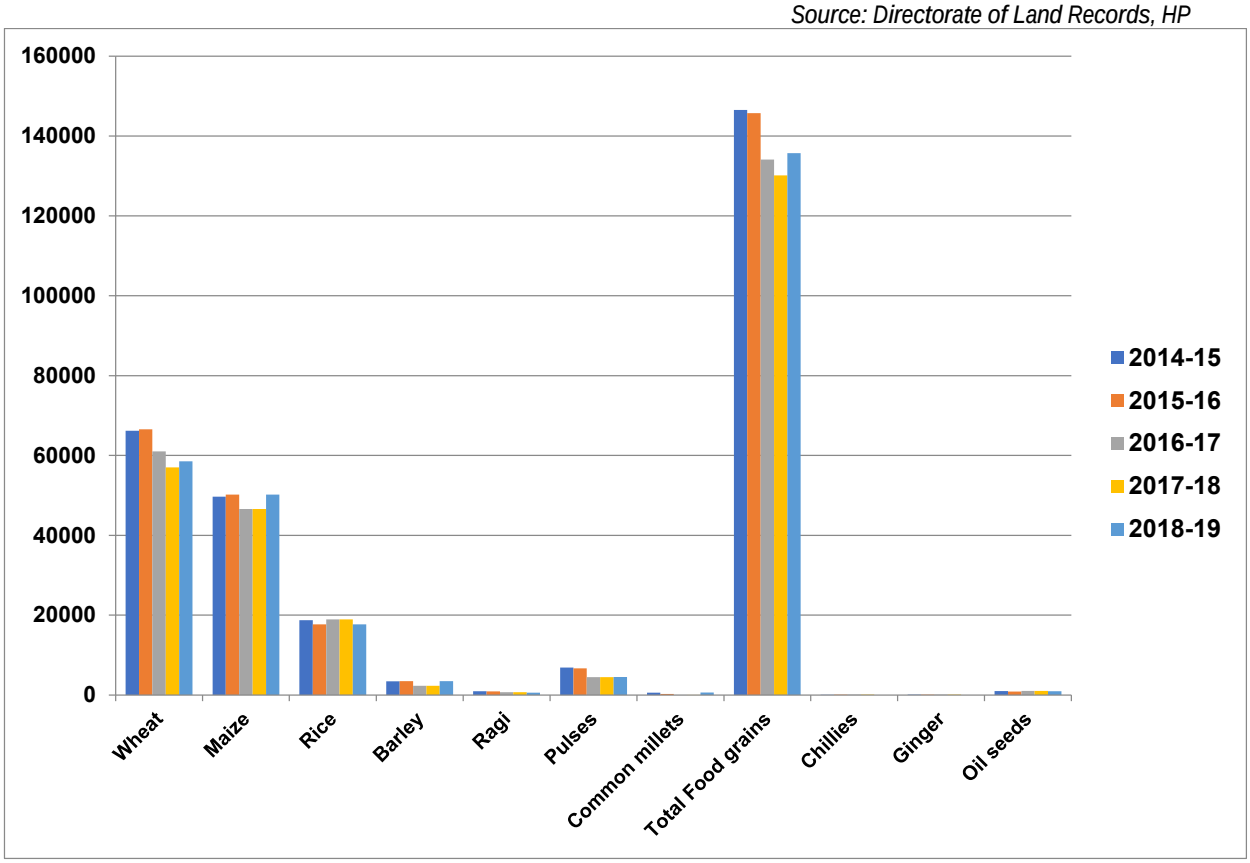
6.1 Agriculture

There is no involvement of agricultural land where mining is proposed, however, in the district, the agricultural and horticultural practices of the region vary from other parts of India due to a variety of factors. The most important one is, of course, the unique climate and landscape of the Himalayas. The mountainous territory strongly influences both techniques and crops. Most agriculture takes place in the form of terrace cultivation, with small strips of mountain slopes that had been more or less levelled out to allow cultivation. The quality of the soil is less than optimal with few nutrients and many small stones and rocky patches. Further, the altitude leads to a harsh climate. While in the valleys with an altitude of around 1500 m above sea level, the cultivation can still take place most of the year; it is reduced in the summer months in regions above 2500 m. Yet, the people there particularly depend on agriculture for survival, largely because the remote locality of their villages denies opportunities in other fields. The area is purely rain-fed, which creates difficulties if the monsoon and snowfall turn out weak. Problems of accessibility and transport are further crucial aspects of the farming in Mandi district.The main cereals grown are wheat, maize, rice, and barley in the district.

Table showing area under Different Crops in Hectares

Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Food grains	Chillies	Ginger	Oil seeds
2014-15	66211	49678	18740	3439	953	6903	589	146513	79	96	997
2015-16	66531	50222	17717	3447	892	6658	254	145721	92	100	868
2016-17	61043	46587	18950	2339	701	4471	42	134133	101	110	1055
2017-18	57043	46587	18950	2339	701	4471	42	130133	101	110	1055
2018-19	58531	50222	17717	3447	608	4537	646	135708	0	0	960

Source: Directorate of Land Records, HP



Graph showing Area under Different Crops in Hectares

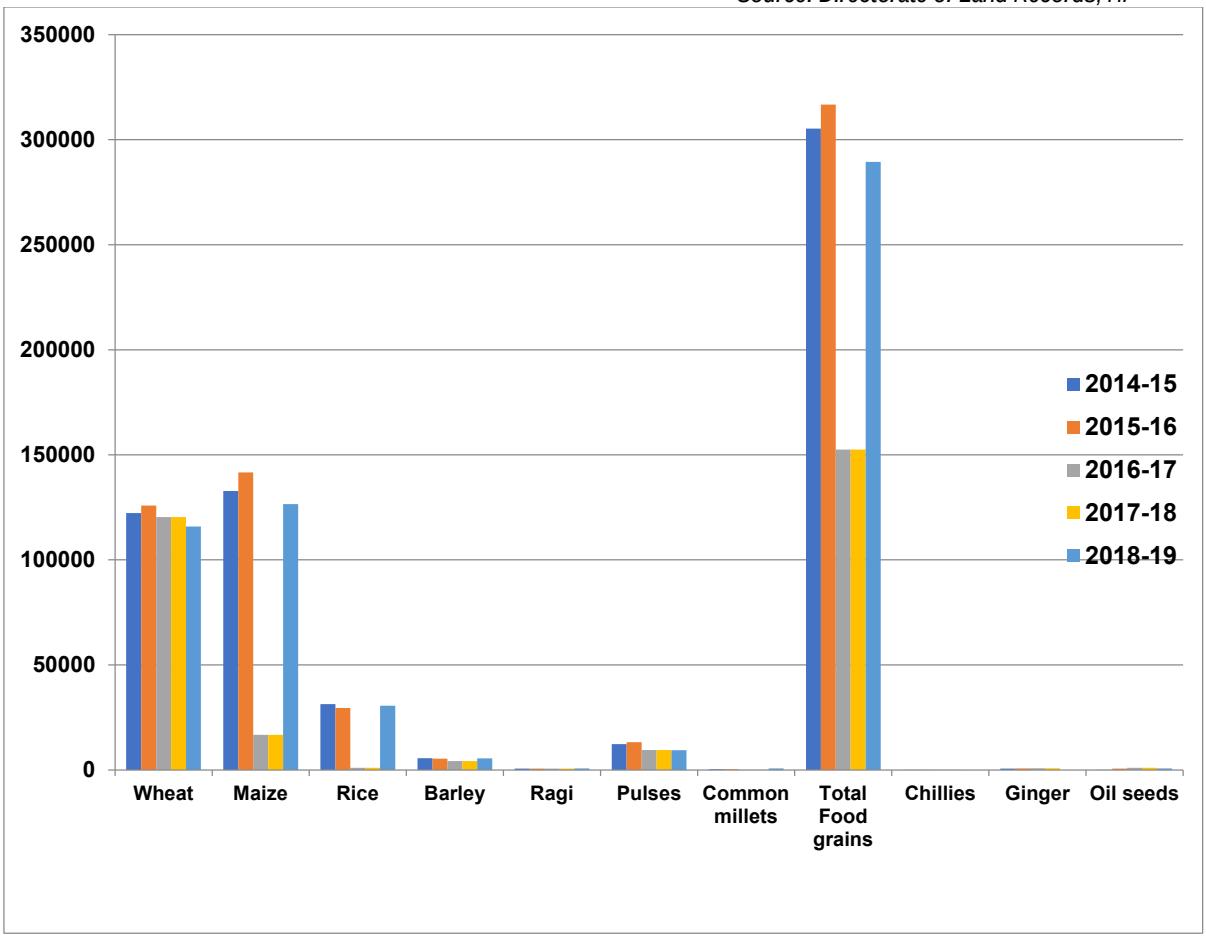
Table showing production under Different Crops in Hectares

Table showing Production of Different Crops (in MT) at District Mandi

Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Food grains	Chilies	Ginger	Oil seeds
2014-15	122315	132786	31288	5581	662	12306	371	305309	16	673	104
2015-16	125847	141665	29528	5400	671	13224	330	316665	23	701	670

2016-17	120395	16701	1042	4208	686	9469	47	152548	26	771	1042
2017-18	120395	16701	1042	4208	686	9469	47	152548	26	771	1042
2018-19	115891	126568	30630	5540	710	9380	757	289476	0	0	729

Source: Directorate of Land Records, HP



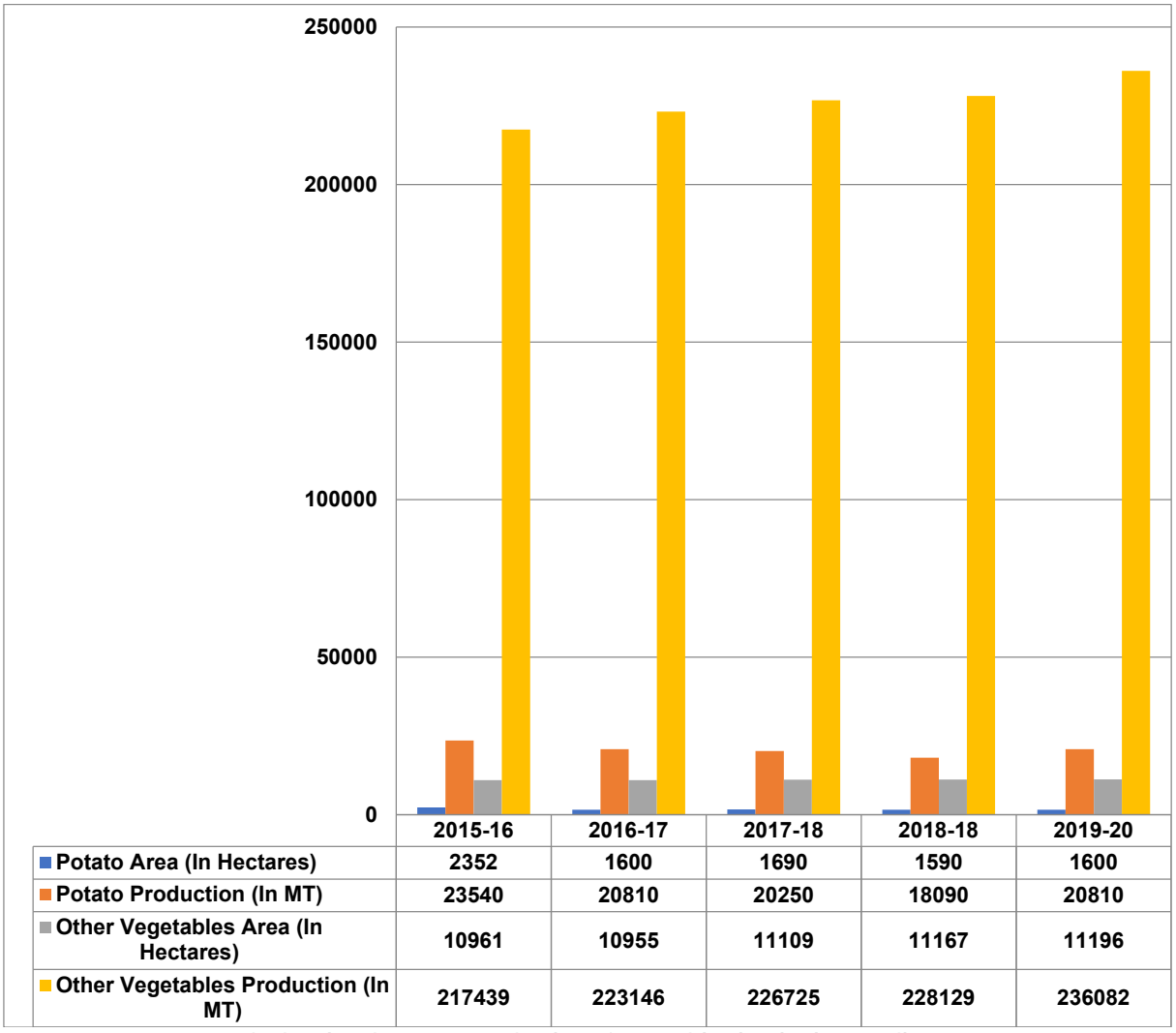
Graph showing Production under Different Crops in Hectares

Table showing Area in Hectares& Production in Tonnes of Vegetables

Table showing Area & Production of Vegetables (Distt Mandi)				
Year	Potato		Other Vegetables	
	Area (In Hectares)	Production (In MT)	Area (In Hectares)	Production (In MT)
2015-16	2352	23540	10961	217439
2016-17	1600	20810	10955	223146
2017-18	1690	20250	11109	226725
2018-18	1590	18090	11167	228129

2019-20	1600	20810	11196	236082

Source: Directorate of Land Records, HP



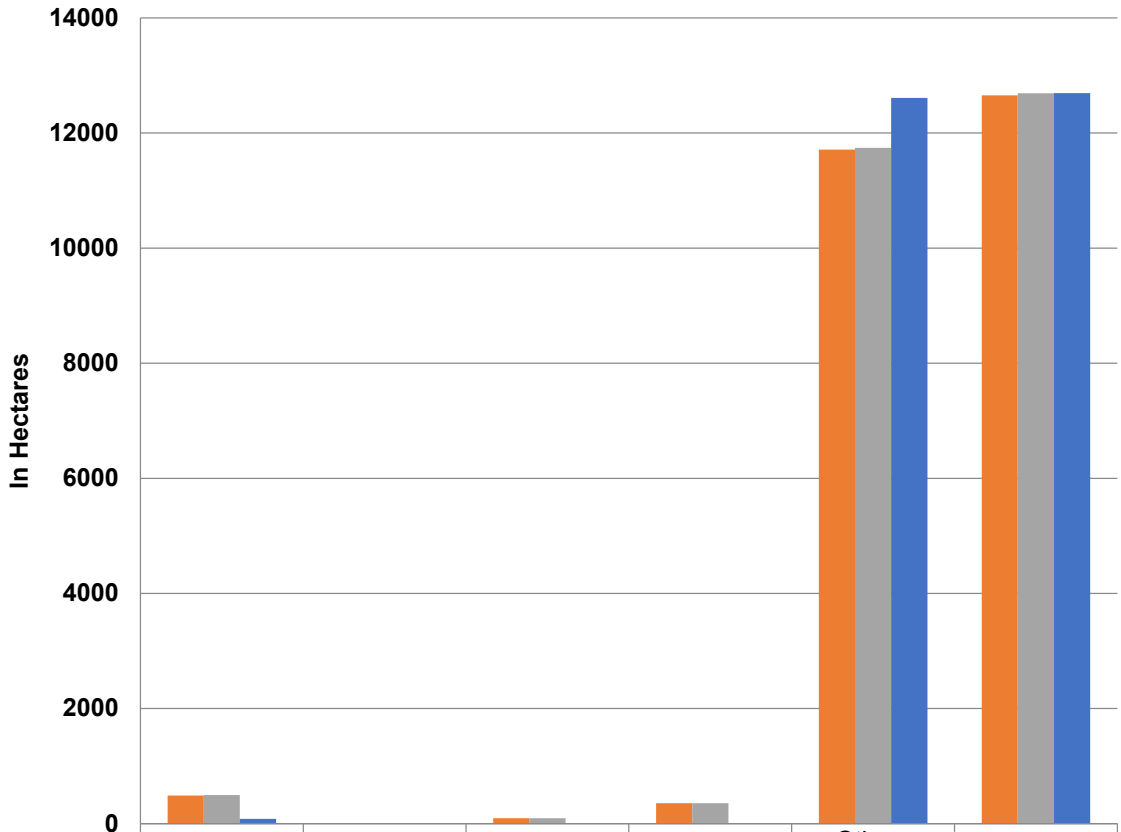
	2015-16	2016-17	2017-18	2018-18	2019-20
Potato Area (In Hectares)	2352	1600	1690	1590	1600
Potato Production (In MT)	23540	20810	20250	18090	20810
Other Vegetables Area (In Hectares)	10961	10955	11109	11167	11196
Other Vegetables Production (In MT)	217439	223146	226725	228129	236082

Graph showing the area &production of vegetables in District Mandi

Table showing Net Irrigated Area of Mandi District by source in Hectares

Table showing Net Irrigated Area of Mandi by source (in Hectares)						
Year	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	490	…	95	356	11713	12654
2011-12	496	…	95	356	11743	12690
2016-17	84	…	…	…	12609	12693

Source: Directorate of Land Records, HP



	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	490	0	95	356	11713	12654
2011-12	496	0	95	356	11743	12690
2016-17	84	0	0	0	12609	12693

Graph showing the Net Irrigated Area of the District Mandi from 2010 to 2017

6.2Horticulture

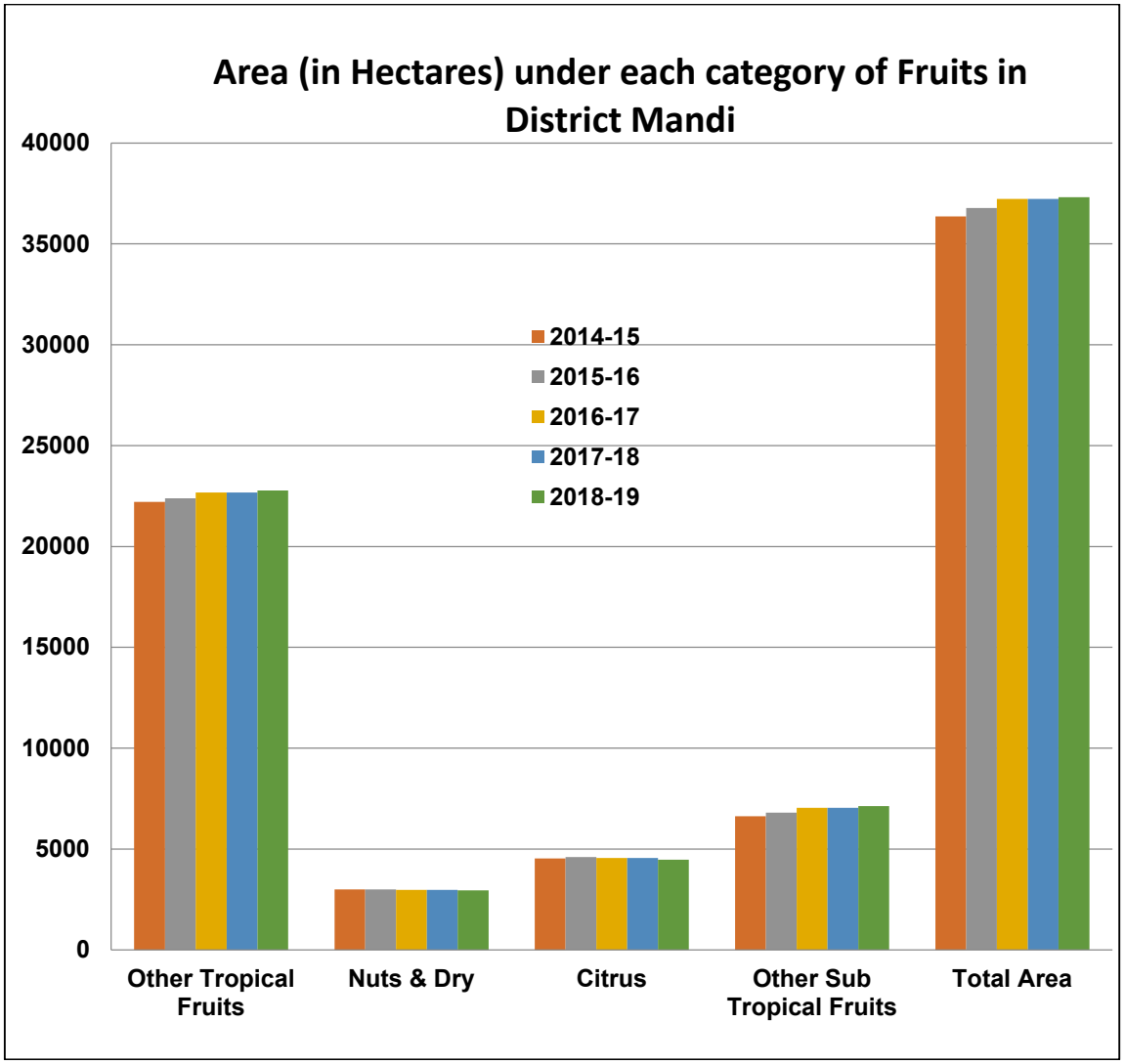
Horticulture plays an important role in the economic life and prosperity of the people of Mandi. During the last three decades, Mandi has made tremendous progress in the field of Horticulture. Greater emphasis is being laid on this sector because the geographical features and climatic conditions prevailing in the district are ideally suited for fruit farming. Among all the fruits grown in Mandi, apples are the most widely grown and represent commercially the most important fruit crop. The cultivated apple area is 15400 hectares. The annual apple production usually lies between 30,000 to 46,000 metric tons. This represents about 4,600 truckloads of apples every year. Apart from apples, the other varieties of fruits grown in Mandi are stone fruits, citrus fruits, Mango, guava, litchi, walnut, and papaya as well as nuts, especially almonds. These fruit plantations cover an area of 27130 hectares and the annual production is approximately 56710 metric tonnes.

Table showing area under Each Category of Fruits in District Mandi

Table showing Area (In Hectares) under Each Category of Fruits in District Mandi					
Year	Other Tropical Fruits	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Area
2014-15	22209	2992	4531	6627	36359

2015-16	22385	2999	4599	6797	36780
2016-17	22672	2971	4550	7036	37229
2017-18	22672	2971	4550	7036	37229
2018-19	22771	2949	4466	7127	37313

Source: Directorate of Horticulture, HP



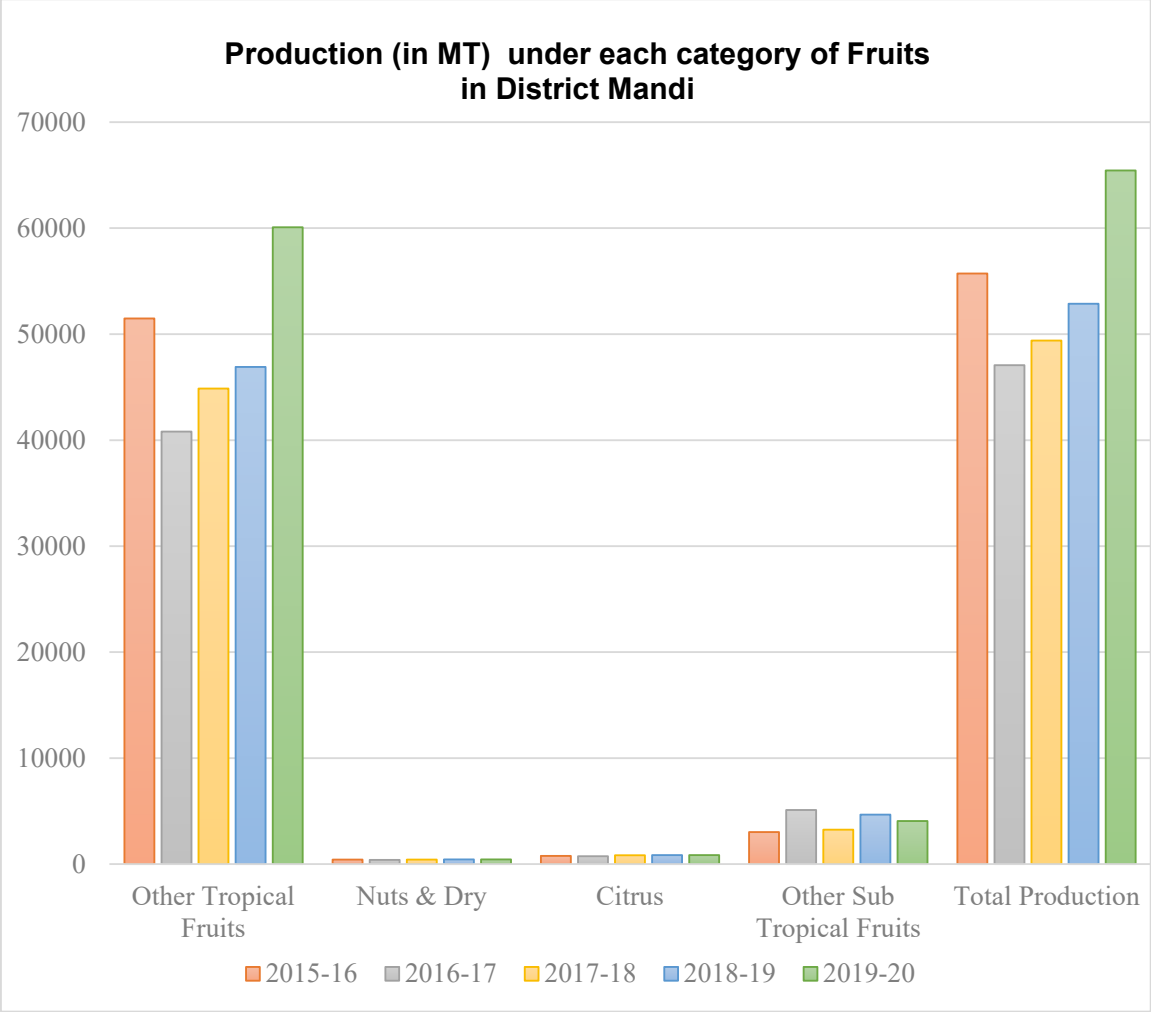
Graph showing Area under Each Category of Fruits in District Mandi

Table showing production under Each Category of Fruits in District Mandi

Table showing Production (In MT) under Each Category of Fruits in District Mandi					
Year	Other Tropical Fruits	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Production
2015-16	51476	435	779	3029	55719
2016-17	40806	403	752	5105	47066
2017-18	44870	430	841	3248	49389

2018-19	46898	447	845	4671	52861
2019-20	60088	447	845	4059	65439

Source: Directorate of Horticulture, HP



Graph showing Production under Each Category of Fruits in District Mandi

6.3 *Animal Husbandry*

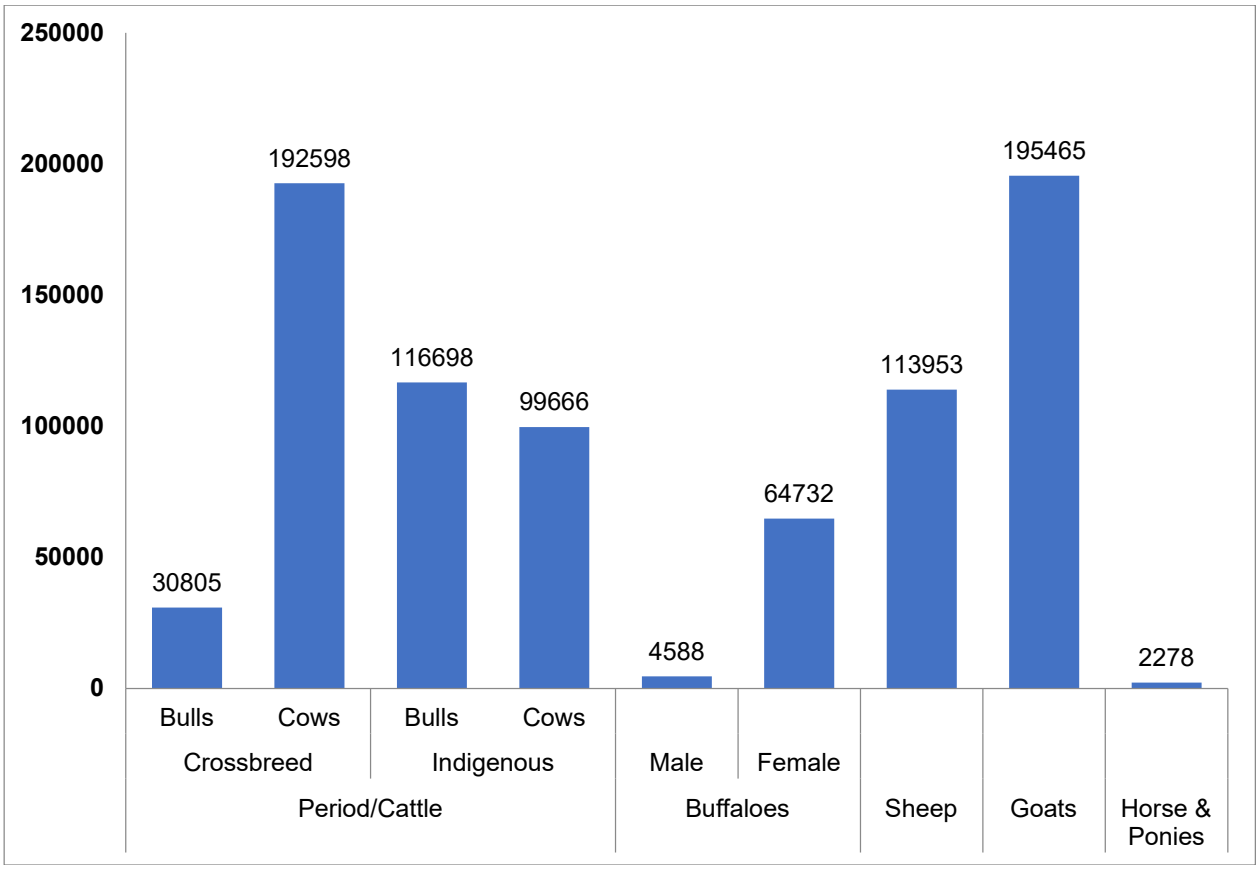
Animal husbandry plays a very important role in the lives of farmers. They depend upon animals to sustain their day-to-day lives. Large numbers of farmers have adopted animal husbandry as a livelihood activity along with agriculture and horticulture. The animals reared by the farmers are mainly for milk, farm yard manure, and meat purposes. Most of the farmers rear animals for milk production which is mainly used for self-consumption. The livestock kept by the farmers includes cows (local and Jersey) buffaloes, goats and bullocks, etc. Most of the animals are indigenous (local breed) having very low milking capacity.

Table showing Livestock census of District Mandi

Table showing Livestock census in District Mandi								
Year	Status	Period/Cattle		Buffaloes		Sheep	Goats	Horse & Ponies
		Crossbreed	Indigenous	Male	Female			

		Bulls	Cows	Bulls	Cows					
2012	At Mandi	30805	192598	116698	99666	4588	64732	113953	195465	2278

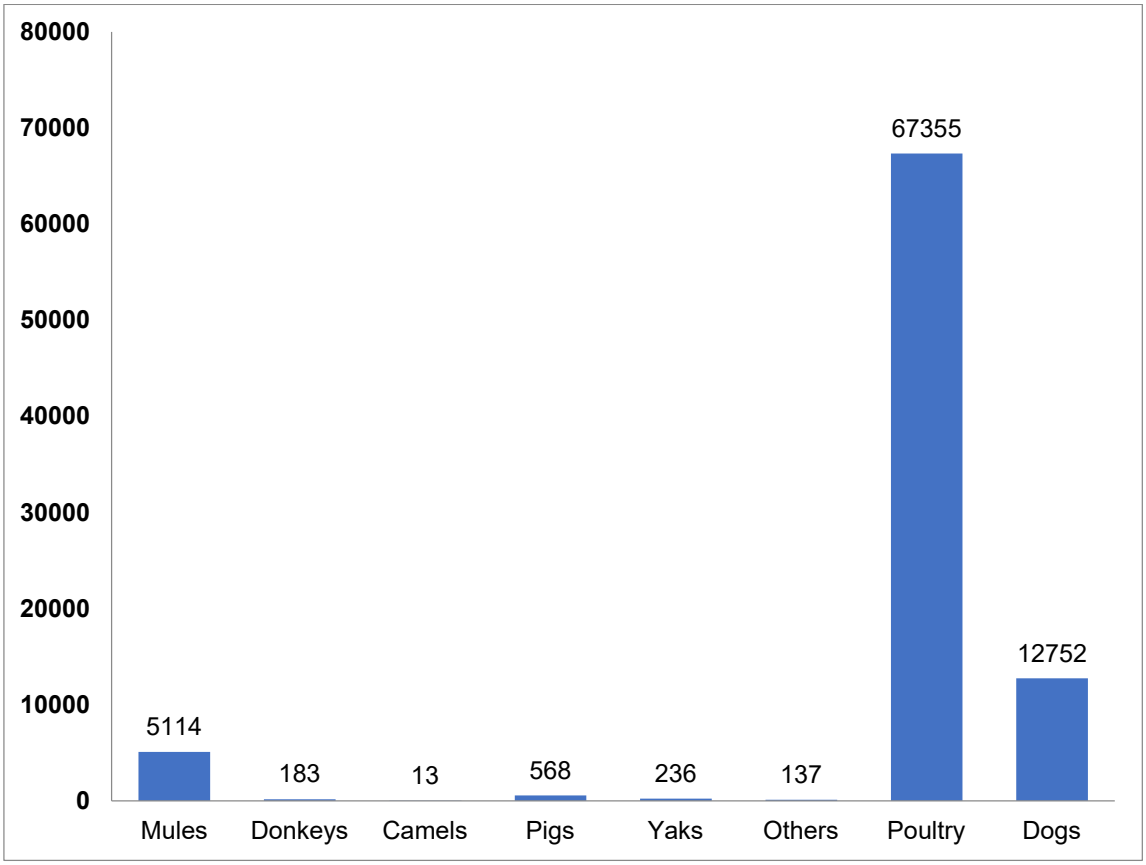
Source: Directorate of Animal Husbandry, HP



Graph showing Livestock census of theMandi District

Table showing OtherLivestock census of District Mandi

Table showing Other Livestock censuses in District Mandi							
Other Livestock							
Mules	Donkeys	Camels	Pigs	Yaks	Others	Poultry	Dogs
5114	183	13	568	236	137	67355	12752
Source: Directorate of Animal Husbandry, HP							



Graph showing Other Livestock census of Mandi District

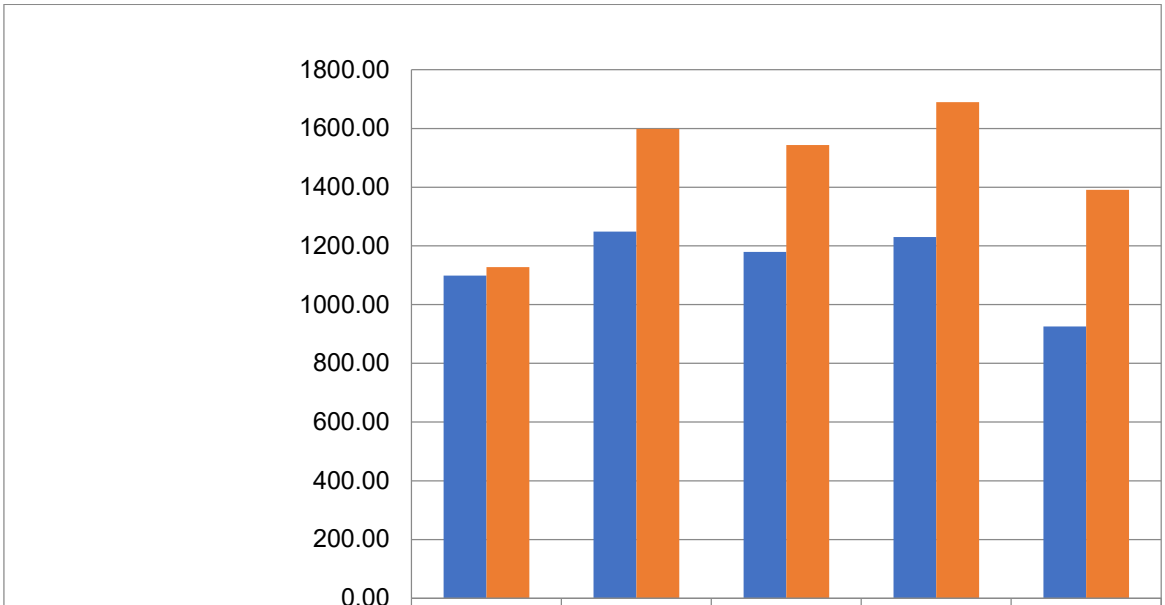
6.4 Fisheries

Reported Fish species in River Beas (district Mandi) is Salma gairdneriigairdnerii (Rainbow Trout), Salma truffafario (Brown Trout), Tor Pitutora (Mahaseer), Catlacatla, Labeorohita, Labeo batu, Labeodero, Labeodyochelus, Cirrhinamrigala, Notopteruschitala, Wallgoattu, Nemachilusbotio, Pontius ticto, Pontius sarana, Silver Carp, Mastacimballusarmatus. Annual production of trout is about 5 tons as per the reports from the Barot fish farm.

Table showing Annual Production of Fisheries and Its Value of Catch in District Mandi

Table showing Annual Production of Fisheries at District Mandi		
YEAR WISE	TOTAL PRODUCTION (IN MT)	VALUE OF FISH PRODUCED (IN LAKHS)
2015-16	1098.99	1127.57
2016-17	1248.56	1598.27
2017-18	1179.21	1543.39
2018-19	1230.31	1689.72
2019-20	925.85	1391.21

Source: Fisheries Department, HP



	2015-16	2016-17	2017-18	2018-19	2019-20
TOTAL PRODUCTION (IN MT)	1098.99	1248.56	1179.21	1230.31	925.85
VALUE OF FISH PRODUCED (IN LAKHS)	1127.57	1598.27	1543.39	1689.72	1391.21

Graph showing Annual Production of Fisheries and Its Value of Catch in District Mandi

6.5 Forest

Because of its complex geography and its great variations in altitude, Mandi is home to an enormous range of species, which span the subtropical to the alpine. The common trees in the Mandi hills belong to the conifer species (deodar, pine, spruce, fir). Several species of medicinal plants like Hath Panja (Dactylorhizahatageria) and Brahma Kamal (Saussureaobvallata) grow luxuriously in the valley. The valley is known for the presence of the majestic snow leopard, the Himalayan brown bear and the Himalayan Tahr. The Western Tragopan (the state bird of Himachal Pradesh) and the Monal pheasant are the prominent bird species found in the region.

Flora

Species/ Botanical Name	Common Name	Elevation Range (m)
Abies spectabilis (D.Don.) Mirbel	Himalayan high-altitude fir	3,000-4,000
Abies pindrowRoyle	Silver fir/ Tosh	2,500-3,200
Acer acuminatum Wall. ex D.Don.	Maple	2,500-3,200
Acer caesium Wall. ex Brandis	Maple	2,200-3,000
Aesculus indica Kk. f. & Th.	Horse chestnut/ Khnor	1,800-3,000
Alnus nepalensis D. Don.	Alder	1,500-2,000
Betula utilis D. Don.	Birch/ Bhojpatra	3,000-4,000
Buxus wallichianaBaillon	Boxwood/ Shamshad	2,500-3,000
Cedrus deodara G. Don.	Deodar/ Cedar	2,000-3,000
Cornus capitata Wall.	Dogwood	1,800-2,800
Corylus jacquemontiiDecne.	Hazelnut/ Bhutibadam	2,500-3,200

Cupressus torulosaD.Don.	Pencil cedar	1,800-3,000
Ilex dipyrena Wall.	Holly/ Kaluchha	2,000-2,800

Shrubs

Species	Altitude (m)
Aconitum heterophyllum Wall. ex Royle	3,300-4,200
Atropa acuminata Royle	1,500-3,000
Dactylorhizahatageria (D. Don.) Soo	2,800-4,000
Jurineamacrocephala (DC.) Benth.	3,000-4,300
Meconopsis aculeate Royle	3000-4,300
PicrorhizakurroaRoyle ex Benth.	3,200-4,200
SaussureagossipiphoraD.Don	3,800-4,500
Angelica glauca Edgew.	2,000-2,800
Arnebiabenthami (Wall. ex G. Don) I. M. Johnston	3,300-4,000
Arnebiaeuchroma (Royle) Johnston	3,500-4,400
Berberis aristata DC.	1,200-1,500
Betula utilis D.Don.	3,300-4,000
Dioscoreadeltoidea Wall.	2,000-3,000
Fritillaria roylei Hook.	2,800-4,000
Malaxismuscifera Lind.	2,000-3,000
Nardostachys grandiflora DC.	3,600-4,300
Paris polyphylla Smith	2,000-3,000
Podophyllum hexandrumRoyle	2,400-4,000
PolygonatumcirrhifoliumRoyle	1,500-3,000
Polygonatummultiflorum (L.) All	2,500-3,500
Polygonatumverticillatum (L.) All.	1,500-3,300
Saussureaobvallata (DC.) Edgew.	3,600-4,500
Taxus wallichianaZucc.	2,100-3,300
Zanthoxylum armatum DC.	1,200-1,800
Aconitum violaceum Jacq. ex Stapf	3,300-4,200
Ephedra gerardiana Wall. ex Stapf.	3,300-4,500
Hypericum perforatum L.	2,000-3,000
Juniperus communis L.	2,800-4,000

Rheum australe D. Don	3,000-4,200
Rheum webbianumRoyle	3,000-4,000
Roscoea alpine Royle	2,400-3,500
Roscoeaprocera Wall. ex Bak.	2,000-3,000
Selinumconnifolium	2,500-3,500
Selinumvaginatum Clarke	2,500-3,500
SkimmialaureolaSieb. &Zucc.	2,200-3,200
Symplocospaniculata (Thumb.) Miq.	1,500-2,500

Fauna

Common Name	Scientific Name
Asiatic Black Bear	*Ursus thibetanus*
Blue Sheep	*Pseudoisnayaur*
Common Leopard	*Panthera pardus*
Himalayan Brown Bear	*Ursus arctos*
Himalayan Ghoral	*Naemorhedus goral*
Himalayan Musk Deer	*Moschus chrysogaster*
Himalayan Tahr	*Hemitragusjemlahicus*
Red Fox	*Vulpes vulpes*
Serow	*Nemorhaedussumtraensis*
Snow Leopard	*Uncia uncia*

Birds

Little Forktail, Tirthan Valley
Crested Kingfisher, Tirthan Valley (2,700 m)
Blue Whistling Thrush, Sainj 2,000 m
Western Tragopan Male
Monal Male
Koklash Pheasant (Male)
White-crested Kaleej

Insects

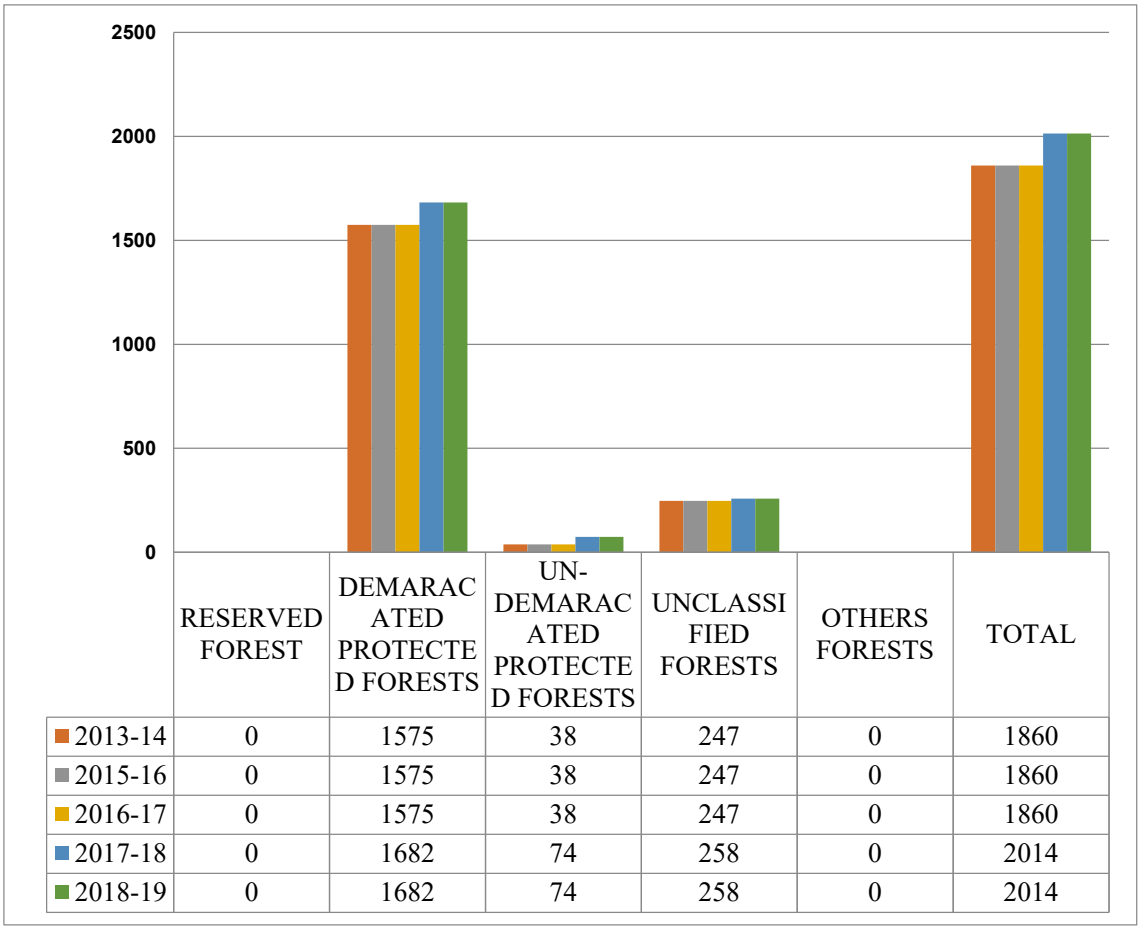
Blue Pansy, Junoniaoenone
The Paris Peacock, Papilioparis

Table showing Classification of Forest Area (in sqkm) of District Mandi

YEAR	RESERVED FOREST	DEMARCATED PROTECTED FORESTS	UN-DEMARCATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL
2013-14	…	1575	38	247	…	1860

2015-16	…	1575	38	247	…	1860
2016-17	…	1575	38	247	…	1860
2017-18	…	1682	74	258	…	2014
2018-19	...	1682	74	258	...	2014

Source: Forest Department, HP



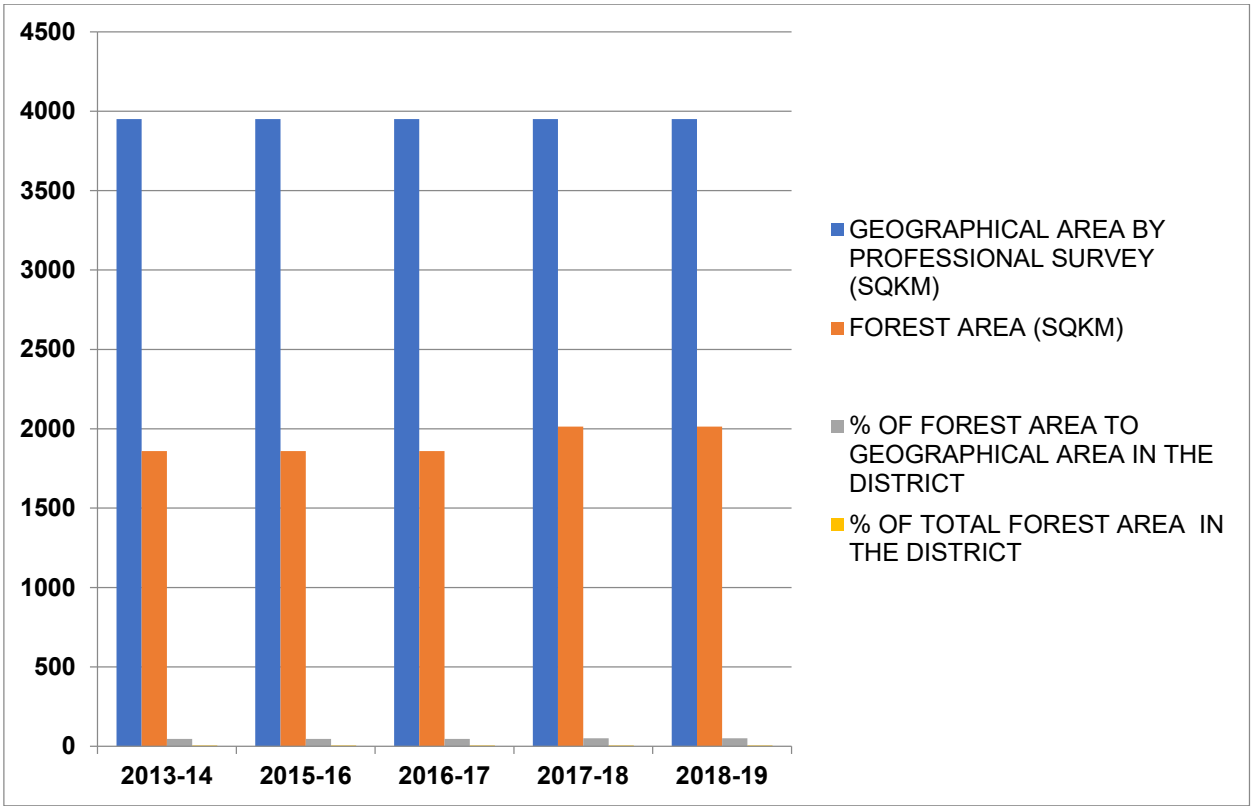
	RESERVED FOREST	DEMARACATED PROTECTED FORESTS	UN-DEMARACATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL
2013-14	0	1575	38	247	0	1860
2015-16	0	1575	38	247	0	1860
2016-17	0	1575	38	247	0	1860
2017-18	0	1682	74	258	0	2014
2018-19	0	1682	74	258	0	2014

Table showing Forest Area of District Mandi

YEAR	GEOGRAPHICAL AREA BY PROFESSIONAL SURVEY (SQKM)	FOREST AREA (SQKM)	% OF FOREST AREA TO GEOGRAPHICAL AREA IN THE DISTRICT	% OF TOTAL FOREST AREA IN THE DISTRICT
2013-14	3950	1860	47.1	5
2015-16	3950	1860	47.1	5
2016-17	3950	1860	47.1	5

2017-18	3950	2014	50.99	5.31
2018-19	3950	2014	50.99	5.31

Source: Forest Department, HP



7. SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT

7.1 Surface Water

The Beas and Satluj rivers form the major drainage system in the district. The river Beas and its tributaries, drain about 70% of the district area in the northern part, whereas the area in the south is drained by the river Satluj(30%). Suketi khad and its tributaries, chiefly drain Balh Valley. The Suketi khad maintains a perennial flow, because of effluent seepage from groundwater. The Annun khad and Chainra khad are the major tributaries of the Staluj River in the district. In northern India, the main drinking water source direct or indirect comes from rivers only but as human activities are profoundly increased a systematic and scientific utilization of the system is very important.

7.2.1 MAJOR RIVERS OF DISTRICT

7.2.1.1 River Beas:

The Beas River rises in the Himalayas in central Himachal Pradesh, India, and flows for some 470 kilometres (290 mi) to the Sutlej River in the Indian state of Punjab. Its total length is 470 kilometres (290 mi) and its drainage basin is 20,303 square kilometres (7,839 sq mi) large. The river rises 4,361 metres (14,308 ft) above sea level on the southern face of Rohtang Pass in Kullu district. It traverses the Mandi District and enters the Kangra District at Sandhol, 590 metres (1,940 ft) above sea level. During its lower course, the Beas is crossed by numerous ferries, many of which consist of inflated skins (darais).

Near Reh in Kangra District it divides into three channels, which reunite after passing Mirthal, 300 metres (980 ft) above sea level. On meeting the Sivalik Hills in Hoshiarpur, the river sweeps sharply northward, forming the boundary with Kangra District. Then bending around the base of the Sivalik Hills, it takes the southerly direction, separating the districts of Gurdaspur and Hoshiapur. After touching the Jullundur district for a short distance, the river forms the boundary between Amritsar and Kapurthala. Finally, the Beas joins the river Sutlej at the south-western boundary of Kapurthala district of Punjab after a total course of 470 kilometres (290 mi). The chief tributaries are Bain, Banganga, Luni and Uhal. The Sutlej continues into Pakistani Punjab and joins the Chenab River at Uch near Bahawalpur to form the Panjnad River; the latter in turn joins the Indus River at Mithankot. The waters of the Beas and Sutlej rivers are allocated to India under the Indus Waters Treaty between India and Pakistan.

The Beas River enters the district from the eastern side near the village Largi where the Sainj and Tirthan streams Join it and flow to the north-western direction. The river beas leaves the district in the western part near the village of Sandhol and enters the Harpur district. Some mall streams like Uhal, Rana Khad, Luni Khad, Binno Khad and many small streams join the river beas in the district.

7.2.1.2 Satluj River

Satluj or Sutlej river rises from beyond Indian borders on the Southern slopes of the Kailash mountain near Mansarover lake from Rakas lake, as Longcchen Khabab river (in Tibet). It is the largest among the five rivers of Himachal Pradesh. It enters Himachal at Shipki (altitude = 6,608 metres) and flows in the South-Westerly direction through Kinnaur, Shimla, Kullu, Solan, Mandi and Bilaspur districts. Its course in Himachal Pradesh is 320 km. from Rakastal, with famous tributaries viz. the Spiti, the Ropa, the Taiti, the Kashang, the Mulgaon, the Yula, the Wanger, the Throng and the Rupi as right bank tributaries, whereas the Tirung, the Gayathing, the Baspa, the Duling and the Soldang are left bank tributaries. It leaves Himachal Pradesh to enter the plains of Punjab at Bhakhra, where the world's highest gravity dam has been constructed on this river. Its total catchment area in Himachal Pradesh is 20,000 sq. km

The river Satluj forms the southern boundary and separates it from the Shimla and Solan districts. The river Satluj enters in the Mandi district near the village Firnu near the Rampur area and flows towards the south-west direction. It leaves the district near Dehar and enters into the Bilaspur district, Behna, Ropri Bagri, Chanod and Alsed are the important streams that fall into the Satluj from the Northern direction of the district.

7.2.1.3 Suketi Khad

The Suketi River (which is a major tributary of the river Beas) is a small basin in the district Mandi. The Suketi River Basin is drained by the Suketi River and its numerous tributaries, the main among these are Umli Khar Jatla Nallah, Bonyat Nallah, Gambhar Khad, Bhadyal Nallah, Gagal Nallah and Chadyam Nallah etc. Most of the tributaries of the Suketi Valley rise from the permanent glacier melt water and the Perennial Spring of the Valley receives a considerable amount of water throughout the year.

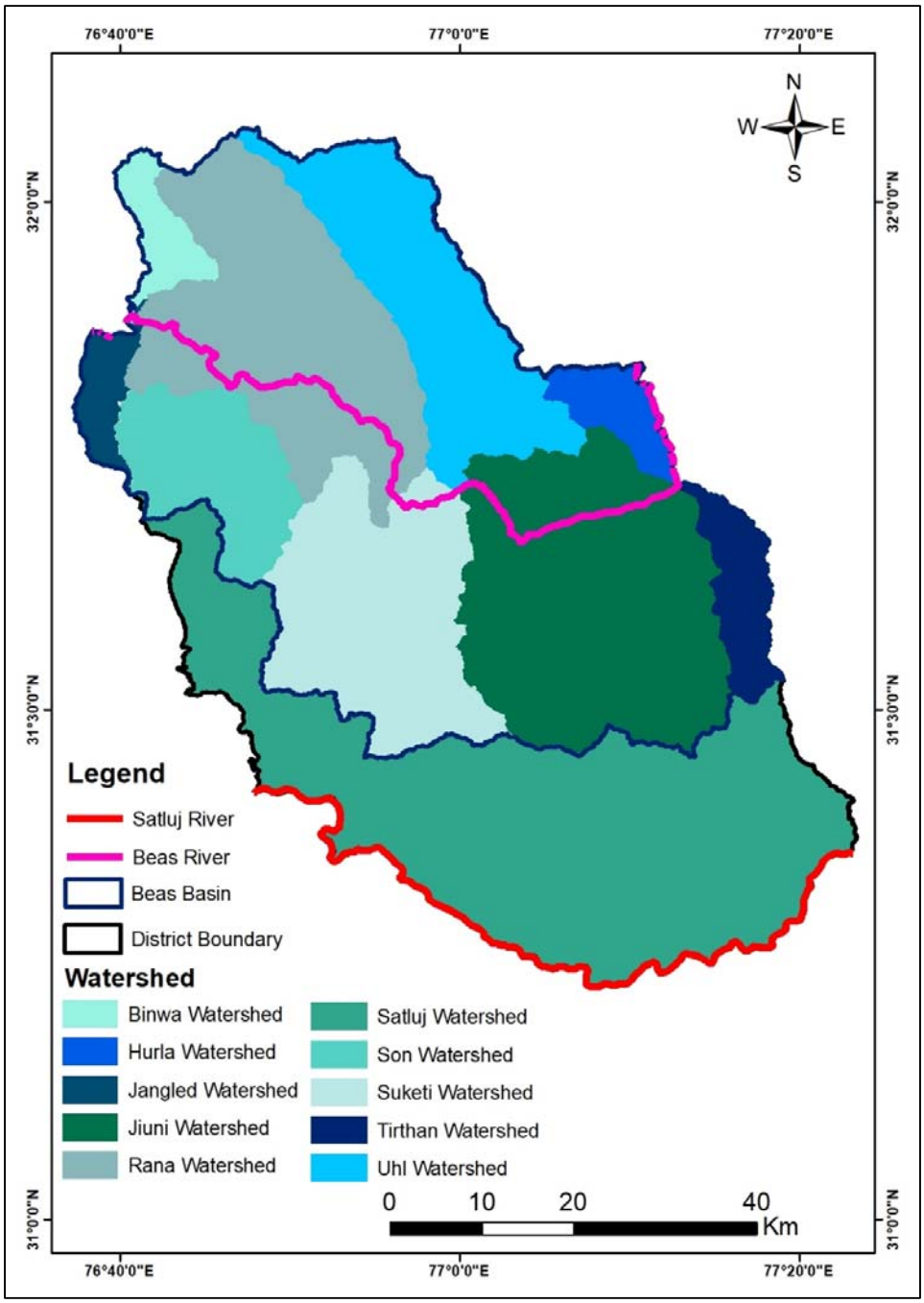


Figure showing watershed and drainage system in the district

7.2 Groundwater

The district being hilly & mountainous, traditional sources of ground water mainly springs have played a major role in past in providing assured irrigation and water supply. These include the nallas, springs, Chasmas, khatis. In some of the areas, at present too, these are the only sources of water for the settlements. However, modern means for tapping the groundwater have been employed in recent years.

Hydrogeological, the district is divided into two distinct and well-defined units viz. porous formations constituted by unconsolidated sediments and the fissured formations or hard rock formations constituted mainly by semi-consolidated to consolidated rock.

The fissured formations include the semi-consolidated to consolidated (hard) rocks exposed in the district and are of sedimentary, metamorphic and igneous origin. These form low and high hill ranges throughout the district. Fractured and jointed sandstone, and siltstone forms low-potential aquifers in the area. In general weathered and fractured hard rocks are favorable for groundwater aquifers. Fracture zones and contact zones form the important aquifers in the topographic low areas, with poor to moderate yields. These fracture or fault zones form potential groundwater zones. Groundwater in these hilly areas oozes in the form of seepages, and springs and is utilized for domestic and other uses. At places, shallow boreholes fitted with hand pumps have been constructed to develop groundwater.

The unconsolidated sediments comprising fluvial, channel deposits, valley fills and terrace deposits and alluvial fans constitute the porous aquifers in the district. These sediments consist of sand, gravel, cobbles, pebbles and boulders interlayered with clay beds. These sediments form prolific aquifers.

Rainfall is the major source of groundwater recharge, apart from the influent seepage from the rivers, irrigated fields and inflow from upland areas, whereas discharge from groundwater mainly takes place through wells and tube wells; effluent seepages of groundwater in the form of springs and base flow in streams etc.

8. RAINFALL OF THE DISTRICT AND CLIMATIC CONDITION

The climate of the district is sub-tropical in the valleys and tends to be temperate near the hilltops. In the higher region, the climate remains cold throughout the year. In winter snow often comes down to 1300 m amsl. Normally, it starts melting from the end of March from places lying below 3300 m. In summer, the whole of Balh Valley and other low altitudes are quite hot. The winter starts in the middle of November and continues till the middle of March. Thereafter, the mercury continues to rise till the onset of the monsoon, which starts from the last week of June or early July and continues till the middle of September. During October and November, the nights are pleasant, whereas the days are a little bit hot. The average minimum and maximum temperature in the district varies from 3° C to 35° C. The district receives precipitation in the form of rainfall, mainly during the monsoon period from July to September. The average annual rainfall in the district is about 1331.50 mm. Annual average rainfall from place to place in the district is highly variable and ranges from 700 to more than 2000 mm at Jogindernagar. During winters snowfall often occurs down to the elevation of 1300m amsl

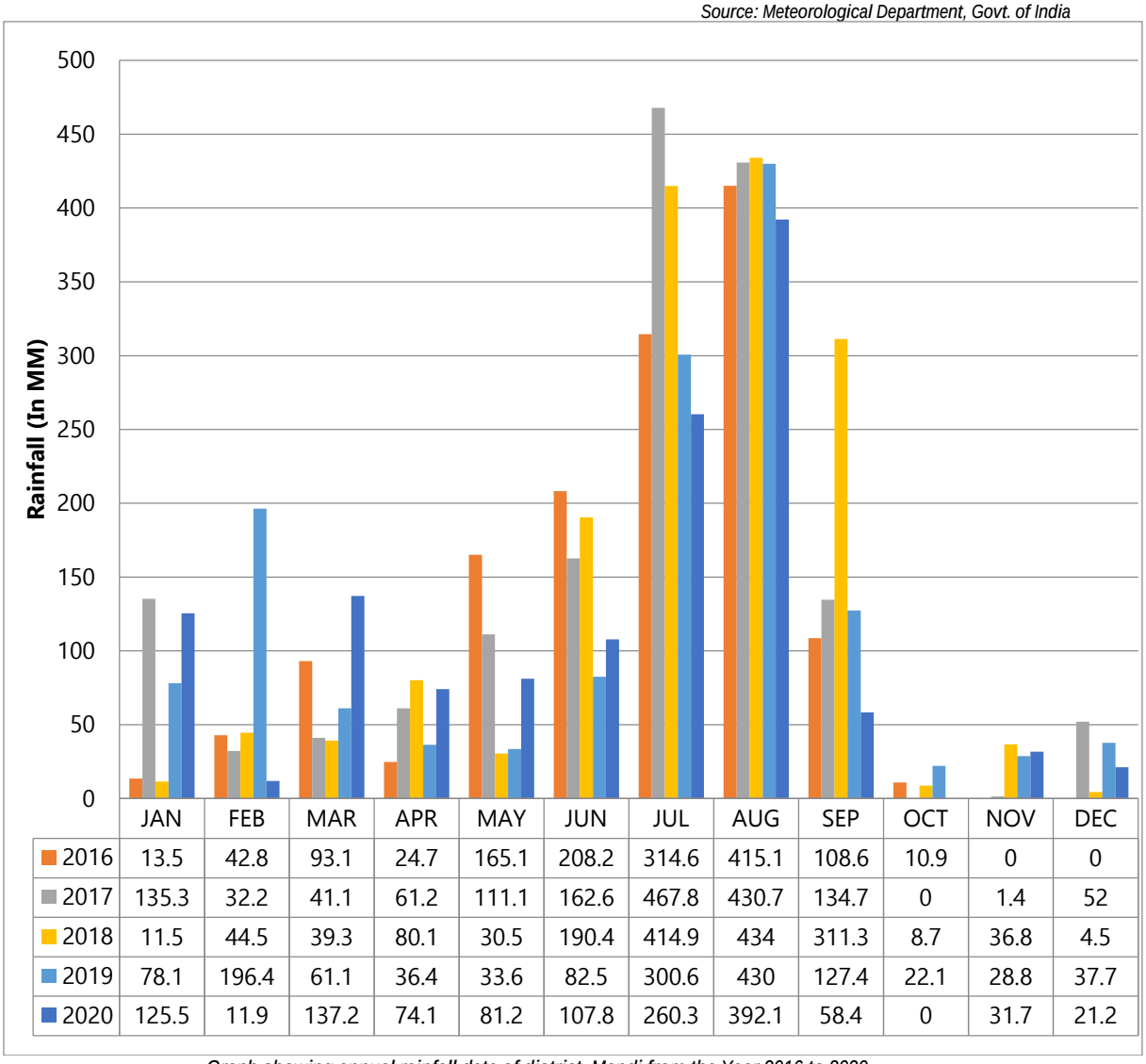
Rainfall varies significantly with the altitude of the area. The catchment area receives rainfall due to western disturbances that pass over the northwestern part of the country during the winter months. Significant precipitation in the form of snow is received at higher altitudes and rainfall in valleys is received during the winter month. The rainy season generally starts in mid-July and extends up to mid-September. During winter the rains are scarce and extend from 15th December to 15th February. The following Table shows the quantum of rainfall from the year 2016 to 2020 in the district as per IMD.

Table showing rainfall data in millimetres of district Mandi

MANDI DISTRICT RAINFALL IN MILLIMETERS (R/F)												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	RAINFALL (in mm)											
2016	13.5	42.8	93.1	24.7	165.1	208.2	314.6	415.1	108.6	10.9	0	0
2017	135.3	32.2	41.1	61.2	111.1	162.6	467.8	430.7	134.7	0	1.4	52

2018	11.5	44.5	39.3	80.1	30.5	190.4	414.9	434	311.3	8.7	36.8	4.5
2019	78.1	196.4	61.1	36.4	33.6	82.5	300.6	430	127.4	22.1	28.8	37.7
2020	125.5	11.9	137.2	74.1	81.2	107.8	260.3	392.1	58.4	0	31.7	21.2

Source: Meteorological Department, Govt. of India



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2016	13.5	42.8	93.1	24.7	165.1	208.2	314.6	415.1	108.6	10.9	0	0
2017	135.3	32.2	41.1	61.2	111.1	162.6	467.8	430.7	134.7	0	1.4	52
2018	11.5	44.5	39.3	80.1	30.5	190.4	414.9	434	311.3	8.7	36.8	4.5
2019	78.1	196.4	61.1	36.4	33.6	82.5	300.6	430	127.4	22.1	28.8	37.7
2020	125.5	11.9	137.2	74.1	81.2	107.8	260.3	392.1	58.4	0	31.7	21.2

Graph showing annual rainfall data of district Mandi from the Year 2016 to 2020

9. DETAILS OF THE MINING LEASES IN THE DISTRICT

Sr. No.	Name of the Mineral	Name of the Leases	Address & Contact No. of Lessee	Area of Mining Lease	Captive / Non Captive	Method of mining (Open cast/ under ground)	Total 5 years Production (In MT)

1	Pulverized Sand	Om Chand S/o Sh. Govind Ram,	Village- Sari, PO- Majhwar, Tehsil Sadar, Distt. Mandi H.P	7-4-1 Bighas	Non Captive	Open Cast	83073
2	Pulverized Sand	Sh. Yog Raj, S/o Sh Chet Ram,	Village- Rakhoon, PO- Kotmoras, Tehsil Sadar, District Mandi H.P.	04-10-10 Bighas	Non Captive	Open Cast	52318
3	Rock Salt	General Manager M/s Hindustan Salt Ltd. A Govt. of India Enterprises.	Village Bhatog PO- Drang, Tehsil Sadar Distt. MandiH.P.	100-07-16 Bighas	Non Captive	Underground	0
4	Pulverized Sand	Sh. Subhash Chand S/o Sh. Bhikam Ram,	Village Sambal PO Pandoh Tehsil Sadar Distt. Mandi H.P.	08-10-02 Bighas	Non Captive	Open Cast	90000
5	Pulverized Sand	Sh. Vijay Kumar Desh RaJ & Sh. Yadvinder Kumar	Village Padhar PO- Majhwar Tehsil Sadar Distt. Mandi H.P.	27-11-06 Bighas	Non Captive	Open Cast	155000
6	Pulverized Sand	Sh. Deepak Pathania,	Village- Nasel, PO- Dudar, Tehsil Sadar, Distt. Mandi H.P.	06-08-14 Bighas	Non Captive	Open Cast	61582
7	Stone	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO- Galama, Tehsil Balh, Distt. Mandi H.P.	07-05-12 Bighas	Non Captive	Open Cast	48216
8	Stone	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO- Galama, Tehsil Balh, Distt. Mandi H.P.	08-05-13 Bighas	Non Captive	Open Cast	88050
9	Pulverized Sand	Sh. Jitender Kapoor S/o Sh. Subhas	Village- Dadanu, PO- Sidhyani,	03-19-07 Bighas	Non Captive	Open Cast	37936

		Chand Kapoor,	Tehsil –Balh, Distt. Mandi H.P.				
10	Stone	Sh. Muni Lal S/o Late Sh. Jagesher Ram,	Village & PO- Kathyaun, Teshil- Balh, Distt. Mandi HP	04-05-16 Bighas	Non Captive	Open Cast	36903
11	Stone	Sh. Vijay Kumar S/o Sh Chint Ram	Vilalge Maggar Padhru PO Baggi Tehsil Balh Distt. Mandi H.P.	12-00-14 Bighas	Non Captive	Open Cast	72370
12	Stone	Sh. Shiv Dayal S/o Sh. Dila Ram	Village Tarwai P.O. Gurkotha Tehsil Sadar, Distt. Mandi, H.P.	8-17-17 Bighas	Non Captive	Open Cast	45000
13	Stone	Sh. Soyab Akhtar, Sh.Mohamma d Shoyab Akhtar,	Village- Dinak, PO- Kanaid, Tehsil Sundernagar District Mandi (H.P.)	11-11-14 Bighas	Non Captive	Open Cast	128290
14	Stone	Sh. Sandeep Kumar S/o Sh.Kuram Chand,	Village Manjeholi, P.O. Rieur, Tehsil Sadar, Distt. Mandi, H.P.	12-15-16 Bighas	Non Captive	Open Cast	26750
15	Stone	Sh. Gangvir alias Ganga Ram, S/o Late Sh. Sant Ram, Prop: M/s Baba Balak Nath Stone Crusehr & Sh Kishan Chand, S/o Late Sh. Rattan Chand, Prop. M/s Sheetla Stone Crusher,	Village Dadaur, PO- Dhaban, Tehsil Sadar, Distt. Mandi H.P.	08-03-18 Bighas	Non Captive	Open Cast	68867
16	Stone	Sh. Santosh Kumar S/o Sh. Tulsi Ram,	Village Dhar, Post Office Darpa, Tehsil	1-12-23 Hect.ar e	Non Captive	Open Cast	112510

			Sarkaghat, Distt. Mandi, H.P. M/s Negi Stone				
17	Stone	Smt. Ruma Devi W/o Sh. Ramesh Chand,	Village Parchoo, P.O. Sajaopiplu, Tehsil Sarkaghat, Distt. Mandi, H.P.Prop. Ruma Stone Crusher	2-00-00 Hectare	Non Captive	Open Cast	202000
18	Stone	Sh. Abhishek Thakur, Anshul Thakur, Sons of Sh. Roop Singh Thakur & Sh. Vihsal Sen,	M/s R.B Traders, Destination The Mall, Lalit Chowk, Sunderngar, District Mandi H.P.	10-03-05 Bighas	Non Captive	Open Cast	184090
19	Stone	Sh. Amar Singh Thakur, Prop. M/s Ghangal Stone Crusher,	Village & PO- Kalahod, Tehsil Sundernagar , Distt. Mandi H.P.	05-00-01 Bighas	Non Captive	Open Cast	207000
20	Sand Stone	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO- Maloh, Tehsil Sundernagar Distt Mandi HP.	19-19-05 Bighas	Non Captive	Open Cast	79500
21	Stone	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO- Maloh, Tehsil Sundernagar Distt Mandi HP.	8-10-00 Bighas	Non Captive	Open Cast	38000
22	Stone	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO- Maloh, Tehsil Sundernagar Distt Mandi HP.	07-00-00 Bighas	Non Captive	Open Cast	21000

23	Sand, Stone and Bajri	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar , Distt Mandi H.P.	05-12-01 Bighas	Non Captive	Open Cast	46125
24	Sand, Stone and Bajri	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar , Distt Mandi H.P.	06-11-05 Bighas	Non Captive	Open Cast	66475
25	Sand Stone (Free Sale)	Smt. Dromti Devi, W/o Sh. Man Singh,	Village-Banshodha, PO-Bagsaid, Tehsil-Thunag, Distt. Mandi H.P.	10-07-02 Bighas	Non Captive	Open Cast	35700
26	Slate	Mohan Singh S/o Sh. Hari Singh,	VPO Bagsaid, Tehsil Thunag Distt. Mandi H.P.	04-04-01 Bighas	Non Captive	Open Cast	11250
27	Slate	Sh. Amar Singh S/o Sh. Keshav Ram	Village Bhajnar PO Jarol Tehsil Thunag Distt Manid H.P.	02-19-09 Bighas	Non Captive	Open Cast	3750
28	Stone	Sh. Indresh Sharma S/o Sh. Gopal Sharma,	Village Taraur, P.O. Shaigali, Tehsil Chachyot, Distt. Mandi, H.P.	9-16-08 Bighas	Non Captive	Open Cast	81476
29	Stone	Sh. Sitender Kumar S/o Late Sh. Lal Singh authorized signatoury-cum pratner M/s L.N. Stone Crusher,	Village Khalwan, PO Thachi, Tehsl Bali Chowki Distt. Mandi H.P.	6-18-12 Bighas	Non Captive	Open Cast	90055
30	Sand	Sh. Vijay Kumar & Sh. Ravinder	Village-Kasan, PO-Sianj, Tehsil-	28-11-03 Bighas	Non Captive	Open Cast	265000

		Rana, Partners of M/s Sianj Valley Sand & Stone Crusher,	Chachyot, Distt. Mandi H.P.				
31	Sand	Sh. Thakar Dass S/o Sh. Uttam Chand & Sh. Bhisham Kumar S/o Sh. Devinder Nath, Partners of M/s Bala Tikka Associates,	Village Sakohar, PO- Movi Seri, Tehsil Chachyot, Distt. Mandi H.P.	07-00-03 Bighas	Non Captive	Open Cast	77787
32	Sand	Sh. Ram Singh Saini, S/o Sh. Mangal Ram,	Vilalge-Sayanh, PO-Lohara, Tehsil- Balh, Distt. Mandi H.P.	12-17-05 Bighas	Non Captive	Open Cast	35325
33	Cut Stone	Sh. Rajeev Kumar S/o Sh. Kundan Lal,	Village & PO-Sukki Tehsil Chachyot Distt. Mandi H.P.	03-14-10 Bighas	Non Captive	Open Cast	10048
34	Slate	Sh. Beli Ram S/o Tholu Ram,	VPO & Tehsil Sainj Distt. Kullu, H.P.	02-03-12 Bighas	Non Captive	Open Cast	10048
35	Slate	Sh. Mani Ram, S/o Sh. Bhime Ram,	VPO-Shehnu, Tehsil Balichowki, Distt. Mandi H.P.	04-16-06 Bighas	Non Captive	Open Cast	12432
36	Stone	Chuni lal & Mohinder Pal, M/s Verma Stone Crusher,	Village & PO Kumarsain Tehsil Kumarsain Distt. Mandi H.P.	36-00-16- Bighas	Non Captive	Open Cast	101000
37	Sand Stone Bajri	Sh. Kuldeep Mehta, S/o Sh. Dwarka Dass Mehta,	Village-Firnoo, PO-Sarahan, Tehsil Karsog, Distt. Mandi H.P.	04-18-11 Bigha	Non Captive	Open Cast	108725

38	Sand stone	Smt.Kaushalya Devi, W/o Sh. Hima Ram,	Village-Khanoch, Parlog, PO-Ogli, Bya Basantpur, Tehsil-Sunni, Distt. Shimla H.P.	08-17-10 Bighas	Non Captive	Open Cast	56124
39	Stone	Sh. Puran Dass Mahant Prop M/s Kamaksha Stone Crusher	Village and PO Hurla Tehsl Bhunter Distt. Mandi H.P.	10-0-00 Bighas	Non Captive	Open Cast	0
40	Sand	Hem Singh S/o Sh. Tula Ram	Village-Malgi, PO Pandoha, Tehsil Sunni, Distt. Mandi H.P.	06-14-16 Bighas	Non Captive	Open Cast	29764

10. DETAILS OF ROYALTY OR REVENUE RECEIVED IN LAST FOUR YEARS

Detail of Revenue Collected by Mining Office Mandi H.P. in Last 04 Years.

Sr. No.	Financial Year	Revenue collected Offline (In Rs)	Revenue Collected Online (In Rs)	Total Revenue Collected (In Rs)
1	2020-21	56763981	24062120	80826101/-
2	2021-22	12879017	42970740	55849757/-
3	2022-23	51996827	49088240	101085067/-
4	2023-24	27860828	21814720	49675548/-

11. DETAILS OF PRODUCTION OF MINOR MINERAL IN LAST FOUR YEARS

Mineral	2019-20	2020-21	2021-22	2022-23
aggregate	321808	4259.5	46593	94242
Clay/ Muck	80255	634168.6	0	0
Bajri	82628	94820	199547	171623.155
Sand	26500	55278	56533	93448
Rough stone	81553.8	96036.3	340529	285298
Building stone	12608	12781	18872.66	15979
Slate	990	1060	526	1127

12. MINERAL MAP OF THE DISTRICT:

Limestone

Limestone is a calcareous sedimentary rock composed of the mineral calcite (CaCO3) which upon calcination yields lime (CaO) for commercial use. Cement and Iron & Steel industries are the major consumers of limestone. It is also consumed in chemical industries like calcium carbide, bleaching powder, soda ash, precipitated calcium carbonate, etc. Besides, it is used as fluxing material in Ferro-alloys, pelletization plants, foundries and in the production of sponges from iron, as refining materials in the production of sugar; as an additive in the glass industry; as a coating material in the fertilizers industry etc.

Details of Limestone Reserve (In Million tonnes)				
District	Proved	Probable	Possible	Total
Mandi	500	20	600	1120

Alsindi Limestone Deposit:

Cement grade limestone belonging to the Sorgharwari Formation of the Shali Group occurs between Alsindi (31^0 17' 45': 77^0 07'45") in Mandi district in the west and Jaunrog (31^0 18'00": $77^0$20'30") in Shimla district in the east. The limestone was investigated along a strike length of 15 km by the Geological Survey of India. The estimated reserves are of the order of 550 million tonnes. The limestone has been investigated by the Geological Wing, Department of Industries and has proven about 200 million tonnes of limestone in approximately 1.5 Sq Km of area. It is pink to grey in colour and contains thin shale partings. The limestone contains CaO varying from 44.40 to 52.00% and MgO trace to 9.80%.

It is situated at a distance of about 70 Km from Shimla (State Capital) on Shimla- Basantpur – Tattapani-Karsog State Highway No 13. The area forms part of the Lesser Himalayas and shows typical mountainous topography. Physiographically, the area is bounded in the east and southeast by Badeog Dhar and in the south by Rista-Ki-Dhar. The terrain ranges in height between 1200 metres to 1992 metres above mean sea level. The drainage pattern is mostly dendritic. The limestone deposits of the area belong to the Sorgharwari Formation of the Shali Group which is fine-grained, dense, homogeneous and exhibit conchoidal to subconcoidel fractures. The colour varies from pink to grey. The pink limestone at places contains purple to green shale partings.

Group	Formation	Lithology	Thickness (In Metres)
Shali	Bandla	Green and purple coloured shale, slate, siltstone, sporadic earthy limestone, thin-bedded orthoquartzite and a fairly persistent band of white quartzarenite at the base.	250
	Parnali	Cherty dolomite, grey limestone and white quartzarenite.	700
	Makri	Grey, green, black and purple shales and slates, thinly bedded limestone, and thinly bedded quartzarenite with or without dolomite.	180
	Tattapani	Cherty dolomite, grey and pink in colour with grey phyllitesed shales.	610
	Sorgharwari	Pink and grey cream textured limestone with shale partings.	460
	Khatpul	Massive dolomite with sporadic quartzarenite, and a thin red shale band at the base.	300
	Khaira	Mainly pink and purple, as well as white quartzarenite.	380
	Ropri	Brick red shale and siltstone with grey dolomite in the lower horizon; local development of salt, salt grit and the marly lithocomplex “Lokhan”	400

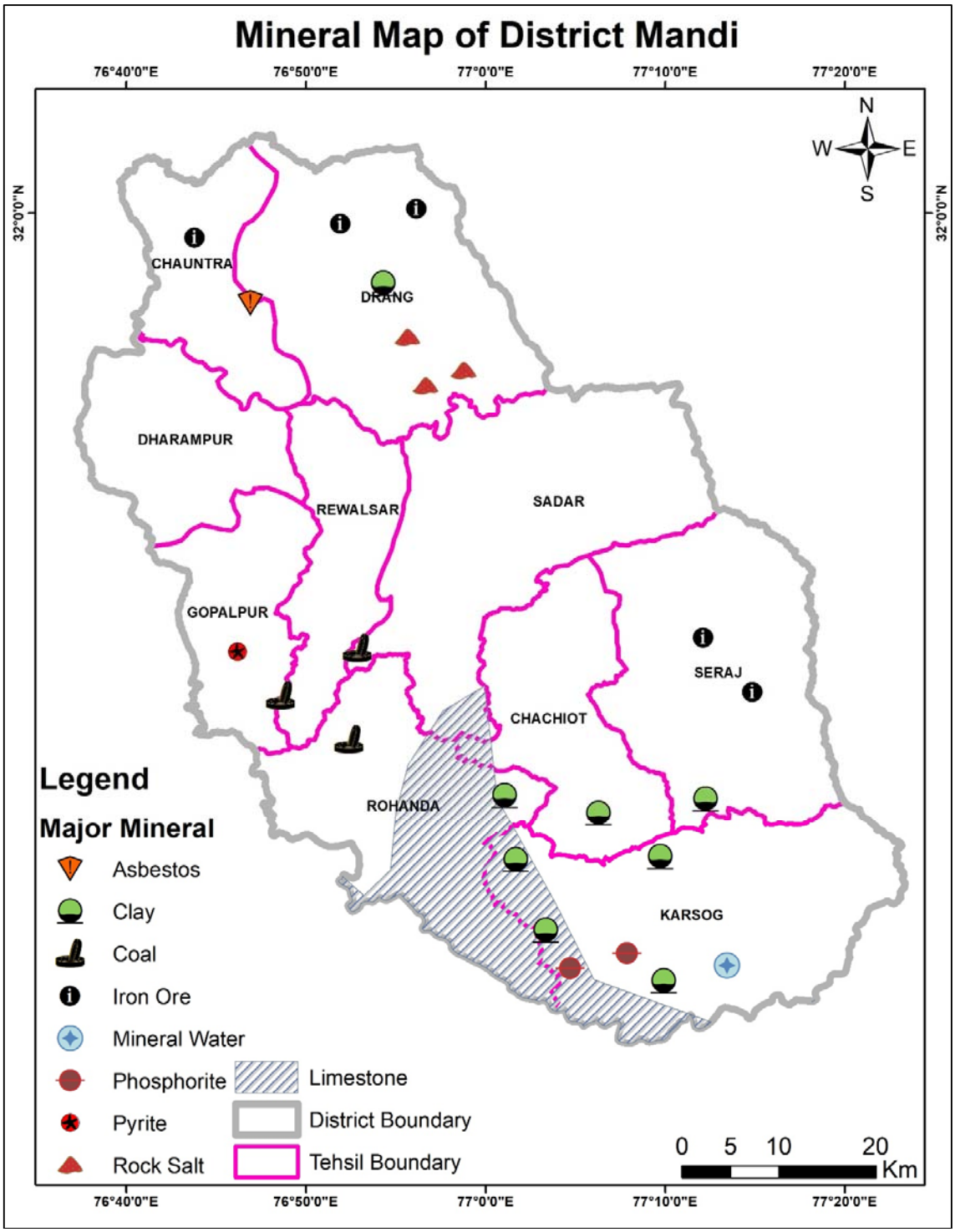


Image showing Mineral map of District Mandi

Rock Salt

The rock salt occurs in Guma (31° 58':76°51') and Drang (31° 46': 76° 56') areas. The total reserves of rock salt are about 75 million tonnes. Chemical analysis indicates on average insoluble impurities at 21%, KCL at 3 % NaCl at about 70.40% and the rest consisting of CaO, CaSO4and MgO. Detailed geological work and drilling have been carried out to assess the grade and reserves. Drilling data shows that except for minor intercalation of non-productive beds(clay, quartzite, etc.), the cores are composed of salt throughout the area investigated. Chemical analyses show that the average salt content is over 70% and with depth no regular change in the salt content is indicated. Besides Drang, saline grits occur intermittently in discontinuous patches over a linear distance of 18 kms northwest of Mandi The

important occurrences of this salt grit are; Megal (31°45': 76°57'), Drang, 9310 480 20"; 760 570 00") Herkalan (31° 56': 76° 52'), Guma (31° 56': 76° 51'), Dewalkhas (32° 05': 76° 40')and Kandbad (32° 071: 75° 35').

Drang -Gumma Rock Salt deposit

Rock Salt has been extracted for a long in Mandi Hills at two locations namely Drang and Gumma. These mines were transferred to M/s Hindustan Salts Ltd. in 1963, after acquiring these from the erstwhile Mandi State by Govt. of India. Mandi Salt belt extends from Mandi to Jogindernagar and even further but three places viz. Megal, Drang and Gumma where Salt is known to occur, lie along N.H.-20. Drang is at a distance of about 40 Kms from Jogindernagar and about 17 kms. ahead of Mandi. The geographical location of Drang which is included in Topo-Sheet No. 53A/13 is as follows:

Latitude 31^0 48' 20"

Longitude 76^0 57' 00"

Drang can be approached from Pathankot by the National Highway, connecting Pathankot with Mandi via Shahpur, Palampur, Baijnath and Jogindernagar. Jogindernagar is also connected by a narrow gauge railway with Pathankot.

Physiography

The area forms a transitional zone between the foothills and the lesser Himalayas. The altitude varies from 1000 to 1400 m above M.S.L. The ridges trending in the NW-SE direction are the main topographical features and these are dissected by nallahs which on joining each other form the tributary of river Beas flowing in the NW-SE direction.

Slate

Slate is a fine-grained, hard, compact, cleavable rock derived from microcrystalline metamorphic rocks of clays and shale and possesses a cleavage that permits it to split readily into thin smooth sheets. The thin layers split along the cleavage planes may cut across bedding planes. The metamorphism of shale by pressure produces slates that are characterized by the presence of close-set planes of cleavage along which they can be split easily into thin sheets. The cleavage plane is related to the direction of pressure to which the material was subjected and not to the bedding plane. Slate has emerged as an alternative to granite and marble which are comparatively costly. Slate has the aesthetic value like other dimension stones i.e. granite and marble. Slate is cut and fabricated into dimensional form. Slate is categorized into minor and major minerals in the country depending on its end use. The slate industry has received a boost in recent years due to increased interest in architecture. The export of slate has increased, over the years. The major use of slate in foreign markets is in roofing tile, but other uses as flooring tile and cladding are also picking up.

Occurrences

Himachal Pradesh is known in the country for its good quality of slate, which finds its place in foreign markets also because of its pleasing colour, durability and uniformity in thickness. The art of extraction of slates has been known to the local people of the area for generations. The good quality thick bands of slates occur in Mandi. Slates are confined to Kullu Group, Shimla Formation, Chamba Formation, Jaunsaur Formation & Katargali Formation.

Asbestos

The highly weathered basaltic rocks of Darla volcanics exposed along the right bank of a small nala flowing between Ardhi and Badsar contain very thin fibres of asbestos.

Clays

Clay occurrences in Himachal Pradesh can be broadly classified into (i) lacustrine and fluvial, (ii) residual associated with granite and (iii) associated with the Middle and Upper Siwaliks.

Small irregular pockets and lenses of clay are found within the weathered muscovite granite, tourmaline -muscovite granite, porphyritic granite and pegmatite of Mandi -Karsog granite complex at Mohi (31° 35':76° 55'), Seri Chak (31° 06' 54": 76° 55' 45"), Seul (31° 40' 36": 76° 55' 36"), Saul Khad (31° 40'28': 76° 53J'27"), Dhalar (31° 35' 24": 76° 55' 30"), Batala Beh (31° 15'50": 77° 13'20"), Karsog (31° 23' 00": 77° 12' 00"), Chichot (31° 33' 00": 77°01'00"), Garaich (31° 24'30": 77° 14'45"), Negi Nal (31°26' 00': 77° 11' 00"), Bashaich (31° 26'15": 77° 13' 30"), Phaish (31° 27' 00": 77° 05'15"), Tarai (31° 35'09": 76° 59'56"), Dopha (31° 31' 33": 77° 01' 22"), Nid (31° 32'20"; 77°01'00"), Oangthar (31° 32'37":

77° 06'15'). Seri,(30° 36' 55": 77° 00'06"), Raipri (31° 37' 34": 77° 00' 30'), Burahata (31° 36' 09": 77° 01'59"), Balhari (31°39' 03": 77° 00'45", Pingla (31° 35' 16"; 770 01' 23"), Rakbnun (31° 47' 30": 77° 17'30"), Tarapur (31° 38' 00": 76° 59'37"), Kohlu, Dalikar (31° 37'38" 77° 01'00"), and Rackchui (31° 39'05': 76° 59' 43").

The clay pockets in the above areas range in length from 10 metres to 220 metres and only the clay pocket at Phaish extends for about one kilometre. The width of the clay pockets varies from one metre to 1040 metres. Physical tests of the clay samples from Garaich and Negi Nal have revealed that the clay is suitable for the manufacture of stoneware. The cumulative reserves of clay pockets at Karsog, Chichot, Batala-Beli, Garaich, Negi nal, Bashaich and Phaish have been estimated at 1, 05,330 tonnes. The tentative reserves of the clay pockets at Tarai, Dopha and Nid are of the order of 5, 14,400, 17,172.02 and 17,714 tonnes, respectively. The clay from all the aforementioned pockets is used by the local inhabitants for whitewashing and plastering of their houses.

Coal

A carbonaceous horizon is traceable for about 90 metres near Mansai (31° 34/: 76° 51'). There is another 91 centimetre thick seam traceable for 45m, 750m to the south of the earlier one. A coal seam near Dehar (31° 251: 76° 491) crops out in and near the steep right bank of Sutlej River about 280m upstream of the suspension bridge. The carbonaceous horizon is interbedded with limestone with almost vertical dips. Two carbonaceous seams, 180cm and 90cm thick could be traced for a distance of about 90m. Small discontinuous patches of coal outcrops are noted near Kaphai (31° 32': 76° 51'). An outcrop of coal is seen on the right bank of a small stream about 600m southeast of Arthi (31° 32': 76° 52'). The coal is sheared and stained dull greyish yellow, rusty on the surface.

Gold

A small Quantity of Gold had been reported in the bed of the Satluj river at Jauri (310 19' N -77 002' E). The detailed analysis of the area between Dharampur & Sarkaghat (lying between 310 41' N & 310 52' N -76039' & 76047' E) shows poor concentration of Gold value ranging from less than 20 ppb to 100 ppb. Flakes of Gold are frequently seen in the sediments of the Sun and Alian Khads, particularly between Hukal and Kandewale and the average concentration is < 6 ppb to 20 ppb.

Iron Ore

Magnetite associated with hematite occurs in schist and phyllite in a belt extending intermittently from Rama Bhet (310 3'1: 77006') up to the vicinity of Sangalwaro (31 º 30': 77 º 13'). Sparsely disseminated magnetite and hematite occur around Jhungi (31 º 25': 77 º 06') in the phyllites. Magnetite occurs as disseminated grains in quartzite and as the concentration in thin bands near Kohar Khas (320 06': 760 48'). The iron-bearing quartzites have been traced from about one and a half kilometres north of Baragoran (32º05': 76 º 00') to Multhan (31º 31': 76 º 05,).

Mineral water

Ten springs occur on the right bank of the Satluj river near Tattapani (31° 14: 77° 50'). The temperature of the water is 57°0. The water is strongly sulphurous with a disagreeable saline taste. It contains chloride and sulphate of soda.

13. LIST OF LETTER OF INTENT (LOI) HOLDERS IN THE DISTRICT ALONG WITH ITS VALIDITY

It is submitted that the department grants mineral concessions in two modes, one through auction and another through mining leases. Further, letter of Intent (LoI) are issued to the applicants by the competent authorities only after recommendations of the Joint Inspection Committee which is a continuous process. for completion of other codal formalities, such as, obtaining the Forest Clearence, Environment Clearence and Mining plan etc. In such a manner, the letter of intent get matured for the grant of the mining lease only after the submission of clearances as mentioned in the conditions of letter of Intent (LoI. As such, it is an ongoing process and as soon as the clearances are obtained, the letters of intent are converted into a mining lease. Also, if the letter of intent holder is unable to obtain the required statutory clearances within the validity period of the letter of intent, the period is accordingly extended so

as to enable the letter of intent holder to obtain the required clearances. Hence, as such it shall not be possible to provide the exact details of the letter of intent in this survey document (DSR) as these keep on changing on a day-to-day basis.

Sr. No.	Name of the Leases	Address & Contact No. of Lessee	Mining Lease grant Order No. and date	Area of Mining Lease
1	3	4	5	6
1	Om Chand S/o Sh. Govind Ram,	Village- Sari, PO- Majhwar, Tehsil Sadar, Distt. Mandi H.P	Udyog-Bhu (Khani-4) Laghu-181/2011-4526, dated 06-08-2022	7-4-1 Bighas
2	Sh. Yog Raj, S/o Sh Chet Ram,	Village-Rakhoon, PO-Kotmoras, Tehsil Sadar, District Mandi H.P.	Udyog-Bhu(Khani-4)(Mandi-Online) Laghu-8/2019-3254, dated 02-08-2021	04-10-10 Bighas
3	General Manager M/s Hindustan Salt Ltd. A Govt. of India Enterprises.	Village Bhatog PO-Drang, Tehsil Sadar Distt. MandiH.P.	Udyog-Bhu(Khani-4) Major-300/2011-4667 dated 22-07-2016	100-07-16 Bighas
4	Sh. Subhash Chand S/o Sh. Bhikam Ram,	Village Sambal PO Pandoh Tehsil Sadar Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Mandi-Online) Laghu-10/20197196, dated 18-11-2021	08-10-02 Bighas
5	Sh. Vijay Kumar Desh RaJ & Sh. Yadvinder Kumar	Village Padhar PO-Majhwar Tehsil Sadar Distt. Mandi H.P.		27-11-06 Bighas
6	Sh. Deepak Pathania,	Village- Nasel, PO-Dudar, Tehsil Sadar, Distt. Mandi H.P.	UdyogBhu (Khani-4)Laghu-19/2020-1670, Dated 24-05-2023	06-08-14 Bighas
7	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO-Galama, Tehsil Balh, Distt. Mandi H.P.	Jagdish Kumar S/o (Khani-4) Laghu-110/16-6272 dated 29-09-2018	07-05-12 Bighas
8	Sh. Jagdish Kumar S/o Sh. Sher Singh,	Village Nalwari, PO-Galama, Tehsil Balh, Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-111/2016-101051, dated 06-01-2018	08-05-13 Bighas
9	Sh. Jitender Kapoor S/o Sh. Subhas Chand Kapoor,	Village-Dadanu, PO-Sidhyani, Tehsil –Balh, Distt. Mandi H.P.	Udyog-Bhu (Khani-4)Laghu-182/2023-7338, dated 05-10-2023	03-19-07 Bighas
10	Sh. Muni Lal S/o Late Sh. Jagesher Ram,	Village & PO- Kathyaun, Teshil- Balh, Distt. Mandi HP	Udyog-Bhu (Khani-4) Laghu-13/2017-2887 dated 29-07-2020	04-05-16 Bighas
11	Sh. Vijay Kumar S/o Sh Chint Ram	Vilalge Maggar Padhru PO Baggi Tehsil Balh Distt. Mandi H.P.	Udyog-Bhu (Khani-4)Laghu-122/2014-6976, Dated 11-11-2021	12-00-14 Bighas
12	Sh. Shiv Dayal S/o Sh. Dila Ram	Village Tarwai P.O. Gurkotha Tehsil Sadar, Distt. Mandi, H.P.	Udyog-Bhu (Khani-4) Laghu-406/06-5449, Dated 11-09-2018	8-17-17 Bighas
13	Sh. Soyab Akhtar, Sh.Mohammad Shoyab Akhtar,	Village- Dinak, PO-Kanaid, Tehsil Sundernagar District Mandi (H.P.)	Udyog-Bhu (Khani-4) Laghu-47/2010-9990,dated 19-01-2022	11-11-14 Bighas
14	Sh. Sandeep Kumar S/o Sh.Kuram Chand,	Village Manjeholi, P.O. Rieur, Tehsil Sadar, Distt. Mandi, H.P.	Udyog-Bhu(Khani-4) Laghu-364/2006-8663 Dated 21-12-2021	12-15-16 Bighas

15	Sh. Gangvir alias Ganga Ram, S/o Late Sh. Sant Ram, Prop: M/s Baba Balak Nath Stone Crusehr & Sh Kishan Chand, S/o Late Sh. Rattan Chand, Prop. M/s Sheetla Stone Crusher,	Village Dadaur, PO-Dhaban, Tehsil Sadar, Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-308/08-2479, dated 15-07-2021	08-03-18 Bighas
16	Sh. Santosh Kumar S/o Sh. Tulsi Ram,	Village Dhar, Post Office Darpa, Tehsil Sarkaghat, Distt. Mandi, H.P. M/s Negi Stone	Udyog-Bhu (Khani-4) Laghu-329/08 dated 28-03-2027	1-12-23 Hect.are
17	Smt. Ruma Devi W/o Sh. Ramesh Chand,	Village Parchoo, P.O. Sajaopiplu, Tehsil Sarkaghat, Distt. Mandi, H.P.Prop. Ruma Stone Crusher	Udgyog-Bhu(Khani-4) Laghu-689/05-3113, dated 24-06-2015	2-00-00 Hectare
18	Sh. Abhishek Thakur, Anshul Thakur, Sons of Sh. Roop Singh Thakur & Sh. Vihsal Sen,	M/s R.B Traders, Destination The Mall, Lalit Chowk, Sunderngar, District Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-13/2020-4947, dated 15-09-2021	10-03-05 Bighas
19	Sh. Amar Singh Thakur, Prop. M/s Ghangal Stone Crusher,	Village & PO- Kalahod, Tehsil Sundernagar, Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu (Mandi-On Line)-4/2018-6404, 05-11-2020	05-00-01 Bighas
20	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	Udyog-Bhu(Khani-4) Laghu-10/2014-7528, dated 25-11-2021	19-19-05 Bighas
21	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	Udyog-Bhu(Khani-4)(Mandi-Online) Laghu-18/2020-7739, dated 30-11-2021	8-10-00 Bighas
22	Sh. Netar Singh S/o Sh. Thunthi Ram Alias Chet Ram ,	Village- Bhanwar PO-Maloh, Tehsil Sundernagar Distt Mandi HP.	Udyog-Bhu (Khani-4) Laghu-17/2020-2368, dated 03-06-2022	07-00-00 Bighas
23	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar, Distt Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-37/2007-3087, dated 28-06-2023	05-12-01 Bighas
24	Sh. Dila Ram, S/o Sh. Durga Ram	Village Khanyod PO Khurahal Tehsil Sundernagar, Distt Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-58/2022-3096, dated 28-06-2023	06-11-05 Bighas
25	Smt. Dromti Devi, W/o Sh. Man Singh,	Village- Banshodha, PO-Bagsaid, Tehsil- Thunag, Distt. Mandi H.P.	Udyog-Bhu (Khani-4)Laghu-121/18-1150, dated 06-05-2021	10-07-02 Bighas

26	Mohan Singh S/o Sh. Hari Singh,	VPO Bagsaid, Tehsil Thunag Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-444/06, dated 20-09-2021	04-04-01 Bighas
27	Sh. Amar Singh S/o Sh. Keshav Ram	Village Bhajnar PO Jarol Tehsil Thunag Distt Manid H.P.	Udyog-Bhu (Khani-4) Laghu-404/06-8700 dated 21-12-2021	02-19-09 Bighas
28	Sh. Indresh Sharma S/o Sh. Gopal Sharma,	Village Taraur, P.O. Shaigali, Tehsil Chachyot, Distt. Mandi, H.P.	Udyog-Bhu(Khani-4)Laghu-425/06-7977, dated 20-12-2019	9-16-08 Bighas
29	Sh. Sitender Kumar S/o Late Sh. Lal Singh authorized signatoury-cum pratner M/s L.N. Stone Crusher,	Village Khalwan, PO Thachi, Tehsl Bali Chowki Distt. Mandi H.P.	Udyog-Bhu (Khani-4)Laghu-98/2010-5949, dated 22-09-2018	6-18-12 Bighas
30	Sh. Vijay Kumar & Sh. Ravinder Rana, Partners of M/s Sianj Valley Sand & Stone Crusher,	Village-Kasan, PO-Sianj, Tehsil- Chachyot, Distt. Mandi H.P.	Udyog-Bhu (Khani-4) (Mandi-Online) Laghu-2/2018-6443, dated 05-11-2020	28-11-03 Bighas
31	Sh. Thakar Dass S/o Sh. Uttam Chand & Sh. Bhisham Kumar S/o Sh. Devinder Nath, Partners of M/s Bala Tikka Associates,	Village Sakohar, PO-Movi Seri, Tehsil Chachyot, Distt. Mandi H.P.	Udyog-Bhu(Khani-4) (Mandi-Online)Laghu/20193039, dated 29-07-2021	07-00-03 Bighas
32	Sh. Ram Singh Saini, S/o Sh. Mangal Ram,	Vilalge-Sayanh, PO-Lohara, Tehsil- Balh, Distt. Mandi H.P.	Udyog-Bhu-(Khani-4) Laghu-3/2021-12337, dated 17-03-2023	12-17-05 Bighas
33	Sh. Rajeev Kumar S/o Sh. Kundan Lal,	Village & PO-Sukki Tehsil Chachyot Distt. Mandi H.P.	Udyog-Bhu(Khani-4) Laghu-5/2018-4137, dated 26-07-2023	03-14-10 Bighas
34	Sh. Beli Ram S/o Tholu Ram,	VPO & Tehsil Sainj Distt. Kullu, H.P.	Udyog-Bhu (Khani-4)Laghu -96/2018- 9506 dated 07-01-2022	02-03-12 Bighas
35	Sh. Mani Ram, S/o Sh. Bhime Ram,	VPO- Shehnu, Tehsil Balichowki, Distt. Mandi H.P.	Udyog-Bhu(Khani-4) (Mandi-Online)Laghu/20193039, dated 29-03-2023	04-16-06 Bighas
36	Chuni lal & Mohinder Pal, M/s Verma Stone Crusher,	Village & PO Kumarsain Tehsil Kumarsain Distt. Mandi H.P.	Udyog-Bhu(Khani-4) Laghu-97/2012-7184, dated 18-11-2021	36-00-16-Bighas
37	Sh. Kuldeep Mehta, S/o Sh. Dwarka Dass Mehta,	Village- Firnoo, PO-Sarahan, Tehsil Karsog, Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-97/18-2380. Dated 13-07-2021	04-18-11 Bigha
38	Smt.Kaushalya Devi, W/o Sh. Hima Ram,	Village- Khanoch, Parlog, PO- Ogli, Bya Basantpur, Tehsil- Sunni, Distt. Shimla H.P.	Udyog-Bhu(Khani-4) Laghu-67/17-10943, 27-03-2021	08-17-10 Bighas

39	Sh. Puran Dass Mahant Prop M/S Kamaksha Stone Crusher	Village and PO Hurla Tehsl Bhunter Distt. Mandi H.P.	Udyog-Bhu (Khani-4) Laghu-9/17-7751 Dated 10-12-2019	10-0-00 Bighas
40	Hem Singh S/o Sh. Tula Ram	Village- Malgi, PO Pandoha, Tehsil Sunni, Distt. Mandi H.P.	Udyog-Bhu(Khani-4)Laghu-102/2018-484 dated 18-04-2023	06-14-16 Bighas

14. TOTAL MINERAL RESERVE AVAILABLE IN DISTRICT: -

Mainly three types of Minor mineral constituents like Sand, Stone and Bajri are required for any type of construction apart from other materials like cement and steel. Mandi is the only district in India from where rock salt is extracted. Rock salt is mined in the Gumma and Darang areas of the district.

In earlier times, mud houses/buildings were constructed with the use of mud. However, with the passage of time, new techniques of development activities were started. As such the demand of Minor minerals started on an increasing trend. In order to meet the requirement of raw material for construction, the local residents used to lift sand etc. from the river beds to meet out their bonafide requirement. However, after coming into being "The Himachal Pradesh Minor Mineral Rules 2015", the mining is regulated in accordance with the rules. From the geological report, it appears that there are deposits of various minerals. The important minerals that are available in this district in a commercial scale are River borne Sand, Stone, Hill slope Stone mines (Leases), Slate etc.

At present, based on existing running mining leases of stone/slate (Hill slope) and available Mining plans (40 registered mining leases) mining operations is being carried out to produce stone/slate mining in the district. However, there is potential of stone and slte deposits have been identified in the District.

15. QUALITY /GRADE OF MINERAL AVAILABLE IN THE DISTRICT: -

The rock formations occupying the district range from the pre-Cambrian to the Quaternary period. Hard formations, form hilly and mountainous terrain and mainly comprise of igneous and metamorphic rocks, belonging to the Jutogh, Shali/ Largi and Shimla groups and occupy the major parts of the area in the northern, central and eastern parts. Granites and gneisses are intruded in the meta-sediments of the Shali/Largi and Shimla groups. In the western and southern parts sediments comprising of sandstone, shale, siltstone, conglomerate etc of the Dharamshala/Sabathu group and Siwalik group of Tertiary age are observed. Alluvium, terrace deposits, and fluvial deposits of the Quaternary period occur in the intermontane valleys, viz., Balh Valley, Sarkaghat Valley etc., and constitute an important unit from a groundwater point of view.

The construction grade aggregate materials of good quality of Minor minerals are present in the District. The slate and building materials are also important minerals of the District. As we have assessed Mineral availability of the district is fair and acceptable quality and it has commercial value. The good quality thick bands of slates which is suitable for roofing, paving and fencing purposes occur in Mandi District. The Quartzitic rock and granitic gneiss, granite etc. are extensively quarried for the manufacturing of grit and are used in road metal, fencing blocks, building constructions etc. Granite & Granite Gneiss rocks are normally composed of mainly feldspar, quartz, mild amphibole, pyroxene, olivine, biotite etc. all these physical properties signify its good cementing properties and higher resistance which indicate its suitability for construction stone as the source areas have numerous fractures & joints.

16. USE OF MINERAL

A lot of construction activity in the private & Government sectors is going on. Stone, Bajri(Grit) and Sand are the basic requirements for construction materials and there is a necessity for such activity to flourish so that the requirement of the material can be met locally. Stone Aggregates represent about 80% to 98% of quarry output, most of which is used in road construction, maintenance and repair. Stones are derived from rocks, which form the earth's crust and have no definite shape or chemical combination but are mixtures of two or more minerals. They are strong, durable and decent in appearance. Much of this goes to the production of road metal, to provide a sturdy base for roads. Stone is an essential and more permanent building material in construction than other natural building materials. Based on the type, Stones can be used in buildings for flooring, roofing, masonry paving roads and also as aggregates for concrete.

Only the harder more resilient rocks can be employed for most road surfacing requirements. Apart from road usage, substantial amounts are mixed (coarse gravel-sized stone with finer stone particles or sand) with cement and water to make concrete.

Good deposits of Slate and Building stone also occur in different parts of Mandi district. The slate is suitable for roofing, paving and fencing purposes and the Building stones are naturally occurring rocks of igneous, sedimentary or metamorphic origin which are sufficiently consolidated to enable them to be cut or shaped into blocks or slabs for use as walling, paving or roofing materials in the construction of buildings and other structures.

17. DEMAND AND SUPPLY OF THE MINERAL IN THE LAST THREE YEARS:

There is a huge demand for Stone Grit and M-Sand for the domestic and infrastructure sectors. Only a few Stone mines have environmental clearance for the extraction of Stone. There is a limited supply of Stone and there is a huge gap. There are no statistical data, regarding the demand and supply of minerals in the district. Due to the construction of National Highways, Tunnels, Hydro projects and public buildings for development works in the district, a large number of Stone chips & boulders are required. This will be met only by granting new leases in the district. As per the present data, a total 40 registered Mining leases have been granted in the District.

Stone(Grit) and sand are the basic requirements for construction materials and have a good market in all regions of the State for the construction of buildings, roads, bridges, railway lines and other construction purposes. There are huge infrastructural activities such as roads, buildings, and railways are coming up by Govt. of India & PSUs. Out of the total production, approximately 70%-80% of the supply is utilized in government works, while the rest is consumed for private purposes. The certainty of the exact demand in the district depends upon various Govt projects & schemes etc, hence quite not impossible to quantify the exact demand. Certainly, there is an unavoidable gap between the demand and supply of road metal/stone in the district, hence to balance the demand-supply gap a few stone quarries have been proposed in certain areas. It is proposed to start the Stone production from larger areas to at least double the production of the district which will enhance the revenue of the State and also support the livelihood of the local people.

The mining project not only brought economic benefits to the State by the ways of royalty of Stone but also benefits to the local people and lessees. It will help in general employment in rural areas in the State where the people are starving due to unemployment. A single mining project shall provide employment to approximately 10 to 20 people of the poorest section of the society and benefit more than 50 to 60 people indirectly. Further, infrastructure development will help in the development of the nation. The socio-economic condition of the area will be improved as mining activity will create additional employment for the local inhabitants to raise their socio-economic status. A significant contribution will be made by the lessee towards the societal development of the surrounding area in the form of DMFT/CSR fund.

18. MINING LEASES MARKED ON THE MAP OF THE DISTRICT

At present about 40 Nos of mining leases (Pvt./Govt. Land) have been granted/executed and are under operation and the demand for furnished material is still high. The details of the Mining lease are as follows::

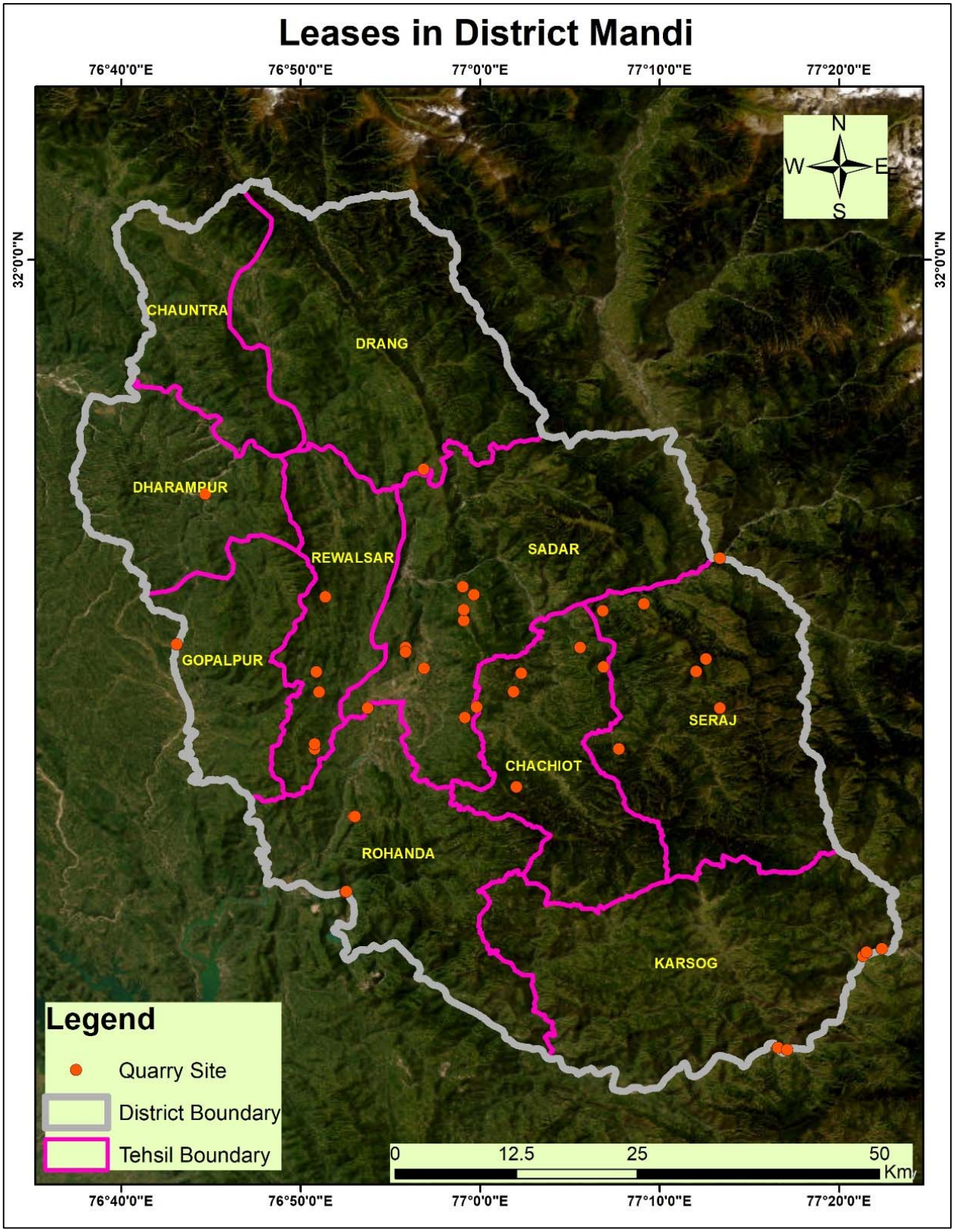


Image showing the location of the mining leases

19. DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASES

The details of Quarries existing within a 500m radius are considered as clusters of Mining Leases as per the MoEF guidelines. However, there is no such cluster zone in the district as all granted leases are scattered in the entire district.

20. DETAILS OF ECO-SENSITIVE AREA, IF ANY, IN THE DISTRICT;

There is no eco-sensitive area in Distt. Mandi

21. IMPACT ON THE ENVIRONMENT

Mining activities can have significant and diverse impacts on the environment across various domains, including air, water, noise, soil, flora and fauna, land use, agriculture, and forests. The specific impacts depend on factors such as the type of mining, mining methods, location, and scale of operations. Here are some common environmental impacts associated with mining:

Impact on the Air Environment

Mining operations can generate dust particles, leading to air pollution. This can affect respiratory health and contribute to soil and water pollution. In some lease surroundings, only a few households are living in the area and the population density of the village is very low. The area does not have any industrial activity in the core/buffer zone and hence, the ambient air quality of the area is good. Hence, the impact on air quality due to mining will not be significant.

Impact on Water Environment Surface

Runoff from mining sites can carry sediments, heavy metals, and pollutants into nearby rivers and streams, impacting aquatic ecosystems.

Groundwater: Improper disposal of mining waste can lead to the leaching of harmful substances into groundwater, affecting water quality.

Noise Pollution:

Blasting and Machinery Noise: Mining operations often involve heavy machinery and explosives, contributing to noise pollution. This can disturb wildlife, affect human health, and disrupt local ecosystems.

Soil Degradation:

Land Disturbance: The removal of vegetation and topsoil during mining can result in soil erosion, leading to reduced fertility and increased susceptibility to landslides.

Chemical Contamination: The deposition of mining waste on land can introduce harmful chemicals into the soil, affecting plant growth and soil quality.

Flora and Fauna Impact:

Habitat Destruction: Mining activities can lead to the destruction of natural habitats, displacing wildlife and disrupting ecosystems.

Land Use Changes:

Deforestation: Open-pit mining and large-scale extraction activities often require clearing extensive areas of forests, contributing to deforestation and loss of biodiversity.

Fragmentation: Mining can fragment landscapes, isolating populations of plants and animals and disrupting ecological connectivity.

Agricultural Impact:

Land Competition: Mining activities may compete with agriculture for land, leading to the displacement of farming communities and a loss of agricultural productivity.

Water Usage: Mining operations may compete with agriculture for water resources, affecting irrigation and water availability for crops.

Forest Impact:

Loss of Biodiversity: Mining-related deforestation can result in the loss of diverse plant and animal species, impacting overall biodiversity.
Carbon Sequestration: Forests act as carbon sinks, and their destruction during mining releases stored carbon into the atmosphere, contributing to climate change.

To mitigate these impacts, sustainable mining practices, strict regulations, proper waste management, and rehabilitation efforts are essential. Environmental impact assessments (EIAs) are often conducted before mining projects to identify potential risks and implement preventive measures

22. REMEDIAL MEASURES TO MITIGATE THE IMPACT OF MINING ON THE ENVIRONMENT

Mitigating the environmental impact of mining involves implementing various remedial measures to minimize negative effects on air, water, soil, flora and fauna, and overall ecosystems. Here are some common remedial measures to mitigate the impact of mining on the environment:

Remedial Measures for Air Pollution:

- All types of machinery and transport vehicles will be properly maintained and pollution checks will be done once in a year to keep the emissions from machinery and vehicles under control.
- Water sprinkling will be done on haul roads to control the emission of dust while transporting minerals and waste. Provision for water spray by tankers on 'Kuccha' road shall be done.
- Water sprinkling at the loading area.
- Tree plantation along the haul roads & approach road will be done. Plantation along the mine boundary shall be done with a tree density of 2000 trees per Hectare as per the norms of MoEF & CC, to control dust & noise.
- Use of personal protective equipment like dust masks.
- Ambient air pollution monitoring will be carried out.

Remedial Measures for Water Pollution:

- Mining is proposed to plan above the groundwater table.
- Garland drain shall be made around the Waste dump and the rainwater shall be collected in the garland drain and allowed to settle in a small pit for settling suspended particles before allowing discharge to natural drainage system.
- For domestic wastewater Septic Tank with a Soak Pit shall be provided, and discharge from the Soak Pit, if any shall be used for plantation.

Remedial Measures for Noise Pollution:

- Diesel-powered machinery, which is a major source of noise in open-cast mining shall be properly maintained. Attention shall be paid towards rigorous maintenance of the silencer of the diesel engines.
- Protective devices shall be provided for use of persons employed in the vicinity of high-noise areas.
- With the adoption of controlled blasting techniques, the ground vibrations will be minimized.
- Plantation around the lease boundary will cut the noise levels.
- Remedial Measures for Land Environment:

Some of the measures followed to minimize the impacts are as follows:

- The mining activities will be restricted within the lease area only.
- The waste material will be utilized for the construction of roads and also will be used by the local people for construction work.
- The surface runoff from the lease area will be retained within the lease and used for plantation, dust suppression and block cutting. So, there will be no soil erosion from the lease area and its surroundings due to mining activity.
- The dump will have an inward slope with catch drains at the inward side of the terrace and the catch drain of the individual terrace will be connected to the garland drain outside the periphery of the dump. The retaining wall and garland drain will be constructed around the dumps and the surface runoff water pass through the garland drain and finally settle in a settling pit before being released outside.

- Biodiversity Conservation: Implement conservation strategies to protect biodiversity, including the preservation of critical habitats, reforestation, and the creation of wildlife corridors.
- Community Engagement: Involve local communities in decision-making processes and ensure they benefit from mining activities. This may include providing employment opportunities, supporting local infrastructure, and contributing to community development projects.
- Closed-Loop Systems: Design mining operations with closed-loop systems to minimize resource consumption and waste generation. This includes recycling and reusing water, materials, and energy within the mining process.
- Monitoring and Compliance: Establish regular monitoring programs to assess the environmental impact of mining activities. Ensure strict compliance with environmental regulations and standards.
- Training and Awareness: Provide training for mining personnel on environmentally friendly practices and the importance of conservation. Increase public awareness about the environmental impacts of mining and the efforts being made to mitigate them.
- Post-Closure Planning: Develop and implement plans for the post-closure phase of mining operations to ensure ongoing environmental monitoring, maintenance, and adaptive management.

By incorporating these remedial measures, mining operations can help minimize their environmental impact and contribute to sustainable resource extraction. It's important to recognize that effective mitigation requires collaboration among industry stakeholders, regulatory bodies, local communities, and environmental experts.

23. RECLAMATION OF MINED-OUT AREA

As per the Himachal Pradesh Minor Minerals Concession Rules, 2015, a reclamation plan is a mandatory part of the approval of the mining plan by the Geological Wing Department of Industries. In the case of hill slope or terrace mining the reclamation plan includes the planation of area. It is necessary to reclaim the land affected by mining for to following reasons:

- To put the land into productive use like agriculture, forestry or recreational purposes.
- To check soil erosion from dumps leading to the destruction of watersheds and siltation of rivers.
- Accumulation of huge quantities of water in worked-out pits may pose a threat to life and property.
- To combat adverse visual impact.

The afforestation programme is the most important programme to improve the environment and ecological balance of the area. Grasses and bushes that have fibrous roots are at the first instance grown which gives the binding property to the soil. After growing grasses and bushes, other tree species in consultation with the experts will be raised, based on the characteristics of soil, topography and climatic conditions.

The main post-mine land use for the Project will be grazing based on a self-sustaining vegetation community using appropriate pasture grasses and scattered plantings of native tree and shrub species. For successful reclamation following points are to be considered

- Listing inventory of pre-mining condition.
- Monitoring flexibility of mining programme in the light of efficient land reclamation.
- Evaluation of the post-mining requirements of the region and to decide on the needs and desires of the affected ground.
- To make reclamation planning suitable to the techno-economical and socio-political environment.
- To assess the physio-chemical characteristics of overburden.
- Extra cost of preservation, re-handling, spreading and levelling of subsoil and topsoil.
- Knowledge of hydrogeological/geomorphological conditions. Aesthetic and/or historic value of land.

The fast-growing plantation and re-grassing shall be done on the exhausted/excavated benches as well as in backfilled pits and will be done in consultation with local peoples or Govt. Authorities like the forest department etc. The mining lease shall be fenced properly in the entire periphery of the safety zone. The total mined-out area of the benches shall be dedicated to plantation and re-grassing. The average year-wise proposed bench area for the plantation is as under: -

a) The plantation/regressing and its maintenance cost will be borne by the applicant. Also, a green belt will be developed in consultation with the local panchayat and forest departments along approach roads in order to minimize pollution.
b) Based on the characteristics of soil, topography and climatic conditions of the area, plantation of grasses/bushes and other tree species will be done by the applicant.
c) Plantation before the onset of the monsoon season will be done progressively until the final closure of the mine.
d) Green Belt shall be properly designed in consultation with the forest department. Plantation shall be carried out as per the periodical plantation programmer.
e) Fast-growing and evergreen trees, trees with broadleaf resistance to specific pollutants and those that would maintain the regional ecological balance, soil and hydrological conditions shall be favoured.
f) Green belt area along the haul roads, buffer zone, dumping sites as well as the excavated benches shall be developed.
g) Besides this, only local labours shall be engaged for watch and ward and plantation activity with proper maintenance.
h) The plantation/regressing and its maintenance cost will be borne by the applicant. Also, a green belt will be developed in consultation with the local panchayat and forest department along approach roads in order to minimize pollution.
i) The estimated survival rate proposed to be achieved shall be 80%

24. RISK ASSESSMENT & DISASTER MANAGEMENT PLAN;

Most of the mines in the district are in Hilly areas. Since the mining benches, trenches or pits are developed on hard compact and medium-grain rocks hence, there may be a chance of possibilities of slope failure if mining activities are done in an unscientific manner. The Risk Assessment & Risk Management Plan will be prepared for the safety of man & machinery deployed in the mining activities as per Mining Act, Rules, and Regulations & DGMS circulars.

24.1 Risk Assessment:

- Identify Hazards:
  Conduct a thorough identification of potential hazards associated with mining activities, considering factors such as geology, equipment, processes, and external influences.
- Risk Analysis:
  Assess the likelihood and potential consequences of identified hazards. This involves quantifying risks to prioritize them based on severity and probability.
- Vulnerability Assessment:
  Evaluate the vulnerability of critical infrastructure, surrounding communities, and the natural environment to potential risks and hazards.
- Stakeholder Engagement:
  Involve relevant stakeholders, including local communities, government agencies, and environmental experts, in the risk assessment process to gather diverse perspectives and local knowledge.
- Emergency Response Planning:
  Develop detailed emergency response plans for various scenarios, considering potential accidents, natural disasters, and other emergencies. Include evacuation routes, emergency shelters, and communication protocols.

24.2 Disaster Management Plan:

- Risk Mitigation Strategies:
  Implement risk mitigation strategies to minimize the likelihood and impact of identified hazards. This may involve engineering controls, process modifications, and the use of advanced technologies.
- Safety Training and Awareness:
  Conduct regular safety training for mining personnel, contractors, and local communities. Promote awareness of potential hazards and the importance of adhering to safety protocols. The required personal protective equipment should be provided and used in a manner that protects the individual from injury. A few minor injuries which can be prevented are slip, trip or fall hazards; hazards due to rock falls and collapse of unstable rocks, atmosphere containing toxic or combustible gases; protection from chemical or hazardous material etc.
- Infrastructure Design:
  Design mining infrastructure with safety in mind, incorporating features such as containment systems for hazardous materials, emergency exits, and protective barriers.
- Contingency Planning:
  Develop contingency plans for various emergency scenarios, outlining specific actions to be taken in the event of accidents, spills, fires, or other critical incidents.
- Collaboration with Emergency Services:
  Coordinate with local emergency services, hospitals, and law enforcement agencies to ensure a seamless response to emergencies. Conduct joint training exercises and drills to improve preparedness.
- Emergency Equipment and Resources:
  Maintain an inventory of emergency equipment, such as first aid supplies, firefighting equipment, and evacuation vehicles. Ensure that resources are strategically located for quick access.

A disaster management plan should be prepared for taking care of any disaster. Other risks that are included in this category are noise, as it occurs and it can lead to permanent disability. There are problems related to road traffic in and out issuers; inappropriate exposure of moving machines; mechanical failure and because of the large number of moving trucks and dumpers there is a large quantity of dust present in roadways which affects the operators and can lead to accidents

By integrating comprehensive risk assessments and disaster management plans into mining projects, companies can enhance the safety of their operations, protect the environment, and contribute to the well-being of surrounding communities. It is essential to work closely with regulatory bodies and local stakeholders throughout the planning and implementation processes.

25. DETAILS OF THE OCCUPATIONAL HEALTH ISSUES IN THE DISTRICT

The persons employed in the mines are exposed to a number of hazards at work which adversely affect their health. Some of the important ones are dust, noise, heat, humidity, vibration etc. In recent times, there has been increasing awareness among the mining industry and workers about occupational diseases such as Coal Worker's Pneumoconiosis, Silicosis, Manganese Poisoning, Hearing Impairment etc. caused by exposure to health hazards at work. Almost all occupational diseases are known to cause permanent disablement and there is no effective treatment. However, most of the occupational diseases can be prevented by adopting proper occupational health measures and engineering control of airborne dust at the workplace. Following diseases have been notified as the diseases connected with mining operations for the purpose of sub-section (1) of Section 25 of the Mines Act, 1952:

In order to detect occupational diseases, the health surveillance programme shall be adopted in mines which includes:

- Initial Medical Examination of persons to be employed in mines.
- Periodic Medical Examination once every five years. General physical examination, chest radiographs, lung function tests and audiometrics.
- Classification of chest radiographs of workers as per ILO Classification.
- Medical examination within one year of superannuation.
- Evaluation of all cases of suspected pneumoconiosis by Pneumoconiosis Medical Board.

Maintenance of medical records till the person is in service and 10 years thereafter. The cases of silicosis detected during health surveillance programmes are referred to as Pneumoconiosis

As per the available record of five-year data, no patients of Silicosis & Tuberculosis have been adversely affected or reported due to the mining activities in the District

26. PLANTATION AND GREEN BELT DEVELOPMENT

Mining in the case of hill slope and terrace deposits is carried out by the formation of benches the height of the benches can vary from 2mX2m, 4mX4m, and 6mX6m, depending on the nature of the rock or deposits and the dimensions of the lease area. It is recommended to the lessee that a separate place has to be kept for dumping the topsoil which can be later on used for plantation purposes and re-grassing. As the mining operations are carried out from the top of the mining lease to the bottom, therefore, plantation and re-grassing have to be done every year on the excavated benches.

The fast-growing plantation and re-grassing shall be done on the exhausted/excavated benches as well as in backfilled pits and will be done in consultation with local peoples or Govt. Authorities like the forest department etc. The mining lease shall be fenced properly in the entire periphery of the safety The green belt along the lease boundary and both sides of the transportation road shall be developed in almost all the existing leases in the district. Maximum numbers of plants shall be planted each year around the lease boundary and both sides of the transportation road as mentioned in the mining plan. Some mine owners also planted a large number of plants outside the lease area to develop a green belt in the district. Deodar, Sal, Khair Pine, Cheil, etc. are some important plants commonly planted Mandi district.

In some cases where the nature of the rock is hard and there is no scope for plantation. lessee is asked to acquire a dedicated land from the private or local govt. bodies for plantation. Plantation is done in consultation with the forest department and local bodies.

A detailed record of the plantation is to be kept by the respective owner/agent/manager of the mine every year, which has been planted in the safety zone area and transport route, which is statutorily required. As per the norms of the Forest department, the plantation has to be carried out at the rate of 2500 local plants per hectare and along the roadside, at an interval of 2 meters in a zig-zag manner on both sides.

27. OTHER INFORMATION

The protection of mineral reserves as well as their sustainable exploitation for development use is one of the concerns of the State Government. As land and mineral reserves are the most important capital assets, protection of such capital assets would be a legitimate plan activity. Therefore, it is the responsibility of the state government to take an effective action plan to combat illegal mining and lifting which has led to huge revenue loss to state exchequer.

Provisions shall be made in the mining plans to protect the environment, though there are no trees in the mining area, even then intensive care will be taken to protect the nearby trees and to make the arrangements with the consultation of the Forest Department to make compensatory plantation & contribution to the Van Mahotsav events etc. Proper arrangements shall be made to dump the waste generated from the mining activities. The topsoil and silty clay will also be dumped at proper places as per suggestions made in the mining plan. So, that it can be used for plantation or agriculture purposes after the mining is over.

Also, it is accepted that effective resource management cannot be done in isolation. The proponent therefore vigorously pursues approaches towards coordination and integration where possible, so as to lead to coordinated regulatory systems.

28. MONITORING & EVALUATION

The Ministry of Environment, Forest & Climate Change has published "Enforcement & Monitoring Guidelines for Sand Mining" in the year 2020 wherein the Monitoring Mechanism has been defined very specifically and recommended that a uniform monitoring mechanism is required to assess the regulatory provision in quantitative terms, with robust institutional and legal framework. Based on past experience and suggestions available, the following requirements are suggested for defining a mechanism for monitoring of mining activities which will help in the identification of mining that is operating either illegally or are violating the regulatory provisions. Some suggestions will facilitate direct or indirect information to help in such an assessment.

1. All precautions shall be taken to ensure that the water stream flows unhindered and process of Natural river meandering doesn't get affected due to mining activity.
2. River mining from outside shall not affect rivers, no mining shall be permitted in an area up to a width of 100 meters from the active edge of embankments or distance prescribed by the Irrigation department.
3. The mining from the area outside river bed shall be permitted subject to the condition that a safety margin of two meters (2 m) shall be maintained above the groundwater table while undertaking mining and no mining operation shall be permissible below this level unless specific permission is obtained from the Competent Authority. Further, the mining should not exceed nine-meter (9 m) at any point in time.
4. Survey shall be carried out for identifying the stretches having habitation of freshwater turtles or turtle nesting zones. Similarly, stretches shall be identified for other species of significant importance to the river eco-system. Such stretch with adequate buffer distance shall be declared as no-mining zone and no mining shall be permitted. The regulatory authority as defined for granting Environmental Clearance, while considering the application of issuance of ToR and/or EC for the adjacent block (to non-mining zone) of mining shall take due precaution and impose requisite conditions to safeguard the interest of such species of importance.
5. District administration shall provide detailed information on its website about the sand mines in its district for public information, with an objective to extend all information in public domain so that the citizens are aware of the mining activities and can also report to the district administration on any deviation observed. Appropriate feedback and its redressal mechanism shall also be made operational. The details shall include, but not limited to, lease area, geo-coordinates of lease area and mineable area, transport routes, permitted capacity, regulatory conditions for operation including mining, environmental and social commitments etc.
6. A website needs to be maintain to track the movement of centralised sand mining and a Centralised server system should be made to manage the data related to sand mining across India.
7. The mineral concession holders shall maintain electronic weighbridges at the appropriate location identified by the district mining officer, in order to ensure that all mined minerals from that particular mine are accounted for before the material is dispatched from the mine. The weighing bridge shall have the provision of CCTV camera and all dispatch from the mine shall be accounted for.
8. The mineral movement shall be monitored and controlled through the use of transit permit with security features like printing on IBA approved MICR papers, Unique bar/QR, fugitive ink background, invisible ink mark, void pantographs and watermarks papers or through use of RFID tagged transit permits and IT /IT-enabled services. Such monitoring system shall be created and made operationalised by State Mining department and district level mining officer shall be responsible for ensuring that all legal and operational mines are connected and providing the requisite information on the system. Regular check and associated report shall be submitted to DLTF and uploaded on the website.
9. State Government shall constitute a District Level Task Force (DLTF) under the Chairmanship of

Deputy Commissioner/District Magistrate/Collector with Superintendents of Police and other related senior functionaries (District Forest Officer, District transport officer, Regional officer-SPCBs, Senior Officer of Irrigation Department, District Mining Officer) with one/two independent member nominated by the Commissioner concerned. The independent member shall be retired government officials/teacher or ex-serviceman or ex-judiciary member. The DLTF shall keep regular watch over the mining activities and movement of minerals in the district. The DLTF shall have its regular meeting, preferably every month to reconcile the information from the mining activity, and other observations made during the month and take appropriate corrective and remedial action, which may include a recommendation for revoking mining lease or environmental clearance. The DLTF may constitute an independent committee of the expert to assess the environmental or ecological damage caused due to illegal mining and recommend recovery of environmental compensation from the miner's concern. The recommendation may also include action under the provision of E(P) Act, 1986.

10. The area not identified for mining due to restriction or otherwise are also to be monitored on a regular basis by the DLTF. Any observations of mining activity from the restricted area shall be reported and corrective measures shall be initiated on an urgent basis by the DLTF.
11. The dispatch routes shall be defined in the Environmental Clearance and shall be avoided through densely habituated area and the increase in the number of vehicle movement on the road shall be in agreement with the IRC guidelines / carrying capacity of the road. The alternate and dedicated route shall be explored and preferred for movement of mining to avoid inconvenience to the local habitat. The mining production capacity, by volume/weight, shall be governed by total permissible dispatch calculated based on the carrying capacity of dispatch link roads and accordingly, the production should be regulated.
12. The movement of minerals shall be reconciled with the data collected from the mines and various Naka/check posts. Other measures may also include a general survey of the potential mineable area in the district which has not been leased/auctioned or permitted for mining due to regulatory or other reasons.
13. The location and number of check post requirement shall be reviewed by DLTF on a regular basis so that appropriate changes in location/number could be made as per the requirement. Such review shall be carried out on a regular basis for the district on inter-state boundary or district providing multiple passages between two districts of different states.
14. The district administration shall compile the information from their district of the permitted and legal mined out minerals and other details and share such information and intelligence with the officials of the adjoining district (Inter or/and Intra State) for reconciliation. The information shall include the area of operation, permissible quantity, mined out minerals (production) the permitted route etc., and other observations, especially where the mine lease boundary is congruent with the district boundary. Such coordination meeting shall be held on a quarterly basis, alternatively in two district headquarters or any other site in two districts decided mutually by the District Magistrate.
15. The mining department shall include submission of an annual environmental audit report as one of the conditions in the mining lease agreement. The annual audit for each river bed mining lease shall be carried out and the audit report shall be uploaded on the website of district administration. The audit shall be carried out by an independent team of 3 members nominated by District Collector/Magistrate/Commissioner comprising of Ex-Serviceman, Ex-Government officials of repute, Professor or Person having experience of mining/environment. The guidelines and method of the audit shall reflect adequately the monitor-able parameters and output and reflect the compliance status with respect to the conditions imposed by the regulatory authorities including conditions of Environmental clearance.
16. The in-situ and ex-situ environmental mitigative measures stipulated as EMP, CER, CSR and other environmental and safety conditions in mines including the welfare of labours shall properly reflect in the audit report.

29 Comments/ Suggestions:

HPSEIAA in its 69th meeting on dated 18th June, 2024 approved the DSR of district Hamirpur and decided to upload the DSR on public domain/ official websites of Department of Industries and Department of Environment, Science Technology & Climate Change for twenty-one days. The comments, if received, shall be considered and if found fit, shall be incorporated in the final Report. As per the decision of the HPSEIAA the DSR was uploaded on the portal. The suggestions received from the users through e-mail on ms.hpseiaa@gmail.com & remarks of the Industries Department are as under:

#	District	Email dated	Comments	Forwarded to industries	Remarks from Industry Deptt., if any
1.	Mandi	17-Jul-24	Kindly update our lease area with khasra no 2869/ 2792 , 2790, 2791 Mauza Pehad, Tehsil Dharampur, Distt Mandi in District Survey Report.	18-Jul-24	The letter of intent is in-principle approval to obtain the required clearances for the grant of mineral concession. The applicant has to complete the codal formalities like preparation of a mining plan and has to obtain environmental clearance before the grant of mineral concession. As such, it is an ongoing process and as soon as the clearances are obtained, the letters of intent are converted into mining lease. Also, if the letter of intent holder is unable to Obtain the required statutory clearances within the validity period of letter of intent, the period is either extended or withdrawn. Please see point No. 13 of DSR District Mandi as well as refer to the email sent on 19.07.2024 sent to ms.hpseiaa@gmail.com
2.	Mandi	17-Jul-24	Not included in DSR - Extraction of Sand, Stone, bajri, located at Khasra No. 344, measuring an area 06-18-	18-Jul-24	-do-

			05 Bighas (Private Land,) falling in Mauza/ Mauza Firnoo, Tehsil Karsog, District Mandi, Himachal Pradesh. Proposed by Sh. Pankaj Parmar S/o Sh. Hans Raj, R/o Village & PO Dhair, Tehsil Anni, District Kullu, Himachal Pradesh		
3.	Mandi	17-Jul-24	Not included in DSR - Extraction of Cut stone situated in Khasra No. 150/2, measuring an area 15- 09-15 Bighas (Private Land/Hill Slope) falling in Mauza/Mohal Luhardi, Tehsil Balh, District Mandi, Himachal Pradesh, proposed by Sh. Thakar Singh, S/o Sh. Parma Ram R/o Village Luhardi, P.O. Randhara, Tehsil Balh, District Mandi, HP	18-Jul-24	-do-
4.	Mandi	17-Jul-24	Not included in DSR - Extraction of stone over an area situated in Khasra No.40 & 45, measuring an area 07-13-14 Bighas (Private Land/Hill Slope) falling in Mauza Kammand, Mohal Khanar, Tehsil Sadar, District Mandi, Himachal Pradesh Proposed by Sh. Prem Singh S/o Sh. Chet Ram, Prop. M/s Prem Stone Crusher Village Ropa & P.O. Ralha, Sub Tehsil Aut, District Mandi, H.P,	18-Jul-24	-do-
5.	Mandi	17-Jul-24	Not included in DSR - Extraction of Stone, Sand and Bajri falling in Mauza Chulla, Tehsil Ladbharol, District Mandi, Himachal Pradesh by Sh. Bhupesh Sharma, Village Narholi & P.O. Gohar, Tehsil Chachyot & District Mandi, Himachal Pradesh,	18-Jul-24	-do-
6.	Mandi	16-Jul-24	In district survey report in sarkaghat Sub. Divison Distt Mandi these area must be included that have sufficient minerals potential. There are many khad as Balyana khad, sunkhad,Roso Khad, Bakar Khad which suitable for mining must be add in district survey	18-Jul-24	-do-

			report. These minerals potential area generate revenue to the govt. If proper mining is done in these area excessive flood will be minimized. Rajeev Kumar V.P.O. Gharwasra Tehsil Dharampur Distt. Mandi (H.P)175025 70182-53057		
7.	Mandi	16-Jul-24	Not included in DSR -Lachmi Devi Stone Mining Project" Located at Khasra No. Khasra No. 1229/1/1 Near Mauza: Kathalag/141, Tehsil: Sadar, District: Mandi, (Himachal Pradesh). Lease Area: 09-01-16 Bighas (0.7353 Ha.) Production Capacity: 52,659 TPA(ROM)	18-Jul-24	-do-
8.	Mandi	16-Jul-24	Not included in DSR - Lachmi Devi Sand & Stone Mining Project" Located at Khasra No. 69/2/1 & 69/2/2 Near Mauza-Choukhari/270, Tehsil-Balh and District: Mandi (Himachal Pradesh) Lease Area: 10-14-14 Bighas (0.8072 Ha.) (Pvt. Land) Proposed Production Capacity: 15,794 TPA(ROM)	18-Jul-24	-do-
9.	Mandi	28th June 2024	Myself Rajeev kumar I have a valid mining lease for extraction of stone from khasra no. 552, 553, 554, 555, 556, 559, 560, 957/565, 563/1 from lease area measuring 10-06-08 bighas falling in mauza/mohal gurkhota/khuddi, tehsil Sadar distt. Mandi. With due respect it is submitted that I have gone through the District survey report mandi district mandi but my name and details has not been entered in the report, I request you to kindly do the needful for entering my details in the District Survey Report, please	29th June, 2024	According to the information from the Mining Officer District Mandi the mining lease expired on 19- 08-2021 and the LoI was expired on 27.08.2022. the applicant not applied for the extension hence not entered in the DSR.

The Deptt. of Industries vide email dated 19th July, 2024 informed that the Department grants mineral concessions by two modes, one through auction and another through mining leases. In both the cases, as per the provisions contained in the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015, the areas are inspected by the

Joint Inspection Committee under the Chairmanship of SDO (Civil) concerned comprising members from other department like Irrigation & Public health, State Pollution Control Board, Forest Department, HP Public Works Department, Geologist or Mining Officer and as such, the letter of intents are issued only after recommendations of the Joint Inspection Committee which is continuous process.

The letter of intent is in-principle approval to obtain the required clearances for the grant of mineral concession. The applicant has to complete the codal formalities like preparation of a mining plan and has to obtain environmental clearance before the grant of mineral concession. As such, it is an ongoing process and as soon as the clearances are obtained, the letters of intent are converted into mining lease. Also, if the letter of intent holder is unable to obtain the required statutory clearances within the validity period of letter of intent, the period is either extended or withdrawn.

So, the list of letters of intents cannot be provided at this stage as these are dynamic in nature and only the information of granted mineral concessions is provided in the updated DSR.