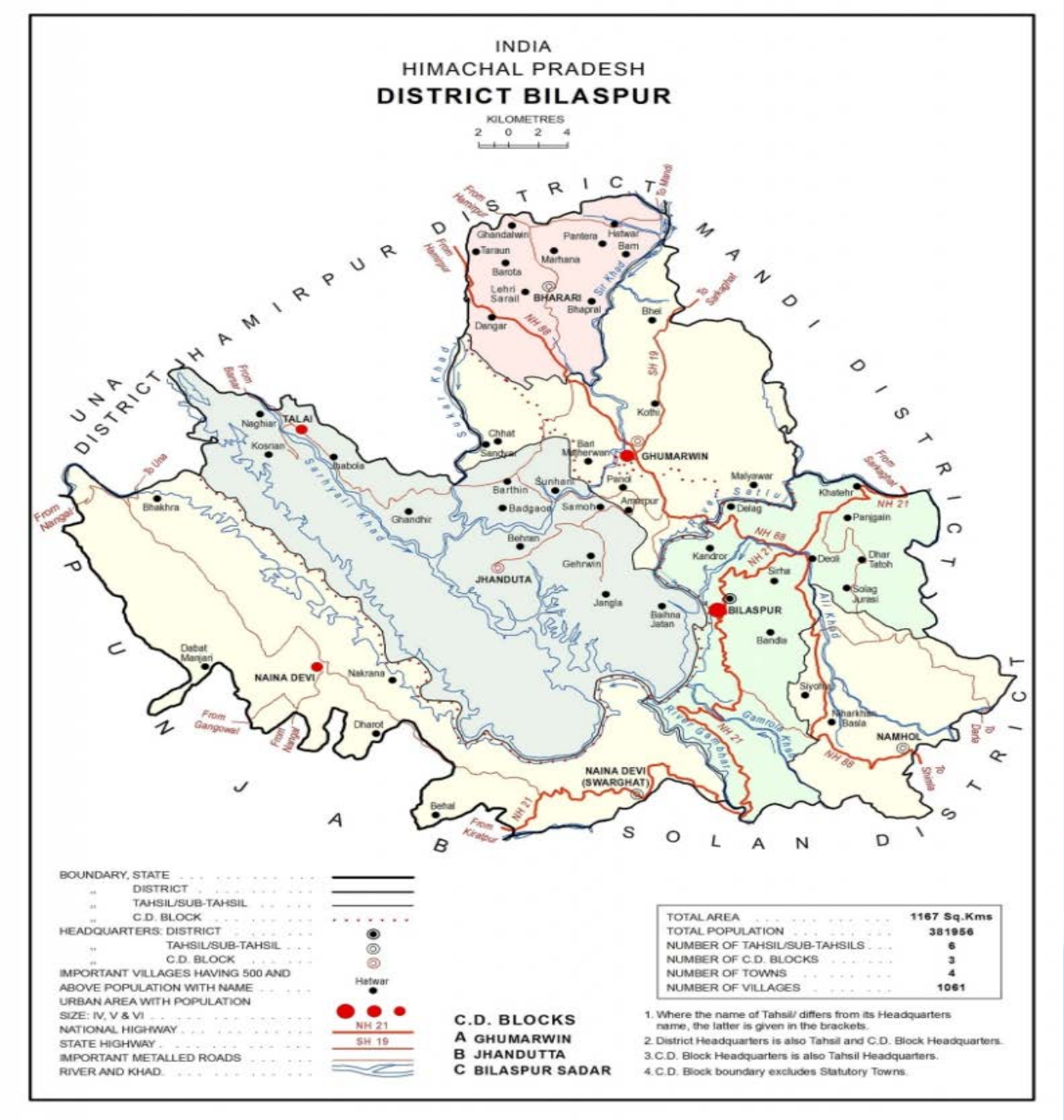
DISTRICT SURVEY REPORT-2024
District- Bilaspur Himachal Pradesh



DISTRICT SURVEY REPORT FOR SAND MINING OR RIVERBED 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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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 the 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. Mining sector is an important segment of the Indian economy. Since independence, there has been a pronounced growth in the mineral production both in terms of quantity and value. India produces as many as 87 minerals, which includes 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 mineral have been defined under section 3(e) of 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 large sector and in small sector. The large sector comprises of limestone projects for manufacturing cement and other lime products while the small mining sector comprises mining of minor minerals like sand, stone, bajri, slate, shale and clay etc. which are basically building material to meet up the demand for infrastructure development of the state.

In pursuance to the orders of 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 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 Imapact Assessmenyt 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 District Survey Report during the year 2016 and the said District Survey Report prepared for District Bilaspur 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 application for Environment Clearence, 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 Bilaspur 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, stream and other sources. The mineral potential has been calculated based on field investigations taking in to consideration the geology of the catchment area of the river/streams and other sources.

2. OVERVIEW OF MINING ACTIVITY

Minerals constitute the back-bone of economic growth of any nation and Himachal has been eminently endowed with this gift of nature. Minerals are non-renewable natural resources essential for mankind and backbone of economic growth of any country. The progressive industrialization and infrastructural activities has led to increased demand and resulting in large scale production of minerals. But there is no large scale mining activity in Himachal as in some other parts of the country as the State is not a mineral rich State. Almost all the mines are open cast and limited in aerial extent.

The main exploitable minerals in the district are Limestone, dolomitic- limestone, shale, brick earth, minor minerals like sand, stone & bajri. The mining activities in district can basically be categorized under large sector and in small sector. The large sector comprises of major limestone projects for cement manufacture and the small mining sector comprises mining of minor minerals like sand, stone, bajri, slates, shale, clay etc. which are basically building material required to meet the infra-structural development of the district. The Cement plant of ACC Ltd. is located near Barmana in Bilaspur district of Himachal Pradesh, on the National Highway NH 205, connecting Ambala and Manali installed with a capacity of 5.6lakh tones of cement per annum, it has modernized and expanded to a total capacity of 4.64 million-tones of cement per annum. In addition to these 9 mining leases for minor minerals has been granted in the district.

3. GENERAL PROFILE OF THE DISTRICT

Bilaspur as an independent district came into existence on 01st September 1972, consequent upon the reorganization of the districts of Himachal Pradesh. It lies in the outer hills of the Himalayas. The district is bounded on the North by Mandi and Hamirpur districts, on the west by Hamirpur and Una districts, and on its south lies the Nalagarh area of Solan district. Bilaspur district lies on both banks of river Satluj which forms the boundary between Mandi and Bilaspur districts up to the centre of the eastern boundary. Bilaspur stands are divided into two natural parts formed by the river Satluj. The river flows from east to west in this district with a large bend midway and divides the district into two equal parts. The district is mostly hilly, the lowest point of the district is about 290 m from M.S.L. and the highest point is 1980 m above M.S.L.

Image showing the Elevation profile of the District

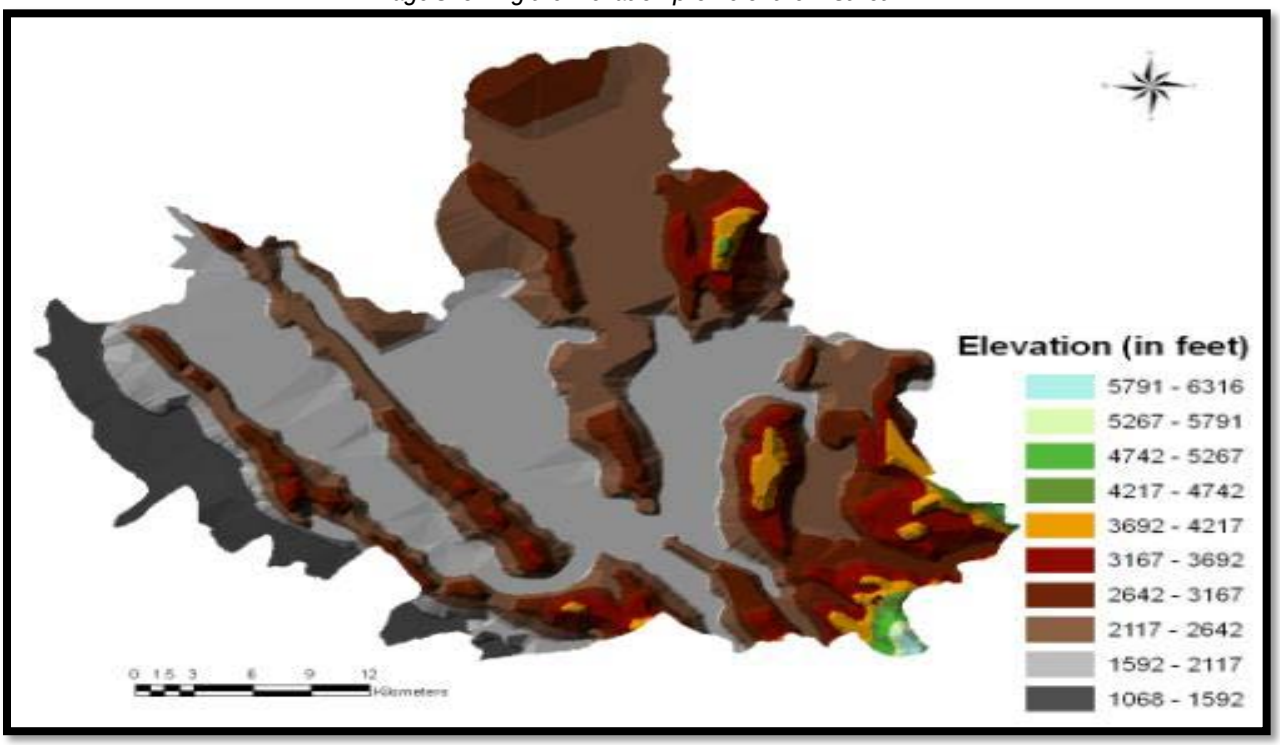
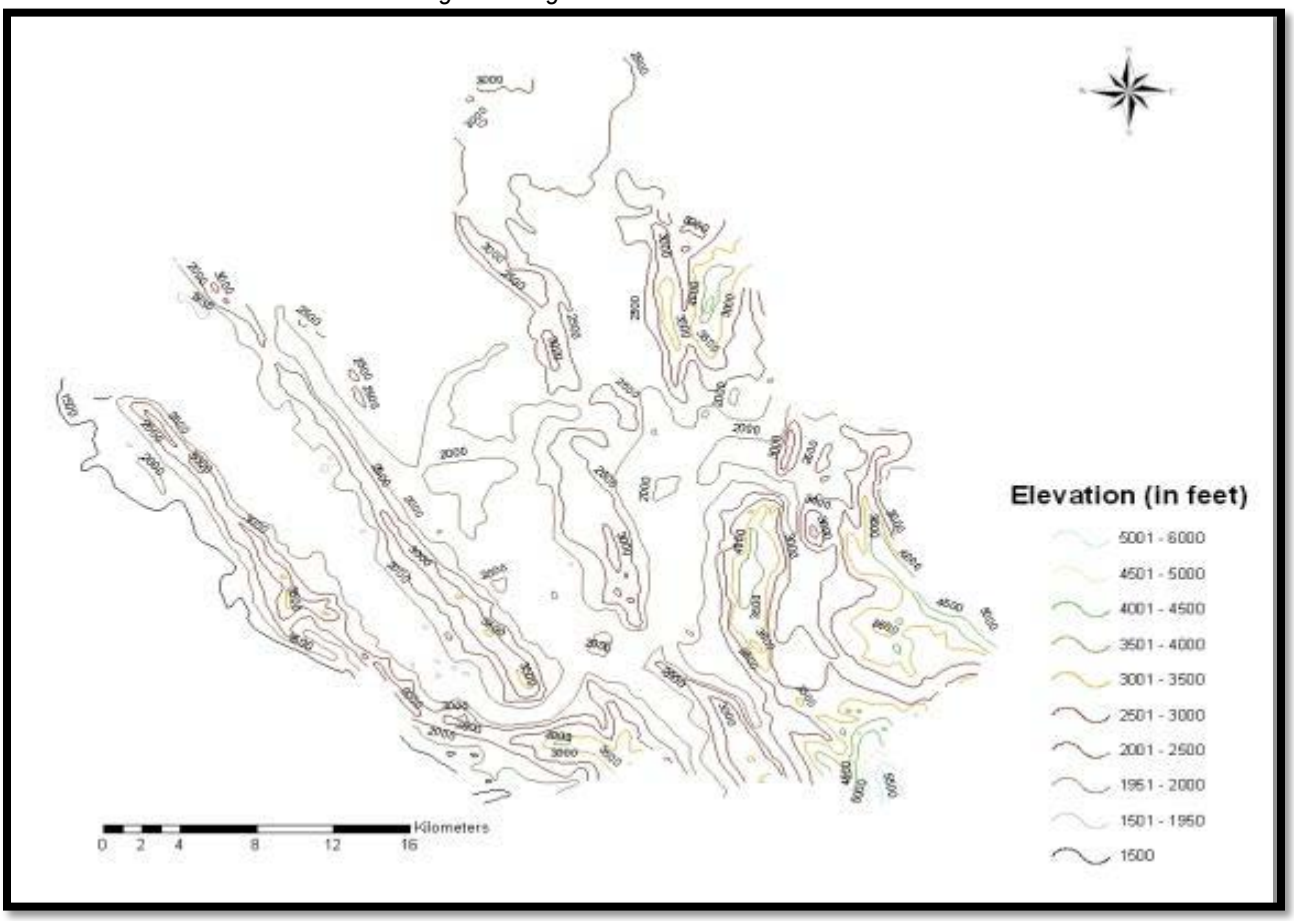


Image showing 3-D Surface View of District



DEMOGRAPHIC PROFILE OF THE DISTRICT BILASPUR

Population (As per District portal)

Total	4,37,844
Male	2,20,124
Female	2,17,720
Sex Ratio	989 / 1000 (F / M)
Density of Population (Per Square KM)	376

People and Culture

Major Religions	Hindu, Muslim, Sikh
Language Spoken	Kahluri or Bilaspuri (Written Script is Devnagiri), Hindi
Traditions Food :	Maize, Rice and Wheat
Economy	Agriculture based and Service

Geographical Area

Total (In Hectares)	111776
Forest Area	14013
Cultivated Area	56011
Unusable Area	72423
Altitude	610 m (above sea Level)
Major River	Satlej (Hot in the summer and cold in the winter)

Climate

Rainfall	Max 62 mm Min 1.5 mm
Temperature	Max 37^{o} C Min 5^{o} C

Distances

From State Capital Shimla	85 Kms
Near Railway Station Kiratpur	65 Kms
Nearest Airport Shimla	85 Kms

Cattle Population(As per district portal)

Buffaloes	99517
Dogs	9097
Sheeps	885
Goats	74,243
Others	1359

4 GEOLOGY OF THE DISTRICT

The Regional Geology of the Area

Bilaspur District lying within the Lesser Himalaya and the Siwalik Foothill comprises rocks ranging in age from Proterozoic to Quaternary. The Oldest rocks of the undifferentiated Proterozoic age belong to the Jutogh Group Comprising carbonaceous phyllite, Schist, Gneiss, Quartzite and Marble. The Sundernagar Group of Rocks of Meso-Proterozoic age is represented by quartzite with basic flows. The Deoban/Shali Group of Rocks (Meso-Proterozoic Comprising limestone, dolomite, (at places tromatolytic) Slate & Quartzite occurs along the Main Boundary Fault and also in the North-Eastern part of the District. The argillo-arenaceous sequence of the Shimla/Jaunsar Group rests unconformably over the Deoban Group. The Jaunsar Group of arenoargillaceous rocks is homotaxial with the Shimla Group and assigned meso- Proterozoic age. Both the Shimla and Jaunsar Group of rocks are unconformably succeeded by the Balaini Group, comprising diamictite, pink dolomite, carbonaceous shale and slate besides quartzite bands. The Krol Group, which overlies the Balaini Group, is dominantly a carbonaceous sequence with minor shale and sandstone. The Regional Geology and the General Stratigraphy of the Bilaspur District are as given below.On the western side of the Bilaspur District, the Shimla Group of rocks are exposed. It is divisible into four formations on the basis of certain characteristic litho-logical associations and order of superposition. Out of four formations, three are exposed in the Bilaspur District. The best development of the Basantpur Formation is exposed between Tal villages near Bilaspur Sadar, pass Ghiana and northward up to the Satluj.

Kunihar Formation succeeds the Chhaosa Formation and is best developed in the vicinity of Kunihar and traceable from Kakarhatti to Bamot. Along the KalthuDhar, the limestone interbeds are exposed which contain algal, stromatolites.

Kunihar marks the contact between the former and the Chaosa where the Kunihar laterally pinches out due to facies, and the Chaosa directly overlies the Basantpur. The best development of the Chaosa Formation is along the Shimla-Bilaspur Highway between Danoghat and Theog.

On the Eastern side of the BilaspurDistrict, Shimla sequences are succeeded by a younger sequence of formation as the Blaini, Infra Krol and Krol, forming two parallel and apparently independent belts. These are respectively referred to as Outer Krol Belt over the Shimla Group and the Inner Krol Belt over the Jaunsaur Group. The Krol Hill, Kamli-Dhar synclinal complex belongs to the Outer Krol Belt. Blaini formation is seen from Halog towards the Giri Valley in the South-East and then extends towards NagoDhar in the North. The Blaini forms the base of the infra Krol -Krol sequence of the outer Krol Belt.

In the Bilaspur area, the black shales of Infra-Krol pass up through a transition unit of shale and slaty Quartzite of Krol sandstone. North-west of Bilaspur, the development of thin-bedded sandstone is noticed. Krol sandstone formation is generally massive and pale grey and coarse to medium-grained rock. The friable variety is mainly developed in the Bilaspur -Barog area. The Tal Group of the early Cambrian age is heterolithic sequence of siltstone dolomite, shale, ash grey tuff, chert/phosphorite, carbonaceous shale, grit and quartz arenite and recorded algal structures and trilobite. Subathu Formation is composed of olive green shale, limestone, quartzite and laterite. The Sirmour Group is represented by a thick pile of Palaeogene sediments exposed in the foothill, bounded by the Main Boundary Fault and Krol Thrust. It comprises shale, fossiliferous limestone, quartz arenite, siltstone, clay, sandstone and local pebble bed. The Siwalik Group of the Middle Miocene and Early Pleistocene age comprises coarse clastic fluviatile deposits of sandstone, clay and conglomerates. The Quaternary sediments (Older Alluvium and Newer Alluvium) along prominent channels consisting of sand, silt, clay, pebbles and cobbles of Middle to late

Pleistocene and Holocene age.

The general trend of the rocks is NW-SE and E-W directions with dips varying from 10º to 40º on either side. Besides Main Boundary Fault, Krol, Giri, Chail and Jutogh Thrust, two major synformal axes running NW-SE also pass through the Krol and Tal Group of rocks.

Nalagarh, Barsar and Bilaspur thrusts are in general parallel to the MBT, The Pinjaur Dun is developed between the detached anticlinal ridges of Siwalik molasses (mainly Upper Siwalik Formations) in the south and Lower Tertiary (Dagshai, Kasauli and Subathu) Tertiary (Lower and Middle Siwalik) rocks in the North, Sabathu, Dagshai and Kasauli formations occurrence within foot-hill Palaeogene belt are termed as Sirmour Group of rocks. They extend from the Ravi to the Yamuna in the Himachal Himalaya. In the main belt, the base of the Sabathu Formation is exposed at Sabathu town. There is considerable tectonisation along the contact. The Sabathu of the Himachal Foot-hill Palaeogene belt at places contains phosphatic nodules with olive green shales. This sequence contains fossils like Gastropods and divergent terrestrial vertebrates.

The Dagshai formation overlies the Sabathu formation along a gradational contact. No break-in sedimentation is noticed. The rocks of this formation are characterized by the presence of purple sandstone and clays with pink clay conglomerate and also grey sandstone. This formation is well developed/exposed at Kasauli.

The Kasauli Formation comprises essentially sandstone with subordinate shale. From Dagshai to the Kasauli, the contact is normal and transitional. This formation is also fossiliferous and contains plant fossils.

The close of sedimentation of the Sirmour basin almost coincided with the development of a new foredeep to its South for a new cycle of sedimentation of the Siwalik Group. The period witnessed a southward migration of the Cenozoic basin.

The rocks of the Sarsa Catchments are represented by the Siwalik Group, Older Alluvium and Newer Alluvium. The stratigraphy of the Sarsa catchments with lithology of the area is as given below in the table:

Table showing stratigraphy of the area

	Group	Lithology	Age
1.Newer Alluvium	1. Chhanel-Alluvium	Grey micaceous, fine to coarse-grained sand, silt and clay. Cyclic sequence of grey micaceous Sand, silt and clay.	Quaternary
	2. Fan-Alluvim	Brownish grey clay, sand and gravel boulders.	
2. Older: Alluvium	Dun-Gravels	Multicyclic sequence of brown to grey silt, clay with kankar and reddish brown to grey micaceous sand with pebbles.	
3.Siwalik Group:	Upper Siwalik B	Predominantly massive conglomerate with red and orange clay as matrix and minor sandstone and earthy buff and brown claystone.	Neogene
	A	Sandstone, clay and conglomerate alternation	
	B	Massive sandstone with minor conglomerate and local variegated claystone.	

	Middle Siwalik	A	Predominantly medium to coarse-grained sandstone and red clay alternation, soft pebbly with subordinate claystone, the locally thin prism of the conglomerate.	
	Lower Siwalik	B	Alternation of fine to medium-grained sporadically pebble sandstone, calcareous cement and prominent chocolate and medium maroon clay-stone in the middle part	
		A	Red and mauve clay-stone with thin intercalations of medium to fine-grained sandstone.	

The Dun is bordered by the Nalagarh thrust in the north and detached Siwalik Hills, (mainly comprising of Upper Siwalik) in the south. Within the Dun, Quaternary sediments are exposed as an alluvial fan and river terraces. North of the Nalagarh thrust, Tertiary (Siwalik Group) and lower Tertiary (Subathu Group) rocks are exposed. The Sub Himalaya, the southernmost division of the Himalaya, is separated from the Lesser Himalaya by the Main Boundary Thrust (MBT) in the north and the southern boundary is demarcated from the Indo-Gangetic Plain by the Himalayan Frontal Fault (HFF). The northern part of the Sub-Himalayan is characterized by a series of intra-basinal thrusts.

The Nalagarh Thrust marks the northern boundary of the Dun, which brought the Tertiary/Lower Tertiary rock over the quaternary Dun sediments. The Satluj River and its tributaries are the major drainage system in the Dun. The Satluj River flows in a longitudinal course from the North West to the southeast, whereas its tributaries originate from the higher reaches of Sub-Himalaya, between Nalagarh Thrust and MBT and flow in transverse courses in a South-Southwest direction. The catchment areas of these Piedmont rivers (tributaries of Sutlej) are mainly comprised of Lower Tertiary and Tertiary (Lower and Middle Siwaliks) rocks. Mudstone and sandstones are the predominant rock types in the Lower and Middle Siwaliks respectively. The important geomorphic feature observed within the Dun basin is alluvial fans and river terraces. Alluvial fans are fan-or cone-shaped sedimentary bodies that accumulated at the base of the Sub-Himalayan mountain front, south of Nalagarh thrust, down slope from the point where the piedmont rivers emerge from the uplands. Extensive road cutting and river cuts provide an excellent opportunity to examine nearly continuous exposures (from fan head to toe and transverse view) of these sediments. A series of alluvial fans are observed exposed around present-day rivers, between Kiratpur in the West and Pinjaur in the East. Many alluvial fans are exposed around Luhund Khad, Kundlu-Ki-Khad, Chikni and Mahadeva rivers etc. The Kundlu-ki-Khad fan is about 15 Km. long and 6 Km. wide, whereas the Luhund Khad fan is about 11Kms. long and 7 Km. wide.

Siwalik Group:

The Siwalik deposits are one of the most comprehensively studied fluvial sequences in the world. They comprise mudstone, sandstones and coarsely bedded conglomerates laid down when the region was a vast basin during Middle Miocene, to Upper Pleistocene times. The sediments were deposited by rivers flowing southwards from the Greater Himalayas, resulting in an extensive multi-ordered drainage system. Following this deposition, the sediments were uplifted through tectonic regimes (commencing in Upper Miocene times), subsequently resulting in a unique topographical entity i.e. the Siwalik Hills. The Siwaliks are divided stratigraphically into three major Sub-groups-Lower, Middle and Upper. These Subgroups are further divided into individual Formations that are laterally and vertically exposed today in varying linear and random patterns.

Ongoing erosion and tectonic activity have greatly affected the topography of the Siwaliks. Their present-day morphology is comprised of hogback ridges, consequent, subsequent, obsequent and resequent valleys of various orders, gullies, choes (seasonal streams), earth-pillars, rilled earth buttresses of

conglomerate formations, semi-circular choe-divides, talus cones, colluvial cones, water-gaps and choe terraces. Associated badlands features include the lack of vegetation, steep slopes, high drainage density and rapid erosion rates.

In the advent of Neogene, a depression was formed in front of the rising mountains (Proto-Himalaya). The depression became a repository of a thick sequence of molasses sediments of the Siwalik. The Siwalik Group comprises conglomerates, friable micaceous sandstone, silt sand and clay sand.

The conglomerates in general are poorly cemented but in places, they are very hard. These consist mainly of pebbles and cobbles of quartzite. The stray pebbles of granite, limestone, sandstone, breccia and lumps of claystone are also observed at places. Often the size of pebbles is large enough to be called boulders. The conglomerates not only occur as regular bands but also as lenticular bands alternative to micaceous sandstone and claybeds. The sediments were brought down 2 to 25 million years ago by the numerous fast-flowing rivers issuing forth from the rapidly rising Mountain mass of the Himalayas in the north.

The Siwalik Group is divisible into three sub-groups respectively the Lower, Middle and Upper on the basis of the lithostratigraphy as given in the table.

Lower Siwalik:

The Lower Siwalik consists essentially of a sandstone-clay alternation. In District Bilaspur, the lower sequence of the lower Siwalik consists of medium-grained subgraywacke inter-bedded with thick red clay, but higher up in sequence, sandstones are coarser and clasts become more frequent while the clays are less developed. The uppermost horizon consists of a conglomerate with well-rounded clasts of grey quartzite possibly derived from the Shali. The total thickness is about 1600 meters.

Middle Siwalik:

The Middle Siwalik Sub-group comprises a large thickness of coarse micaceous sandstone along with some inter-beds of earthy clay and conglomerate. It normally succeeds the Lower Siwalik along a gradational contact. The sandstone is less sorted than those in Lower Siwalik. Clay bands are dull-colored and silt. The general thickness is 1400 to 2000 meters.

Upper Siwalik:

The Upper Siwalik is mainly represented by sandstone inter-bedded with silt and conglomerate. The lower portion of the upper Siwalik mainly consists of soft, massive, pebbly sandstone with intercalations of conglomerates. In the upper portion, the conglomerate intercalation is replaced by the clay intercalations. The general thickness in the District is about 2300mtrs.

Older Alluvium:

The Older Alluvium in Dun Valley is designated as Dun Gravels while in the plains as Varanasi (Ambala). It is a multi-cyclic sequence of brown to grey silt, clay with Kankar and reddish brown to grey micaceous sand with pebbles.

Newer Alluvium:

Newer Alluvium has been subdivided into Fan Alluvium comprising of brownish grey clay, sand and gravel sequence lies over Older Alluvium within a narrow zone immediately to the south of Siwalik hill and terrace alluvium exposed as depositional terraces of Satluj River and comprising of a cyclic sequence of grey, micaceous, fine to coarse-grained sand, silt and clays.

5 DRAINAGE AND IRRIGATION PATTERN

Bilaspur as an independent district came into existence on 01st September 1972, consequent upon the reorganization of the districts of Himachal Pradesh. It lies in the outer hills of the Himalayas. The district is bounded on the North by Mandi and Hamirpur districts, on the west by Hamirpur and Una districts, and on its south lies the Nalagarh area of Solan district. Bilaspur district lies on both the banks of river Satluj which forms the boundary between Mandi and Bilaspur districts up to the centre of the eastern boundary. Bilaspur stands are divided into two natural parts formed by the river Satluj. The river flows from east to west in this district with a large bend midway and divides the district into two equal parts. The district is mostly hilly and has no mountains or higher altitudes from M.S.L. The elevation of the lowest point of the district is about 290 m from M.S.L. and the highest point is 1980 m above M.S.L.

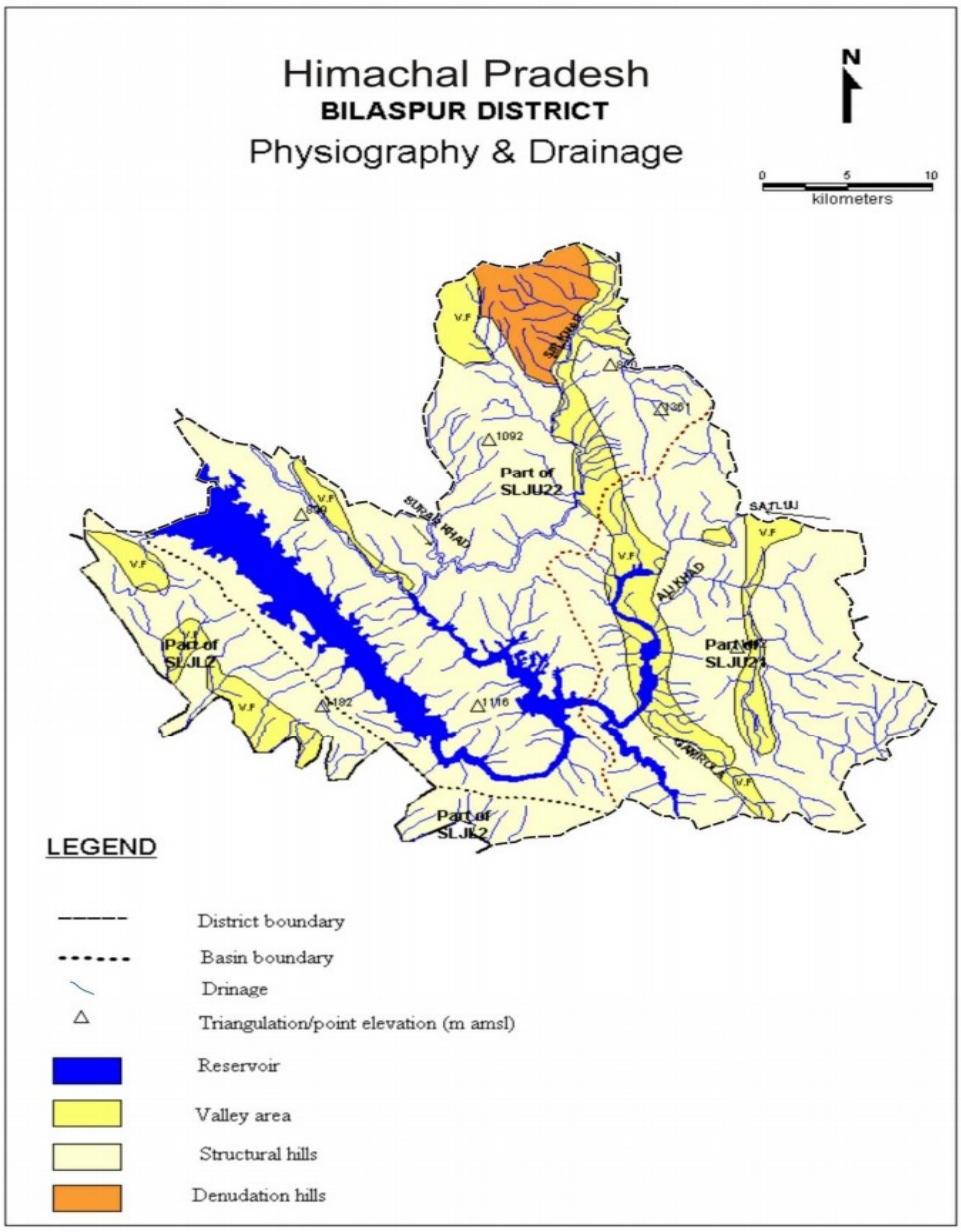


Image showing Physiographic and drainage of the district

Salient features of important rivers and stream

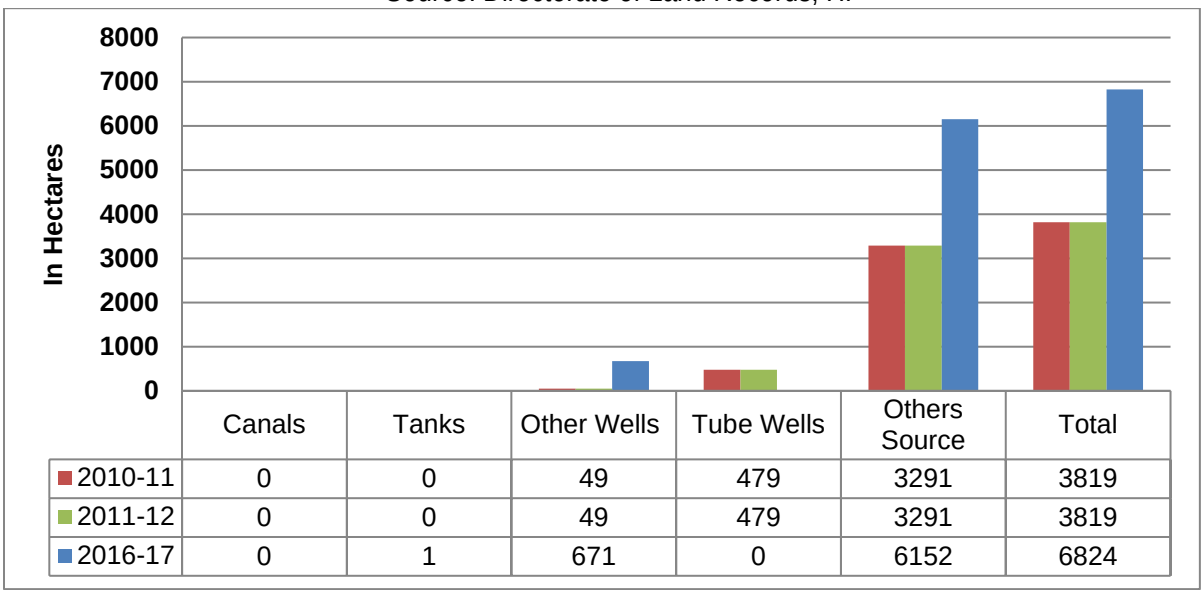
S.no	Name of river/stream	Total length in km(in district)	Place of entrance in district	Altitude at place of entrance in district
1	Satluj	14	Kasol	600m
2	Seer khad	35	Jahu-dehra	700m
3	Snehal khad	8.7	Kot-Samlog	825m
4	Sukkar khad	17	Dhalo	700m
5	Saryali khad	15.5	Naghiar	865m
6	Ali khad	10	Jabal	800m
7	Ghambrola khad	20	Swarghat	980m

The major river that passes through the middle of the district from east to west is Satluj. It enters the district near a place known as Kasol in the North- West and after traversing a course of 90 kms, leaves it near Naila and enters the territory of Punjab in the South- West. The Satluj is joined by several tributaries from both the sides, the main three tributaries are Ali Khad, Gamrola Khad and Seer Khad.. The length of Ali khad is about 26 17 kms. It rises in the Shimla district and after passing through Bahadurpur Dhar joins the river Satluj at Bilaspur. Gamrola khad also rises in the Shimla district and after draining the Rattanpur Dhar joins the river about 5 kms downwards from Bilaspur town. Seer Khad which is the third tributary of Satluj originates at Wah Devi which is 10 kms from Sarkaghat in Mandi district. After draining Kot-Ki-Dhar and a greater portion of Ghumarwin Tehsil it joins Satluj river at village Serimatla nearly 15 kms downwards from Bilaspur town.

Table showing the Net Irrigated Area of Bilaspur District by source in Hectares

Table showing the Net Irrigated Area of Bilaspur by source (in Hectares)						
Year	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	...	...	49	479	3291	3819
2011-12	...	...	49	479	3291	3819
2016-17	...	1	671	...	6152	6824

Source: Directorate of Land Records, HP



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

5.1 Process of Deposition of Sediments in the River Bed

Deposition is the opposite of erosion. Deposition is where a river lays down or drops the sediments or material that it is carrying. Rivers carries lots of different sediments, including rocks, boulders, silt, mud, pebbles and stonnes. Normally, a river has the power to carry sediments. If the force of a river drops, the river cannot carry sediment. This is when the river deposits its sediment.

Constituents of minor mineral

The work done by a river consists of the following

1) Erosion
2) Transport of the material produced by erosion
3) Accumulation (deposition) of the transported material

The erosion and transport of material go hand in hand with the deposition of the latter. There is not a single river that doesn't carry fragmental material and deposit it. Even at the early stages, in the development of a river, when the erosion and transport definitely prevail over accumulation, the material carried by the river is deposited in some of the sections. During youthful stage of the river, these deposits are unstable and when the volume of water and stream velocity increases (during flood), they may start moving again downstream. The load carried by a stream includes the rock waste supplied to it by rain wash, surface creep, slumping etc. by tributaries, external agents such as glaciers, wind, together with, acquired by its own erosion work.

The term load doesn't specifically mean the maximum amount of debris, that a stream could carry in a given set of conditions, that amount is referred to as the transporting power or capacity of a river. The term load is technically defined as the total weight of solid detritus transported in unit time. The transporting capacity of a stream rises very rapidly as the discharge and the velocity increases.

Experiments show that with debris of mixed shapes and sizes, the maximum load that can be carried is proportional to something between the third and fourth power of the velocity. But the fragments of a given shape, the largest size that can be moved (not the actual mass of mixed debris) is proportional to the sixth power of the velocity, provided of course that the depth of water is also adequate for the purpose.

As the velocity of a river is checked, the bed load s first to come to rest with continued slackening of the flow, the larger ingredients of the suspended load are dropped, followed successively by finer and finer particles. When the stream begins to flow more vigoroussly, the finer materials are the first to move again. A river begins to sort out its load or burden as soon as it receives it. The proportion of fine to coarse amongst the deposited materials tend on average to increase downstream, but there may be interruptions of this tendency because of addition of coarse debris from tributaries or from landslides and steepening of the banks.

Both discharge and load depend on the climate and geology (litholgy, structure and relief) of the river basin concerned and both co-operate in carving out the channels down.

<table>
<tr><td rowspan="2">Size</td><td colspan="2">Rounded, Subrounded, Subangular</td><td></td></tr>
<tr><td colspan="2">Fragment</td><td>Aggregate</td></tr>
<tr><td rowspan="2"></td><td>Boulder</td><td rowspan="2">Round stone</td><td>Boulder gravel Boulder conglomerate</td></tr>
<tr><td>Cobble</td><td>Cobble gravel Cobble conglomerate</td></tr>
</table>

256 mm-- 128 mm- 64-10mm- 6-2 mm-- <2 mm--	Pebble		Pebble gravel Pebble conglomerate
	Granule		Granule gravel
	Sand		Sand Sandstone
	Silt		Silt Siltstone
	Clay		Clay Shale

General Geo-morphological Characteristics of Rivers/Streams

Transport of Sediment by Streams and Rivers

The material transported by a stream can travel as:
1. Bed load
2. Suspended load
3. Dissolved load (salts, chemicals

Stream capacity
- Maximum quantity of solid material that a stream can carry
- Related to velocity (discharge)
- Higher after a rain (more sediment in water

Stream competence (or competency)
- Measure of the maximum size of particles the stream can transport
- Predict erosive capabilities

Types of rivers or streams

1. Meandering

These streams are very sinuous, and tend to migrate back and forth across the floodplain (or meander), over time. The word "meander" comes from the name of a sinuous river in Turkey, named the Menderes.

2. Braided

These streams have lots of lenticular-shaped in-channel bars. The stream channel bifurcates around these bars, and follows a pattern resembling braided hair.

Fluvial Geomorphology

Erosion is the set of all processes by which soil and rock are loosened and moved downhill or downslope. The most important process of erosion is due to running water. Erosion by running water acts in two basic forms: overland flow and channel flow.

Splash Erosion

Most running water starts off as rain. Rain drops have diameters of between 0.5 to 7 mm and hit the ground at between 1 - 9 m/sec. The force of the impact loosens material and throws it into the air. This is called splash erosion. In violent thunderstorms over 200 tonnes/hectare can be disturbed. On a sloping surface, soil is shifted downhill as grains are moved slightly greater distances downhill than uphill. More importantly, however, it leads to a decrease in the permeability of the surface due to openings being sealed by particles. There is therefore less infiltration and an increase in overland flow

Overland Flow

Runoff starts as a broad sheet. The sheet exerts a drag force over the ground surface and some weathered products may be removed. This is sheet erosion. Generally, after traveling a short distance, small channels or rills are formed, which coalesce into gullies, concentrating the erosive action.
The amount of erosion of a slope depends on the

- Length and steepness of the slope
- Rainfall intensity
- Permeability and structure of the surface
- Amount of vegetation cover.

Channel Flow

Stream erosion is "the progressive removal of mineral matter from the surfaces of a stream channel which itself may consist of bedrock or regolith" (Strahler). Erosion will only occur when the stream has an excess of energy. In mountainous streams, the rough channel walls may amount to 96% of the potential energy of the stream. Some energy is also spent in transporting load previously acquired. Erosion will result if the energy available > cohesion of particles.

The quantity of water passing through the channel is termed the discharge (m2/sec) and is equal to the channel cross-sectional area (m2) times the average stream velocity (m/sec).

The amount of sediment carried by the stream is called the stream load (kg/m3)

Sub-processes of erosion

a. Hydraulic Action

- The force of the running water alone. This is very important in weak alluvial deposits, especially in times of flood, when fast flowing; turbulent water undermines the channel banks.

b. Abrasion

- the scouring caused by the impact of rock particles that are being transported. Abrasion features include plunge pools, potholes and chutes. Abrasion is proportional to velocity2, so a three-fold increase in velocity leads to nine times as much abrasion. The mutual erosion of two particles is known as attrition

c. Solution (Corrosion)

- chemical reactions between ions in solution and exposed minerals. It is particularly important in limestone areas or on beds of rock salt and gypsum, but all common minerals are soluble to some extent.

Stream Velocity

Stream velocity can be estimated from Manning's equation

$$V = \frac{1}{n}\left(\frac{A}{P}\right)^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where A = cross-sectional area, P = wetted perimeter, S = slope and n = roughness coefficient. The value of n will vary from around 0.02 for a smooth channel to 0.03 for rough gravel. Other factors such as surface irregularities, changes in cross-section, obstructions, vegetation and degree of meandering will also affect the roughness coefficient. In general, as you go downstream, the slope decreases (lowers velocity) and n decreases (raises velocity). At any point along the stream's course, an increase in the depth of the stream's channel (e.g. during floods) will lead to an increase in A/P, with a consequent increase in velocity.

Erosion Velocities

The easiest grains to erode are in the fine to medium sand size range (see figure 1). Particles greater than this size have a proportionally greater volume to surface area ratio, so are harder to erode. For clays, ionic bonding leads to increased cohesion between clay particles, making them harder to erode. Clays are also platy minerals and form smooth surfaces. Laminar flow over the smooth surface decreases the ability of the stream to erode the particles. Clays also infill between larger grains and so are protected by the larger grains. Sands, therefore, may be moved during "normal" river flow, but it is only when floods increase the stream's velocity that the larger and smaller particles can be moved. Once the particles are being transported, there is an orderly deposition of particles with the largest being deposited first and clays being held almost indefinitely. Hence the sediment becomes sorted downstream.

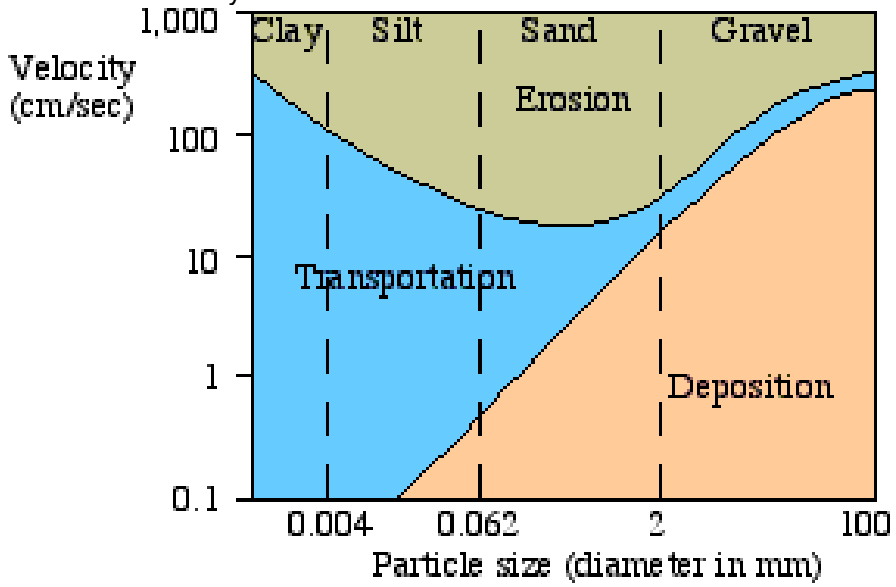


Figure 1. Diagram showing the stream velocity required to erode, transport and deposit particles of various sizes.

Transportation

The particles carried by streams is known as the stream load. Particles may be carried by

- Floatation. Of very minor significance.
- Solution. Ions of dissolved minerals that may travel downstream indefinitely. The most common are Na, Ca, K, Mg, Cl, So4 and HCO3. One estimate of U.S. rivers was that they carry 300 million tonnes of dissolved load each year, and 250 million tonnes of solid load.
- Suspension. The temporary support of particles when turbulence is greater than the settling velocity of the particle. Clay and silt are normally transported in suspension, but sand may be carried this way in floods.
- Saltation. Intermittent "jumping" of grains that are lifted by turbulence, but are too heavy to remain in suspension.
- Traction. The sliding or rolling of particles along the stream floor. Particles moved in this way comprise the bed load. Bed load normally constitutes around 10% of the solid load, but may be up to 50% during floods, when the major work of the stream is done.

Transportation is aided by the buoyancy of water, e.g. quartz grains are Å 2000 times the density of air, but only two and a half times that of water. Unequal velocities at the top and bottom of boulders also assists transportation, as does steep gradients.

The total load of particles of all sizes that a stream can carry is known as its capacity. It is proportional to discharge, which is proportional to velocity. A faster flowing stream therefore has a higher capacity. If a stream's capacity is less than its load, the stream cannot carry its load, so deposition occurs. If capacity exceeds load, the stream has excess energy (gravitational, potential energy), so it can erode more sediments. Streams switch back and forth from depositional to erosional agents, depending on load vs. capacity. A stream can erode along one stretch and deposit along another, since gradient and channel shape/size vary along the stream's course. Streams can erode during periods of higher velocity or discharge (floods) and deposit during periods of lower velocity or discharge. Anything that alters the sediment load delivered to the channel or that alters the stream's capacity to carry that load will cause the stream's gradient or channel geometry to change in response

The largest particle that a stream can transport is known as its competency. Assuming that there is sufficient depth to cover the particles, then competence is proportional to the square of velocity.

Deposition

Deposition will occur when a loss of energy results in a decrease in velocity. This may be due to such things as declining gradient, a decrease in water volume, an increase in cross-sectional area (particularly pools, lakes, and oceans), or by local obstructions. An excessive load produced by increased erosion in the drainage basin or tributary valleys, or from glaciofluvial outwash will also inevitably lead to deposition. The accumulations of stream deposits are called alluvium

Note: There is a constant interaction between erosion, transportation and deposition. During a flood, the bed of a stream at a particular point may be eroded, but as the flood subsides the bed is filled again. Similarly, in different parts of the stream, velocity differs and hence one part of the stream may be eroding its bank, while on the opposite bank deposition is taking place.

Downstream Adjustments

Overall, despite some variations, effluent streams (those that receive water from the water table) generally show the following changes downstream:

- discharge increases (due to more tributaries and a greater drainage area)
- total load increases (due to more tributaries and a greater drainage area)
- channel size increases (to cope with the increased discharge and load)
- particle size decreases (due to increased abrasion/attrition and changes in velocity)
- the smoothness of the channel increases (due to decreased particle size)
- gradient decreases

Stream velocity downstream is increased by the smoother channels, but decreased by lower gradients. Under normal conditions, velocity is proportional to discharge0.1, so there is a slight overall increase in the average velocity of the stream - despite the appearance of faster flowing mountain streams at the headwaters. In such streams, the amount of turbulence and associated eddies and backward flowing portions of the streams means that the average velocity is lower than the smoother flowing waters downstream. During floods, however, when the major work of the stream is done, velocity is proportional to discharge0 (i.e. it is constant), so the increased velocity associated with floods allows the erosion and transportation of a large range of particle sizes throughout the drainage system.

It can be seen from these relationships that peak discharge conditions that occur during floods are very important in determining the form of rivers and the features associated with them, and not the "normal" river level.

These changes take place in an orderly manner and lead to a longitudinal profile that is smooth and concave. This is known as a graded profile (see Figure 2 and Chernicoff & Whitney, fig, 14-7, pg 438).

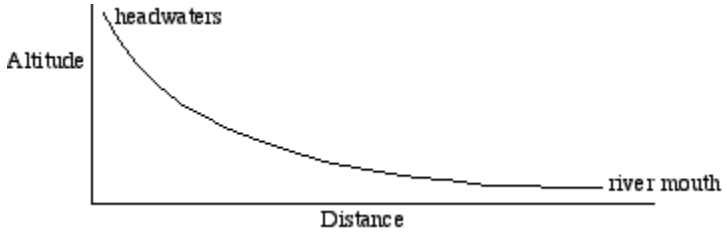


Figure 2. Long profile of a graded stream, showing a regular change in gradient.

For a stream with an irregular profile, erosion will be more pronounced at places of higher than normal gradient, such as at falls and rapids, and sedimentation will occur in areas of low gradient, such as lakes. The "bumps" are therefore ironed out until the graded profile is achieved.

Over geological time, providing that tectonic forces do not change the base level, any stream, irrespective of length, discharge, and bedrock, will achieve such a state of "dynamic equilibrium".

It is a "dynamic" system, as there is constant re-adjustment of the channel in response to local variations in the volume, velocity and load, that leads to a local balance between the sediment being transported and the energy available. That is, short term changes of scour and fill may occur, but in the long term the gradient and velocity are such that the available load can be transported without erosion or deposition dominating in any particular place. Over geological time, erosion dominates and the whole profile is lowered until a peneplain is developed close to base level. The base level is the lowest level that a stream can erode its channel. A temporary base level results from obstructions such as resistant outcrops, lakes, dams etc. that lead to temporary sub-profiles

An increase in base level will lead to aggradations, the built up of sediment on valley floors and the development of thick deposits of alluvium.

A decrease in base level will lead to such things as nick points that migrate upstream, alluvial terraces, valley in valley topography and entrenched meanders.

The rise in sea level from 18,000 to 10,000 years ago means that most present river systems don't demonstrate ultimate base level control by modern sea level. Estuaries (in streams with minor solid loads) and deltas (large loads) demonstrate adaptations to the changed conditions.

Salient Features of Important Rivers and Streams

s. no	Name of river/s tream/ khadd	Part of topo Sheet No.	Averag e width	Lengt h	Enters Bilaspur district from	Meets BBMB reservi or at	RL at Origi n(at the entra nce in the ditric t)	RL at Confl uenc e	Villages falling ir to Confluence	Mineral composition(%age)				Areas identified for granting mineral concessio n
1	Satluj River	53A/ 15	60-70m	14 km	Kasol		600m	545m	Bilaspur, BBMB area	San d	Bou lder	Bajr i	Sil t/c lay	Bilaspur, BBMB area
2	Seer khadd	53A/ 11	100-350(mtr s)	35km	Jahu-Dehra(from Mandi district)	Mandw an(Lag)	700m	529m	Bhadrog, talwara, Chudani, Dehlwin, Bamm, Sunhani, Ree, Jharari, Nihan, Barad	25	35	25	15	Bhadrog, talwara, Chudani, Dehlwin, Bamm, Sunhani, Ree, Jharari, Nihan, Barad
3	Snehal khadd	53A/ 10	50-100(mtr s)	8.7k m	Kot-Samlog)(fro m Hamirpur district)	meets Seer khadd at Jahu	825m	712m	Diara, Hatwarh	25	25	35	15	Diara, Hatwarh
4	Sukkar khadd	53A/ 11	50-250(mtr s)	17Km	Dhalo(from Hamirpur district)	Malang an	700m	523m	Fagog, Bhallu, Androli, Malagaon, Sandyar, Mandwan(BB MB)	25	35	25	15	Fagog, Bhallu, Androli, Malagaon, Sandyar, Mandwan(BBMB)
5	Saryali khadd	53A/ 11	50-200(mtr s)	15.5k m	Naghiar(fro m Hamirpur district)	Maand wan(kal lar)	865m	520m	Shahtalai, Jhabola, Bharoli Khurd, Bagru	25	35	30	10	Shahtalai, Jhabola, Bharoli Khurd, Bagru
6	Ali Khadd	53A1 5	50-75(mtrs)	10km	Jabal(from solan district)	Chandp ur	800m	600m	Jabbal,Bholi, Jhukala, Ashamanjari, Kuddi,	20	30	25	25	Jabbal,Bho li, Jhukala, Ashamanja ri, Kuddi,
7	Ghamb her Khadd	53A/ 15,16	25-100(mtr s)	20Km	From Swarghat,S olan District	Ghamb erpul	980m	690m	Neri a nd Charrol(BBM B)	40	20	30	10	Neri a nd Charrol(BB MB)

Methodology adopted for calculation of Mineral Potential:

The mineral potentials have been calculated based on field investigations and geology of the catchment area of the river/streams. It is also important to mention here that the there is a provision in the

River/Stream Bed Mining Policy Guidelines where collection of material upto a depth of one meter is allowed in a single season where mineral concession have been granted. As per the provision in the River/Stream Bed Mining Policy Guidelines, only 60% of the area of the particular river/stream bed has been taken into account for calculation of mineral potential. It is noticed that during flood season whole of the pits so excavated is completely filled up and as such the excavated area is replenished with new harvest of mineral. No change in river profile is noticed in the past few years. Mineral constituents like boulder, river borne bajri, sand upto a depth of one metre is considered as resource mineral. Other constituents like clay and silt are exclude as waste while calculating the mineral potential of particular river/stream. The specific gravity of each mineral constituents is different. While calculating the mineral potential, the average specific gravity is taken as 2.25. The percentage of mineral constituents like boulder, river borne bajri, sand is also varies for different river/stream. While calculating the mineral potential the percentage of each mineral constituents is taken as, 35-40% for Boulder, 30-35% for river born Bajri, 25-30% for sand and 5-15% for silt and clay.

The deposition in river beds is more pronounced during rainy season. Although the quantum of deposition is varies from stream to stream depending upon numbers of factors such as catchment lithology, discharge, river profile and geomorphology of the river course. However, there are certain geomorphological features developed in the river beds such as channel bars, point bars etc. where annual deposition is much more even two to three metres. The annual deposition of minor mineral in the different river/stream beds has been calculated on the basis of field investigations and geology of the catchment area of the river/streams. The rate of annual deposition of minor mineral in the different river/stream beds of district Sirmour varies from 5 cm to 30 cm.

Part of Topo sheet of Survey of India	53A/15		
TOTAL LENGTH	14 Km(14000m)		
GENERAL WIDTH	60-70m		
AVERAGE WIDTH	65m		
TOTAL CATCHMENT AREA(appx)	800sqkm		
RL AT ENTRANCE	600m at Kasol where river enters in bilaspur district		
RL AT CONFLUENCE	515 m near confluence with Govind Sagar		
TOTAL RIVER BED AREA	91-00-00 hect		
VILLAGES	Bilaspur, BBMB area		
GEOLOGY	Satluj passes through shivalik formations in entire bilaspur district		
TOTAL RESERVE CALCULATED(60%)	= 12,01,200 MT		
TOTAL DEPOSITION	4,20,420MT		
	Sand	Boulder	bazri
Reserve(MT)	300300	420420	300300
Deposition (MT)	105105	105105	147147

Description of Rivers/Streams

1. Satluj River

It is evident from the above table about 1201200 MT of mineable mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 420420 MT. As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserves are area specific, for which mineral concession are granted/or to be granted.

2. Seer Khad

Part of Topo sheet of Survey of India	53A/11		
TOTAL LENGTH	35Km(35000m)		
GENERAL WIDTH	100-350m		
AVERAGE WIDTH	150m		
TOTAL CATCHMENT AREA(appx)	1200sqkm		
RL AT ENTRANCE	700m		
RL AT CONFLUENCE	529 m		
TOTAL RIVER BED AREA	525-00-00 hect		
VILLAGES	Bhadrog, talwara, Chudani, Dehlwin, Bamm, Sunhani, Ree, Jharari, Nihan, Barad		
TOTAL RESERVE CALCULATED	=6930000 MT		
ANNUAL DEPOSITION	=2079000 MT		
	Sand	Boulder	BAZRI
Reserve(MT)	1732500	2425500	1732500
Deposition(MT)	519750	519750	727650

It is evident from the above table about 6930000 MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 2079000MT. As such mineral concession can be granted in the whole length of river

bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

3. Snehl Khad

Part of Topo sheet of Survey of India	53A/10		
TOTAL LENGTH	8.7 Km(8700m)		
GENERAL WIDTH	50-100m		
TOTAL WIDTH	65m		
TOTAL CATCHMENT AREA(appx)	80sqkm		
RL AT ENTRANCE	825m		
RL AT CONFLUENCE	712m		
TOTAL RIVER BED AREA	56-55-00 hect		
VILLAGES	Diara, Hatwarh		
TOTAL RESERVE CALCULATED	=746460 MT		
ANNUAL DEPOSITION	=223938 MT		
	Sand	Boulder	Bajri
Reserve(MT)	186615	186615	261261
Deposition(MT)	78378.3	55984.5	55984.5

It is evident from the above table about 746460MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 223938 MT. As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

4. Sukkar Khad

Part of Topo sheet of	53A/11		
TOTAL LENGTH	17 Km(17000m)		
GENERAL WIDTH	50-250m		
TOTAL WIDTH	100m		
TOTAL CATCHMENT AREA(appx)	250sqkm		
RL AT ENTRANCE	700m		
RL AT CONFLUENCE	523m		
TOTAL RIVER BED AREA	170-00-00 hect		
VILLAGES	Fagog, Bhallu, Androli, Malagaon, Sandyar, Mandwan(BBMB)		
TOTAL RESERVE CALCULATED	=2244000 MT		
TOTAL DEPOSITION	=673200 MT		
	SAND	BOULDER	BAZRI
Reserve(MT)	561000	785400	785400
Deposition(MT)	235620	168300	235620

It is evident from the above table about 22,44,000 MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 6,73,200 MT. As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

5. Saryali Khad

Part of Survey of India	53A/11		
TOTAL LENGTH	15.5 Km(15500m)		
GENERAL WIDTH	50-200m		
TOTAL WIDTH	100m		
TOTAL CATCHMENT AREA(appx)	200sqkm		
RL AT ENTRANCE	865m		
RL AT CONFLUENCE	520m		
TOTAL RIVER BED AREA	155-00-00 hect		
VILLAGES	Shahtalai, Jhabola, Bharoli Khurd, Bagru		
TOTAL RESERVE CALCULATED	=2046000 MT		
TOTAL DEPOSITION	=613800 MT		
	SAND	BOULDER	BAZRI
Reserve(MT)	511500	716100	613800
DEPOSITION(MT)	184140	153450	214830

It is evident from the above table about 2046000 MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 613800MT . As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

6. Ali Khad

Part of Topo sheet	53A/15		
TOTAL LENGTH	20 Km(20000m)		
GENERAL WIDTH	50-75		
TOTAL WIDTH	60m		
TOTAL CATCHMENT AREA(appx)	135sqkm		
RL AT ENTRANCE	800m		
RL AT CONFLUENCE	540m		
TOTAL RIVER BED AREA	120-00-00 hect		
VILLAGES	Jabbal,Bholi, Jhukala, Ashamanjari, Kuddi,		
TOTAL RESERVE CALCULATED	=1584000 MT		
TOTAL DEPOSITION	=475200 MT		
	SAND	BOULDER	BAZRI
Reserve(MT)	316800	475200	396000
DEPOSITION(MT)	118800	95040	142560

It is evident from the above table about 1584000 MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 475200MT. As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

7. Gambher Khad

Part	53A/15,16		
TOTAL LENGTH	20 Km(20000m)		
GENERAL WIDTH	25-50m		
TOTAL WIDTH	40m		
TOTAL CATCHMENT AREA(appx)	350sqkm		
RL AT ENTRANCE	900m		
RL AT CONFLUENCE	680m		
TOTAL RIVER BED AREA	80-00-00 hect		
VILLAGES	Neri and Charrol(BBMB)		
TOTAL RESERVE CALCULATED	=1056000 MT		
TOTAL DEPOSITION	=316800 MT		
	BOULDER	SAND	BAZRI
Reserve(MT)	422400	211200	316800
DEPOSITION(MT)	126720	2851200	63360

It is evident from the above table about 1056000 MT of mineral of different sizes are available up to a depth of 1 m. The annual deposition of mineral in the stream bed has been calculated approximately 316800MT. As such mineral concession can be granted in the whole length of river bed along river bank and flood plains at suitable places where transportation is smooth and material can be easily transported. However, no lifting/mining shall be allowed where any work allotted (supply scheme, Bridge etc) by any agency. The above said reserves are total reserves in the above mentioned stretch of river bed and mineable reserve is area specific, for which mineral concession are granted/or to be granted.

River/stream	Portion of the river/stream recommended for mineral concession	Length of area recommended for mineral concession	Average width of the area recommended for mineral concession	Mineable mineral potential(i n MT)
Satluj	Along the river banks and flood plain, mineral concession can be granted in the whole length of river bed at suitable places where transportation is smooth and material can be easily transported, Detail of places where mineral concession may be granted can be obtained by Mining office.	14	60-70	1201200
Seer khad	Do	35	100-350	6930000
Snehal khad	Do	8.7	50-100	746460
Sukkar khad	Do	17	50-250	2244000
Saryali khad	Do	15.5	50-200	2046000
Ali khad	Do	10	50-75	1584000
Ghambrola khad	Do	20	25-100	1056000

Mineral potential in MT

	Boulder	Bajri	Sand	Total mineable mineral (60% of total mineral potential)
Satluj	420420	300300	300300	1021020
Seer khad	2425500	1732500	1732500	5890500
Snehal khad	186615	261261	186615	634491
Sukkar khad	785400	785400	561000	2131800
Saryali khad	716100	613800	511500	1841400
Ali khad	475200	396000	316800	1188000
Ghambrola khad	422400	211200	316800	950400

Annual deposition

Mathematical calculations based upon various geomorphological indicators which is done for average profile of river bed throughout the length of river in the district.

The process of mineral potential reclamation/deposition depends upon rainfall received in the catchment areas of the river/stream and their tributaries and the velocity of the river. Thus it is difficult to predict, what quantity of mineral is deposited by the river. During less rain, %age of deposition is less however during heavy rainfall water gushes into rivers may force the change in the river course, thus old sites of deposition may be irrelevant. Thus the figures may be a mere prediction. Also the figures may vary from area to area and year to year basis. Therefore it is suggested that DEAC committee is at liberty to make the spot inspection of the area under question to make necessary amendments in the document.

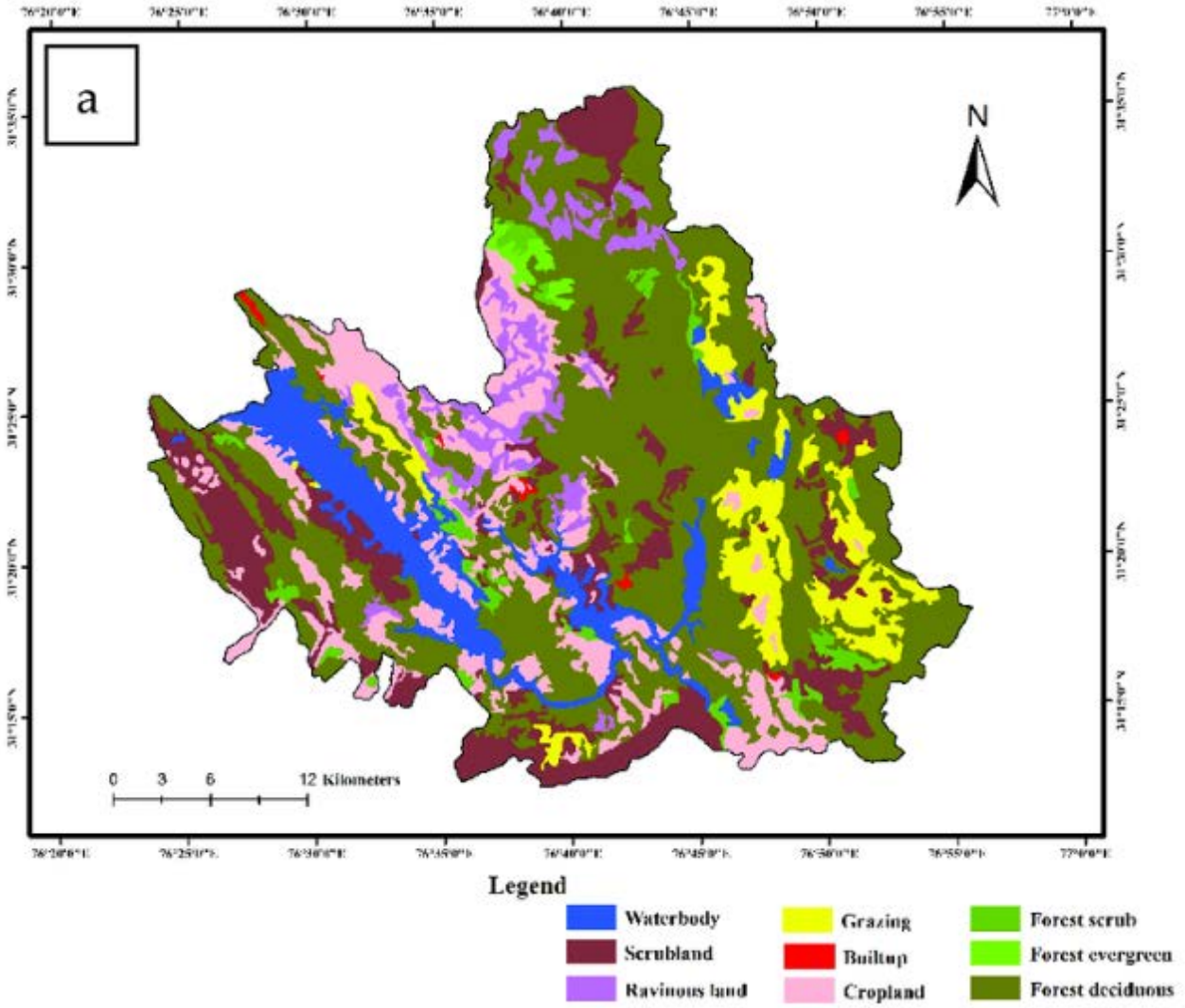
River/stream	Boulder	Bajri	Sand	Total annual deposition
Satluj	105105	147147	105105	357357
Seer khad	519750	727650	519750	1767150
Snehal khad	55984.5	55984.5	78378.3	190347.3
Sukkar khad	168300	235620	235620	639540
Saryali khad	153450	214830	184140	552420
Ali khad	95040	142560	118800	356400
Ghambrola khad	126720	63360	2851200	3041280

NOTE: - *The mineral reserves have been calculated only upto 1.00 metre depth however, in general the minor mineral in the form of sand, stone, boulder, bajri is is available at least upto a depth of 03-05 meters. Although there are some portions in the river beds such as channel bars, point bars and central islands where the annual deposition is raising the level of river bed thus causing shifting of the rivers towards banks and causing cutting consequently of banks and at such locations, removal of this material upto the bed level is essential to control the river flow in its central part and to check the bank cutting. While calculating the mineral potentials, the mineral deposits lying in the sub-tributaries of that particular stream/river has not been taken into consideration. Since these mineral deposits are adding annually to the main river, the mineral deposits will be much more.*

6. LAND UTILIZATION PATTERN IN THE DISTRICT

GENERAL INFORMATION

Geographical area (Sq. Km) = 1167
Administrative Divisions Sub divisions= 3
Number of Tehsils= 4 Number of Sub Tehsils= 2 Development blocks= 4



Land Utilization Map of District Bilaspur

6.1 Agriculture:

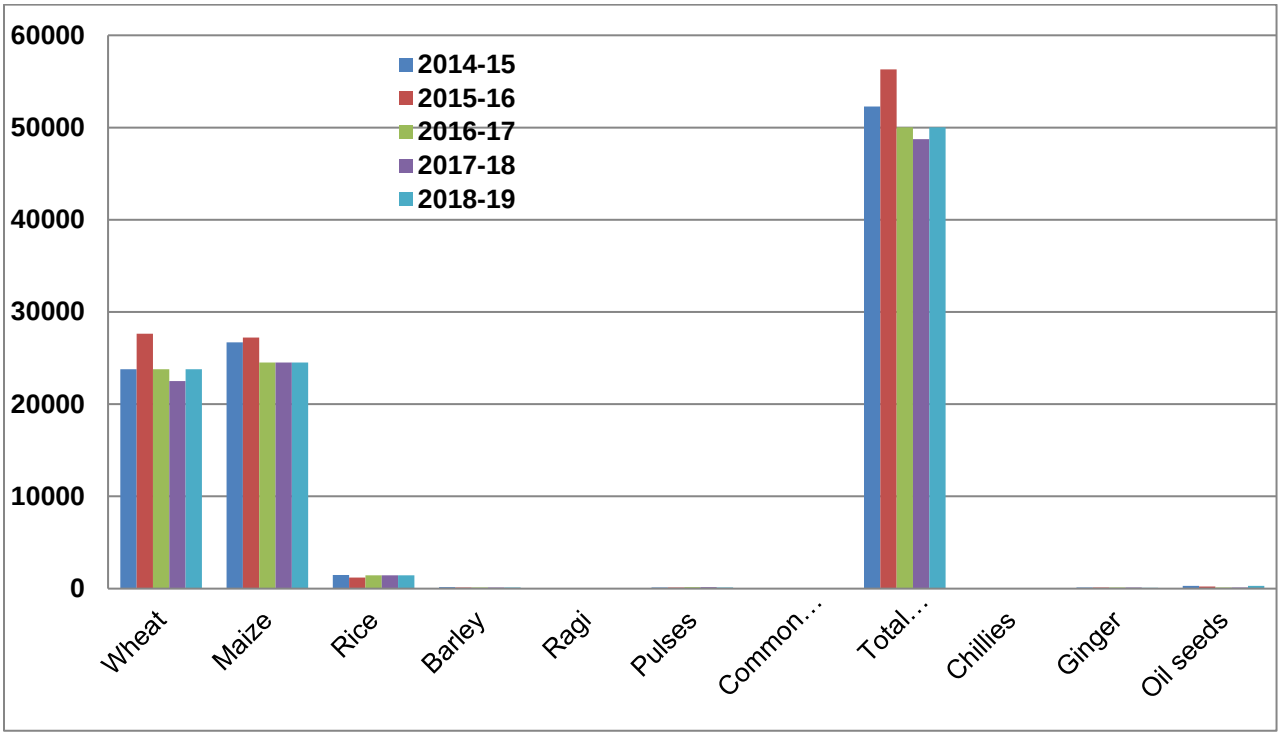
Agriculture is the main occupation of the people in the District, having different types of soil and agro-climate conditions which are quite suitable for the growth of various types of cereals vegetables, temperate and stone fruits and other crops. The major crops grown in the district are wheat, Paddy, Maize, Barley, and Millet. Besides these, potatoes and a variety of vegetables like green peas, cauliflower, cabbage, spinach tomatoes, etc. are also grown in the district. The economy is mostly agrarian and the majority of the population depends on agriculture and activities allied to it to earn their lively hood. Most of the land is un-irrigated and depends upon the rainy season. Part of the land is irrigated and the irrigation facilities are provided by lifting water from streams. The water flows throughout the year in this Khad. The land holding in the district is small and scattered. The farmers grow more than two crops in a year to get

maximum production from the land. In the whole district, just 32000 hectares of area is irrigated which contributes to only 10.2% of the total available area. Also, there are 61 Lift Irrigation Schemes working in the whole district.

Table showing the area under Different Crops in Hectares

Table showing Area under Different Crops (in Hectares) at District Bilaspur											
Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Foodgrains	Chillies	Ginger	Oil seeds
2014-15	23807	26694	1465	173	0	126	0	52265	47	132	305
2015-16	27637	27212	1189	125	0	140	0	56303	16	116	244
2016-17	23801	24509	1428	132	0	165	0	50035	18	127	122
2017-18	22501	24509	1428	132	0	165	0	48735	18	127	122
2018-19	23801	24509	1429	132	5	136	0	50012	4	90	311

Source: Directorate of Land Records, HP

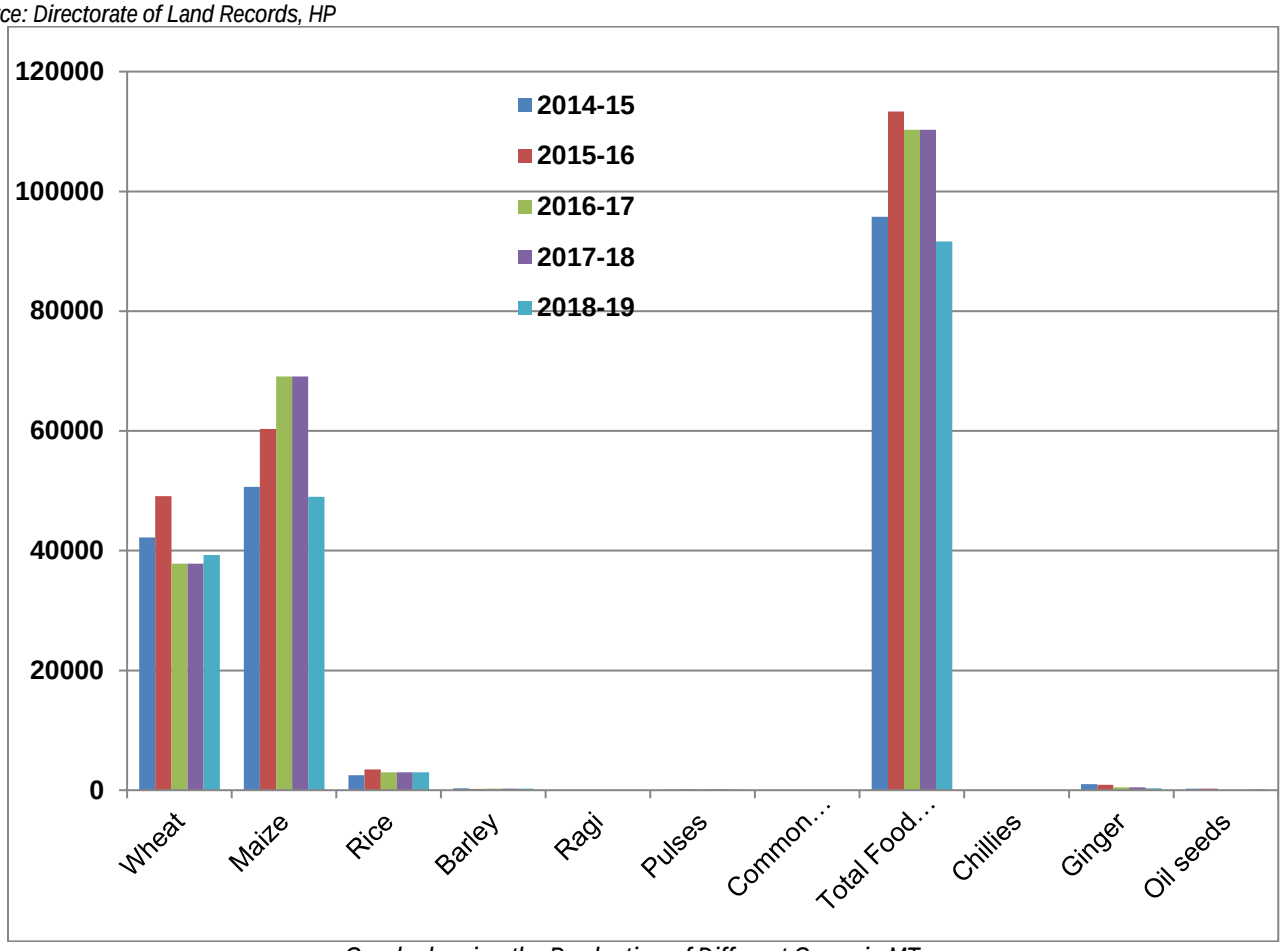


Graph showing the Area under Different Crops in Hectares

Table showing the Production of Different Crops in MT

Table showing Production of Different Crops (in MT) at District Bilaspur											
Year	Wheat	Maize	Rice	Barley	Ragi	Pulses	Common millets	Total Foodgrains	Chillies	Ginger	Oil seeds
2014-15	42212	50629	2508	300	0	104	0	95753	13	1004	257
2015-16	49119	60349	3481	218	0	150	0	113317	5	883	245
2016-17	37851	69071	2985	258	0	149	0	110314	8	451	68
2017-18	37851	69071	2985	258	0	149	0	110314	8	451	68
2018-19	39271	49008	2987	257	3	118	0	91644	1	333	159

Source: Directorate of Land Records, HP

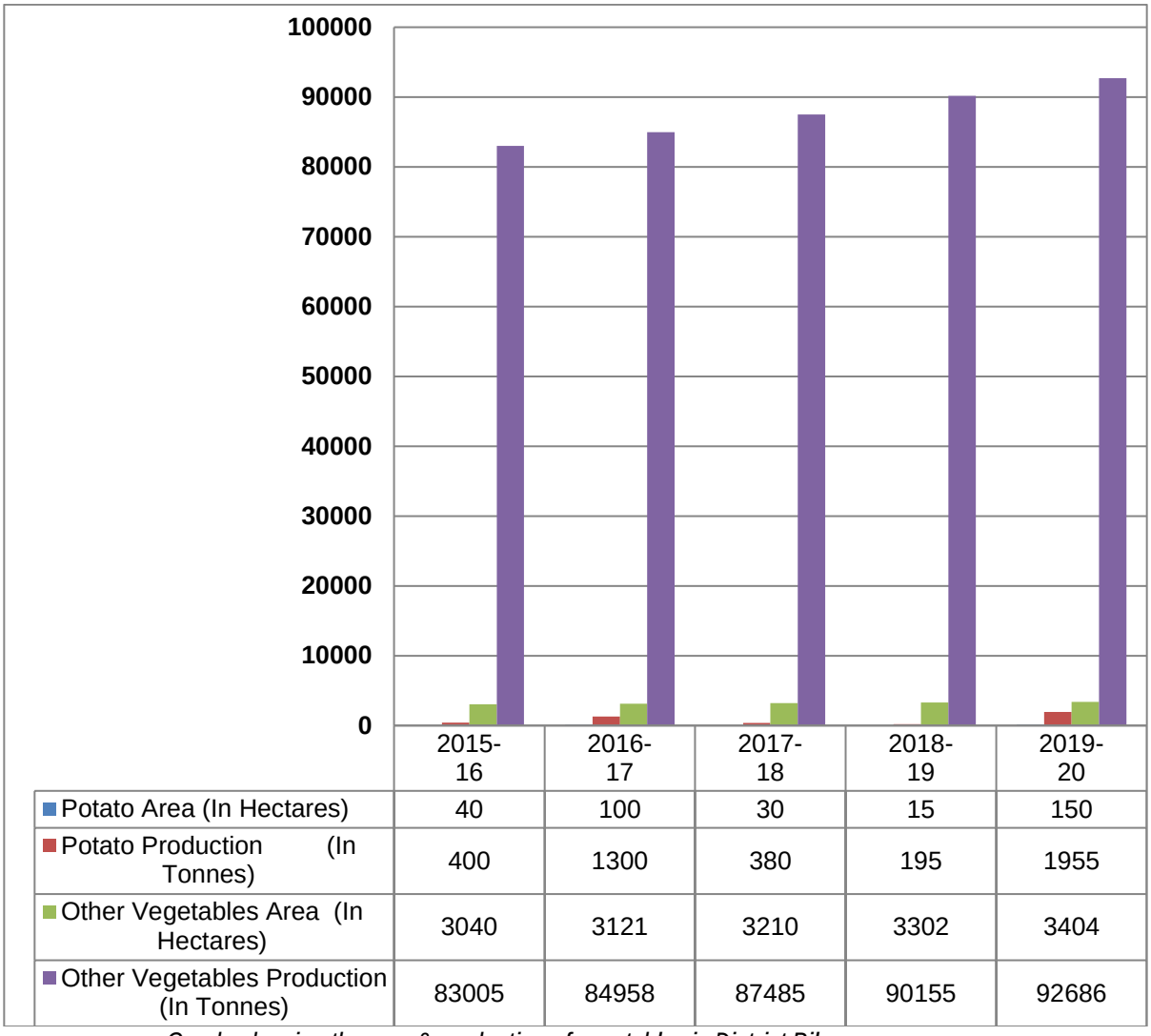


Graph showing the Production of Different Crops in MT

Table showing Area & Production of Vegetables in Tones

Area & Production of Vegetables (Dist- Bilaspur)				
Year	Potato		Other Vegetables	
	Area (In Hectares)	Production (In Tones)	Area (In Hectares)	Production (In Tones)
2015-16	40	400	3040	83005
2016-17	100	1300	3121	84958
2017-18	30	380	3210	87485
2018-19	15	195	3302	90155
2019-20	150	1955	3404	92686

Source: Directorate of Land Records, HP

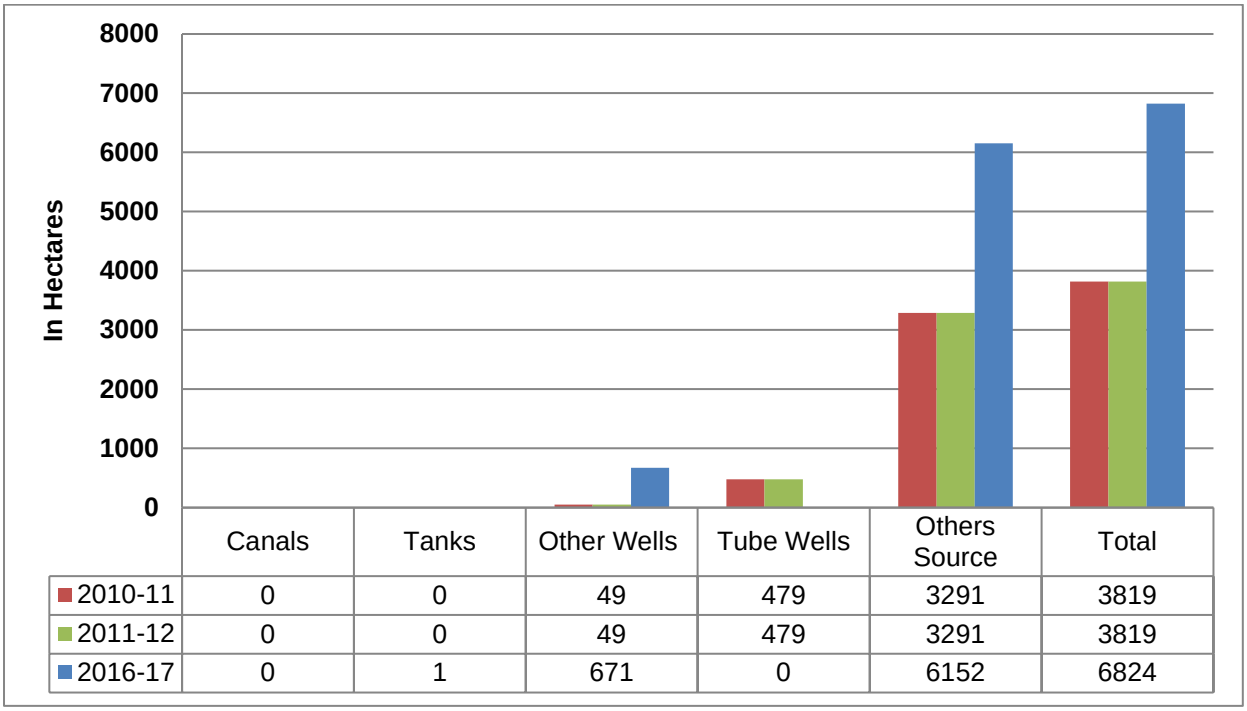


Graph showing the area & production of vegetables in District Bilaspur

Table showing the Net Irrigated Area of Bilaspur District by source in Hectares

Table showing the Net Irrigated Area of Bilaspur by source (in Hectares)						
Year	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	...	...	49	479	3291	3819
2011-12	...	...	49	479	3291	3819
2016-17	...	1	671	...	6152	6824

Source: Directorate of Land Records, HP



	Canals	Tanks	Other Wells	Tube Wells	Others Source	Total
2010-11	0	0	49	479	3291	3819
2011-12	0	0	49	479	3291	3819
2016-17	0	1	671	0	6152	6824

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

6.2 HORTICULTURE

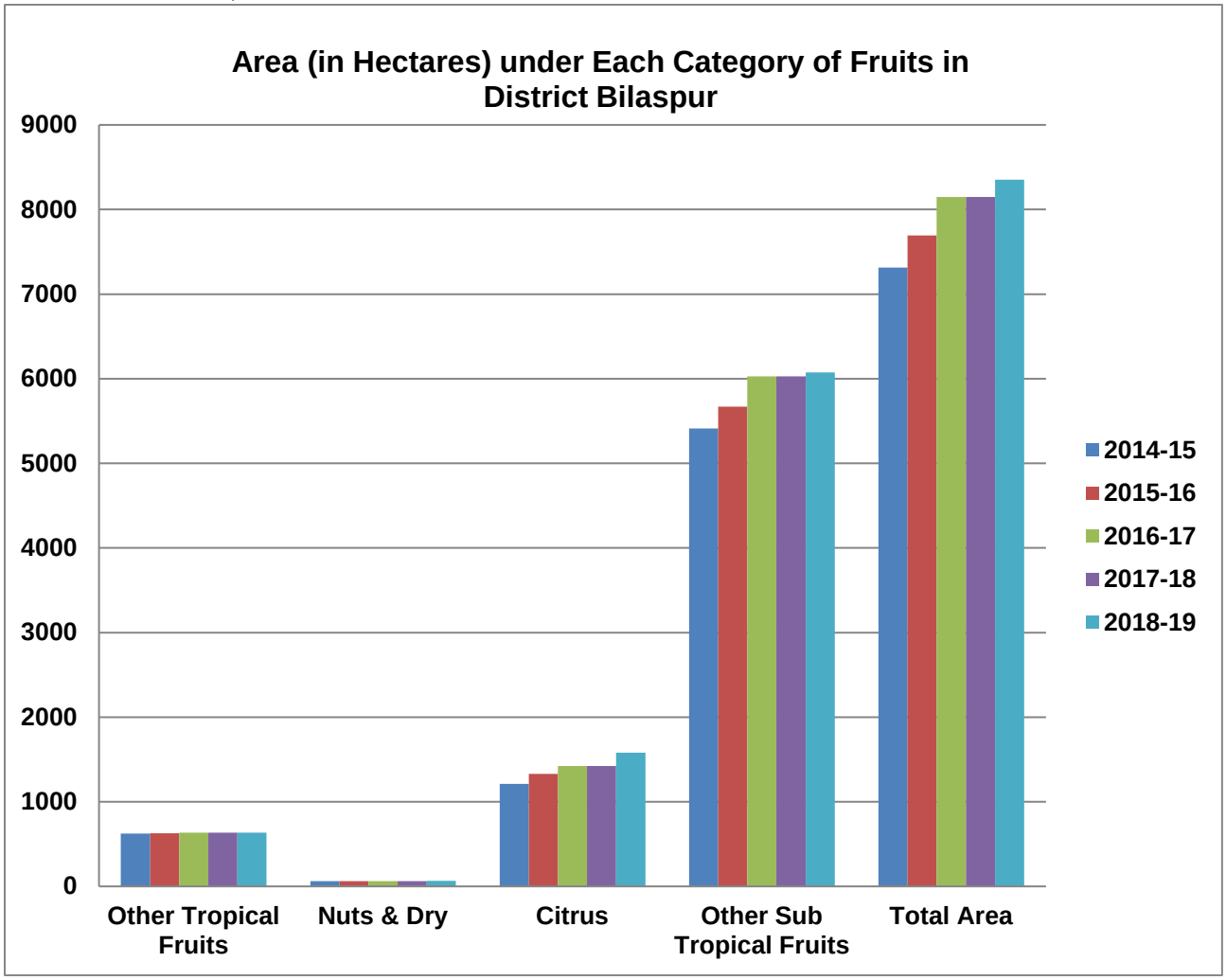
The topography and agro-climatic conditions of the district are quite suitable for the production of various fruits. The topography of the district can be grouped into three categories namely High hill areas located at the higher elevation mid-hill areas and low-lying valley areas Fruits of various kinds depending upon the terrain climatic condition and soil are grown in the district. The Main horticulture produce of the area can be classified into four categories

1 Citrus Fruits
2 Sub-tropical Fruits
3 Nuts and dry fruits
4 Other temperate fruits

Table showing area under Each Category of Fruits in District Bilaspur

Table showing Area (In Hectares) under Each Category of Fruits in District Bilaspur					
Year	Other Tropical Fruits	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Area
2014-15	623	63	1213	5414	7313
2015-16	629	63	1330	5671	7693
2016-17	636	63	1423	6028	8150
2017-18	636	63	1423	6028	8150
2018-19	636	65	1580	6073	8354

Source: Directorate of Horticulture, HP

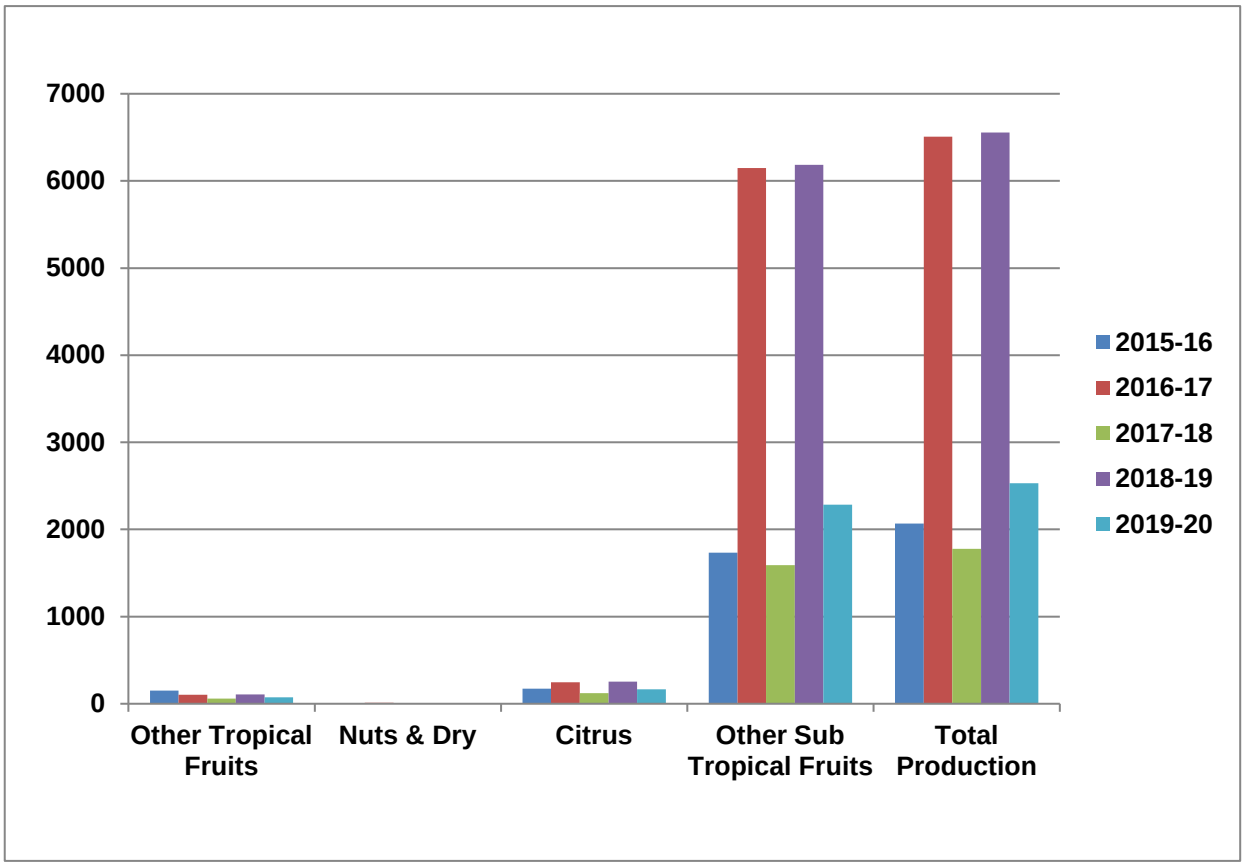


Graph showing Areas under Each Category of Fruits in District Bilaspur

Table showing Production under Each Category of Fruits in District Bilaspur

Table showing Production (In MT) under Each Category of Fruits in District Bilaspur					
Year	*Other Tropical Fruits*	Nuts & Dry	Citrus	Other Sub Tropical Fruits	Total Production
2015-16	150	9	173	1735	2067

2016-17	103	10	246	6147	6506
2017-18	60	8	121	1590	1779
2018-19	107	9	255	6183	6554
2019-20	73	8	167	2284	2532



Source: Directorate of Horticulture, HP

Graph showing Production under Each Category of Fruits in District Bilaspur

6.3 ANIMAL HUSBANDRY

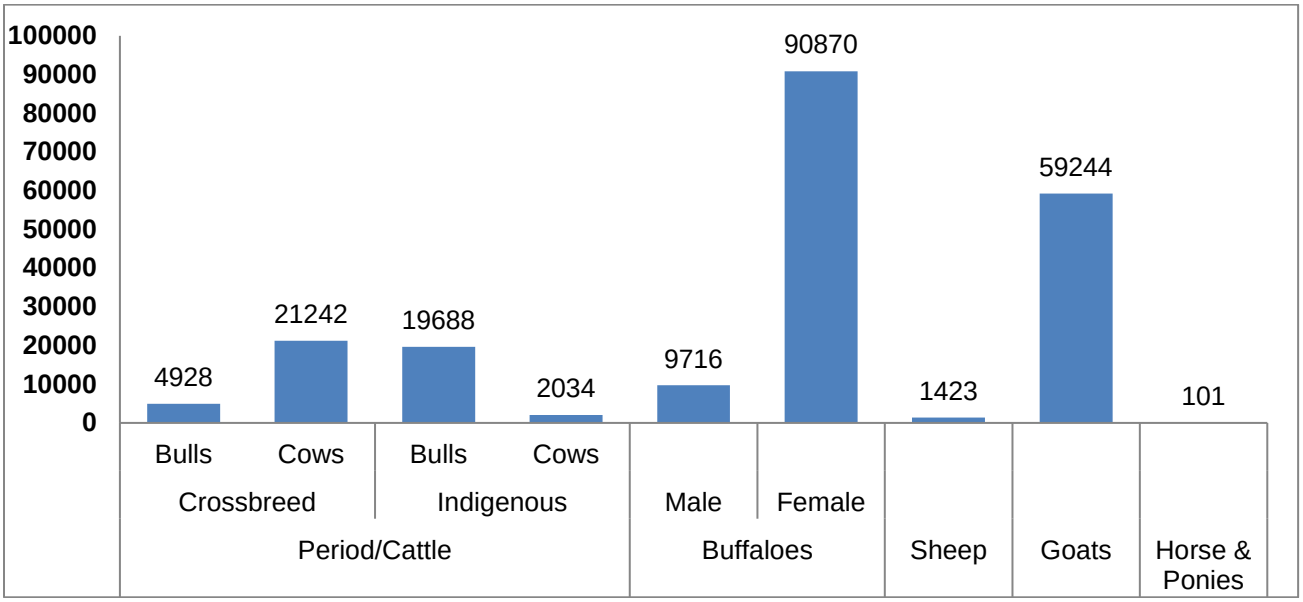
Livestock is the main wealth next to the agriculture of the predominant population of the district. The entire terrain in the district is mountainous with high slopes and deep valleys. The development of agriculture, therefore, broadly depends upon the development of animal husbandry. Animal husbandry has several direct and indirect uses for a farmer and so it is an almost integral part of agriculture. To improve the fertility of the soil and to plough the fields, they need animals. Besides this milk and wool is also need of the people. The people keep the following kind of animals:-

1	Cow	2	Buffalo
3	Sheep	4	Horse and Ponies
5	Mules	6	Donkey
7	Goats	8	Poultry

Table showing the Livestock census of District Bilaspur

Livestock Census in District Bilaspur										
Year	Status	Period/Cattle				Buffaloes		Sheep	Goats	Horse & Ponies
		Crossbreed		Indigenous		Male	Female			
		Bulls	Cows	Bulls	Cows					
2012	At Bilaspur	4928	21242	19688	2034	9716	90870	1423	59244	101

Source: Directorate of Animal Husbandry, HP

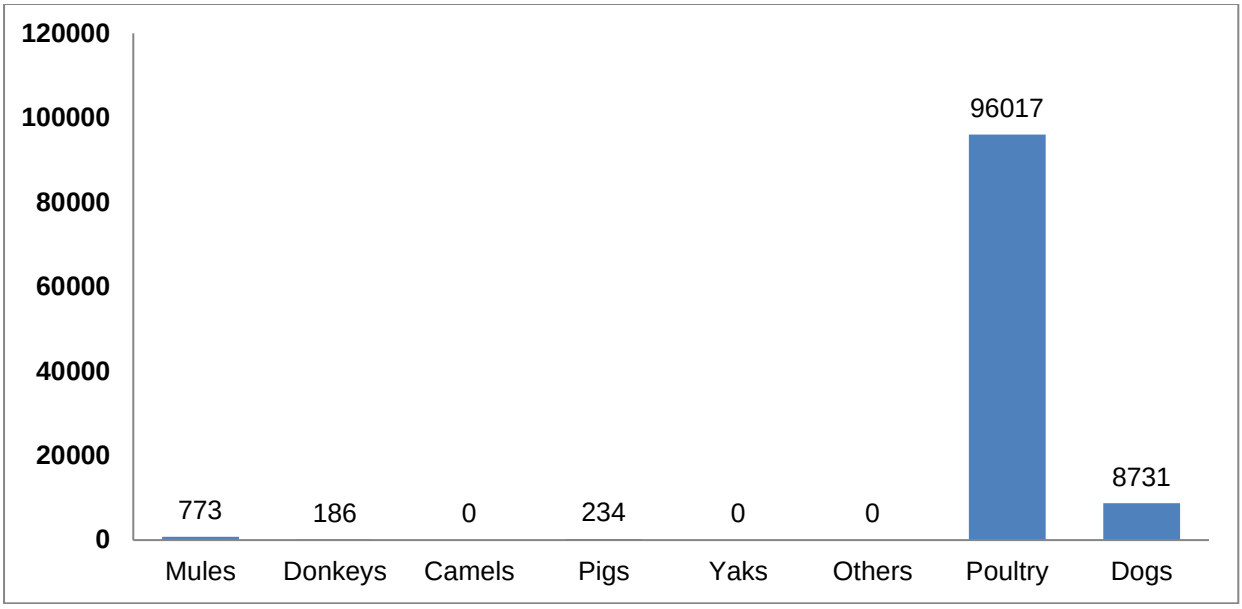


Graph showing the Livestock census of the Bilaspur District

Table showing other Livestock censuses of District Bilaspur

Other Livestock Census in District Bilaspur							
Mules	Donkeys	Camels	Pigs	Yaks	Others	Poultry	Dogs
773	186	0	234	0	0	96017	8731

Source: Directorate of Animal Husbandry, HP



Graph showing other Livestock censuses of the Bilaspur District

6.4 FISHERIES

Bilaspur District is blessed with vast and variegated fisheries resources in the vast network of perennial rivers, streams, Khuds and fast-flowing cold waters, harboring a wide variety of tropical species of fish. The river system in the District constitutes rivers Gambhar, Sarsa and tributaries. The following prominent varieties of fish families are found in the river and streams of the Bilaspur District.

Mahaseer
Gid
Mirror carp

Fishing in this water is regulated by Fisheries Legislation under the Himachal Pradesh Fisheries Act, 1976. Small fishes are spotted on the Ali Khad where the water is enough deep and stagnant.

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

Table showing Annual Production of Fisheries at District Bilaspur		
YEAR WISE	TOTAL PRODUCTION (IN MT)	VALUE OF FISH PRODUCED (IN LAKHS)
2015-16	1721.14	1475.09
2016-17	1703.39	1613.74
2017-18	1539.41	1507.74
2018-19	1359.42	1404.85
2019-20	1250.58	1369.12

Source: Fisheries Department, HP

	2015-16	2016-17	2017-18	2018-19	2019-20
TOTAL PRODUCTION (IN MT)	1721.14	1703.39	1539.41	1359.42	1250.58
VALUE OF FISH PRODUCED (IN LAKHS)	1475.09	1613.74	1507.74	1404.85	1369.12

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

6.5 FLORA

The topography, climate and nature of the soil are mainly responsible for the growth of various types of trees and shrubs which are important for making the environment of the area most suitable for the survival of living beings. The trees and shrubs grow according to the heights. The Chil is considered the prevailing conifer up to about 1950 metres in height when it gives place to the Deodar and the Blue Pines. In Bilaspur District, the forest range between the Shrubs, Sal and Bamboo forest of the low hills to the Fur and Alpine forest of the higher elevations. The lowest point of the southern boundary of the district is less than 300 metres above Mean Sea Level and the highest range is at an elevation of 5500 metres in the north. The forests grown between these two extremes vary as the elevation. The following most prominent varieties of trees are found at different elevations.

Table showing the most prominent varieties of trees in the area

	Name of tree	Scientific name
1	Mango	(Magniferaindica)
2	Tali	(Dalbergiasisoo))
3	Pipal	(Ficusreligiosa)

4	Behul	(Grewiaoppsitifolia)
5	Chil	(Pinus Rose burghi)
6	Simbal	(Bomberemalabaricum)
7	Tuni	(Cedrclatoana)
8	Jamun	(Engeniajambolana
9	Bamboo	
10	Brah	
11	Tos	

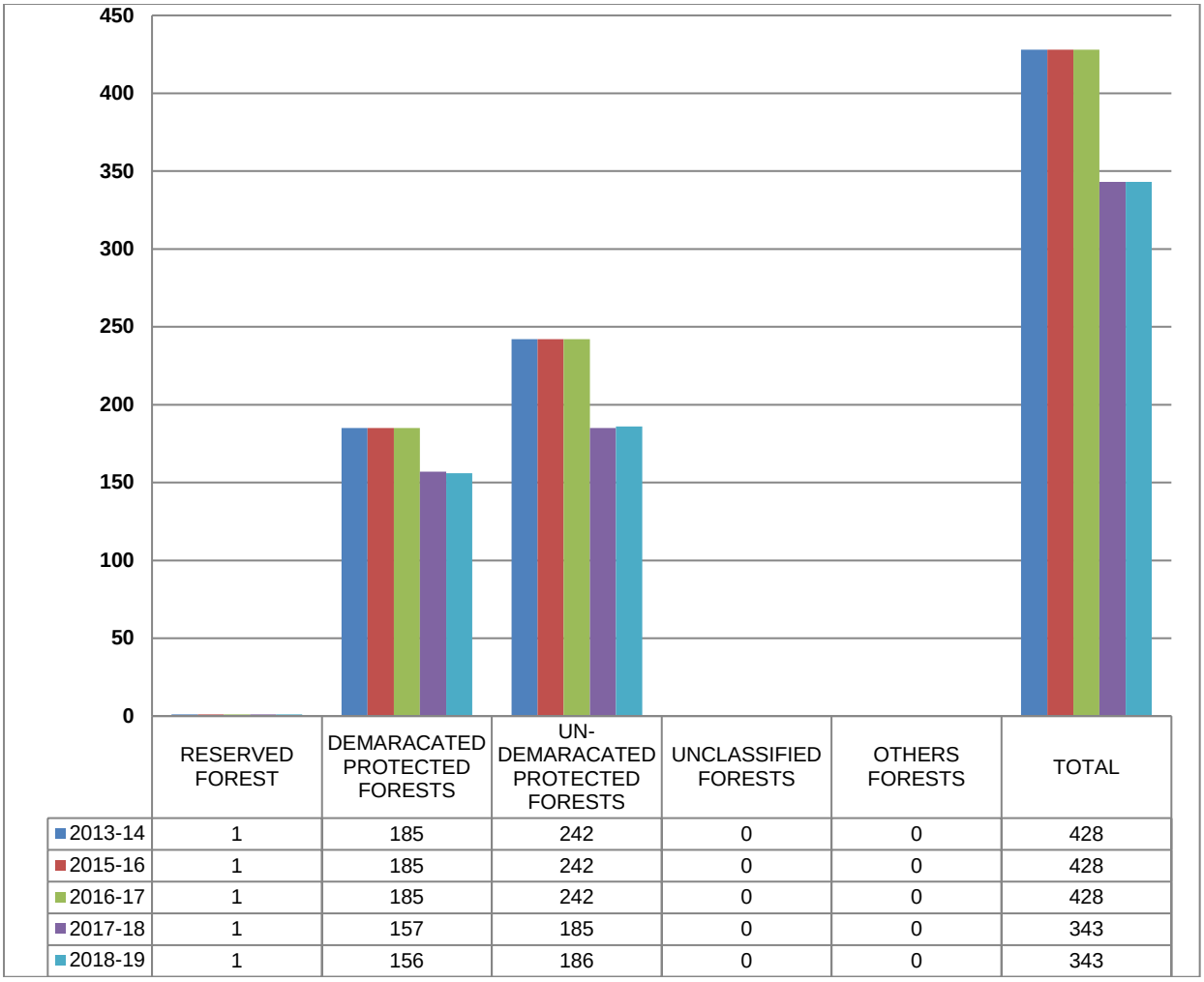
Broadleaf species

Ber and other bushes

Table showing the classification of forest area (in sq.km.) of district Bilaspur

CLASSIFICATION OF FOREST AREA (IN SQ.KM.) OF DISTRICT BILASPUR						
YEAR	RESERVED FOREST	DEMARCATED PROTECTED FORESTS	UN-DEMARCATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL
2013-14	1	185	242	…	…	428
2015-16	1	185	242	…	…	428
2016-17	1	185	242	…	…	428
2017-18	1	157	185	…	…	343
2018-19	1	156	186	…	…	343

Source: Forest Department, HP



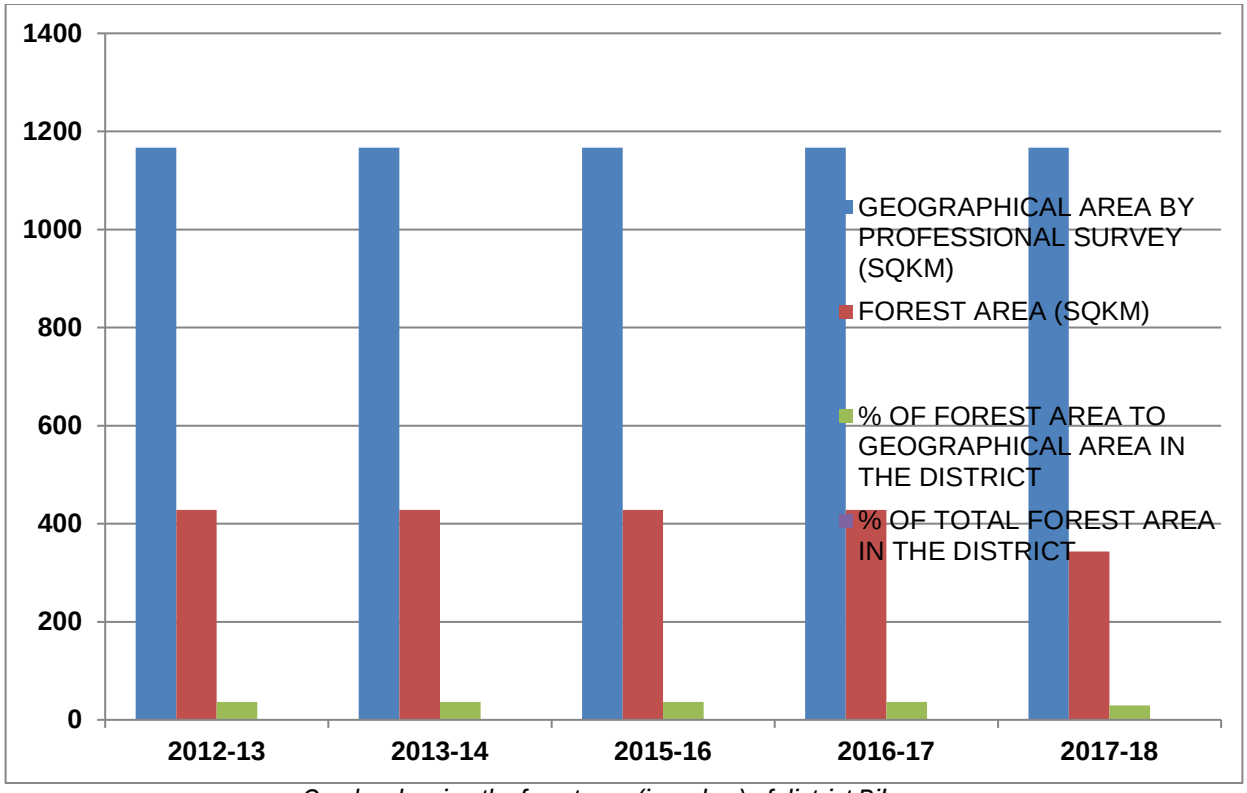
	RESERVED FOREST	DEMARACATED PROTECTED FORESTS	UN-DEMARACATED PROTECTED FORESTS	UNCLASSIFIED FORESTS	OTHERS FORESTS	TOTAL
2013-14	1	185	242	0	0	428
2015-16	1	185	242	0	0	428
2016-17	1	185	242	0	0	428
2017-18	1	157	185	0	0	343
2018-19	1	156	186	0	0	343

Graph showing the classification of forest area (in sq.km.) of district Bilaspur

Table showing forest area of District Bilaspur

FOREST AREA OF DISTRICT BILASPUR				
YEAR	GEOGRAPHICAL AREA BY PROFESSIONAL SURVEY (SQ KM)	FOREST AREA (SQ KM)	% OF FOREST AREA TO GEOGRAPHICAL AREA IN THE DISTRICT	% OF TOTAL FOREST AREA IN THE DISTRICT
2012-13	1167	428	36.70	1.10
2013-14	1167	428	36.70	1.10
2015-16	1167	428	36.70	1.10
2016-17	1167	428	36.70	1.10
2017-18	1167	343	29.39	0.90

Source: Forest Department, HP



Graph showing the forest area (in sq.km.) of district Bilaspur

6.6 Fauna

The wildlife in an area is directly related to characteristics of the habitat i.e. availability of food and water, nature and density of flora prevalent in the area along with other factors like slope, climate, prevalent anthropogenic activities etc. Variation of altitude and slope in the study area has resulted in the proliferation of fauna which adopts the ruggedness and hard climatic conditions. Due to diverse flora, climate and altitude, the area possess a well unique variety of Himalayan wildlife species.

Due to wide variations in the altitude, a large variety of fauna is available in the forest of the district. The Black Bears are common in the higher valley. The Leopards are found throughout the district. The Musk deer or Kastura are found in certain areas. The thick forest and climate of the district are the best for the survival of many animals and birds.. The following common animals and birds are found in the district:

Table showing Fauna in Bilaspur district

1	Black bear	(Selenarctosthebatanus)
2	Samber	(Cerveus unicolor)
3	Leopard	(Felisbengalensis)
4	Musk deer	(Moschumischifarus
5	Hare	(Lepus nigricoilies)
6	Fox	(Vaulepusbengalanesis)
7	Langoor	(Preshytes entellus)
8	Flying squirrel	(Hylopetusfimbriatus
9	Bat	(Hippsideros armiger)

10	Snow leopard	(Pantheraunica)
11	Monkey	(Macacamulatta)
12	Bilaspur Sadarng deer	(Munteicusmuntisk)
13	Pigeon	(Columbia livia)
14	Mor	(Payocrisslatus)
15	Crow	(Crovussplendes)
16	Parrot	(Prottaculakarneri)
17	House sparrow	(Parser domcrticus)
18	Cranes	(Grurs species)
19	Himalayan fly catcher	(Terpsibhousparadisi)
20	Woodpecker	(PicoidesMacer)

7 SURFACE WATER AND GROUND WATER SCENARIO OF THE DISTRICT.

7.1 HYDROGEOLOGY

The rock formations occupying the district range in age from pre-Cambrian to Quaternary period. The generalized geological succession in the district is given below:-

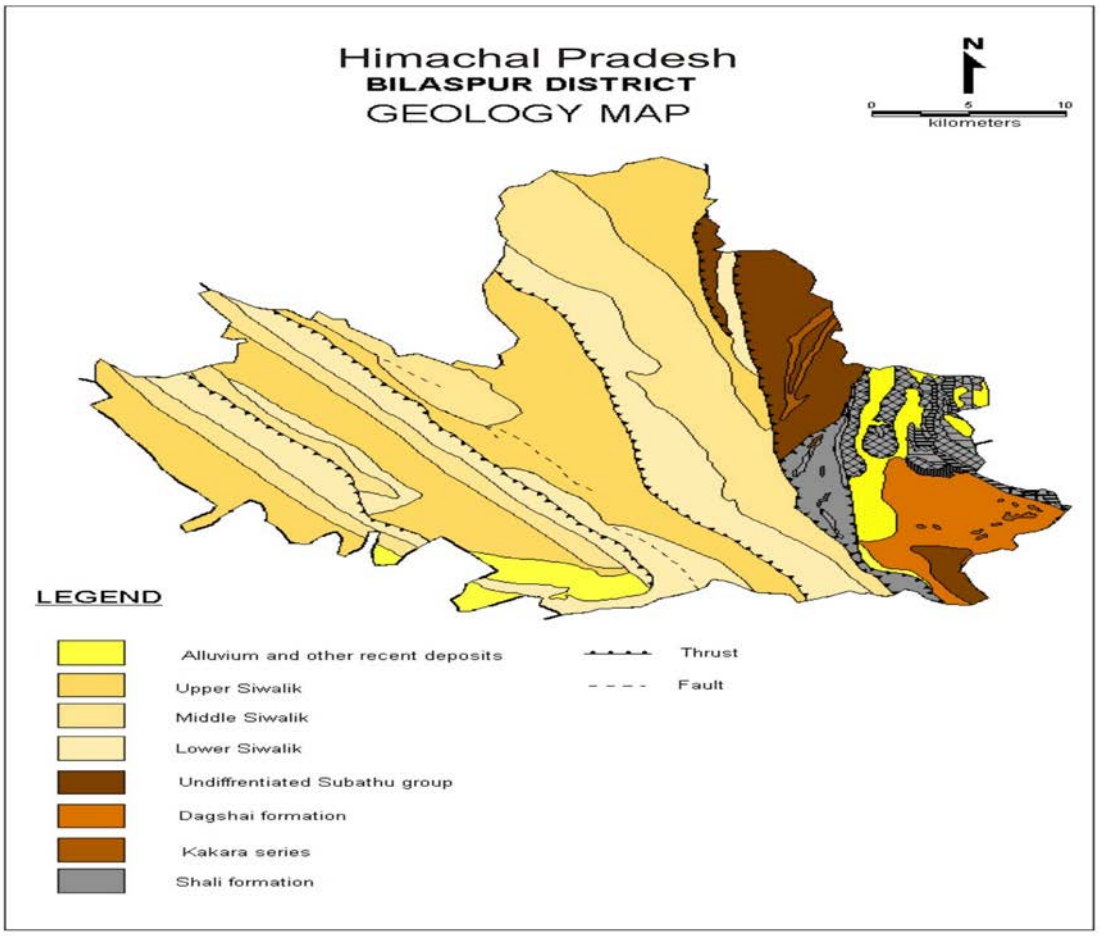
EON	ERA	PERIOD	GROUP FORMATION	DESCRIPTION
Phanerozoic	Cenozoic	Quaternary (Recent to sub-Recent)	Alluvium; fluvial, terrace, piedmont	Sand, silt, clay, gravel, pebble and cobble etc.
			Undifferentiated	Sand, clay, gravel, pebble, cobble and boulders
		Tertiary Pliocene to Mid. Miocene	Upper Siwalik	Soft sandstone, brownish clay, shale, poorly sorted and crudely bedded conglomerate. Boulder beds.
			Middle Siwalik	Grey sandstone, and brownish clay/ shale
			Lower Siwalik	Red and purple sandstoneand shale
		Oligocene-Lower Miocene	Subathu Group	Grey sandstone, shale, Clay
			Kasauli Formation	Greenish to grayish hard sandstones
			Daghshai Formation	Dark-red and purple coloured shale
			Subathu Formation	Dark nodular clays
Proterozoic	Upper ProterozoicIII Proterozoic II		Krol Formation Shali Formation	Greyish massive dolomitesand Limestone Cherty Dolomite, Quartziteand Lime stone

Hydrogeologically, both the unconsolidated valley fill and alluvial formation are occurring in the valley area and semi-consolidated sediments belonging to Siwalik Group form aquifer system in the district. Porous alluvial formation forms the most prolific aquifer system in the valley area where as the sedimentary semi-consolidated formation forms the aquifer of low yield prospect.

The ground water in the Siwalik group of rocks occur under unconfined to semi confined conditions mainly in the arenaceous rocks viz., sandstone, siltstone, gravel & boulder beds etc. The occurrence and movement of ground water is controlled by inter-granularpore spaces and also the secondary fracture porosity. Siwalik sediments underlying hilly/undulating areas where springs (mostly gravity/contact type) and *bowries* are the main ground water structures apart from the hand pumps. The discharges of the springs, varies from seepages to 0.50 lps. B*owries* are dug well type structures constructed on the hill slopes for tapping the seepages. In the low lying areas underlain by Siwalik rocks, dug wells and hand

pumps are the main ground water structures that range in depth from 3.00 to 25.00 m bgl, where in depth to water level ranges from 2.50 to 15.00 m bgl. In upland/plateau areas the water level is generally deep. In Beet area, water level more than 60 m below land surface is observed.

In valley areas, the ground water occurs in porous unconsolidated / alluvialformations (valley fills) comprising sand, silt, gravel, cobbles / pebbles etc., and forms prolific aquifers. Ground water occurs both under phreatic and confined artesian conditions. Water logging areas are observed in northern part of Jukhola valley. Ground water is being extensively developed in the area by medium tube wells and dug wells, and also by hand pumps. Depth of dug wells ranges from 4.00 to 15.00 m bgl whereas depth to water level ranges from near surface to 6 m bgl in pre monsoon. Yield of shallow aquifer is moderate with well discharges up to 10 lps.



CGWB has drilled 6 exploratory wells in the district in the depth range of 31.8 to 115m bgl. Static water level ranges from 3.35 to 36.55 m bgl and discharge ranges from 7.7 to 20.75 lps with a drawdown of 2.6 m to 11.11 m.

7.2 GROUND WATER RESOURCES

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

The district has hilly terrain having very high slopes. The valley areas are narrow and isolated. The areas

therefore not considered for estimation of the ground water resources being discontinuous aquifers.

7.3 GROUND WATER QUALITY

CGWB has not established Ground Water Monitoring Stations in the district because of nonexistence of dug wells and piezometers. However, the water samples collected form springs and hand pumps during the various hydrogeological studies have been analyzed and results are tabulated below.

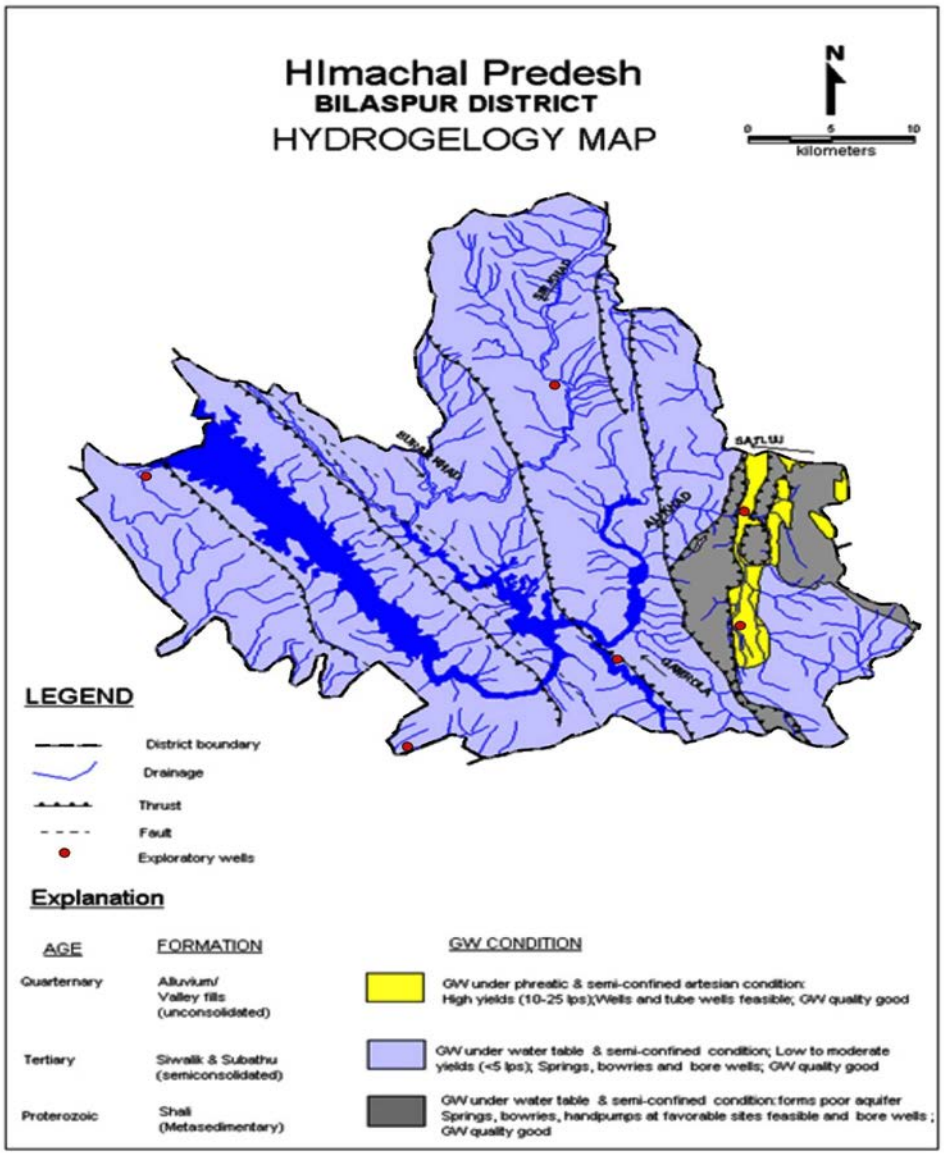


Table: Range of chemical constituents of ground water, Bilaspur district.

S. No	Parameter		Range	
			Min	Max
1.	pH		7.43	8.20
2.	EC	(µS/cm)	190	965
3.	Cl	(mg/l)	7	167
4.	NO_3	(mg/l)	6	95
5.	Ca	(mg/l)	20	122
6.	Mg	(mg/l)	5	46
7.	Na	(mg/l)	2	70
8.	K	(mg/l)	2	9.4
9.	TH as $CaCO_3$	(mg/l)	80	465

The ground water of the district is alkaline in nature. pH of shallow ground water ranges from 7.43 to 8.20. The EC in the area ranges from 190 to 965 µS/cm. Nitrate values range from 6 to 95 mg/l. The chemical quality reveals that the overall ground water quality is good and is suitable for domestic and irrigation use. There is an urgent need to have proper water quality monitoring and checks on regular basis.

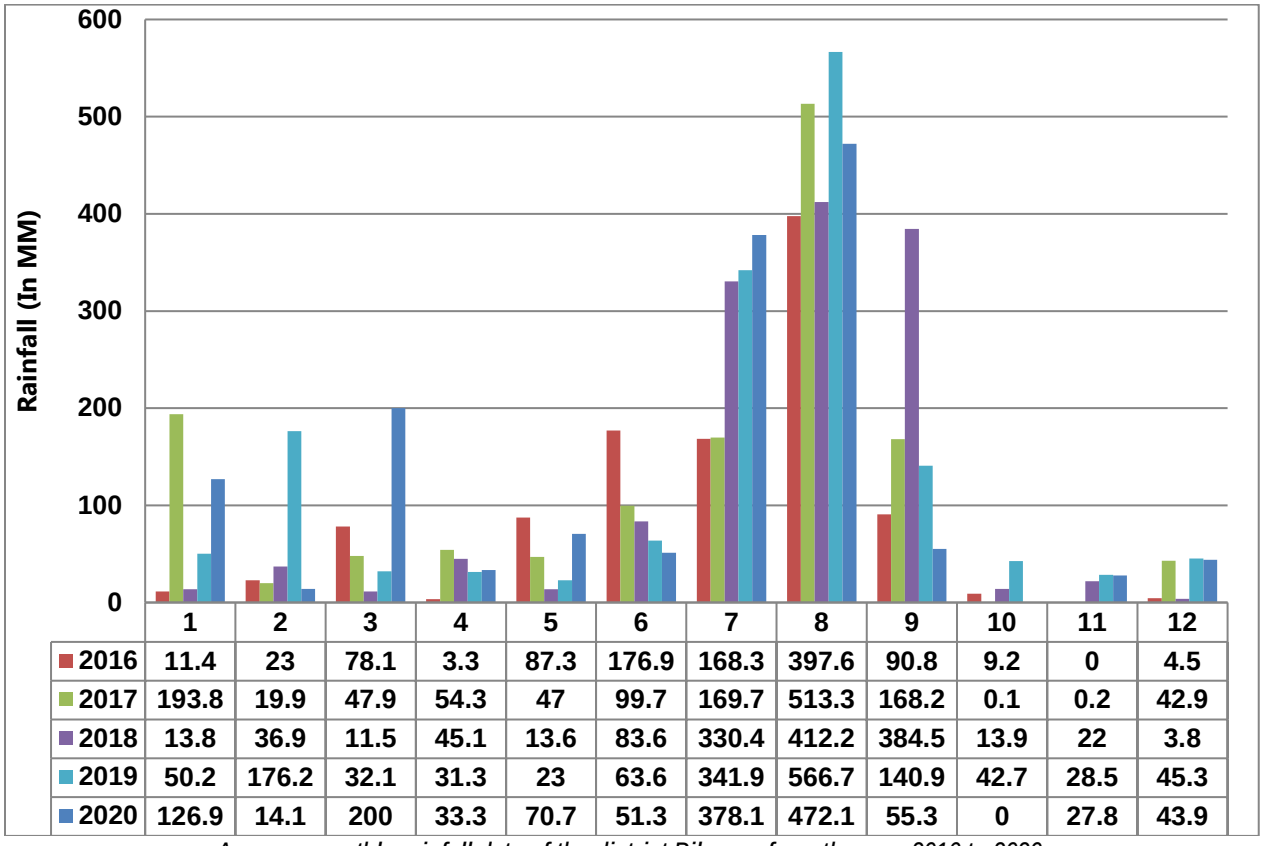
8. RAINFALL OF THE DISTRICT AND CLIMATIC CONDITION

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 adjoining the mining lease area as per IMD.

Table showing monthly rainfall data of the district

DISTRICT BILASPUR RAINFALL IN MILLIMETERS (R/F)												
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	RAINFALL (IN mm)											
2016	11.4	23	78.1	3.3	87.3	176.9	168.3	397.6	90.8	9.2	0	4.5
2017	193.8	19.9	47.9	54.3	47	99.7	169.7	513.3	168.2	0.1	0.2	42.9
2018	13.8	36.9	11.5	45.1	13.6	83.6	330.4	412.2	384.5	13.9	22	3.8
2019	50.2	176.2	32.1	31.3	23	63.6	341.9	566.7	140.9	42.7	28.5	45.3
2020	126.9	14.1	200	33.3	70.7	51.3	378.1	472.1	55.3	0	27.8	43.9

Source: Meteorological Department, Govt. of India



Average monthly rainfall data of the district Bilaspur from the year 2016 to 2020

The region has four distinct seasons. The area experiences severe winter from December to March followed by a servers summer season lasting from April to June. The area receives rainfall The catchment area receives rainfall due to western disturbances that pass over the northwestern part of the country

during the winter months. Rainfall in valleys is also received during the winter month. The rainy season generally starts from mid-July and extends up to mid-September. During winter, the rains are scarce and extend from 15th December to 15th February.

The terrain in general has a profound influence on the temperatures of a region. The temperature generally rises from the beginning of March till June, which is the hottest month of the year with mean minimum and maximum temperatures of 25.6°C to 44°C respectively. With the onset of monsoons by the end of June, the temperature begins to fall. The drop in day temperature is much more than the drop in night temperature. The night temperature falls rapidly after the withdrawal of monsoons by mid-September. The month of January is the coolest month with the mean maximum and minimum temperatures being 24°C and 1.7°C respectively. Under the influences of western disturbance, the temperature falls appreciably during winters and it may go even below 0° C.

Humidity is generally low throughout the year. During the summer season, humidity is lowest at 55%. During monsoon months, it goes as high as 80-9+%. The highest levels of humidity are observed in the month of August. The average humidity during synoptic hours is 53% and 62% respectively.

Table showing the Climate in the Bilaspur district

CLIMATE OF THE AREA DISTRICT BILASPUR HIMACHAL PRADESH				
Rainfall	Max.	82.0 mm	69.0 mm	175. 0
Period		Oct.-Mid March	Mid. March-June	July-September
Weather		Cool	Hot	Humid
Humidity		84%	55%	98%
Temperature	Max.	33.0 C	45.5 C	35.0 C

9 THE LIST OF MINING LEASES IN THE DISTRICT

Sr. No.	Name of Mineral	Name of the Lessee	Address of Lessee	Area of Mining Lease Bighas/ Hects.	Type (Riverbed/ Hillslope)	Period of Mining Lease		Geo-Coordinates	Annual Approved Production (in MT)
						From	To		
1	Minor Mineral (Sand, Stone, Bajri)	Sh. Mahender Singh	M/S Naina Stone Crusher, village Gassur,PO Jukhala, Tehsil Sadar, Distt. Bilaspur H.P.	50-10 Bigha	Riverbed	17.06.2009	16.06.2024	31°18'48.46"N 76°49'10.06" E 31°1836.99 N 76°49'13.5"7E	1ST – 65025 MT 2ND – 65025 MT 3RD – 65025 MT 4TH – 65025 MT 5TH – 65024 MT
2	Minor Mineral (Sand, Stone, Bajri)	Sh Ashok Kumar Dabra	M/s. Jeewan Industries, Village Jabbal, PO Jukhala, Tehsil Sadar, Distt. Bilaspur H.P.	13-05 Bighas	Hill Slope	04.10.2017	03.10.2022	31°19'13.6"N 76°49'03.3"E	1ST -9000 MT 2ND -9000 MT 3RD -9000 MT 4TH -9000 MT 5TH-9000 MT
3	Minor Mineral (Stone)	Sh. Jagat Pal	s/o Sh. Sita Ram, Village Kothi Batala, P.O. Rani Kotla, Tehsil Sadar, Distt. Bilaspur H.P.	9-15 Bighas	Hill Slope	07.09.2021	06.09.2026	31°18'52.0"N 76°50'37.0"E 31°18'47.0"N 76°50'38.0"E	1ST -12340 MT 2ND -12340 MT 3RD -12340 MT 4TH -12340 MT 5TH-12340 MT
4	Minor Mineral (Stone,)	Sh Shashi Kant	M/s Kehloor Stone crusher, Vill- Neri, PO Jamli, Tehsil sadar 174011	11-11 Bighas	Hill Slope	14.07.2017	13.07 .2027	31°16'09.31"N 76°45'16.73"E	1ST -12000 MT 2ND -14500 MT 3RD -14916 MT 4TH -15000 MT 5TH -15000 MT
5	Minor Mineral (Shale)	Sh Subhash Thakur & Company	S/o Sh. Sada Ram, Village Baghari, P.O. Nichli Bhatehar, Tehsil Sadar, Distt. Bilaspur , H.P. 174004	16-18 Bighas	Hill Slope	03.09.2019	02.09.2024	31°23'28.78"N 76°46'2.25'E	1ST -55000MT 2ND -54500MT 3RD -53901MT 4TH -55000MT 5TH -53514MT
6	Minor Mineral (Sand, Stone, Bajri)	Sh. Narender Singh	s/o Sh. Munshi Ram, VPO Dhaloh, Tehsil Ghumarwin, Distt. Bilaspur H.P. 174029	22-01-00 Bighas	Riverbed	22.10.2021	21.10.2026	31°29'17.58"N 76°36'38.95'E 31°29'12.21"N 76°36'38.66"E	1ST -32625MT 2ND -32625MT 3RD -32625MT 4TH -32625MT 5TH-32625 MT
7	Minor Mineral (Stone)	Smt. Anita Devi	W/O Sh. Kuldeep Singh ,Vill. Khater PO. Barmana	55-08 Bighas	Hill Slope	07.03.2012	06.03.2027	-	Not working since Grant of Mining

			Tehsil Sadar Distt. Bilaspur H.P.						Lease
8	Minor Mineral (Sand, Stone Bajri)	Sh. Raj Kumar	M/s Raj Kumar Quarries,Village Sungal, P.O. Binola, Tehsil Sadar, Distt. Bilaspur H.P. 174001	32-05 Bighas	Hill Slope	17.09.2021	16.09.2026	31°24'12.2"N 76°45'15.3"E	1ST -28575 MT 2ND -34650 MT 3RD -36223 MT 4TH -39150 MT 5TH –42750 MT
9	Minor Mineral (Sand, Stone, Bajri)	Sh. Suresh Kumar	S/o Sh. Prabh Dyal, VPO Kuthera, Tehsil Ghumarwin, Distt. Bilaspur HP 174026	40-12 Bighas	Hill Slope	29.07.2021	28.07.2031	31°32'11.6"N 76°41'49.1"E 31°32'07.8"N 76°41'47.8"E	1ST -71428 MT 2ND -71429 MT 3RD -85715 MT 4TH -92857 MT 5TH-100001 MT
10	Minor Mineral (Sand, Stone, Bajri)	Ms Sunidhi	D/o Sh. Rakesh Chander, Village Gharuani, P.O. Lafran, Tehsil Bijhari, Distt. Hamirpur H.P 176049	25-06 Bighas	Terrace Deposit	25.08.2020	24.08.2025	31°10'09.6"N 77°42'31.1"E	1ST -28572 MT 2ND -28572 MT 3RD -27913 MT 4TH -29333 MT 5TH -32000MT
11	Major Mineral Limestone	M/s ACC Ltd.		2890 Bigas	Hill Slope	10.06.2016	31.03.2030	31°23'23.10"N TO 31°24'57.50"N 77°50'15.5"E TO 76°51"8"E	1ST -4498750 MT 2ND -5000125 MT 3RD -4999300 MT 4TH -4998900 MT 5TH-4998800 MT
12	Minor Mineral (Sand, Stone, Bajri)	Sh. Sanjeev Kumar	Director, M/s Devyani Builders, VPO Leda, Tehsil Balh, District Mandi H.P.	25-07 Bighas	Riverbed	28.11.2016	27.11.2021	31°18'56.59"N 76°49'10.92"E	1ST -41586 MT 2ND -41586 MT 3RD -41586 MT 4TH -41586 MT 5TH- 41586 MT

10 DETAIL OF ROYALTY/REVENUE RECEIVED IN LAST THREE YEARS

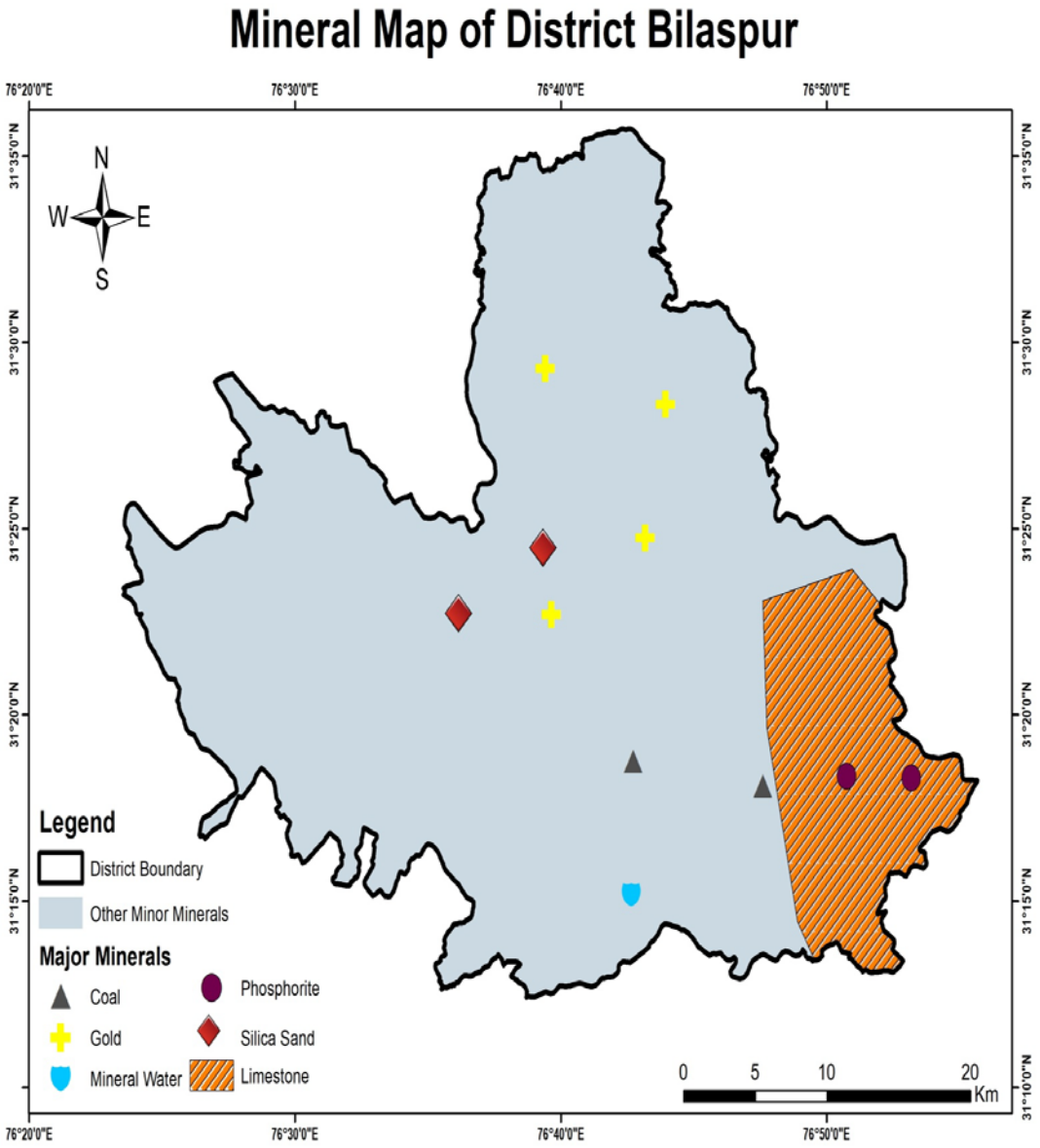
Year	Major Mineral	Minor Mineral	Total
2020-21	26,74,25,000/-	34,40,160/-	27,08,65,160/-
2021-22	31,25,98,000/-	2,91,26,640/-	34,17,24,640/-

2022-23	22,10,92,000/-	3,41,76,895/-	25,52,68,895/-

11 DETAIL OF PRODUCTION IN LAST THREE YEARS

Year	Major Mineral	Minor Mineral	Total
2020-21	30,84,550	4,35,010	3519560
2021-22	38,82,200	1,13,492	39,95,692
2022-23	27,63,650	98252	28,61,902

12 MINERAL MAP OF THE DISTRICT



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

It is submitted that the department grants mineral concessions by two modes, one through auction and another through mining leases. In both 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 applicant has to complete the codal formalities like preparation of mining plan and has to obtain environment clearance before the grant of mineral concession. As such, it is an ongoing process and as soon as the clearances are obtained, the letter of intents 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 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 intents in this survey document as these keeps on changing on day to day basis.

14 TOTAL MINERAL RESERVE AVAILABLE IN THE DISTRICT

The total limestone reserve of Bilaspur district (as per Geological Survey of India) is about 160 million tonnes. Apart from above, the all the other minor minerals are extracted in the district from the riverbeds as well as hill slopes. The riverbed deposits are always replenishable and the reserves vary depending upon many factors like rainfall, deposition of mineral etc. It is important to mention here that as per the provisions contained in the Himachal Pradesh Minor Minerals (Concession) and Minerals (Prevention of Illegal Mining, Transportation and Storage) Rules, 2015, any area applied for grant of mineral concessions (Riverbed or Hill Slope) 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 as such, the letter of intents are issued only after recommendations of the Joint Inspection Committee.

Further, the mineral potential is site specific and is calculated and year wise planning is done while preparing the mining plan of the area.

15 QUALITY/GRADE OF MINERAL AVAILABLE IN THE DISTRICT

Limestone

GLASS SAND:- (Quartzite pebbles / cobbles / boulders):- Soft white quartzite near Sirha (31°21':76°47') Aruali (31°18': 76°47'), Banda (31°19':76°47') and Solag (31°21':76°50') might be suitable for glass industry.

GOLD: Placer gold is recorded from the nala sands towards the northeast of Ghamarwin (31°27': 76°42'), the source being the boulder beds of the Siwalik.

LIMESTONE AND DOLOMITE:- Large reserves of limestone (both dolomitic and non-dolomitic) occur amongst the pre-Tertiary rocks near Jamthal (31°24':76°52'), Aur or Gagal-Hill (31°20':76°51'), Chhabiawae (31°23':76°52') and Darobn (31°21':76°51'). The limestone is suitable for cement manufacture. In Gagal-Burmana area, the reserves of cement grade limestone have been estimated at 117.1 million tonnes. The Gagal limestone deposit contains CaO 45.20% to 47.80% and MgO 0.91%. The Burmana limestone deposit contains CaO 47.62% and MgO 1.47%. Occurrence of dolomite has been reported from a locality 1.5km west of Lohrda (31°15': 76°00') and 800m east of Bhajun (31°14':76°49'). The analyses show that the dolomite may find use as flux. Occurrences of calcareous tufa have been recorded at Lathwin (31°31':76°41') and near Thakurdwars (31°26':76°31'). Bands of low silica dolomite have been delineated in the rocks of the Parnali and Tattapani formations of the Shali Group in Bilaspur district. The Parnali Formation consists of pink and grey colour, fine grained, hard and compact stromatolitic dolomite while the Tattapani Formation chiefly consists of grey to bluish grey colour, fine to medium grained, stromatolitic, cherty dolomite. Dolomite band of the Parnali Formation is in lensoidal shape. It is well exposed at Sihra (31°21'24": 76°47'35"), Bandla (31°10'45":76°47'30") and Parnali (31°18'15":76°47'30") area. The dolomite band is about 850m thick and has strike extension of about 13.7km with thickest zone occupying the central portion. The dolomite band of the Tattapani Formation is exposed near Barog Ghagas-Bharatu area. The bands exhibit continuous linear pattern. It consists of grey to bluish grey colour, fine to medium grained, stromatolitic, cherty dolomite with a strike extension of 12.2km and thickness of 430m. Similar dolomite band is exposed at Karot-Thanger-Deoli area. The exposed thickness is about 812m with strike continuity of about 8.3km. Silica content in both the zones ranges between 0.38% to 0.9226% but with very high CaO+MgO content which makes them suitable for the manufacture of refractory bricks and is of flux grade.

MINERAL WATER:- At Bhasra (31°14':76°47') the water is strongly saline and has a slightly aperients quality. It is said to be efficacious in cases of scrofula, dropsy and rheumatism

PYRITE:- At Belag (31°24':76°46') and other places in the district, pyritious materials occur as lumps in coal. The occurrences are not found to be of any economic significance.

SOILS:- The soils of the state can broadly be divided into nine groups on the basis of their development and physico-chemical properties. These are: (i) alluvial soils, (ii) brown hill soil, (iii) brown earth, (iv) brown forests soils, (v) grey wooded or podzolic soils, (vi) grey brown podzolic soils, (vii) planosolic soils, (viii) humus and iron podzols (ix) alpine humus mountain speletal soils. The soil found in the districts of Mandi, Kangra, Bilaspur, Una, Solan, Hamirpur and Sirmaur is generally brown, alluvial and grey brown podzolic, Kulu and Shimla have greywooded podzolic soils, while Kinnaur, Lahaul and Spiti and some parts of the Chamba district have humus mountain speletal soils.

16 USE OF MINERAL

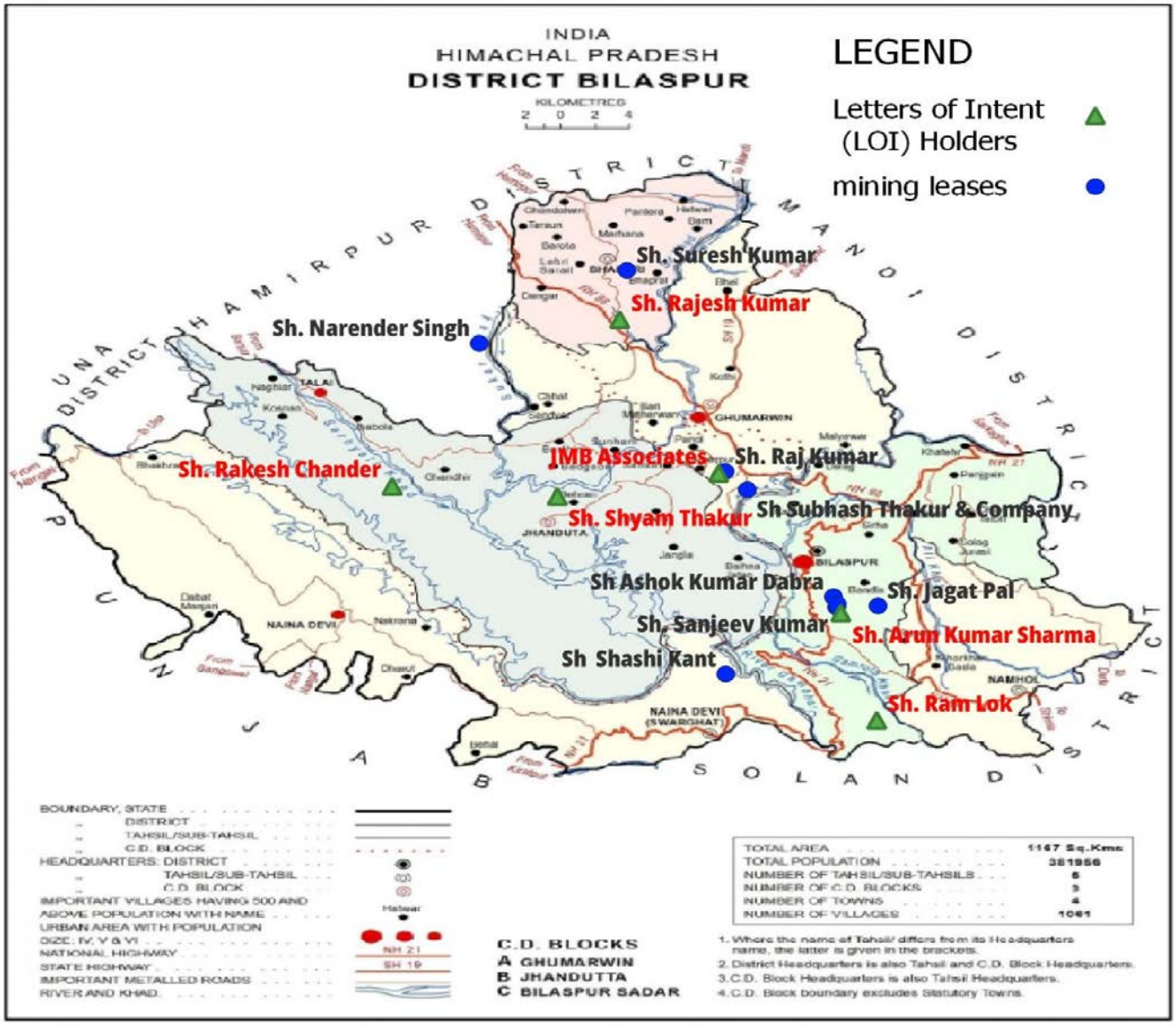
Limestone, dolomitic- limestone, shale, brick earth, minor minerals like sand, stone & bajri. The mining activities in district can basically be categorized under large sector and in small sector. The large sector comprises of major limestone projects for cement manufacture and the small mining sector comprises mining of minor minerals like sand, stone, bajri, slates, shale, clay etc. which are basically building material required to meet the infra-structural development of the district . The Cement plant of ACC Ltd. is located near Barmana in Bilaspur district of Himachal Pradesh, on the National Highway NH 21, connecting Ambala and Manali installed with a capacity of 5.6 lakh tones of cement per annum, it has modernized and expanded to a total capacity of 4.64 million-tonnes of cement per annum.

17 DEMAD AND SUPPLY OF THE MINERAL IN THE LAST THREE YEAR

The demand is huge as constructions activity grow with faster growth of country as well as state. Cement manufacturer makes cement as per market demand of both local and out of district and the minor minerals are basically building material required to meet the infra-structural development of the district.

Sr. No.	Name of Mineral	Year	Production (in MT)
1	Minor Mineral	2020-21	435010
2.		2021-22	113492
3.		2022-23	98252
Total			646754
1.	Major Mineral	2020-21	3084550
2.		2021-22	3882200
3.		2022-23	2763650
Total			9730400

18 MINING LEASE MARKED ON THE MAP OF THE DISTRICT



19 DETAILS OF THE AREA OF WHERE THERE IS A CLUSTER OF MINING LEASES VIZ. NUMBER OF MINING LEASES, LOCATION (LATITUDE AND LONGITUDE)

The details of all the mining leases granted in the district alongwith the Geo-Cordinates is already provided at (9) and have also been marked on the distrcit map at (18).

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

There is no eco-sensitive area in the district.

21 IMPACT ON THE ENVIRONMENT (AIR, WATER, NOISE, SOIL, FLORA & FAUNA, LAND USE, AGRICULTURE,FOREST ETC.)DUE TO MINING ACTIVITY

Generally, the environment impact can be categorized as either primary or secondary. Primary impacts are those which are attributing directly by the project. Secondary impacts are those which are indirectly include the associate investment and change pattern of social and economic activities by the proposed action.
The impact has been ascertained for the project assuming that the pollution due to mining activity has been completely spelled out under the base line environmental status for entire ROM which is proposed to be exploited from the mines. The major air pollutants due to mining activity include

AIR ENVIRONMENT

Dust is emitted to air mainly due to vehicular movement on the un-metal led road and such pollution is seen mainly during summer and winter seasons.

As far as air pollution is concerned, fugitive dust (SPM) pollution will be predominant over the others such as NOx, SO2 etc. Mining unit operation such as excavation, loading & unloading, movement of truck/tippers on the kuchha roads, no doubt, will generate the fugitive dusts.

WATER ENVIRONMENT

Some time the mining activity leads to the water table causing ground water depletion. Due to the interference with surface water sources like river.

Strata water gets disturbed and contaminated in case of intersection of ground water table.
Natural water table of the area gets disturbed.

Contamination of surface water bodies due to the discharge of mine water and surface runoff workshop effluent.

NOISE LEVELS

The source of noise will be due to the deployment of machines in the lease area.
Operation of drilling machines, blasting, excavation, loading & unloading of mineral etc. such high level of noise can cause health effects, poor work performance and disturbances to human and wild life and constant source of disturbance.

LAND ENVIRONMENT

The topography of the area will change certain changes due to mining activity which may cause some

alteration to the entire eco system. Mining causes various land disturbances/degradation due to change in land use pattern.

Removal of forest cover which causes loss to flora and fauna and take many years to get back similar forest cover if the mining area is properly reclaimed. Removal of top soil and overburden causes loss on agriculture.

IMPACT ON FLORA & FAUNA

The impact on biodiversity is difficult to quantify because of its diverse and dynamic characteristics. Mining activity generally result in the deforestation ,land degradation, water, air & noise pollution which directly or indirectly affect the faunal and flora status of the project area. However, occurrence and magnitude of these impact are entirely dependent upon the project location, mode of operation and technology involved.

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

MITIGATION MEASURES

The following mitigation measures is being/ will be adopted to mitigate air pollution generated due to the mining activities:

During Drilling Operation

- Dust generation is reduced by using sharp teeth of shovels.
- Providing dust extractors to drilling units.
- Personal protective equipment's is being provided to drill operators and his helpers.

During Blasting Operation

- Proper stemming in blast holes.
- Avoiding blasting during unfavourable condition.
- Use of Rock Breaker to avoid blasting in ridges.

During loading operation

- Latest generation loading equipment's like hydraulic excavators is being/ will be used and operated by skilled operators to load dumpers.
- Water tanker arranged for water sprinkling on haul roads and Loading Point
- Propagation of this dust is/ will be confined to loading point only and does not affect any person nearby. Both the operators of excavator and dumpers present at that point operate the machine from a closed cabin.

During Crushing

- Crusher hoppers & conveyor systems to be totally enclosed and provided with water sprayers.
- Completely covered stacker and reclaimed shed are provided at crusher.
- Water sprinkling system has been installed at crusher.

During Transport operation

- Water tanker has been in operation for regular water sprinkling on haul roads for dust suppression.
- To control the gaseous emission, all mine machineries are maintained in proper order/as per OEM through routine checklist.
- Strict speed limit (20-25 km/hr) of vehicles is /will be implemented.
- Proper covering of transported material and stored raw material.
- Regular maintenance of HEMMs & transportation vehicles.
- Measures will be taken to reduce the diesel consumption during transportation.

Plantation work

Local forest trees (Acacia catechu, Acacia nilotica, Acacia Senegal, Aegle marmelos, Albizia amara, Albizia lebbeck, Albizia odoratissima, Albizia procera, Alstonia scholaris, Anogeissus latifolia, Azadirachta indica, etc..) has been used for plantation/greenbelt.

Safety Measures for Water Reservoir at Conceptual Stage

- Construction of wire fencing along the periphery of the reservoir.
- Plantation will be done between the mining pits and the periphery of lease.
- Conduct geo-technical stability studies involving expert agencies.
- Management of Waste Water generated at mine site
- No waste water is being/ will be discharged outside lease boundary.
- Domestic waste water generated is being/ will be disposed off in Soak pit.
- Workshop waste water is treated and reuse for washing purpose by installing gravity separation method to separate water & oil.

NOISE & VIBRATION AND MITIGATION MEASURES

The following control measures is being/ will be adopted to keep the ambient noise levels within the limits:-

- When conventional drilling, use of sharp drill bits to achieve optimum drilling performance and to reduce noise generation at source.
- Avoiding the secondary blasting.
- Adoption of control blasting with proper spacing, burden and stemming.
- Blasting is to be carried out during favorable atmospheric conditions and low human activity timing.
- Use of proper designed machinery, maintained properly.
- Crusher is totally enclosed in a covered building to minimize sound propagation.
- Sound insulated chambers for the workers deployed on the machineries producing higher level of noise like dozers, drills etc.
- Regular maintenance, oiling and greasing of machines at regular intervals is being/ will be done to reduce generation of noise.
- All employees and operators has been/ will be provided with protective equipment, earmuffs and earplugs as a protective measure from the high noise level generated near the machinery.
- Noise Monitoring is carried out in core zone and buffer zone by NABL accredited laboratory.

23 RECLAMATION OF MINE OUT AREA (BEST PRACTICE ALREADY IMPLIMENTED IN THE DISTRICT, REQUIRMENT AS PER RULES AND REGULATION, PROPOSED RECLAMATION PLAN)

As per status all mines are to be closed before final closure of mine.

Reclamation of exhausted mines are planned to be undertaken in below three possible manner

1-if, sustainable amount of waste is there, the exhausted quarry can be fully or partly backfilled using the store waste. the backfilled area to be brought under plantation of local species.

2-if the generation of waste is much less and depth is less then plantation on broken up surface.

3-convert to water reservoir after stabilization of slope if the exhausted quarry continue much below the surrounding surface level. it is preferred to cordon the water reservoir either throw wire fencing or retaining wall with plantation from the safety point of view.

Reclamations shall be taken up only after exhaustion of the ore/mineral from the area.

24 RISK ASSESSMENT & DISASTER MANAGEMENT PLAN

Risk Assessment

The complete mining operation is being/ will be carried out under the management control and direction of a qualified mine manager holding a First Class Manager's Certificate of competency to manage a metalliferous mine granted by the DGMS, Dhanbad. The DGMS have been regularly issuing standing orders, model standing orders and circulars to be followed by the mine management in case of disaster, if any. Moreover, mining staff is being/ will be sent to refresher courses from time to time to keep them alert. However, following natural/industrial hazards may occur during normal operation.

Natural Hazards

- Landslides;
- Flash floods;
- Damage of life and property;
- Disruption of road & telecommunication facilities; and
- Lightening

Industrial Hazards

- Accident due to explosives;
- Accident due to heavy mining equipment; and
- Sabotage in case of magazine.

In order to take care of above hazard/disasters, the following control measures is being/ will be adopted:

- All safety precautions and provisions of Mine Act,1952, metalliferous Mines Regulation, 1961 and Mines Rules,1955 will be strictly followed during all mining operations;
- Entry of unauthorized persons is prohibited;
- Firefighting and first-aid provisions in the mines office complex and mining area;
- Provisions of all the safety appliances such as safety boot, helmets, goggles etc. has been made available to the employees and regular check for their use;

- Training and refresher courses for all the employees working in hazardous premises; Under Mines vocational training rules all employees of mines shall have to undergo the training at a regular interval;
- Working of mine, as per approved plans and regularly updating the mine plans;
- Cleaning of mine faces is being/ will be regularly done;
- Handling of explosives, charging and blasting is being/ will be carried out by competent persons only;
- Provision of magazine at a safe place with fencing and necessary security arrangement;
- Regular maintenance and testing of all mining equipment as per manufacturer's guidelines;
- Suppression of dust on the haulage roads;
- Adequate safety equipment is being/ will be provided at explosive magazine; and
- Increasing the awareness of safety and disaster through competitions, posters and other similar drives.
- For any type of above disaster, a rescue team has been formed by training the mining staff with specialized training.

POSSIBLE HAZARDS IN OPEN CAST MINE

- There are various factors, which can cause disaster in the mines. The mining activity has several disaster prone areas. The identification of various hazards is shown in figure-7.1 and the hazards are discussed below:

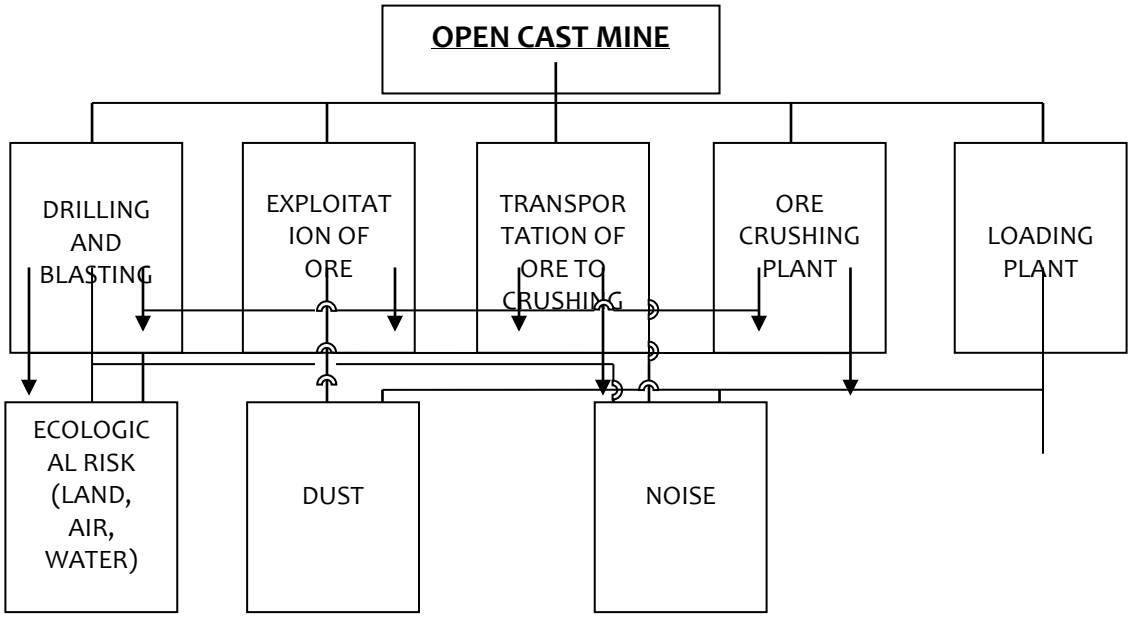


Fig: 7.2Identification of Hazards in Open Cast Mine

BLASTING

- Most of the accidents from blasting occur due to the projectiles, as they may sometimes go even beyond the danger zone, mainly due to overcharging of the shot-holes as a result of certain special features of the local ground. Flying rocks are encountered during initial and final blasting operations. Vibrations also lead to displacement of adjoining areas. Dust and noise are also problems commonly

encountered during blasting operations. As this region is hilly in nature so there is a possibility of Landslides due to Blasting in the mine.

OVERBURDEN

- The overburden dumps may cause landslides. High overburden dumps created at the quarry edge may cause sliding of the overburden dump or may cause failure of the pit slope due to excessive loading, thereby causing loss of life and property. Siltation of surface water may also cause run-off from overburden dumps.

HEAVY MACHINERY

- Most of the accidents during operation of dumpers, excavators and dozers and other heavy vehicles are often attributable to mechanical failures and human errors.

STORAGE OF EXPLOSIVES

- Explosive magazine storage facility is located within the existing ML area which will cater to the existing mining activities in the same ML area. For the purpose of transportation of explosives, explosive van is present. The main hazard associated with the storage, transport and handling of explosives is fire and explosion. The rules as per the Indian explosive act-1983 and explosiverules-2008 should be followed for handling of explosives, which includes transportation, storage and use of explosives.

FUEL STORAGE

- Most of the HEMM will operate on diesel. However, no major storage is envisaged at the ML area.

WATERLOGGING

- The rainwater would flow down the slope of the hills and also along the natural streams. Rain water Harvesting has been proposed and water is being stored in the pit for use.

DISASTER MANAGEMENT PLAN

OBJECTIVES OF DISASTER MANAGEMENT PLAN

- The disaster management plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the disaster management plan, it should be widely circulated and personnel training through rehearsals/drills.
- The objective of the Disaster Management Plan is to make use of the combined resources of the mine and the outside services to achieve the following:
- The objective of onsite disaster management plan for the captive mine is to be a state of perceptual readiness through training, development to immediately control and arrest any emergency situations, so as to avert a full-fledged disaster and the consequence of human and property damage. In the event of a disaster still occurring & to manage the same so that the risk of the damage to life and property is minimized.

The salient features are elaborated as below:

- Effect the rescue and medical treatment of casualties;
- Safeguard other people;
- Minimize damage to property and the environment;
- Initially contain and ultimately bring the incident under control;
- Identify any dead;
- Provide for the needs of relatives;
- Provide authoritative information to the news media;
- Secure the safe rehabilitation of affected area; and
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

- In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

EMERGENCY ORGANIZATION

It is recommended to setup an Emergency Organization. (Mine Manager) who has control over the affairs of the mine would be heading the Emergency Organization. He would be designated as Site Controller. As per the General Organization chart, in the mines, the Mines Manager would be designated as the Incident Controller. The Incident Controller would be reporting to the Site Controller.

Each Incident Controller, for himself, organizes a team responsible for controlling the incidence with the personnel under his control. Shift In-charge would be the reporting officer, who would bring the incidence to the notice of the Incidence Controller and Site Controller.

Emergency coordinators would be appointed who would undertake the responsibilities like firefighting, rescue, rehabilitation, transport and provide essential and support services. For this purposes, Security In-charge, Personnel Department, Essential services personnel would be engaged. All these personnel would be designated as key personnel.

In each shift, electrical supervisor, electrical fitters, pump house in-charge and other maintenance staff would be drafted for emergency operations. In the event of power or communication system failure, some of staff members in the mine offices would be drafted and their services would be utilized as messengers for quick passing of communications. All these personnel would be declared as essential personnel.

Following officers of the mines are responsible for co-ordination in case of emergency situation in any section of the mine. All are based at residential colony of the company at a distance of 2 Km from the mine site. Their organizational position and telephone nos. are as follows:

OFF-SITE EMERGENCY PLANNING

INTRODUCTION

The off-site emergency plan is an integral part of any hazard control system. It would be based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the off-site plan follows logically from the analysis that took place to provide the basis for the on-site plan and the two plans should, therefore, complement each other. The key feature of a good off-site emergency plan is flexibility in its application to emergencies other than those specifically included in the formation of the plan. The roles of the various parties that may be involved in the implementation of an off-site plan are described below. The responsibility for the off-site plan will be likely to rest either with the works management or with the local authority.

Either way, the plan must identify an emergency coordinating officer who would take overall command of the off-site activities. As with the on-site plan, an emergency control center will be required within which the emergency coordinating officer can operate. An early decision will be required in many cases on the advice to be given to people living “within range” of the accident – in particular whether they will be evacuated or told to go indoors. Consideration of evacuation may include the following factors:

In the case of a major fire but without explosion risk (e.g. an oil storage tank), only houses close to the fire are likely to need evacuation, although a severe smoke hazard may require this to be reviewed periodically.

But if the fire escalates it might be necessary to evacuate people nearby, but only if there is time; if insufficient time exists, people would be advised to stay indoors and shield themselves from the fire while measures are taken by those outside to douse fire.

ASPECTS TO BE INCLUDED IN AN OFF-SITE EMERGENCY PLAN

Some of the aspects to be included in off-site emergency plan are as follows:

a) Organization

Details of command structure, warning systems, implementation procedures, emergency control centers, name and appointments of incident controller, site main controller, their deputies and other key personnel.

b) Communications

Identification of personnel involved, communication center, call signs, network, list of telephone numbers.

c) Special Emergency Equipment

Details of availability and location of heavy lifting gear, bulldozers, specified fire-fighting equipment, fireboats.

d) Voluntary Organizations

Details of organizers, telephone numbers, resources, etc.

e) Meteorological information

Arrangements for obtaining details of weather conditions prevailing at the time and weather forecasts will be made.

f) Humanitarian Arrangements

Transport, evacuation centers, emergency feeding, treatment of injured, first aid, ambulances, temporary mortuaries.

g) Public Information

Arrangements for: -

Dealing with the media-press office

Informing relatives, etc.

h) Assessment

Arrangements for: -

Collecting information on the causes of the emergency

Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

ROLES OF MAJOR HAZARD MANAGEMENTS

Where the local authority has the organization to formulate the plan, the role of management in off-site emergency planning has/ will establish liaison with those preparing the plans and to provide information appropriate to such plans. This will include a description of possible on-site accidents with potential for off-site harm, together with their consequences and an indication of the relative likelihood of the accidents.

Advice should be provided by works managements to all the outside organizations which may become involved in handling the emergency off-site and which will need previously to have familiarized themselves with some of the technical aspects of the works activities, e.g. emergency services, medical departments, etc.

25 DETAILS OF OCCUPATIONAL HEALTH ISSUE IN THE DISTRICT (LAST FIVE YEAR DATA OF NUMBER OF PATIENTS OF SILICOSIS & TUBERCULOSIS IS ALSO NEED TO BE SUBMITTED)

Occupational health should aim at the promotion and maintenance of the highest degree of physical, mental and social well being of workers in all occupations. the prevention among workers of departure from health cause by their working conditions, the protection of workers at there employment from risks resulting from factors adverse to health, the adoption of work to men and each man to his job. in recent years the application of ergonomics has made a significant contribution for reducing industrial accidents and overall health efficiency of workers.

OCCUPATIONAL HEALTH

The industrial workers today is placed a highly complicated environment which is getting highly complicated as man becoming ingenious. An industrial worker may be exposed to many types diseases depending upon the occupation.

- Diseases due to physical agent
- Heat –heat hyperpyrexia, heat cramps
- Cold-Trench foot, frost bite, chilblains
- Pressure-caisson disease, air embolism
- Noise-Occupational deafness
- Radiation- Cancer, Leukemia, Pancytopenia
- Mechanical Factor- Injuries, Accident
- Diseases due to chemical agent
- Various toxic gases like carbon dioxide, carbon monoxide causes various type of diseases. Anthracnose, silicosis, siderosis, bagassosis etc.
- Diseases due to biological agent
- Brucellosis, anthrax, fungal infection etc.
- Diseases of Psychological organs-industrial neurosis, hypertension, peptic ulcer etc.

year	Silicosis	Tuberculosis
2019-20	Nil	852
2020-21	Nil	690
2021-22	Nil	674
2022-23	Nil	799
2023-24(till 31.10.2023	Nil	714

26 PLANTATION AND GREEN BELT DEVELOPMENT IN RESPECT OF LEASES ALREADY GRANTED IN THE DISTRICT

Specific conditions are being imposed by the state pollution control board during grant of consent to operate to the mines to developed adequate no. of plantation as per the recommendation made in the approved mining plan during operation period and closure of mining activity. As most of the mines of the district are yet to be exhausted of their mineral content no sort of reclamation measures has been undertaken excluding gap plantation of local species in the peripheral safety zones of the quarries/clusters and in some of the haul road.

27 ANY OTHER INFORMATION

Nil

28 MONITORING & EVALUATION

The Ministry of Environment, Forest & Climate Change has published "Enforcement & Monitoring Guidelines for Sand Mining" in the year 2020 wherein 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 identification of mining which is operating either illegally or are violating the regulatory provisions. Some suggestion will facilitate direct or indirect information to help in such an assessment.

1. All precaution 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.
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 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 Bilaspur 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.	Bilaspur	17-Jul-24	Not included in DSR -Extraction of Sand, Stone & Bajri over an area situated in Khasra No.53/1, measuring 07- 03 Bighas or 00-53-80 Ha (Private Land/Hill Slope) falling in Mauza Nalti, Tehsil Ghumarwin, District Bilaspur, Himachal Pradesh. Proposed by Sh. Yogesh Aeri, Prop. M/s JMB Assosiates, Village & P.O Nain Gujran, Teshil Ghumarwin, District Bilaspur HP	18-Jul-24	Please see point No. 13 of DSR as well as refer to the email sent on 19.07.2024 sent to ms.hpseiaa@gmail.com
2.	Bilaspur	17-Jul-24	Extraction of stone over an area situated in Khasra No.468 measuring 23-19-00 Bighas (Private Land/Hill Slope) falling in Mauza/Mohal Bholi, Tehsil Sadar, District Bilaspur, Himachal Pradesh, proposed by M/s Naina Stone Crusher, Sh. Mahender Kumar, R/O, Village Gasaur, P.O. Jukhala, Tehsil Sadar, District Bilaspur, H.P	18-Jul-24	Please see point No. 13 of DSR as well as refer to the email sent on 19.07.2024 sent to ms.hpseiaa@gmail.com
3.	Bilaspur	17-Jul-24	Not included in DSR - Terrace deposit mining project for the extraction of sand, stone & bajri over an area situated in Khasra No. 315, & 317/3, measuring 31-19 Bighas (Private Land/Terrace deposit) falling in Mauza/Mohal Malangan, Tehsil Jhandutta, District Bilaspur, Himachal Pradesh, by Sh. Saurav Thakur, R/o VPO Malangan, Tehsil Jhandutta, District Bilaspur, Himachal Pradesh	18-Jul-24	Please see point No. 13 of DSR as well as refer to the email sent on 19.07.2024 sent to ms.hpseiaa@gmail.com

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.