

WORKSHOP ON
MINERAL RESOURCES
AND THE GOLD VALUE
CHAIN IN ANGOLA

18 APRIL 2024

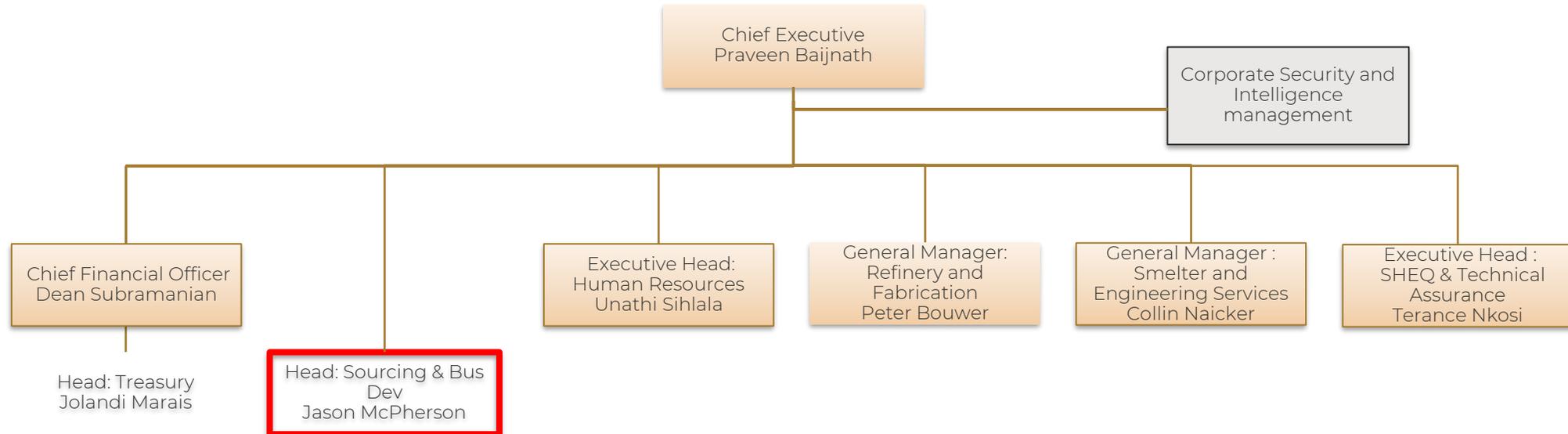
RAND REFINERY



INTRODUCTION TO RAND REFINERY

RAND REFINERY

HIGH LEVEL ORGANOGRAM



A PROUD HERITAGE

- One of the largest single-site, integrated smelter, refiner and fabricator of precious metals.
- Established in 1920 – a 104 year heritage of integrity and excellence
- More than 50 000 tons of gold refined since 1921 – nearly one third of all the gold ever mined in the world
- Over 61 million Krugerrand bullion coins sold.
- Rand Refinery is the only London Bullion Market Association ("LBMA") accredited precious metals refiner in Africa
- One of only 5 international LBMA Referees, and the only referee in the southern hemisphere
- Serving 36 countries across the world
- Rand Refinery currently employs >400 associates

Our reputation for integrity and excellence as well as our longstanding history as one of the world's leading refiners has seen Rand Refinery receive global accreditation, international referee status and ISO certification.

Accreditation

- **1921:** London Bullion Market Association
- **1974:** New York Commodities Exchange
- **1993:** Tokyo Commodities Exchange
- **2006:** London Metal Exchange (silver)
- **2017:** Global Precious Metal Code

ISO Certification

- **ISO 9001:** Quality Management System
- **ISO 14001:** Environmental Management
- **ISO 45001:** Occupational Health and Safety Management
- **NNR:** Nuclear Accredited facility

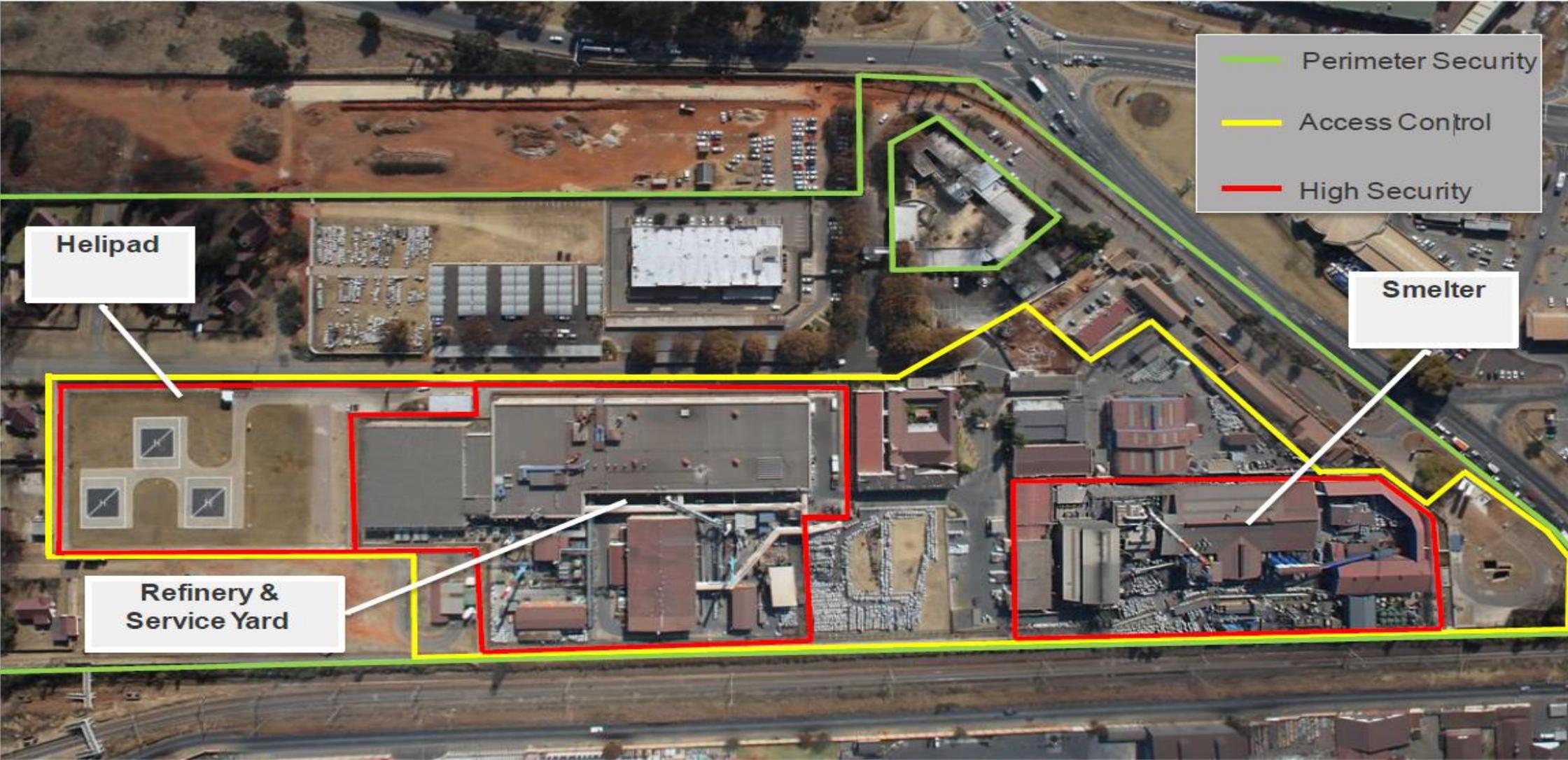


LBMA
GOOD DELIVERY
REFEREE

RAND REFINERY SITE

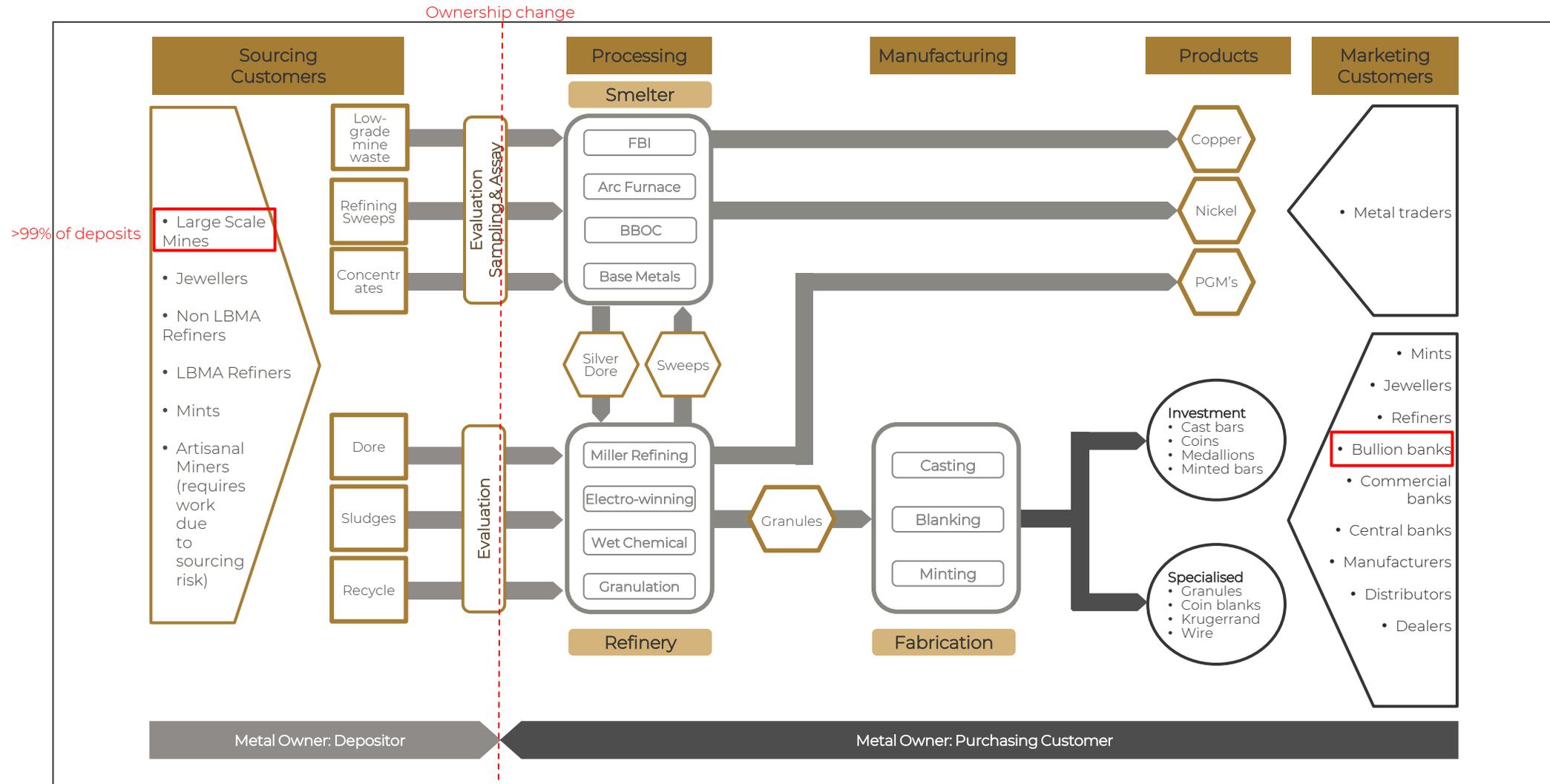


RAND REFINERY SITE



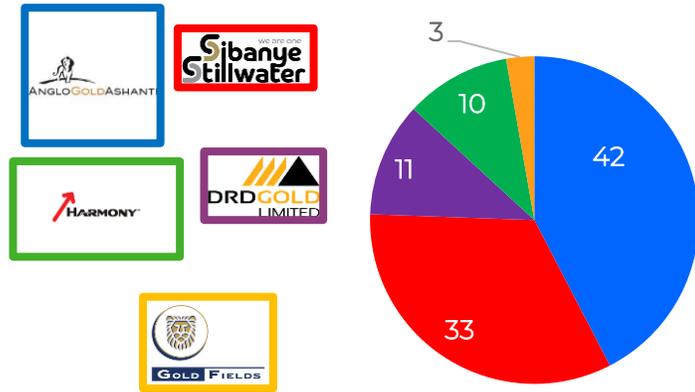
HIGH LEVEL PROCESS FLOW

Refining, Smelting and Fabrication



FORMATION, SHAREHOLDING, DEPOSITORS & BANKS

Shareholding Percentage



Where our Shareholders are Listed



Other Listed Depositors



FORMATION

- 1920 - formed with capital raised from South African gold mining houses
- 1920 – 1993 – an affiliate of the Chamber of Mines
- 1993 – independent company with shareholders directly appointing the board

CAPACITY & FOCUS

- 1921 – 370 tons gold per annum refinery completed
- 1970 – 1000 tons gold per annum refinery due to upgrades
- Currently - capacity to refine 400-600 tons gold annually
- Set-up to serve mines – 99% of our input is mines gold (unlike others)

MINE SHAREHOLDERS

- Listed on western stock exchanges – governance and comfort to our other depositing mines & bullion banks



GOVERNANCE COMMITTEE'S ENABLE VARIOUS ELEMENTS

Key Slide

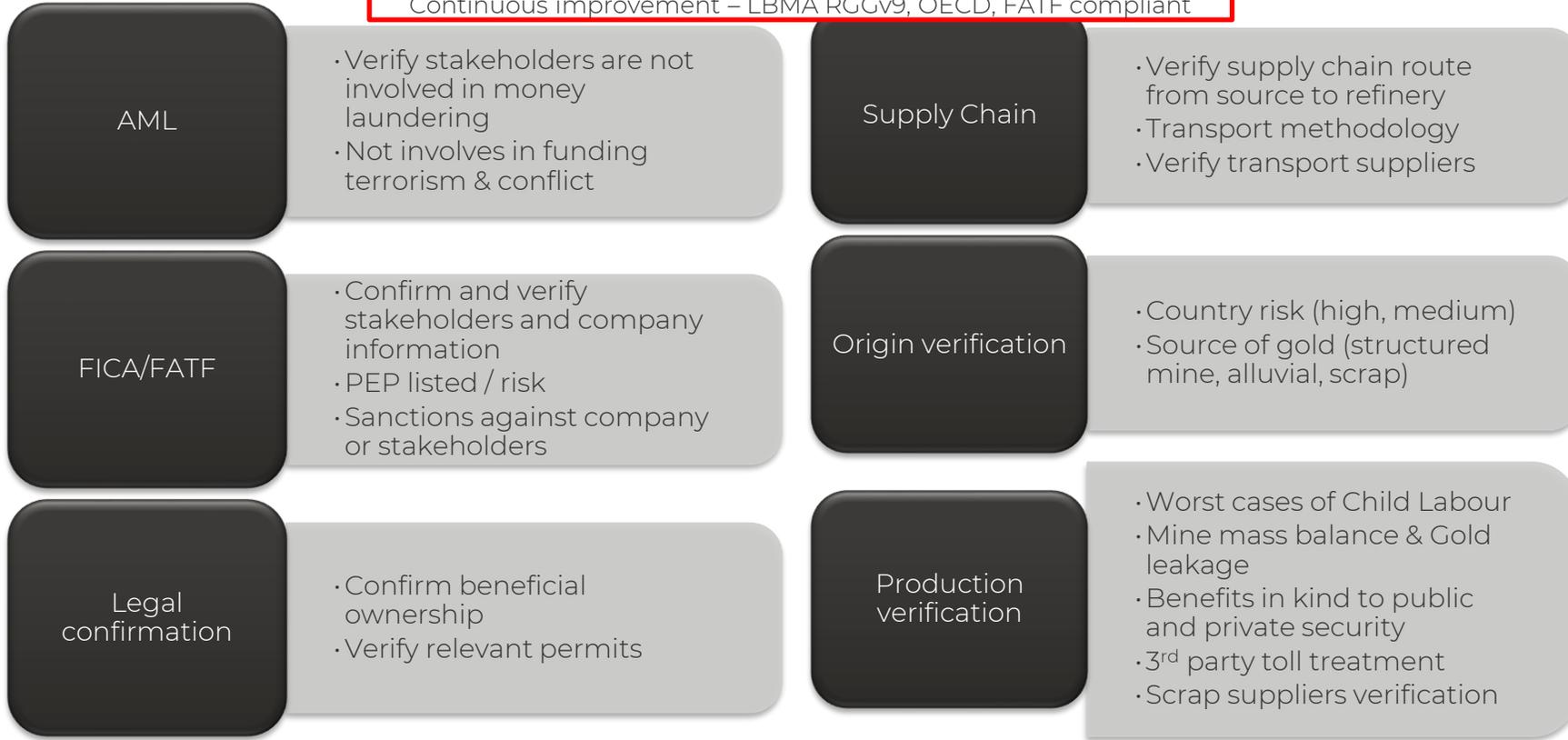
Gold refining is more than just purifying gold, key enablers and competencies are required to add value and manage risk. All these elements must come together and support each other.



RESPONSIBLE SOURCING AND DUE DILIGENCE



Continuous improvement – LBMA RGGv9, OECD, FATF compliant



FATF
Financial Action Task Force

FIC
Financial Intelligence Centre

FATF
Local SA Laws:
FICA
Precious Metals Act
Organised Crime Act
Mining Act
Protection of Information Act
(FIC, SARS, SADPMR, DMRE)

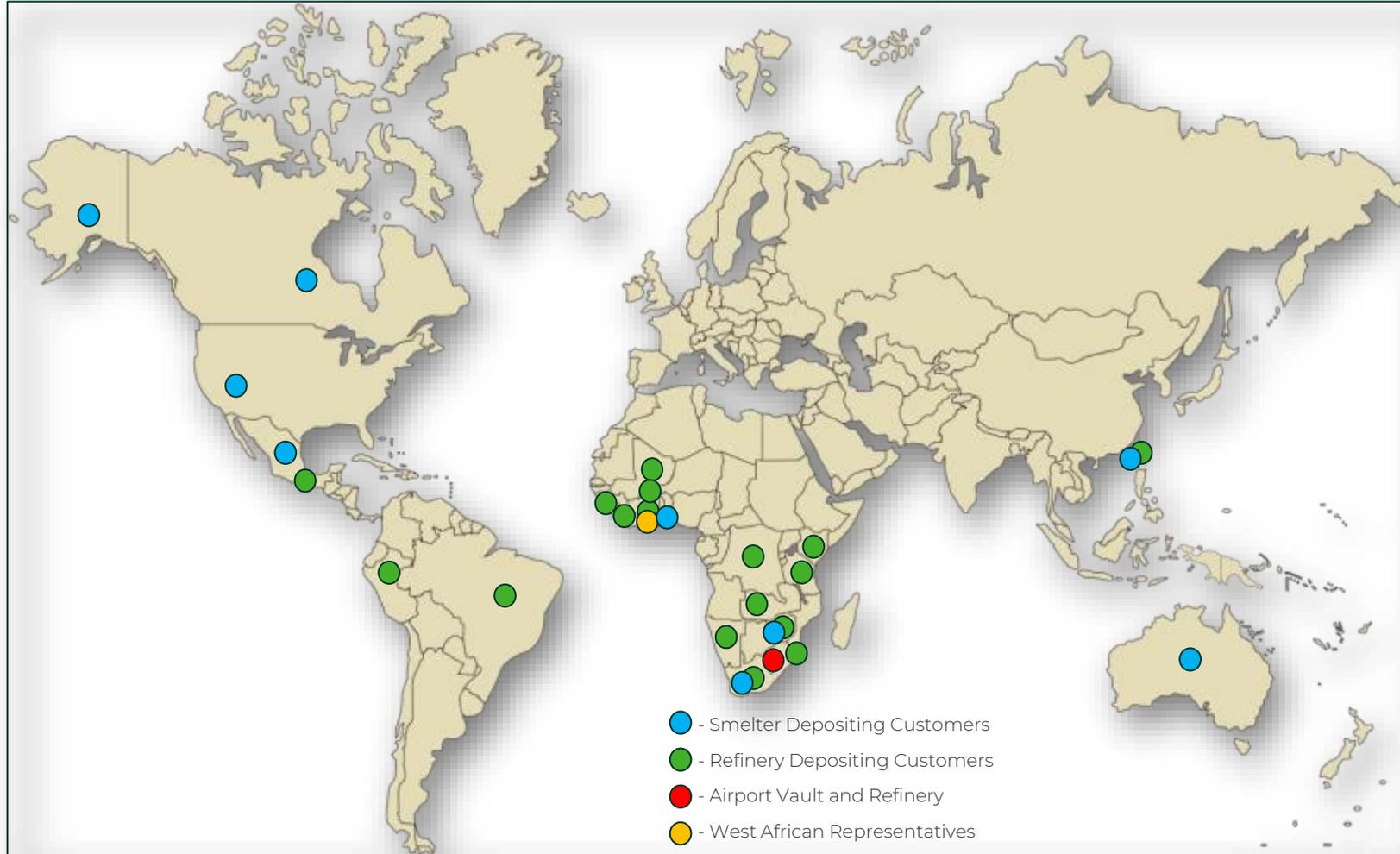
OECD

LBMA

WORLD GOLD COUNCIL

OECD
Resp Au Guide.
Resp Ag Guide
ASM Forums
RJC
WGC Principles
Cyanide Code
RMI
ESG reports

RAND REFINERY SUPPLY



Sourcing Base: Where we get our gold

Of the approx. 500tpa African LSM mined dore market Rand Refinery has a market share of 50%.

Rand Refinery is currently a major player in terms of African LSM mined gold (>99%), but small in terms of gold scrap / recycled gold, and silver.

We are the commercial mined dore market leader in Africa.

We are experienced at processing complex mine dore hence attract select material from further afield

Our Smelter competes globally given that material travels by sea freight (not like dore that typically goes to the closest refinery)



RAND REFINERY
OPERATING MODEL &
VALUE CHAIN

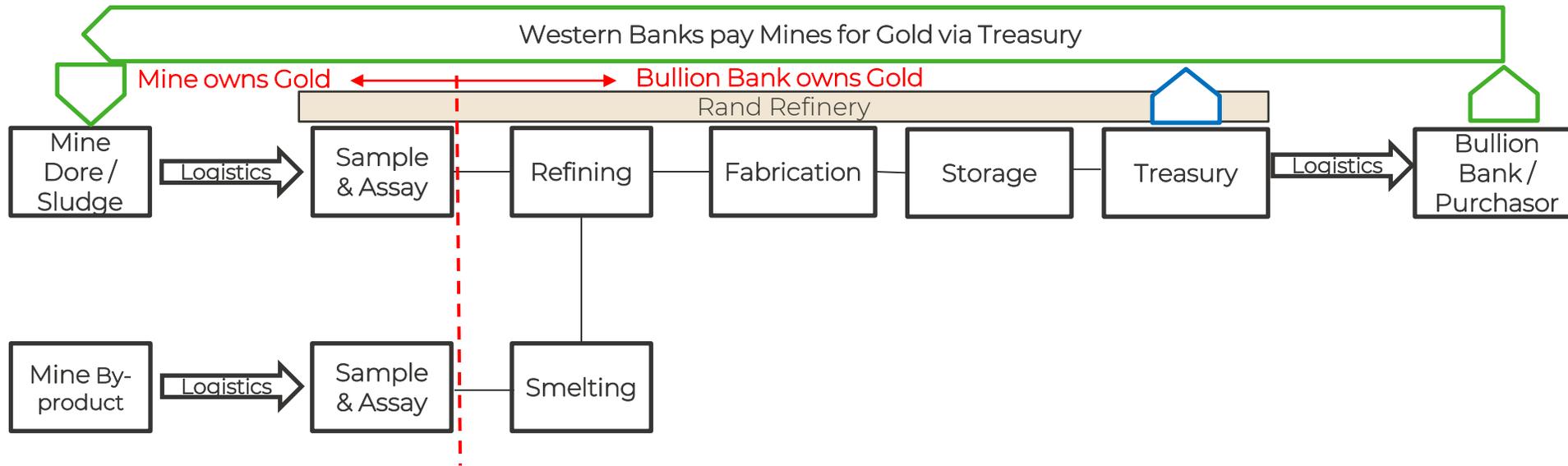
RAND REFINERY

THE RAND REFINERY VALUE CHAIN

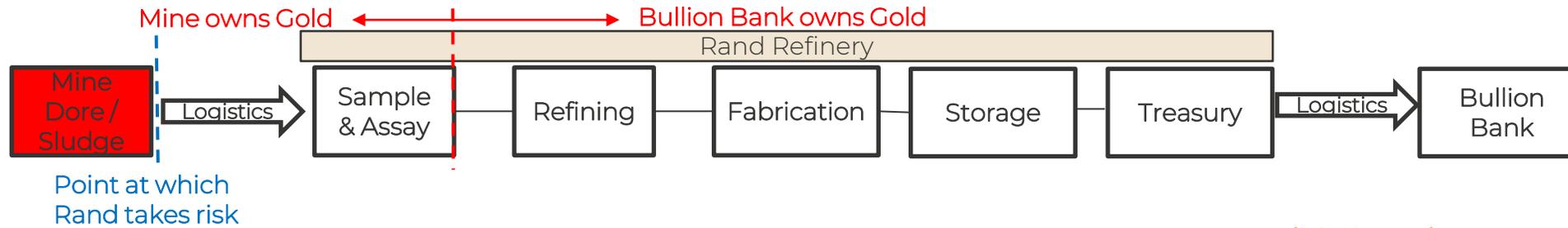
Rand Refinery operates as a "toll refinery" and as such never owns the gold, this mitigates any risk around trading, and means that the gold in Rand Refinery (work in progress) is owned by the Bullion Banks that hold us to account.

Key Slide

No cash payments – all remittance through Banking system



RESPONSIBLE SOURCING



Responsible Sourcing

Required to ensure the market remains free of illicit material associated with criminality, human rights abuses or environmental damage.

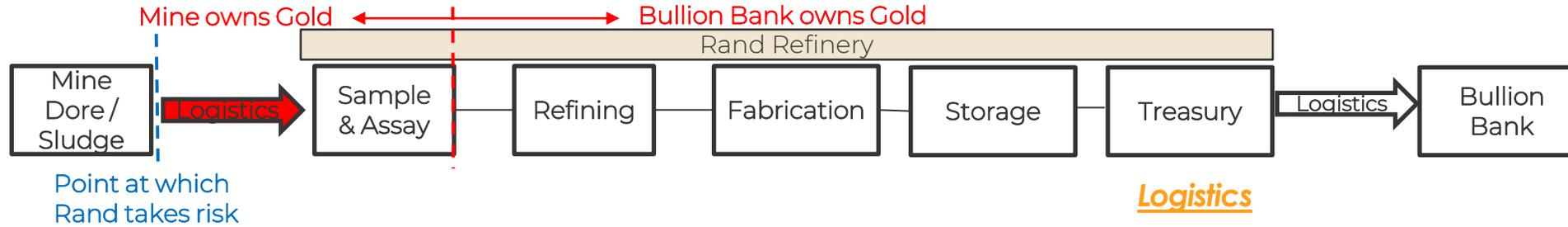
LBMA responsible sourcing audited conducted annually = license to operate

Governance:

- *Responsible gold officer*
- *Customer Compliance Committee*
- *Compliance department*
- *Site visits*
- *Continuous monitoring and tools*
- *Training, whistleblowing*
- *Strict onboarding and shipment tracking*

We consider our responsible sourcing a differentiator, we turn away a significant volume of business due to responsible sourcing issues

LOGISTICS - REFINERY



Logistics

Rand Refinery appoints a valuable cargo transporter (Brinks, AVA) as its agent to collect the dore and takes risk from mine gold room. (custodian follows shipment)

Transport routing – typically helicopter or fixed wing to capital then commercial airline to Rand Refinery (unless emergency then charters)

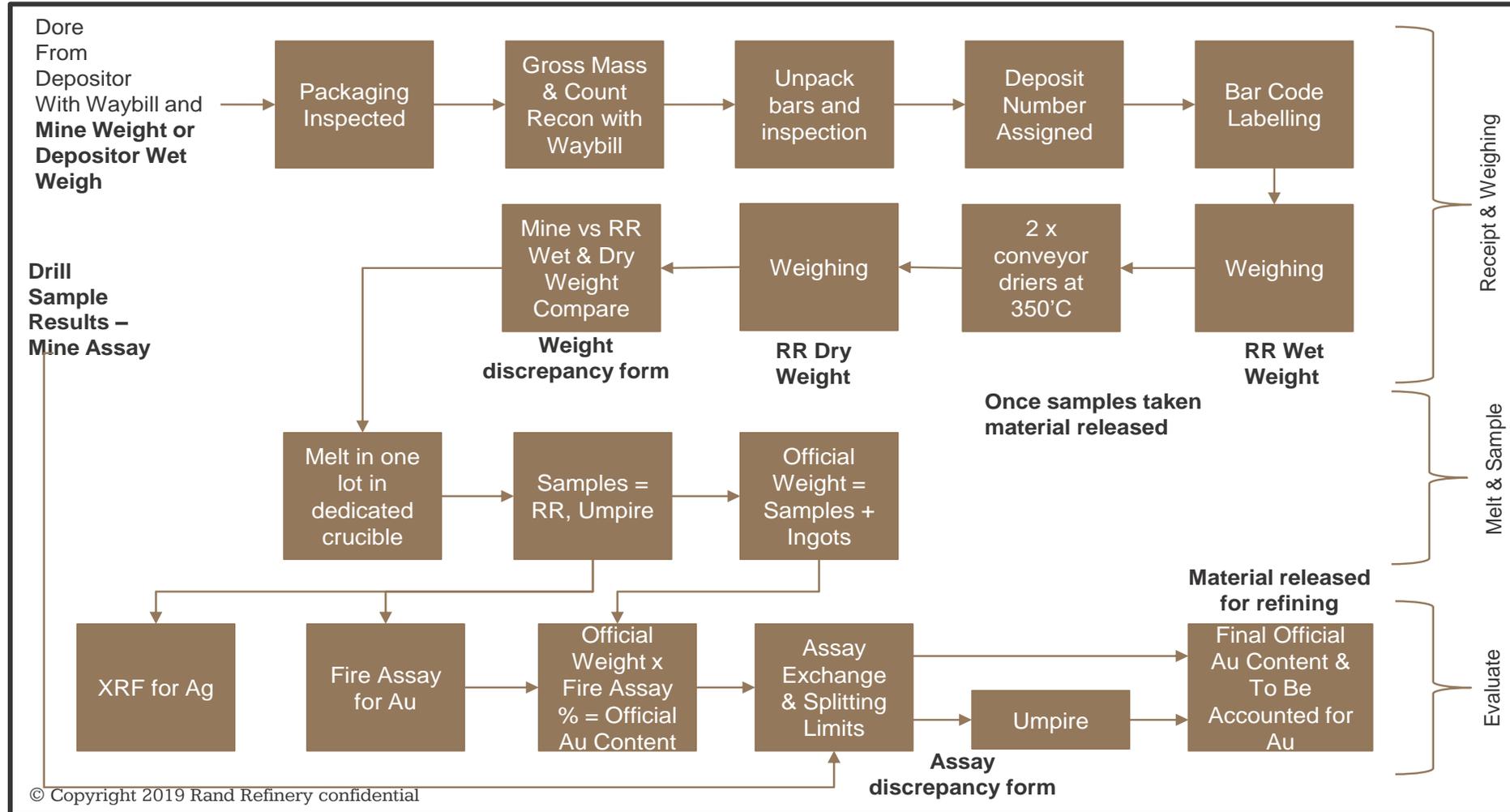
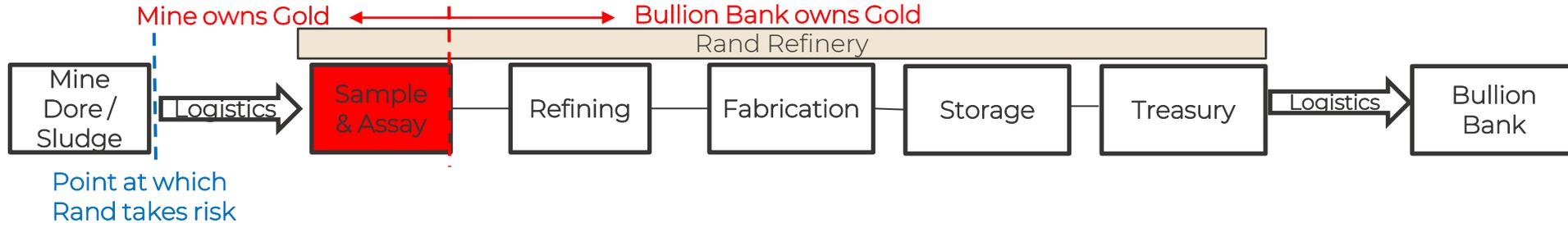
Delivery point – Rand Refinery vault at OR Tambo (where we take on full risk)

Planning & tracking – unlike other refiners our vault staff plan and track logistics (optimise quarter ends, help when needed – e.g. expat rotation during Covid)

Billing – Rand Refinery bills mine for transport



EVALUATION: DORE



PRODUCTS / FABRICATION



Good Delivery Gold Bars



Good Delivery Silver Bars



Gold & Silver Granules



HAuCl₄ Solution



Cast Bars of One Kilogram and less (small bars)



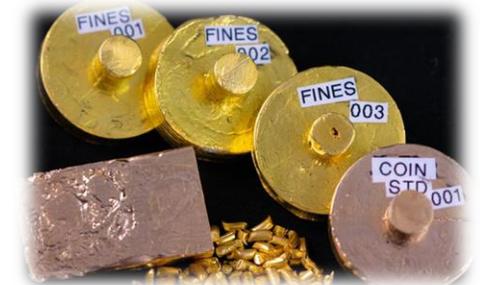
Small Minted Bars



Coins and medallions



Lab Standards / Wire etc.





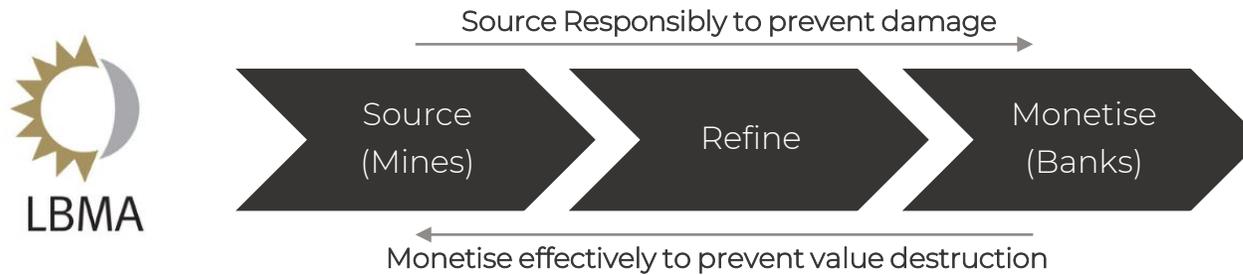
LONDON BULLION
MARKET ASSOCIATION
ACCREDITATION
ECOSYSTEM

RAND REFINERY

LBMA ACCREDITATION

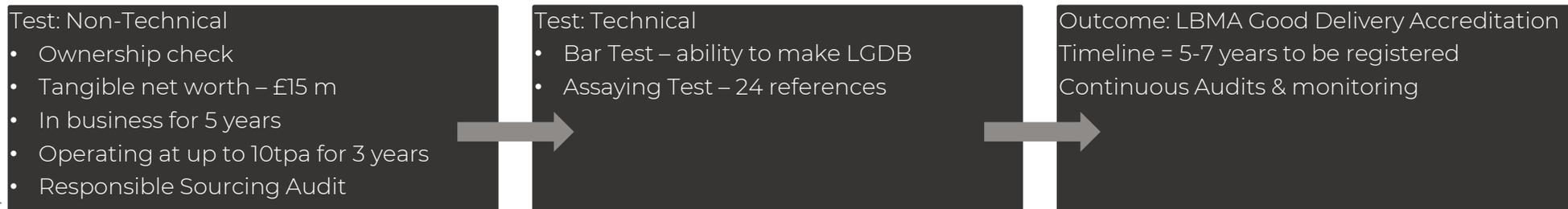
Provides access to the over the counter market and the ability to monetise large scale mined gold

Key Slide



- LBMA: Trade Association of banks, refiners, transporters
- Members: 150 companies in 24 countries
- Standard Setting Organisation: sourcing, refining and trading rules
- Ensures: Quality & integrity of metals (dore and product) and market participants
- Pricing: involved in setting the transparent gold price fix in London (AM & PM fix)
- Market: intimately involved in “regulating” the Loco London Over the Counter Market and clearing system
- Volume in the London Market: 9700 tonnes of gold stored in London vaults
- Volume through LBMA Refiners: 92% of annual mined gold production
- Access to the LBMA Ecosystem is critical in monetising large scale mined gold
- Process to become an LBMA Accredited Good Delivery Refiner is onerous

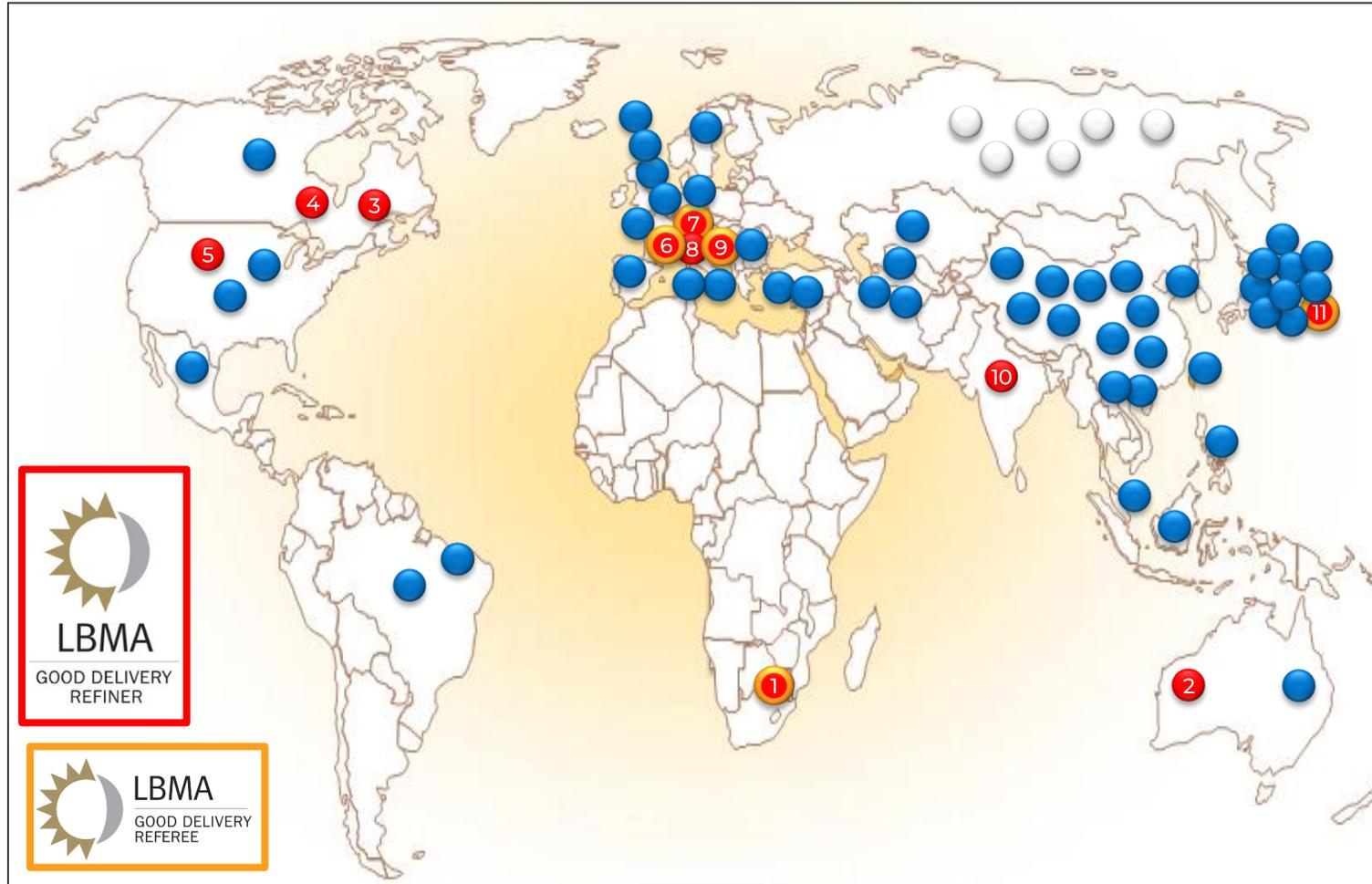
LBMA Good Delivery Accreditation Process



LBMA GOOD DELIVERY AND REFEREE ACCREDITATION

Key Slide

There are approximately 70 LBMA Good Delivery Refiners world-wide, however only 11 play in the large scale mine dore market (others = recycled gold), of these only 5 are LBMA Referees (including Rand Refinery), Rand Refinery competes against four European refiners for the African commercial dore market





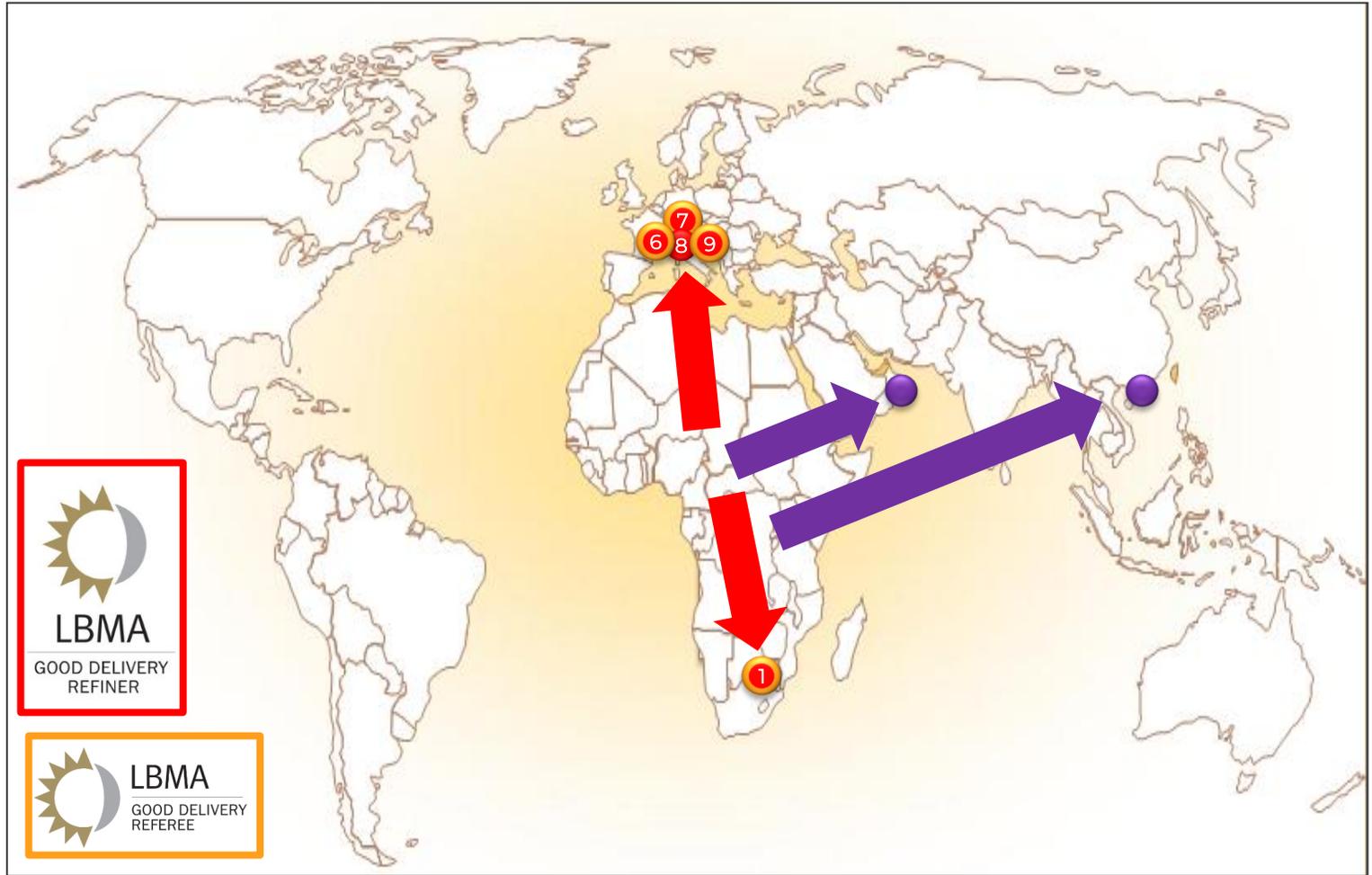
HOW AFRICA'S GOLD
IS MONETISED

RAND REFINERY

AFRICAN MINED GOLD – WHERE IS IT MONETISED

Africa Mines approximately 1000tpa of gold, with 500tpa commercially mined and 95%+ of this material going into the LBMA ecosystem to be monetised. Conversely the other 500tpa of artisanal mined material flows either directly or via small African intermediate refineries and is mainly monetised in Dubai and the Far East

Key Slide



LBMA Refineries in Africa: Rand Refinery

LBMA Refineries in Switzerland: PAMP, Metalor etc.

Refineries in Dubai: many e.g.: SAM, Al Etihad

Other Non LBMA Refineries Across Africa: there are hundreds ranging from melthouses that produce impure bars / dore to those that do full refining, these refineries mainly export to Dubai / Far East

Examples:

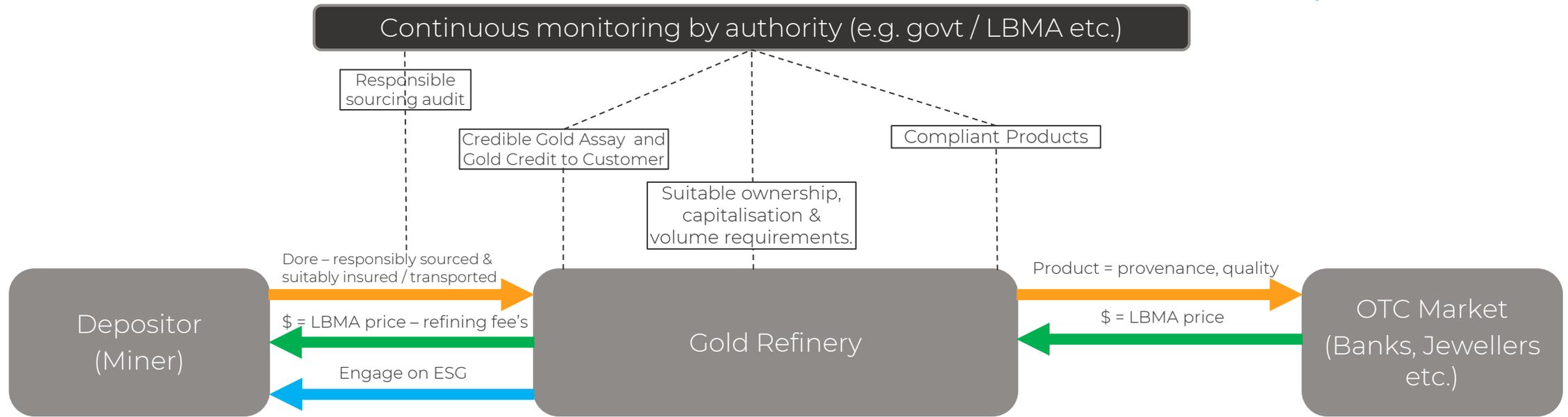
- African Gold Refinery Uganda (US Sanctions)*
- Geita Gold Refinery Tanzania*
- Mwanza Gold Refinery Tanzania*
- Gold Coast Refinery Ghana*
- Rosy Royal Refinery Ghana*
- ...many Geeta others.*



LOCAL REFINERIES
CAN ADD OR
DESTROY VALUE

RAND REFINERY

REFINERY THAT ADDS VALUE



Certified supply chain provenance

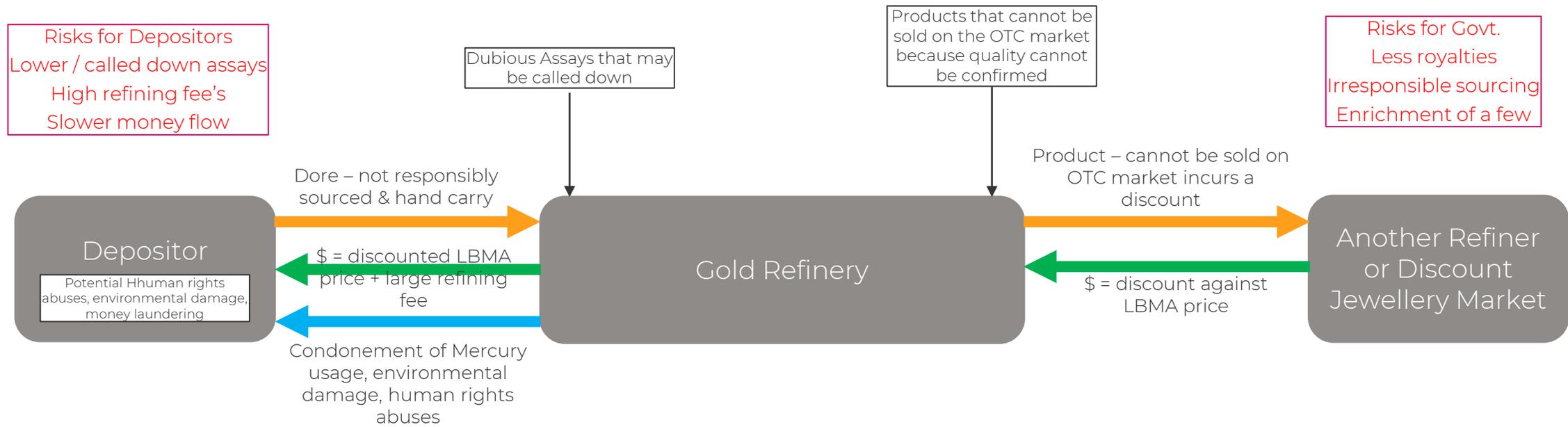
Depositors: Mines and other customers that deposit their gold are assured of the integrity of the sampling and assaying (i.e. the gold content will be measured and stated correctly), world class refining services, and that the products made from their gold can be readily sold on the market at the highest possible market value. A mine can therefore rely on the refinery to deliver the best price, at the lowest refining cost, and always keep delivering (i.e. even in a soft market LBMA refiners can still sell the gold and enable cash flow).

Purchasers: Bullion banks and other entities that purchase gold from the Refiner can be assured that the products are of the specified weight and quality, and that these materials have been responsibly sourced and are not associated with human rights abuses, conflict etc.

Host Countries: These refiners are focused on sustainability, and ensure credible gold sourcing, assaying and refining, and product manufacture. Correct amount of gold is declared and royalties paid.

REFINERY THAT DESTROYS VALUE

Badly setup / vested interest



Non-compliant sourcing activities and the sourcing of smuggled, illicit or conflict gold, thereby indirectly funding conflict, or ensuring African governments do not receive their rightful royalties.

Questionable metrology (weighing) and assaying that does not meet the necessary standards, thereby resulting in value loss to the Depositor. This “under-reporting” also results in African governments not receiving their rightful royalty / the enrichment of a few.

Some refiners simply becoming melt houses and do not refiner material, this means that Refiners simply melt and assay the material and send it out of the host country un-beneficiated. There is no value add to depositors or the host country, in that the Refining mandate to create jobs and procure goods and services is not fulfilled. The Refiner cannot sell its product at the highest market price, and as a result must “sell-on” to another refiner who in-turn must repeat the sampling and assaying process thereby destroying value (i.e. at a minimum a double sampling and assaying fee is being incurred by the depositor – essentially playing a “middleman”).

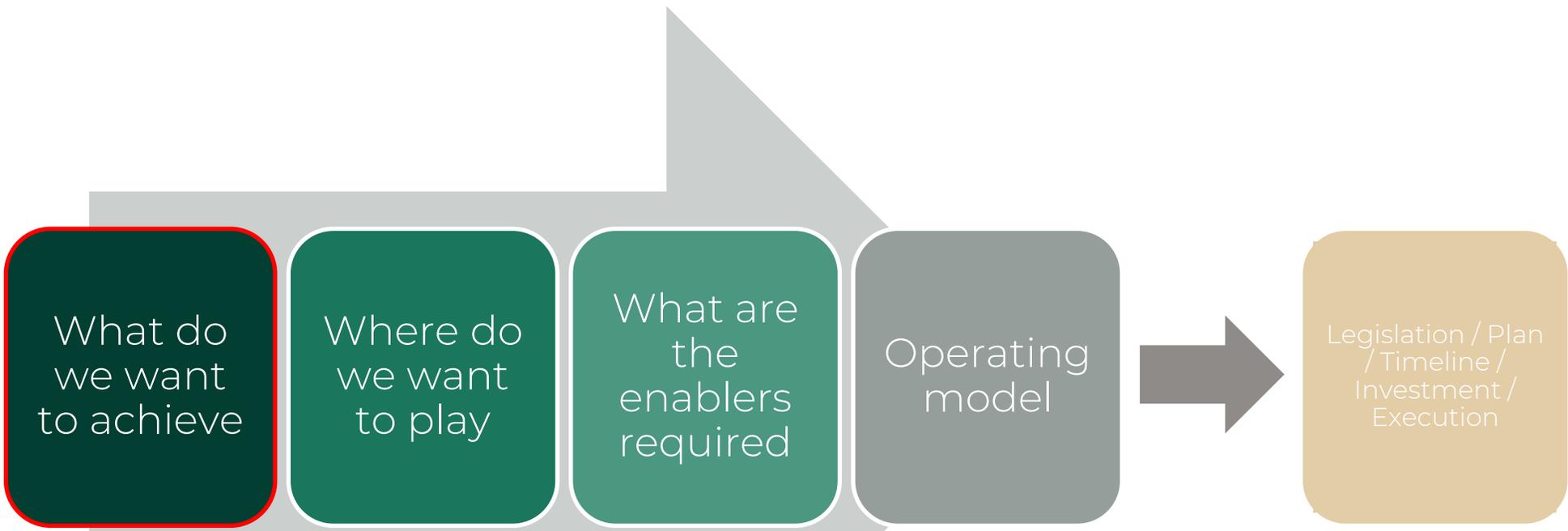


ANGOLA SETTING UP
A LOCAL REFINERY

RAND REFINERY

QUESTIONS TO ASK WHEN SETTING UP A REFINERY

Key Slide



What do we want to achieve

Where do we want to play

What are the enablers required

Operating model

Legislation / Plan / Timeline / Investment / Execution

- Anti money laundering
- Import, export
- Tax laws
- Central Bank remittance / forex flow

- Employment direct & indirect
- Attract Banks
- Ecosystem
- Taxes
- Forex / Currency Hedge

- Buy
- LSM Gold
 - ASM Gold
 - Local / Regional
- Make
- Granules
 - Bars / Coins
- Sell (to)
- Banks
 - Investors

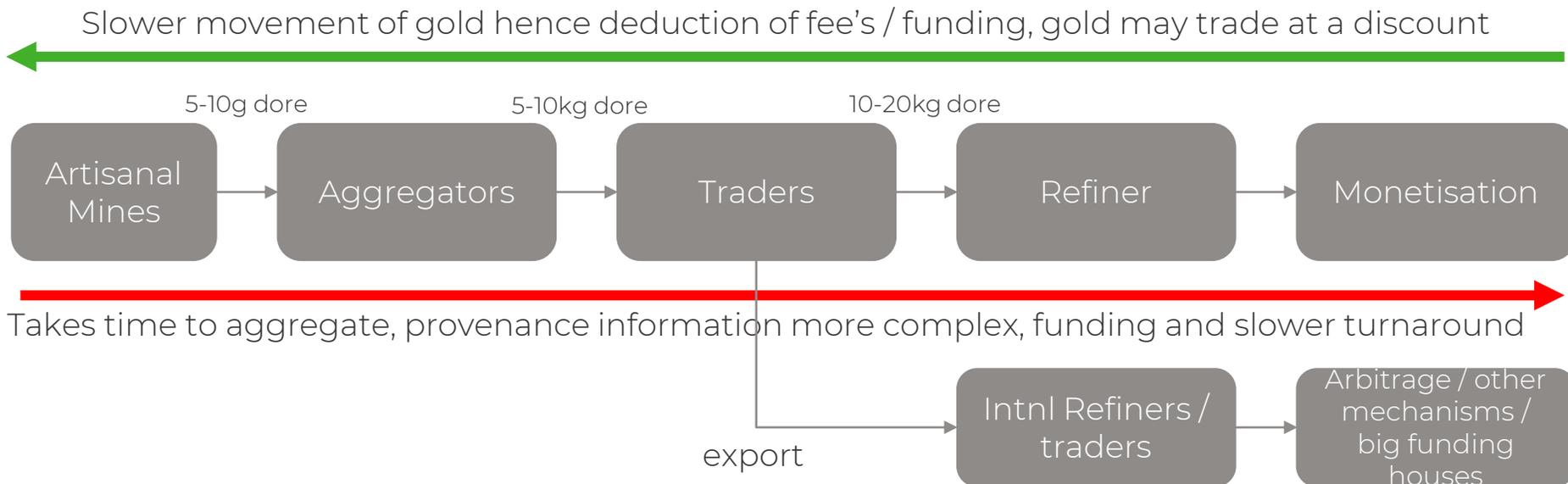
- LBMA Accred.
- RJC Accred.
- Tax laws
- Regulation
- Skills
- Technology (must suit what we will buy – dore, and need to make)

- Agency vs. title
- Who funds working capital
- Insurances
- Remittance

WHERE DO WE WANT TO PLAY: LSM VS. ASM

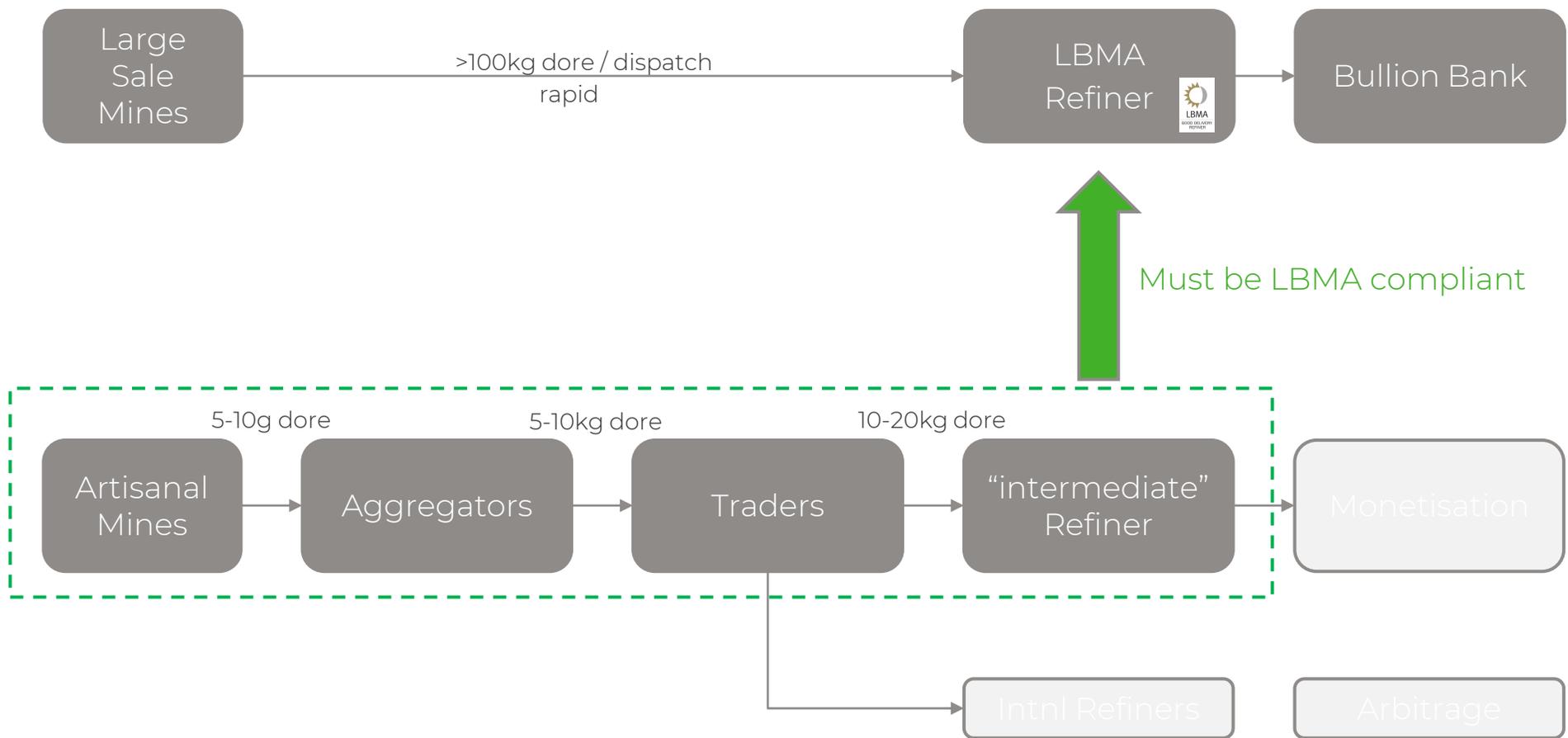
Key Slide

To unlock the refining of large scale mined gold suitable accreditation and assurances are required for large mining companies that are listed on Western Stock exchanges, these gold flows and remittances are subject to scrutiny and governance. This is not the case in the small scale / ASM sector where the dynamics are different.



INTERMEDIATE REFINERY OPTION

Key Slide



REFINING TECHNOLOGIES TO CONSIDER

THE FEEDSTOCK WILL DETERMINE THE DECISIONS

REFINING TECHNIQUE	TYPICAL THROUGH PUT	GRADE OUT FPE	REMOVE BASE METALS	REMOVE SILVER	REMOVE PGMs	LARGE SCALE REFINER	SMALL SCALE REFINER	OTHER CONSIDERATIONS
CUPELLATION	Grams/day	99.999%	✓	✗	✗	✓	✓	<ul style="list-style-type: none"> Primarily used in fire assaying Highly suited for lead ores
➔ PYROMETALLURGICAL MILLER PROCESS	1.5h/0.7T	99.60% 98%	✓	✓	✗	✓	✗	<ul style="list-style-type: none"> Robust –can refine grades from 10% - 90% Au Needs sophisticated scrubber system
ALS - ACIDLESS REFINING	6h/0.125T	90.00% +99%	✗	✓	✗	✓	✓	<ul style="list-style-type: none"> Not suitable for mined gold – want high silver Do not use chlorine
➔ WOHLWILL ELECTROLYTIC REFINING*	24h/0.25T	99.995% 78%	✓*	✓	✓	✓	✗	<ul style="list-style-type: none"> Input Gold grade +95% May need preceding Miller step
FIZZER CELL			✓	✓	✓	✗	✓	<ul style="list-style-type: none"> Improved Wohlwill process with change in cathode design
➔ AQUA REGIS PROCESS**	48h/0.25T	<99.99% if input grade high 80%	✓	✓**	✓	✓	✓	<ul style="list-style-type: none"> Input silver grade < 6 % High effluent generation containing gold Require technical aptitude – sensitive process Chlorine intensity higher than Miller refining

* Can only be used when initial gold content is about 96%

** Only suitable when initial silver content is less than 10%. Achieving 99.99% not easy and 80% of output is 99.90%

The two gold refining methods most commonly employed to derive pure gold are: the Miller process and the Wohlwill process. Aqua Regis process works well for jewellery scrap and mine gold depending on silver and deleterious content.

CAPITAL REQUIREMENTS TO ESTABLISH A NEW REFINERY

PUBLIC ANNOUNCEMENTS OVER THE PAST 10 YEARS

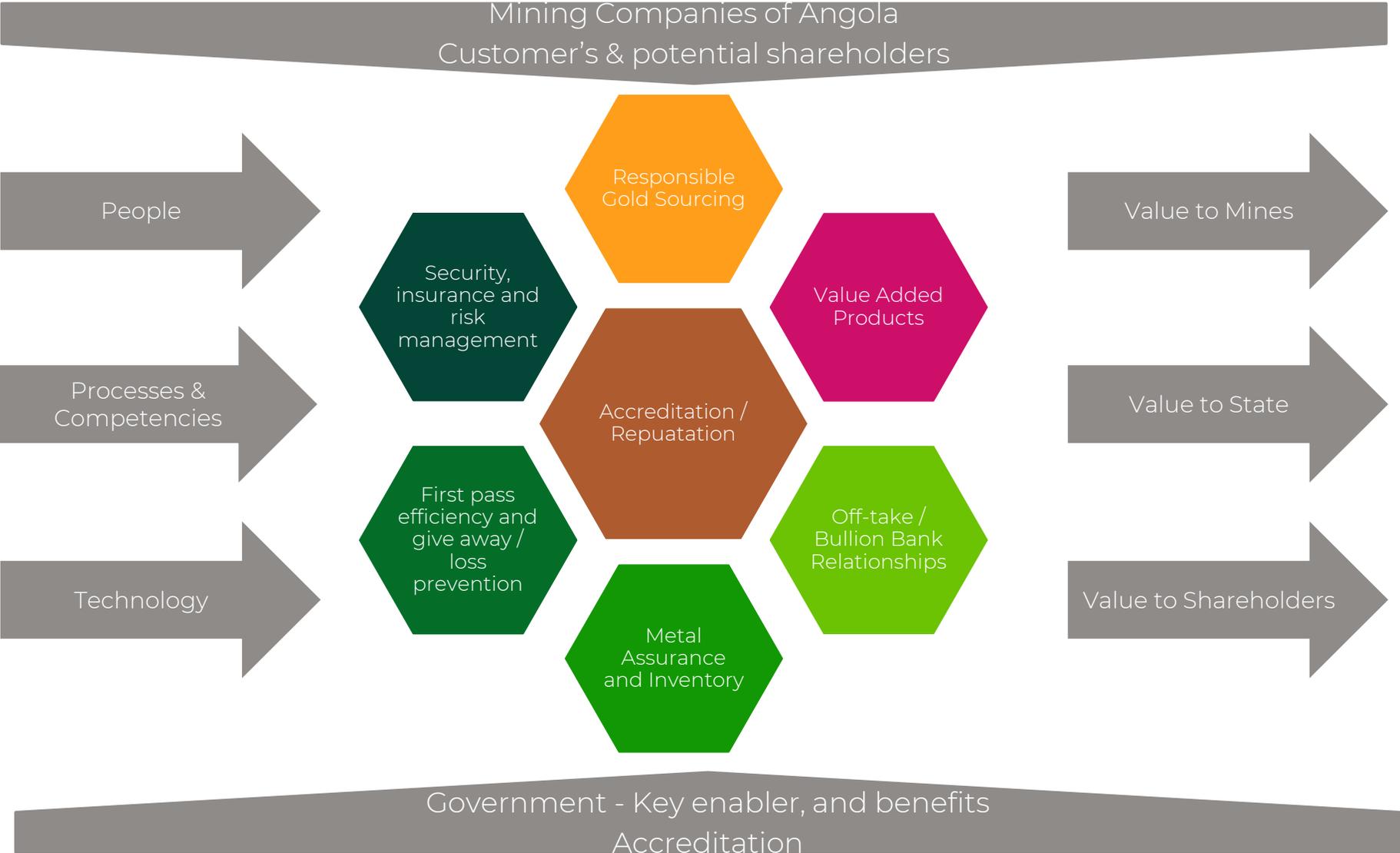
Country	Announced	Throughput	Total Investment	Technologies	Comments
Kazakstan (3 rd Gold Refinery)	2012	25tpa Au	\$30 million	Miller and Wohlwill	<ul style="list-style-type: none"> Plant process mined gold primarily
United Arab Emirates (Dubai Kaloti Group Gold Refinery)	2013	1400tpa Au 600tpa Ag	\$60 million	Aqua Regis and Wohlwill	<ul style="list-style-type: none"> Plant process primarily high grade gold from other refineries or recyclers Questions have been asked about actual cost and throughput
Uganda (Africa Gold Refinery Limited)	2016	12tpa Au	\$20 million	Miller and Wohlwill	<ul style="list-style-type: none"> Plant process both mined and alluvial gold Announced to be for DRC and Tanzanian gold deposits

Inferred from the above:

1. Uganda and Kazakhstan refinery shows pricing parity for a Miller-Wohlwill refinery complex
2. Investment in and type of product fabrication facilities for above not known although Kilobars can be assumed for Kaloti and LGD bars for the other two refineries

ENABLERS

Gold refining is more than just purifying gold, key enablers and competencies are required to add value and manage risk



ENABLERS

Key Slide



- Sampling & Assaying - Mine is settled on sampling & assaying not outturn: must sample and assay properly or could over / underpay for gold
- Metal Accounting = mine refining is a high volume, low margin game – first pass efficiency and full gold recovery from waste streams is critical – our refiner operates at a 99.99% efficiency
- Fabrication = in making products there is recycle waste, lockup and each product has a “give away”, these need to be carefully controlled.
- Treasury = treasury needs to sell the gold to Bullion Banks and remit funds locally and overseas. Our treasury does not own its own gold therefore does not take a position and cannot put our company at risk.
- Throughput and lockup = gold needs to move through the process quickly, and waste / recycle streams result in a lock up of gold, we have approx. 6-8tons of lockup in our refining at any time. This lockup needs to be funded.
- Storage = in order for a bank to fund and hold gold in country security and insurances must be in place. Insurances are through Lloyds of London and bank considers country, company and ownership risk.

SUGGESTIONS



SUGGESTIONS

Key Slide

Location: Don't build the refinery in a rural area / town / near a mine – do build the refinery in Luanda at the secure airport precinct with exclusive runway access – access to international flights / security is key for insurance

Ownership: Keep accreditation in mind – if the refinery is to ever become LBMA / RJC / RMI accredited it needs suitable ownership. Do a full background check on the owners / directors using a reputable company (e.g. Kroll, Refinitiv etc.) to ensure the ownership will be suitable for accreditation. Note: the strategy deployed by the owners will determine if the refinery is value adding or not.

Sourcing ASM: Don't expect that if you build a refinery “it will come”, ASM supply chains are extremely complex and many rely on funding mechanisms and currency arbitrage / hawala / offshoring. Many refineries have been built across Africa and have failed to source ASM.

Refining equipment: Don't assume that the equipment is wholly important, Italimpianti (Italy) and EMTEK (Turkey) sell small refineries that are easy to setup. Rather it is getting the strategy, ownership and ecosystem right in order to achieve your aims and add value to Angola.

Lessons learnt: do learn from others, a review of non-LBMA refineries across Africa will show how unsuitable ownership, strategy and ecosystems have resulted in bankrupt refineries / refineries destroying value and enriching a few / refineries funding conflict and criminal activity / money laundering.



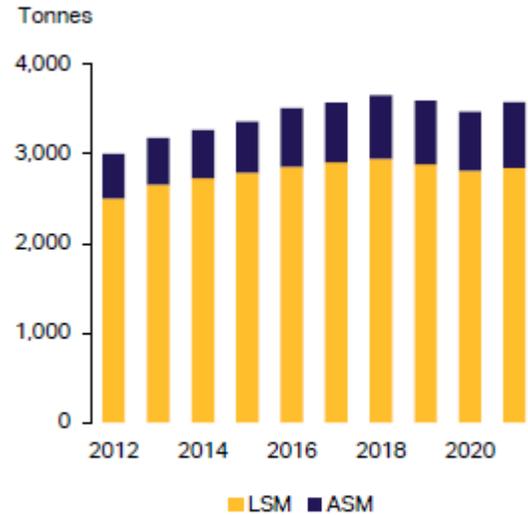
ARTISANAL MINING

RAND REFINERY

ARTISANAL MINING

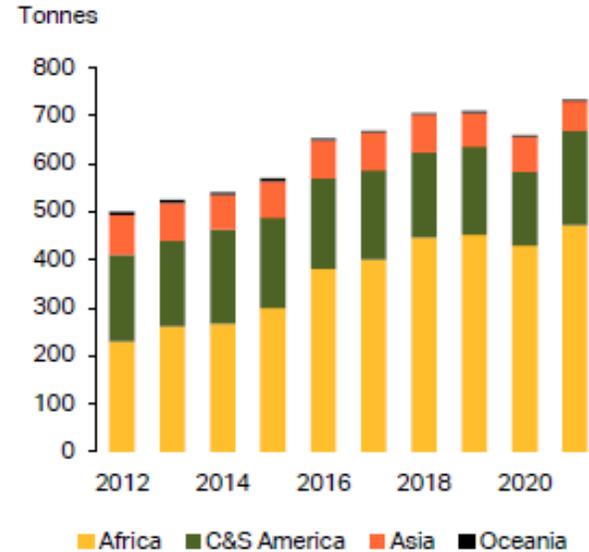
ARTISANAL MINING HAS GROWN SIGNIFICANTLY OVER THE LAST 10 YEARS, AND NOW REPRESENTS 50% OF AFRICAN PRODUCTION AT APPROX. 500TPA

LSM & ASM Gold Production



LSM - Large Scale Mining
ASM - Artisanal and Small-scale Mining
Source: Metals Focus

ASM Production by Region



ASM - Artisanal and Small-scale Mining
Source: Metals Focus

Table 1 & 2 – Gold Sourced by LBMA Refineries [tons]

Source	2019	2018	2019	2018	ASM	2018	2018
Large Scale Mine	2270	2127	46%	44%	South America	15	58%
Artisanal	22	26	1%	1%	East Asia	8	32%
Recycled	2646	2683	54%	55%	Africa	3	10%
Total	4938	4836	100%	100%	Total	26	100%

ASM has grown globally from 500 – 730 tpa in the last 10 years

ASM is currently approx. 730tpa compared to LSM production of around 2900tpa. ASM is 20% of global mine production

Africa has the highest proportion of ASM growing from approx. 220 – 500tpa in the last 10 years.

LBMA Refineries source approx. 20-30tpa of artisanal gold, this represents 3% of the total available ASM material

LBMA Refineries source approx. 3 tpa of African artisanal gold which is less than 1% of the total available African ASM material

ASM is responsible for the majority of African mine volume growth, with an estimated 50% of African production being ASM related

DEALING WITH NEGATIVE ASM

Silting of rivers



Machete Gangs



Child Labour / Human Rights



Mercury Use & Disposal



Other: Funding of criminal syndicates, money laundering, proliferation / conflict finance, exchange control violation / offshoring, hawala, political patronage, no payment of taxes and royalties

Technology as an Enabler

Information Network



Co-ops / councils

Tracking Blockchain & Security



Parent Unit - used for tracking and a gateway for the Children Unit
Children - communicate with the parent

These sensors measures:

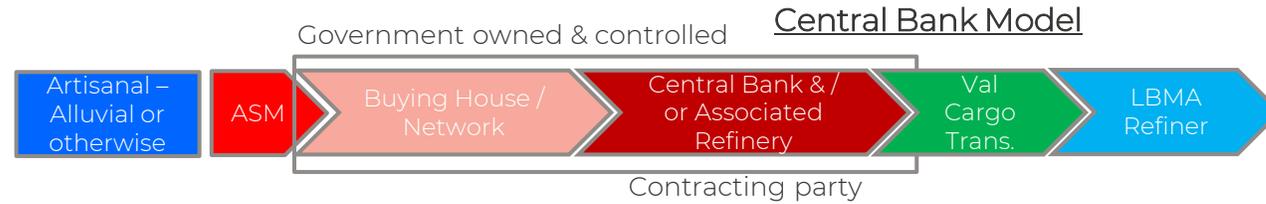
- Shock
- Temperature
- Motion
- Light
- Pressure
- Battery
- Tracks location - using the local cellular network.

Satellite / drones remote sensing: Environmental Impact, Monitoring, Active Areas, Compliance

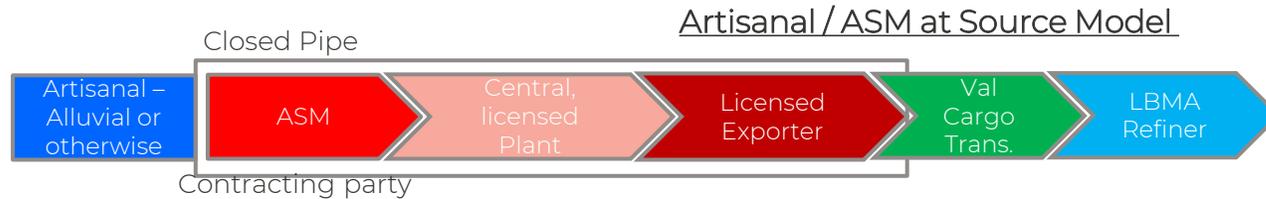


IMAGE: SATELLITE IMAGES USED IN THE STUDY SHOW DEFORESTATION AND ELEVATED SUSPENDED SEDIMENT (ORANGE/BROWN WATER) DUE TO GOLD MINING OPERATIONS IN THE RIO INAMBARI AND RIO COLORADO WATERSHEDS IN PERU. [view more >](#)

VARIOUS SOURCING MODEL'S – ARTISANAL MINING



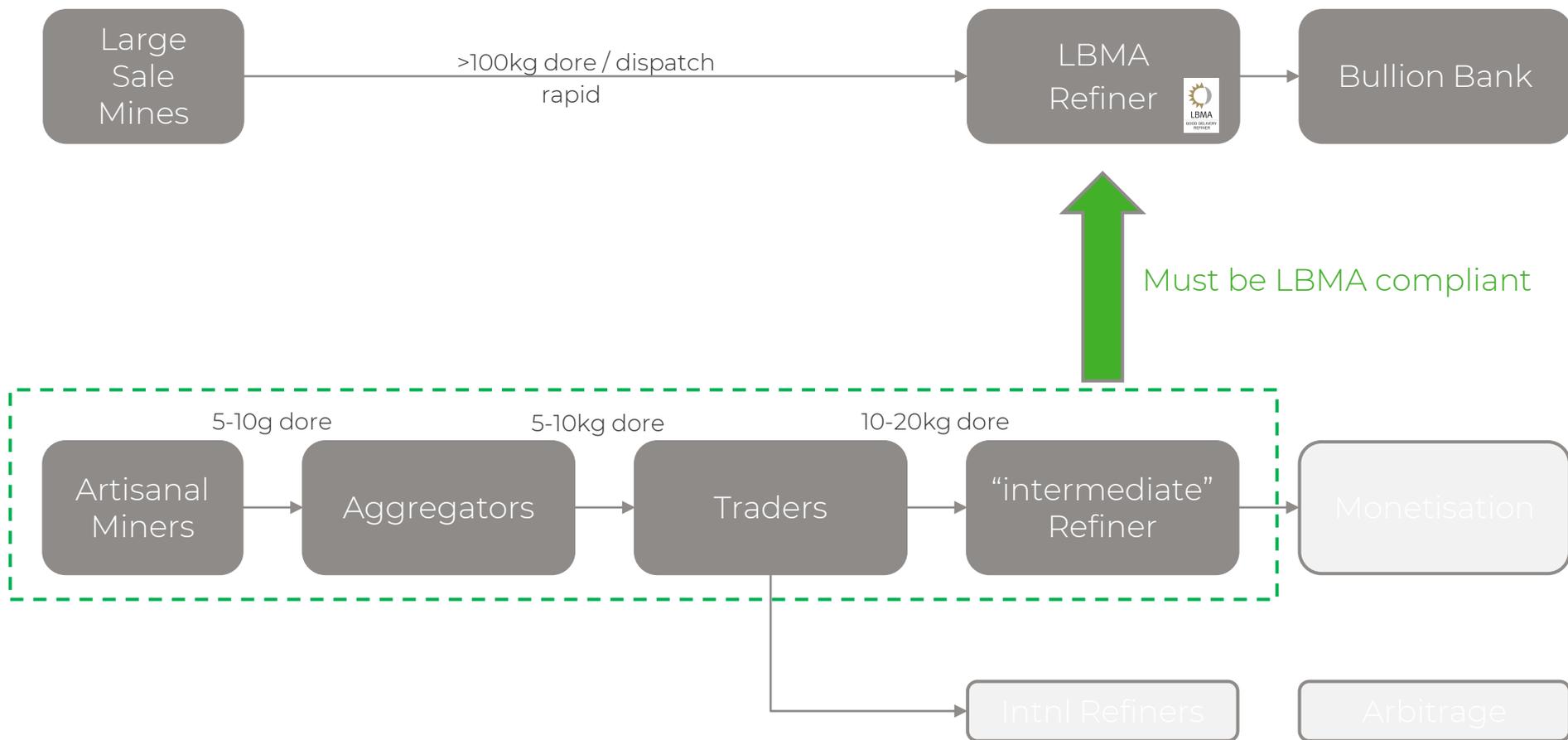
* Our preferred model



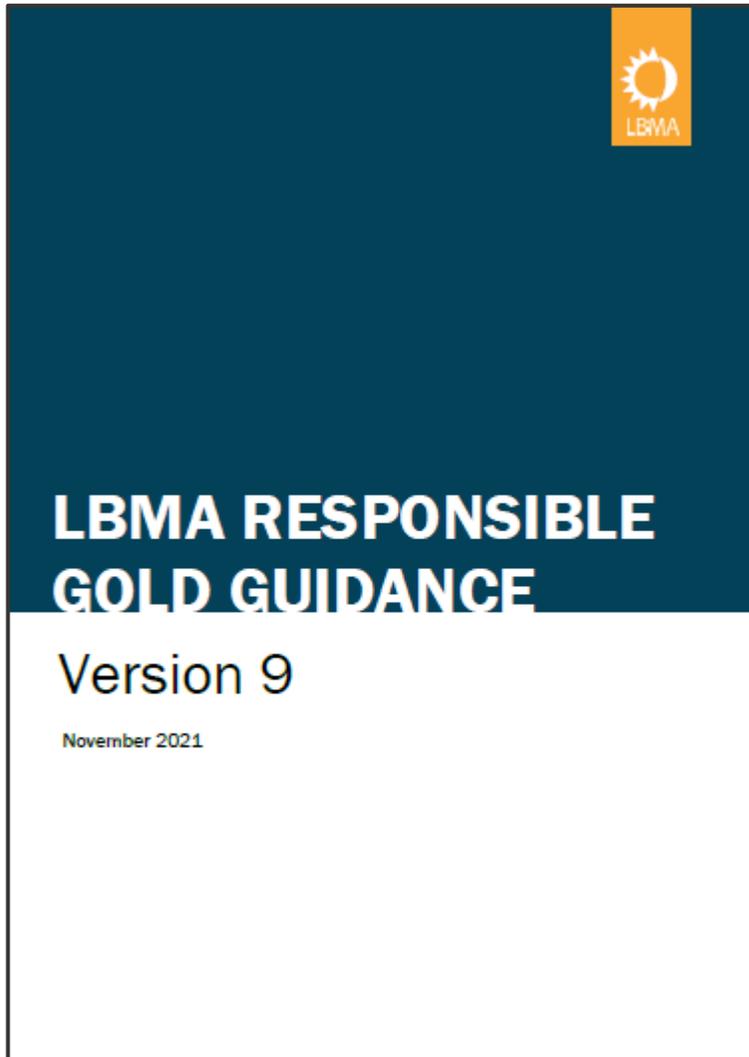
Model	Pro's	Con's
Central Bank	Government takes most of the risk, collects, assays and pays for material and gets it to sufficient scale. Government is in control of the sourcing network therefore it should be closed pipe and legal.	Compliance is only as good as law enforcement / inspections. Risk mitigation involves checking government sourcing process / network (visits, NGO's, free press, etc.)
Exporter / Aggregator	Exporter takes most of the risk, collects, assays and pays for material and gets it to sufficient scale.	Exporter must ensure the supply chain is closed pipe, risk mitigation involves checking exporters sourcing process / network
ASM at Source	Virtually guaranteed to be closed pipe as Refiner is sourcing directly from miners. Risk mitigation involves monitoring / checking miners.	Refiner takes most of the risk, directly or indirectly collects, assays and pays for the material and gets it to sufficient scale. Requires significant investment / network

INTERMEDIATE REFINERY OPTION

Key Slide



“INTERMEDIATE REFINERIES” UNDER LBMA RGGV9



Intermediate Refiner: Non-GDL Refiner that has performed a refining process on material prior to delivery to the GDL Refiner. An Intermediate Refiner typically consolidates various streams such as jewellery scraps, electronic scrap and process recoveries into viable batches for refining. Melting-only operations are not considered Intermediate Refiners.



High Risk Sources or Practices (ASM automatically high risk)

- An independent Assurance Report on the Intermediate Refiners' responsible sourcing

The assurance should:

- conformance with an OECD aligned responsible sourcing scheme
- be commissioned by the Intermediate Refiner
- be completed before the start of a new business relationship
- The identity of the UBOs of the Intermediate Refiners.

RAND REFINERY

