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Sub-Saharan Africa Precious & Related Commodity Project Database

31 May 2018

List of Tables

These *Tables* provide a quick reference to mining projects in Sub-Saharan Africa at various stages of development. We also provide some key facts about each industry in the Sub-Saharan region.

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Executive Summary

This publication provides the latest developments related to mining and extraction projects in various stages of development across Sub-Saharan Africa. It allows suppliers to identify areas of expansion, miners to benchmark their competitors and investors to identify potential business opportunities.

Stronger commodity prices over 2017 and early 2018 have rekindled interest in projects, but exploitation of Africa's vast mineral resources continues to be hampered by uncertainty over mining laws, lack of infrastructure and financing, and, in some instances, high levels of corruption. Within each commodity class, however, there are promising pockets of development.

We now provide a brief overview of the various commodities covered in the publication:

Precious metals

- South African **PGM** projects are being squeezed by thin profit margins, with major producers Amplats and Implats shutting high-cost shafts in 2017 and 2018. Investment should however pick up from 2019 as margins expand. Prospects in Zimbabwe have improved significantly since the end-2017 removal of Mugabe and the country's mining sector has seen an influx of investment. A prime example is the planned $1.4bn Karo Resources PGM project.
- South Africa's **gold** sector continues to lose its shine, with various producers resorting to retrenching large parts of their labour force in an attempt to keep mines profitable. On the other hand, West Africa continues to enhance its status as Africa's new gold frontier, where many players are focusing on shallow mine development.

PGM related metals

- **Chrome ore** production is expected to rise, supported by high margins and as new **PGM** retreatment tailings plants ramp up. Zimbabwean output is expected to rise with the new wave of confidence in the country's mining industry, with Zim Alloys, Zimasco (top 2 producers) and Karo Resources all tabling plans to boost output from 2018.
- The South African **ferrochrome** industry is poised for a comeback after significant consolidation, with Samancor now also eyeing Hernic Ferrochrome.
- **Copper** mining, primarily in the DRC and Zambia, is making progress. New investment in many cases is led by Chinese companies, but hampered by uncertainty regarding new mining laws.
- **Nickel** production on the continent is largely tied to the fortunes of PGM mining, with a significant portion produced as a by-product of PGM mines in South Africa and Zimbabwe. Nkomati (SA) and Ambatovy (Madagascar) are the only producing operations primarily focused on nickel mining.

As always, we would appreciate any feedback on this report. Please contact us with any questions, suggestions or comments at 021 422 4500 or *ayanda@afriforesight.com*.

The Afriforesight Team

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Glossary

Column Descriptions	
Country	Geographic location of project.
Owner	Ownership share is provided and generally represents the final owner with share of project as a percentage.
Project	Name of mine, property or mineral project.
Mine Type	A description of the main mining method employed or planned (surface, underground, tailings, in-situ recovery or alluvial).
2015-2017 Production	The reported or estimated (e) production from the project per calendar year (unit of production given in brackets in column heading). Where calendar year values not available, financial year reporting is indicated with *.
2018 Production Forecast	2018 estimated forecast is based on the latest available production figures, official guidance and estimated performance, taking into account company strategy.
Capacity Guidance	The reported or estimated (e) production capability of the project when fully operational in a year. This incorporates current and future expansion projects underway.
Project Information	Information regarding stage of project, latest production figures, issues affecting operational performance, expansion plans and status updates.
Infrastructure and Additional Information	Information regarding logistics, processing, mineral rights, ownership changes and pertinent information on strategic future of the project.

Project Status	
Projects in Production	Operations which are currently producing.
Non-Focused/Plants in Production	Operations which produce the commodity as a by- or co-product by mining or retreatment. Category also includes listed terminals if relevant.
Projects in Development	Projects under construction or in mine development stage.
Projects with Development Potential	Projects in exploration stages with no or limited published plans for mine development.
Idled Projects	Operations retaining all necessary infrastructure which have been placed on care and maintenance or suspended.

Unit Definitions	
g/t	Grams per tonne
mnt	Million tonnes
mntpa	Million tonnes per year
MW	Megawatt
cts	Carats
ctspht	Carats per hundred tonnes
ctsphm^3	Carats per hundred cubic metres
kctspa	Thousand carats per year
mnctspa	Million carats per year
kozpa	Thousand ounces per year
kt	Thousand tonnes
ktpa	Thousand tonnes per year

General Terminology	
AISC	All-in sustaining costs (per unit)
Alluvial	Surface mining methods often employing floating dredges
BFS	Bankable feasibility study
Cu	Copper
DC	Direct current
DFS	Definitive feasibility study
DMR	Department of Mineral Resources (South Africa)
DMS	Dense media separation
e	Estimated figure (where official figures are unclear or absent)
EIA	Environmental impact assessment
ESO	Employee share ownership
HPAL	High pressure acid leach
IDC	Industrial Development Corporation (South Africa)
Ir	Iridium
H	Half-yearly reporting period (during calendar year)
JORC	The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves
JV	Joint venture
LoM	Life of mine (estimated duration of operations under current conditions)

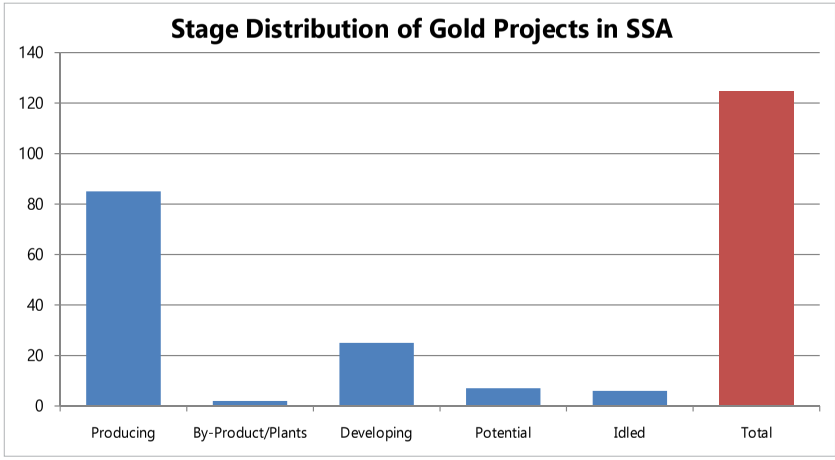
Marine	Shallow ocean bottom mining method carried out from specialised vessels
MoU	Memorandum of understanding
Ni	Nickel
OC	Opencast or surface mining
PGM	Platinum Group Metals
Pd	Palladium
Pt	Platinum
Q	Quarterly reporting period (during calendar year)
Rd	Rhodium
RoM	Run of mine (quantity of unprocessed raw material extracted at mine site)
Ru	Ruthenium
SAF	Open Submerged Arc Furnace
SSA	Sub-Saharan Africa
Stripping Ratio	Measure of the volume of waste to be removed per same volume of ore achieved
SX-EW	Solvent extraction and electrowinning
TL	Tailings and dump reprocessing
UG	Underground mining
Wk	Week
Yr	Year
3E	3 elements (Platinum, Palladium, Gold)
4E	4 elements (Platinum, Palladium, Rhodium, Gold)
6E	6 elements (Platinum, Palladium, Rhodium, Iridium, Osmium, Gold)

Notes	
e	Symbol is used to indicate an Afriforesight-estimated production figure if official results are unclear or incomplete. Forecasts for 2017 are Afriforesight estimates.
*****	Symbol is used if the figure pertains to a different unit of measurement or different reporting period than the one generally used. See column heading and notes in the specific Project Table for clarification.
0	Used if no production occurred even though mine was capable of producing.
-	Symbol used to show no valuable information to add at time of writing or no production is expected in a developmental project.
Unclear	Term used if production figures reported are unclear, or insufficient information from credible is available to estimate future values from.
Not reported	Term used if there is no information to indicate production figures. Can include companies which are under no obligation to report production figures.

1.1 Gold Projects

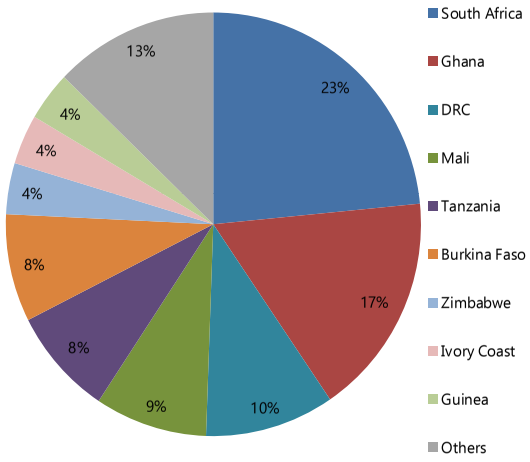
Key Facts

South Africa is the continent's largest gold producer, with Ghana ranked second. However, South Africa's production continues to decline due to high costs and deteriorating reserves, with West Africa (over 40% of African production) identified as the new frontier for African gold mining. Burkina Faso in particular displayed good production growth in 2017. The project database shows that the majority of projects in development and new exploration projects are located in West Africa.

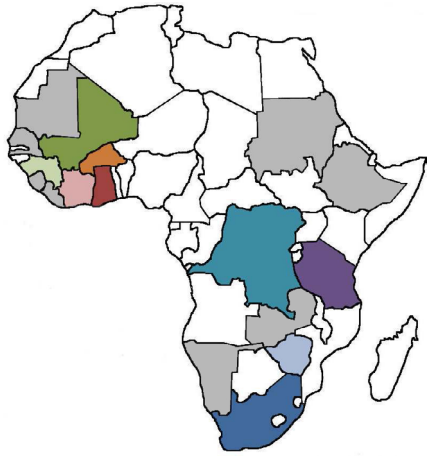


Sub-Saharan African Gold Production 2017

Total: 19.7mnoz (18.9% of global)



Source: Thomson Reuters GFMS Gold Survey



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Gold Projects

Country	Ownership	Project	Mine Type	2015 Production (koz)	2016 Production (koz)	2017 Production (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
Projects in Production										
Botswana	Galane Gold	Mupane	OC-UG	24	26,8	29	30	32	1Q18 production: 7.6kt, down 13.2% from prev Q on ball mill outage affecting grind size. Forecasted to produce 32kozpa for 5yr mine life; opportunities exist for expansion. Continuing Tau underground development under current open pit.	Processing plant on site. Train to smelter 5km away.
Burkina Faso	Avocet (90%), State (10%)	Inata	OC	75	73	80e	85	Unclear	Avocet plans to increase Inata's mine life by up to 7 yrs and add 86kozpa production through development of 3 satellite deposits - Souma, Pali and Ouzeni (Feb '17). Current mine life ends 4Q19.	6 open pits with mining focused on Minfo North, Centre West and Far South East pits (other pits are North, Central and Far South).
Burkina Faso	Endeavour (90%), State (10%)	Karma	OC	-	62	98	105-115	110-120	1Q18 production: 28.2koz, up 34.2% from prev quarter.	The newly installed plant are expected to boost stacking capacity beyond the initial design capacity of 4mntpa ore. Project includes 6 identified gold deposits with a shallow open pit. Claimed to need no blasting and has a low stripping ratio. Mine life reported to be 10 yrs in 2017.
Burkina Faso	Endeavour (90%), State (10%)	Hounde	OC	-	-	69	250-260	235	Mine started in Oct'17. 1Q18 production 73.8koz, up 6.9% from prev quarter.	$10mn (related mainly to billing timing and the second tailings storage facility) is expected to be spent in 2018.
Burkina Faso	Avesoro Resources	Balogo	OC	-	-	116** (*see right*)	120** (*see right*)	100	Production reported combined with Youga (below): 2H17 production 67koz, up 36.9% from prev half. Ores transported by road to Youga processing plant nearby.	Avesoro bought Youga and Balogo gold mines from parent company in 2017 for $69.5mn. Mines will increase company's expected 2018 production by 60% to 230koz.
Burkina Faso	Avesoro Resources (90%), State (10%)	Youga	OC	68	40e	116** (*see right*)	120** (*see right*)	Unclear	Production reported combined with Balogo (above): 2H17 production 67koz, up 36.9% from prev half.	Avesora bought Youga and Balogo gold mines from parent company in 2017 for $69.5mn. Mines will increase company's expected 2018 production by 60% to 230koz.
Burkina Faso	IAMGOLD (90%), State (10%)	Essakane	OC	426	419	389	380-396	410	2H17 production: 195koz, up 1% from prev half on higher throughput and grades, partially offset by lower recovery.	Oxygen plant under construction since 4Q17, to be commissioned 4Q18, to improve recoveries. Efforts to reduce power consumption are on-going. 15MW solar project construction at mine started in 2Q17 after 15-yr renewable power purchase signed in March '17.
Burkina Faso	Nord Gold (90%), State (10%)	Bissa-Bouly	OC	235	214	319	320	320	2H17 production 156.9koz, down 34% from prev half.	Bissa and Bouly are 2 mines reported as one operation. No construction planned for 2018. Power supplied on-site from 21MW heavy fuel oil power station. Mining licence applications for Bissa satellite pits Ronguen & Zinigma in process (Jan '17). Feasibility studies commissioned for Yimiougou & Noungou pits (Jan '17).
Burkina Faso	Nord Gold (90%), State (10%)	Taparko	OC	83	111	108	110	Unclear	2H17 production: 45.9koz, down 26.3% from prev half. Study to evaluate underground potential below the 35 pit continues.	The mine comprised 4 open pits alongside a processing plant, ball milling facility and CIL circuits.
Burkina Faso	Roxgold (90%), State (10%)	Yaramoko	UG	-	77	127	110-120	110	2H17 production: 63.4koz, unchanged from prev half.	Roxgold received environmental approval for mine's Bagassi South deposit, with first production expected late 4Q18, to increase mine's capacity by 33% to 160kozpa in 2019. Construction works at Bagassi South continue on schedule, on track for delivery of first ore in 4Q18; permitting received in Jan '18.
Burkina Faso	SEMAFO (90%), State (10%)	Mana	OC	256	240	206	230	>200	2H17 production 103.4koz, unchanged from prev half.	-
DRC	Banro	Namoya	OC	48	93	69	80	120	2H17 production 26.9koz, down 36% from prev half. Banro granted bankruptcy protection in Dec '17, started court-approved process to find buyers or investors in company - sale proceeds to fund debt and recapitalisation of Namoya and Twaziga mines (179koz combined output in 2017).	Uses process plant design in which a heap leach operation works in conjunction with gravity gold recovery operation and a CIL plant
DRC	Banro	Twangiza	OC	136	104	110	120	Unclear	2H17 production: 67.2koz, up 57.2% from prev half.	Banro started court-approved process to find parties interested in acquiring or investing in the company - any proceeds to fund debt and recapitalisation of its Namoya and Twagiza mines.
Ethiopia	Midroc	Lega Dembi	OC	-	-	-	Unclear	145	May '18: Minister suspended mining licence, renewed in Apr, following protests by local residents claiming water and air pollution. Govt conducting impact study, timeline unclear.	-
DRC	Randgold (45%), AngloGold Ashanti (45%), SOKIMO (10%)	Kibali	OC-UG	643	586	596	730	750	2H17 production 313koz, up 11.1% from prev half on higher grades and ore volumes. Mined volumes increased on underground material handling systems commissioning in 4Q17. The plant operated for extended periods on 100% sulphide ore achieving design recovery and above design throughput.	-
Ghana	AngloGold Ashanti	Iduapriem	OC	193	215	228	235	Unclear	2H17 production: 121koz, up 13.1% from prev half on mining of deeper higher grade areas.	Processing facilities include a CIP plant with a gravity circuit.

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Gold Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (koz)	2016 Production (koz)	2017 Production (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
Ghana	Asanko (90%), State (10%)	Asanko	OC	-	160	205	253	300	1Q18 production: 48.2koz, down 6.5% from prev Q, down 17.2% from 1Q17. Goldfields bought 45% stake in mine for $185mn in Mar '18 - targets 253kozpa production at $860/oz AISC over 2019-2023.	Mine consists of 2 main deposits, Nkran and Esaase, and 9 known satellite deposits.
Ghana	BCM International (90%), State (10%)	Nzema	OC	110	88	115	120	120e	2H17 production 62koz, up 16.3% from prev half. Endeavour Mining sold its 90% stake to BCM International for $65mn (Aug '17), transaction finalised Jan '18.	About 4yr LoM expected from current reserves. Processing through a 1.6mntpa gravity and CIL plant with gold recoveries between 75%-93%.
Ghana	Gold Fields (90%), State (10%)	Damang	OC	168	148	144	160	265	1Q18 production: 36koz, up 4.3% from prev quarter. Mine reinvestment plan announced in Oct '16 to extend mine life from 2017 to 2024 producing 1.6mnoz over LoM on schedule.	Jaw crusher installation in progress, anticipated to be commissioned in 2Q18. SAG mill shell replacement on track with installation and commissioning planned for 4Q18. Gold Fields commissioned new gas plants 4Q16. The processing plant was upgraded from 4mntpa to 4.5mntpa and includes a SAG and ball mill followed by a CIL process.
Ghana	Gold Fields (90%), State (10%)	Tarkwa	OC	586	568	566	520	600e	1Q18 production: 131.2koz, down 6.2% from prev quarter, down 5% from 1Q17. Mine to be handed over to contractor and 1700 workers to be retrenched. Contractor will employ part of retrenched workforce.	Ore is processed utilising a conventional CIL plant, with a gyratory crusher feeding a SAG mill and ball mill. Gold is recovered from solution by electro-winning and smelted in an induction furnace. Current plant capacity is 13.5mntpa. Gold Fields (Feb '17) commissioned new gas plants 4Q16. LoM until 2031.
Ghana	Golden Star (90%), State (10%)	Bogoso/ Prestea	OC-UG	114	90	130	135	120e	1Q18 production: 22.1koz, down 25.8% from prev quarter as mine nears end of life.	Prestea has a CIL processing facility with up to 1.5mntpa capacity, located 14km away at Bogoso, suitable for treating non-refractory gold ore, where ore from both underground and the open pits is processed.
Ghana	Golden Star (90%), State (10%)	Wassa	OC-UG	108	104	137	145	175	2H17 production: 73.7koz, up 15.7% from 1st half on increased production from underground mine.	From end-Jan '18, Wassa became an underground-only operation. Wassa has a 2.7mntpa non-refractory CIL processing plant.
Ghana	Kinross (90%), State (10%)	Chirano	OC-UG	256	212	252	260	Unclear	1Q18 production: 60.2koz, down 9.2% from prev quarter, down 6.9 from 1Q17.	Company estimates mine life to end in 2020. Mill capacity of 3.5mntpa.
Ghana	Newmont	Akyem	OC	473	471	473	500	450	1Q18 production: 127koz, up 24.5% from prev quarter, unchanged from 1Q17.	Operations comprised of one mill and one open pit mine. Commenced commercial production in Oct '13.
Ghana	Newmont	Ahafo	OC-UG	332	349	349	355	Unclear	1Q18 production: 94koz, up 5.6% from prev quarter, unchanged from 1Q17.	2 ore zones: Ahafo South and Ahafo North. Mining is currently underway at Ahafo South. Ahafo Mill Expansion to accelarate stockpile processing adding 75-100kozpa over 1st 5 yrs from 2020, with 1st production expected 2019.
Ghana	Perseus (90%), State (10%)	Edikan	OC	189	153	208	290	258	2H17 production: 54koz, down 3.7% from prev quarter.	Mining from 4 pits (Abnabna, Fobinso, Fetish and Chirawewa). Diesel-fired power station for mine completed Jul '16 to ensure 100% self-sufficiency from grid.
Guinea	AngloGold Ashanti (85%), State (15%)	Siguiri	OC	300	306	380	390	300	2H17 production: 195koz, up 5.7% from prev half on mining of higher grade areas, incl new Seguelen pit.	Over 2 yr period investing $115mn to add hard rock plant to current processing infrastucture in order to develop significant sulphide ore potential. Project to enable processing of harder sulphide ores, extending mine life, increasing production and lowering costs. Also buildiongd $43mn power station. Project remains largely on schedule (Feb '18).
Guinea	Nordgold	Lefa	OC	214	195	209	215	Unclear	2H17 half production: 106koz, up 2.1% from prev half	Evaluation of satellite pits as oxide ore sources to maximise mill throughput to continue. Further evaluating replacing power infrastructure to improve efficiency. Mine includes 2 main open pits with several satellite pits.
Ivory Coast	Endeavour (55%), Sodemi (30%), State (10%), others (5%)	Ity	OC	81	76	59	63	235	1Q18 production: 18.3koz, up 5.7% from prev quarter.	Optimisation study for mine's carbon leach plant shows 235kozpa, up 42% from feasibility estimate, at $495/oz AISC over initial 5yrs; to start production mid-2019. CIL project comenced construction in Sep '17, set to increase mine life by 14 yrs with annual production of 204kozpa for the first 10 yrs.
Ivory Coast	Endeavour (85%), State (10%), Sodemi (5%)	Agbaou	OC	181	196	177	145	Unclear	1Q18 production: 32.1koz, down 25.4% from prev quarter.	Located approximately 200km north of Abidjan port city. Uses a gravity and CIL plant with recovery rates of 97%. Mining operations run by contractor.
Ivory Coast	F&M Gold Resources (Forbes & Manhattan Group) & African Finance Corporation (89.9%), State (10%)	Bonikro	OC	146	130	139	140	Unclear	1Q18 production: 36.1koz, down 10.1% from prev quarter.	Mine purchased from Newcrest for $72mn on 13 Dec '17; completed Mar '18. Mining at Hiré deposit. Processing through a CIL and a gravity circuit.

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Gold Projects continued...

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Ivory Coast	Perseus Mining (85%), State (10%), others (5%)	Sissingué	OC	-	-	-	50	75	Poured 1st gold Jan '18; reached commercial production Apr '18, targets 70kozpa over 5 yr mine life.	Significant potential to increase resources, with exploration to commence once mine starts generating positive cash flow.
Ivory Coast	Randgold (89%), State (10%), others (1%)	Tongon	OC	243	261	289	290	300e	2H17 production: 144koz, unchanged from prev half.	2018 production target under threat due to intermittent industrial action by subcontractor's workers. 6 new generators commissioned in 4Q16, boosting power capacity to 24MW and minimising impact of disruptions, scheduled to be completed by Sep '18.
Liberia	Avesoro Resources	New Liberty	OC	17	64	76	110-120	120	1Q18 production: 27.9koz, up 9% against prev quarter on plant optimisations.	1.1mntpa throughput at gravity and CIL plant. Changed name from Aureus Mining (Dec '16).
Mali	AngloGold Ashanti (41%), IAMGOLD (41%), State (18%)	Sadiola	OC	168	171	157	160	Unclear	2H18 production: 80.5koz, up 6.5% from prev half. 2017 production down on 10% decrease in recovered grade due to limited remaining oxide ore.	Owners evaluating a project to add sulphide-ore processing capability to the plant, without which production will xecline. Discussions with govt about project ongoing, but without resolution (Feb '18).
Mali	B2Gold (90%), State (10%)	Fekola	OC	-	-	111	400	410	1Q18 production: 114koz, up 8.6%. Commercial production reached 30 Nov '17. Processing plant may be upgraded following positive extension drilling results (Apr '18).	Significantly increased resource potential from drill results from North Extension Zone.
Mali	Endeavour (80%), State (20%)	Tabakoto	OC-UG	152	163	144	115-130	Unclear	2H17 production: 60koz, down 28.8% from prev half on lower average head grades.	75% increase in sustaining capital expenditures to $35mn for replacement of mining equipment, plant maintenance and underground capital development. 1.4mntpa gravity and CIL processing facility.
Mali	Hummingbird Resources (80%), State (20%)	Yanfolila	OC	-	-	-	110	132	Poured 1st gold Dec '17, in commercial production from 1 Apr '18, startup on budget.	Hummingbird to acquire 50% stake in Kobada project from African Gold (Oct '17). Ore from project to be processed at Yanfolila operations, increasing output by 45% to 150kozpa within next 3yrs and extend mine life by 2.5yrs to 10yrs.
Mali	Randgold (80%), State (20%)	Loulo-Gounkoto Complex	OC-UG	630	707	730	740	750	1Q18 production: 144koz, down 18.9% from prev quarter on reduced grades.	Investigating upgrading of older, smaller power units over the coming year to increase generation capacity and keep base load power costs low (May '18). Mining comprises of Loulo underground mines (Yalea and Gara) and Gounkoto open pit mine (with potential for underground development).
Mali	Resolute Mining (80%), State (20%)	Syama	OC-UG	233	236	238	245	250	1Q18 production: 43.6koz, up 3% from prev quarter.	On-site power generation from diesel generators. Processing at 2 parallel plants: 2.1mntpa sulphide and 1.3mntpa oxide circuit. Syama underground mine development on track to deliver 1st ore output in Dec '18. Targeting an increase in overall recovery levels from sulphide operations of 85%. Stage 1 commissioned: new calcine regrind and CIL circuit. Stage 2 of P85, consisting of repurposing existing calcine CIL tanks and detox circuit, due to be commissioned in Apr '18.
Mali	Robex Resources (90%), State (10%)	Nampala	OC	0,5	15.5e	35e	39	39	Mine restarted in Jan '16; reached commercial production in Jan '17	750kW new ball mill installed to replace temporary 200kW ball mill (Nov '16). LOM is 8yrs.
Mauritania	Mauritania Copper Mines (First Quantum)	Guelb Moghrein	OC	64	54	49	50	60	1Q18 production: 11.7koz, down 11.5% from prev quarter on lower gold circuit recovery due to treating low-grade copper ore.	Also produces copper as co-product. Sulphide ore is treated at on-site plant producing copper-gold concentrate.
Mauritania	Kinross	Tasiast	OC	219	175	237	250	409	2H17 production: 122koz, up 6.8% from prev half. Denied key permit for phase 2 expansion, Kinross to contest decision.	Tasiast Phase 1 expansion Development on time and budget, full commercial production expected by June '18. Plant construction 93% complete. Phase 2 expected to begin commercial production in 3Q20.
Namibia	B2Gold (90%), EVI (10%)	Otjikoto	OC	146	166	192	160-170	200	2H17 production: 108koz, up 28% from prev half high-grade ore tonnage from Wolfshag Phase 1 pit and strong mill throughput.	Solar plant commissioning started in April '18; expected to reduce mine's HFO consumption by about 2.3mnl and fuel costs by approximately 10% in 2018.
Senegal	Toro Gold (90%), Senegal Govt (10%)	Mako	OC	-	-	-	-	140	First gold pour Jan '18, ahead of schedule and under budget; operations ramping up with steady state expected 1H18. 15yr mining concession awarded Jul '16. DFS results showed 140kozpa production in first 5 yrs. Average AISC of $794/oz over 8yr LoM. Exploration targets exist with potential to increase LoM if investigated.	Power generation from 14MW diesel fuelled plant operated on an independent power producer basis.
Senegal	Teranga	Sabodala	OC	182	217	233	245	1000	2H17 production: 119koz, up 3.8% from prev half.	Reserves upgraded 17.4% to 2.7mnoz from Dec'15 estimate following Niakafiri exploration. Underground production deferred to 2023.
South Africa	Kopanang Gold Mining Company (Heaven Sent SA Sunshine Investment Company (74%))	Kopanang	UG	117	91	91	91	Unclear	1H17 production 48koz, up 9.1% from prev half. In Oct '17 mine and related infrastructure purchased from Anglogold Ashanti.	-

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Gold Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (koz)	2016 Production (koz)	2017 Production (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Harmony Gold	Moab Khotsong	UG	254	281	294	295	Unclear	2H17 production: 164koz, up 26.2% from prev half on fewer safety related disruptions and improved efficiencies. Mine bought from Anglogold Ashanti in Oct '17.	Single shaft system mining to a depth of 3.1km.
South Africa	AngloGold Ashanti	Mponeng	UG	219	254	224	250	Unclear	2H17 production: 118koz, up 11.3% from prev half. 2017 output down on lower grade, time constraints as mining was further from shaft sations and 3 separate seismically induced fatalities.	AngloGold to invest $1bn to expand mine output to 450kozpa at AISC $750/oz over 20 yr mine life. Work on project progressing to feasibility stage; expected to be completed 3Q18.
South Africa	AngloGold Ashanti	TauTona	UG	209	145	91	-	Unclear	2H17 production: 34koz, down 40.4% from prev half as mine underwent orderly closure (1Q18) due to restructuring of operations.	-
South Africa	Gold Fields (90%), others (10%)	South Deep	UG	198	290	281	244	500	2H17 production: 132koz, up 36% from prev half after ground falls in prev half. Safety related stoppages, labour restructuring and low mobile equipment reliability to impact 2018 production.	Mining value chain execution reportedly remains sub-optimal despite technical progress made. Operating an intermediate to deep-level mechanised gold mine. It is estimated that the current mineral reserves will be depleted in 2095 (79 yrs).
South Africa	Harmony Gold	Bambanani	UG	93	0	87	88	Unclear	2H17 production: 45.4koz, up 9.2% from prev half.	-
South Africa	Harmony Gold	Doornkop	UG	87	86	96	95	Unclear	2H17 production: 52.9, up 21.5% from prev half on better grades and ore milled.	LoM increased by 1yr to 18yrs on reserves upgrade (Aug '17).
South Africa	Harmony Gold	Joel	UG	73	77	60	70	Unclear	2H17 production: 29.2koz, down 4.2% from prev half on decrease in recovered grade and ore milled. Joel decline project nearing completion; development in footwall areas have commenced and is expected to continue for 12-18mnths whereafter grades are to increase (May '18).	LoM is 9yrs.
South Africa	Harmony Gold	Kalgold	OC	39	36	39	40	Unclear	2H17 production: 19.5koz, down 1.9% from prev half.	Ore processed at CIL plant on-site.
South Africa	Harmony Gold	Kusasalethu	UG	123	130	143	140	Unclear	2H17 production: 72.2koz, up 1.5% from prev half on increase in recovered grades.	LoM shortened to 5yrs to focus on high-grade sections (Aug '16).
South Africa	Harmony Gold	Masimong	UG	79	75	90	95	Unclear	2H17 production: 48.3koz, up 15.1% from prev half on increased recovered grade.	LoM increased by 1yr to 4 yrs on reserves upgrade .
South Africa	Harmony Gold	Phakisa	UG	113	133	136E	138	Unclear	Phakisa was integrated with Tshepong (below), now reported as one segment, Tshepong operations (Jul '17). Combined yr-ending Jun '18 guidance: 303koz, up 6.8% from prev yr.	Phakisa operations merged with Tshepong project to fully exploit installed capacity from 1 Jul '17. ombined LoM is 17 yrs.
South Africa	Harmony Gold	Target 1	UG	123	79	99	100	Unclear	2H17 production: 50.3koz, up 3% from prev half. Production was hampered by unfavourable mining conditions in higher grade areas.	LoM is 7 yrs. Mechanised operations with some conventional stoping.
South Africa	Harmony Gold	Tshepong	UG	145	159	163e	250	Unclear	Tshepong was integrated with Phakisa (above), now reported as one segment, Tshepong operations (Jul '17). Combined yr-ending Jun '18 guidance: 303koz, up 6.8% from prev yr.	Combined LoM is 17 yrs.
South Africa	Harmony Gold	Unisel	UG	54	55	43,8	50	Unclear	2H17 production: 22koz, up 10.5% from prev half.	LoM is 5 yrs.
South Africa	Pan African Resources	Barberton	UG-TL	108	106	90	110	125	Doubled mineral resource at mine's Royal Sheba project to 720koz, with potential to produce 30kozpa - feasibility study expected by mid-2018.	Installation of regrind mill at Barberton Tailings retreatment plant expected to be completed Apr '18 (Feb '18).
South Africa	Pan African Resources	Evander	UG-TL	82	89	90	Unclear	105	Mine consists of underground and tailings retreatment operations. Decision taken to cease underground mining due to high costs (May '17). Consultation for retrenchment of 1 722 workers (95% of workforce) completed May '18; to cost R160mn.	Evander tailings retreatment plant: capacity 30kozpa, 15yr LoM. 2nd tailings palnt to open in Aug '18, to produce combined 70kozpa.
South Africa	Sibanye Gold	Beatrix	UG-TL	325	323	292	300	333e	1Q18 production: 61.4koz, down 13% from prev half on loss of production shifts following the collapse of Eskom power supply lines caused by a severe storm.	Mine infrastructure consists of 3 producing shaft complexes and 2 gold processing plants, both treating underground and surface material.
South Africa	Sibanye Gold	Cooke	UG-TL	201	182	100	100	Unclear	1Q18 production: 7.7, down 53.3% from prev half on cessation of underground operations. Cooke 1, 2 and 3 shafts placed on care and maintenance during end-2017.	Mine infrastructure comprises 4 shaft complexes that mine using open ground and pillar method; deepest operating level is 1.6km below surface (Cooke 4). Underground material from Cooke 1, 2, 3 processed at Doornkop Plant.
South Africa	Sibanye Gold	Driefontein	UG-TL	558	519	482	480	605e	1Q18 production: 98.7koz, down 16% from prev quarter on lower grades at 5 Shaft and 8 Shaft. Surface production decreased due to depletion of higher grade surface resources. May '18: Closed Masakhane shaft after seismic event resulted in death of 7 employees.	Mine comprises 6 operating shafts and 3 metallurgical plants. Plants are Driefontein 1, 2 and 3 which include CIP and CIL.

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South Africa	Sibanye Gold	Kloof	UG-TL	452	489	528	535	548e	1Q18 production:122.8koz, down 10.8% from prev quarter.	Mine infrastructure comprises 5 producing shaft complexes; deepest operating level 3.3km below surface. Two gold processing plants on site.
South Africa	West Wits Mining (West Wits Mining Ltd (90%), Witpoortjie Resources (10%))	Soweto Gold	OC-UG	-	Unclear	Unclear	Unclear	100	Company plans 100kozpa output for 10yrs from various small open pit operations. Production started at Sol Plaatjies Project (SPP) open pit in Sept '16. West Wits assessing Main & South Reef project (M&S) for development (Mar '17). M&S 2nd project in pipeline of 5-6 surface opportunites.	Underground infrastructure still in place. Significant processing infrastructure close to site. 17 surface and shallow underground deposits being targeted. Objective of SPP is to remove, process and rehabilitate 1.5km section of strike of Kimberly Reef outcrop.
Tanzania	Acacia Mining	Buzwagi	OC	171	162	268	200	Unclear	2H17 production 142.7koz, up 13.2% from prev half.	Mine is moving to a stockpile processing operation in 2018. LoM estimated to be 3yrs based on proven and probable gold reserves of 400koz.
Tanzania	Acacia Mining	Bulyanhulu	UG	274	289	176	120	350	2H17 production: 53koz, down 57% from prev half on reduced operational activity. In Sept 2017, announced reduction in operational activity at Bulyanhulu and until there is an improvement in the operating environment and will only operate the tailings retreatment project, with underground operations ceasing.	Plant capacity is 1.1mntpa producing both ore and copper/gold concertrate. 2.4mntpa CIL facility added in 2014 to process tailings.
Tanzania	Acacia Mining	North Mara	OC-UG	287	378	324	325	Unclear	2H17 production: 144koz, down 20% from prev half.	At Nyabirama, company is progressing the permitting for underground exploration decline, process is expected to be completed in 2018. Process plant has average capacity of 2.8mntpa of ore from two deposits: Gokona (underground) and Nyabirama (open pit).
Tanzania	AngloGold Ashanti	Geita	OC-UG	527	489	539	550	Unclear	2H17 production: 310koz, up 35.4% from prev half. 2017 production up on mining of higher grade ore at Nyankanga cut 7 and cut 8.	Mine serviced by 5.2mntpa CIL processing plant. Mine generates own power, the operation of its power facility is outsourced and fuel is delivered by road.
Tanzania	Shanta Gold	New Luika	OC-UG	82	88	80	85	84	1Q18 production: 17.7koz from prev Q, down 17% in line with revised plan to extend mine's life.	Shanta purchased adjacent Saza-Makongolosi project with 635koz resource; to up New Luika mine resource by 77.1% to 1.5mnoz (Jun '17) .
Zambia	First Quantum (80%), ZCCM (20%)	Kansanshi	OC	136	148	141	145	150	2H17 production: 70koz, down 1.8% prev half.	Mine produces copper, with gold as byproduct. (See *Copper* Table).
Zimbabwe	Asa Resource Group (85%), others (15%)	Freda Rebecca	UG	65e	60e	63e	65	90-100	Long-term production target of 90koz-100koz in line with original plant design capabilities.	Single largest gold-producing mine in Zimbabwe, plans to increase annual output significantly from 65koz to over 90kozpa over the next few years.
Zimbabwe	Caledonia Mining (49%), others (51%)	Blanket	UG	43	50	56	57	80	1Q18 production: 12.9koz, down 21.3% from prev quarter on prioritising of development work. Sinking of central shaft continues to progress according to plan and within budget, shaft currently at a depth of 990m. Expected production in 2020.	Mine installed diesel generators for back-up during power interruptions from grid supply (2011). Also entered into an un-interruptible power supply agreement with state-owned electricity supplier.
Zimbabwe	Bulawayo Mining Company (Metallon)	How	UG	52	50.2	63e	Unclear	100	Deepening of the 16N7 Shaft from 28 level to 34 level to access additional ore commenced in 2016; commissioning expected 1Q19 and will increase future production. Metallon said (Jun '15) it plans 100koz output by 2019.	Mine transferred into a separate operating subsidiary in restructing process by Metallon (Sept '17). Processing of ore occurs at a central processing facility, using conventional milling (360ktpa) and a CIL process.
Zimbabwe	Goldfields of Mazowe (Metallon)	Mazowe	UG	11	12	17e	Unclear	Unclear	Metallon said (Jun '15) that 141koz production planned by 2019.	To invest $12mn at Mazowe mine to boost production (Mar '18). Mine transferred into a separate operating subsidiary in restructing process by Metallon (Sept '17). New $18mn, 65ktpm processiong plant completed and commissioned in 2017.
Zimbabwe	Kings Daughter Mining (Company Metallon)	Redwing	UG-TL	1	10,1	14e	Unclear	111	Mine resumed production in Nov '15 following dewatering. Metallon said Jun '15 it plans 111koz production by 2019. LoM 20yrs.	Mine transferred into a separate operating subsidiary in restructing process by Metallon (Sept '17). 2 plants - one dedicated to underground ore processing, one for sands retreatment.
Zimbabwe	Goldfields of Shamva (Metallon)	Shamva	UG	25	21	29e	Unclear	96	Contract mining introduced in Sept '16. Plans are underway to refurbish processing plant to 70ktpm capacity (Oct '16). Metallon said Jun '15 that it plans 96koz production by 2019.	Mine transferred into a separate operating subsidiary in restructing process by Metallon (Sept '17). A 10km drilling programme, focused on 8 targets at Shamva Hill, underway to investigate a potential opencast 'super pit'. Ore is processed on site through single crushing, milling and combined gravity/CIL/CIP metallurgical facility.
Zimbabwe	RioZim	CAM & Motor	OC	14	25e	31	35	48	Comisioned in Oct 2016, experienced various problems in the milling and crushing sections. Interventions to fully optimize the plant were successfully carried out in 2H16. Due to foreign currency constraints, execution of some of the planned projects were delayed.	-
Zimbabwe	RioGold (Riozim)	Dalny	UG	-	-	13	18	20	Open pit mining restarted in 2017, with about 20kozpa. Mine was under care and maintenance since 2013 (produced 6koz in Jan-Sept '13). RioZim bought mine complex from Falcon Gold in Oct '16 for about $8mn, sale approved Apr '17. LoM estimated at 13 yrs.	Complex includes mine, processing plant, surrounding gold claims and mining equipment and compound. RioZim plans to delineate more ore resources at the operation and commence underground mining in future.

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Zimbabwe	RioZim	Renco	UG	24	22,9	22,1	23	35	Accelerated exploration and development programme in place. Milled tonnage increased 11% in 2017 against prev yr on improved ore generation from underground and above budget plant availability and utilisation.	-
Zimbabwe	Gray Fox Investments (50%), Vast Resources (25%), Others	Pickstone-Peerless	OC	2.5e	17	18	20	20e	2H17 production: 10.7koz, up 54% from prev helf.	The new sulphide plant is fully operational (2nd half '17). Potential development of satellite open pit mine at nearby Giant mine with 500koz JORC compliant inferred resource (Aug '16). Vast Resources sold 25% of its stake in to SSCG Africa (investment company) to advance other activities (Jan '17).
Zimbabwe	Zimbabwe Mining Development Corporation	Sabi	Unclear	-	-	7	10	27e	The mine plans to ramp up gold output to 27kozpa, but only if it can access $6mn from the Reserve Bank of Zimbabwe to purchase consumables.	Mine currently operating at low scale production levels until commissioning. Mine was suspended in 2014.
Retreatment Projects										
South Africa	DRD Gold	Ergo	TL	150	139	145	150	Unclear	2H17 production: 75.3koz, up 8.1% from prev half. Company in legal dispute with City of Ekhuruleni over R127mn surcharge on electricity rates, due to be heard in court Dec '18.	2 reclamation sites commissioned in 2H16: 4L2 dam site - 11.9mnt slime at 0.3g/t gold to be sent to City Deep plant at 300kt/mnth, then Ergo extraction plant. 4L37 site - slimes of 7.2mnt at 0.28g/t gold to Ergo at 300kt/mnth for 24mnths.
South Africa	Harmony Gold	Phoenix	TL	28	27	27	30	Unclear	2H17 production: 12.3koz, down 15.2% from prev half.	Tailings retreatment operation.
Projects in Development										
Burkina Faso	B2Gold (81%), State (10%), GAMS-Mining F&I (9%)	Kiaka	OC	-	-	-	-	340	2018 exploration budget for Burkina Faso (includes Toega mine) $9.1mn after sucesfull drill results in 2017.	Second mining licence re-approved Apr '16 following appointment of new council ministers after elections. 10yr LoM estimated.
Burkina Faso	Orezone (90%), State (10%)	Bomboré	OC	-	-	-	-	116	Updated feasibility study to be completed by late 2Q18 and the update mineral resource estimate to be completed by 3Q18.	85km east of Ouagadougou, adjacent to major highway with nearby power and water infrastructure. Plan to build an open pit, combined heap leach and CIL operation that yields average recovery of 87%.
Burkina Faso	SEMAFO (90%), State (10%)	Natougou/ Boungou	OC	-	-	-	60	226	Construction mine 91% complete (Apr '18). Targets 204kozpa output from 3Q18 over 8yr mine life. Pre-stripping 77% complete, 14mnt extracted.	Projected LoM of over 7 yrs at AISC $518/oz and an estimated 92.9% gold recovery rate. Project located 320km east of Ouagadougou.
Burkina Faso	Teranga (90%), State (10%)	Wahgnion (renamed from Banfora)	OC	-	-	-	-	133	Updated resource estimate expected by end 2Q18, with updated reserve and mine plan to follow by end 3Q18. Construction expected to start during 2018. Feasability study indicates Banfora could deliver an average of 119kozpa of gold over 9 yr LoM, at an average AISC of $843/oz.	Existing grid power located 30km from mine with access to hydroelectric power approx. 90km south.
DRC	Armadale Capital (80%), State (20%)	Mpokoto	OC	-	-	-	-	25	Armadale to sell non-core Mpokoto to Weghsteen Capital Advice SA ('WCA') for$562.5k and 1.5% gold royalty.Sale is expected Q1 '18, but no further information available.	Project subject to 4 mining licences valid for an initial term of 30 yrs from 30 Sept '14. Project has 9yr mine life.
Ethiopia	KEFI (95%), State (5%)	Tulu Kapi	OC	-	-	Unclear	-	140	Plan $150mn bond issue to fund mine development; targets 140kozpa gold production at $773/oz AISC over initial 7 yrs from end '19.	-
Ghana	Azumah (90%), State (10%)	Wa Lawra	OC	-	-	-	-	90	Secured $1.5mn in a private placement to purchase the Julie West licence from Castle Minerals. $17mn, 27km drill program underway targeting 1mnoz ore reserves over 2yrs.	Grid power, high quality roads, good access to water and sealed airstrip. Project also known as Wa. Initial LoM 7 yrs.
Ghana	Asante Gold	Kubi	UG	-	-	-	-	35	Asante entered JV agreement (Feb '17) with China's BXC to develop mine. BXC to provide $14.9mn for 50% stake in Kubi and 30% in Asante. BXC to also provide funding for construction of additional facilities.	Temporary permit to commence construction issued. 20yr renewable mining lease issued, 11yrs remaining. Goknet study showed two milling options: 1) Toll milling - $20mn funding required; 12mnth timeline to production. 2) Build mill - $50mn; 18mnth timeline to production. AngloGold Ashanti mined 59koz at 3.65g/t from surface oxide ore; backfilled pits.
Guinea	Avocet (60%), Managem (40%)	Tri-K	OC	-	-	-	-	55	Avocet entered into $14mn JV agreement with Managem in Dec '16. Managem to initially acquire a 40% interest, but stake to increase up to 70% on completion of agreed work conditions. Managem committed to providing BFS for CIL operation within 24mnths with production targeted for 2020.	Feasibility Study work completed 2013 on the basis of a heap leach development showed that the project can support a 7 year life of mine, producing an average of 55kozpa. Project consists of several exploration permits. Mining permit awarded Mar '15.

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Ghana	Resolute Mining (90%), State (10%)	Bibiani	UG	-	-	-	-	100	Apr '18: Feasibility study on upgraded resource being finalised, expect to have environmental approval end-2Q18. Prev feasibility shows 100kozpa in initial 5 yrs, with AISC $858/oz over 10yr LoM. Initial results from 2nd test drill round (about 50% complete on 23 Mar '17) indicated several high-grade ore areas. Project to refurbish and use existing processing plant; 9mnth development timeline expected.	Project receives electrical power from the national grid with excellent road access and two fresh water dams at project.
Ivory Coast	Perseus Mining (65%), Amara Mining (35%)	Yaoure	OC	-	-	Unclear	-	248	Applied for an exploitation permit in Jan '18 after completeing definitive feasibility study (Nov '17) and completed a community consultation process required as a pre-requisite to granting permit.	Low operating costs due to nearby infrastructure - grid power and water supply within 5km, dual carriageway within 40km. Acquired through merger of Perseus and Amara Mining.
Ivory Coast	Afema JV (70% Teranga Gold, 30% Sodim Ltd.)	Afema	OC	-	-	Unclear	-	36	Project acquired by Afema JV Dec '17, upon Teranga's delivery of a positive feasibility study, Sodim has option to convert 30% interest to 3% net smelter royalty. BFS completed in May '16 for initial 36kozpa small scale mining operation over first 5yrs. Construction reportedly started in Sept '16 with 9mnths lead time to production. Mine licence secured.	Teranga to prioritise updating June 2016 historical estimate. Main project centred around small scale oxide pits with longer term opportunity to further define sulphide resource and develop larger operation. Initial operation independent of power grid.
Mali	African Gold (90%), State (10%)	Kobada	OC	-	-	23	25	60	Company advancing project with a completed economic assessment and plans to pursue equity and debt financing. Process plant commissioning planned for Sept '17. Company raised $7mn through share issue (early Mar '17) to fund development.	Hummingbird Resources to acquire up to 19.9% for $8mn (Oct '17), definitive feasibility study to be undertaken. Upon completion of the study, if sucessful, Humingbird resources will fund capital costs required to construct mine and processing plant.
Mali	Ashanti Gold	Kossanto East	OC	-	-	-	-	27	Drilling tests started May '18, resource estimate expected 3Q18.	Ashanti acquired prev owner, Alecto Minerals', share Aug '17 for CAD$1mn, Alecto retains 1.5% net smelter return. (May '17) Ashanti planned to raise $2mn through shares issue to fund exploration at Anumso and Kossanto East projects.Kossanto East estimated cash cost of $582/oz is lower than industry average.
Mali	SOMIKA (Endeavour (80%), State (20%))	Kalana Main	OC/UG	10	-	-	-	148	Sep '17: Endeavour bought out prev owner, Avnel, in an all-share transaction. Avnel approved 18-mnth shutdown (from June '17) to expand operations to 148kozpa and build new processing plant. Larger, open pit operations, with estimated 1.9mnoz reserves, to start from Jan '19.	Optimised feasibility study showed 148kozpa production for first 5yrs at average AISC of $561/oz. 101kozpa average production expected at $730/oz AISC over 18yr LoM.
Senegal	Bassari Resources	Makabingui	OC-UG	-	-	-	-	50	$13m project financing deal secured with Coris Bank International Apr '18, project prepared for early development. (Jan '17) Test drilling programme was scheduled to start by Feb'17. Feasibility shows 50kozpa output at $683/oz cash cost over initial 3yr LoM. Underground scoping study shows potential to extend LoM about 3yrs. Exploitation permit approved Nov '16.	Govt granted Bassari exploration permit for project over both Makabingui and Makabingui South properties (Nov '16). $1.8mn raised in Jul '16 to assist in development of project.
Sierra Leone	Perseus	Baomahun	OC-UG	-	-	-	-	100	Company intended to complete scoping study for open and/or underground mining - was expected 6-9 mnths from commencement in Apr '16, but no information available.	Asset obtained with acquisition of Amara Mining in Apr '16.
South Africa	Galane Gold	Galaxy	UG-TL	-	-	0	0	60	Company secured $5mn loan (Mar '18) to refurbish and expand processing facilities and restarting underground mining operations. Anticipates first production in 1Q19. Restart to increase annual production to over 25koz of gold at an operating cash cost per ounce of less than $800.	Planned conventional gold mine with mill and CIL processing. Current LoM is 9yrs but new pre-feasibility study could extend that. Development started in Jul '16. Long-term target 60kozpa.
South Africa	Pan African Resources	Elikhulu	TL	-	-	-	-	55	Project construction ahead of schedule - commissioning expected early 2019.	Project was disrupted end-2017 by "criminal grouping" demanding tenders, blockading streets and intimidating employees, in defiance of court interdict granted Oct '17. Project expected to produce 56kozpa in initial 8 yrs, 45kozpa for remaining 5 yrs at average AISC of $523/oz over LoM. Elikhulu to potentially treat slimes from the Winkelhaak, Leslie and Kinross tailings storage facilities at up to 12mntpa.
South Africa	Sibanye Gold	Burnstone	UG	-	-	-	-	130	Project planned with initial 23yr LoM, with 6yr ramp-up and then steady state production. Construction underway (Mar '18). 1.9mnoz of mineral reserves and 9mnoz of mineral resources	Numerous water intersections were intercepted in latter part of 2017, delaying development, leading to comprehensive water handling plan to prevent futher delays (Mar '18).

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South Africa	Sibanye Gold	West Rand Tailings Retreatment Project (WRTRP)	TL	-	-	-	-	210	Movable pilot plant is operating. Permitting for tailings retreatment plant expected in 2H17. DFS was completed in 2016. Sibanye CEO in Dec '16 said project was expected to be launched within 6 months. DRDGold purchased portions of the project in exchange for 38% of DRD shares (about R1.3bn); Sibanye has option to increase to 50.1% of DRD.	Project focuses on 4 high-grade anchor resources (containing approx 2.4mnoz of gold) which will produce approx 100kozpa initially over 18yr LoM. Tailings sourced from Cooke, Driefontein, ventersdorp and Kloof complex.
South Africa	Stonewall Resources	TGME	OC-UG	-	-	-	-	Unclear	$4.1mn secured in Jan '17 to advance TGME project, targeting initial 25kozpa output. Pre-feasibility currently underway. Company investigating low-cost options to bring CIL plant and talings dam back to production (Mar '18). Focus will be on pre-mined residue (PMR), i.e. underground stockpiles left from sorting, to produce high grade ore.	Located in Sabie-Pilgrim's Rest goldfield, 300km northeast of Witwatersrand. Company has JORC hard rock resource of 3mnoz including Rietfontein, Beta, Thetha Hill and others. Rietfontein fully permitted; scoping study results show 60kozpa at cash cost of $417/oz. Rietfontein contains 905koz total JORC resource at 11g/t gold. Preliminary metallurgical tests at Theta Hill show excellent recoveries with cyanide extraction, continued drilling to establish reserves in 2018.
Tanzania	Acacia (95%), Orecorp (5%)	Nyanzaga	OC-UG	-	-	-	6	100	Pre-feasibility study completed Mar '17 shows 213kozpa over 12 yr mine life at AISC $838/oz. Definitive feasibility study completion expected 2018 (Mar '18). Development period expected to be 18 months. Feb '18: Environmental approval granted. Special mining license application lodged, progress on this front requires moratorium on new licenses to end. Project value reduced to $34mn from $42 on potential impact of Tanzanian mining laws.	OreCorp entered into earn-in JV with Acacia to earn initial 25% in project on completion of DFS. Can then increase stake to 51% (Sept '16). Plan to use 4mntpa CIL (85% recovery) plant with power from regional grid.
Tanzania	Katoro Gold (Kibo Resources 57%)	Imweru	OC-UG	-	-	-	-	100	Drilling started early Jun '17 and completed. Pre-feasibility study and viability under new Tanzanian royalty laws being studied, outcome expected in 2018 (Mar '18). Construction prev. planned to start late 2018. Mineral resource estimated at 515koz at 1.43g/t in Mar '17. (Jun'16) Production is targeted at 50kozpa by 1H19 and 100kozpa thereafter.	Consolidated adjacent Imweru and Imwelo into one project (Jun '16). Katoro Gold was demerged from Kibo Resources in 2017.
Tanzania	Tanzanian Royalty (55%), State (45%)	Buckreef	OC	-	-	-	-	54	Project mining licence renewed on 7 Oct '16, valid for 10yr period. Preparation for pre-stripping and grade-control drilling was started (Mar '17). Feasibility study (Jul '17) shows 1.064mnt reserve, 910koz gold to be mined over LoM.	Intends to ship dore bars to Switzerland for refining by Argor-Heraeus. Said project not affected by new Tanzanian royalty laws (Aug '17).
Projects with Development Potential										
Burkina Faso	Golden Rim Resources	Kouri	OC	-	-	-	-	-	1mnoz maiden resource declared (May '18), double exploration target.	Golden Rim intends to continue drilling at Kouri for 12 mnths from May '18, to better determine the scope of the project before considering development options.
DRC	Moku Goldmines (65%), SOKIMO (35%)	Moku-Beverendi	-	-	-	-	-	-	Moku is controlled by Dan Gertler, sanctioned by US govt over corruption charges (Dec '17). Randgold Resources was undertaking exploration and completing a pre-feasibility study for the Moku-Beverendi deposit, but declared forece majeure over sanctions (Feb '18). Deposit estimated to contain 5mnoz.	Randgold formed JV with Moku and state-owned SOKIMO in Mar '16. Randgold to do exploration and feasibility; after completion to own up to 51% in project.
Ivory Coast	Taurus Gold	Hana Lobo	-	-	-	-	-	200	Plans to conduct more intensive exploration. Targets 200kozpa in long term. Mineral resource estimated to be 385koz as of Jun '15.	No recent mine activity reported.
Mali	Merrex (100% IAMGOLD)	Siribaya	-	-	-	-	-	-	2017 drilling program highlights: indicated resources 2.1mnt grading 1.9 g/t Au for 129koz of gold, and inferred resources of 19.8mnt grading 1.7 g/t Au for 1.1mnoz. 2018 plans: drilling to continue at the Diakha deposit and to explore other identified priority targets. Updated resource estimate expected by yr-end.	Mine is near borders with Senegal and Guinea.
Senegal	IAMGOLD	Boto	OC	-	-	-	-	-	Prefeasibility study (Feb '18) shows: Indicated resource of 1.9mnoz with an average gold grade of 1.6g/t; reserves of 1.4mnoz grading 1.64g/t. Nearly 100kozpa production over 13.5yr LoM at $707/oz cash cost and $829/oz AISC. Full feasibility study completion expected in 2H18.	-
Senegal	Randgold (83%), others (17%)	Massawa-Sofia	-	-	-	-	-	-	Randgold to complete feasibility mid-2018 (Jun '17) and make decision on project development timeline. Total reserves: 2.7mnoz. Total resources measured and indicated: 2.9mnoz. Total resources inferred: 990koz.	Located within the Kounemba permit in eastern Senegal which geologically lies within the 150km long Mako greenstone belt; 90km west of Randgold's Malian Loulo operation.

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Gold Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (koz)	2016 Production (koz)	2017 Production (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	White Rivers Exploration (65%), Harmony Gold (35%)	White Rivers-Harmony JV	UG	-	-	-	-	250-300	White Rivers and Harmony announced 11.5mnoz gold resource at 8.9g/t at JV project in the Free State, with 250-300kozpa potential production over 30 yrs (Sept '16). White Rivers and Harmony conducting prefeasibility study. Exploration to start end-2018; bankable feasibility expected by Jul '19; decision to mine by end-2019.	Reef at 1.4 - 2.2km depth below sea level. Neighbours Harmony's Target mine and near developed infrastructure. Significant uranium resources.
Idled Projects										
Ghana	AngloGold Ashanti	Obuasi	UG	53	3	3	3	450	AngloGold to spend $500mn to restart production at mine by 3Q19, targets 400kozpa at $750-850/oz AISC over initial 10yrs (Mar '18).	Ghana's oldest gold mine, was largely idled due to high input costs, illegal miners and an ageing ore body. Agreement reached with govt for redevelopment mine in Ghana, subject to ratification by parliament (Mar '18). In interim, board approved $31mn interim funding to cover first 6 mnths, for project team establishment, set-up and front end engineering and design.
South Africa	Randlord Consolidated Mines	Blyvooruitzicht	UG-TL	-	-	-	-	100	Randlord finalising funding and last regulatory approvals needed to resume 18kozpa surface tailings treatment and 50kozpa underground mining (shaft 5 only) - expanding to 100kozpa after yr 3 (Mar '18). Estimated underground resource of 169mnt of ore containing 26.4mnoz of gold at 4.85g/t average grade, 30yr LOM.	Mine was overrun by illegal miners in 2013 and idled by Village Main Reef in 2014. Shaft and underground operations are "defunct" after extensive theft. R140mn set aside for rehabilitation.
South Africa	Vantage Goldfields	Barbrook	UG	5e	5.7e	-	Unclear	Unclear	Company under business rescue and mine suspended in Dec '16; creditors subsequently applied for liquidation. Siyakhula Sonke secured a R190mn loan from IDC (Apr '18) to acquire a 74% stake in Vantage Goldfields SA. Liquidation application postponed until 31 July.	Merger talks with Galane Resources collapsed in early Aug '17. Galane intended to combine Vantage Goldfields's idled Barbrook and Lily mines with its own Galaxy mine to produce 160kozpa at $900/oz AISC.
South Africa	Vantage Goldfields	Lily	UG	27e	-	-	-	Unclear	Mine suffered partial collapse in Feb '16 and remains idled. Govt investigation into collapse started Feb '17 must conclude before operations can restart. Company under business rescue and mine suspended in Dec '16; creditors subsequently applied for liquidation. Siyakhula Sonke secured a R190mn loan from IDC (Apr '18) to acquire a 74% stake in Vantage Goldfields SA. Liquidation application postponed until 31 July.	Merger talks with Galane Resources collapsed in early Aug '17. Galane intended to combine Vantage Goldfields's idled Barbrook and Lily mines with its own Galaxy mine to produce 160kozpa at $900/oz AISC.
Tanzania	Stamico (State)	Buhemba	OC-TL	Unclear	Unclear	Unclear	-	75	Production officially suspended since 2007. Jan '18: Stamico seeking new JV partner after deal with prev. partner Manjaro Resources unsuccessful.	Illegal mining in project led to mine collapse mid-Feb '17, killing several miners.
Zimbabwe	TN Securities	Arcturus	Unclear	7	1	-	Unclear	108	Mine under care and maintenance after operations suspended by Metallon (Mar '16). Sold to TN Securities (Dec '17) for est. $10mn, who plan to invest a further est. $2mn to relaunch operations. Planned to relaunch in 2H18 depending on foreign exchange availability.	Metallon prev plan (Jun '15): 108koz production by 2019.

Notes:

AISC - All In Sustaining Costs

CIL - Carbon-in-Leach

CIP - Carbon-in-Pulp

* - Figure given by company for their year-ending June period.

** - Value combined with other mines - see Project information column.

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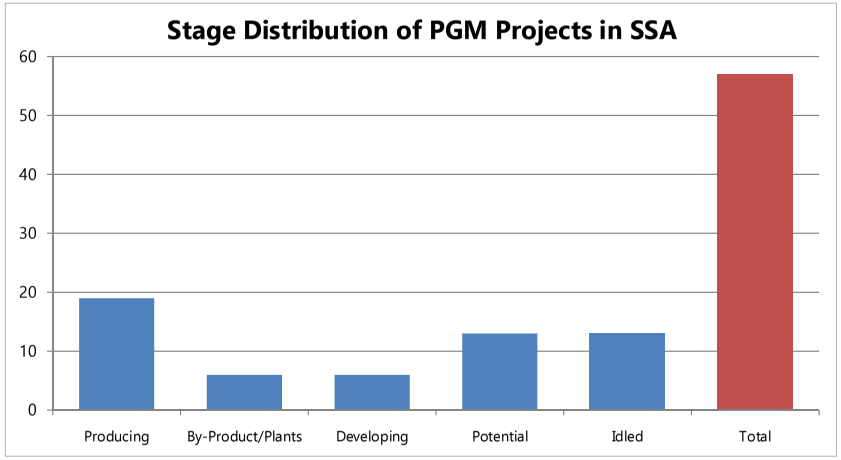
1.2 Platinum Group Metals Projects

Key facts

Sub-Saharan PGM production is dominated by 2 countries.

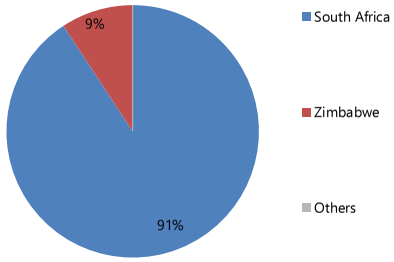
South Africa accounted for 91% of Africa's and 72% of global platinum production in 2017. SA produces about 87% of Africa's palladium, but only 39% globally, the 2nd largest after Russia. SA dominates rhodium production, with 93% of African and 80% of global output - all concentrated in the Eastern and Western Limbs of Bushveld Igneous Complex (BIC), which also contains notable copper, nickel and chrome mineralisation. More recent interest has focused on the Northern limb of the BIC, which already hosts the world's largest opencast PGM mine and has two more mechanised mines in development.

Zimbabwe's PGM reserves are concentrated on the Great Dyke, a linear geological feature running 550km from the north to the south of the country. In 2017, platinum output fell about 6% from as output at Zimplats normalised after a sharp increase in 2016 due to processing of concentrate backlogged from 2015 smelter outage. A major boost in output is expected from around 2020 as Great Dyke Investments and Karo Resources bring online their large scale projects.

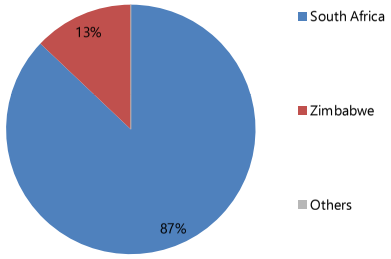


Sub-Saharan PGM Producers 2017

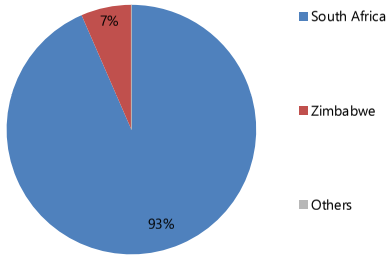
Total Pt: 4.8mnoz (79% of global)



Total Pd: 3mnoz (45% of global)



Total Rh: 658koz (85% of global)



Source: StatsSA, Zimstat, WPIC

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Platinum Group Metals Projects

Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
Projects in Production											
South Africa	African Rainbow Minerals (51%), Impala Platinum (49%)	Two Rivers	UG	Pt	178	191	169	173	200e	1Q18 platinum production: 40koz, down 3.4% from prev Q, down 7% y-on-y on planned mining of low-grade split-reef areas. Yr-ending Jun '18 platinum production guidance: 170koz, down 2.9% from prev guidance, down 6.5% from yr-ended Jun '17. Initiated project to secure improved capacity to maintain its platinum production profile while mining split reef.	Fully mechanised board and pillar mining - 2 on-reef decline shafts. Has additional Merensky reef resource, but only mining UG2 currently. Concentrator on site. LoM lifted by 30yrs through Tamboti resource acquisition. ARM to increase share to 54% on completion of shareholding agreement (Oct '17).
				Pd	105	114	100	103	120e		
				Rh	32	34	30	30	40e		
				4E	-	-	-	-	-		
				6E	383	410	362	372	430e		
South Africa	Anglo Platinum	Amandelbult	OC-UG	Pt	430	459	438	466	500e	1Q18 platinum production: 104koz, seasonally down 10.9% from prev Q, but up 7% y-on-y on improved underground efficiencies, higher grades. Chrome plant commissioned 2016 has now reached steady-state (see *chrome ore* project table).	Consists of 2 mines (Tumela & Dishaba), 3 concentrators and 1 chrome plant. Conventional underground mining and mechanised opencast operations. Sold portion of project's resource to Northam in exchange for more accessible resource and R1bn cash (Dec '17).
				Pd	199	207	203	218	230e		
				Rh	71	75	75	80	80e		
				4E	706	747	721	770	820e		
				6E	845	891	858	920	980e		
South Africa	Anglo Platinum	Mogalakwena	OC	Pt	393	412	464	450	500e	1Q18 platinum production: 139koz, up 14.5% from prev Q, up 24.6% y-on-y on higher grades and optimisation of North Concentrator although base metals output fell from the north pit. Planned smelter rebuilds in 2Q18-3Q18, to curb output. North Concentrator upgrades (R300mn capex) expected to yield additional 15koz from early 2019.	Largest opencast platinum mine globally comprised of 5 fully mechanised open pits using truck and shovel mining method, and 3 concentrators (incl. Baobab concentrator). As part of the Pandora stake sale to Lonmin, Amplats signed 3-yr contract for sole use and operational control of Baobab concentrator (produced 31koz Pt in 2016).
				Pd	430	452	509	500	550e		
				Rh	29	30	32	40	40e		
				4E	902	946	1 063	1 040	1150e		
				6E	936	980	1 099	1 070	1190e		
South Africa	Siyanda Resources (85%), Bakgatla-Ba-Kgafela traditional community (15%)	Union	UG	Pt	141	151	155	148	180e	Siyanda Resources acquired mine from Amplats Feb '18. 2017 platinum production increased due to better stoping efficiencies. Amplats & Siyanda signed 7 yr concentrate purchase agreement and toll arrangement from 8th yr.	2 vertical shafts (Richard and Spud) operational, declines section closed (used to contribute 61koz Pt) and concentrator complex. Chrome recovery plant on site.
				Pd	64	69	71	68	80e		
				Rh	26	27	29	20	30e		
				4E	232	249	256	240	300e		
				6E	281	300	309	290	360e		
South Africa	Anglo Platinum (50%), Sibanye-Stillwater (50%)	Kroondal	UG	Pt	263	274	279	150	300e	1Q18 4E PGM production: 114koz, seasonally down 12.6% from prev Q, up 1.2% y-on-y on underground efficiencies and improved concentrator recoveries. Amplats considers asset non-core and decided 2016 to exit mine - expected to see high sale price as mine generates attractive cash flow, no formal discussions have started.	Sibanye acquired all of Aquarius Platinum's shares in Oct '15. Amplats previously had pooling-and-sharing agreement with Aquarius Platinum. Mine is mechanised and consists of 5 decline shafts and 2 concentrators located adjacent to Amplats's Rustenburg operations.
				Pd	138	145	148	80	160e		
				Rh	49	52	53	30	60e		
				4E	453	473	482	247	520e		
				6E	554	578	586	300	630e		
South Africa	Anglo Platinum (50%), African Rainbow Minerals (41.5%), local community trust (8.5%)	Modikwa	UG	Pt	105	115	127	130	150e	1Q18 6E PGM production: 77.1koz, down 3.6% from prev Q, up 16% y-on-y on improved stoping efficiencies as well as purchasing of concentrate stockpiles from Mototolo. Ramp-up of South 2 Shaft production continues, with Phase 1 complete and expected to reach steady-state in yr-ending Jun '19. North Shaft redeepening curtailed to preserve cash.	Amplats purchases African Rainbow Minerals (ARM) share of production. Jointly managed by Amplats and ARM. 3 decline shafts (South 2 decline in development) operating as a hybrid (conventional & mechanised breast mining).
				Pd	102	112	123	120	150e		
				Rh	22	24	26	20	30e		
				4E	232	254	278	290	330e		
				6E	274	299	325	340	390e		
South Africa	Anglo Platinum (50%), Glencore (37%), Kagiso Tiso Platinum Venture (13%)	Mototolo	UG	Pt	115	117	85	66	130e	1Q18 6E PGM production: 84.7koz, up 188% from prev Q, up 38% y-on-y on improved stoping efficiencies and processing of additional stockpiles built-up following temporary closure Helena tailings facility in 3Q17. Feasibility on new tailings storage underway. Owners to retain share of asset during restructuring.	Mine is fully mechanised and consists of 2 decline shafts (Lebowa & Borwa) and 1 concentrator. Glencore manages mine and Amplats manages concentrator. Glencore processes all UG2 chrome tailings from PGM concentrator. Amplats processes all PGM tailings from chrome concentrate.
				Pd	70	71	53	43	80e		
				Rh	20	20	15	11	20e		
				4E	207	210	154	60	230e		
				6E	251	254	185	74	280e		

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Platinum Group Metals Projects continued...

Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Impala Platinum (96%), "ESO" (4%)	Impala	UG	Pt	649	620	608	676	800	1Q18 platinum production: 71koz, down 48.9% from prev Q, down 55.6% y-on-y on electrical failure at Furnace 5. Yr-ending Jun '18 production guidance: 660koz, down 5.7% from prev guidance, up 0.8% from yr-ended Jun '17 output. 16 Shaft project on schedule and to accelerate underground development, 20 Shaft was hampered by safety stoppages and geological challenges.	14 shafts in complex. Shaft 17 remains on care and maintenance, was expected to start in 2021 and add 180kozpa. Royal Bafokeng and Impala extended royalty mining deal to 2026, increasing Impala's shaft 6 mine life by 5yrs and 4E PGM resources by 58% to 980koz; deal grants Impala access to Royal Bafokeng's southern platinum reef for a 6%-25% royalty return. 16 and 20 Shafts target 800kozpa platinum by 2020.
				Pd	311	293	319	360	380e		
				Rh	92	79	88	100	110e		
				4E	-	-	-	-	-		
				6E	1287	1195	1174	1310	1590e		
South Africa	Impala Platinum (73%), BEE partners (27%)	Marula	UG	Pt	78	79	68	84	90	1Q18 platinum production: 20koz, up 1% from prev Q, up 122% y-on-y when output was hampered by community unrest. Yr-ending Jun '18 production guidance: 80-90koz, up 25.2% from yr-ended Jun '17 output. Restructure process implemented during yr-ended Jun '17 lifted capacity to 90kozpa.	Located in Limpopo, some 35km from Burgersfort, mine comprises 2 decline shaft system and 1 concentrator plant. Uses both hybrid and conventional mining methods targeting UG2 reef only. Produces concentrate which is then transported by road to Impala Refining Services.
				Pd	81	81	70	90	90e		
				Rh	17	17	14	20	20e		
				4E	-	-	-	-	-		
				6E	206	207	178	220	240e		
South Africa	Lonmin	Marikana (incl. Pandora)	OC-UG	Pt	701	650	652	663	750e	1Q18 platinum production: 137koz,down 10% from prev Q, up 6.1% y-on-y. Yr-ending Sept '18 platinum sales guidance: 650-680koz, down 5.8% from 2017 on ongoing closure of high cost Generation 1 shafts and furnace outtage from Dec '17 to Feb '18. Generation 2 shafts (now incl reclassified E3 and Pandora shafts) to continue ramping up. Sibanye Stillwater to acquire Lonmin for R5.2bn by 2H18.	Expansion projects, including: Saffy Shaft expansion and K4 shaft part of long term strategy, company requires additional $200mn to complete K4. Shafts W1, E1, Hossy and Newman scaling down for closure. Newman and E2 shafts placed under care and maintenance 1Q18. Smelter located on site. Accounts for 95% of Lonmin's output. Historic production updated to include Pandora.
				Pd	328	300	303	310	350e		
				Rh	103	93	94	100	110e		
				4E	1148	1058	1064	1080	1230e		
				6E	1349	1244	1254	1280	1440e		
South Africa	Northam Platinum	Booysendal North	UG	Pt	80	113	120	119	130e	2017 platinum production up 6.1% from 2016. Week-long strike held back 1Q18 output as 750 miners demanded end of contract termination packages from then contractor Murray & Roberts Cementation. Mine transitioned to owner-operator status as of 1 May '18. Fully mechanised shallow mine with access via declines to UG2 North and Merensky North modules.	Ore from both UG2 and Merensky blended and fed to UG2 concentrator. Merensky could expand to add 75koz (4E) (from 25koz (4E)) if concentrator capacity allows. Acquisition of Booysendal South (Everest) to expand project and open new Central and South properties (see *Booysendal South*) increasing production to about 500kozpa (4E) by 2021 for entire complex. LoM speculated to be 50+ yrs. Glencore agreed Feb'17 to market and sell all chrome produced by Northam's operations.
				Pd	37	54	58	58	60e		
				Rh	13	19	19	19	20e		
				4E	131	187	198	198	215		
				6E	-	-	-	-	-		
South Africa	Northam Platinum	Zondereinde	UG	Pt	166	164	174	184	200e	2017 platinum production up 6.2% from 2016. Smelter complex's 2nd furnace commissioned Feb '18, expanding capacity over 1mnozpa 4E PGM. First shipment from US recycling operations arrived Apr '18. LoM extended to 20yrs through acquisition of resources from Amplats' Amandelbult (Tumela block) mine. Drying plant commissioned with R672mn total capital expenditure to date.	Mature operation with vertical shaft complex. 16.7mnoz 4E PGM resource acquired from Amplats' Amandelbult mine with greater access to higher-grade Merensky reef; Amplats to receive R1bn and ancilliary resource adjacent to their Amandelbult mine (Sept '16). Glencore agreed Feb'17 to market and sell all chrome produced by Northam's operations.
				Pd	82	79	85	89	100e		
				Rh	25	26	26	28	30e		
				4E	276	272	288	305	330		
				6E	-	-	-	-	-		
South Africa	Royal Bafokeng Holdings (52%), Anglo Platinum (36%), Free Floating (12%)	BRPM	UG	Pt	180	196e	212	209	310e	1Q18 platinum production: 52.3koz, up 13% y-on-y. Amplats sold 8.8% stake (retaining 2.6%) in RBPlats to raise funds for its share in projects. 2018 4E PGM guidance (incl. Maseve and Styldrift): 370-387koz, up 15.4% from 2017 output. BRPM Phase 3: Project development on track. Capex to date is R1.08bn. Planned to reach 480koz 4E by 2020 (Feb '16).	RBPlat extended royalty mining deal with Implats to 2026, giving Implats access a southern platinum reef for a 6%-25% royalty return. 250ktpm upgrade on BRPM concentrator completed 1Q16. Project to ramp up over 36mnths from 1H17 to reach a steady state production of 480kozpa 4E PGM in 2020. Project will be fully mechanised.
				Pd	74	81e	90e	90	130e		
				Rh	17	18e	20e	20	30e		
				4E	278	304	328	320	480		
				6E	311	340e	370e	370	540e		
South Africa	Royal Bafokeng Holdings (52%), Anglo Platinum (36%), Free Floating (12%)	Styldrift 1	UG	Pt	-	-	40e	90	40e	1Q18 platinum production: 11.4koz, up 133% y-on-y on project ramp-up; output growth to continue to 320kozpa 4E PGM steady state by 2020 with mining and infrastructure activities on track. Commissioned services shaft and overland conveyor belt to BRPM 1Q18. Capex to date is R9.03bn.	Project making steady progress, moving from phase 1 (50ktpm) to phase 2 (150ktpm) ramp-up, with 250ktpm goal. Development of 100ktpm concentrator and conveyor deferred to 2019 (depending on market conditions). Project will be fully mechanised. Feasibility study and exploration for Styldrift 2 also delayed in Aug '16.
				Pd	-	-	20e	40	20e		
				Rh	-	-	3.6e	10	2.5e		
				4E	-	-	60e	130	320		
				6E	-	-	70e	150	70e		
South Africa	Sedibelo (Pallinghurst Ivy Lane Capital (28%), Bakgatla-Ba-Kgafela local community (26%), IDC (16%), others)	Pilansberg Platinum Mines	OC-TL	Pt	-	-	80e	100	150e	4Q17 4E PGM production: 39.9koz, up 28% from prev Q as excavating equipment availability improved after changeover of contractors (MCC terminated contract and Trollope took over from 1 July '17), down 8.9% y-on-y in line with new LoM plan due to low rand PGM prices. R36mn exploration expenditure went into Pilansberg exploration projects to date.	Concentrator on site. Focused on lower unit capital and operating costs and tax breaks for expansion of metal production volumes. Partnering with LifeZone's Kell Process - innovative hydrometallurgical alternative to PGM concentrate smelting - feasibility study completed, 2 test runs completed (Sept '16). Project includes Magazynskraal property which has a proposed underground mine.
				Pd	-	-	40e	40	70e		
				Rh	-	-	20e	20	30e		
				4E	-	-	133	160	250		
				6E	-	-	-	-	-		

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Platinum Group Metals Projects continued...

Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Sibanye-Stillwater	Rustenburg Section (includes WLTR)	UG-TL	Pt	499	364	490	480	500e	1Q18 4E PGM production: 196koz, unchanged from prev Q, unchanged y-on-y. Underground operating cash cost: down 12% y-on-y. 2018 production guidance (all operations): 1.1-1.15mnoz, down 5.8% from 2017 output. Sibanye took control of operations from Amplats Nov '16.	5 mines consolidated to 3, then further consolidated to 2 (East and West Mine). Sibanye to sell concentrate to Anglo Platinum. Vuselela Energy and H1 Holdings opened a clean energy plant to power the Waterval smelter in 2015.
				Pd	258	188e	250e	250	260e		
				Rh	59	43e	60e	60	60e		
				4E	835	609e	810e	782	850e		
				6E	925	674e	900e	870	940e		
Zimbabwe	Anglo Platinum	Unki	UG	Pt	67	75	75	75	90e	1Q18 platinum production: 20.6koz, up 25.6% from prev Q, up 9% y-on-y on increased stockpiled ore availability following Dec '17 completion of planned concentrator maintenance. 2018 production guidance: 75koz, up 0.5% from 2017 output. Smelter project to be completed 2H18 at R650mn total cost, with R306mn incurred in 2017.	Mechanised mine located on the Great Dyke with 22+ yr LoM. 2017 capital expenditure to be focused on construction of smelter which began 3Q16, commissioning planned for 2018. Unki indigenisation plan approved and Amplats to spend or retain at least 75% of gross sales in Zimbabwe.
				Pd	52	61	64	65	71e		
				Rh	6	7	7	7	9e		
				4E	133	151	156	156	180e		
				6E	140	160	166	167	241e		
Zimbabwe	Impala Platinum (50%), Sibanye-Stillwater (50%)	Mimosa	UG	Pt	118	121	124	120	125e	1Q18 platinum production: 30koz, down 3.2% from prev Q, unchanged y-on-y. Yr-ending Jun '18 production guidance: 115-120koz, down 3.4% from prev yr. $40mn expansion aims to increase output by 30% over next 5yrs and extend LoM 20yrs.	Off-take agreement with Centametall AG of Switzerland who receives the refined product from Impala Refining Services. Discussions for co-funding a smelter underway. Concentrator on-site.
				Pd	93	96	98	95	100e		
				Rh	10	10	11	10	10e		
				4E	-	-	-	-	-		
				6E	251	257	263	255	270e		
Zimbabwe	Impala Platinum (87%), others	Zimplats	OC-UG	Pt	218	297	280	248	260	1Q18 platinum production: 68.9koz, up 2.5% from prev Q, up 3.1% y-on-y. Yr-ending Jun '18 production guidance: 255-265koz, down 7.5% from prev yr as Ngwarati and Rukodzi mines scale down. Development approved for $264mn Mupani mine - to replace depleting Ngwarati and Rukodzi mines by May '21 and reach full capacity Aug '25. Selous Metallurgical Complex Base Refinery upgrades constrained by cash-flow (Sept '17).	Complex comprised of 4 underground mines and Ngezi concetrator, with Selous Metallurgical Complex. Expansions include: redevelopment of Bimha mine to replace existing opencast mining and ramp-up of 90kozpa Mupfuti mine progressing well. Smelter production expected at 260kozpa in matte. Selous Metalurgical Complex has a concentrator and a smelter.
				Pd	177	241	234	206	220		
				Rh	20	27	25	22	20e		
				4E	-	-	-	-	-		
				6E	464	630	601	531	550e		
Non-Focused/Retreatment Projects											
South Africa	African Rainbow Minerals (50%), Nornickel (50%)	Nkomati	OC-UG	Pt	38	30	40	40	40e	1Q18 platinum production: 4koz, down 60% from prev Q and y-on-y as mining remained constrained by legacy inefficiencies, geotechnical issues at Pit 3 and processing of low-grade stockpiles. Nickel and copper mine with PGEs as co-product.	(See *nickel* project table)
				Pd	106	80	92	92	110e		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	163	117	142	142	170e		
South Africa	Jubilee Metals	Hernic Project (incl. tailings from Dilokong Chrome Retreatment Plant (DCM))	TL	Pt	-	-	4.9e	13	20e	1Q18 4E PGM production: 4.9koz, up 30.4% from prev Q as plant continues to ramp up from Mar '17 start-up. In May '17, Jubilee made first R20mn payment for 1.3mnt PGM-bearing tailings from Platcro to be processed at its Hernic project. Signed agreement with Northam Platinum to utilise Northam's PGM recovery plant at Eland mine to process Platcro tailings - targets 33.6kozpa from Feb'19.	Site works commenced with plant lay down area preparation. To use ConRoast process to concentrate PGMs from chrome rich ore to be better accepted by furnaces. Additional estimated 1.6mnt of tailings available, but not declared as resource. Planned to be largest PGM recovery plant from chrome tailings in the world. One of the world's lowest cost operations (below $400/oz). PGM split: Pt (65%), Pd (23%), Rh (12%), Gold (0.4%).
				Pd	-	-	1.7e	4,5	6.9e		
				Rh	-	-	0.9e	2,4	3.6e		
				4E	-	-	7,5	20	30		
				6E	-	-	-	-	-		
South Africa	Lonmin	Bulk Tailings Treatment	TL	Pt	-	-	-	3,0	29	Project successfully commissioned Feb '18; expected to reach 29kozpa Pt or 55kozpa 6E PGM steady-state during 2018 with 7yr LoM. Project mined by contractor and investigating LoM extension tailings dams.	The BTT project involves the re-mining of Lonmin's Easterns Tailings Dam. The project entails the reprocessing of 26 million tonnes of Tailings material at a rate of 300ktpm and is expected to produce the lowest cost ounces in the Lonmin portfolio.
				Pd	-	-	-	1,2	12e		
				Rh	-	-	-	0,4	3.6e		
				4E	-	-	-	4,7	45e		
				6E	-	-	-	5,8	55		

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Platinum Group Metals Projects continued...

Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Sibanye-Stillwater (91.7%), others	Platinum Mile (plant)	TL	Pt	7	10e	12e	9	15e	1Q18 4E PGM production: 3.7koz, down 33.2% from prev Q, down 14% y-on-y. Produces 4E PGM concentrate at 59% platinum and sells it to Anglo Platinum under profit-sharing agreement.	Plant located on Anglo Platinum's Rustenburg mine, adjacent to Kroondal mine, and is processing tailings.Sibanye Gold acquired all Aquarius Platinum's operations (Mar '16).
				Pd	4	5e	6e	4	7e		
				Rh	1	1e	2e	1	2e		
				4E	12	17	19	15	25e		
				6E	14	20e	23e	17	29e		
South Africa	Sylvania Platinum	Sylvania Dump Operations	TL	Pt	34e	40e	42e	47	54e	1Q18 4E PGM production: 16.9koz, down 2.6% from prev Q, down 1.4% y-on-y. Yr-ending Jun'18 production guidance: 73koz, up 3% from prev yr output. Sylvania finalised acquisition of 12kozpa 6E PGM Phoenix plant from Pan African Resources in Jan '18.	Engages in retreatment of Samancor chrome mine and dump material for PGEs from 7 operations. Dump operations include: Millsell, Mooinooi Dump and Mooinooi RoM on the western limb of the Bushveld Igneous Complex (BIC), and Lannex, Steelpoort, Doornbosch and Tweefontein on the eastern limb.
				Pd	15e	17e	18e	20	23e		
				Rh	7e	9e	9e	10	12e		
				4E	56	67	70	78	90e		
				6E	-	-	-	-	-		
South Africa	Tharisa	Tharisa Chrome Mine	OC	Pt	66e	81e	83e	84	112e	1Q18 6E PGM production: 38.2koz, down 1.5% from prev Q, up 11.4% y-on-y. Yr-ending Sept '18 production guidance: 150koz, up 4.5% from yr-ended Sept '17 output. Targets 200kozpa from 2020 on Voyager Plant upgrade from 4Q19 (See *chrome* ore project table for more).	2 plants: 100ktpm Genesis plant and 300ktpm Voyager plant. Concentrate is sold to Impala Platinum. 6E PGM split in concentrate: 56.2% Pt; 16.2% Pd; 13.7% Ru, 9.3% Rh; 4.4% Ir; 0,2% Au. Tharisa plans to invest R70mn in flash floatation and scavenger plants at Voyager Plant.
				Pd	19e	23e	24e	24	32e		
				Rh	16e	20e	20e	21	27e		
				4E	101e	124e	127e	129	173e		
				6E	118	143	148	150	200		
Projects in Development											
South Africa	Ivanhoe (64%), BEE Partners (26%), Japanese Consortium (10%)	Platreef	UG	Pt	-	-	-	-	214	Shaft sinking half-way to target depth; expected to reach Flatreef mineralisation 3Q18. Positive DFS results (Jul '17) - 476kozpa 4E PGM production, up 9.9% from pre-study estimate. Cash cost a low of $351/4E PGM oz, down 12.5% from pre-study. First concentrate production now expected by 2022, later than 2019 prev expected. 2 expansions planned in 2024 and 2028 to increase plant capacity to 8mntpa (870kozpa 4E), then 12mntpa (1.3mnozpa 4E).	Pt:Pd ratio of 1:1, also contains 0.32% nickel and 0.15% copper. Power line energised in Feb '17 and connects project to national grid (close to Medupi & Kusile). Water to come from Olifants River (currently under development) (Mar '17). Secured permit with Mogalakwena Local Municipality for minimum 1.8mncmpa treated water supply for 32yrs from 2022 to cover Phase 1 bulk water needs.
				Pd	-	-	-	-	219		
				Rh	-	-	-	-	14		
				4E	-	-	-	-	476		
				6E	-	-	-	-	500e		
South Africa	Northam Platinum	Booysendal South (Everest)	UG	Pt	-	-	-	-	-	Central boxcut and pollution control dam almost complete. 2H17 capital spending: R920mn. Concentrator to be commissioned by 2019. Current workings at Booysendal South project expected to add a further 215koz 4E PGM to Northam's production.	Mine was placed on care and maintenance by Aquarius (2011). Acquired by Northam Mining (Oct '15), to be incorporated with Booysendal division (see *Booysendal North*). Infrastructure includes 250ktpm concentrator plant. To build Ropecon aerial conveyor system to transport ore from mine to concentrator over topography, completion aimed for 2019.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	250		
				6E	-	-	-	-	-		
South Africa	Platinum Group Metals (50%), Implats (15%), JOGMEC (12%), Mnombo Wethu (13%), Hanwa (10%)	Waterberg	UG	Pt	-	-	-	-	220e	$2.7mn capex spent on mine development in 6 mnths to Feb '17. Pre-feasibility completed in Oct '16. Drilling commenced 4Q17, total expenditure to end-2017 about $49mn. To produce 744kozpa 4E PGM from mid-2021. New shareholders include Implats and Japanese Hanwa.	Planned as a low cost fully-mechanised operation. At full production, claimed to produce more palladium than Stillwater Mine (US), could contribute 6% of global palladium supply (based on 2015). Project construction and ramp-up expected between 2018 and 2021.
				Pd	-	-	-	-	460e		
				Rh	-	-	-	-	10e		
				4E	-	-	-	-	744		
				6E	-	-	-	-			
South Africa	Sylvania Platinum	Volspruit	OC	Pt	-	-	-	-	Not reported	Granted mining right on 28 Jun '17 and to apply for Water Use Licence. Also waiting for Environmental Authorisation to commence mining - Limpopo Dept of Economic Development & Tourism did not give approval and Sylvania appealed against decision.	Open pit mine project at southern end of Northern Limb, close to N1 and N11 highway intersection and the North-South railway. Water licence application postponed until environmental assessment is accepted (Aug '16). Project assets contain about 1.8mnoz PGM.
				Pd	-	-	-	-	Not reported		
				Rh	-	-	-	-	Not reported		
				4E	-	-	-	-	Not reported		
				6E	-	-	-	-	Not reported		
South Africa	Wesizwe Platinum	Bakubung	UG	Pt	-	-	-	-	262e	Phase 1 development complete - includes commissioning of main and service shafts, as well as ore handling system - WorleyParsons is EPCM contractor. Total capex at end-Jun '17 was at R2.9bn. Bulk sampling for concentrator plant completed in Jun '16. Main commissioning to start in 4Q18 to reach 420kozpa 4E PGM full production by 2022.	Located on the Western Limb north of Rustenburg, adjacent to RBPlats's Styldrift project and north of Maseve mine.Twin vertical shaft and processing plant to form complex. Aveng contracted for sinking and development in 2012, but due to market conditions scope of work was reduced to only complete sinking by May '17.
				Pd	-	-	-	-	118e		
				Rh	-	-	-	-	31e		
				4E	-	-	-	-	420		
				6E	-	-	-	-	-		

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Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
Zimbabwe	Great Dyke Investments (Afromet JSC (50%), Pen East (50%))	Darwendale	UG	Pt	-	-	-	-	-	Feasibility study reportedly completed (Nov '16) after extensive exploration drilling, company's next development decision pending. Mining infrastructure design started Feb '16. Plans to invest additional $400mn to develop project and smelter.	Infrastructure includes a concentrator and smelter complex. Pen East Mining Company has the state-owned Zimbabwe Mining Development Corporation (ZMDC) as one of its shareholders. Pre-feasibilty study shows 45mnoz PGM reserves.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	800		
Projects with Development Potential											
Ethiopia	Yubdo Platinum (KEFI)	Yubdo	OC	Pt	-	-	-	-	0,1	KEFI in Jun '16 reported that mining licence extension application was lodged. Exploration project.	520km almost due west from Addis Ababa. The road is tarred to Gimbi (460km from Addis) and the remainder of the road is gravel. Previously owned by Nyota Minerals and private investors, sold in 2015. Small pilot plant was operating but is now an exploration site.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
Madagascar	Pacific Resources (90%), Jubilee Metals (10%)	Ambodilafa	-	Pt	-	-	-	-	-	PGE-Cu-Ni project forms part of the Vohipaha ultramafic/mafic complex. Environmental permit obtained. A target for limited drilling programme has been identified. Exploration fundamentally for iron-ore while Jubilee interested in PGE mineralisation on property.	Located 160km south east of the capital Antananarivo. Access is by way of a 90km road from the eastern coastal port of Nosy Varik.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Anglo Platinum	Der Brochen	OC	Pt	-	-	-	-	-	Exploration continuing, but drilling affected by capital cost cuts of the company. 2 proposed pits (North and South) for a future mine.	Mining right granted. Ore from open pit will be unsuitable for processing in the Mototolo Concentrator and will be transported off site for processing. Project borders Northam's Booysendal mine. Project to be fully mechanised and expected to be low cost.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	African Rainbow Minerals (46%), Platinum Australia (44%), Anglo American (10%)	Kalplats and Extended Project	-	Pt	-	-	-	-	-	Retention permit granted for Kalplats (2015). Prospecting licence for Extended Project. Platinum Australia completed a Definitive Feasibility Study which African Rainbow Minerals reviewed.	Exploration project located on the magnetites of the Stella Layered Intrusion in the North West province.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Afplats (Impala (74%), Ba-Mogopa Platinum (26%))	Leeuwkop	UG	Pt	-	-	-	-	170	LAST UPDATE FOUND - Jun '14: Shaft sinking reached 1km level (two thirds of target) and Implats considered making mine mechanised.	Project located on the Western limb of the Bushveld Complex. Exploration programme intersected both Merensky and UG2 reefs.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Bokoni Platinum Holdings (Atlatsa (51%), Anglo Platinum (49%))	Kwanda	-	Pt	-	-	-	-	-	Exploration project located in Northern Limb. No recent activity reported. Amplats signed deal 2H17 with Atlatsa to acquire Kwanda North and Central Block Prospecting Rights for R350mn, subject to DMR approval.	Atlatsa reportedly responsible for prospecting programmes. Project part of Flatreef Projects.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Nkwe Platinum (Zijin (60.47%), others)	Garatau-Tubatse	UG	Pt	-	-	-	-	-	Initial mine proposed on Garatau property. Feasibility study completed 2012. Environmental authorisation granted in Dec '15. Awaiting decision from DMR on mining rights (Oct '16). Company deadline to submit required information was on 11 Nov '16.	Eskom should be able to deliver power to Garatau from 2018 - claimed by owner. Start-up power, if needed before, will be supplied through diesel generators. Located near Modikwa, Marula mines. Zijin by 34.12%.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	300		

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Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Sylvania Platinum (50%), Sibanye (50%)	Everest North	OC-UG	Pt	-	-	-	-	-	Waiting for improved economic conditions. Environmental Impact Assessment for mining right was being carried out in 2012. Project had agreement to process ore at Aquarius concentrator plant (now acquired by Sibanye) at Everest South (now owned by Northam), but Aquarius placed the plant on care and maintenance in Jun '12.	Merensky reef disturbed and occasionally absent, deemed not of commercial interest. Near regional road systems.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Tjate Platinum Corporation (Jubilee Platinum (63%), NewPlats (27%))	Tjate	UG	Pt	-	-	-	-	-	Awarded mining right in Mar '17 and will mine PGMs, chrome, nickel and copper for up to 30yrs. Initial development to target Merensky first. Declared resource of 22mnoz 4E PGM. LoM is 20yrs.	Seeking investment partner. Sold Quartzhill portion of property to Anglo Platinum in 2014. ConRoast process to be used to overcome effects of UG2 chromitite mixed with Merensky ore.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	335		
				6E	-	-	-	-	-		
Tanzania	IMX Resources	Mibango	-	Pt	-	-	-	-	-	Exploration rights relinquished during 2015, no further activity reported on property. Classified as a Nickel-Copper-PGM project.	The resource extends over a 15km strike, 1.5km across strike and ranges from 1m to 32m in thickness. Maximum depth of deposit approximately 40m below surface.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
Zimbabwe	Global Platinum (ZMDC (State), Norinco (State-China))	Shin-Zim	-	Pt	-	-	-	-	-	Stage of development unclear. LAST UPDATE FOUND - Oct 2013: Exploration report was due by end-2013.	Concession used to belong to Implats. Located in Selous region. (ZMDC - Zimbabwe Mining Development Corporation).
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
Zimbabwe	Karo Resources (100%)			Pt	-	-	-	-	-	Karo Resources announced $4.2bn investment towards PGM mine and refinery with initial output by 2020 and reach 1.4mnozpa capacity within 3yrs.	Contractors expected to start work on mining area in Jun '18. Concession contains chrome ore which company said would exploit from Oct '18. Karo also plans to construct autocatalyst manufacturing facility on site.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	1 400		
Zimbabwe	Todal Mining (ENRC (60%), Zimbabwe Mining Development Corporation (40%))	Bokai (Bougois)	Unclear	Pt	-	-	-	-	-	LAST UPDATE FOUND - Jan '14: Project includes Kironde property. Current stage of development unclear.	Concession used to belong to Amplats. (ENRC - Eurasian Natural Resources Corp, ZMDC - Zimbabwe Mining Development Corporation).
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	180		
Idled Projects											
South Africa	African Thunder Platinum (69.75%), local community (9%), others	Smokey Hills	UG	Pt	7e	-	-	-	28e	Mine operations suspended since end-Mar '16 due to market conditions, after restarting in Jan '15 with plan to ramp up to 64kozpa 4E PGM. African Thunder Platinum signed deal with India's SAIL Group to sell 42.3% stake in Smokey Hills for $25mn.	Concentrator on site. Preiouvs agreement that Impala would purchase concentrate. Pt:Pd ratio 44:45 with proportion of each element in the resource being 44% Pt : 45% Pd : 10% Rh : 1% Au
				Pd	7e	-	-	-	29e		
				Rh	2e	-	-	-	6e		
				4E	16	-	-	-	64		
				6E	-	-	-	-	-		
South Africa	Anglo Platinum (50%), Sibanye (50%)	Marikana Mine	UG	Pt	-	-	-	-	-	Operations as independent mine entity halted in 2012, but resources being accessed via Kroondal infrastructure. Clarity on operation will follow from future reporting by Sibanye. (see *Kroondal*)	Sibanye acquired Aquarius in Oct '15. Metal concentrate sold to Impala Platinum in terms of an off-take agreement that was in place when Marikana Platinum Mine pooling-and-sharing agreement commenced. Metal concentrate surplus was refined by Amplats.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	103		
				6E	-	-	-	-	-		

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Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Anglo Platinum	Twickenham	UG	Pt	13	6	1	-	160	Operations under care and maintenance due to unprofitability, no production recorded since 2Q17. Produced 1.9koz platinum 1Q17. Amplats continues to trial new technology and made progress with rock cutting technology, eliminating need for explosives, while increasing stoping and development efficiencies.	Expansions halted and decision on resumption of operations delayed until after 2017. Hackney shaft under care and maintenance since Dec '15. Some of the mining footprint is being used to do research on new mining technology which includes small-scale mining activity. Mine planned to be mechanised.
				Pd	13	7	1	-	170e		
				Rh	2	2	0	-	30e		
				4E	29	15	1	-	360e		
				6E	33	16	2	-	420e		
South Africa	Atlatsa Resources (51%), Anglo Platinum (49%)	Bokoni	OC-UG	Pt	105e	92e	60e	-	140e	2017 4E PGM production down 34.6% from 2016 - mine was placed under care and maintenance Oct '17 as partners are no longer able to fund project. Amplats to only fund one-off costs via a loan to Atlatsa until end-2019. Open cast operation on care and maintenance since 2016 and unprofitable UM2 and Vertical shafts on care & maintenance since 2015.	2 planned long term projects: The Brakfontein project entails extension of existing decline shaft from 5 Level, and forms part of the production build-up to 100 ktpm of Merensky Reef ore. Project planned to replace declining Merensky output from Vertical and UM2 shafts. Brakfontein Merensky and Middelpunt Hill UG2 on target to achieve steady state by 4Q16 and 2019 respectively. PGM split: Pt (55%), Pd (35%), Rh (6%), Gold (4%).
				Pd	67e	59e	40e	-	90e		
				Rh	11e	10e	10e	-	15e		
				4E	191	167	104	-	250e		
				6E	-	-	-	-	-		
South Africa	Barplats (Eastern Platinum)	Crocodile River	UG	Pt	-	-	-	-	-	Hebei Zhongheng Tianda Platinum (HTZ) was supposed to purchase Barplats, including the mine, for $50mn cash from Eastplats. Deal fell through in Feb'17 after Barplats' shareholders voted against sale due to pending lawsuit that HTZ filed against them. Barplats to decide whether to develop, enter into JV or sell new Zandfontein tailings storage - with 540koz 4E PGM resource (Aug'17).	Eastplats pulled funding in 2013 and operation was placed on care and maintenance mid-2013. Searching for new BEE partner after former was bought out by prev board - DMR may revoke mining licence in response (Aug '16).
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	150		
South Africa	Eastplats (87%), Lions Head Platinum	Mareesburg	OC	Pt	-	-	-	-	-	Eastplats said (Aug '16) open pit could restart if funding secured and PGM markets improve. Developments stopped in May '12.	To share infrastructure with Spitzkop and Kennedy's Vale (see *Spitzkop - Kennedy's Vale*).
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	100		
South Africa	Eastplats (74%), Spitzkop Platinum	Spitzkop-Kennedy's Vale	UG	Pt	-	-	-	-	-	Eastplats said (Aug '16) that operation could restart if PGM markets improve and correct financing or partners are found. Trial mining was postponed 2010, subject to improved PGM prices. All project developments stopped in May '12. Scoping study submitted 2013 by Rhodium Reef (Eastplats subsidiary).	K'Enyuka completed study of concentrator design, infrastructure and road network (Jul '12). K'Enyuka claims project will be fairly easy to restart when economic conditions are ripe. Kennedy's Vale included a concentrator development project.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		
South Africa	Northam (100%)	Eland	OC	Pt	26	-	-	-	295e	Glencore sold operations to Northam Platinum for R175mn - deal finalised Jan '18. On care and maintenance since Oct '15 due to continuing poor market conditions and operational difficulties. Northam signed deal with Jubilee to use PGM recovery plant to process PGM-rich chrome tailings from Jubilee's PlatCro operations from Feb '19.	Assets include 2 mining rights (resource estimate 21.3mnoz 4E PGM). 250ktpm concentrator, chrome spiral recovery plant, 100mnt tailings storage facility, 2 decline systems and mining fleet in excess of 100 vehicles (which Northam plans to utilise at Booysendal South).
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	37	-	-	-	426		
				6E	-	-	-	-	-		
South Africa	Royal Bafokeng Holdings (52%), Anglo Platinum (36%), Free Floating (12%)	Maseve (formerly WBJV)	UG	Pt	-	-	50e	-	160e	On care and maintenance since Jul '17. Platinum Group Metals sold mine to RBPlat for $74mn - finalised Apr '18. As at 31 May '17, post impairment, Platinum Group Metals carried $317mn total deferred acquisition, development, construction, equipment and other costs related to the Maseve Mine	Concentrator on site. All major processing components installed and commissioned, 20MVA power installation completed and power is steady (Feb '17). First concentrate delivered to Anglo Platinum Feb '16 and targets commercial production during 17H1. Steady state target: 250kozpa.
				Pd	-	-	20e	-	70e		
				Rh	-	-	10e	-	20e		
				4E	-	-	85	-	250		
				6E	-	-	-	-	-		
South Africa	Ridge Mining (Sibanye (50%), Imbani (50%))	Blue Ridge	UG	Pt	-	-	-	-	75	Suspended operations since Aug '10. LoM of 18yrs was expected. Mining operations and development suspended in 2Q11. Operation used 2 declines, Central and North.	Located 30km south-east of Groblersdal. Failed to secure sale to Chinese consortium combined with Sheba's Ridge in late 2015. Testwork showed recoveries between 82%-86%. Sale of project to China National Art & Crafts terminated late 2014. Sibanye acquired Aquarius Oct '15. Concentrator was run by Minopex and was built by Bateman and Murray & Roberts.
				Pd	-	-	-	-	35		
				Rh	-	-	-	-	13		
				4E	-	-	-	-	125		
				6E	-	-	-	-	-		

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Country	Ownership	Project	Mine Type	Product	2015 Production (koz)	2016 Production (koz)	2017 Production Estimate (koz)	2018 Production Forecast (koz)	Capacity Guidance (kozpa)	Project Information	Infrastructure and Additional Information
South Africa	Sibanye (50%), Sylvania (25%), Ivanhoe (25%)	CTRP (Chrome Tailing Retreatment Plant)	TL	Pt	-	-	-	-	5e	Feed source from surrounding Glencore and Bayer chrome tailings dumps to extract PGMs. On care and maintenance since Aug '12.	Reported as an impaired investment. Originally started produciton in 2006. Located near Kroondal.
				Pd	-	-	-	-	2e		
				Rh	-	-	-	-	1e		
				4E	-	-	-	-	9		
				6E	-	-	-	-	-		
South Africa	Sibanye (39%), Anglo Platinum (35%), IDC (26%)	Sheba's Ridge	OC	Pt	-	-	-	-	-	On care and maintenance. Strategic operational decision needed.	Acquired by Sibanye as part of Aquarius acquisition in Oct '15.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				3E	-	-	-	-	380		
				4E	-	-	-	-	-		
South Africa	Western Platinum (Lonmin (82%), Mvelephanda Resources)	Limpopo (incl. Baobab and Dwaalkop)	UG	Pt	-	-	-	-	-	Limpopo operations were placed on care and maintenance in 2009. Mined 6kt in 2014 in limited form. Baobab concentrator still operational; processing low-grade ore from Mogalakwena mine. Amplats signed 3yr deal with Lonmin for full management of Baobab concentrator (Nov '16).	Limpopo includes Dwaalkop JV, which is a joint venture between Mvelephanda Resources (50%) and Western Platinum (50%) that is managed by Lonmin. Limpopo assets were fully impaired in 2015. Complex includes a concentrator. In 2011 Lonmin signed conditional agreement to sell controlling stake of this asset to BEE partner, Shanduka - pending merger with Pembani.
				Pd	-	-	-	-	-		
				Rh	-	-	-	-	-		
				4E	-	-	-	-	-		
				6E	-	-	-	-	-		

Notes:

MMZ - Main Mineralisation Zone (reef)

PCMZ - Peridotitic, Chromatitic Mineralisation Zone (reef)

LoM - Life of Mine

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2.1 Chrome Ore Projects

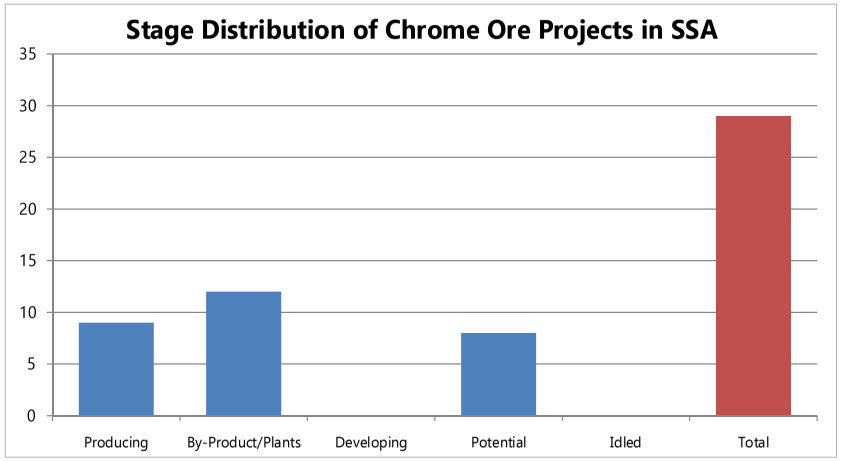
Key Facts

Sub-Saharan chrome ore reserves are dominated by 2 countries.

South Africa holds 72% of global chrome ore reserves and is Africa's most significant producer. 40% of SA's production is derived as a by-product from PGM mines. In recent years, there has been strong growth in the number of new plants to reprocess chrome and PGM tailings. In 2017, 70% of SA's chrome ore is exported, mainly to China, with remainder consumed by SA ferrochrome smelters.

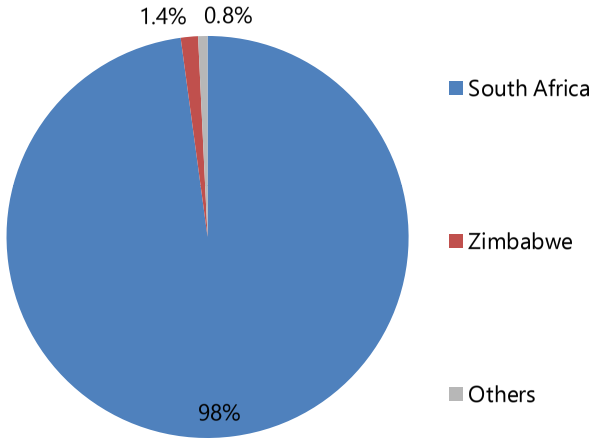
Zimbabwe holds about 12% of global reserves, but production has been hampered by political uncertainty in recent years. However, the removal of President Mugabe has drawn a great deal of investment. Zim Alloys, Zimasco and Karo Resources all plan to invest in capacity expansions from 2018. In anticipation of a boom in export volumes, the National Railways of Zimbabwe signed a deal with a Transnet-led consortium for $400mn capital injection to boost carrying capacity by 1.2mntpa.

Sudan and Madagascar also produce chrome ore, but only small scale at this stage and are not included in the table.



Sub-Saharan Chrome Production 2016

Total: 15mnt (44% of global)



Source: StatsSA, Zimstat, Bloomberg, news articles

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Chrome Ore Projects

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Projects in Production										
South Africa	Afarak (81%), BEE partners (19%)	All Operations	OC-UG-TL	413	203	451	690	840	1Q18 chrome production: 139kt, down 9.8% from prev Q. 2017 production increased significantly due to Jan '17 restart of opencast mining at Mecklenburg and higher output at Stellite. Underground mining at Mecklenburg to reach steady-state in 4Q18 while Vlakpoort mine was restarted 2Q18. Capacity at Stellite mine planned to double in 2019. Signed R20mn agreement (27 Sep '17) to acquire Zeerust Chrome Mine and hopes to start production 2H18.	Stellite's beneficiation plant comprises of a dense media separation (DMS) plant with RoM feed capacity of 480ktpa and a 60ktpa tailings retreatment shaking table (completed Feb '16). Excess lumpy ore (38% grade) sold to China. Zeerust has 2mnt opencast resource, 1.2mnt tailings and 180ktpa plant.
South Africa	Assore	Dwarsrivier	UG	1 129	1 338	1 392	1 427	1 500	2H17 chrome production: 714.5kt, up 5.5% from prev H on improved efficiencies. Net profit margin 21.6%. Mine generated over R800mn cash during 2017, allowing payback period of less than a yr for R450mn acquisition of 50% stake from ARM (finalised Jul '16).	Beneficiation plant at Dwarsrivier has design capacity to feed about 1.4mntpa RoM. Exported concentrate (95% of total) shipped from Maputo and Richards Bay ports. African Rainbow Minerals sold its 50% stake to Assore for R450mn in 2016.
South Africa	Bauba Platinum (60%), Bapedi Nation (37.5%), Hlabirwa (2.5%)	Moeijelijk	OC-UG	79	-	210	330	360	2H17 chrome production: 150kt, up 150% from prev H. Production restarted in Jan '17 from an opencast resource but lowered mid-2017 due to lower prices. Underground operations expected to produce 300kt in yr-ending Jun'18 and reach 360ktpa during 2H18.	20yr mining right granted in Jun '16. Off-take agreement with ASA Metals (now owned by Samancor). Underground production from LG6 at 40% grade. Bauba plans to invest R18.4mn in 420ktpa spiral circuit washing plant and 492ktpa crushing plant to be commissioned by Jul '18. Ore mining rate expected to be 30% higher at 3.8mnt over 12-yr mine life.
South Africa	Glencore (79.5%), Merafe (20.5%)	All Mines	OC-UG	3300e	3400e	3564e	3 581	3 623	2017 production up on fewer safety stoppages, better recoveries and less power interuptions as well as higher ferrochrome production.	Glencore-Merafe mainly focuses on ferrochrome production - from 5 plants located in Eastern and Western Limb. Mines include (Merafe share): Boshoek (100%), Kroondal and Wonderkop (20.5%), Helena (20.5%) and Magareng (20.5%). Horizon was sold during 2015.
South Africa	Hernic (Mitsubishi (51%), Others (49%))	Morula and Bokone	OC-UG	900e	500e	700e	718	1 500	Hernic has been in business rescue since Sept '17 and has identified Samancor as preferred buyer after discussions with potential buyers - expected to fetch around R1.7bn. Mine and smelting operations still producing and Hernic has managed to repay some of its debt.	Operates 4 smelters next to Morula (underground mine), about 15km from Bokone (opencast and underground mine). Company commissioned the 1.4mntpa (RoM feed) Dense Medium Separation (DMS) Plant in Jun '15 - producing DMS chips, lumpy, fines and coarse product. Exports mainly to Asian and European markets.
South Africa	Samancor Chrome (Terris Chrome (>70%), various BEE partners, minority shareholder)	All Operations	OC-UG-TL	2600e	1880e	2600e	2 761	5030e	In Nov '16, Samancor awarded Zizwe (mining contractor) an opencast mining contract for 960ktpa at Eastern Chrome Mines (ECM). In Jul '17, DMR approved transfer of Lesedi mining rights, now awaits Sky Chrome mining right transfer (both aquired from IFM). Samancor to become the largest chrome ore producer globally if Hernic acquisition is approved.	ECM located in Steelpoort valley and includes 3 underground mines, 1 opencast mine (Tweefontein, Hooggenoeg and Quartz), 4 surface beneficiation plants and 4 tailings re-treatment plants. WCM located close to Mooinooi and includes 2 underground mines, 1 opencast mine, 2 surface beneficiation plants and 2 tailings re-treatment plants. Samancor acquired Lesedi, Rooderand and Sky Chrome mines from IFM in 2016 as well as Dilokong from ASA Metals in 2017.
South Africa	Tharisa Minerals (74%), Thari Resources (20%), Tharisa Community Trust (6%)	Tharisa	OC	1 137	1 294	1 370	1 400	2 000	1Q18 chrome production: 367kt, unchanged from prev Q. 2017 production up on improved efficiencies as company transitioned from contractor to owner operation model. Yr-ending Sept '18 production guidance: 1.4mnt, up 5.2% from 2017; targets 2mntpa by 2020. Ongoing R390mn expansion plan includes upgrade to Genesis plant crusher, raising output by 3% from mid-2018, and construction of 380ktpa recovery plant, raising output by 30% from late-2019.	Mine has 2 concentrators, the Genesis (1.2mntpa processing capacity) and Voyager (3.6mntpa) plants, recovering chrome by gravity concentration methods and PGMs by froth flotation. Opencast LoM expected till 2038; transition to underground mining to commence in 2032.
Zimbabwe	Benscore Investments (83%), Cometal (15%), Rosenmarket Investments (2%)	ZimAlloys	OC-UG	-	-	-	300	Unclear	Zim Alloys (under judicial management since July 2013) creditors approved $100m investment by Balasore Alloys - to settle debts and develop old and new smelters. Expects all furnaces to reach full 120ktpa capacity by mid-2019. Chrome ore production guidance - 2018: 300kt, 2019: 700kt, 2020: above 1mnt as six new 60ktpa concentrator plants gradually come online.	Company claims that most chrome resources need underground mining development to access. In talks with govt to cede additional 15% of its chrome ore claims in order to secure chrome ore export licence.
Zimbabwe	Sinosteel (63%), China-Africa Development Fund (10%), Zimbabwe Indigenous Shareholders (27%)	Zimasco	OC-UG	-	60e	350e	560	600	2017 production up significantly after Zimasco surrendered 50% of its claims to state in exchange for export license. In Jan '18, Zimasco was stuck with 200kt stockpile due to lack of transport to smelters. In Feb '18, Zimasco emerged from 18mnths of judicial management. 2018 production guidance: 560kt, up 60% from 2017, with 360kt earmarked for export and 200kt used in for domestic smelting.	Mines located along Great Dyke deposit at South, Middle and North Section. Mines include Shurugwi, Lalapanzi, Guinea Fowl and South of Shurugwi open pit mines, Peak and Railway Block underground. Mining has been leased out to small scale miners in North Dyke Section. EIA completed for Impinge, Lalapanzi (North and South) and South of Shurugwi.

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Chrome Ore Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production Estimate (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Non-Focused/Retreatment Plants in Production										
South Africa	African Rainbow Minerals	Nkomati	OC-UG	385	174	343	343	900e	2H17 chrome sales:199kt, up 37.7% from 1H17, up 106% y-on-y on ramp-up of chrome washing plant from Oct '16 after closure in Nov '15 due to low chrome ore prices.	(see *Nickel* Projects Table)
South Africa	African Rainbow Minerals and Implats	Two Rivers	UG	270	286	248	255	300e	2H17 chrome sales: 116kt, down 12.7% from 1H17, down 19% y-on-y due to mining of low-grade split-reef areas.	(see *Platinum* Projects Table)
South Africa	Anglo Platinum	Waterval Chrome Plant	TL	189e	172e	108e	152	350	Reprocesses UG2 material from Anglo Platinum Rustenburg mining activities.	Located in Rustenburg. IFM, before being acquired by Samancor, had agreement to fund construction and purchase chrome produced.
South Africa	Anglo Platinum (74%), Baphalane Siyanda Chrome (26%)	Amandelbult Chrome Recovery Plant	TL	-	235	654	700	700e	1Q18 chrome ore production increased 45% from prev year as spiral plant reached steady state and improved yields. Project currently under review to curb all-in-sustaining-costs.	Cost of project R415mn and generated R320mn operating free cash flow. Baphalane Siyanda Chrome is 75% owned by Baphalane community and 25% by Siyanda Resources.
South Africa	Anglo Platinum (50%), Sibanye-Stillwater (50%)	Kroondal	UG	189e	172e	108e	152	600e	(see *Platinum* Projects Table)	(see *Platinum* Projects Table)
South Africa	ChromTech (74%), Thakadu Resources (26%)	ChromTech	TL	-	-	-	252	420	Plant commissioned Jan '18 and was expected to reach steady-state Mar '18 with R230mn total investment.	ChromTech operated 5 plants with combined 250ktpa capacity prior to this new plant.
South Africa	Glencore, Merafe, partners	UG2 Plants (East and West)	TL	2110e	2220e	2050e	2 095	2 353	UG2 production volumes in 2017 were 7.6% less than 2016 due to a lower offtake in 2Q18/7? when prices were low.	Reprocessing of UG2 material from multiple mines. Glencore-Merafe have access to various UG2 plants; Kanana Impala (100% Merafe), Lonmin UG2 plants (20.5% Merafe), and Mototolo (Amplats 50%, Glencore 50%).
South Africa	Jubilee Platinum	Dilokong Chrome Retreatment Plant (DCM)	TL	-	63	60	74	120e	1Q18 chrome production: 9.8kt, down 16.8% form prev Q. 2017 production down due to plant upgrades at chrome recovery circuit. Jubilee signed agreement (Mar '17) to process 60ktpa 3rd party higher-grade chrome and PGM-containing ore.	Commissioned in Feb '16 to process 1.1mnt of PGM-bearing chrome ore tailings. Upgraded chrome recovery circuit plant and further upgrades expected to commence in 3rd Q '18.
South Africa	Lonmin	All Operations	TL	1 512	1 510	1 370	1 404	1600e	1Q18 chrome production: 293kt, down 16.8% from prev Q. ChromTech secured R250mn to construct tailings treatment plant at Lonmin; expected to come online within Apr-Sept '17 period. Plant is part of Lonmin's bulk tailings treatment project.	(see *Platinum* Projects Table)
South Africa	Northam	Booysendal	UG	166	254	284	289	500e	(see *Platinum* Projects Table)	(see *Platinum* Projects Table)
South Africa	Northam	Zondereinde	UG	290	300	327	333	500e	(see *Platinum* Projects Table)	(see *Platinum* Projects Table)
South Africa	Siyanda Resources	Masa Chrome	TL	189e	172e	108e	119	330	Amplats sold its 50.1% stake to Siyanda Resources - completed Jan '18 as part of sale of Union PGM mine. Reprocesses UG2 material from Union mining activities.	Produces 3 products: Metallurgical, Chemical and Foundry Grade chrome. Located at the Union mine site (see *PGM* project table). Exports via Richards Bay.
Projects with Development Potential										
South Africa	Glencore (79.5%), Merafe (20.5%)	De Grooteboom	OC-UG	-	-	-	-	Unclear	Advanced exploration stage - 1.5mnt total resource.	-
South Africa	Glencore (79.5%), Merafe (20.5%)	Klipfontein/ Waterval	UG	-	-	-	-	Unclear	Exploration status unclear. 28.2mnt measured and indicated resource.	Klipfontein/Waterval prospecting right successfully converted to mining right and incorporated into Kroondal rights in 2014.
South Africa	Glencore (79.5%), Merafe (20.5%)	Townlands Extension 9	UG	-	-	-	-	Unclear	Reported (early 2016) that exploration activities have been performed here to fulfil requirements of the Prospecting Works Programmes.	13.85mnt total resource.
South Africa	Glencore (79.5%), Merafe (20.5%)	Wonderkop	UG	-	-	-	-	Unclear	Reported (early 2016) that basic exploration activities have been performed here to fulfil requirements of the DMR's Prospecting Works Programmes (application for a prospecting right).	7.05mnt total resource.
South Africa	Sylvania Platinum	Grasvally	OC	-	-	-	-	Unclear	Environmental assessment was officially recognised Jun '17, but activities cannot start until mining, water and sanitation authorisations are secured.	Bulk sampling underway for planned 15kt. Initial tests indicated good results with concentrations of +50% achieved
Zimbabwe	Afarak	Waylox mine (Prince of Wales and Trixie)	Unclear	-	-	-	-	Unclear	Afarak reported Waylox mine as mine development project (2013). Former owner, Waylox Mining operated the mine from 2008 until 2010. Trixie property contains an alluvial chrome deposit of 1.9mnt at 13.8% chromite grade. Current status and nature of operation unclear.	Properties form part of Darwendale region. Waylox was previously owned by Chromex which was acquired by Afarak in 2010.

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Chrome Ore Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production Estimate (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Zimbabwe	Karo Resources	Unclear	Unclear	-	-	-	Unclear	Unclear	KARO RESOURCES plans to start mining as early as Oct'18 as part of $4.2bn investment announced Mar '18.	Chrome ore is contained in the periphery of its mining lease area for planned PGM project.
Zimbabwe	RioZim	Maranatha	Unclear	-	-	-	-	90	Management placed project on hold pending improvement in chrome ore prices. 6mnt reserve (2011 estimate).	Current ferrochrome capacity of 26.4kt for export from 2 furnaces at the smelter. Management waiting for chrome ore prices to rise before initiating funding to start project. Expansion plans for 3

Notes:

Production for specific mines not always reported.

Technical notes:

MG - Middle group (reef)

UG2 - Upper Group 2 (reef)

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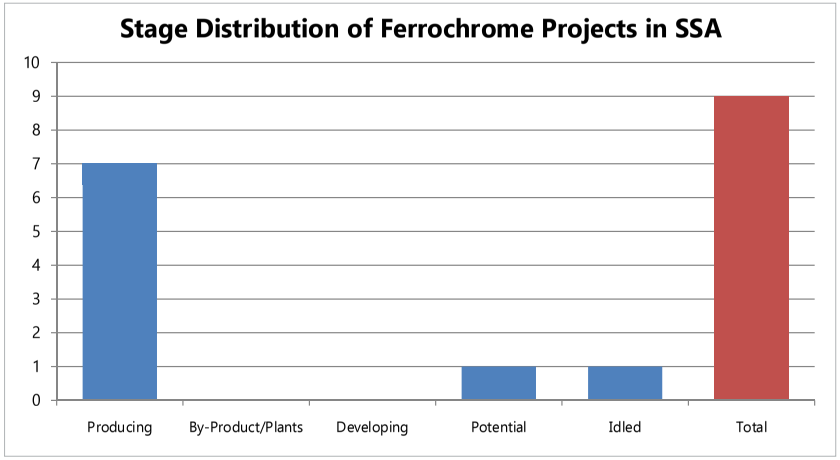
2.2 Ferrochrome Projects

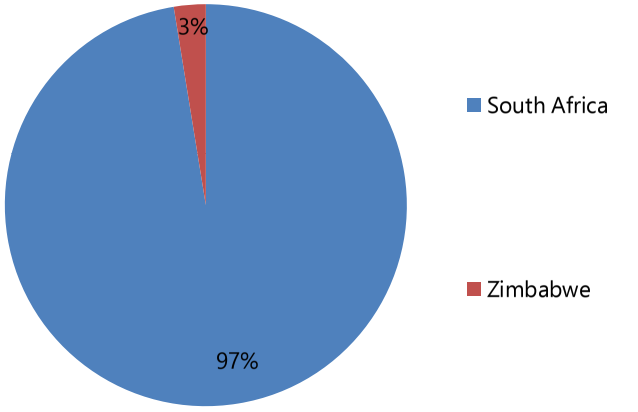
Key Facts

South Africa and Zimbabwe are the only ferrochrome producers in Africa, fed by their vast reserves of chrome ore. SA produces almost all of Africa's ferrochrome, mainly through the Glencore-Merafe joint-venture (the largest global producer) and Samancor. The industry is undergoing major consolidation, with these 2 large players having absorbed some smaller producers. Samancor's latest target is Mitsubishi-owned Hernic Ferrochrome, the acquisition of which would make it the world's largest producer.

Zimbabwe's small ferrochrome industry has been plagued by several issues, including low profitability. However, the major 2 producers, Zimasco and Zim Alloys, have both recently emerged from business rescue and are resuscitating smelters. Further improvement is on the cards with the help of foreign investment, incl. a $1bn injection by Sinosteel in Zimasco's smelting capacity expansion.



Sub-Saharan Ferrochrome Production 2016
Total: 3.8mnt (39% of global)



Source: Merafe Resources 2016

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Ferrochrome Projects

Country	Ownership	Project	2015 Production (kt)	2016 Production Forecast (kt)	2017 Production Forecast (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Projects in Production									
South Africa	Afarak	Mogale Alloys	77	76	78	88	120	1Q18 ferrochrome production: 23.3kt, down 26.1% from prev Q on breakdowns of processing equipment. Afarak switched two 30ktpa silicomanganese furnace to ferrochrome in Jun '17 and would bring online 4th furnace 4Q17 - plant now has 120ktpa ferrochrome capacity.	Installing an energy saving 2.8MW heat recovery unit in Mogale to curb CO2 emissions and boost productivity. 2 Submerged Arc Furnaces, 2 DC Arc Furnaces. Four key products: silicomanganese, plasma ferrochrome, charge ferrochrome and stainless steel. In Dec '14, Afarak added 18ktpa granualtion plant.
South Africa	Glencore (79.5%), Merafe Resources (20.5%)	Glencore-Merafe JV	1 839	1 916	1 926	2 013	2 339	1Q18 ferrochrome production :409kt, down 7.7% from prev Q on furnace downtime for additional maintenance requirements at the Lion and Rustenburg ferrochrome plants. Capacity utilisation at end-2017 was 82%.	12 semi-closed pelletising and sintering furnaces, 2 closed pelletising and sintering furnaces, 1 semi-closed premus kiln furnace and 7 closed premus kiln furnaces. Smelters are Wonderkop, Rustenburg, Boshoek (all Northwest), Lydenburg (Mpumalanga) and Lion I and II (Limpopo).
South Africa	Hernic (Mitsubishi (51%), Others (49%))	Hernic Ferrochrome	340e	320e	350e	300	420	Entered business rescue Sept '17, but operations are expected to continue as long as markets remain stable and project has cash flow. Business rescue practitioners identified Samancor as the best suitor to acquire operations for R500mn.	Four ferrochrome furnaces; two 37MVA closed furnaces, one 54MVA closed furnace and one 78MVA closed furnace. Jubilee Platinum reached deal in Jan '15 with Hernic to process Hernic's chrome and PGM tailings with from Dec '16.
South Africa	Samancor	All operations	1170e	1220e	1200e	1 600	2 265	Between 2016-17, Samancor acquired ASA Metals and IFM operations to increase its capacity to almost that of Glencore-Merafe JV. Samancor warned higher winter electricity tariff will force it to temporarily shut some furnaces at its primary (excl. ASA and IFM) smelters.	Samancor has 4 smelting operations, Ferrometals (FMT), Middelburg Ferrochrome (MFC), Tubatse Ferrochrome (TFC) and TC Smelter (TCS) with 12 open submerged arc furnaces, 4 closed submerged arc furnaces and 2 direct current furnaces (at MFC)
South Africa	Traxys	Richards Bay Alloys	Unclear	0	100e	100	150	Tata Steel KZN shut its Richards Bay ferrochrome plant Jun '15. Traxys, metals financier and marketer, acquired ferrochrome plant (Jun '16) but also struggled to maintain profitability and shut the plant for 3mnths (Sept '17) due to low ferrochrome prices.	Traxys to supply plant in Richards Bay with ore from Steelpoort and Sefateng mines, both more than 600km away.
Zimbabwe	Benscore Investments (83%), Others (17%)	Zim Alloys	53e	36e	100e	120	146	$100mn investment deal approved with Balasore Alloys Group, an Indian ferroalloys producer, to settle ZimAlloys' $50mn debt and work towards refurbishing and restarting the blast furnaces.	2nd largest ferrochrome producer in the country. Raised ferrochrome recovery jig plant capacity by 176% to 28.2ktpa. In talks with African Chrome Mines to set-up 2 electric arc furnaces.
Zimbabwe	Sinosteel (63%), Others (37%)	Zimasco	108e	74e	100	120	300	$80mn investment planned for new furnace smelting capacity. Sinosteel plans to invest $1bn into Zimbabwe to boost ferrochrome production by 66.7% to 300ktpa in next 5 yrs.	Largest ferrochrome producer in Zimbabwe. Chrome ore sourced from Peak Mine and Railway Block in Shurugwi and from tributor miners along the Great Dyke.
Projects with Development Potential									
South Africa	Siyanda Resources	Siyanda Chrome Smelting	0	0	0	0	150	Siyanda Resources announced Sept '15 it was studying ferrochrome smelter project. Project start-up expected in 2019-20.	Project site close to power substation and railway line connecting to Richards Bay port.
Idled Projects									
South Africa	Assmang (Assore (50%), African Rainbow Minerals (50%))	Machadodorp Ferrochrome Works	16	20	2e	0	250	2H17 ferrochrome production not clear as plant was expected to run for a further 6mnths (according to Yr-ended Jun '17 results) due to depletion of slag for recovery plant. Plant is expected to be recovering ferromanganese from slag dumps.	Machadodorp has 5 24MVA furnaces, metal recovery plant and a pelletising plant. Metal slag recovery plant has around 20ktpa capacity.

Technical Notes:

PSP - Pelletising and Sintering Plant

SAF - Open Submerged Arc Furnace

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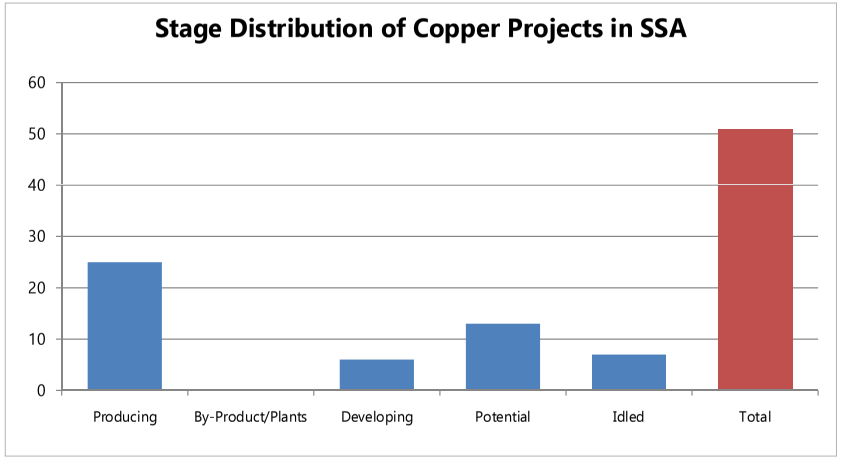
2.3 Copper Projects

Key Facts

The DRC is Africa's largest copper producer, accounting for half of the continent's output, followed by Zambia. Together the two countries contributed 10% to 2017 global output. New investment, spurred by expectations of rising prices, is in many cases led by Chinese companies and is directed mostly at the DRC and Zambia, but also Botswana and Namibia.

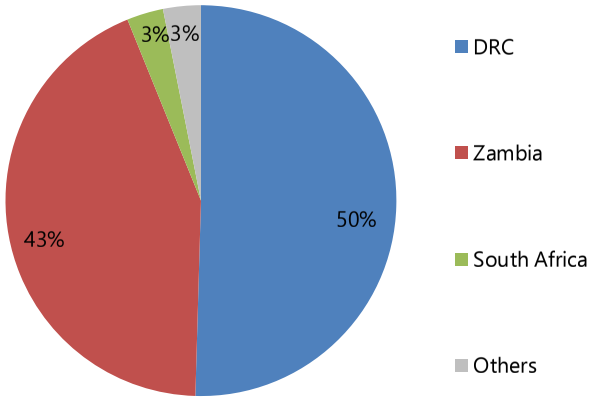
Production growth has been hampered by several factors, including political and regulatory uncertainty in both Zambia and the DRC and a shortage of infrastructure, particularly electricity.

Transport infrastructure is also a problem. Some concentrates need to be exported via South Africa, a 3000km trip by road. A planned railway linking Zambia to Malawi could allow railed exports via Mozambique. Fixing the run-down Tazara line, to allow more exports through Tanzania, would also increase export options.

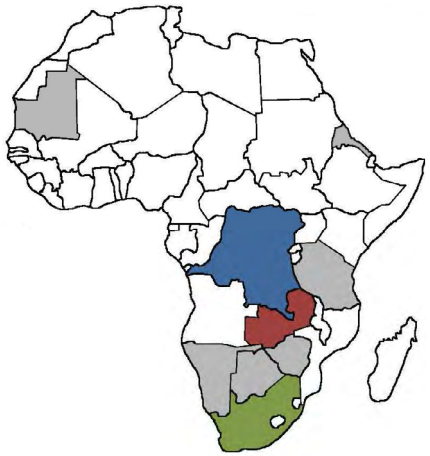


Sub-Saharan Copper Production 2017

Total: 2mnt (10.7% of global)



Source: WBMS through Bloomberg



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Copper Projects

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Projects in Production										
Botswana	Cradle Arc Investments (60%), ZCI (40%)	Mowana	OC	Unclear	0	9	12	22	Reached 12ktpa contained copper production rate 3Q17 after mining restarted Apr '17 (stopped Nov '15). Investigating dense media separation plant installation and could lift output to 23kt by Q3 2018. Alecto Minerals (now Cradle Arc) bought 60% stake in Mowana for $8.3mn (Dec '16) and is operating mine. Mine life of opencast 11yrs. Potential underground operations can lift life to 20yrs. Cradle Arc listed on LSE's AIM market (3Q17).	Located at Dukwi. First production was in 2008. Mine consists of Mowana pit, Thakadu pit and plant at Mowana processing ore from both pits.
DRC	Eurasian Resources (95%), State (5%)	Frontier	OC	Not reported	107	100+	100+	100+	Seeking buyer for mine since Mar '17 after 2014 attempt failed on low copper prices. Mine produces concentrates at 27% Cu. Signed long term agreement in Jun '16 to sell about 50% of concentrate output to China Nonferrous Metals' Foreign Engineering and Construction	Processing plant and mining licence acquired in 2012. Located near Sakania town. 27MW power supply deal with state-owned SNEL.
DRC	Eurasian Resources (70%), Gécamines (State) (30%)	Boss Mining	OC	Not reported	Unclear	Unclear	Unclear	50e	Produces 42ktpa of copper cathode and supplies 69ktpa concentrates to company's Chambishi smelter. Also produces significant cobalt volumes.	Acquired in 2009. Operations located in Lubumbashi, Kakanda and Luita (Katanga Province). Facility includes concentrators and an electro-winning plant. Associated Chambishi smelter closed anode and reduction furnaces on electricity shortage (Nov '16).
DRC	Eurasian Resources	Comide	OC	Not reported	Unclear	Unclear	Unclear	22e	Produces 200ktpa oxide and 44ktpa fines concentrate, both at 9% Cu.	Commissioned in 2012 and located near Kolwezi. Includes two dense medium separators and a spiral concentrator.
DRC	China Molybdenum (56%), BHR Newwood (24%), Gécamines (State) (20%)	Tenke Fungurume	OC	204	216	219e	200	500	1Q18 production: 39.5kt. Expansion delayed until market conditions improve. China Molybdenum bought 56% from Freeport in May '16. Lundin sold its 24% stake for $1.1bn to BHR Newwood, affilate of Chinese private equity firm BHR Partners (21 Nov '16) - sale finalised Apr '17.	Sulphuric acid plant commissioned 1Q16. Uses electricity from Nseke hydroelectric power station. Mine has 200MW agreement with state power company. Also produces cobalt concentrates; supplies to Chambishi smelter.
DRC	Jinchuan (75%), Gécamines (State) (25%)	Ruashi	OC	35	32	32	32	38	May '18: Jinchuan to double copper and cobalt production in next 2-3yrs from Ruashi and Chibuluma (Zambia). Mining consists of 3 open pits and SX-EW plant.	Share of electricity supply from diesel generators reduced to 1% in 2017 from 16% in 2016. Mineral resources at end-2017 571kt copper at 2.3% grade and 75kt cobalt at 0.3%. Exploring partnerships with fellow miners to decrease dependency on hydropower. Also produces cobalt.
DRC	Compagnie Minière de Musonoie Global - COMMUS (Zijin Mining (51%), Gécamines (State) (28%), Zhejian Huayou (21%))	Kolwezi	OC	-	-	22	40	60	Production started in Jun '17. Zijin to raise about $508mn through private placement to spend on Kolwezi project.	Situated near town of Kolwezi, close to railway and road connecting to Lubumbashi. Reserves of 1.5mnt copper (average grade 4%). Concession rights held since 2008.
DRC	MMG	Kinsevere	OC	80	81	80	80	80	1Q18 production: 19.9kt, down 1% from prev Q, up 3% y-on-y. Offtake agreement with Trafigura (multinational commodity trader) over 8yr LoM.	Power supply initiatives continue to improve availability and lower cost of grid supply; more than 90% of power sourced from the grid in 4Q17, rest diesel-generated. Located 35km from Lubumbashi, Katanga province. Cathodes trucked to Dar es Salaam (Tanzania); freight cost shifts to Trafigura at mine gate.
DRC	Glencore (100%)	Mutanda and Kansuki	OC	216	213	192	230	230	1Q18 production: 50.8kt, down 1.4% from prev Q. Glencore now owns 100% after buying 31% stake from Fleurette Group for $922mn.	Refurbishment of generation and transmission equipment by state power utility to increase power supply to Mutanda and Katanga (see Katanga below) to 450MW by end-2017.
DRC	Shalina Resources (95%), State (5%)	Etoile	OC	Not reported	Not reported	Unclear	Unclear	52e	Feb '15: Shalina announced development of further 20ktpa processing plant with first output by Jul '16. Produces concentrates as well as cathodes. 2014 copper output was 15kt.	Located 10km northeast of Lubumbashi. Produced 5kt cobalt in 2017.
DRC	Sinohydro, China Railway Group (combined 68%), Huayou (5%), Gécamines (State) (32%)	Sicomines	OC	10e	Unclear	36	Unclear	250	DRC govt halted copper exports in Oct 2017, ordered local refining. Production began Nov '15. Output target for 2016 was 125kt - half of potential target due to incomplete power infrastructure.	Contract signed in Jun '16 for construction of 240MW Busanga hydropower scheme, to supply 170MW to mine, to be completed in 5yrs. Plant part of a "resources-for-infrastructure" deal between state and its two Chinese partners.

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Copper Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
DRC	Tiger Resources (95%), State (5%)	Kipoi	OC	26	23	32	32	50	1Q18 production: 5.1kt, up 7.3% from prev Q on processing of ores from Kipoi North trial mining which ended in the Q. Jan '18: Tiger Resources sold DRC assets Kipoi, Lupoto and La Patience to Sinomine Resource for $260mn to reduce debt - awaiting shareholder and regulatory approval. No other mining takes place; production from stockpiles only.	Work programme to expand plant capacity to 32.5ktpa completed. LoM estimated as over 16yrs at 32ktpa. Eventual target is 50ktpa. Tiger considered cobalt production from mine. Lubumbashi-Likasi railway passes through project.
DRC	Katanga Mining (Glencore (64.7%), Gécamines (State) (25%))	Katanga	OC-UG	114	-	2	150	300	1Q18 production 27.7kt after operations restarted Dec '17 (after suspension 3Q15); to ramp up to 300kt in 2019. Apr '18: Gécamines started legal proceedings to dissolve Katanga subsidary Kamoto, due to capital shortage it says caused by high interest on debts owed to Glencore. Glencore opposes. Postponed to Jun '18. Also facing legal proceedings over not paying royalty to Ventora Developments. Glencore owns 86.3% of holding company after buying 31.1% stake from Fleurette Group for $38mn (Feb '17).	Collaborating with govt power company to refurbish Inga turbines and transmission infrastructure to guarantee required 200MW power supply. Company owns 2 smelters - KTC and Luilu.
Eritrea	Nevsun (60%), Enamco (State) (40%)	Bisha	OC	62	25	11	15	15	1Q18 production 4.1kt, 156% from prev Q, up 173% y-on-y due to new processing methods and deployment of new heavy mining equipment. No production in 2H16 as mine started zinc production (see Zinc) and was unable to produce consistently salable concentrates from ore mined. LOM halved to 4 yrs (mid-2021) as smaller pit now to be mined.	Good road and port infrastructure; power generated on site. Nevsun faces damages claim for allegedly using forced labour during 2008-2010 mine construction in Canadian court (Sept '16), still ongoing by May '18.
Namibia	Weatherly	Tschudi	OC	11	16	15	14	20	May '18: Several mining areas underwater after increased inflows following mining blast in early Apr '18. Production expected to be impacted, additional pumps to be acquired. 1Q18 production: 4.2kt, down 12.2% from prev Q on seasonal rains. Mine life to end in 2020. Company examining options to increase LoM. Currrent nameplate capacity 17ktpa. As part of potential expansion to 20ktpa, solvent extraction plant demonstrated 20ktpa potential (Nov '16).	Apr '18: Weatherly looking for buyers for company or its assets. Company completed construction of 4 new leach pads. Earthworks and clay liners for remaining pads also complete. Easy access to site by rail and road for delivering equipment and supplies; local water supply sufficient
South Africa	Hebei Iron and Steel (26%), BEE partners (26%), Tewoo (15%), General Nice (15%), IDC (15%), CAD Fund (4%)	Palabora	UG	43	45e	48	48	60	Construction of R9.3bn Lift II underground expansion started 2015 and to last until 2020, extending LoM to 2033. First production from Lift II was expected 3Q17. Mine's ore capacity 30kt/day.	Lift II expansion infrastructure progressing: overhead lines, underground raisebore holes, workshop, underground substations, silo, permanent air and water services complete. Mine produces zirconium, magnetite and nickel sulphate by-products.
Zambia	Barrick	Lumwana	OC	130	123	116	112	150e	1Q18 production: 21.8kt, down 18.6% from prev Q, down 15.8% y-on-y, due to temporary lower grades and mill shutdowns.	Concentrator on site.
Zambia	NFC Africa Mining (China Non-Ferrous Metals Company (85%), ZCCM (State) (15%))	Chambishi	Unclear	Not reported	30e	45	60	130	Mines at the Chambishi Main Mine and Chambishi West Mine, and is currently developing the 100ktpa Chambishi South-East Mine. Sandvik to supply mining & automation equipment from Mar '17 to 2020 (announced Sept '16). Associated Chambishi smelter also processes ore from other mines.	-
Zambia	First Quantum	Sentinel	OC	33	140	191	220	300	1Q18 production: 50.3kt, down 12% from prev Q due to rainy season, up 38% y-on-y on operational improvements. Mine opened Aug '15; commercial production reached on 1 Nov '16. Company president said in Feb '17 that reaching 300ktpa capacity off cards for moment, but production should still increase.	Mar '18: Company contesting $8bn tax assessment ($6bn interest, $2bn penalties) over claimed unpaid import duties on goods, consumables and spare parts for mine over 2013-2017. Receiving unrestricted power supply from mid-Sept '17 after agreeing to tariff hikes; can import a portion of their power. Company offered to build more capacity in the interconnector from Zimbabwe. Project also known as Kalumbila.
Zambia	First Quantum (80%), ZCCM (State) (20%)	Kansanshi	OC	227	253	251	240	400	1Q18 production: 63.6kt, down 1.9% from prev Q, unchanged y-on-y. First Quantum may invest further $350mn to upgrade mine and $700mn in new smelter, but only if it sees "fiscal stability over period of time" in country (Feb '17). ZCCM suing First Quantum over insufficient interest on loans meant for construction of Kansanshi smelter (Nov '16) but attempts to settle out of court (Jul '17).	Receiving unrestricted power suppy from mid-Sept '17 after agreeing to tarrif increases. Mine has smelter which also processes copper from Sentinel (see above). Mine receives sufficient power for normal production.

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Copper Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Zambia	Glencore (73%), First Quantum (17%), ZCCM (State) (10%)	Mopani	Unclear	92	41	42	44	170	1Q18 production: 14.4kt, down 4% from prev Q. Mine partially suspended in Sept '15 until cost-reducing expansions completed. Glencore investing $1.1bn over 3yrs in 3 new mine shafts (first sunk May '16) and concentrator to extend LoM by more than 25 yrs, to open by late 2018. Target of 170ktpa announced in 2013.	Mines have associated concentrator, smelter and refinery.
Zambia	Jinchuan (85%), ZCCM (State) (15%)	Chibuluma South	OC-UG	13	10.5	11	11	19	May '18: Jinchuan to double copper and cobalt production in next 2-3yrs from Chibuluma and Ruashi (DRC). 2017 production up 5% on mining of Chifupu deposit which started production in 4Q16 to extend mine life to 2022. Mine to close thereafter unless further deposit found.	Mineral resource at end-2017: 106kt contained copper at 2.9% grade. Located in Lufwanyama district, Copperbelt province; is operated by Jinchuan subsidiary Metorex. Also produces cobalt.
Zambia	EMR Capital (80%), ZCCM (State) (20%)	Lubambe	UG	24	19	19	19	45	Feb '18: Ramp-up to 45ktpa expected over next 2 yrs. Vale and ARM sold their 80% to private equity firm EMR Capital for $97mn in Aug '17.	Mine faces challenge of high water levels inhibiting access to areas of deposit. Previously called Konkola North Project.
Zambia	Vedanta (79%), ZCCM (State) (21%)	Konkola Copper Mines (Konkola, Nchanga and Nampudwe mines)	UG-OC	122	108	84	95e	400e	1Q18 production 22kt, down 8.3% from prev Q on lower leach plant recoveries and heavy rains. Nchanga mine restarted in 2017 after put on care and maintenance in Nov '15 on low prices.Vedanta plans to invest $1bn to quadruple output in next 3yrs (Jun '17).	New electro-static precipitator installed in 4Q16 to clean dust-filled furnace gas, raising smelter output by 35%.
DRC	Eurasian Resources	Metakol (Roan Tailings Reclamation Project)	TL	-	-	Unclear	Unclear	70	Hydro-metallurgical facility to retreat tailings from historic mining. Construction started in 2015, reportedly ramping up production in 2017. Phase 2 expected to produce 105ktpa.	Located near Kolwezi. Signed an agreement with China Nonferrous Metals' Foreign Engineering and Construction to build a $700mn processing plant (Sept '15).
Projects in Development										
Botswana	Cupric Canyon	Khoemacau	UG	-	-	-	-	80	Cupric Canyon secured $50mn loan to develop mine (Feb '17). Construction start delayed to 2nd half '18 due to permitting issues and cost uncertainty with first production 2 yrs later (Jul '17) at 50ktpa copper and 1.4mnozpa silver. Future expansions could increase annual output to 120ktpa.	Botswana Power Corp to build $495mn new powerline to connect northwest of country to grid; Khoemacau signed up for 30MW. Completion expected 2020. Bought nearby mothballed Boseto mine (closed in Feb '15) for its processing plant - to be upgraded from 3mntpa to 3.6mntpa ore. Mine also known as Qhoree.
DRC	Jinchuan (77%), Sodimico (23% - state owned)	Kinsenda	-	-	-	-	16	24	Started trial mining end-2017. Commercial operation expected 1Q2018. 10 year LoM, possible extension to 30+. Claimed as one of world's highest grade copper deposits with declared mineral resources of 20.7mnt at 5.6% copper grade. Bankable feasibility study completed in 2012.	Near border town of Kasumbalesa, Katanga province. Redevelopment of 1980 mine.
DRC	Nzuri Copper (85%), La Generale Industrielle et Commerciale au Congo (10%), State (5%).	Kalongwe	OC	-	-	-	-	19	Apr '18: Stage 1 feasibility shows 18.7ktpa copper and 1.4tpa cobalt over 8yr LOM. JORC ore reserves 234.8kt copper and 27.1kt cobalt. Stage 1 will comprise of an open pit mine and on-site 1mntpa DMS plant. Stage 2 could consist of a full SX/EW plant and cobalt circuit to process DMS generated rejects and cobalt-only ore.	Dec '17: Huayou Cobalt (world's largest cobalt chemicals producer) bought 14.7% stake in Nzuri for $7.6mn, mainly to fund ongoing exploration in Kalongwe. Nzuri increased stake from 30% to 85% by buying shares from DRC-registered GICC for $3mn in 2016. Located in Katanga province, about 15km from Kamoa. Nzuri formerly known as Regal Resources. Also contains cobalt.
DRC	Ivanhoe (39.6%), Zijin Mining (39.6%), State (20%), Crystal River Global (0.8%)	Kamoa-Kakula	UG	-	-	-	Unclear	542	Feb '18: New resource estimate for Kakula increased Kamoa-Kakula indicated resource to 1bnt at 3.17% copper. Rated 4th largest global discovery with highest grade among top 10 deposits. Nov '17 preliminary assessment shows 370ktpa copper production over initial 10yrs. Development began mid-2014. Construction of twin declines at Kamoa began 1Q16, currently ahead of shedule. Production expected 2018. Kakula excavation started Jun '17. Exploration continuing on Kakula Discovery property.	Company signed agreement with govt power company to upgrade 3 hydroelectric plants - Mwadingusha, Koni and later Nzilo 1 - to eventually provide 200MW to Kamoa, sufficient for 300ktpa operations. Initial 11MW electricity fed to grid in Sept '16. Mine to have rail link to Lobito port (Angola). Started drilling at new sites Kamoa Ouest (West) and Makalu/Kakula NE (Aug '17). '16: Govt stake increased to 20% and undertook to support mine development, not levy special taxes.
Zambia	Intrepid Mines	Kitumba	UG	-	-	-	-	40	Intrepid considering options (May '18) after Dec '17 mine sale to Weatherly collapsed in Apr '18 on lack of financing. Development expected to cost $433mn with 13yr LoM at 37ktpa average output. JORC compliant resource estimated at 578kt contained copper at 2.32% grade.	Part of Intrepid's Mumbwa project, located about 200km west of Lusaka. Site readily accessible, grid power nearby, adequate supply from nearby ground water sources. Mining licence valid until 2029. Optimised feasibility study completed Oct '15.

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Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Zambia	CNMC Luanshya Copper (China Non-Ferrous Metals Company (80%), ZCCM (State) (20%))	Luanshya (Baluba and Muliashi mines)	Unclear	44	0	0	Unclear	45e	Jan '18: CNMC to spend $13mn to reopen mine in 2018. LOM 3yrs. Baluba on care and maintenance since Sept '15 on low price. Previously reported lowering grades and structural difficulties at Baluba. Produced 44.8kt in 2014 (15.3kt from Baluba, 29.5kt from Muliashi).	-
Projects with Development Potential										
Botswana	MOD Resources (70%), Metal Tiger (30%)	T3	UG-OC	-	-	-	-	28	Jan '18: Pre-feasibility study shows 23-28ktpa copper production over 10-12 yrs. Cash cost $2 690-2 867/t. Feasibilty and decision to mine expected in 4Q18.	Dec '17: Drilling reveals potential for simultaneous underground development alongside planned open-pit operation with central planned processing plant. Original discovery in Mar '16. Also to produce 690-903kozpa silver.
Botswana	MOD Resources (70%), Metal Tiger (30%)	T1 (Mahumo)	-	-	-	-	-	-	53kt copper resource at 2% grade - highest grade in Kalahari copperbelt. Underground mining scoping study underway.	Discovered in 2001. Also contains silver.
DRC	Hayou	Luiwishi and Lukuni	-	-	-	-	-	-	Acquired asset from assets from Gécamines for $52mn in Jun '15.	Hayou also controls copper and cobalt smelters which process material mainly from artisanal mines.
DRC	Ivanhoe (68%), Gécamines (32%)	Kipushi	UG	-	-	-	-	-	Zinc-copper redevelopment project (see Zinc). Company outlined plan for 2yr construction period. Definitive feasibility expected in 2	Mine previously mined approximately 60mnt ore with grades of 11% zinc and 7% copper between 1924 and 1993.
DRC	Tiger Resources	La Patience	-	-	-	-	-	-	Jan '18: Tiger Resources sold DRC assets Kipoi, Lupoto and La Patience to Sinomine Resource for $260mn to reduce debt - awaiting shareholder and regulatory approval. Prev. planned to resume exploration after renewing exploration permit. Previous exploration included geophysical survey.	Tiger bought project in Jan '13. Located 10km southeast of the company's Kipoi mine.
DRC	Tiger Resources (95%)	Lupoto	-	-	-	-	-	-	Jan '18: Tiger Resources sold DRC assets Kipoi, Lupoto and La Patience to Sinomine Resource for $260mn to reduce debt - awaiting shareholder and regulatory approval. Project has 14.7mnt resource at 1.4% copper for 200kt contained copper. Tiger received environmental study as part of process to convert exploration licence to a mining licence.	Located approx. 10km to the south of the company's Kipoi mine.
DRC	Soludo Lambert Mining (Cape Lambert Resources (50%), Paragon Mining (50%))	Kasombo	-	-	-	-	-	-	Jan '18: preliminary drilling shows 0.22-3.5% copper grades and 0.1-0.13% cobalt grades. Exploration started 2017 by Fe Limited under terms sheet which assigns 100% rights to Fe Limited.	Located within 3-5km of Cape Lambert's Kipushi processing plant.
Namibia	Deep-South	Haib	-	-	-	-	-	21.3	Feb '18: Preliminary assessment shows 21.3ktpa over 55yr mine life. Estimated 2.6mnt copper-molybdenum resource. Deep-South bought 70% stake from Teck Resources (Feb '17, finalised by May '17), to now hold 100%.	Located 8km from South African border, 12 - 15km from national road and 120km from nearest rail. Deep-South previously known as Jet Gold.
South Africa	SHiP (85%), Galileo Resources (15%)	Concordia	-	-	-	-	-	-	Exploration started Feb '17, using nontraditional and traditional methods, but in Dec '17 Galileo Resources (formerly 51%) opted not continue with further exploration and diluted its share to 15%. 5 massive bulk copper mineralised zones within a 10km radius of each other.	Prospecting licence valid until Aug '19. Located 20km north of Springbok, Northern Cape province. All outcroppings on surface, in an area with good infrastructure.
South Africa	Orion Minerals (73.3%), BEE partners (26.8%)	Prieska Copper Mine	OC	-	-	-	-	15	Apr '18: Mining right and environmental assessment applications submitted. Feb '18: Resource estimated at 365kt contained copper at 1.2% grade. Feasibility expected in 4Q18 and production start in 4Q20 at 12-15ktpa copper and 20-25ktpa zinc concentrates.	Project located along dip and strike extensions of ore previously mined. Major infrastructure in place. Orion acquired Agama in Mar '17 which owned 73.33% in project. Mine produced 430kt copper, 1mnt zinc between 1971 and 1991. Closed shaft in better than expected condition when inspected (Jun '17). Also known as PC Project.
Uganda	Sipa Resources (100%)	Akelikongo	Unclear	-	-	-	-	-	Rio Tinto agreed to invest $59mn in exploration for up to 75% stake (May '18) in Kitgum Pader project, which comprises Akelikongo (copper-nickel) and Pamwa (lead-zinc-silver)prospects. Sale subject to Rio conducting due diligence by Aug '18.	Drilling results include 84.5m@ 0.53% Ni eq including 5.2m@ 1% Ni, 0.4% Cu and 0.05% Co in basal semi-massive sulphide.

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Copper Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project Information	Infrastructure and Additional Information
Zambia	Moxico Resources	Mimbula II	OC	-	-	-	-	-	Inferred resource of 35.5mnt at 1.23% Cu (reported in 2012).	Former Konkola Copper Mines project situated in Chingola. Project also contains 1.7mnt of tailings at 0.94% copper.
South Africa	Smarty Mineral Investments	Musina	OC	-	-	-	-	20	Jan '18: Environmental study released for proposed 20ktpa open-pit copper mine.	Situated on outskirts of Musina town.
Idled Projects										
Botswana	Bamangwato Concessions (BCL) (State)	Selibe-Phikwe 5	UG	Unclear	Unclear	-	-	Unclear	Govt closed the mine in Oct '16 stating it is unable to subsidise mine further and started liquidation. Liquidators to sell assets piecemeal if no buyer for mine found (Jun '17). Produced combined 31kt of nickel, copper and cobalt in matte (including Tati nickel mine production) in 2015. Previously planned to produce 60kt in 2016.	High sulphur (20%) matte was sent to Norway refinery and low sulphur (6%) matte to Zimbabwe refinery. Nickel produced as co-product (see Nickel).Complex made up of smelter and 5 underground production areas - Phikwe No 1, Phikwe Central, South East Extension (SEE), Selebi North and Selebi mines. Mine consumed 20% of country's electricity.
DRC	Mawson West (Galena Private Equity Resources Fund)	Dikulushi	OC	0.3	-	-	-	7e	Project on care and maintenance since Jan '15.	Located in in Haut Katanga District, Katanga province. Silver was produced as co-product.
DRC	Mawson West (Galena Private Equity Resources Fund)	Kapulo	OC	14	Unclear	Unclear	-	16	Commercial production achieved Jul '15 but placed on care and maintenance Mar '16 due to low prices. LoM 5 yrs.	-
Namibia	Weatherly	Central Operations (Otjihase and Matchless)	UG	Unclear	-	-	-	12	Mine on care and maintenance, ready for an immediate restart subject to developing needed skills. Evaluating opportunity to produce 10-12ktpa at reduced cost for next 10yrs for capex of under $10mn. Produced copper in concentrate when active.	Matchless and Otjihase mines make up Weatherly's Central Operations unit. Acquired from Ongopolo Mining in 2006. Matchless is 30km southwest of Windhoek; Otjihase 18km northeast of Windhoek. Good road, rail access. Power from national grid.
South Africa	O'okiep Copper	Carolusberg and O'Kiep Sulphide Tailings Dams	TL	-	-	-	-	-	Xtract Resources obtained option to buy project, but decided (Feb '16) not to process copper tailings dam material as recoveries were too low to produce viable concentrate.	Mine closed in 2004. Company now engaged in plant hire.
Uganda	State	Kilembe	Unclear	-	-	-	-	-	4.5-6mnt reserve copper mine. Extraction ceased 1983 due to dilapidated equipment and political turmoil. In 2013 Tibet Hima was granted 25yr mining concession, rescinded in 2017 due to non-compliance. Currently still idle.	Ugandan govt is seeking a new investor for the mine.
Zimbabwe	Zimbabwe Mining Development Corporation (State)	Mhangura, Sanyati, Lomagundi, Alaska	Unclear	-	-	-	-	-	Mhangura mine was closed in 2000, Sanyati and Lomagundi in 1999, due to weak prices. Owner looking for "serious and holistic" investors to help reopen mines as it wishes to diversify from diamonds and gold. Also looking to refine copper locally.	Zimbabwe Mining Development Corp seeks $500mn investment to revive its Mhangura Sanyati and Alaska mines and build new refinery & smelter at Alaska.

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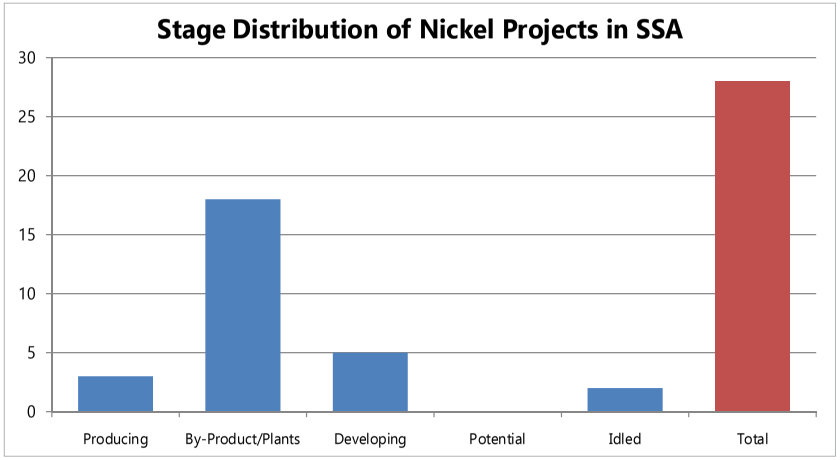
2.5 Nickel Projects

Key Facts

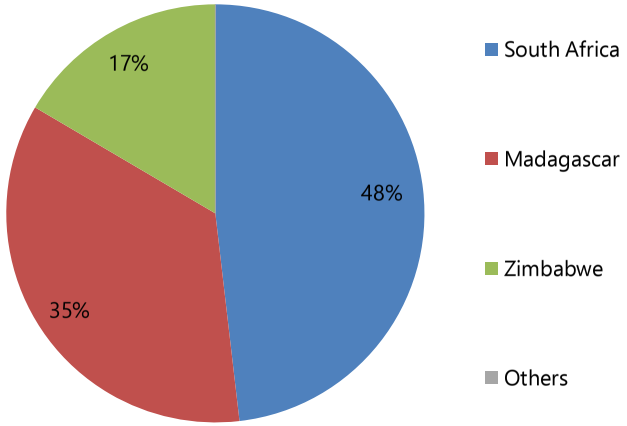
Africa accounts for only 5% of global nickel production. South Africa is Africa's largest producer, but only the Nkomati mine is primarily focused on mining nickel, with most other output derived as a by-product of PGM mining.

The second biggest producer is Madagascar, with all volumes from the Ambatovy project. Zimbabwe is the only other producer with volumes mainly derived from the Bindura Nickel mine and the rest as by-product from PGM mines (owned by SA producers). Botswana's only producer BCL's Tati Nickel went under liquidation in 2016 due to an unprofitable operating environment. Mine equipment was planned (in June 2017) to be sold separately if no bids were approved for the acquisition of the mine. Early stage projects are under development in Tanzania and Zambia.

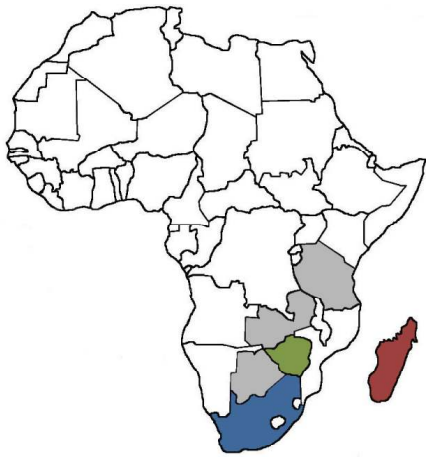


Sub-Saharan Nickel Production 2017

Total: 100kt (5.1% of global)



Source: Bloomberg



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Nickel Projects

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production Forecast (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project information	Infrastructure and Additional Information
Projects in Production										
Madagascar	Sumitomo (47.7%), Korea Resources (40.3%), Sherrit (12%)	Ambatovy	OC	47	46	35	42	60	1Q18 production: 5.6kt, down 28.4% on weather disruption in Jan and lower sulphuric acid availability. 2017 production declined due to failures in acid plant and sulphur smelter, poor reliability of pressure acid leach, unplanned shutdown on hydrogen sulphide emissions and lower recovery rates. From 11 Dec '17, Sherritt's share was reduced to 12% from 40%. 2018 production guidance: 40-43kt, up 17% y-on-y.	HPAL processing plant is fed by 220km slurry pipeline from mine site. Slurried ore processed and refined to produce high-grade nickel and cobalt briquettes. Plant located close to rail and road - 8km from Port Toamasina. LoM about 29yrs.
South Africa	African Rainbow Minerals (50%), Nornickel (50%)	Nkomati Nickel	OC-UG	22	17	16	16	Unclear	2017 production declined due to constraints at Pit 3 and low grades due to processing of stockpiled ore. At end 2017, 11kt nickel concentrate was stockpiled due to shipping delays which were expected to resume in Apr '18. Mining currently confined to lower-grade eastern benches while company awaits construction of 2nd large pile wall. Output planned to stay at about 16ktpa to 2019. Botswana govt paid Nornickel $45mn to settle dispute over BCL pulling out of $281mn purchase of Nornickel's 50% stake.	Mine has PCMZ and MMZ concentrator plants on site; concentrates were to be smelted at BCL plant in Botswana with matte exported to Nornickel (Finland). All metals in concentrate produced (excluding chrome), are sold to Metal Trade Overseas AG. Tailings pipeline project was set to be completed in Feb '18 and connects mine to cross-valley storage at Onverwacht.
Zimbabwe	Asa Resource Group (75.4%), Others	Bindura Nickel (Trojan mine)	UG	6.4	7.2	7.1	7.0	17	(Jul '17) Yr-ended Mar'17 nickel production: 6.8kt, up 2.1% from prev yr boosted by more equipment (incl. two 20t dump trucks) availability. Made 31% gross margin. 2 executives of Chinese-owned Asa, incl CEO, relieved of their duties after allegedly moving $4.3mn out of Zim illegally. ASA Resource Group administrators (in Dec '17) were evaluating buyout offers - company delisted from AIM in Jan '18. Redeepening project also underway to extend mine life by 5 yrs.	Alongside Trojan mine Shangani mine remains on care and maintenance. Bindura also owns a 17ktpa smelter and 14.5ktpa refinery. ASA plans to restart smelter by Mar '18 (at 83% completion as of Jul '17) to produce nickel matte. Feasibilty study to restart part of refinery underway. ASA also owns Hunter's Road deposit that forms part of the Trojan project.
Non-Focused Nickel Producers										
South Africa	African Rainbow Minerals (51%), Impala Platinum (49%)	Two Rivers	UG	0.6	0.6	0.6	0.6	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum	Amandelbult	OC-UG	1.7	1.6	1.4	1.5	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum	Mogalakwena	OC	14.8	16.9	16.0	15.6	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum (50%), Sibanye (50%)	Kroondal	UG	0.4	0.4	0.6	0.4	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum (50%), African Rainbow Minerals (41.5%), BEE partners (8.5%)	Modikwa	UG	0.5	0.5	0.3	0.3	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum (50%), XK Platinum Partnership (50%)	Mototolo	UG	0.4	0.4	0.3	0.4	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum	Twickenham	UG	-	-	-	-	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Anglo Platinum (85%), Bakgatla-Ba-Kgafela (15%)	Union	UG	0.3	0.3	0.3	0.2	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Impala Platinum (96%), "ESO" (4%)	Impala	UG	4.0	3.0	4.3	4.8	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Impala Platinum (73%), BEE partners (27%)	Marula	UG	0.3	0.3	0.2	0.3	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Lonmin	Marikana	OC-UG	3.5	3.3	3.2	3.3	Not Reported	(See *Platinum* Projects Table)	-

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Nickel Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production Forecast (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project information	Infrastructure and Additional Information
South Africa	Lonmin (50%), Anglo Platinum (42.5%), Northam (7.5%)	Pandora	UG	0.1	0.1	0.1	0.1	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Royal Bafokeng Platinum (67%), Anglo Platinum (33%)	BRPM	UG	1.7	1.9e	2.1	2.1	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Sibanye	Platinum Mile	TL	-	-	-	-	Not Reported	(See *Platinum* Projects Table)	-
South Africa	Sibanye	Rustenburg/WLTR	UG-TL	2.9	2.1	2.8	2.8	Not Reported	(See *Platinum* Projects Table)	-
Zimbabwe	Anglo Platinum	Unki	UG	1.7	1.7	2.2	2.2	Not Reported	(See *Platinum* Projects Table)	-
Zimbabwe	Impala Platinum (50%), Sibanye (50%)	Mimosa	UG	3.5	3.4	3.6	3.5	Not Reported	(See *Platinum* Projects Table)	-
Zimbabwe	Impala Platinum (87%), State (13%)	Zimplats	UG	4.3	5.4	4.9	4.3	Not Reported	(See *Platinum* Projects Table)	-
Projects in Development										
South Africa	Uru Metals (50%), BSC Resources (50%)	Burgersfort	Unclear	-	-	-	-	-	Burgersfort is a Nickel-Copper-PGM exploration project located 250km northeast of Johannesburg. No start-up dates indicated by owners. Project has a resource estimate of about 1bnt at 0.22% nickel contained. Drilling and resource estimate done in 2012.	Located close to a railway line and road.
South Africa	Uru Metals	Zebediela	OC	-	-	-	-	20	(Apr '17) Project's Preliminary Economic Assessment completed with indicated resources of 485mnt @ 0.25% Ni. Metallurgical work also started. Company renewed its 3 prospecting rights early Nov '16 for another 2yrs. No start-up date indicated by owner.	Located in Limpopo province (16km from Mogalakwena mine and adjacent to Ivanplats's project), close to existing rail, highway and electrical power infrastructure. Claims a 25yr LoM.
Tanzania	Blackdown Resources	Dutwa	OC	-	-	-	-	30	Timeline for development unclear. Declared resource of 107mnt at 0.91% nickel contained. Ore contains low iron and high silica content and project is forecasted to utilise Atmospheric Tank Leaching Process.	Located 110km from the city of Mwanza and near highway to ports of Dar es Salaam and Tanga. A 20km power line will be available from acid plant. Water to be drawn from Lake Victoria (25km away).
Tanzania	Glencore (50%), Barrick Gold (50%)	Kabanga	UG	-	-	-	-	40	Barrick Gold and Glencore expect to receive new prospecting licence after govt cancelled retention licence which allowed miners to keep ownership of deposit despite not having plans to develop immediately.	LAST UPDATE FOUND - May '15: Barrick and Glencore looking to sell stakes in JV.
Zambia	First Quantum	Enterprise	Unclear	-	-	-	-	60	First Quantum's Enterprise nickel mine is 12km from the producing Sentinel copper mine. Commissioning of processing plant sections at Enterprise complete but processing copper ore from Sentinel and should continue to do so in the short term (Oct '16). Pre-strip mining activities deferred due to depressed nickel price (Aug '17).	Scope to increase capacity from current target of 38ktpa to 60ktpa if market conditions encourage it.

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Nickel Projects continued...

Country	Ownership	Project	Mine Type	2015 Production (kt)	2016 Production (kt)	2017 Production Forecast (kt)	2018 Production Forecast (kt)	Capacity Guidance (ktpa)	Project information	Infrastructure and Additional Information
Idled Projects										
Botswana	Bamangwato Concessions (BCL) (State)	Tati Nickel	OC-UG	Not reported	Not reported	Not reported	-	Not reported	BCL in provisional liquidation after it couldn't afford $754mn to keep operations running. In Apr '18, company was removed from provisional liquidation despite it not being liquid. Mine reported as loss-making with nickel cash cost around $8/lb ($17 000/t) - said Mineral Resources Minister (Oct '16).	While managed by Nornickel, ore was processed into concentrate at on-site Phoenix enrichment plant, then smelted at the BCL plant in Selebi Phikwe, Botswana.
Zambia	Jinchuan	Munali	UG	-	-	-	-	5.0	Operations stopped in 2011 on low prices and poor operational performance. Restart was planned for 2017Q3, but missed deadline. Targeting 30-40kt nickel concentrate (also containing cobalt, copper and PGMs) output over 7yr LoM. Current design capacity of 5ktpa with possible future expansion to 8ktpa.	Located 70km south of Lusaka on new sealed roads. Electricty supply from Kafue dam hydroelectric system with dedicated line. 20km from rail siding connected to South Africa's Durban port and Botswana's BCL smelter. Mine operated by Consolidated Nickel Mines.

Notes:

All production figures reported are for nickel contained

MMZ - Main Mineralisation Zone

PCMZ - Peridotite Chromotitic Mineralised Zone

HPAL - High Pressure Acid Leach

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