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India's contribution to the world mine production of gold is insignificant being about 2.50 tonnes per annum which is produced from one major mine and its two satellite mines viz. (i) Hutti Gold Mines in Karnataka and its two satellites-Hira-Buddini and Uti. The demand for Gold in India is the highest in the world. One third of the global annual gold production of about 2,700 tonnes gets into India. Thus, gold plays an important role in our national economy. The gold import bill of India is about 37 billion dollars. This is one of the factors behind India's high Current Account Deficit. Gold mining has the potential to convert a more or less continuously depreciating currency into an asset representing "net" foreign exchange. Therefore, it would be in the national interest to establish more gold mines and maximize production even if the break even cost of production equals the rupee equivalent of the international bullion price in view of the other significant direct and indirect benefits of mining gold in rural India.

India is historically recognized as one of the oldest gold mining centres in the world. The ancient Indian gold mining history could be 6,000 to 8,000 years old. Ancient Indians mined and panned for gold at over 900 locations over the length & breadth of India. Panning is still underway in many parts of the country. All these ancient pits and gold-shows can be viewed as anomalies helpful in modern exploration. British and Indian Geologists mapped most parts of the country and revisited the ancient mine workings and reopened several of them. GSI and State Mines & Geology Departments as well as private exploration companies have further explored many of these and established gold Resources and Reserves. Several of them could be developed into small (<250,000 Ozs of gold Reserve) & medium scale mines (<1M Ozs of reserve).

Area available for gold exploration: Out of India's land area of 3.3 million sq km approximately 2.4 million sq km comprises hard rock. About 700,000 sq km i.e. ~25% of the hard rock area holds potential for exploration for precious metals & basemetals. Out of this, about 500,000 sq km was granted by Govt. of India on Reconnaissance Permits of which about 400,000 sq km area was for precious metals. Only 500 sq km or 0.125% of the area explored under RP has been granted for gold prospecting. Because of years of delay and complicated lengthy procedures there is hardly any FDI into mineral exploration. On the other hand, Indian companies have preferred to invest in exploration & mining in many business friendly overseas destinations.

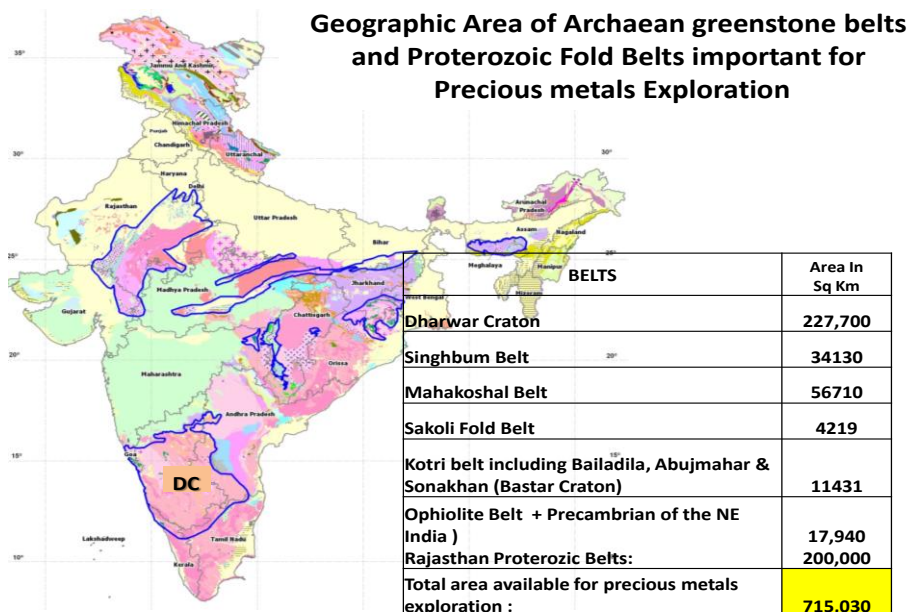


Fig.1: Important areas for precious metals exploration.

Current Status of Reserves & Resources of Gold in the Country: A compilation attempted by me as a member of the Core Group on the 12th Five Year Plan indicates that the total estimated gold resource in the country as on 1.4.2011 was **658 tonnes**. Currently about **700t**. This tonnage is spread over 13 different States. Out of this **167 tonnes** is categorized as **Reserves** (UNFC 111 & 121), and the remaining **531 tonnes of gold** as Resource of which **298 tonnes** is the actual drilled Resource (UNFC 211, 331 & 332) and the remaining **233 tonnes** is the projected potential resource which fall under 333/334 UNFC categories. These resources await upgradation through detailed prospecting and feasibility studies to mineable ore Reserves.

ALL INDIA RESERVES/RESOURCES of GOLD, STATE-WISE, EXPRESSED IN TERMS OF THE CONTAINED METAL

State	Reserves (A)		Drilled Resource (B)				Inferred Resource (C)	Total Resources (A+B+C) as on 1.4.2014
	As on 1.4.2000	As on 1.4.05	As on 1.4.14	As on 1.4.2000	As on 1.4.05	As on 1.4.14		
All India Total			167.16			298	233	698
Andhra Pradesh	6.6	6	27.58	20.00	25	22	36	85
Chhattisgarh				2.7	3	0.5	7	7.5
Jharkhand		1	0.2	0.1	2	8	4	12.2
Karnataka	52.35	78	139.38	50.02	75	120	77	336
Kerala: Primary + Lateritic				0.2	0	6	3	9
				5.86	6	-	6	6

Placer								
Madhya Pradesh				15.72	8	8	22	30
Maharashtra				3.55	4	6	3	9
Orissa						-	5	5
Rajasthan				13.1	126	125	28	153
Tamil Nadu				1	1	1	1	2
Uttar Pradesh						-	3	3
Bihar				21.6	38	-	38	38
West Bengal					124	2	-	2
TOTAL			167.16	133.85	412	298	233	698

Gold in Dharwar Craton: As of now DC is the best among the Cratons of India for gold exploration. Yet the gold-bearing potential (Gpb) of the craton excluding Kolar and Hutti Mines is 1.6 kg. per sq.km. as against over 50 for other comparable cratons of the world. There is much scope for exploration using modern techniques of exploration. The greenstone belts of the Craton is dotted with over 80 old gold workings, 20 new prospects explored by drilling in the last 40 years, besides two world class gold deposits, one at Kolar and the other at Hutti. The Kolar Gold Field produced ~850 tonnes of gold during its 100 years long history. The 8km long Champion Lode system was developed upto 3 km depth where the reef is still open with no sign of petering out. Hutti is the only operating major gold mine. It is a world class mine operating 9 parallel reefs having an ore Reserve-Base of ~188 tonnes of gold. The author has estimated the total gold Resource potential of the belt at 400tonnes. The mine production at the Hutti mine could be increased to 5 to 8 t. of gold/annum.

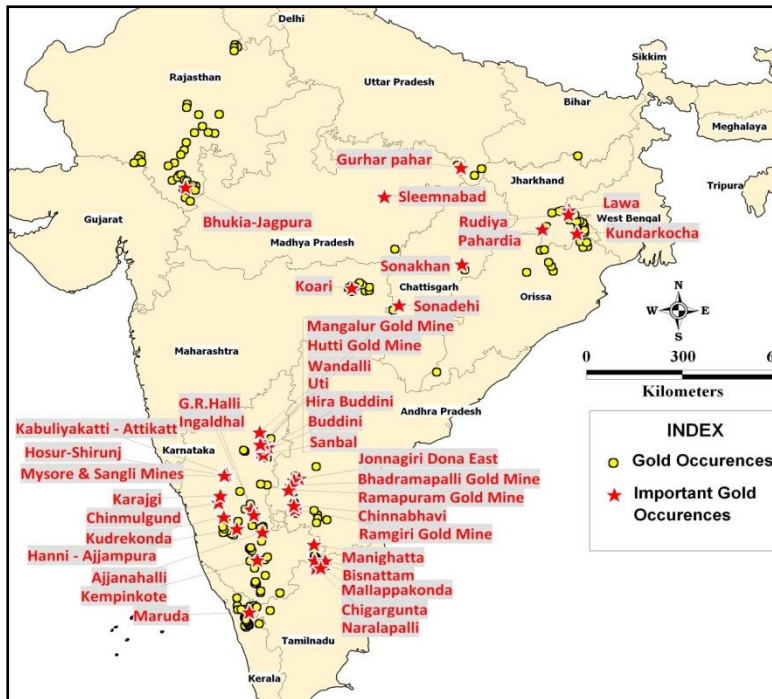
Dharwar Craton comprises several Neoproterozoic greenstone belts forming integral parts of two tectonic terranes, each characterized by distinctive geophysical features. In the western part, a pre-2900 Ma complex of orthogneisses, granodiorites and narrow slivers and pods of supracrustal rocks form the basement to volcano-sedimentary basins (Greenstone belts) of the Dharwar Supergroup (ca. 2800-2550 Ma). The eastern part of the craton comprises several parallel, steep N-S to NW-SE trending linear belts of calc-alkaline, anatectic and juvenile granites and granodiorites (*Dharwar batholith*, ca.2750-2510 Ma) with intervening volcano-sedimentary belts. The plutonic belts are 15 to 25 km wide, up to 150 km long, and bound by steep NW-SE high-strain zones, up to 2 km wide, with sinistral shear sense. These characteristics fit into a convergent plate tectonic model of basin development & inversion. Gold mineralisation in the western foreland region and in the intra-arc type greenstone belts in the eastern part of the Dharwar craton is associated with syn-to-late tectonic vein systems synchronous and outlasting intrusion/accretion of thick sheets of granite/granodiorite plutons. The western part of the craton is interpreted as the foreland Archaean Nucleus to an accretionary arc

represented by the eastern *Dharwar batholith*. This geological setting is very similar to Andean mobile belt, North American cordillera, the Yilgarn craton of Western Australia, the Slave Province of the Canadian Shield and Kaapvaal and Rhodesian Archaean cratons of Southern Africa, all of which are known for a number producing gold mines and high rate of success in gold exploration.

Gold Resource Potential of the Other 3 Cratons: The Neoarchaeon and Mesoproterozoic volcano-sedimentary belts and associated plutonic intrusives in the other 3 Cratons viz., Bundelkhand, Bastar & Singhbhum Cratons also host Orogenic style ie., structurally controlled gold-quartz-sulphide-carbonate vein type deposits. The linear, 800 km long, ENE-spreading Mahakoshal belt, the arcuate Singhbhum belt, the triangular Sakoli belt, the Kotri, Sonakhan & associated belts in western part of Chhattisgarh State and Aravalli fold belt in Rajasthan, which are comparable in age and lithological association to the gold-rich West African Birrimian sequence, have the potential to deliver mineable gold deposits. All these belts are composed of a lower volcanic sequence which is overlain by thick clastic to chemical sedimentary sequences. Contacts between the two successions are marked by thick conglomerate units. It is to be noted that in many Neoarchaeon belts, world-class gold mineralization is controlled by sheared tectonic contacts marking volcanic and clastic sedimentary units containing thick boulder conglomerates. Such contacts commonly mark prominent intra-basinal faults. These intra-basinal faults channel the fluids required for gold mineralization which are generally reflected in carbonate-silica-chlorite-sericite (potassic) alteration haloes.

India's Exploration Expenditure on Gold is Trivial: Huge investment of the order of hundreds of millions of dollars per annum is the key to major gold discoveries and development of mines. During Global expenditure on gold exploration alone is ~US\$ 4 billion out of the global total exploration expenditure of US\$ 18 billion on all minerals. Alas! India's total exploration expenditure for precious metals stands at <US\$ 5 million/annum of which GSI's expenditure on precious metals exploration is about US\$ 3 M and that of the private sector about US\$ 2 mill., the latter due to inordinate delays in grant of license for prospecting and clearances from Forest Depts & MoEF.

In the next 5 years the Ministry of Mines, Govt of India, should lay a proper-investor-friendly foundation for exploration and development of new gold mines in the country. 33 gold prospects have the potential to become new mining centres as listed in Table 2. The 12th Plan Working Group on precious metals had set a goal of reaching an annual mine production of 100 tonnes by year 2025.



The known gold fields which await detailed exploration are given in Table-1 and presented in Fig.2.

TABLE-1: POTENTIAL ZONES for EXPLORATION & DEVELOPMENT of GOLD DEPOSITS in INDIA

Craton	Belts	State	Name of Goldfield/Mine/ Prospect
DHARWAR CRATON 1. Eastern Accretionary Complex	<ol style="list-style-type: none"> 1. Kolar Belt 2. Hutti belt 3. Jonnagiri belt 4. Gadwal belt 5. Ramagiri-Penakacherla-Hungund belt 6. Veligallu belt 7. Raichur-Deodurga belt 8. Mangalur belt 	Karnataka, Andhra Pradesh & Tamil Nadu	Expansion of currently operating Hutti Gold Mines, Uti and Hira-Buddini Mines, Hirenagnur Gold Mine, Hutti Mine North Prospect, Kolar Gold Fields West Reefs , South Kolar Cluster Mines including Chigargunta Main & NE, Mallappakonda, Bisnattam old & New, Surapalle, Manighatta, Jaderi-Arikere, Reopening of Ramagiri gold mine, Chinnabhavi, Jibutil Bhadrampalle, Ramapura, Venkatampalle, Buddini-Maski gold mine, Kadoni gold mine, Uti South West Extension, Wandalli gold mine, Revival of Mangalur mines, Jainapur, Maharajagadai. Processing of 35million t Tailings in KGF.
2. Western Foreland Terrane	<ol style="list-style-type: none"> 1. Chitradurga belt including the Gadag part 2. Dharwar-Shimoga basin 3. Northern Part of Bababudan belt 4. Nuggihalli belt 5. Manantwadi belt & Attappadi Gold Fields, Nilambur Gold Fields 6. Wyanad Gold Fields 	Karnataka Kerala	Ganajur Main Gold deposit, Karajgi Main Prospect, Ganajur Satellite Prospects, Sangli gold mine, Hosur Champion Gold Mine, Yelisirur Gold Mine, Kabulyatkatti gold mine, Mangalgatti Gold Mine, Bhavihal Gold Mine, Kuluvalli Prospect, Lakkikoppa prospect, Hiriyyur (Paramanahalli), Kempinkote, Hanni-Ajjampur Gold Mine, Maruda gold Prospect, Puttumala, Laterite gold in Nilambur-Wyanad region.
	1. Aravalli belt-Banswara	Rajasthan	1. Bhukia-Jagpara gold field

BUNDELKHAND CRATON		Banswara, Dungarpur & Dausa Districts	2. Hinglazmata 3. Bharkundi 4. Pindwara-Watera 5. Dhani-Basri Cu-Au
	2. Mahakoshal belt	Sidhi & Sonbhadra Dts., Madhya Pradesh & Uttar Pradesh	1. Gurharpahar 2. Sonapahari 3. Sonkorwa 4. Parsoi 5. Hathipatar 6. Sulkhana-Amlihwa 7. Khairchhan 8. Chakariya 9. Gulaldih
	3. Sonrai Basin	Lalitpur Dist., Uttar Pradesh	Sonrai Prospect
BASTAR CRATON	1. Sonakhan Belt	Chhattisgarh	1. Sonkhan 2. Sonapur 3. Bhagmara 4. Arjuni 5. Thalkadebri 6. Baya 7. Beldih 8. Barnaidadal
	2. Proterozoic Granite	Jashpur dt., Chhattisgarh	Pathalgaon gold field 1. Pharsabahal prospect 2. Bhagora-Mayurnacha, 3. Semarkachhar 4. Baghbahal 5. Pandripani 6. Garaibandh 7. Madwakhani
BASTAR CRATON	3. Kotri belt	Chhattisgarh	1. Sonadehi 2. Gurpher 3. Lohattar 4. Puromichagaon 5. Gurwandi 6. Tohe
SINGHBHUM CRATON	1. Singhbhum volcano sedimentary belt	Jharkhand	1. Parasi 2. Tamar 3. Lawa-Maisara 4. Rudiya 5. Sonapet 6. Hesadi-Pahardiha 7. Sonua-Ankua 8. Kundarkocha 9. Potka
	2. QPC Hosted Gold	Jharkhand Orissa	1. Several prospects in Dhajori basin 2. Mankarhachua & 3. Phuljhari in south west part of Singhbhum belt.
DHARWAR, BASTAR & BUNDELKHAND	Meso & Neoproterozoic sedimentary basins	-	1. Basal parts of Cuddapah basin 2. Kaladgi & Bhima Basins & 3. Vindhyan Basin