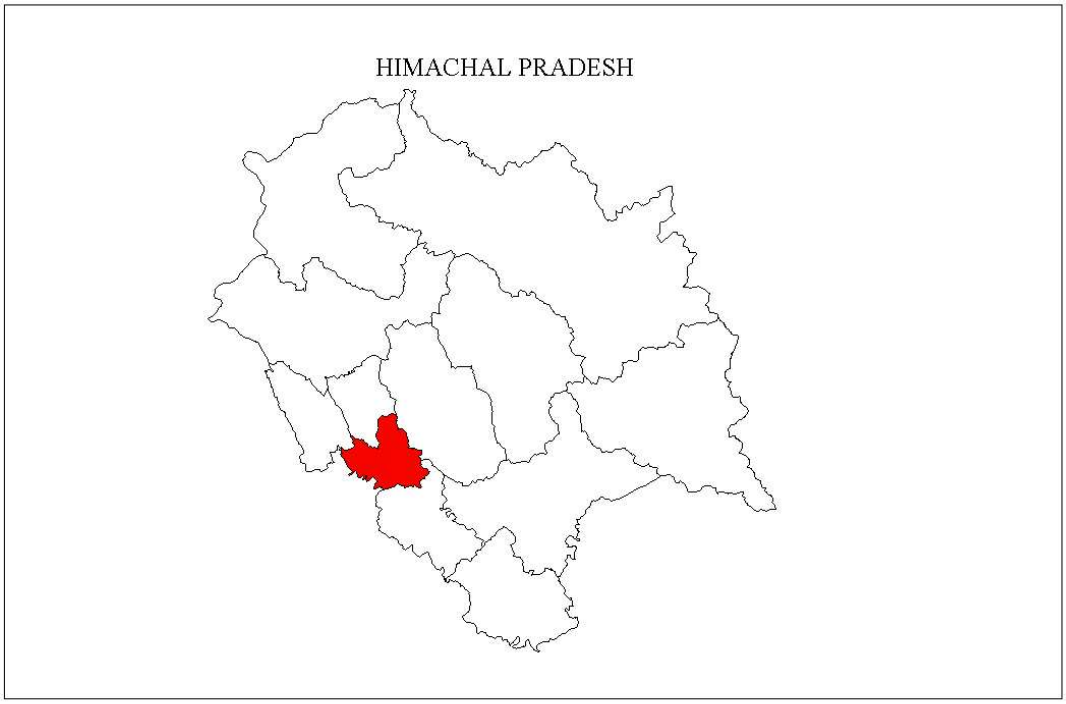
Government of India
Ministry of Water Resources
CENTRAL GROUND WATER BOARD

DISTRICT GROUND WATER BROCHURE
BILASPUR DISTRICT, HIMACHAL PRADESH



NORTHERN HIMALAYAN REGION
DHARAMSALA
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Our Vision

"Water Security through Ground Water Management"

DISTRICT GROUND WATER BROCHURE
BILASPUR DISTRICT, HIMACHAL PRADESH

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BILASPUR DISTRICT AT A GLANCE

S. No.	Items	Statistics
1.	**GENERAL INFORMATION**	
	i) Geographical area (Sq. Km)	1167
	ii)Administrative Divisions	
	Sub divisions	2
	Number of Tehsils	4
	Number of Sub Tehsils	2
	Development blocks	3
	No. of Panchayats/Villages	151/1080
	iii) Population (As on 2011 census)	381956
	iv) Average annual rainfall (mm)	1106.28 mm About 81.5% during monsoon
2.	**GEOMORPHOLOGY**	
	Major physiographic units	Structural Hill, Denudational hill, and Valley fill
	General altitude	610 m amsl
	Major Drainages • Sutlej Basin	 Satluj, Ali Khad, Gamrola Khad and Seer khad
3.	**Land Use** (hectares)	
	a) Forest area:	14013
	b) Total cropped area	56500
4.	**MAJOR SOIL TYPES**	Alluvial soils and Non- calcic brown soils
5.	**AREA UNDER PRINCIPAL CROPS**	Maize, Paddy, Wheat
6.	**IRRIGATION BY DIFFERENT SOURCES** (2008-09)	(In Hectares)
	Tanks	58
	Tube wells / Bore wells	349
	Other wells	132
	Other sources	3123
7.	**NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on March 2013)** No. of Dug Wells No. of Piezometers	No Monitoring wells
8.	**PREDOMINANT GEOLOGICAL FORMATIONS**	Siwaliks, Kasauli, Dagshai, Subathu
9.	**HYDROGEOLOGY**	
	Major Water bearing formations	

	1. Consolidated sediments/ Hard Rocks (Older Crystalline & Metamorphics)	Covering minor part
	• Yield prospects • GW structures	Low (<5 lps) Hand pumps & springs
	2. Unconsolidated / Semi-consolidated sediments	Covering major part and in Valley areas
	• Yield prospects • GW structures	Low to high (<5 – 15 lps) Dug wells, Hand pumps,
10.	**GROUND WATER EXPLORATION BY CGWB (As on 2013)**	
	No of wells drilled (EW, OW, PZ, SH, Total)	6
	Depth Range (m)	31.8 m bgl to 115 bgl
	Discharge (litres per second)	7.7 to 20.75
11.	**DYNAMIC GROUND WATER RESOURCES**	Not estimated due to localized aquifers
12.	**AWARENESS AND TRAINING ACTIVITY**	--
	Mass Awareness Programmes organized • Date/Place/No of participants	Nil
	Water Management Training Programmes organized • Date/Place/No of participants	Nil
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAIN WATER HARVESTING**	Nil
15.	**GROUND WATER CONTROL AND REGULATION**	
	Number of OE Blocks	Nil
	No of Critical Blocks	Nil
	No of blocks notified	Nil
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	Nil

DISTRICT GROUND WATER BROCHURE
BILASPUR DISTRICT, HIMACHAL PRADESH

1.0 INTRODUCTION

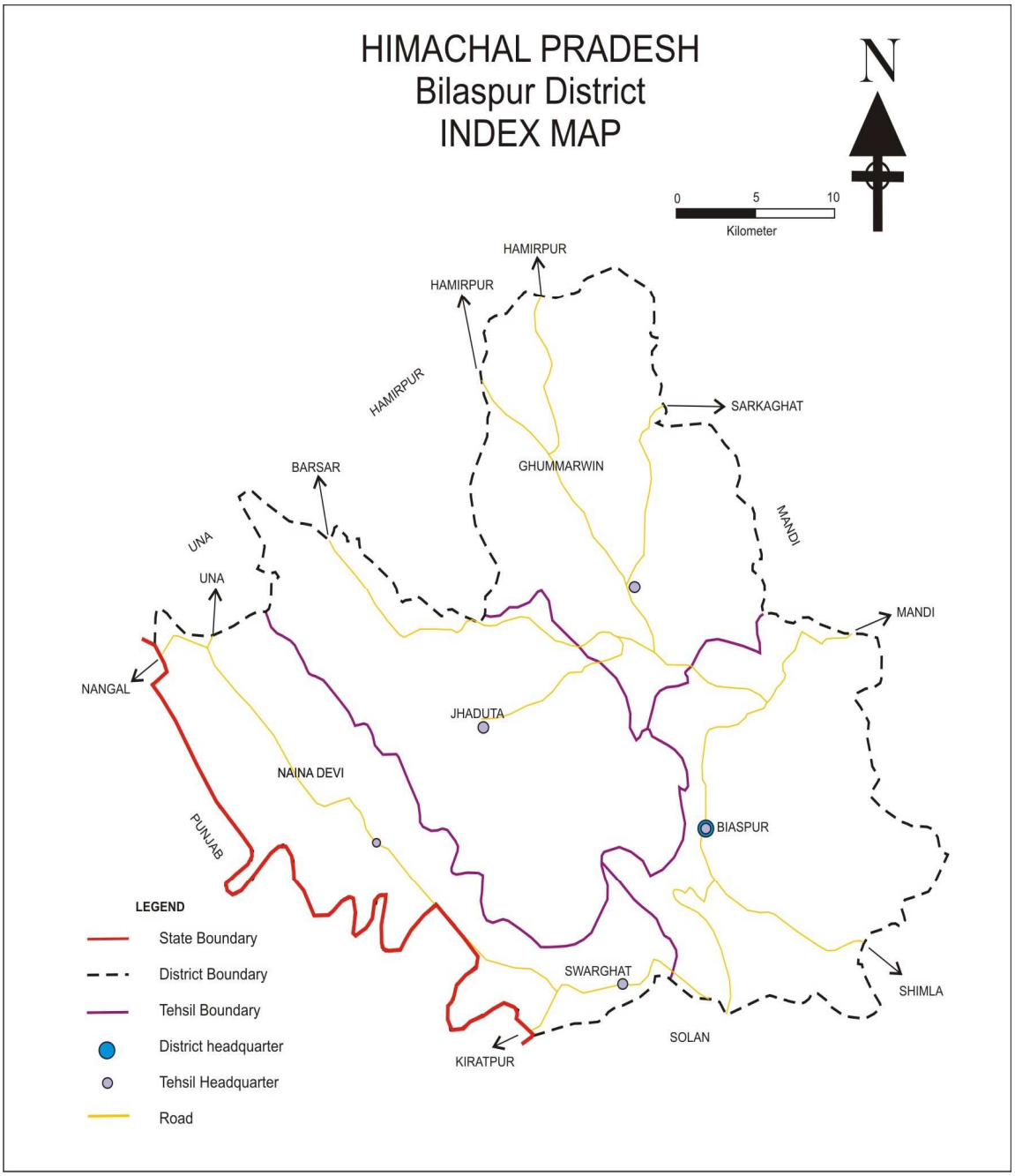
Bilaspur district is located in southwestern part of the State of Himachal Pradesh. The district, with it's headquarter at Bilaspur town, has a geographical area of 1167 sq km and covers 2.1 % area of the State. It lies between north latitude 31°18'00" and 31°55'00" and east longitude 75°55'00" and 76°28'00" and falls in Survey of India degree sheet No.53A. Towards north it is bounded by Hamirpur district, east by Mandi district, and southeast by Solan district and towards southwest by the State of Punjab.

Administratively, the district has been divided into two sub-divisions namely Sadar and Ghummarwin and comprises of 4 tehsils namely Sadar, Ghummarwin, Jhandutta and Sri Naina Devi Ji at Swarghat. Further, there are 3 Community Development blocks viz., Sadar, Ghummarwin and Jhandutta. There are 4 towns i.e. Bilaspur, Ghumarwin, Naina Devi and Talai, 1080 villages, and 151 Gram Panchayats in the district. Bilaspur district is well developed in the industrial sector due to close proximity to Punjab state .The district is well connected by road network. The nearest airport is Chandigarh.

As per 2011 census, the district has a population of 3,81,956 with a population density of 327 persons/sq km. The sex ratio is 981 females per 1000 males. Rural population is about 93% indicating that the district has an agricultural economy.

Agriculture is the major occupation of the people of the district with more than 70% population engaged in agriculture and allied sector. Major crops like maize, wheat, rice, sugarcane and pulses are grown apart from the vegetables in the district. Total cropped area is 56,500 hectares. Net area irrigated in the district is about 3,662 ha in the year 2008-09 (as per the State statistical abstract of HP 2011-12). There is large number of water supply wells and tube wells, springs; *kulhs* (water channels) are used exclusively for domestic and irrigation purposes.

Central Ground Water Board (CGWB) has carried out Hydro-geological studies and Ground Water Exploration in the district. Exploration commenced in the year 2006 and under exploratory drilling programme, 6 exploratory wells ranging in depth from 31.8 to 115 m bgl have been drilled so far in the district.



2.0 RAINFALL & CLIMATE

Climate of the district is temperate to Sub- tropical. The summer is invariably hot. The winter starts from November and continues till the middle of March. Thereafter, the

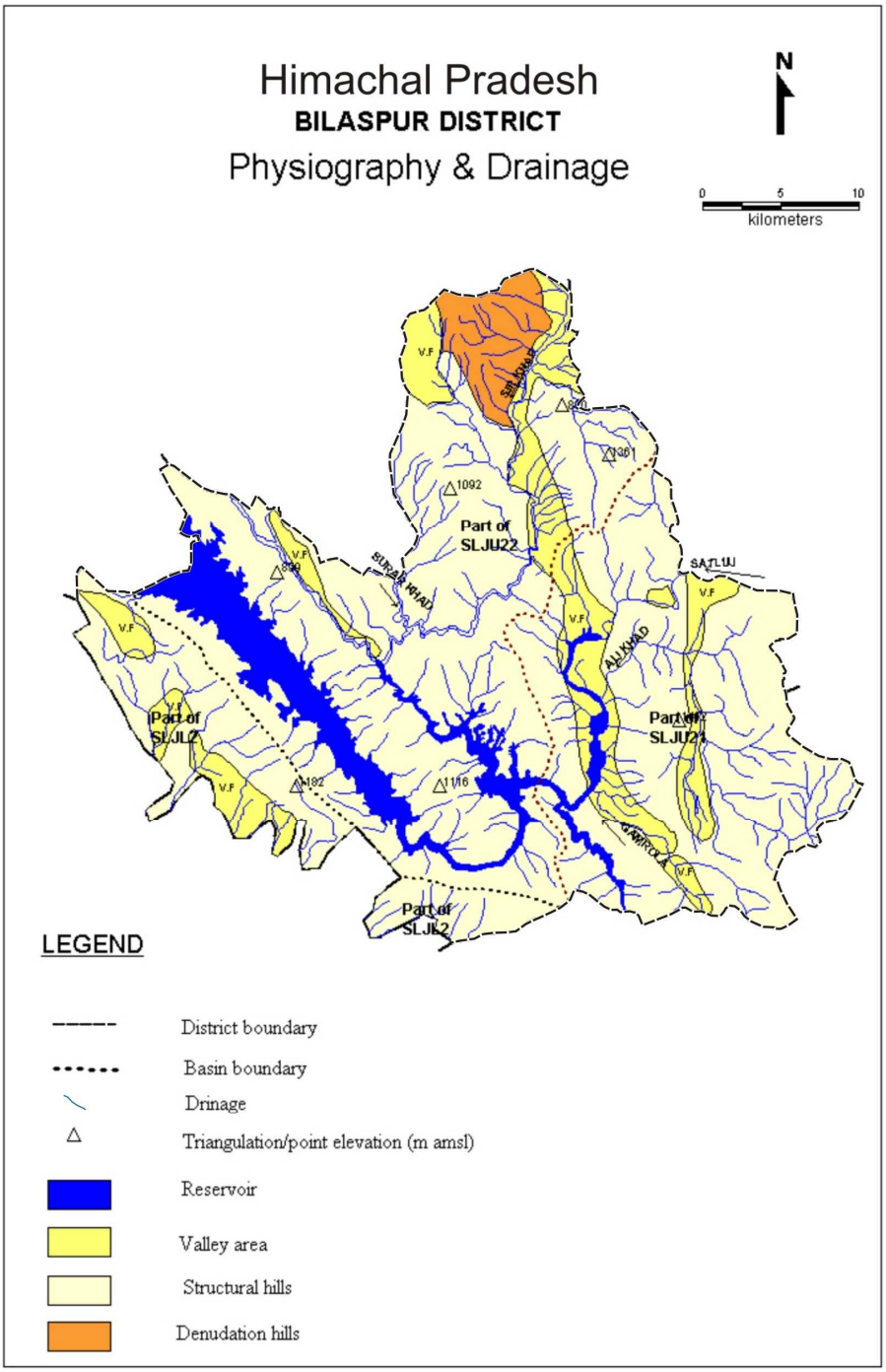
mercury continues rising till the onset of monsoon. The minimum and maximum temperature varies from 1.3^{o}C in January to 34.7^{o}C in May. For three months in winter, a thick mist surrounds the Sutlej. The places situated at higher elevations such as Swarghat, Nambhol have a bracing climate. The hills and valleys along the khads are quite dry in summer. In rainy season humidity increases and the weather becomes hot and sultry. The area receives rainfall during monsoon period extending from June to September and also non-monsoon period (winter). The annual average rainfall in the area is about 1106.28 mm and about 81.5% rainfall occurs during monsoon period.

3.0 GEOMORPHOLOGY & SOILS

Bilaspur district is located on Siwalik ranges and forms part of the lesser Himalayas. It has a diverse landscape of hills, valleys with piedmont zone. There are seven main hill ranges i.e. *Naina Devi, Kot, jhanjiar, Tiun, Bandla, Bahaurpur and Ratanpur* constituting the hill system. The elevation of the lowest point is about 290 m amsl and of the highest peak i.e. *Bhadurpur hill* is 1980 m amsl.

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

Two types of soils are observed in the district viz, alluvial soil and non-calcic brown soil. Most of the area in the district is covered with alluvial soil and only hilly area in the district is covered with non-calcic brown soil. Soil is rich in nutrients and is fertile.



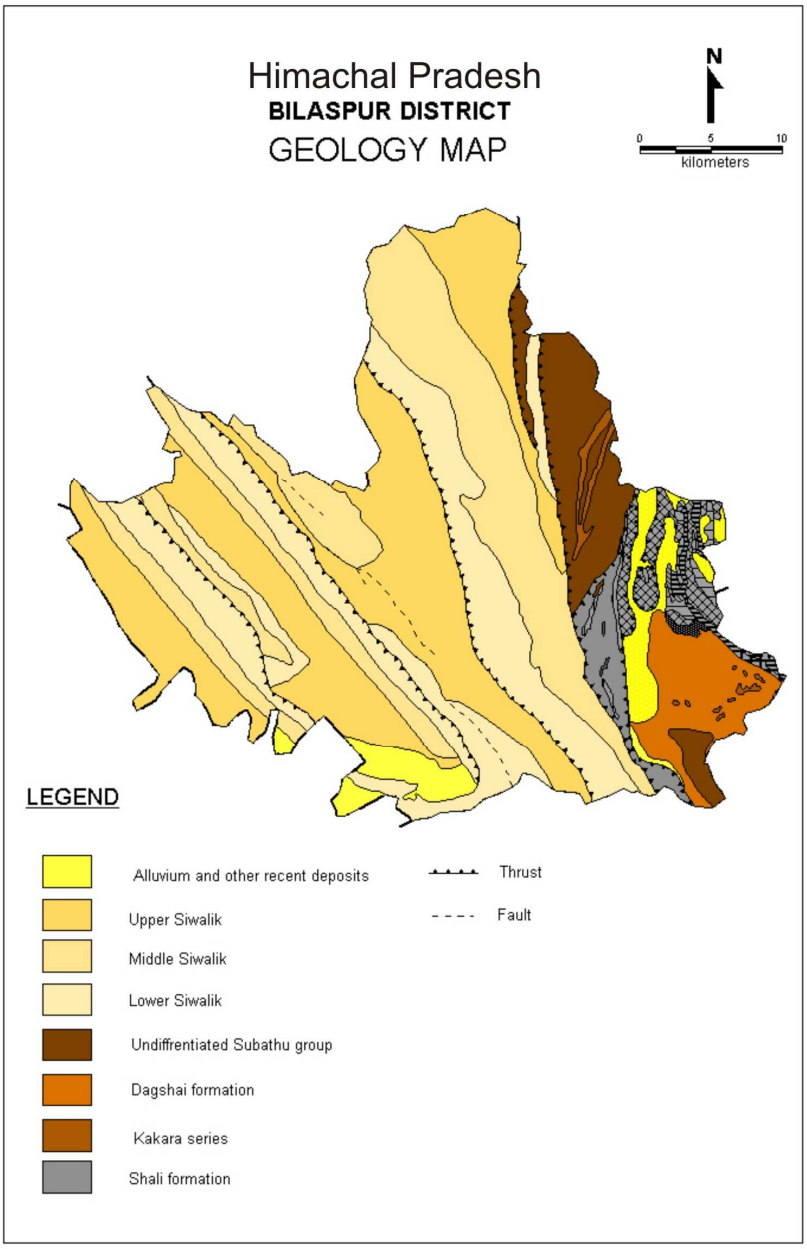
4.0 GROUND WATER SCENARIO

4.1 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 sandstone and 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 Proterozoic III Proterozoic II		Krol Formation Shali Formation	Greyish massive dolomites and Limestone Cherty Dolomite, Quartzite and 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-granular pore 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 / alluvial formations (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 115 m 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.

4.2 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.

4.3 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.

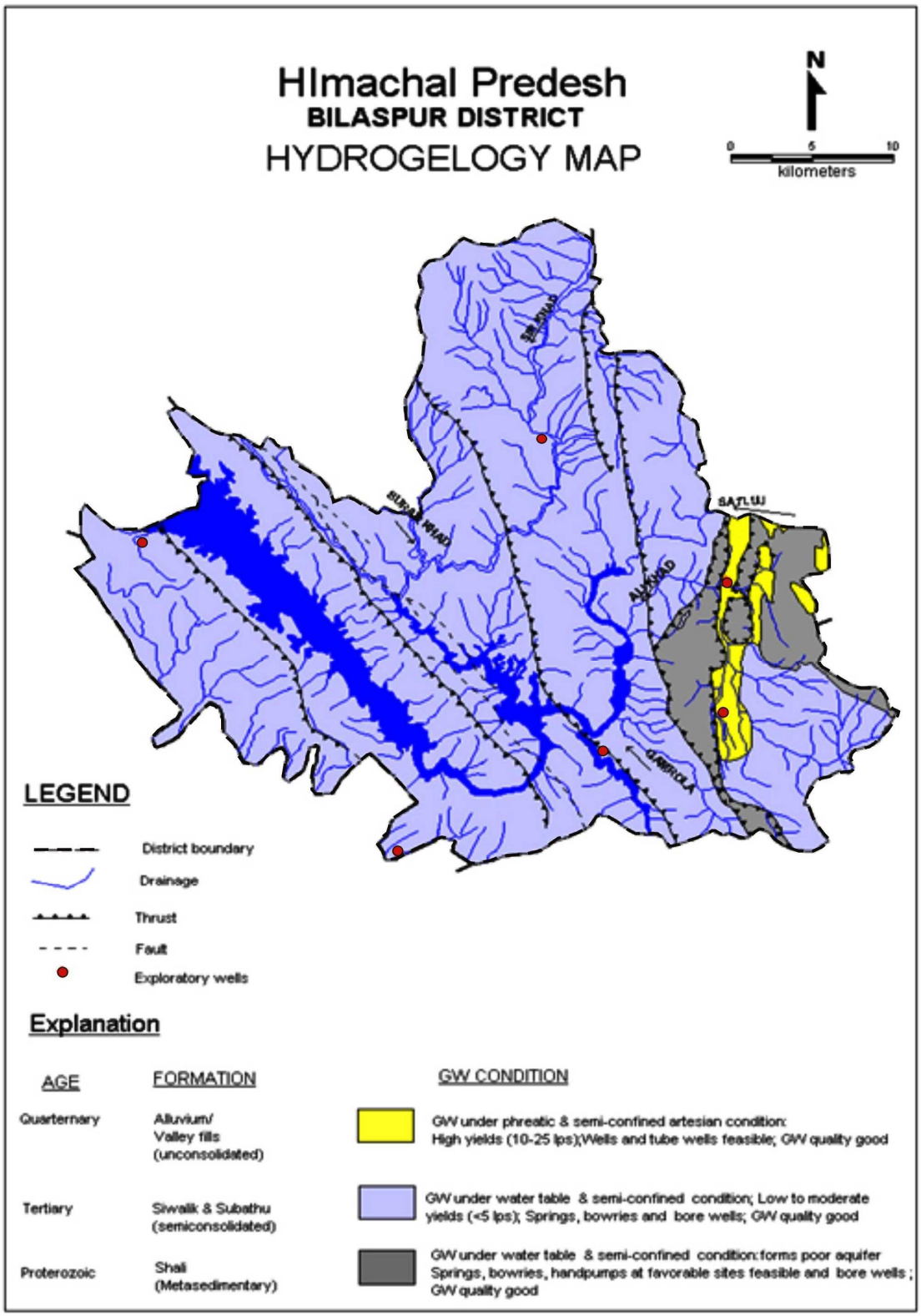

HImachal Predesh
BILASPUR DISTRICT
HYDROGEOLOGY MAP
N
0
5
10
kilometers
SATLUJ
LEGEND
District boundary
Drainage
Thrust
Fault
Exploratory wells
Explanation
AGE
FORMATION
GW CONDITION
Quarternary
Alluvium/
Valley fills
(unconsolidated)
GW under phreatic & semi-confined artesian condition:
High yields (10-25 lps);Wells and tube wells feasible; GW quality good
Tertiary
Siwalik & Subathu
(semiconsolidated)
GW under water table & semi-confined condition; Low to moderate yields (<5 lps); Springs, bowries and bore wells; GW quality good
Proterozoic
Shali
(Metasedimentary)
GW under water table & semi-confined condition:forms poor aquifer
Springs, bowries, handpumps at favorable sites feasible and bore wells ;
GW quality good

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.

4.4 STATUS OF GROUND WATER DEVELOPMENT

Mostly the demand for domestic and irrigation use is fulfilled by means of either spring or nallah sources. Most of these sources are perennial with low to moderate seasonal fluctuation. Such sources are tapped by the irrigation department for further use.

Ground water exploration has been carried out by CGWB in Bilaspur district but not in the entire area of the district because of difficulty in approach for heavy machinery. However, State Irrigation Department (I&PH) has drilled number of shallow bore wells fitted with hand pump in various parts of the district for domestic use. The depth of these bore wells range between 30 to 45 m. Some of the wells are energized where the discharge is sufficient. These hand pumps are installed in hard rock hilly terrain and also along the river valleys. Tube wells are also installed in all these valleys.

5.0 GROUND WATER MANAGEMENT STRATEGY

The district being hilly and mountainous, traditional sources of ground water mainly spring and nallas have played a major role since time immemorial in providing assured irrigation and water supply. However, modern means for tapping the ground water have been employed in recent years.

During the last 15-20 years, Irrigation and Public Health Department has constructed number of shallow bore wells fitted with hand pumps in these areas. High hill ranges occupy more than 95 % of the area of the district. Ground water development on a small scale is seen in the valleys. Hand pumps have been installed in these areas and are energized for the water supply. The entire hilly area of the district is feasible for only drilling shallow to medium depth bore wells.

5.1 WATER CONSERVATION & ARTIFICIAL RECHARGE

Ground water extraction through springs and hand pumps are the major sources of water supply, but the availability of water during summer is limited particularly in lean periods and requires immediate attention to augment the ground water resource. Based upon the climatic conditions, topography, hydrogeology of the area, suitable structures for rain water harvesting and artificial recharge to ground water are required. Proper scientific intervention for spring development and its revival is required in water scarce areas. In the hilly areas, roof top rainwater harvesting structures like storage tanks are recommended while in low hill ranges both i.e. check dams and roof top rainwater harvesting structures may be adopted.

6.0 GROUND WATER RELATED ISSUES & PROBLEMS

The district being hilly and mountainous, most of the rainfall goes waste as runoff. This has resulted in decrease of recharge to ground water. In such hard rock terrain, since the aquifers are discontinuous and of different geological/hydrogeological setup, the ground water scenarios are different in various parts of the district.

Most of the ground water issues and problems so far noted in the district are localized and need to be treated independently by taking micro-level studies in a particular

area. One of the common issues is deeper water level because of the terrain and hydrogeological setup.

7.0 AWARENESS & TRAINING ACTIVITY

7.1 MASS AWARENESS PROGRAMME (MAP) & WATER MANAGEMENT TRAINING PROGRAMME (WMTP) BY CGWB

No Mass Awareness Programme / Water Management Training Programme have been conducted in the district so far.

7.2 PARTICIPATION IN EXHIBITION, MELA, FAIR etc

CGWB has not participated in exhibition, melas so far in the district.

7.3 PRESENTATION & LECTURES DELIVERED IN PUBLIC FORUM/ RADIO/ TV/INSTITUTION OF REPUTE/ GRASSROOTS ASSOCIATION/NGO/ACADEMIC INSTITUTIONS etc

Nil

8.0 AREAS NOTIFIED BY CGWA / SGWA

None of the areas of the district is notified by CGWA / SGWA.

9.0 RECOMMENDATIONS

- In valley areas, in addition to traditional ground water structures like springs, shallow to medium depth tube wells can be constructed for developing the ground water resource.
- In hilly terrain, springs and perennial nallas are the major sources of water. Shallow to medium depth bore wells fitted with hand pump are useful ground water structures for meeting the domestic needs and are feasible at favorable areas.
- Traditional resources like springs need to be revived, developed and protected on scientific lines for various uses. The discharge of such springs can be sustained by construction of small check dams or subsurface dykes across nallas/tributaries at favorable locations.
- Small ponds/tanks/talavs can be utilized for recharging ground water. These structures can be constructed for harvesting water and to meet the domestic needs.

- Roof top rainwater harvesting practices may be adopted in hilly areas since the district receives ample rainfall and because of hilly terrain majority of the rainfall goes as runoff, and a very small quantity is contributed towards ground water replenishment.
- Rainwater harvesting in general and RTRWH in particular is an ideal solution for augmenting water resources particularly in slopy / hilly and chronic water scarce areas. There is thus a need to create awareness for water conservation, augmentation and proper waste disposal for protecting water sources
- Peoples participation is a must for any type of developmental activities. So, they should be made aware of proper utilization and conservation of water resources available. In addition, micro-level efforts are required for proper implementation of development programmes.

SAVE WATER – SAVE LIFE

For Technical Assistance Relating to
Rainwater Harvesting & Artificial Recharge to Ground Water

Contact

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