Prepared in cooperation with the Ministry of Petroleum, Energy and Mines, Islamic Republic of Mauritania

Second Projet de Renforcement Institutionnel du Secteur Minier de la République Islamique de Mauritanie (PRISM-II)

Mineral Potential Tracts for Orogenic, Carlin-Like, and Epithermal Gold Deposits in the Islamic Republic of Mauritania:

Phase V, Deliverable 69

By Richard J. Goldfarb, Erin E. Marsh, Eric D. Anderson, John D. Horton, Carol A. Finn, and Georges Beaudoin

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Multiple spellings are used in various literatures, and may be reflected in the text.

This report is preliminary and has not been reviewed for conformity with U. S. Geological Survey editorial standards or for stratigraphic nomenclature.

The report is being released in both English and French. In both versions, we use the French-language names for formal stratigraphic units.

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Conversion Factors

SI to Inch/Pound

Multiply	By	To obtain
	Length	
centimeter (cm)	0.3937	inch (in.)
millimeter (mm)	0.03937	inch (in.)
decimeter (dm)	0.32808	foot (ft)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
	Area	
hectare (ha)	2.471	acre
square meter (m^2)	0.0002471	acre
square kilometer (km^2)	0.3861	square mile (mi^2)
	Volume	
cubic kilometer (km^3)	0.2399	cubic mile (mi^3)
	Mass	
gram (g)	0.03527	ounce, avoirdupois (oz)
kilogram (kg)	2.205	pound avoirdupois (lb)
megagram (Mg)	1.102	ton, short (2,000 lb)
megagram (Mg)	0.9842	ton, long (2,240 lb)
metric ton per day	1.102	ton per day (ton/d)
megagram per day (Mg/d)	1.102	ton per day (ton/d)
metric ton per year	1.102	ton per year (ton/yr)
	Pressure	
kilopascal (kPa)	0.009869	atmosphere, standard (atm)
kilopascal (kPa)	0.01	bar
	Energy	
joule (J)	0.0000002	kilowatt hour (kWh)

ppm, parts per million; ppb, parts per billion; Ma, millions of years before present; m.y., millions of years; Ga, billions of years before present; 1 micron or micrometer (μor μm) = 1×10^{-6} meters; Tesla (T) = the field intensity generating 1 Newton of force per ampere (A) of current per meter of conductor

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

°F=(1.8×°C)+32

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

°C=(°F-32)/1.8

Coordinate information is referenced to the World Geodetic System (WGS 84)

Acronyms

AMT	Audio-magnetotelluric
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
BIF	Banded iron formation
BLEG	Bulk leach extractable gold
BGS	British Geological Survey
BRGM	Bureau de Recherches Géologiques et Minières (Mauritania)
BUMIFOM	The Bureau Minier de la France d'Outre-Mer
CAMP	Central Atlantic Magmatic Province
CGIAR-CSI	Consultative Group on International Agricultural Research-Consortium for Spatial Information
DEM	Digital Elevation Model
DMG	Direction des Mines et de la Géologie
EC	Electrical conductivity
EMPA	Electron Microprobe Analysis
EM	Electromagnetic (geophysical survey)
EOS	Earth Observing System
eU	Equivalent uranium
GGISA	General Gold International
GIF	Granular iron formation
GIFOV	Ground instantaneous field of view
GIS	Geographic Information System
HIF	High grade hematitic iron ores
IHS	Intensity/Hue/Saturation
IAEA	International Atomic Energy Agency
IOCG	Iron oxide copper-gold deposit
IP	Induced polarization (geophysical survey)
IRM	Islamic Republic of Mauritania
JICA	Japan International Cooperation Agency
JORC	Joint Ore Reserves Committee (Australasian)
LIP	Large Igneous Province
LOR	Lower limit of reporting
LREE	Light rare-earth element
METI	Ministry of Economy, Trade and Industry (Japan)
MICUMA	Société des Mines de Cuivre de Mauritanie
MORB	Mid-ocean ridge basalt
E-MORB	Enriched mid-ocean ridge basalt
N-MORB	Slightly enriched mid-ocean ridge basalt
T-MORB	Transitional mid-ocean ridge basalt
Moz	Million ounces

MVT	Mississippi Valley-type deposits
NASA	United States National Aeronautics and Space Administration
NLAPS	National Landsat Archive Processing System
OMRG	Mauritanian Office for Geological Research
ONUDI	(UNIDO) United Nations Industrial Development Organization
PRISM	Projet de Renforcement Institutionnel du Secteur Minier
PGE	Platinum-group elements
RC	Reverse circulation drilling
REE	Rare earth element
RGB	Red-green-blue color schema
RTP	Reduced-to-pole
SARL	Société à responsabilité limitée
SEDEX	Sedimentary exhalative deposits
SIMS	Secondary Ionization Mass Spectrometry
SNIM	Société National Industrielle et Minière (Mauritania)
SP	Self potential (geophysical survey)
SRTM	Shuttle Radar Topography Mission
SWIR	Shortwave infrared
TDS	Total dissolved solids
TIMS	Thermal Ionization Mass Spectrometry
TISZ	Tacarat-Inemmaudene Shear Zone
TM	Landsat Thematic Mapper
UN	United Nations
UNDP	United Nations Development Program
US	United States
USA	United States of America
USGS	United States Geological Survey
UTM	Universal Transverse Mercator projection
VHMS	Volcanic-hosted massive sulfide
VisNIR	Visible near-infrared spectroscopy
VLF	Very low frequency (geophysical survey)
VMS	Volcanogenic massive sulfide deposit
WDS	Wavelength-dispersive spectroscopy
WGS	World Geodetic System

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1 Summary

The gold resources of Mauritania presently include two important deposits and a series of poorly studied prospects. The Tasiast belt of deposits, which came into production in 2007, is located in the southwestern corner of the Rgueïbat Shield and defines a world-class Paleoproterozoic(?) orogenic gold ore system. The producing Guelb Moghrein deposit occurs along a shear zone in Middle Archean rocks at the bend in the Northern Mauritanides and is most commonly stated to be an iron oxide-copper-gold (IOCG) type of deposit, although it also has some important characteristics of orogenic gold and skarn deposits. Both major deposits are surrounded by numerous prospects that show similar mineralization styles. The Guelb Moghrein deposit, and IOCG deposit types in general are discussed in greater detail in a companion report by Fernette (2015). In addition, many small gold prospects, which are probably orogenic gold occurrences and are suggested to be early Paleozoic in age, occur along the length of Southern Mauritanides. Existing data indicate the gold deposits and prospects in Mauritania have a sulfide assemblage most commonly dominated by pyrrhotite and chalcopyrite, and have ore-related fluids with apparently high salinities.

A preliminary evaluation of these gold data can be used to develop broad, first-order tracts defining favorable and permissive areas for gold resources; detailed metamorphic and structural maps are required for more detailed future tract definition. Such a first-order assessment can, nonetheless, broadly identify four tracts of gold resource potential. Three of these are favorable for discovery of new orogenic gold deposits. One tract, although not favorable, is nevertheless permissive for discovery of epithermal gold deposits. Tract 1 is defined by favorable medium metamorphic grade greenstone belts within vast areas of unfavorable high metamorphic grade, Mesoarchean and Paleoproterozoic granite-gneiss basement of the Rgueïbat Shield. Faults >200 km in

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length following the general strike of the greenstone belts; lineament intersections with both exposed and buried parts of greenstone belts within 500 m of the surface, as defined by aeromagnetic data (Finn and Anderson, 2015); and areas of banded iron formation (BIF) in the belts are particularly favorable areas for hosting gold resources in orogenic gold deposits within and along the margins of the greenstone belts. Tracts 2 and 3, also for orogenic gold, reflect the favorable Proterozoic-Cambrian metamorphic rocks of the Northern and Southern Mauritanides, with >200-km-long faults following the general strike of the range, and areas underlain by ultramafic and BIF rocks being particularly favorable. Outcrops of Triassic-Jurassic igneous rocks along the margins of the Taoudeni Basin define tract 4, which is permissive for epithermal gold deposits. Although extensive data are lacking for the area, carbonate units along the northern side of the Taoudeni Basin could be considered permissive host rocks for Carlin-type mineralization, but the deep-water carbonate lithologies are typically not favorable for such.

2 Introduction

Orogenic gold deposits (Goldfarb and others, 2005) are widespread within deformed metamorphic terranes from Middle Archean to Tertiary age. This coherent group of gold deposits are characterized by features that include low sulfide volumes, carbonate-sulfide±sericite±chlorite alteration assemblages, low to moderate salinity and CO_2-rich ore fluids, ore fluid $\delta^{18}O$ values between 5 and 10 per mil, spatial association with regional-scale transpressional to compressional fault zones, and spatial and temporal associations with magmatism. In addition to gold, deposits are commonly enriched in Ag, As, Bi, Hg, Sb, Te, and (or) W. Host rocks for orogenic gold deposits are variable, with metavolcanics common in Archean terranes, banded iron formations (BIF) and metasediments common in Proterozoic terranes, and slates and turbidites common in Phanerozoic terranes. Mineralization styles include quartz veins and veinlets, breccias, and disseminated ores. Deposits formed over a uniquely broad P-T range of 1–5 kb and 200–650^{o} C, which has led to their division into epizonal, mesozonal, and hypozonal subgroups. They are rarely present in extremely low- or high-grade metamorphic rocks. These gold deposits are best interpreted as the products of regional fluid flow inherent to orogeny. The fluids are commonly suggested to be of metamorphic origin.

Epithermal gold deposits (Simmons and others, 2005) are hosted mainly by relatively coeval calc-alkaline to alkaline volcanic rocks, in Mesozoic and younger environments. They form in veins at depths of <1.5 km and at temperatures of <300^{o} C from low salinity, aqueous fluids. This deposit type is commonly subdivided into low and high sulfidation groups based on the association with either a quartz-calcite-adularia or a quartz-alunite-pyrophyllite-kaolinite assemblage, respectively. The low sulfidation deposits, dominated by meteoric water, show characteristic crustiform-colloform textures. High sulfidation deposits, typically closely associated with causative intrusions, can have vuggy quartz textures and are associated with variable amounts of Cu-sulfide minerals.

Carlin-like gold deposits (Cline and others, 2005), best recognized in Nevada, USA, are less well understood and show characteristics somewhere in between those of orogenic and epithermal deposits. They form at the same to slightly higher P-T regimes than epithermal gold ores, but have ore fluids somewhat enriched in CO_2. The source of the ore-forming fluids is still uncertain. The age of these deposits in Nevada is Tertiary, but some other hypothesized examples world-wide are as old as Paleozoic. The gold ores are localized in miogeoclinal carbonate/clastic sequences, with gold occurring as submicron inclusions or in solid solution in arsenian pyrite that is left behind during dissolution of ferroan carbonate.

3 Gold-Dominant Mineral Deposits and Occurrences in Mauritania

3.1 Rgueïbat Shield

The northern part of Mauritania is mainly underlain by Mesoarchean and Paleoproterozoic rocks of the Rgueïbat Shield, which is the most northern part of the gold-rich West African Craton (for example, Schofield and Gillespie, 2007; Key and others, 2008). Worldwide, Mesoarchean basement rocks generally are not favorable hosts for lode gold deposits because they are typically very high-grade gneisses and related lithologies, although there are important exceptions such as Barberton, South Africa. Much of the Mesoarchean of the Rgueïbat Shield appears to be mapped as such high-grade gneiss. In contrast, Paleoproterozoic rocks of the West African craton, including those of the Eburnean or Leo Shield to the south of the Taoudeni Basin, define broad areas of greenschist facies provinces and are very favorable gold hosts. However, the Paleoproterozoic eastern half to the Rgueïbat Shield, near the contact with the Archean rocks and similar to the Archean rocks, is mainly underlain by very high-grade metamorphic rocks in the west. These also expose crustal levels that are below gold-favorable zones; in other words, much of the West African Craton within Mauritania is likely to have lost any gold endowment during pre-cratonization denudation. Nevertheless, the metamorphic grade of the Paleoproterozoic rocks appears to decrease to more favorable greenschist facies to the east in Mauritania's Rgueïbat Shield and defines an area of definite favorability for orogenic gold deposits in Eburnean rocks in Mauritania.

A few small gold prospects, now being explored by Drake Resources Limited (for example, Conchita-Florence or Nsour, El Mheissat, Oued El Mar, and Bia-652; http://www.drakeresources.com.au/mauritania; table 1), are recognized north of latitude 21^{o} in Mauritania, a region that includes most outcrops of ca. 2.1 Ga Eburnean rocks of the Shield. There is little information on these occurrences, although Drake reports high-grade gold grab samples at Conchita adjacent to a 140-km-long shear zone system of anomalous gold termed the Hendrix shear zone. This zone also represents the one distinct belt of volcaniclastic rocks defined to-date in the eastern part to the Shield (for example, Bradley, Motts, and others, 2015a). The anomalies are associated with outcropping gold-bearing quartz veins (mesothermal deposit type of PRISM-I report; Marot and others, 2003; Gunn and others, 2004), with some base metal sulfide minerals; some of the mineralization might occur as wallrock disseminations or in gossan zones. Geochemical anomalies include Ag, Au, Mo, Sb, Te, and W, all of which could be important as pathfinder elements in exploration. The host rocks are Paleoproterozoic, probably greenschist facies metapelites, although defined as gneiss or "migmatite" using terminology on the Mauritanian Office for Geological Research (OMRG) website (http://www.omrg.mr/spipef16.html?article1150). A couple of $^{40}Ar/^{39}Ar$ dates on hydrothermal sericite from prospects to the southeast along this trend (Bradley, O'Sullivan, and others, 2015) suggest a belt of Paleoproterozoic orogenic gold occurrences.

Table 1. Identification number, name and location of Au occurrences in the Islamic Republic of Mauritania.

Occurrence identification	Name	X_WGS84_PRISMII	Y_WGS84_PRISMII
001IND0012	Bia-652	-8.533055305	26.333055496
038IND0029	Jemelein	-15.057499886	20.357221603
038IND0030	Eucalyptus	-15.172499657	20.344444275
038IND0031	Acacia	-15.225000381	20.304445267
038IND0032	Jarrah	-15.237500191	20.230556488
038IND0033	N'Derek	-15.421388626	20.311388016
039IND0005	South Ahmeyim	-14.399167061	20.801944733
050IND0021	El Joul (Ouest)	-14.350000381	19.709722519
050IND0022	El Joul Est	-14.284444809	19.708610535
050IND0027	Camel Tick	-14.436940000	19.732130000
050IND0028	Redwood	-14.584360000	19.924580000
050IND0029	Guelb El Hadej	-14.150010000	19.901710000
086IND0021	Indice 78	-12.725000381	16.732221603
086IND0022	Oua Oua 3	-12.672778130	16.349721909
086IND0026	Fra Agharghar Nord	-12.750000000	16.680000305
086IND0027	Fra Agharghar Sud	-12.739999771	16.629999161
086IND0029	Boularath 3	-12.520000458	16.750000000
086IND0035	Oua-Oua 1	-12.659999847	16.059999466
091IND0008	Nema HC-6019	-7.282777786	16.631944656
091IND0009	Nema HC-5075	-7.282777786	16.091667175
091IND0010	Nema H-1028	-7.203055382	16.098054886
EH7408		-8.420710000	25.959960000
HM7384	Conchita Florence	-8.628980000	26.128950000
086IND0005	Bou Zraibe 1	-12.760780000	16.857870000
086IND0006	Bou Zraibe 2	-12.750000000	16.816667557
086IND0028	Naaj	-12.699999809	16.680000305
001IND0022	Conchita Florence	-8.652777672	26.181388855
038IND0017	Aoueouat	-15.512499809	20.572221756
038IND0018	C5-1	-15.766666412	20.649999619
038IND0019	C6-7 Fennec	-15.512499809	20.644443512
038IND0020	C6-8 W	-15.502778053	20.613889694
038IND0021	C6-8 E	-15.487500191	20.619443893
038IND0022	C6-12	-15.470833778	20.552778244
038IND0023	C6-9S	-15.495490000	20.467630000
038IND0024	C6-15	-15.491666794	20.408332825
038IND0025	C6-14	-15.491666794	20.427778244
038IND0027	Lebzenia West	-15.883889198	20.779443741
038IND0028	Rusty	-15.864444733	20.725555420
038IND0034	C23	-15.471111298	20.925832748
039IND0003	Tijraj	-14.379166603	20.857778549
039IND0004	North Ahmeyim	-14.393055916	20.912776947
2015_Fosse_Sud_Tasiast	Fosse Sud, mine Tasiast	-15.50524849	20.56876651
2015_Tasiast_South_Project	Tasiast South Project	-15.575183511	20.437487110
2015_Tijirit	Tijirit	-15.225122535	20.307329424
2608_Hendrix	Hendrix (Conchita-Florence)	-8.640721572	26.183001323
2608_Nsour	Nsour (Conchita-Florence)	-8.650000000	26.200000000
2510_El_Mheissat	El Mheissat	-10.238889000	25.009722000
2408_Oued_El_Mar	Oued El Mar	-8.547900000	24.372200000
050IND0020	Anomalie A1	-14.183333397	19.616666794

Further assessment of this region north of latitude 21^o for gold resources in Paleoproterozoic orogenic deposits will require detailed geochemical maps, regional metamorphic maps, and evaluation of existing regional structure. If permissive areas exist for important gold resources in the eastern part of the Rgueïbat Shield, then such areas are likely to be broadly defined as those underlain by medium metamorphic grade greenschist facies rocks. They will likely be newly recognized metasedimentary rock belts similar to those that host the Conchita-Florence occurrences. These favorable areas would include rocks of the Lower Birimian (Aguelt Nebkha, Tsalabia el Khadra, and Adam Talha Formations) and Upper Birimian (Aioun-abd-el-Malek Formation) supracrustal units that are located east of the Sfairiat Shear Zone. Where such areas of medium metamorphic grade rocks can be identified, sediment, soil, or rock chip anomalies for As, W, and (or) Au itself, are likely best to delineate any areas of resource favorability. Geochemistry provided for the PRISM I project provides nearly countrywide As and Au analyses of soil and rock samples. To the southeast of the Conchita-Florence occurrences, in an area underlain by the same regional gneiss (unit AAgn) and also adjacent lower grade metasedimentary rocks (unit BZan1), there are a number of locations with samples showing relatively elevated As and Au values. In addition, the relatively NNW-trending major faults cutting the eastern most part of the Shield are likely to be particularly permissive hosts for gold ores where present in lower grade metamorphic domains; margins of igneous rocks shown along some of these faults on the 1:500 000-scale map should be carefully examined in any lower grade exposures.

Aeromagnetic data have been used to delineate the permissive NNW-trending structural zones. Shear zones can be laterally extensive linear lows in aeromagnetic data as a result of the destruction of magnetite caused by greater alteration and weathering in these relatively more permeable areas (Henkel and Guzman, 1977). Finn and Anderson (2015) showed that the Paleoproterozoic granites and granodiorites in the eastern half of the Rgueïbat Shield are associated with broad reduced to pole (RTP) magnetic highs and lows. The broad magnetic anomalies are suggestive of homogeneous sources such as competent intrusive rocks. A more complex pattern of high frequency magnetic highs and lows is found along the edges of the broad magnetic highs. This complex pattern is interpreted to reflect faulted and sheared rock where magnetite may have been created or destroyed by hydrothermal fluids and weathering. At a broad-scale, linear magnetic lows near the complex magnetic pattern may represent shear zones. These shear zones can be mapped by defining areas of high phase symmetry within the local frequency components of the RTP data (Holden and others, 2008). The interpreted linear lows with a 5 km buffer are considered favorable for gold resources in the eastern half of the Rgueïbat Shield.

The far southwest corner of the Rgueïbat Shield, at roughly latitude 20–21^o and longitude 14–16^o, is the only area of the Mesoarchean part to the Shield with greenschist facies greenstone belts; the seven defined belts (figure 1; Bradley and others, 2015a) tend to trend N-S in the west (for example, Chami) and NE-SW in the east (for example, Tijirit) of this area. The greenstone belts are exposed in the southern part of the Tasiast-Tijirit terrane of Schofield and others (2012). They are surrounded by a basement of ca. 3.1–3.0 Ga migmatitic gneisses that were metamorphosed at ca. 2.97 Ga; the greenstone belts are likely of similar age to the gneisses. Younger, voluminous tonalities and granodiorites, which now tend to core dome-like features, surround the basement rocks and greenstone belts (Maurin and others, 1997; Key and others, 2008). They are dated as ca. 2.95–2.87 Ga and 2.69–2.65 Ga (Schofield and others, 2012). Geophysical data from Finn and Anderson (2015) define the extent of these belts under cover; buried extensions of the belt within 500 m of the surface are also considered as favorable areas for mineral resources.

The Tasiast gold deposits are located along a N-S-trending shear system within the 70 x 15 km Chami Greenstone Belt. Tasiast has been mined since 2008, first by Red Back Mining and now by Kinross Gold Corp. Kinross (http://www.kinross.com/operations/operation-tasiast-mauritania.aspx) reports a world-class reserve+resource of at least 21 Moz (million ounces) Au at 1.47 g/t. The mines produce just over 200,000 oz Au per year. The most detailed available information is in company reports from Henderson (2010) and Sedore and Masterman (2012).

The Tasiast deposits occur as sheeted quartz-carbonate-albite-pyrrhotite-pyrite veins, gold-bearing quartz-carbonate veinlets, and adjacent disseminated gold, hosted in an upper greenschist to lower amphibolite facies, magnetite-quartzite BIF and adjacent volcaniclastic rocks. The orebodies are present within two parallel zones that continue for >10 km along strike (Davis, 2011; Sedore and Masterman, 2012). The brittle orebodies follow a series of reactivated thrusts that include the Tasiast and Piment fault zones. The greenstone belt consists of lower ultramafic rocks and felsic to intermediate flows, overlain by mafic volcanic rocks and volcaniclastics, and then BIF within a felsic volcanic rock sequence. The Piment deposits at the northern end of the belt are hosted by the BIF, felsic volcanic rocks, and associated clastic rocks, whereas the West Branch deposits at the southern end of the belt occur in the mafic rocks (figure 2; Sedore and Masterman, 2012). Anomalous Ag, As, Sb, and W, are reported at the deposits. Altered rock includes biotite, sericite, and chlorite (Davis, 2011). Clay alteration and high salinity fluid inclusions have led to some discussion as to whether this is an epithermal gold deposit, but it almost certainly is an orogenic gold deposit similar to those Paleoproterozoic BIF-hosted ores in Northern Territory, Australia and at Homestake, USA. Reported K-Ar ages on hydrothermal sericite of 1.85 and 1.50 Ga (Higashihara and others, 2004; Marutani and others, 2005) are unusual, as typically Mesoarchean rocks host Mesoarchean gold deposits and Paleoproterozoic rocks host Paleoproterozoic deposits. A major NW-striking aeromagnetic lineament (Finn and Anderson, 2015) intersects the Aoueouat sector of the Chami Greenstone Belt within the Tasiast mineralized area and may have important implications for explorationists (see below).

Other prospective areas within a few tens of kilometers of the Tasiast deposits could include the Rusty prospect (see plate for location) to the northwest of Tasiast, where auriferous quartz veins are identified in folded BIF and mafic volcanic rocks. At prospect C23, north of Tasiast and stated to be in the Chami Greenstone Belt, gold-bearing quartz veins occur along a sheared margin to a granodiorite body. To the south of Tasiast, in mainly sand covered areas, Drake Resources report gold anomalies in drill data from the southern part of the Chami Greenstone Belt. The above mentioned aeromagnetic anomaly of Finn and Anderson (2015) crosses the greenstone belts to the east (Sebkhet Nich) and west (Hadeibt Agheyâne and Hadeibt Latheiniye) of the Chami Greenstone Belt, and these locations are marked by some of the small orogenic gold prospects. These intersections of greenstone belts and the lineament, which is perhaps an ancient craton margin boundary or a fault parallel to the boundary just inside the ancient margin, are considered extremely favorable targets for new resources.

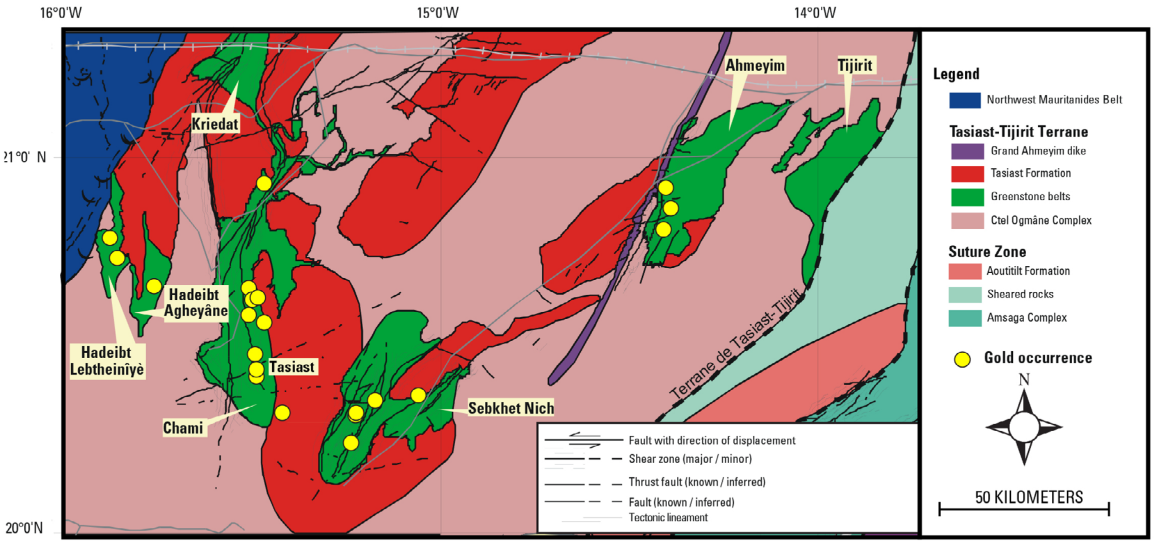

Figure 1. The main lithotectonic units of the Tasiast-Tijirit region of the Rgueïbat Shield (from Pitfield and others, 2004).

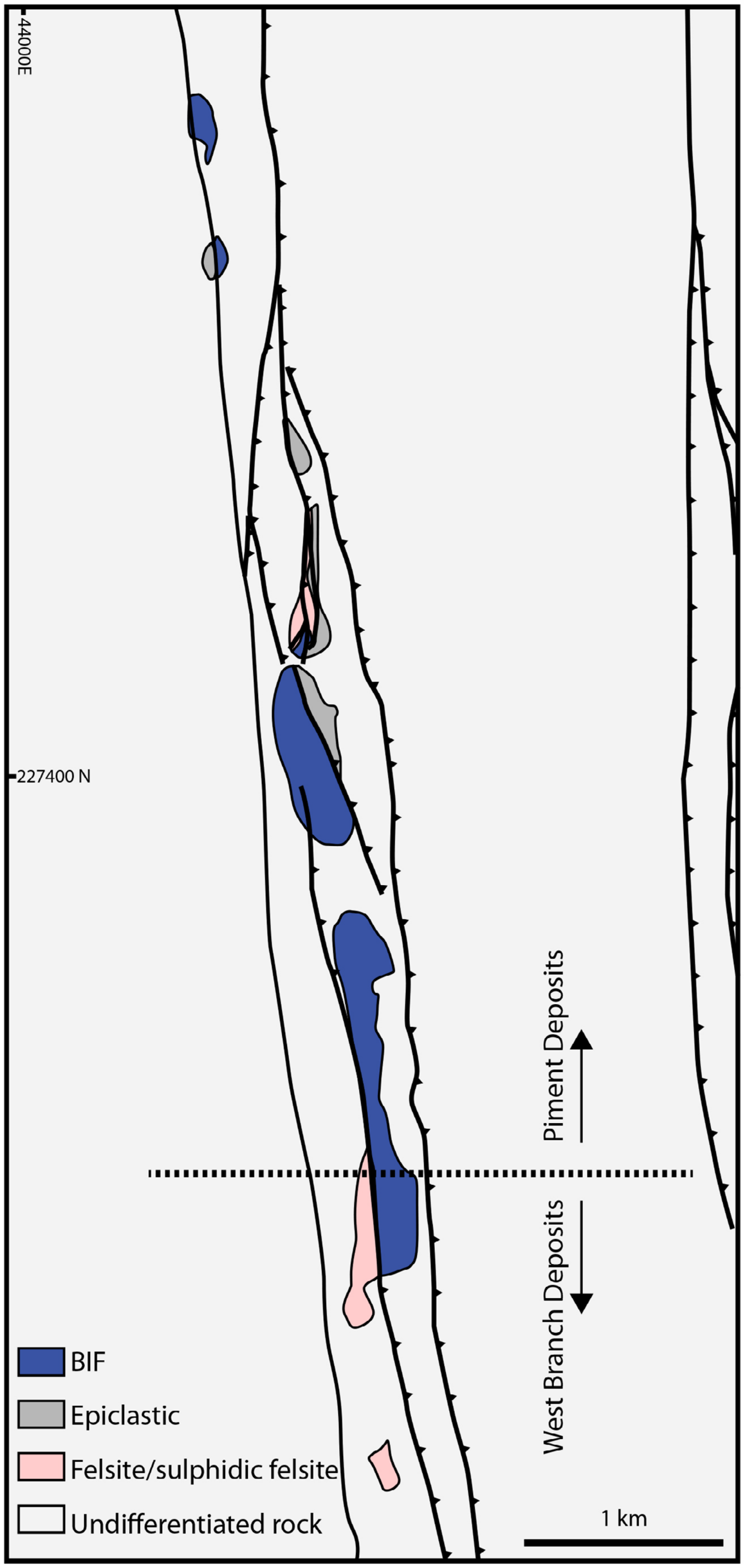

Figure 2. Generalized pit geology form the Tasiast belt of deposits showing the northern Piment and southern West Branch deposits (modified from Davis, 2011).

It is also very important to note that more detailed work in this southwestern part of the shield is likely to identify other important gold resources, as typically single orogenic gold deposits or deposit groups do not exist. Similar orogenic gold deposits are probably present in the Sabkhet Nich Greenstone Belt to the east of Tasiast. A NNE-trending shear contains auriferous quartz veins that continue for as much as 200 m along strike. Country rocks include basalt, gabbro, and schist. Reported high-salinity fluid inclusions again are atypical of orogenic gold deposits (http://www.omrg.mr/spip.php?article82).

3.2 Northern Mauritanides (Inchiri Region)

The NW-trending Mauritanide belt or orogen is the continuation of the Paleozoic Appalachian belt into western Africa. The northern part of the belt, sometimes referred to as the Akjoujt section (for example, Villeneuve, 2005), displays a significant western bend in the orogen such that it follows the southern margin of the Rgueïbat Shield. Meyer and others (2006) suggest the rocks in this area are Archean in age. The structurally deformed rocks are dominated by amphibolite, metadolerite, schist, and iron carbonate- and magnetite-rich BIF. These units appear to be like those found in many typical Archean greenstone belts and are different from those in all other parts of the Mauritanide belt; particularly, widespread BIF is uncommon in late Neoproterozoic sequences in other parts of the orogen and globally in this age of rocks. However, geological mapping in the Akjoujt area and detrital zircon data suggest that the area is underlain by a complex group of nappes of Neoproterozoic age, which are in contact with the Mesoarchean gneisses of the Shield to the north (Bradley, Motts, and others, 2015). Therefore, the age of the rocks in the Akjoujt region remains uncertain. Much of the section only exposes greenschist facies rocks and inverted metamorphic sequences are reported, features that are commonly associated with favorable terrain for orogenic gold deposits (for example, Goldfarb and others, 2005).

The Akjoujt section is highly mineralized (fig. 3). The large Guelb Moghrein Cu-Au deposit is located about 25 km south of the Shield and, importantly, within these rocks of controversial age. Replacement bodies at Guelb Moghrein (for example, Kolb and others, 2006) contain high gold grades and a few percent copper. In addition, mineralized quartz veins, such as at Tabrinkout, a historic W prospect, were found during exploration drilling in 1975 and 1992 (Shield Mining, 2008). The mineralization is typically restricted to carbonate-rich units within schist. At Tabrinkout, wolframite was mined in the 1960s for W, and anomalous Au, Bi, and Cu were more recently reported. Company press releases suggest mineralization with similarities to Guelb Moghrein, located 30 km to the west (Shield Mining, 2008).

Mining is occurring at Guelb Moghrein that has a resource of almost 24 Mt at 1.88 percent Cu and 1.41 g/t Au; about 60,000 oz Au were recovered in 2011 (http://www.first-quantum.com/Our-Business/operating-mines/Guelb-Moghrein/default.aspx). The orebodies occur along a shear between schist and mafic metavolcanic rocks in two lenses of magnesian siderite. In addition to abundant surrounding magnetite, which may or may not be ore-related, the gold-related phases include chalcopyrite and pyrrhotite, with lesser arsenopyrite, cobaltite, cubanite, and minor graphite, molybdenite, and bismuth-bearing tellurides (Kolb and others, 2006). Locally, areas with talc and cummingtonite define small zones of skarn alteration. Reconnaissance level fluid inclusion data suggest relatively low temperature and high salinity hydrothermal fluids for the gold-related mineralization. Characteristics of the deposit are described in more detail in a companion report by Fernette (2015).

Whether the Guelb Moghrein deposit, as well as surrounding prospects, represents an IOCG, skarn, or even an orogenic gold deposit is debatable. Although many workers have argued that the metallogenic signature is similar to IOCG ores, the structural style, metamorphic setting, and perhaps also the metallogenic signature itself are more similar to those defining many orogenic gold deposits. The ore-hosting siderite bodies could be somewhat similar to the famous “lapa seca” carbonate beds in the Quadrilatero Ferrifero of Brazil, where large Late Archean gold resources are localized in these massive carbonate alteration zones in a sequence of BIFs and graphitic mafic schists. Geochronology for Guelb Moghrein is very contradictory and includes a reported K-Ar date of 393 Ma on metamorphic muscovite, K-Ar dates on skarn minerals ranging between 829 and 626 Ma, an Ar-Ar date on amphibolite of 1.7 Ga, and a K-Ar date on metagabbro of 3.6 Ga. Even more interesting are reported new U-Pb dates of 2,492 Ma on monazite and 1,742 Ma on xenotime from the deposit; these were interpreted as minimum ages of mineralization and remobilization, respectively (Marutani and others, 2005; Meyer and others, 2006). Nevertheless, as noted above, detrital zircon data, including from sediments below the ore-hosting volcanic rocks, show no evidence of material older than Neoproterozoic (Bradley, O’Sullivan, and others, 2015). Many questions remain regarding the age and type of this deposit.

If the mineralization in the Northern Mauritanides is part of the same Archean or Paleoproterozoic gold-forming event as is observed at Tasiast and in the other greenstone belts to the northwest, then are the Northern Mauritanides a continuation of the gold-favorable western edge of the Rgueïbat Shield and not a part of the Neoproterozoic Mauritanides? Is Guelb Moghrein a different type of deposit than those in the greenstone belts? Could Guelb Moghrein be part of a very small window of older rocks exposed within a series of Neoproterozoic nappes? Alternatively, could Guelb Moghrein be a surprisingly young IOCG deposit or some other type of gold deposit associated with Pan African or Appalachian deformation? All these issues remain as critical items to address in future work.

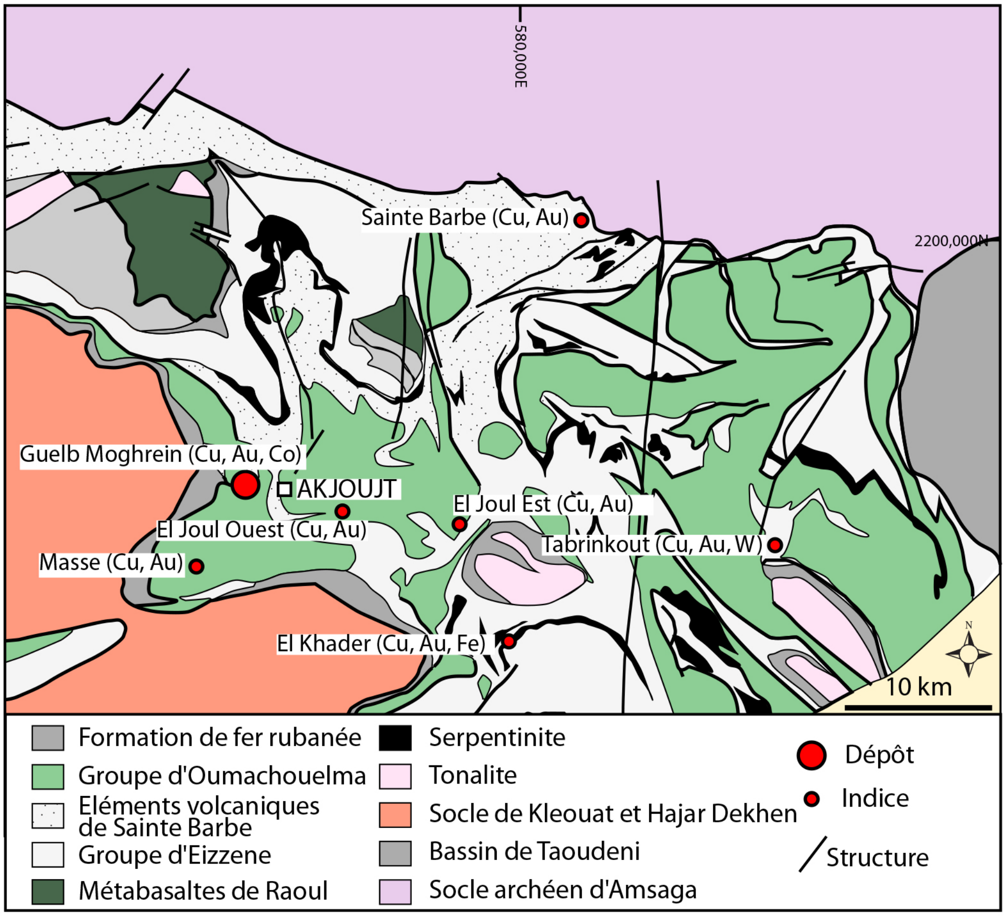

Figure 3. Generalized geology of the Akjoujt region (modified after Eden and Meyer, 2002).

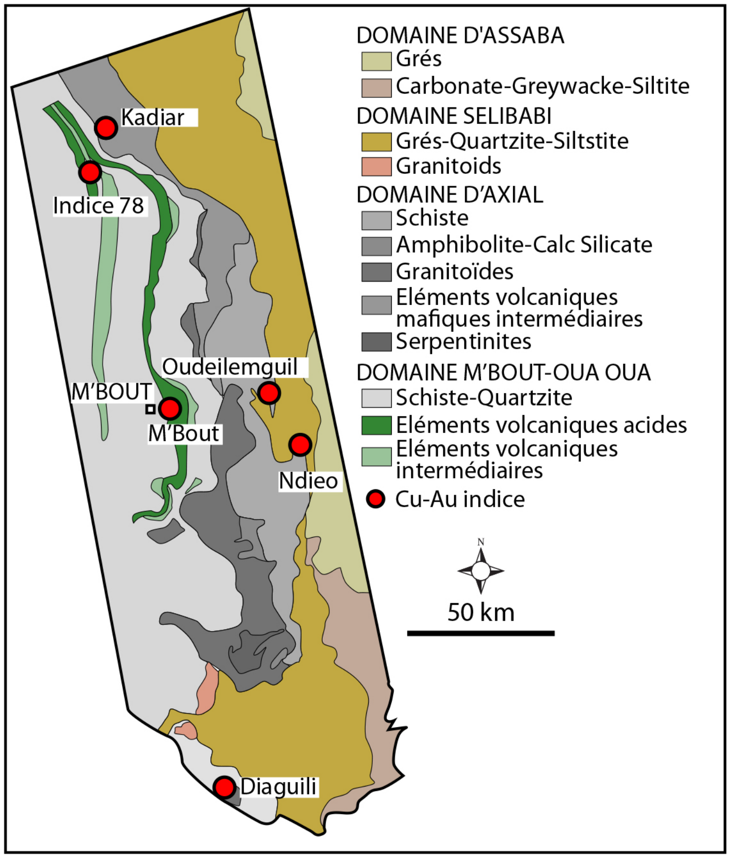

Figure 4. Generalized geology and location of Cu-Au occurrences in the southern Mauritanides (modified after Eden and Meyer, 2002).

3.3 Southern Mauritanides

At least 15–20 small gold and (or) copper prospects (including Chiron, Kadiar, Gold Project 337, Indice 78, Oudelemguil, M'Bout, Ndieo, and Diaguili; figure4; http://www.alectominerals.com/index.php/news/131-alecto-minerals-plc-alecto-or-the-company-drill-programme-finalised-for-wad-amour-gold-project-in-mauritania; Eden and Meyer, 2002) extend along the length of the Mauritanide orogen, from about latitude 17^{o} south to the Senegal border. The host rocks in the Southern Mauritanides, or Mejoria-Kidira section of Villeneuve (2005), are dominantly Neoproterozoic through Cambrian metasedimentary and metavolcanic units that were accreted to and thrusted upon the Gondwanan continental margin during early Paleozoic Pan-African tectonism in West Africa. Collision with the North American craton during Hercynian times (ca. 330–270 Ma) reactivated many of the structures from this earlier collisional orogenesis and formed the Appalachian-Mauritanian belt, which later broke apart during Triassic rifting. Both Pan-African and Hercynian events are recognized globally for their roles in the formation of important orogenic gold deposits; thus, orogenic gold deposits of either age are permissive in the metamorphic rocks of the Southern Mauritanides. However, it might be noteworthy that the rifted part of the belt, now comprising southeastern USA, was only a minor gold producer. The reason for this is unclear, but could reflect an obduction style of tectonics, leading to low-T, moderate-P conditions that are not favorable for gold ore formation. Ages of gold in the much better studied Appalachian part to the belt are late Paleozoic for small orogenic gold deposits in Alabama, Georgia, and the Carolinas.

Present understanding of the gold-copper prospects in the Southern Mauritanides is quite poor. These have been defined as IOCG deposit types by German workers, and epithermal or mesothermal (orogenic) type gold deposits by Japanese workers (Gunn and others, 2004; Pitfield and others, 2004). The latter also report a K-Ar date of 513±13 Ma on hydrothermal sericite from the Oudeilemguil copper prospect, which suggests a late Pan-African mineralizing event. Descriptions of the prospects indicate that they represent a broad area with small quartz veins and related gossans that contain gold, pyrite, and a variety of copper-bearing sulfide and oxide mineral phases. Most reported gold and silver grades are very low. A few reconnaissance level fluid inclusion studies by the Japanese workers of a few prospects are not conclusive for helping understand gold deposit type.

The tectonic setting is atypical of epithermal deposits. The presence of hematite breccias and widespread carbonates, the dominance of copper, and the identification of REE and Fe prospects in the area are similar to many features observed at the Guelb Moghrein deposit. However, the tectonic setting and potentially different age make it unlikely that this is an area with the same gold-bearing deposit types. Association of the prospects with accreted metamorphic rocks, including ultramafic bodies likely localized along terrane boundaries, is very consistent with an orogenic gold model. However, gold does not seem to be highly anomalous in these prospects. Existing geological and geochemical data from this section of the Mauritanides might be useful to best predict areas of highest gold potential along the length of the orogen, but some more detailed work on the prospects is still necessary before gold resources can be confidently assessed with some type of model recognition. It might be particularly critical to examine past problems in the understanding of the gold metallogeny of the southern Appalachians, where early Paleozoic gold-rich VMS deposits were sometimes misclassified as epigenetic orogenic gold deposits; both deposit types could also be present in the Mauritanides.

3.4 Taoudeni Basin

There is very little available geological information about the southeastern side of the Taoudeni Basin along the Mauritania-Mali border. In the area of the village of Nema, there are three reported gold prospects lacking any information other than location. The prospects appear to be in a region of Mesozoic volcanism and represent the one part of the country that is at least permissive for gold resources in epithermal deposit types.

The area between the Rgueïbat Shield and northern side of the Taoudeni Basin is underlain by Neoproterozoic through early Paleozoic platform sedimentary units, which apparently include significant amounts of carbonate rocks. No gold occurrences are reported from this E- to NE-trending continental margin sedimentary rock sequence. Nevertheless, if any mercury, antimony, or gold anomalies are found in stream sediments, the area could be permissive for Carlin-like deposits. However, favorability for such is unlikely because these are deeper water carbonate rocks relative to those that host typical Carlin gold ores. In addition, another belt of Mesozoic volcanic rocks, which overlie the older sedimentary rocks and trend northeast into Algeria must also be examined in detail for epithermal gold potential.

4 Potential Mineral Tracts for Gold Resources

A preliminary evaluation of the above gold data can be used to develop broad, first-order tracts defining favorable and unfavorable areas for gold resources. Detailed metamorphic, geochemical, and structural maps are required for more detailed future tract definition. Below, we describe the first-order tracts within four permissive regions of Mauritania.

4.1 Gold Tract 1—Rgueïbat Shield

Most areas in the southwestern part of the shield, which is underlain by Mesoarchean to Paleoproterozoic gneiss and granite, are regarded as unfavorable for gold resources as they generally include rocks uplifted from depths too deep for Precambrian gold ores. Also areas of Phanerozoic cover rocks are eliminated as favorable. Any lower grade rock units of the greenstone belts within the granite-gneiss basement are delineated as favorable for gold resources in orogenic gold deposits. Also, buried parts of the belts within 500 m of the surface are also favorable. The units of interest are mafic-ultramafic igneous rocks, other volcanic rocks, and metasedimentary rocks (table 2). Five-km-wide haloes surrounding north- to northeast-trending faults >200 km in length are very favorable, as well as areas of intersections between regional geophysical lineaments and the greenstone belts.

Areas in the northeastern part to the shield underlain by Paleoproterozoic high-grade rocks and Phanerozoic rocks or cover are not permissive, whereas all other areas of Paleoproterozoic rocks are defined as permissive for gold resources in orogenic gold deposits. Areas where the analytic signal of the reduced-to-pole (RTP) aeromagnetic map show strong linear features are included in the permissive tract because they most likely represent BIF and magnetic ultramafic rocks, such as serpentinites. Five-km-wide halos surrounding the broad-scale linear magnetic lows found on the edges of the relatively competent Paleoproterozoic granites are considered favorable. The lows may represent magnetite destruction associated with shearing events. Particular attention should be given to structures locally deviating from the main structural trends. Five-km-wide haloes surrounding faults >200 km in length and areas of BIF are highlighted as very favorable (see table 3 for map units of permissive and non-permissive geologic units).

Table 2. Permissive geology of tract 1.

Notation	Lithology
AEgb	Gabbro, gabbro hypersthene, leucogabbro, quartz diorite, ultrabasite
AgF	Meta-basalt (lava and breccia), meta-chlorite schist and chlorite-sericite schist basic
Ags	meta-gabbro layered (cumulate pyroxene amphibolitisés)
AMam	Meta-mafic rock, amphibolite
AMcp	Meta-carbonate rock (cipolin)
AMfe	Banded iron formation (BIF)
AMs	Quartz schist
Ase	Serpentinite
BMh	Biotite alkali granite M'Chara
BMn	Sodium amphibole granite Negal
BZam1	Pyroclastite, shale tuffacé rhyolitic
BZam2	Sandstone, conglomeratic arkose
BZam3	Level benchmark conglomerate
BZan	Siltstone, arenite, calcareous sandstone
BZan(1)	With contact metamorphism
BZan(2)	Shale meta-tuff
fe	Ferruginous quartzite
GLam	Amphibolite
GLar	Meta-arkose conglomerate
GLsc	Mica biotite + / - andalusite, sillimanite, cordierite, staurolite
GLse	Undifferentiated metasediments: aluminous gneiss, quartzite, gneiss calcium
IJem	Ferruginous quartzite, quartzite, micaceous sandstone and schist
IMcg	Conglomerate
IMgs	Sandstone, arkose, cinerites, lahars
IMqz	Locally conglomeratic quartzite
IMrh	Rhyolite, rhyolitic ignimbrite
KHan	Meta-andesite porphyry
KHap	Grained amphibolite
KHar	Meta-conglomerate, meta-arkose
KHep	Graded Epiclastites, rhyolitic tuffaceous shale, quartzite
KHhy	Meta-hyaloclastite
KHpx	meta-pyroxenite, gabbro meta-+ / - quartzite
KHqz	Quartzite, quartzite manganese
LbAb	meta-basalts
LbAf1	Banded iron formation (BIF)
LbAf2	Banded iron formation (BIF) demagnetized
LbAq	Quartzite, locally ferruginous / mylonitic
LbAs	Metasediments and meta-volcanics, undifferentiated
LbAu	Actinolite schist
LbAv	meta-volcanic felsic to intermediate
LbB	meta-volcanics Basic / amphibolite
LbJb	meta-basalts
LbJp	Phyllite and sericite schist
LbJs	Quartz-muscovite schist + /-chlorite, quartzites and meta-felsic volcanics, intermediate
LbSb	meta-basalts; partially amphibolitisés
LbSd	Plagioclase-rich amphibolite (meta-diorite / meta-andesite)
LbSf	Banded iron formation (BIF)
LbSq	Quartzite
LbSs	Actinolite schist
LbTa	meta-volcanics Basic / meta-basalts amphibolitisés
LbTb	meta-basalts; partially amphibolitisés
LbTd	meta-andesite
LbTs	Actinolite schist
Lbu	Ultramafic rocks
Lbvf	meta-felsic volcanics; breccia crater
LG	Volcanite acid tuff, granophyre, microgranite, microgabbro, basalt
MAab	Calcium gneiss, amphibolite, quartzite + / - pyroxene + / - garnet
MAam	Amphibolite, garnet amphibolite
OcMg1	Microgabbro
OcMg2	Gabbro-microgabbro synvolcanic
PrSy	Ferruginous quartzite conglomerate and quartzite
RAab	Amphibolite, locally coarse-grained (metagabbro), meta-pyroxenite
RAam	Amphibolite, garnet amphibolite
RAgn	Migmatitic paragneiss in garnet, pudgy levels of calcium garnet gneiss
RAqz	Quartzite magnetite, dolomite marble
SAa	meta-volcanic basic; (amphibolite and schist)
SAfm	Banded iron formation (BIF) magnetite
SAfp	Banded iron formation (BIF) magnetite - pyrrhotite
SAgn	meta-volcanics with basic leucogneiss muscovite
SAqz	Micaceous quartzite and shale
SAv	meta-felsic volcanics, feldspar porphyry
TAff	Grained syenite Hassi el Fogra
TAfg	Coarse-grained syenite Hassi el Fogra
TAga	Aegirine granite
TAh	Augite syenite aegyrinique Gara el Hamoueid
TAph	Phonolite Bir Lefjah
TAts	Nepheline syenite (granite Tabatanate)
TGdi	Diorite to biotite + amphibole
TRkh	Quartz-mica schist, quartzite, biotite gneiss, migmatitic gneiss, granite, amphibolite, calcium silicate rocks (cipolin), ferruginous quartzite and BIF (ATRF or distinguished)
TRle	Leptynite, hypersthene gneiss, gneiss kinzigitique, migmatitic gneiss
TRmf	BIF and ferruginous quartzite
TRmi	Granite, migmatitic gneiss, amphibolite to pyroxene, quartzite, quartzite and magnetite BIF (ATRF or distinguished) kinzigitique gneiss, granite and monzonite charnockitic hypersthene, monzonite
TSlc	Leucogranite
TTam	Leptynite amphibolite and garnet associated meta-gabbro, meta-dunite, granulite corundum + rutile
TTdu	meta-serpentinized dunite
TTga	meta-gabbro garnet meta-gabbro two pyroxenes (enderbite), garnet anorthosite
TTle	Leptynite garnet, meta-gabbro two pyroxenes (enderbite)

4.2 Gold Tract 2—Northern Mauritanides

All outcrops and shallowly buried areas of amphibolite, metadolerite, schist, and iron carbonate- and magnetite-rich BIF are favorable for orogenic gold deposit, but areas of large igneous masses should be defined as unpermissive. Five-km-wide haloes surrounding faults >200 km in length and areas of BIF should be highlighted as very favorable locations with tract no. 2 (table 3).

Table 3. Permissive geology for tract 2 and 3.

Notation	Lithology
AgA	Basaltic volcanics and meta-metagabbro intrusions synvolcanic amphibolitisé with units psammite epidotic
Agg	Meta-basic intrusive complex, mainly meta-gabbro and meta-microgabbro amphibolitisé, hornblendite (after pyroxenite) chloritite, pegmatitic gabbro, meta-ultramafic, undifferentiated inclusions of meta-meta-chert and basalt
AgT	Micaceous quartzite and quartzite, locally mylonitized, schist and quartz-muscovite + /-andalusite, quartz-sericite schist + /-chlorite, psammite epidotic and granitic gneiss
AgTq	Micaceous quartzite and quartzite, locally mylonitized, interbedded with quartz-muscovite schist + /-andalusite schist and psammite epidotic
AnFr	Sandstone-quartzite aspect moruloïde or ity
AY	Gabbronorite stratified leucogabbro and gabbrodiorite amphibolitized
br	Mégablocs chaotic sandstone
Dj	Undifferentiated group Djonaba
DjA	Schistose quartzite and conglomerate, séricitoschistes microconglomeratic
DjC	Sericite quartzite, sandstone séricitoschistes
DjD	Fine sandstones, siltstones and phosphatic micaceous silty mudstones
DjM	Séricitoschistes sandstone and microconglomeratic polygenic sandstones, quartzites and siltstones hematite
DjN	Séricitoschistes, quartzites, conglomerates and conglomeratic
DjQ	Séricitoschistes, sericite quartzites and dolomites
Eh	Shale basic meta-chlorite, sericite and ferruginous quartzite, calcareous schist and BIF (facies carbonate)
Fr	El Fadra undifferentiated group
FrB	Pelitic schist and semipélitique units with more sandy
FrK	Pelitic schist and phyllite, locally with chlorite and / or actinolite
Ga	Mixture of ultramafic rocks, talc schist, chlorite and pelitic
GA	meta-gabbro, anorthosite, serpentine, hornblende gneiss + /-biotite pegmatite
Gaam	Banded amphibolite, garnet amphibolite, meta-gabbro
Gams	Mica biotite + muscovite
GaQ	Banded iron formation (BIF) / ferruginous quartzite / jaspilites ferruginous
GaSp	Body mass serpentinites and ultramafic rocks or distinguished
GDg	Gabbro-tonalite-granodiorite, partly epidotized
GrE	Andesitic volcanics and meta-meta-basalt chlorite; pelitic schists and quartz arenites
GrEf	Schists and felsic meta-volcanic rhyolite to dacite (tuffs and breccias)
GrM	Pelitic schist / semipélitique sericite-chlorite-quartz-hematite
GrO	Quartzarénites fine grained micaceous quartzite and-means
Gu	Undifferentiated group Gueneiba
GuA	Meta-volcanic basic, chlorite + /-sericite locally calcareous limestone with meta-calc-quartzites, pelitic schists and ultramafic rocks
GuAj	Banded iron formation (BIF) BIF / jaspilite ferruginous
GuE	Meta-volcanic basic, chlorite, chlorite-séricito locally calcareous limestone units with meta-felsic and pelitic schists and ferruginous quartzite
HDa	Amphibolite and meta-sedimentary rocks interbedded
HDcp	Meta-carbonate rocks, rocks and calcium silicates psammites
HDM	Supracrustal metamorphic quartzite gneiss, mica gneiss and quartz-garnet-cordierite retrométamorphosé orthogneiss interlayered with gneiss and leucogranite-medium grained, undifferentiated
HDv	meta-felsic volcanics
HrS	Pelitic schist and phyllite, chlorite locally; quartzite units
HrT	Pelitic schist
HrTq	Quartz arenite-medium grained
IbB	Quartzite, conglomerate and subordinate sericite schist
IbD	Banded iron formation (BIF) in past quartzite, limestone and meta-microgabbro
IbE	Chlorite-sericite schist in past quartzite, limestone and calc chlorite schist
IbF	Meta-basalt, calc-chlorite schist and meta-tuffs chlorite
IbM	Calc chlorite schist, sericite schist and banded iron formation (BIF)
IbT	Quartzite, sericitic quartzite, conglomerate, banded iron formation (BIF) and quartz sericite schist
Jbg	Sandstone-quartzite fine to coarse
JbN	Glacial deposits tillitiques
Jbt	Clayey sandstone microconglomeratic khaki to pebbles and boulders of sandstone and granite
Jbt1	Clayey sandstone microconglomératique green khaki pebbles and boulders of sandstone and granite (lower tillite)
Jbt2	Clayey sandstone microconglomératique red, rare pebbles and boulders of sandstone and granite (upper tillite)
MsB	Pelitic schist and chlorite schist basic meta-
MsBs	Meta-tuff and breccia meta-volcanic
MsDj	Silty clay shale chlorite and / or sericite, séricitoschistes, meta-rhyolite, dacite meta-
MsNi	Last conglomeratic
MsO	Phyllites and schists sericite-quartz-feldspar (meta-felsic volcanics)
MsOs	Chlorite quartz, variably epidotized (meta-andesite)
OcAf	Banded iron formation (BIF) quartz-magnetite-carbonate
OcIa	Argillite, meta-siltstone, slate, phyllite and meta-pelitic schist and greywacke
OcIt	Sandstone-quartzite and psammitic schist muscovite-quartz schist, rare BIF
OcJ	basaltic volcanics and meta-microgabbros locally carbonatisé
OcJf	Banded iron formation (BIF)
OcL	Banded iron formation (BIF) in oxide and carbonate facies; pyritic chert (sulphide facies)
OcSf	Banded iron formation (BIF)
ODg	Granofels undifferentiated gneisses and locally charnockitic and leucocratic, partly mylonitic
ODt	Basalt and olivine gabbro
Pgm	Gabbro and microgabbro
Ppqm	Pegmatite quartz-muscovite + /-tourmaline
Pse	Serpentinite and associated rocks
SDam	Garnet amphibolite
TeB	Chert and argillite rolled (chert)
TeD	siltstones and argillites past green chlorite schists (platelet) quartzites and limestones séricitoschistes or phosphates
TeK	Meta-argillite, meta-siltstone with tuffaceous acid levels
TeK(1)	Coarse greywackes
TeK(2)	Alternating siltstone grauwackeux and meta-argillite
TeO	Dolomite limestone barite
TeOy	Argillite violet or green tuffaceous beds clear purpose
TeOy (1)	Alternating fine sandstone grauwackeux patina chamois and dark argillites
TeOy(1)	Alternating siltstone grauwackeux patina chamois and dark argillite
TeT	Feldspathic sandstone, siltstone, mudstone, locally siliceous and calcareous silty
TF	Eclogite and amphibolite

4.3 Gold Tract 3—Southern Mauritanides

All Neoproterozoic and Cambrian outcrops of metamorphic rocks are favorable for orogenic gold deposits. Five-km-wide haloes surrounding faults >200 km in length, areas of ultramafic bodies, and areas of BIF should be highlighted as very favorable within tract no. 3 (table 3).

4.4 Gold Tract 4—Taoudeni Basin

Areas of Mesozoic volcanism surrounding the Basin should be defined as permissive for epithermal gold deposits. These would include all areas underlain by rock units Mgg, as well as MCG, Md, and Mg.

5 Conclusions

Two major gold deposits are presently being exploited in Mauritania. An iron formation- and metavolcanic rock-hosted orogenic gold deposit in the Paleoproterozoic of the Rgueïbat Shield (Tasiast), and a hypothesized IOCG deposit in the Neoproterozoic supracrustal rocks or in a window of Archean rocks of the Northern Mauritanides (Guelb Moghrein), contain significant gold resources. Many smaller gold prospects with limited geological and resource data are also scattered throughout the country

Three broad tracts favorable for gold resources in orogenic gold deposits can be defined. Tract 1 is composed of the greenstone belts within the granite-gneiss terranes of the Rgueïbat Shield. Tracts 2 and 3 are defined by the amphibolite, metadolerite, schist, and iron carbonate- and magnetite-rich iron formations of the Northern Mauritanides and Neoproterozoic to Cambrian metamorphic rocks of the Southern Mauritanides, respectively. Outcrops of iron formation (chemically favorable host rocks) or ultramafic rocks (typically along favorable structural zones) define highly favorable areas for such deposits within the tracts.

Tract 4 defines the Mesozoic igneous rocks that surround the Taoudeni Basin. These rocks are permissive hosts for epithermal gold vein deposits.

Carbonate units in the platform sequence on the northern side of the Taoudeni Basin are considered as permissive for gold resources in Carlin-like deposits. However, because these are unfavorable deep-water carbonates, the likelihood of the presence of such ores is small and thus no favorability tracts have been outlined.

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