

Where, what, when and who?

Highlighting key global exploration opportunities, trends and a perspective on the cycle of mineral exploration

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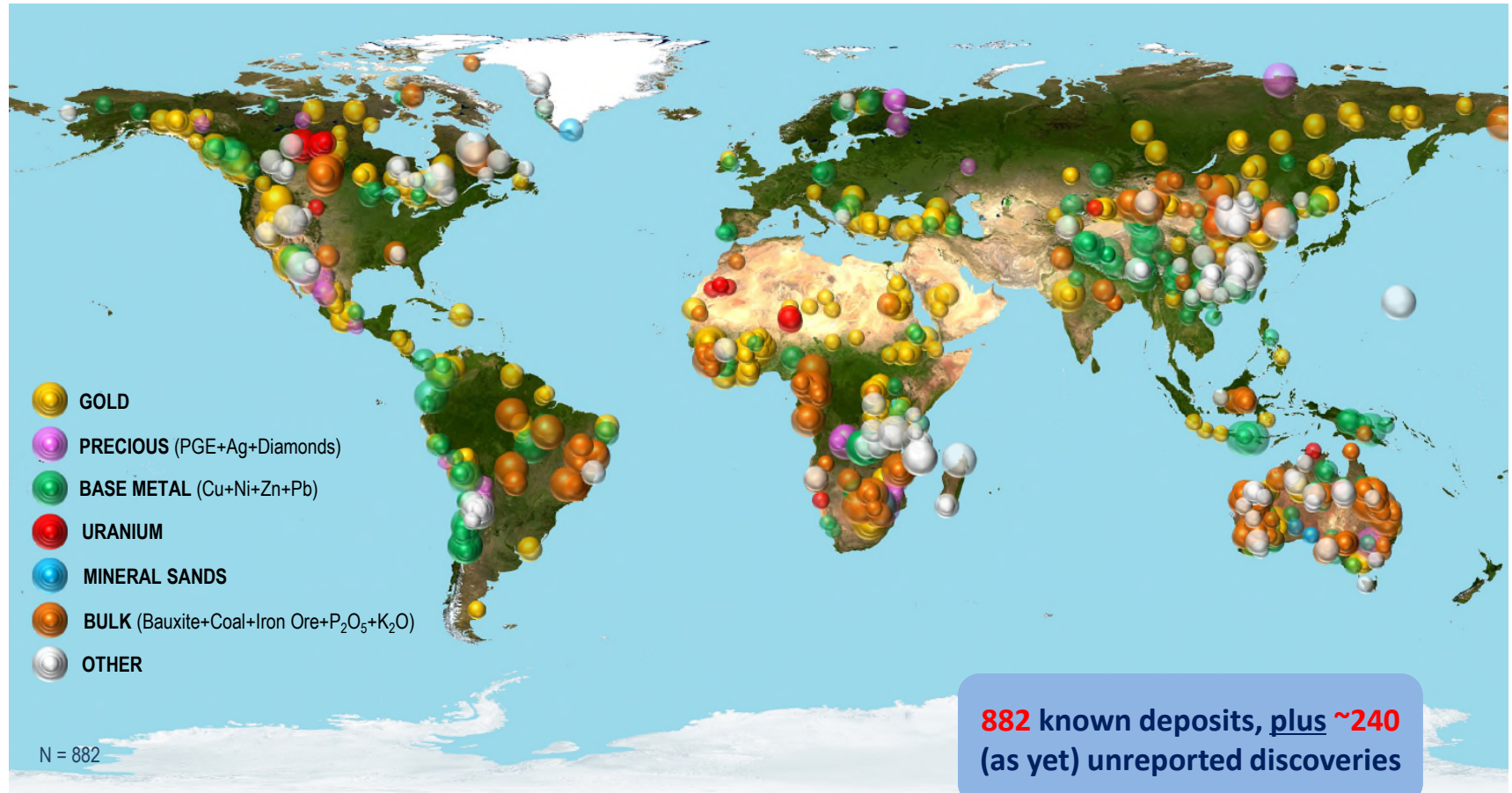
Overview

1. Location of recent discoveries
2. Trends in the number, size and quality of discoveries
3. Who made the discoveries ?
4. Trends in the discovery methods used
5. How much is being spent on exploration, and what's the likely outlook ?
6. What's happening in the Junior Sector?
7. When is the best time in the business cycle to be an explorer?
8. Summary / Conclusions

Over the last decade more than 1100 significant discoveries were made in the World

1. LOCATION OF RECENT DISCOVERIES

Significant discoveries in the world by **Size**: 2008-2017



Note: Bubble Size refers to Moderate / Major / Giant deposits

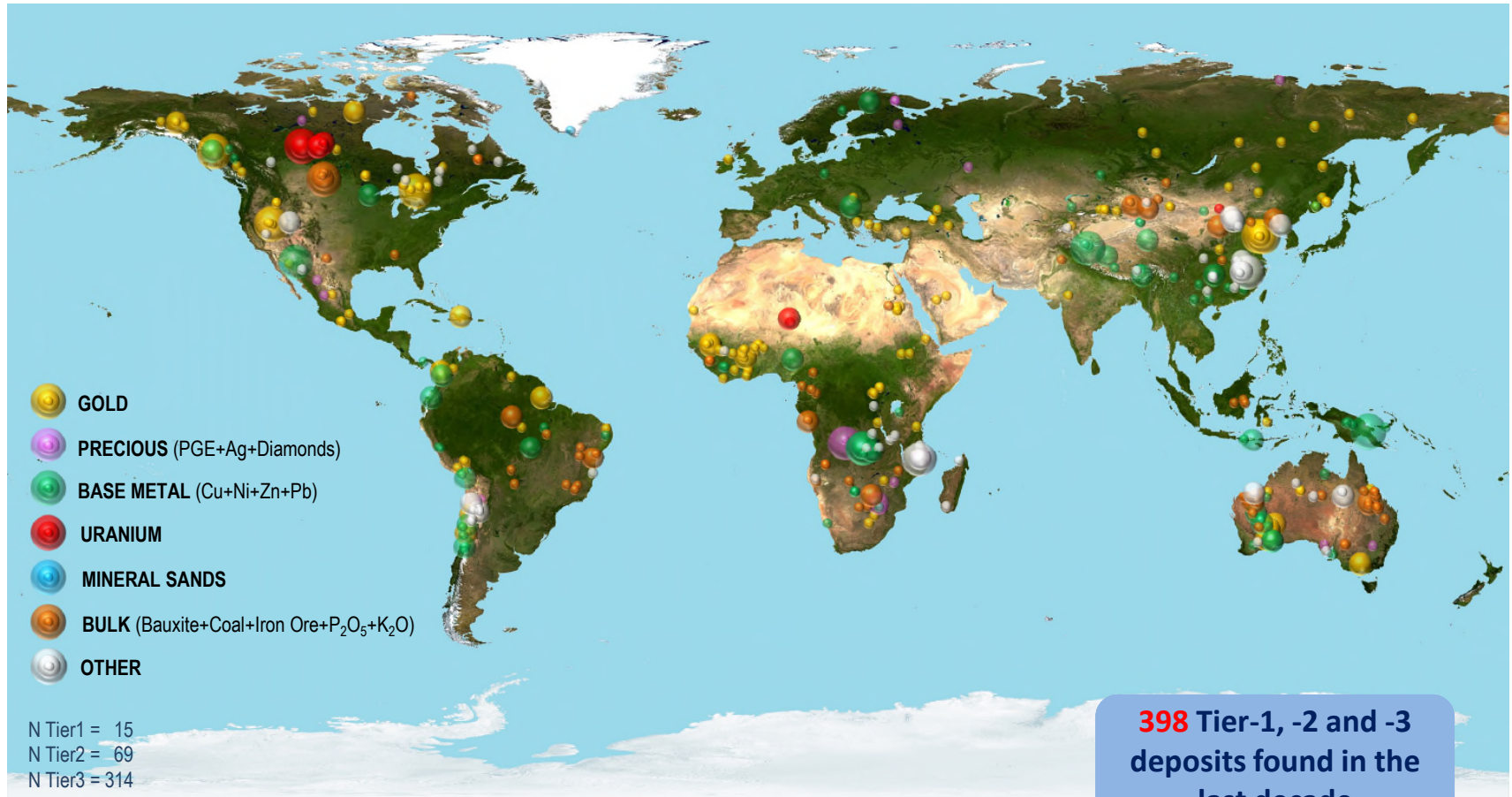
Note: "Moderate" >100koz Au, >10kt Ni, >100Kt Cu, 250kt Zn+Pb, >5kt U₃O₈, >20 Mt Fe, >20 Mt Thermal Coal

"Major" >1Moz Au, >100kt Ni, >1Mt Cu, 2.5Mt Zn+Pb, >25kt U₃O₈, >200 Mt Fe, >200 Mt Thermal Coal

"Giant" >6Moz Au, >1Mt Ni, >5Mt Cu, 12Mt Zn+Pb, >125kt U₃O₈, >1000 Mt Fe, >1000 Mt Thermal Coal

Source: MinEx Consulting © October 2018

Significant discoveries in the World by **Quality**: 2008-2017



Note: Bubble Size refers to Tier 1 / Tier 2 / Tier 3

"Tier 1" deposits are company-making mines and are large, long life and low cost with NPV at the Decision-to-Build stage of >\$1000m (in 2013 US Dollars)

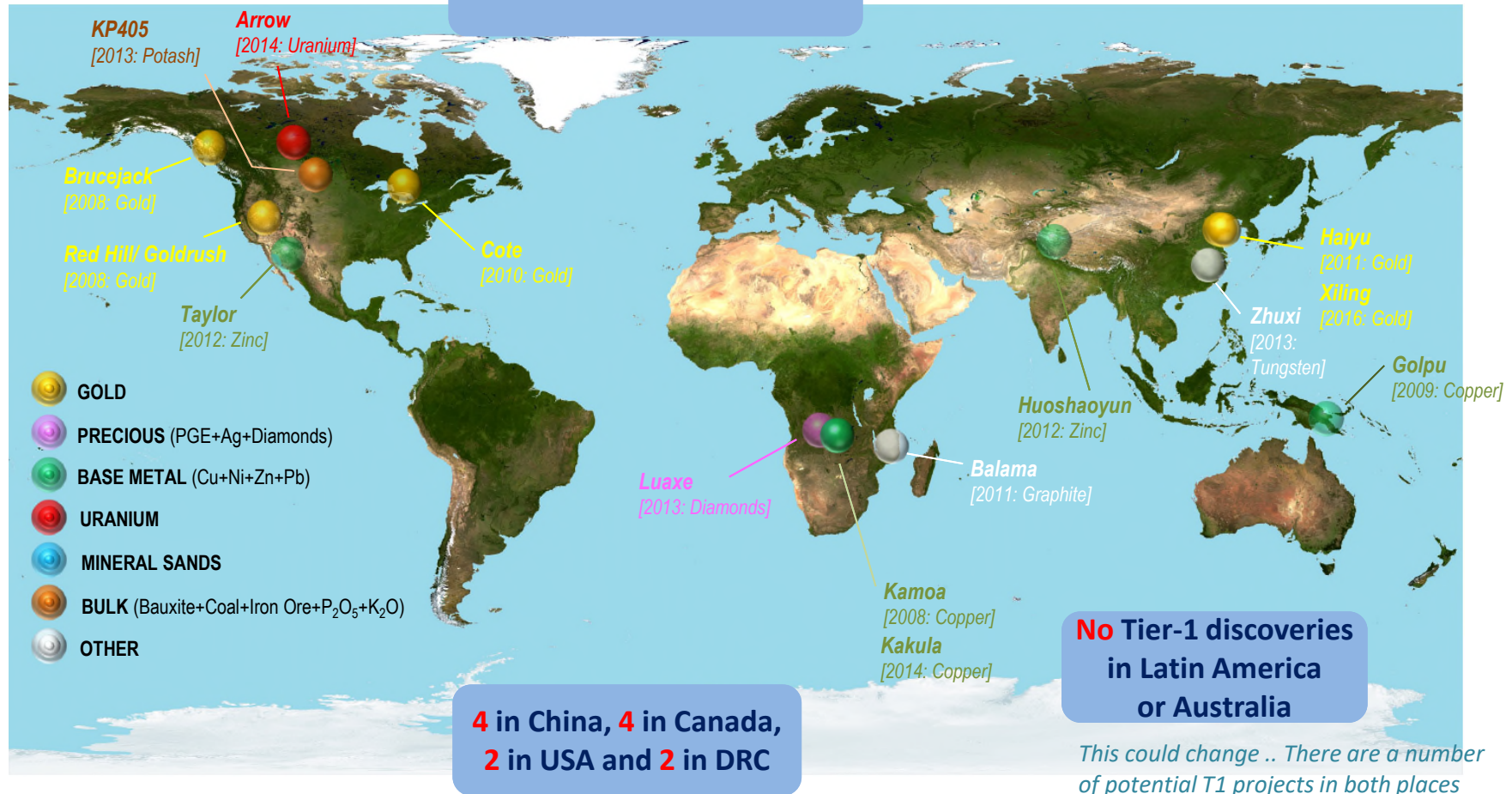
"Tier 2" deposits are "significant" and have some of the elements of a Tier 1 but have an NPV of \$200 to \$1000m

"Tier 3" deposits are modest or marginal deposits, with an NPV of \$0 to \$200m

Source: MinEx Consulting © October 2018

Tier 1 discoveries in the World : 2008-2017

15 of these are Tier-1



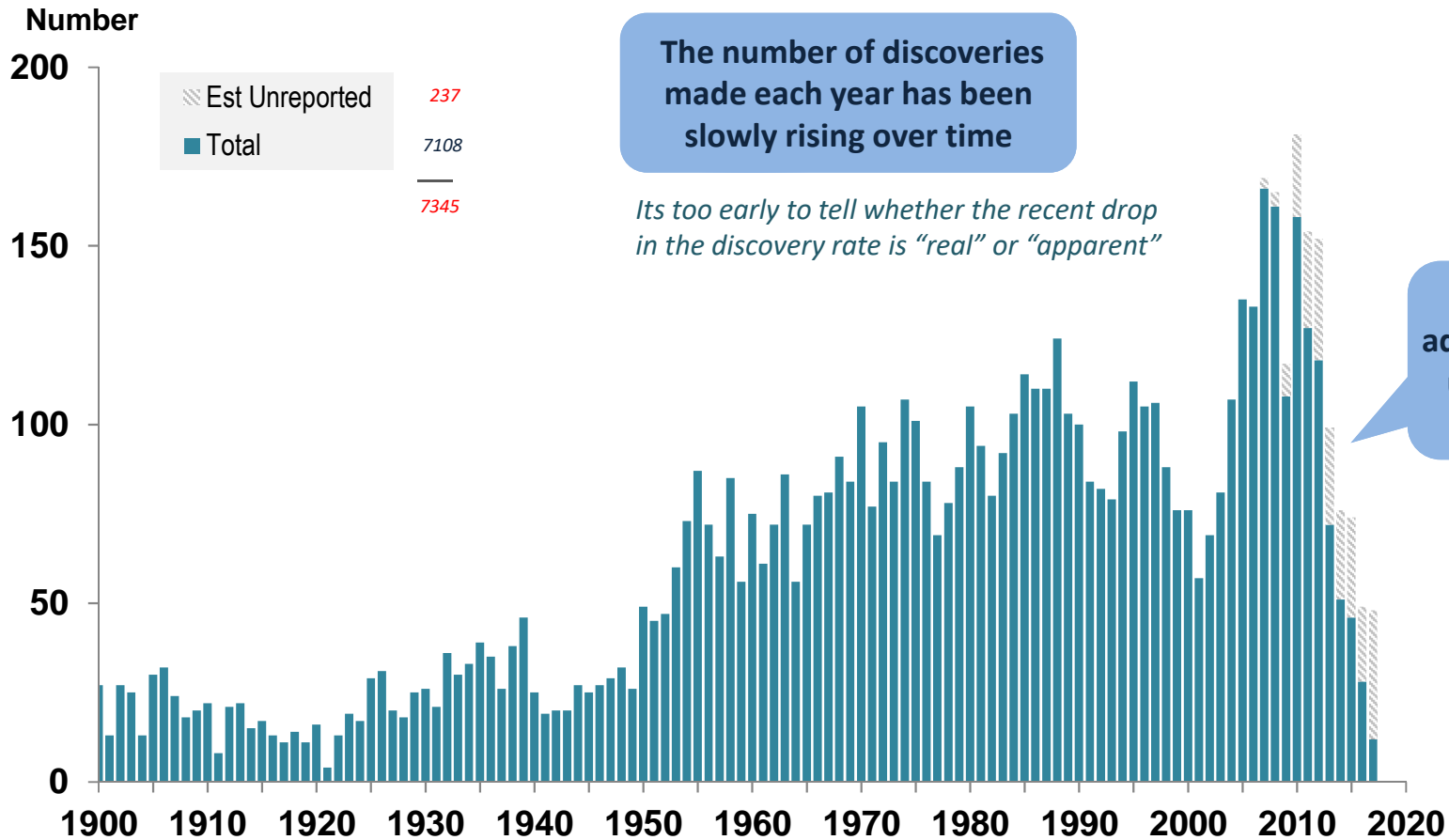
Source: MinEx Consulting © October 2018

The number of discoveries made has steadily risen over time

2. LONG TERM TRENDS IN THE NUMBER, SIZE & QUALITY OF DISCOVERIES

Number of discoveries

Significant mineral discoveries in the World: 1900-2017

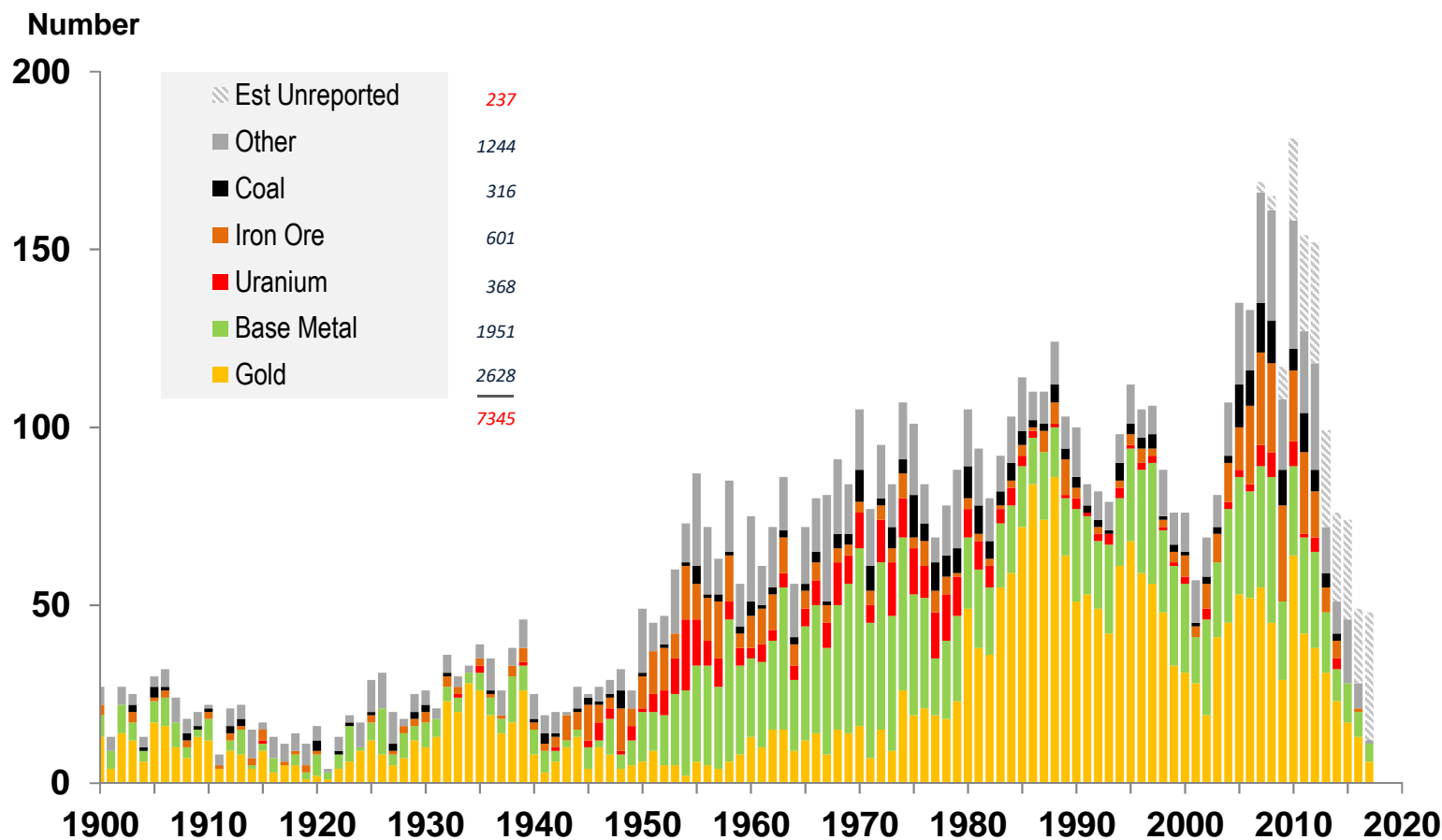


Note: Based on deposits >="Moderate" in-size. i.e. >100koz Au, >10kt Ni, >100Kt Cu, 250kt Zn+Pb, >5kt U₃O₈, >5 Mt Heavy Minerals, >20 Mt Fe, >20 Mt Thermal Coal >10 Mt Met Coal, >3 Mt P₂O₅ and >3 Mt K₂O

Source: MinEx Consulting © October 2018

Number of discoveries by commodity type

Significant mineral discoveries in the World: 1900-2017



Note: Based on deposits \geq "Moderate" in-size. i.e. $>100\text{koz Au}$, $>10\text{kt Ni}$, $>100\text{Kt Cu}$, 250kt Zn+Pb , $>5\text{kt U}_3\text{O}_8$, $>5\text{ Mt Heavy Minerals}$, $>20\text{ Mt Fe}$, $>20\text{ Mt Thermal Coal}$, $>10\text{ Mt Met Coal}$, $>3\text{ Mt P}_2\text{O}_5$ and $>3\text{ Mt K}_2\text{O}$

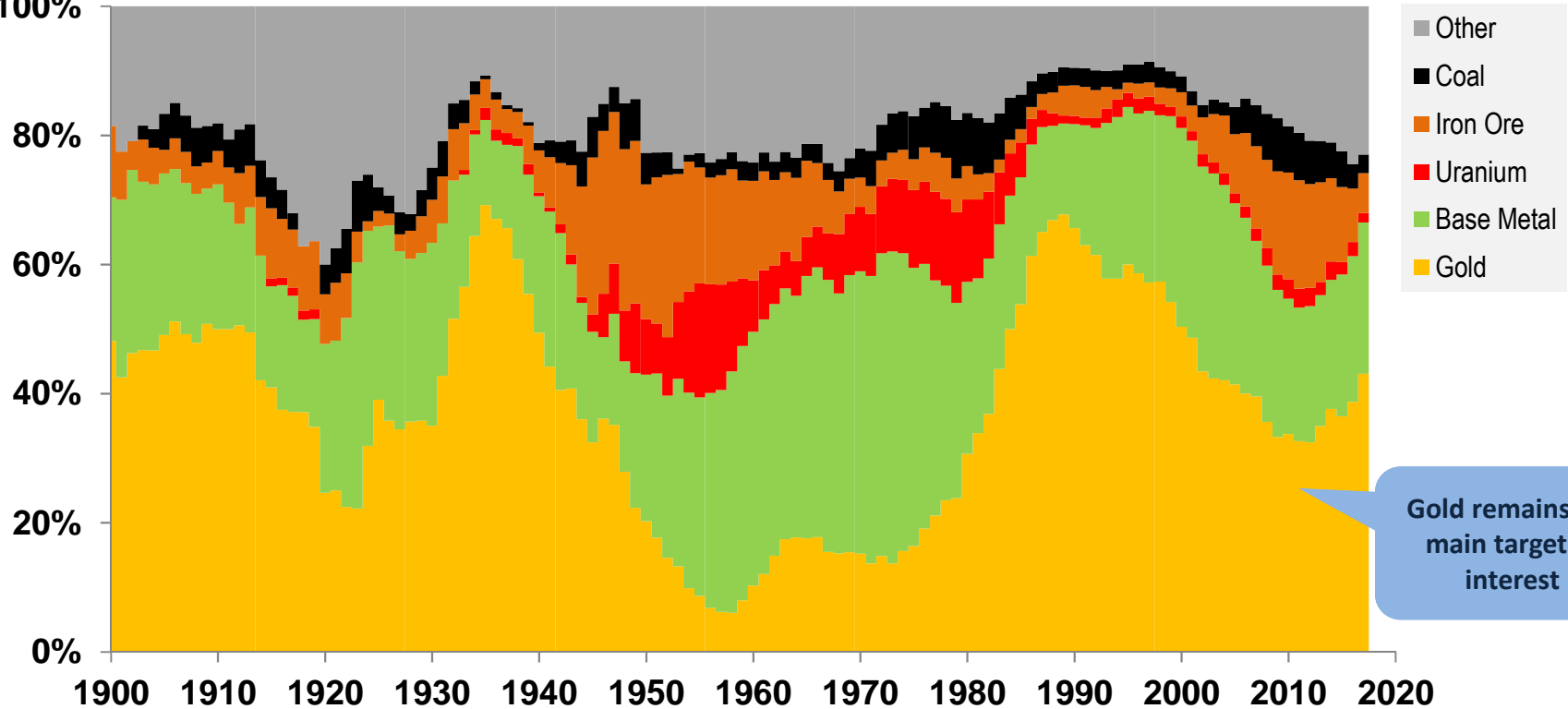
Source: MinEx Consulting © October 2018

Number of discoveries by commodity type

Significant mineral discoveries in the World: 1900-2017

Smoothed Data
(5 year rolling average)

Percentage of Total
100%



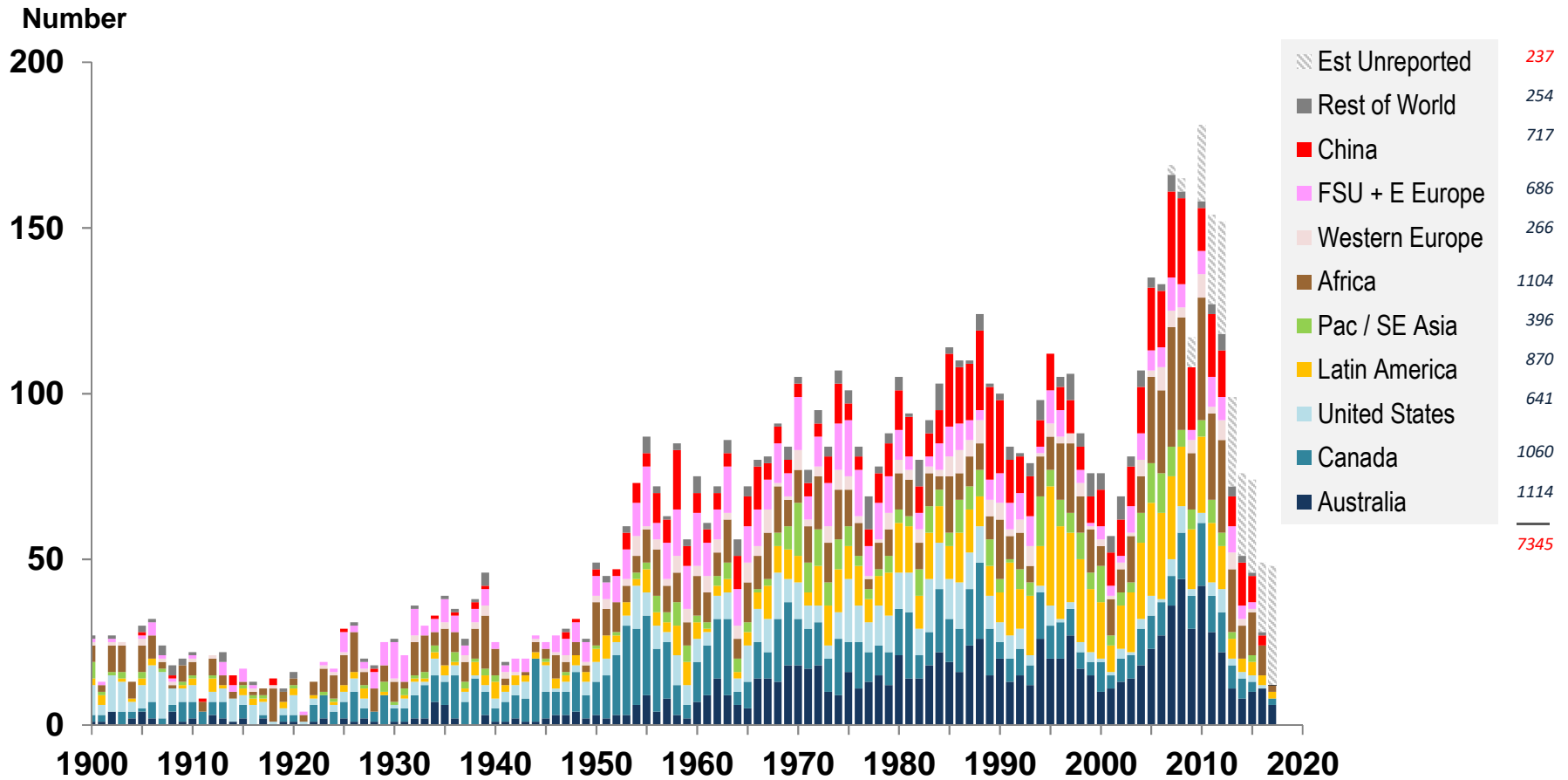
Gold remains the main target of interest

Note: Based on deposits >="Moderate" in-size. i.e. >100koz Au, >10kt Ni, >100Kt Cu, 250kt Zn+Pb, >5kt U₃O₈, >5 Mt Heavy Minerals, >20 Mt Fe, >20 Mt Thermal Coal >10 Mt Met Coal, >3 Mt P₂O₅ and >3 Mt K₂O

Source: MinEx Consulting © October 2018

Number of discoveries by region

Significant mineral discoveries in the World: 1900-2017



Note: Based on deposits >="Moderate" in-size. i.e. >100koz Au, >10kt Ni, >100Kt Cu, 250kt Zn+Pb, >5kt U₃O₈, >5 Mt Heavy Minerals, >20 Mt Fe, >20 Mt Thermal Coal >10 Mt Met Coal, >3 Mt P₂O₅ and >3 Mt K₂O

Source: MinEx Consulting © October 2018

Number of discoveries by region

Significant mineral discoveries in the World: 1900-2017

Smoothed Data
(5 year rolling average)

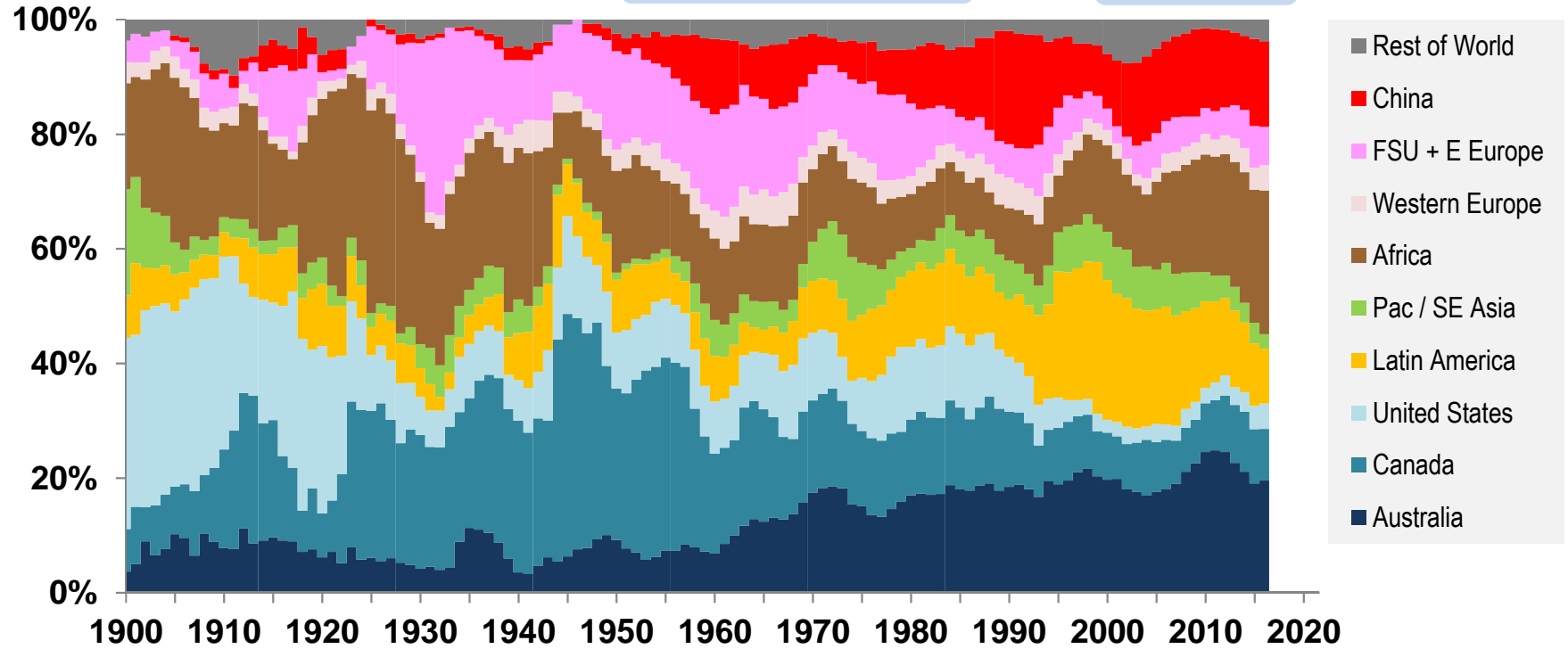
The relative importance of each Region changes over time

... is driven by geological maturity, technology, infrastructure and Country Risk

Russia dropped out following the collapse of the Soviet Union in 1991

Rise of China and the return of Africa

Percentage of Total



In the early 1900's USA was dominant ...

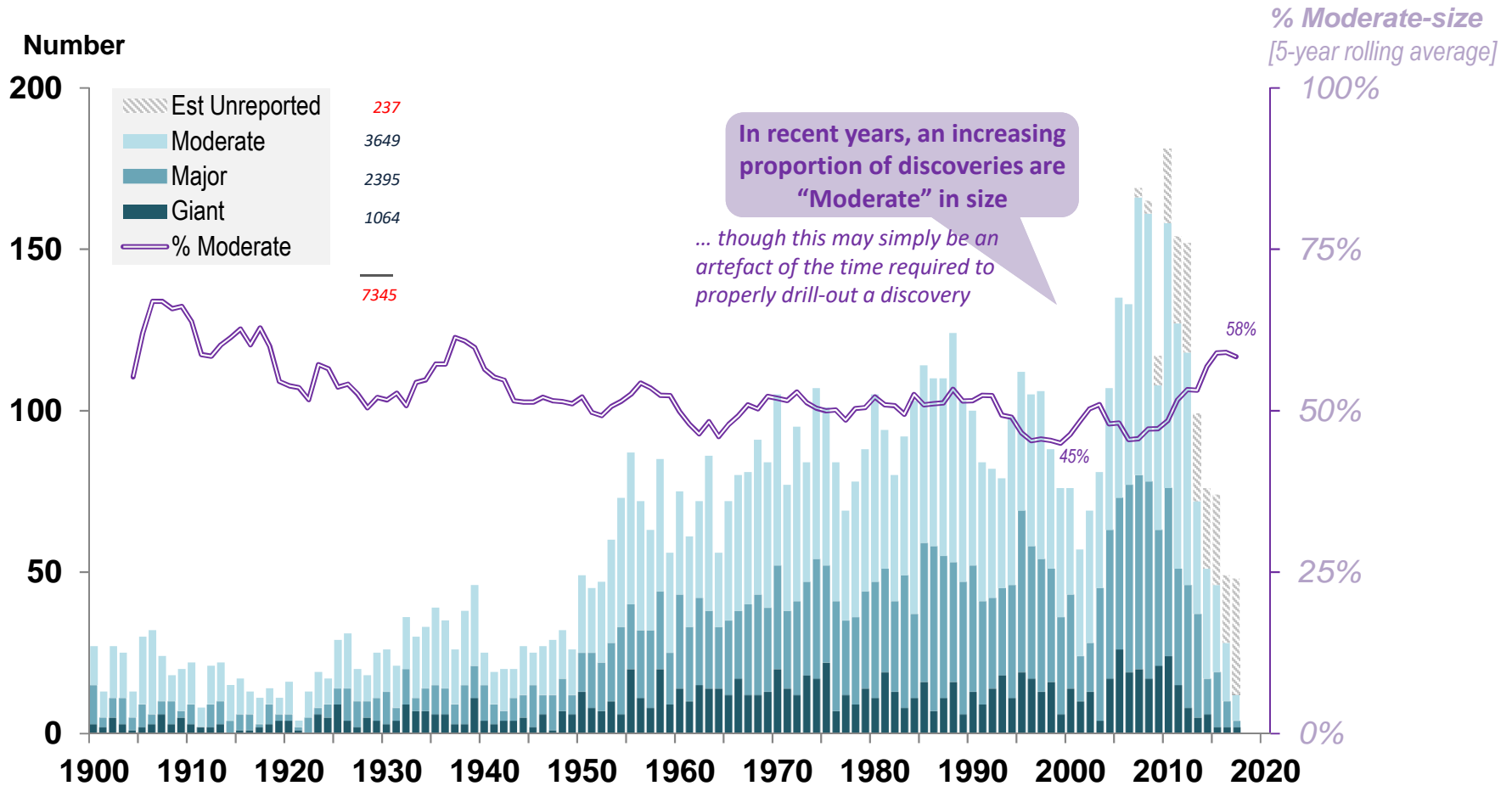
... followed by Canada

Australia has grown ... but many of these discoveries are small in size

Source: MinEx Consulting © October 2018

Number of discoveries by size

Significant mineral discoveries in the World: 1900-2017

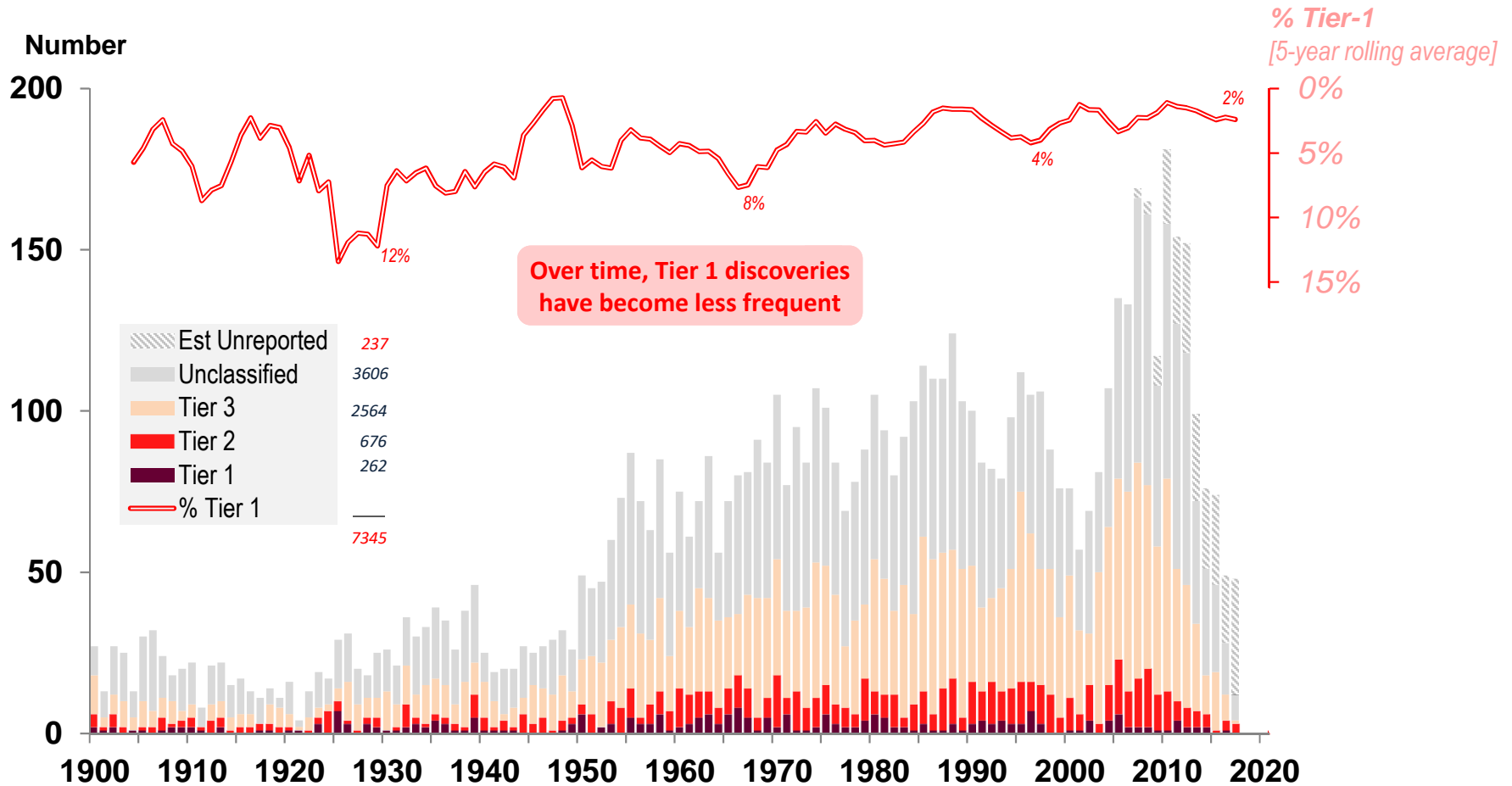


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Source: MinEx Consulting © October 2018

Number of discoveries by quality

Tier 1, 2 & 3 mineral discoveries in the World: 1900-2017



Note: "Tier 1" deposits are company-making mines and are large, long life and low cost with NPV at Decision-to-Build of >\$1000m (in 2013 US Dollars)

"Tier 2" deposits are "significant" and have some of the elements of a Tier 1 but have an NPV of \$200 to \$1000m

"Tier 3" deposits are modest or marginal deposits, with an NPV of \$0 to \$200m

"Unclassified" deposits are small deposits with an Expected Value of ~\$10m

Source: MinEx Consulting © October 2018

Junior explorers are now finding most of the deposits

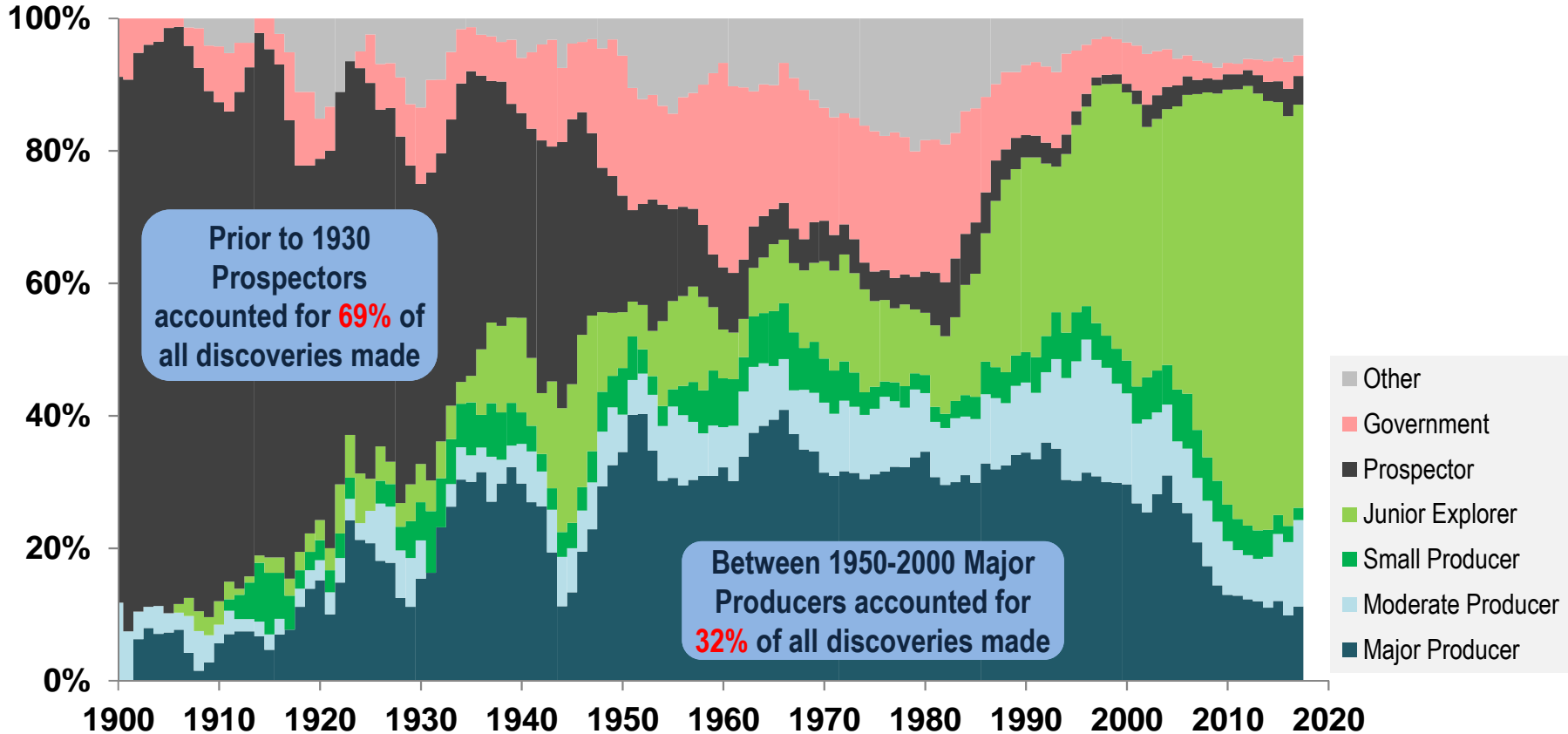
3. LONG TERM TRENDS IN WHO MADE THE DISCOVERIES

Number of discoveries by company type

Significant mineral discoveries in the **Western World**: 1900-2017

In the last decade **65%** of all discoveries in the WW were made by Junior Explorers

Percentage of Total



Note: "Junior Explorer" has no income
 "Small Producer" has a single small mine and <\$50m pa sales revenue (in 2013 US Dollars)
 "Moderate Producer" has 1-3 mines and \$50-500m pa sales revenue
 "Major Producer" has several large mines and >\$500m pa revenue
 "Other" includes industrial companies, major oil companies and private/unlisted companies

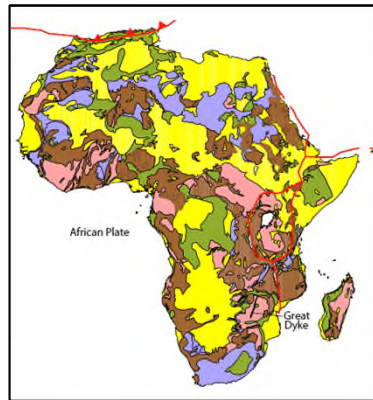
Source: MinEx Consulting © October 2018

There have been several innovations in the exploration tools used to make discoveries

4. LONG TERM TRENDS IN EXPLORATION METHODS

Trends in exploration methods

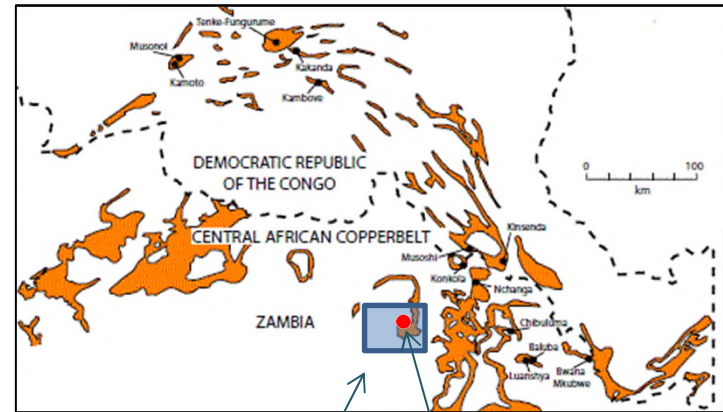
The preferred search method used varies by commodity type, depth of cover and “scale”



Continental-Scale



Province-Scale



District-Scale

Project-Scale

Prospect-Scale

MinEx has carried out a detailed analysis of the discovery history of 3799 deposits at these two scales

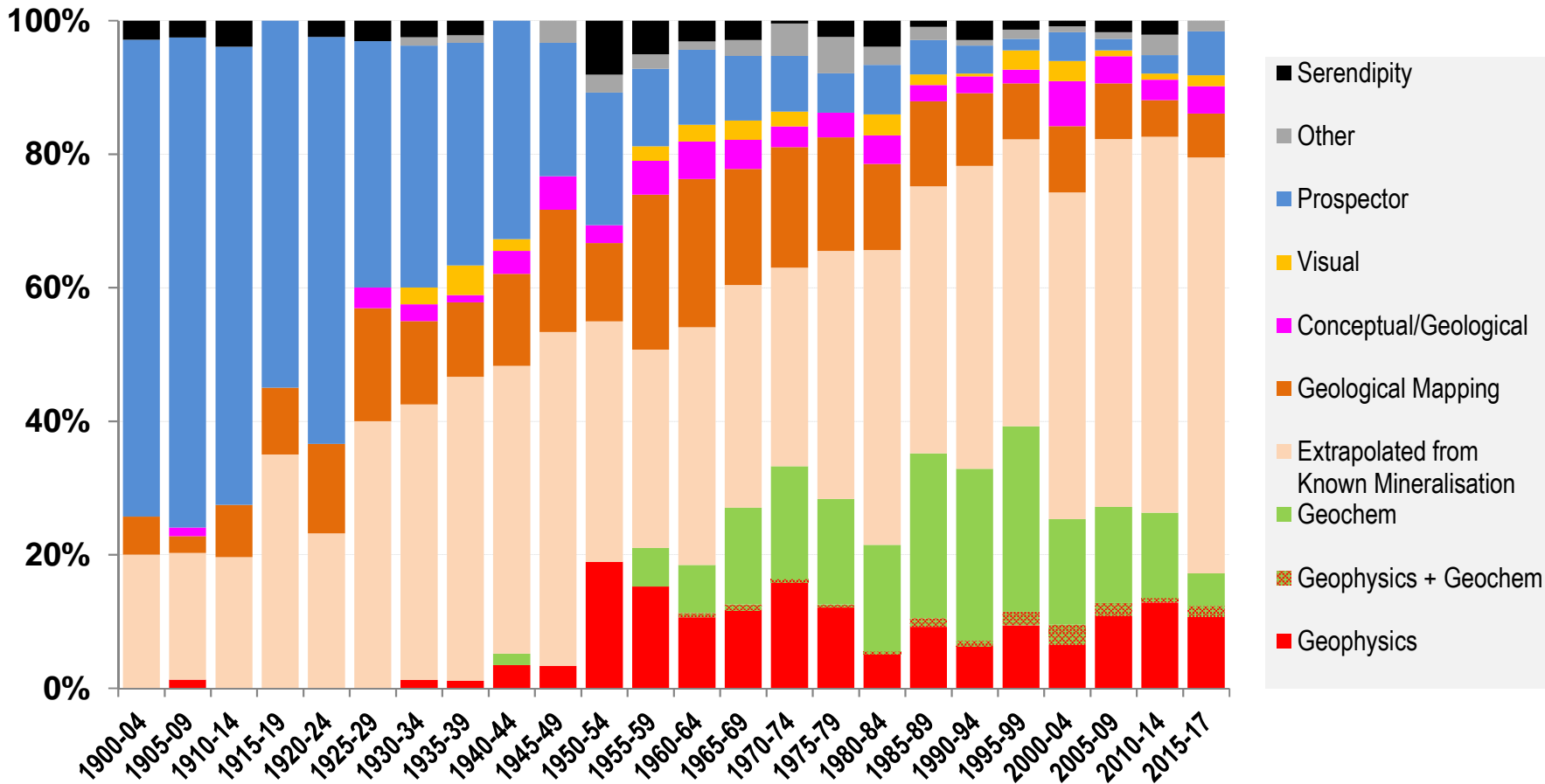
Primary search method used at the **project-scale**

ALL discoveries in the World: 1900-2017

ie What method was used to decide where to **peg the leases**

The most popular area selection method is to work in areas of known mineralisation

Percentage of total discoveries



Note: Analysis based on detailed analysis of 3799 projects (out of 7108 known discoveries)

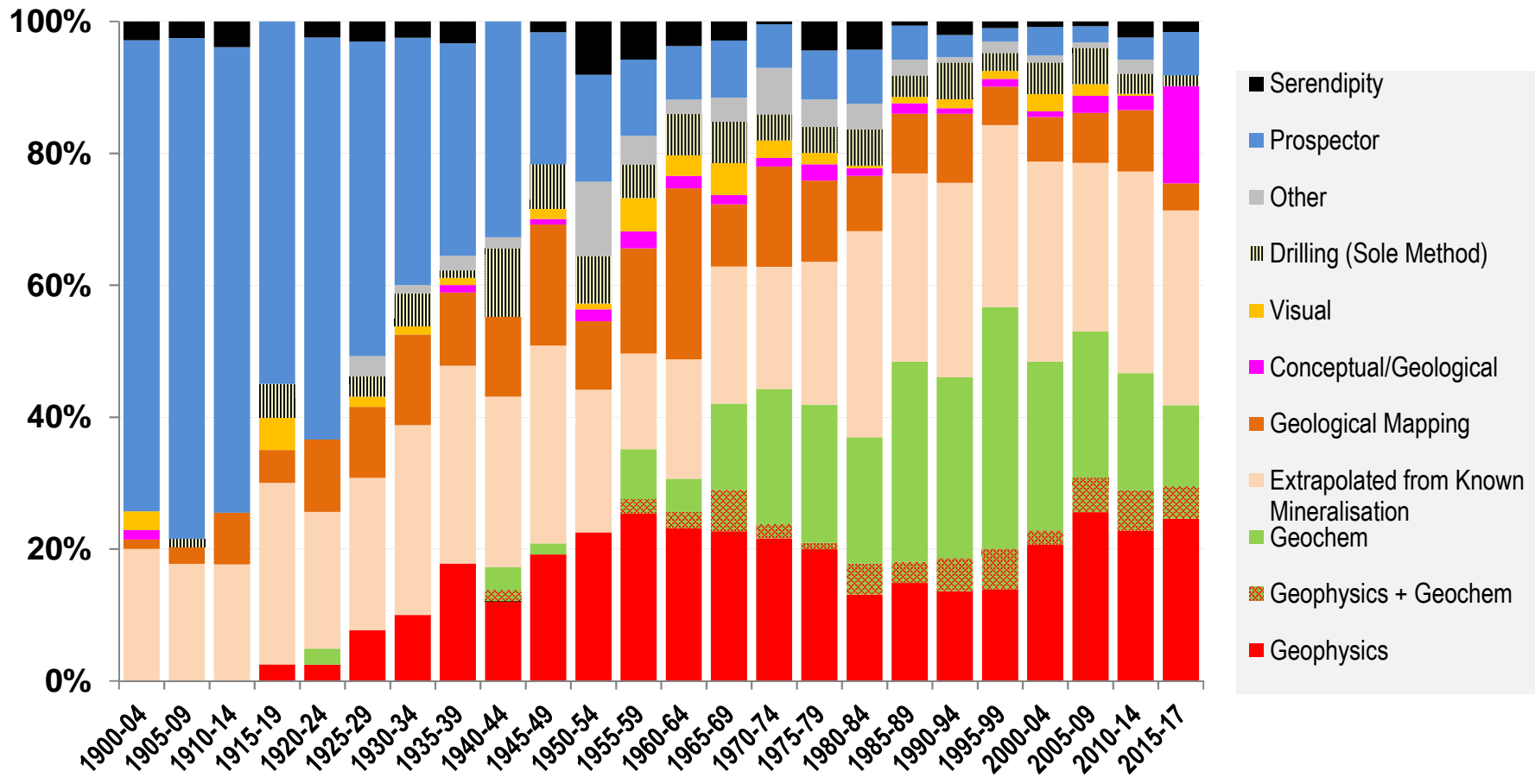
Source: MinEx Consulting © October 2018

Primary search method used at the prospect-scale

ALL discoveries in the World: 1900-2017

(Depending on the commodity & location) Geophysics and Geochemistry are the two main techniques used to site the drill rig

ie What method was used to decide where to drill the first hole



Note: Analysis based on detailed analysis of 3799 projects (out of 7108 known discoveries)

Source: MinEx Consulting © October 2018

$R^2 = 0.91$

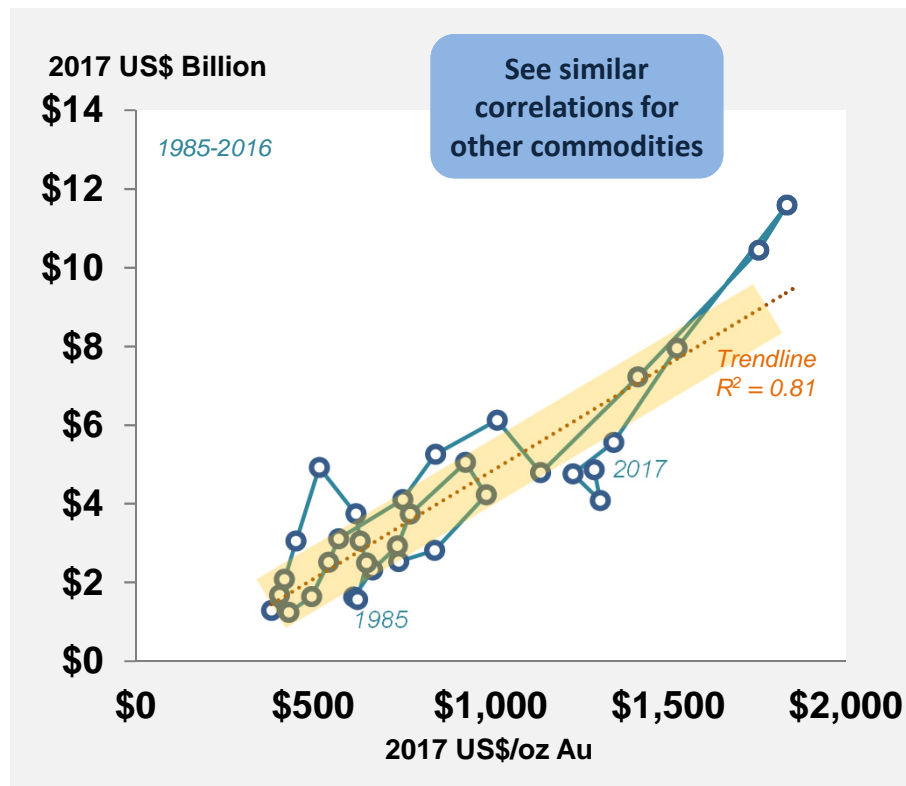
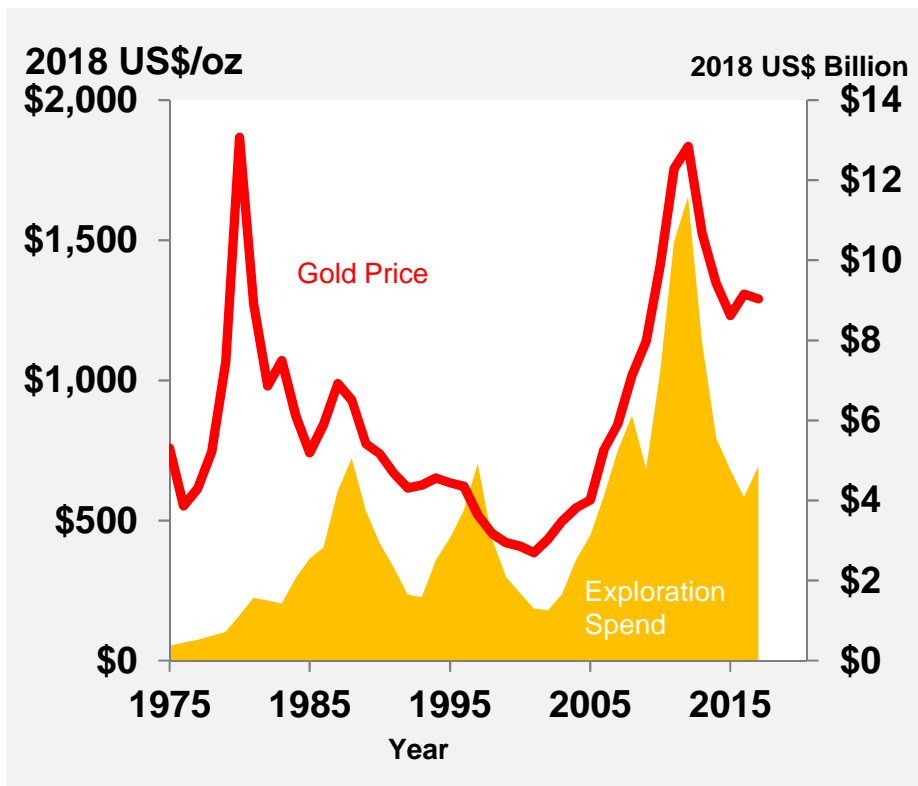
A Multi-Factor model was built to **predict** the likely exploration spend

MinEx forecasts a sustained recovery in exploration over the next decade

5. HOW MUCH IS SPENT ON EXPLORATION, AND WHAT'S THE OUTLOOK?

Exploration spend varies with the commodity price : Gold

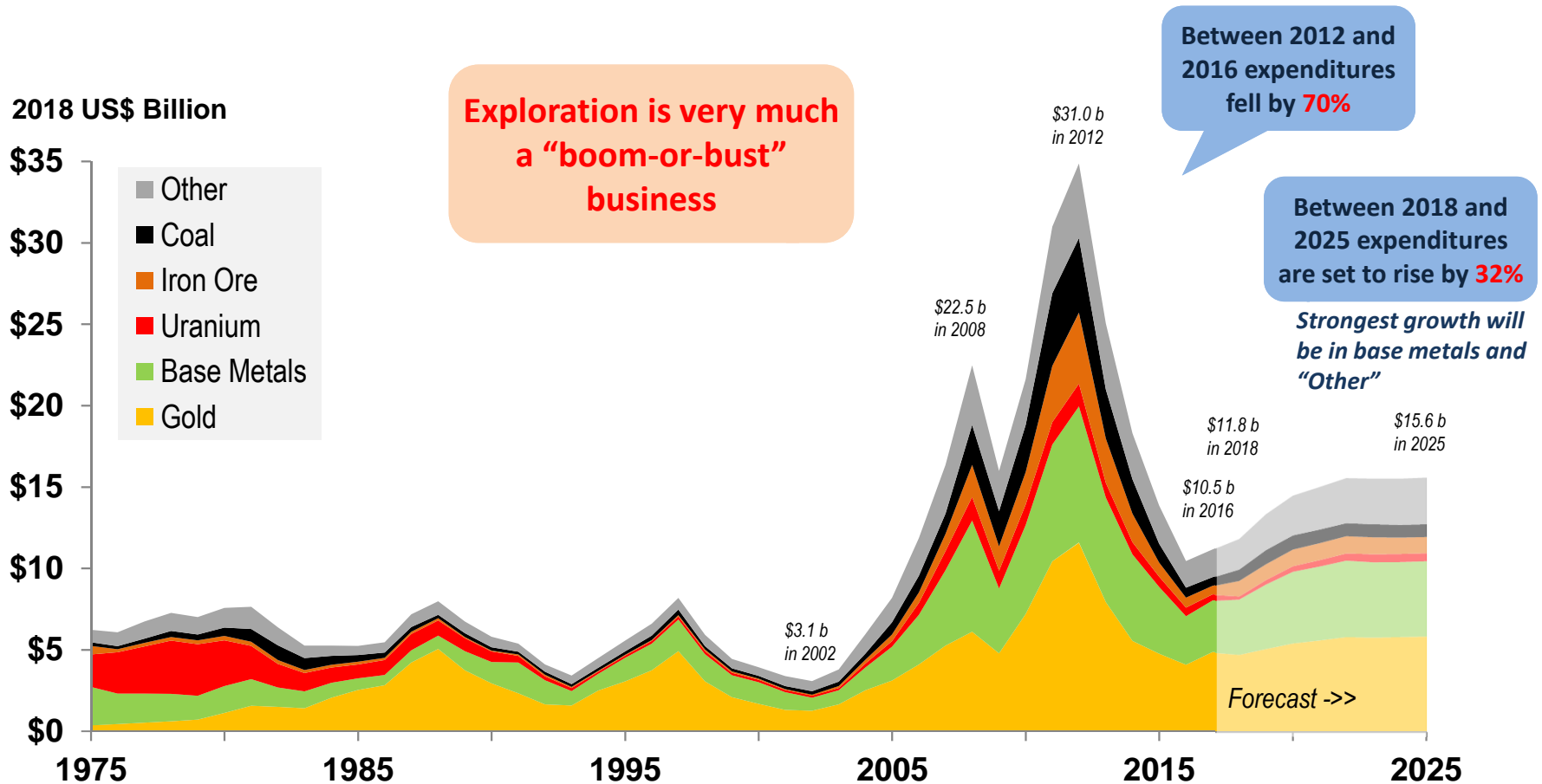
Gold price and exploration expenditures - World : 1975-2017



Source: MinEx Consulting © October 2018

Historical and forecast exploration expenditures by Commodity

Mineral exploration – World : 1975-2025



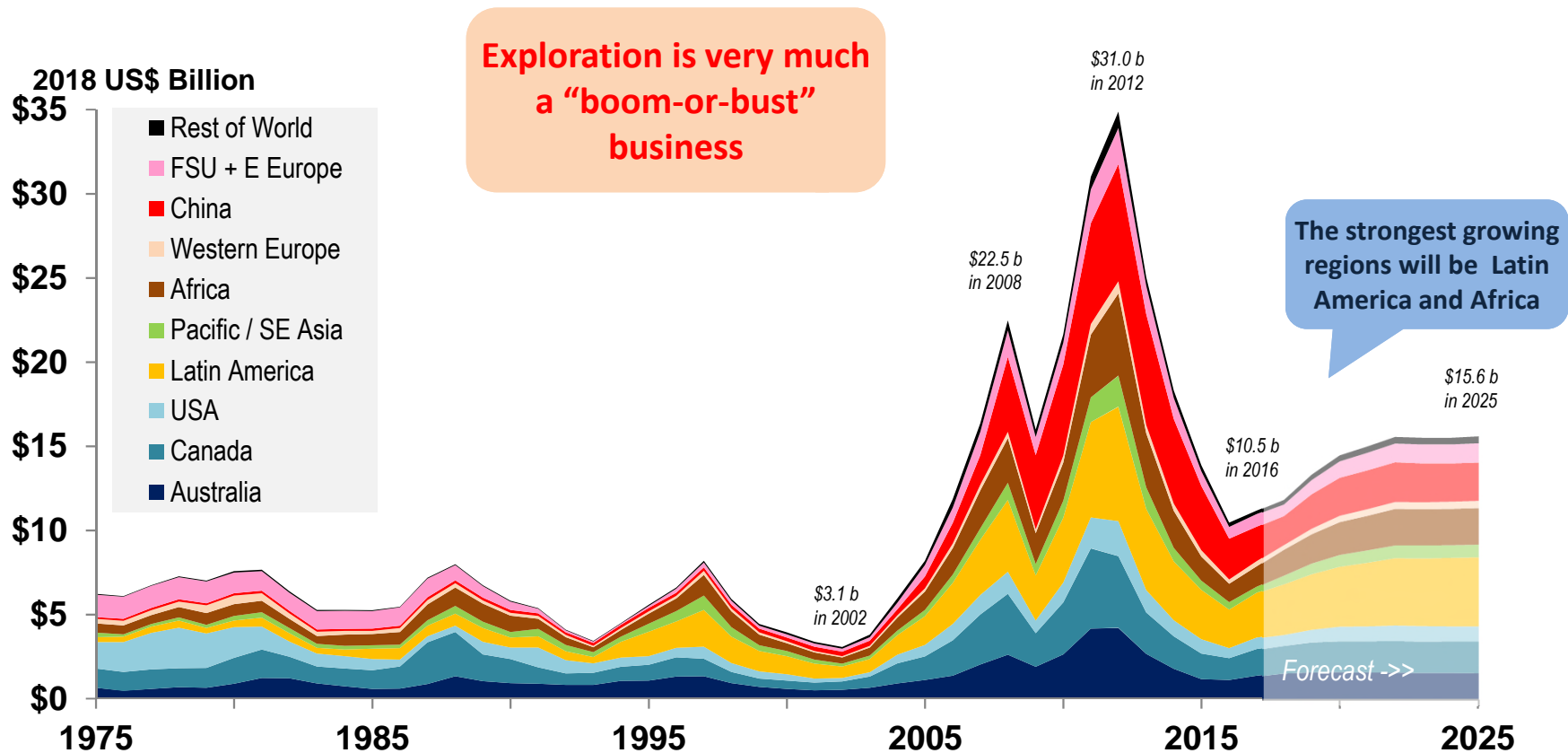
Note: Includes expenditures on non-bulk and bulk mineral (i.e. bauxite, coal, and iron ore) exploration

Forecast is based on a long-run price (in constant 2018 US Dollars) of \$1200/oz Au, \$3.00/lb Cu, \$7.50/lb Ni, \$1.00/lb Zn, \$0.80/lb Pb, \$50/lb U₃O₈ \$60/t iron ore fines and \$75 & \$150/t for thermal & met coal

Source: MinEx Consulting © October 2018

Historical and forecast exploration expenditures by Region

Mineral exploration – World : 1975-2025



Note: Includes expenditures on non-bulk and bulk mineral (i.e. bauxite, coal, and iron ore) exploration

Forecast is based on a long-run price (in constant 2018 US Dollars) of \$1200/oz Au, \$3.00/lb Cu, \$7.50/lb Ni, \$1.00/lb Zn, \$0.80/lb Pb, \$50/lb U₃O₈ \$60/t iron ore fines and \$75 & \$150/t for thermal & met coal

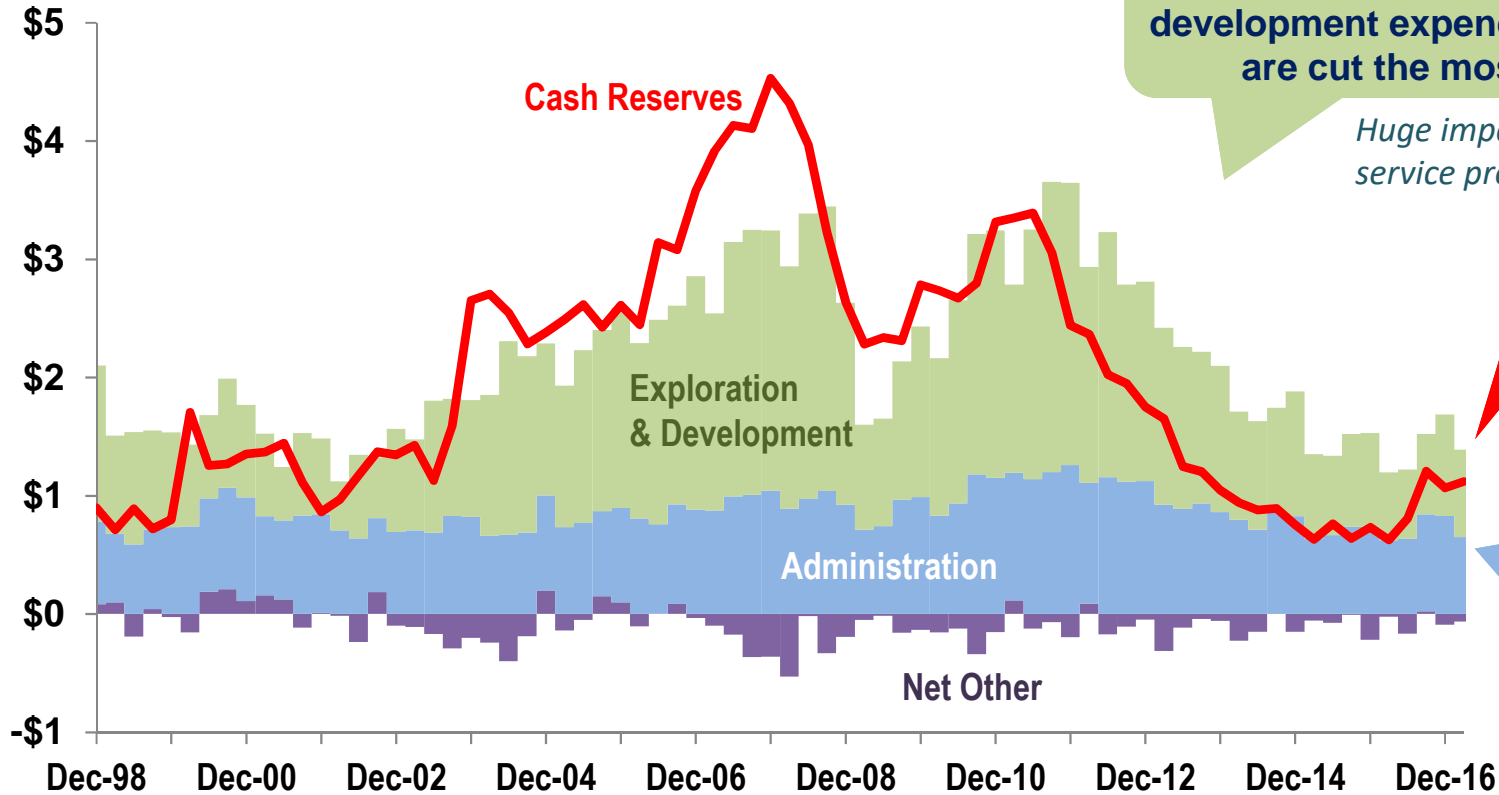
Source: MinEx Consulting © October 2018

The junior sector has gone through some tough times – and is now on way back up

6. WHAT'S HAPPENING IN THE JUNIOR SECTOR ?

Cash Reserves and Expenditures for the MEDIAN Australian Junior Exploration Company : 1998-March 2017

2016 A\$ Million pa



During a downturn, “in-field” exploration & development expenditures are cut the most
Huge impact on service providers

Cash Reserves are building off an all-time low

Admin costs tend to be “fixed”

Note: Survey based on a sample of 320 junior exploration companies listed on the ASX between 1998-2017
“Net Other” includes production and other costs less interest income, mine revenue, Government Assistance and R&D tax credits
Quarterly spend data has been multiplied by 4x to produce an annualised spend rate

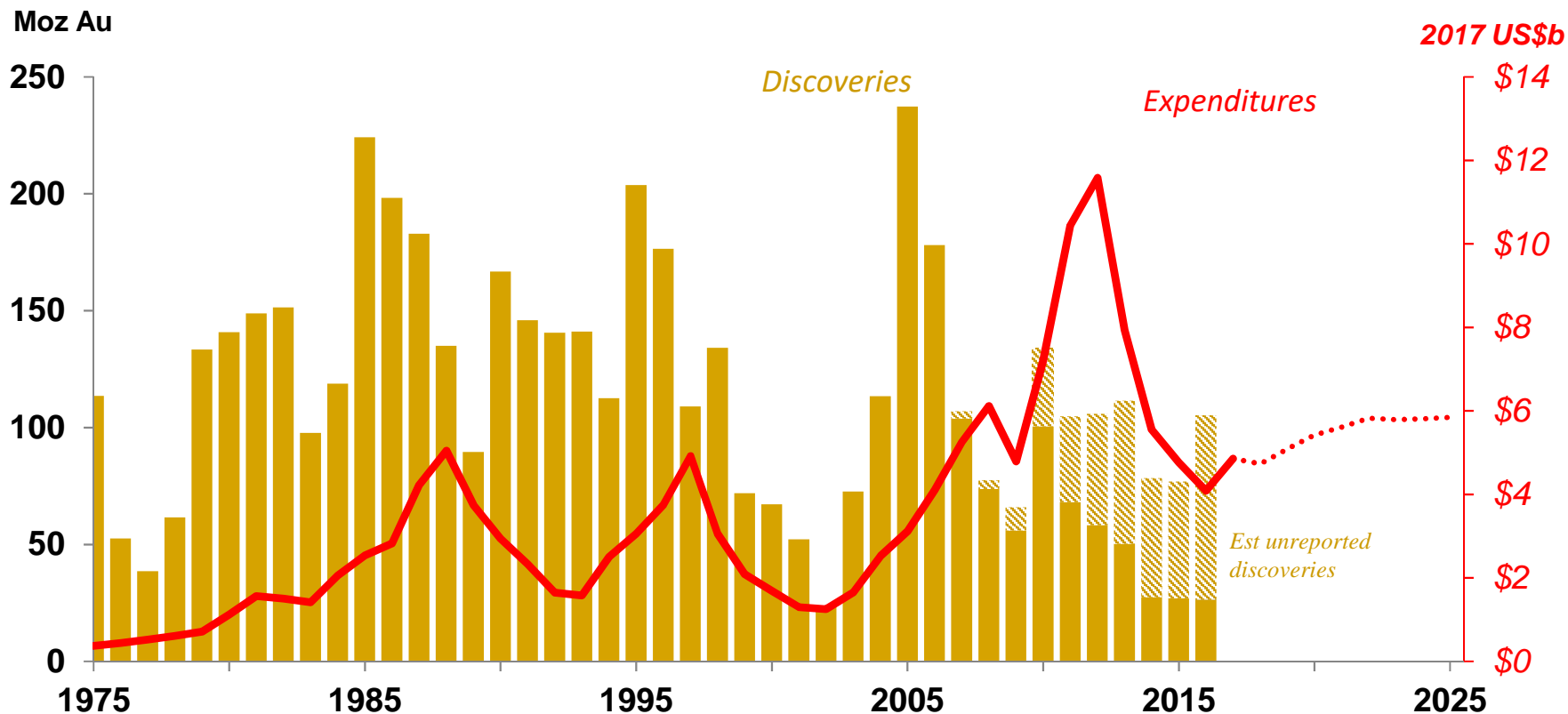
Source: MinEx Consulting © June 2017
based on Quarterly Reports to the ASX

Discovery performance varies greatly over time

7. WHEN IS THE BEST TIME IN THE BUSINESS CYCLE TO BE AN EXPLORER ?

Exploration Expenditures and amount of Primary Metal discovered

Primary Gold World: 1975-2016

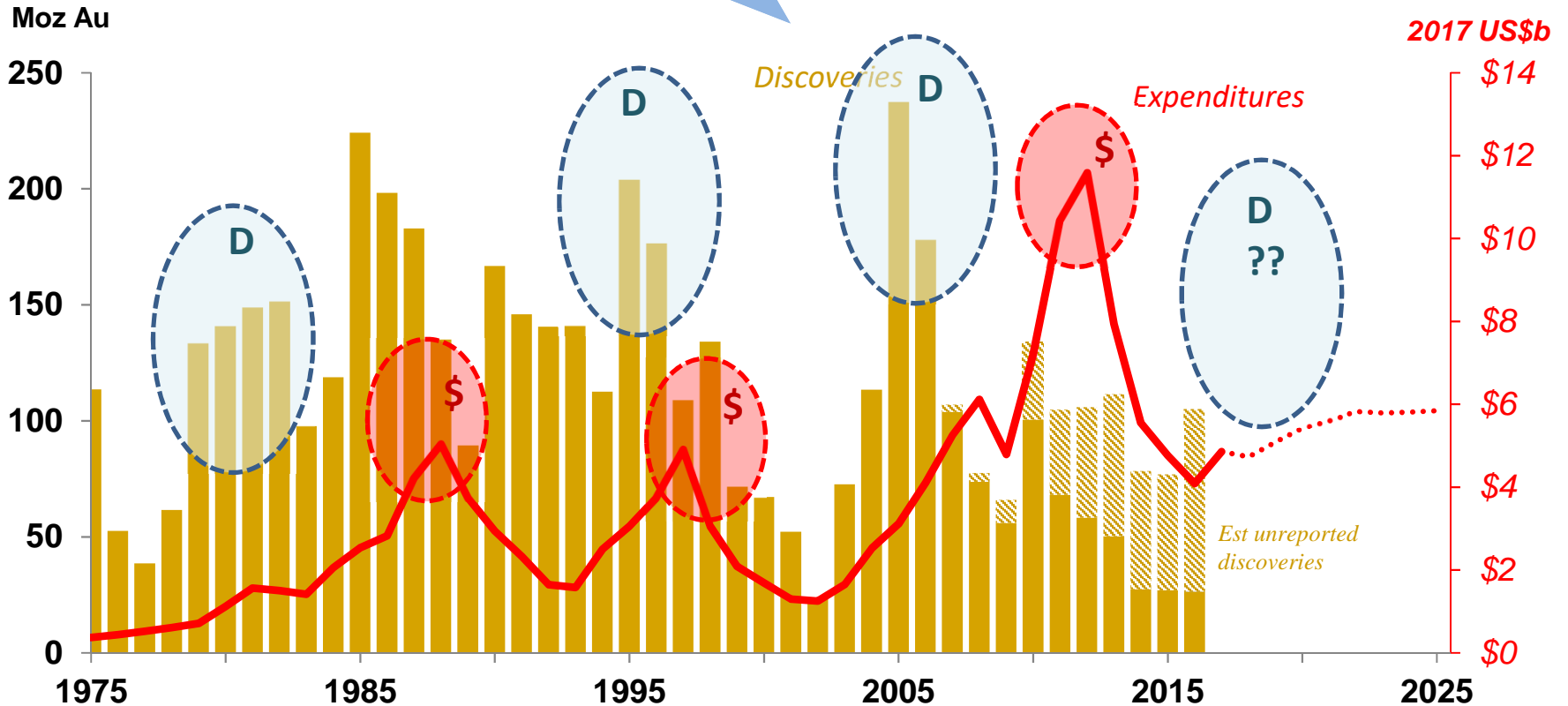


Source: MinEx Consulting © October 2018

Exploration Expenditures and amount of Primary Metal discovered

Primary Gold World: 1975-2016

The peaks in discoveries precedes the peaks in spend !



Source: MinEx Consulting © October 2018

The best time to get in, is when exploration spend bottoms out and starts rising ...

*.... which is **NOW** !*

8. SUMMARY / CONCLUSIONS

Summary / Conclusions [1/2]

1. **Location of recent discoveries** – over 1100 discoveries have been made in the last decade ... but only 15 of these were Tier 1 (or World Class). 4 each were found in Canada and China, 2 each in USA and DRC and zero in Australia.
2. **Trends in the number, size and quality of discoveries** – Gold still remains the main focus. Appears to be a drop in the size and quality of recent discoveries. Its getting harder to find a Tier 1 deposit. The number of discoveries made each year has been slowly rising over time.
3. **Who made the discoveries ?** – Used to be driven by the Majors. Junior explorers now account for 65% of all discoveries (by number). Chinese SOE's are important within China.
4. **Trends in the discovery methods used** – Area selection is mainly driven by presence of known mineralisation. Geophysics and Geochemistry are the two main techniques used to site the drill rig

Summary / Conclusions [2/2]

5. How much is being spent on exploration, and what's the likely outlook ? – Exploration is very much a “boom-or-bust” business. The 2 key drivers are commodity prices and market sentiment (which affects Junior Company's ability to raise capital). Exploration expenditures are set to rise by 32% over the next 7 years. Strongest growth will be in base metals and “Other”. Strongest regions will be Latin America and Africa.
6. What's happening in the Junior Sector? – Junior companies are now raising cash – and are coming out of hibernation / more active in the field.
7. When is the best time in the business cycle to be an explorer?
– Peak performance precedes peak spending ! Based on the last 3 business cycles, exploration performance is maximised in the first couple years after coming out of the bottom of the business cycle

... That time is now !!

My call is that the industry will deliver a number of game-changing discoveries over the next 2 years

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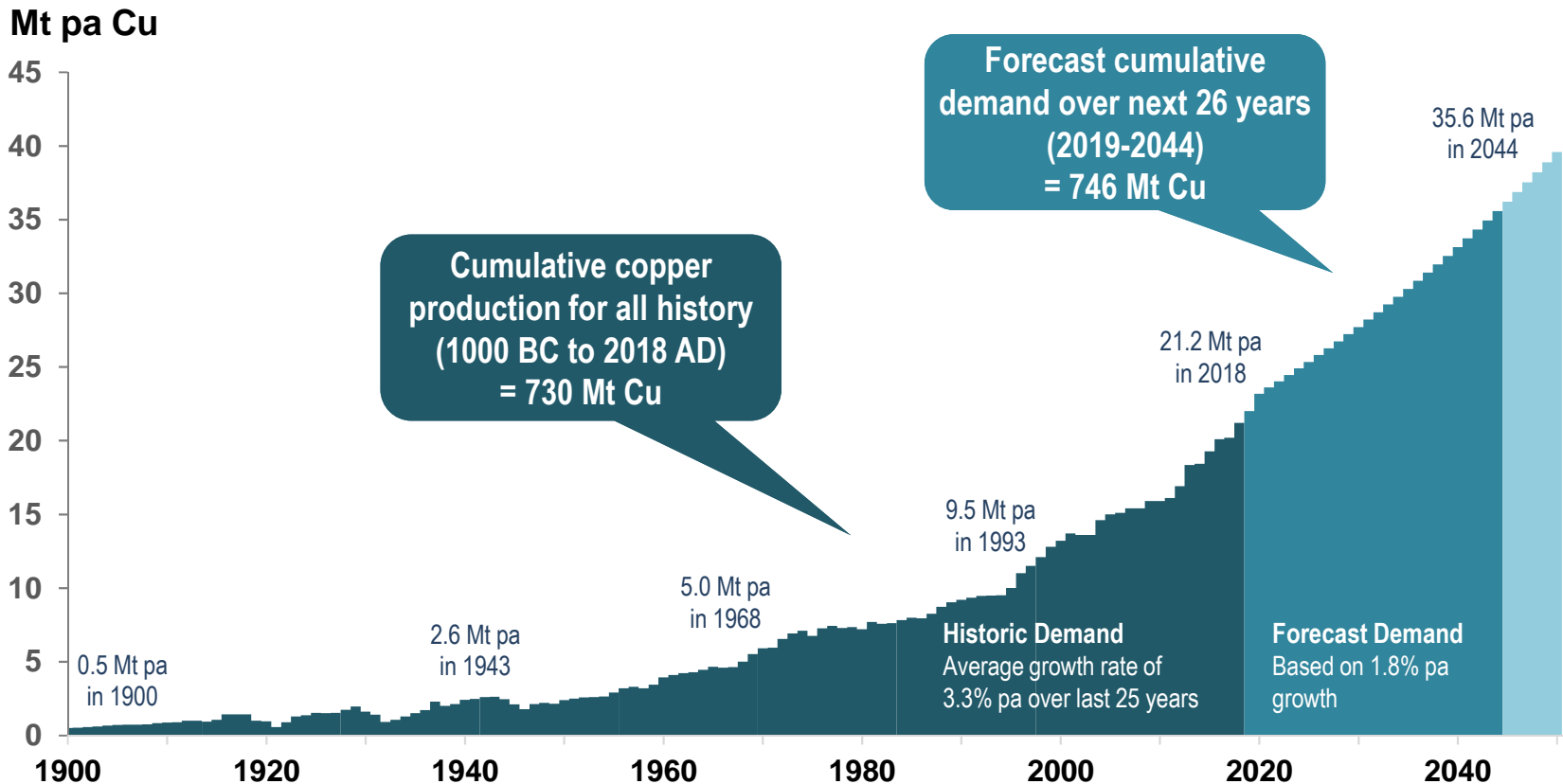
SPARE SLIDES

Its simple – for the industry to be sustainable it need to find (good) new deposits to replace what it mines.

X. BUSINESS CASE FOR EXPLORATION

World's demand for metals doubles every 20-30 years

Primary copper production for World: 1900-2050



Over the next 26 years the world is going to mine more copper than what has been mined in all history

Sources: Historical data from USGS and Office of the Chief Economist Sept 2018