# Sustaining our urbanizing planet. New roles for vital ‘green metals’.

*Imagine: 8 billion of us – in just 3 more years!*

Invest in African Mining Indaba | February 5, 2020

**ROBERT FRIEDLAND**
Executive Co-Chairman

IVANHOE MINES

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Certain statements in presentation constitute “forward-looking statements” or “forward-looking information” within the meaning of applicable securities laws, including, without limitation, the timing and results of: (i) statements regarding the ongoing development and exploration work at the Kamoa-Kakula Project, including drilling, decline development, and feasibility, pre-feasibility (PFS) and preliminary economic assessment (PEA) studies; (ii) statements regarding the ongoing development work, including shaft sinking, and the feasibility study at the Platreef Project; and (iii) statements regarding ongoing upgrading and development work and the pre-feasibility study at the Kipushi Project. As well, the results of the PFS and PEA of the Kamoa-Kakula Project, the feasibility study of the Platreef Project and the PFS of the Kipushi Project constitute forward-looking information, and include future estimates of internal rates of return, net present value, future production, estimates of cash cost, proposed mining plans and methods, mine life estimates, cash flow forecasts, metal recoveries, and estimates of capital and operating costs.

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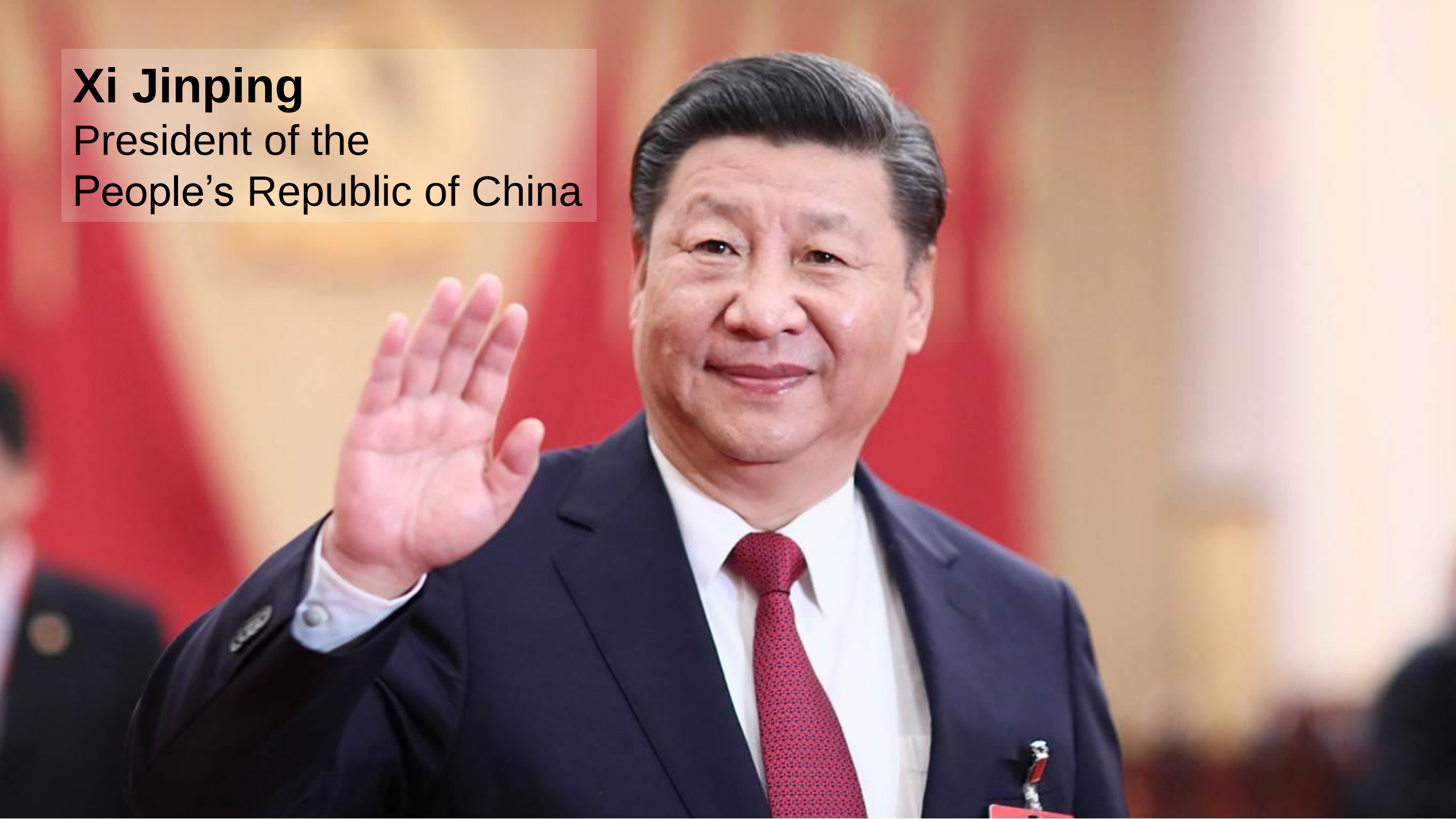
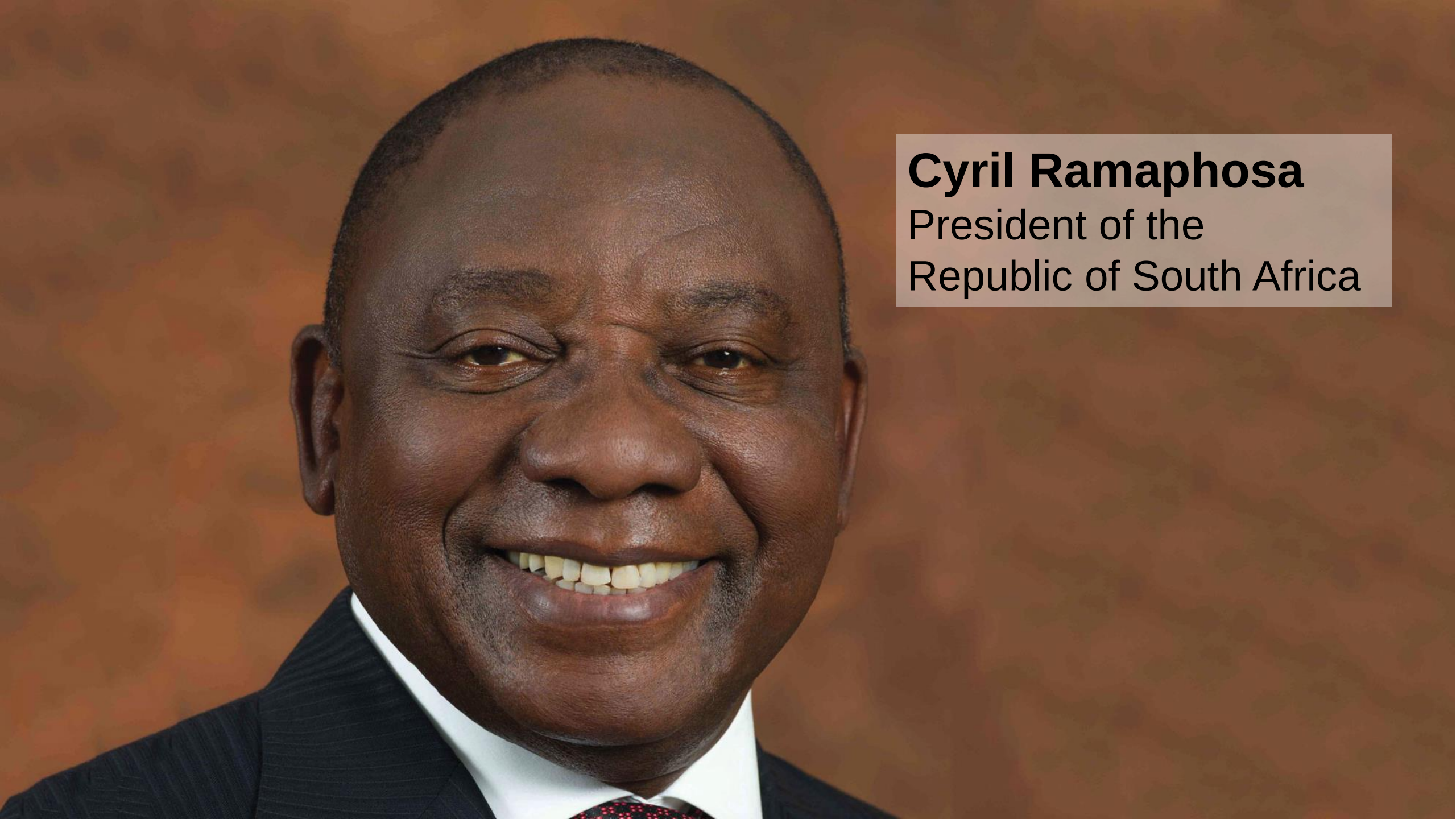
This presentation also contains references to estimates of Mineral Resources. The estimation of Mineral Resources is inherently uncertain and involves subjective judgments about many relevant factors. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The accuracy of any such estimates is a function of the quantity and quality of available data, and of the assumptions made and judgments used in engineering and geological interpretation (including estimated future production from the company’s projects, the anticipated tonnages and grades that will be mined and the estimated level of recovery that will be realized), which may prove to be unreliable and depend, to a certain extent, upon the analysis of drilling results and statistical inferences that ultimately may prove to be inaccurate. Mineral Resource estimates may have to be re-estimated based on: (i) fluctuations in copper, nickel, platinum-group elements (PGE), gold or other mineral prices; (ii) results of drilling, (iii) metallurgical testing and other studies; (iv) proposed mining operations, including dilution; (v) the evaluation of mine plans subsequent to the date of any estimates; and (vi) the possible failure to receive required permits, approvals and licences.

Disclosures of a scientific or technical nature in this presentation have been reviewed and approved by Stephen Torr, who is considered, by virtue of his education, experience and professional association, a Qualified Person under the terms of NI 43-101. Ivanhoe has prepared a NI 43-101 technical report for each of the Kamoa-Kakula Project, the Platreef Project and the Kipushi Project, which are available under the company’s SEDAR profile at www.sedar.com. These technical reports include relevant information regarding the effective date and the assumptions, parameters and methods of the mineral resource estimates on the Kamoa-Kakula Project, Kipushi Project and Platreef Project cited in this presentation, as well as information regarding data verification, exploration procedures and other matters relevant to the scientific and technical disclosure contained in this presentation in respect of the Kamoa-Kakula Project, Platreef Project and Kipushi Project.


**Xi Jinping**
President of the
People’s Republic of China


Source: AFP/JIJI


**Cyril Ramaphosa**
President of the
Republic of South Africa

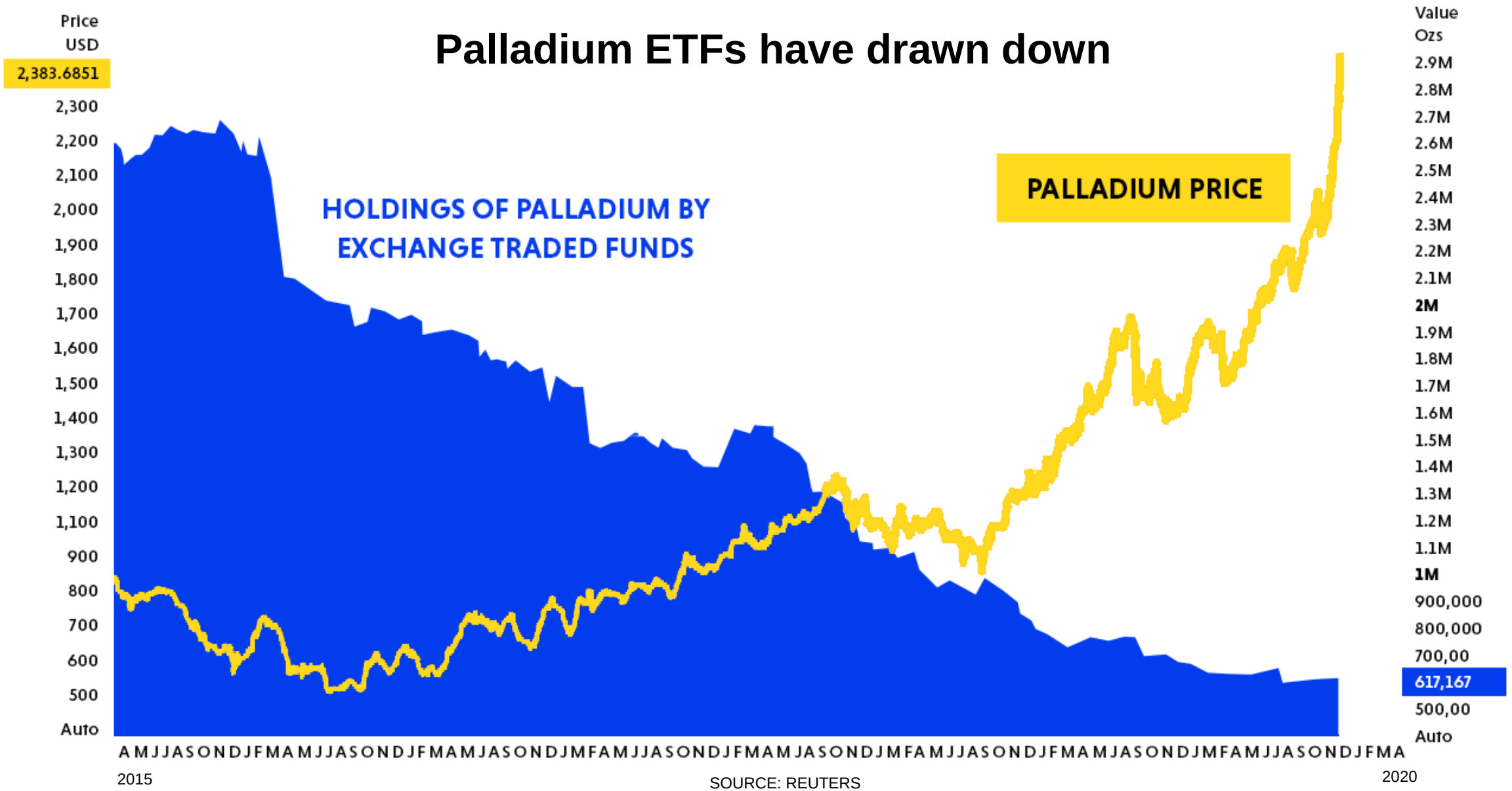

Source: Reuters/Baz Ratner

# Visualizing the auto industry's problem


Note: Size represents the global market value of the commodity. Source: CleanTeQ

# Precious Metal? Palladium Is Now More Expensive Than Gold Has Ever Been

# The Palladium Market has Been in Deficit for Most of the Last Decade




SOURCE: REUTERS

# Prices for the world's most precious metal are soaring

# 20 years of a long-lasting friendship with CITIC

***"We are confident that the CITIC Group has the experience, financial resources – and a shared commitment to our objectives – to greatly assist us as we advance our projects to production."***


**In April 2003**, **Robert Friedland**, Chairman of Ivanhoe Mines, and **Wang Jun** (left), Chairman of CITIC Group, announced the formation of a strategic alliance in mineral exploration, development and production on Chinese national television.

**September 19, 2018: Completion of a major strategic equity investment totalling C$723 million (approximately US$556 million) in Ivanhoe Mines by CITIC Metal to help advance three world-scale mine-development projects in Southern Africa.**


Ivanhoe Mines' Executive Co-Chairman **Robert Friedland** (above, middle right) and CITIC Metal Group President and Ivanhoe Co-Chairman **Yufeng "Miles" Sun** (above, middle left), signed the landmark agreement to complete CITIC's investment in Ivanhoe during a ceremony in Beijing on September 19, 2018.

# On August 16, CITIC Metal closed its second investment ~US$1 billion at a +35% premium to market.

Left to right: **Peter Zhou** (Vice President, Ivanhoe Mines), **Yufeng "Miles" Sun** (President, CITIC Metal Group, Co-Chairman, Ivanhoe Mines), **Robert Friedland** (Executive Co-Chairman, Ivanhoe Mines) and **Manfu Ma** (Vice President, CITIC Metal Group).

# URBANIZATION:

Resources and technologies for one of the greatest social and economic transformations in human history.

Today, **4.2 billion people** (**55%** of the global population) live in cities.

By 2050, it will be **6.7 billion people in cities** (**68%** of the global population).

Tokyo, currently the world's largest urban area (pop. 38 million)

*Source: Oct 2018 United Nations report*

# The number of megacities (pop. >10 million) is projected to rise from 33 in 2018 to 43 in 2030

## Giants among today's megacities


**1. Tokyo**: 32.5 million in 1990; 37.5 million in 2018; **36.6 million in 2030** (estimate).

**2. Delhi**: 9.7 million in 1990; 28.5 million in 2018; **38.9 million in 2030** (est.).

**3. Shanghai**: 7.8 million in 1990; 25.6 million in 2018; **32.9 million in** 2030 (est.).

*Source: United Nations 2018 World Cities report*

# In 2019, air pollution is considered by WHO as the greatest environmental risk to health

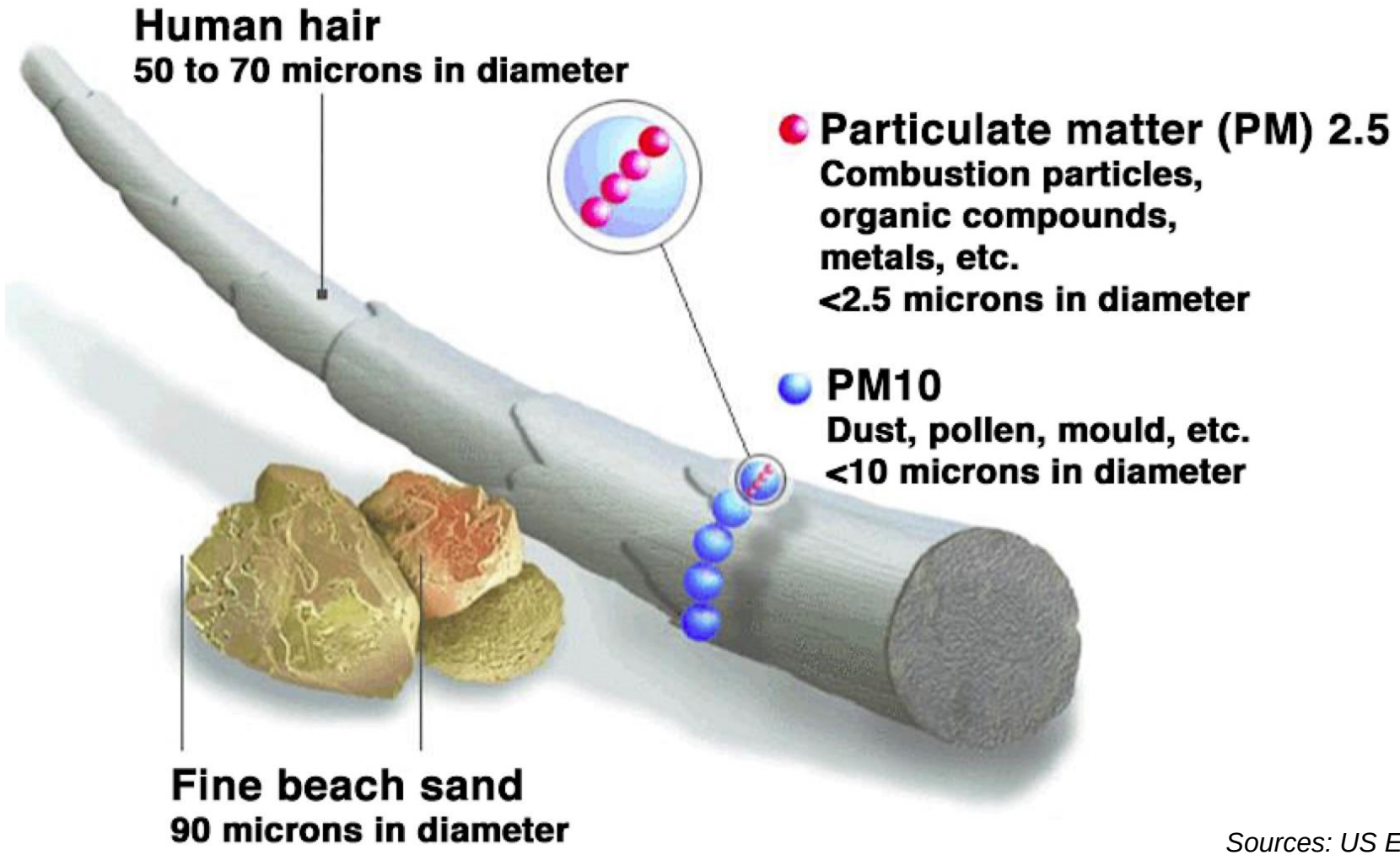
> “As the world continues to urbanize, sustainable development depends on the **successful management of urban growth**.”
>
> **– United Nations World Urbanization Report**

**Jakarta, Indonesia**

*Photo: MenaFN*

# Humans are vulnerable to air pollutants seeping into bloodstreams and brains

Miniscule airborne particles are less likely to be trapped by hairs and the mucus that line our noses – our body's natural barrier.




*Sources: US EPA, BBC*

# Studies reveal dangers of prolonged exposure to air pollution

**2.7 million premature births** a year linked to air pollution.

REUTERS

Air pollution tied to **chronic kidney disease.**

The New York Times

**Heart disease** linked to air pollution.

BBC

Possible **Alzheimer's** link cited by UK researchers.

BBC

Air pollution linked to 3.2 million new **diabetes** cases in one year.

THE LANCET

**Higher cancer death risk** linked to air particle pollution.

Newsweek

Young and old – air pollution affects the most vulnerable

# Babies in prams/strollers can be exposed to up to 60% more pollution than adults

BBC

- Infants in prams/strollers are exposed to dirtier air because they are lower to the ground and closer to vehicle exhaust pipes.
- Toxic air puts 17 million **babies' brains and lungs at risk**: UNICEF.

REUTERS

*Photo: Elizabeth Dalziel / Greenpeace*

# Higher incidence of dementia associated with living close to heavy traffic

THE LANCET medical journal

- People living closest to major traffic arteries estimated to be up to **12% more likely to be diagnosed with dementia**.
- “Even a modest effect from near-road exposure could pose a large public health burden.”

  – Hong Chen, lead scientist.

*Mumbai, India*

# In 2014, Chinese Premier Li Keqiang declared a "war against pollution"

## Beijing 2015: Week after week of smog-shrouded skies


*Photo: Zou Yi*

# Almost every Londoner exposed to dangerous levels of toxic air pollution

**7.9 million Londoners – nearly 95% of the capital's population – live in areas that exceed WHO's limit of damaging PM2.5 particles, an October 2017 report showed.**

*Photo: AP/Alastair Grant*

# As air pollution gets worse, a dystopian accessory is born

Global companies capitalizing on air pollution with anti-pollution masks; market projected to reach $4 billion by 2022.

## Xiaomi mask, China

## Freka mask, U.K.

## Vogmask, U.S.

# GRETA takes center stage

**QuickTake by Bloomberg**
@QuickTake

Follow

Climate activist @GretaThunberg called out business and political leaders at #COP25 for using "clever accounting and creative PR" instead of doing more to combat climate change


3:44 AM - 11 Dec 2019

**35** Retweets **76** Likes


Companies that don’t adapt – including companies in the financial system – will go **bankrupt without question**. (But) there will be great fortunes made along this path aligned with what society wants.

Mark Carney, Bank of England Governor
*Reuters – July 2019*

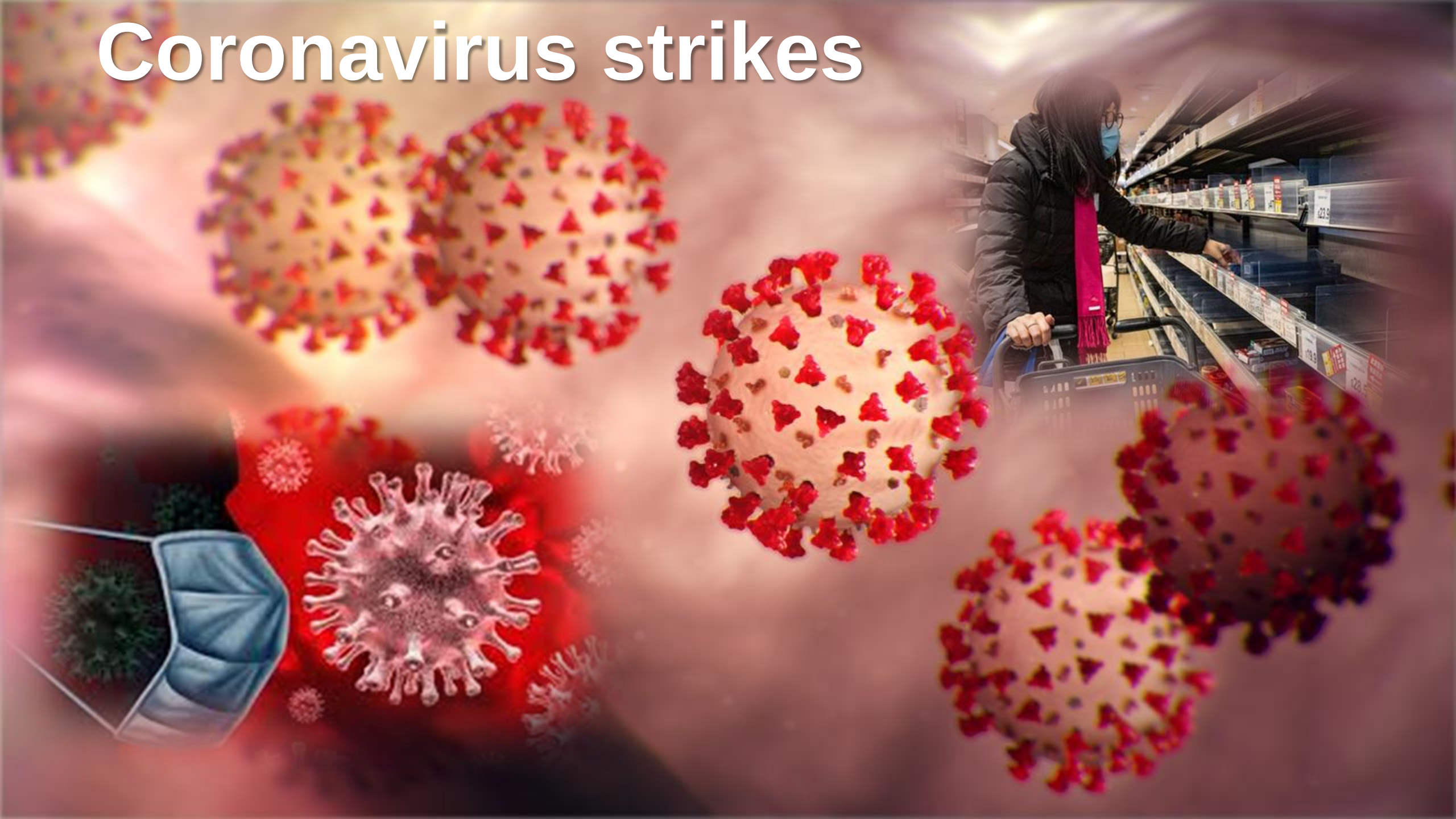
# “EU toughens CO2 limits for cars in bid to spur electric vehicles”

Bloomberg March 2019

## *Airpocalypse*: Scenes of an urban scourge



# Coronavirus strikes



# Copper: the friendly, green, bug fighter

**ANTI-MICROBIAL COPPER: THE BIGGEST LIFE-SAVING ADVANCE AGAINST HEALTHCARE-ACQUIRED INFECTIONS SINCE HAND WASHING**

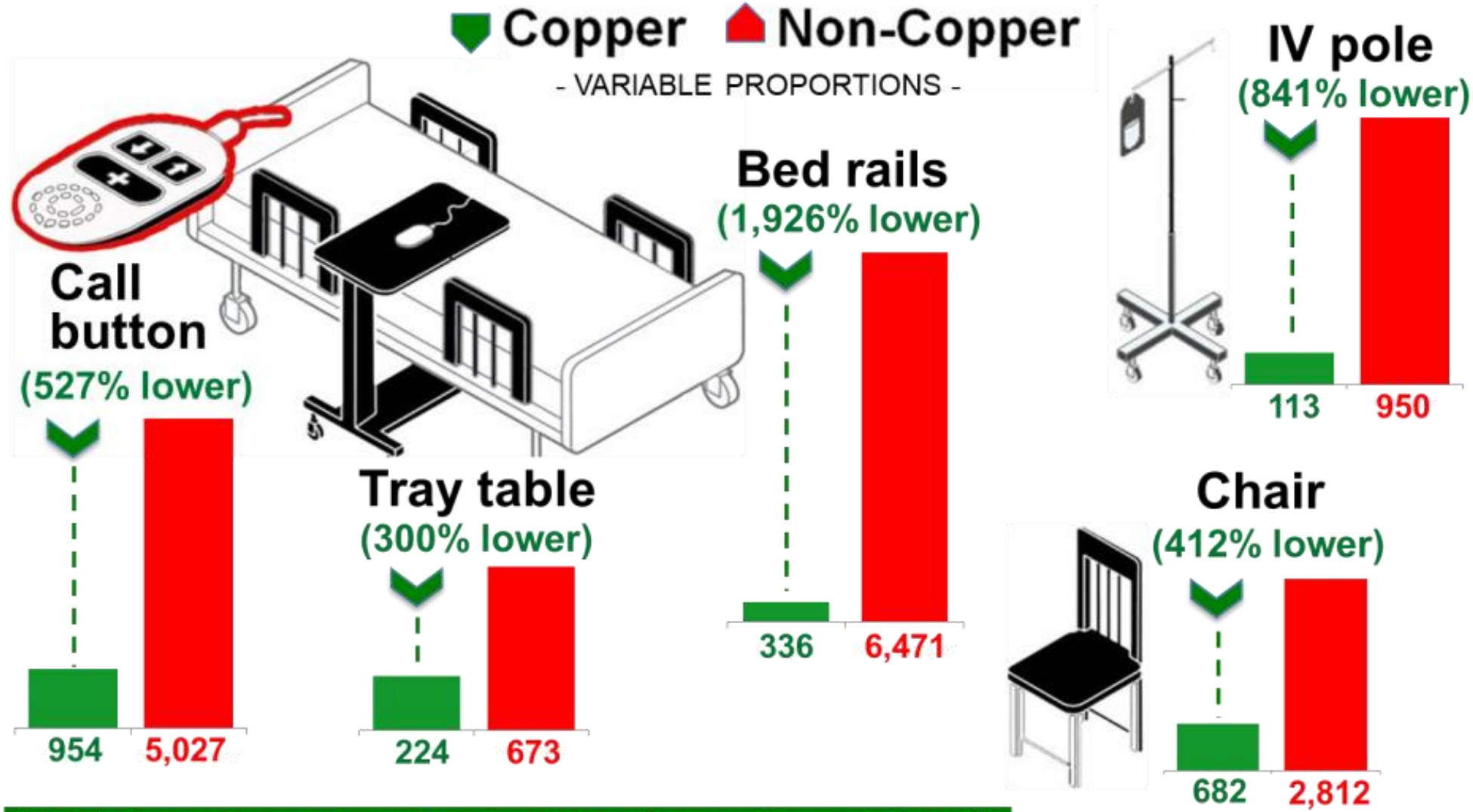
- Surfaces covered in **anti-microbial copper** can reduce patient infections acquired through health-care by **58%**.
- Anti-microbial copper can **continuously kill up to 99.9%** of bacteria, including ‘superbugs’ resistant to antibiotics, within 2 hours of contact.
- WHO: 7 million infections a year in healthcare facilities cost $80 billion globally. 1 in 20 patients develops a healthcare-related infection in the U.S.

**Copper everything in intensive-care room**

*Source: Copper Development Association*

# Bugs cannot live on copper

**Bacterial colonies generally are greatly reduced on copper materials**
**– *which can keep levels up to 19 times lower on high-contact objects.***

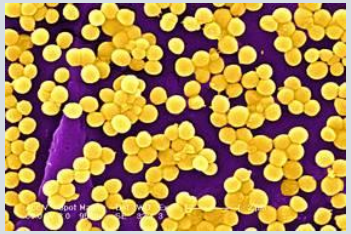



*Source: Wall Street Journal*

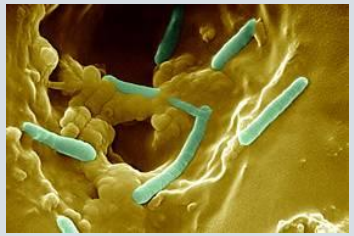
# Copper certified to kill six types of bacteria

Enterobacteria aerogenes

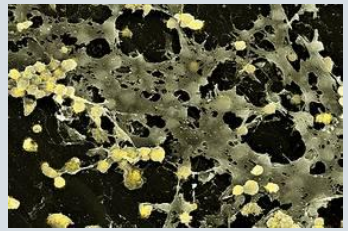
E. coli



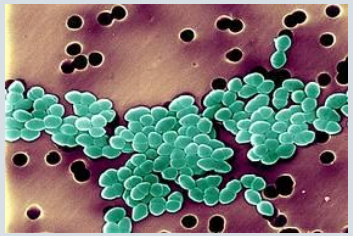
MRSA



Pseudomonas aeruginosa



Staphylococcus aureus



Vancomycin resistant enterococci


Gyms

**“Day cares, shopping malls, cruise ships should be made completely out of copper.”**

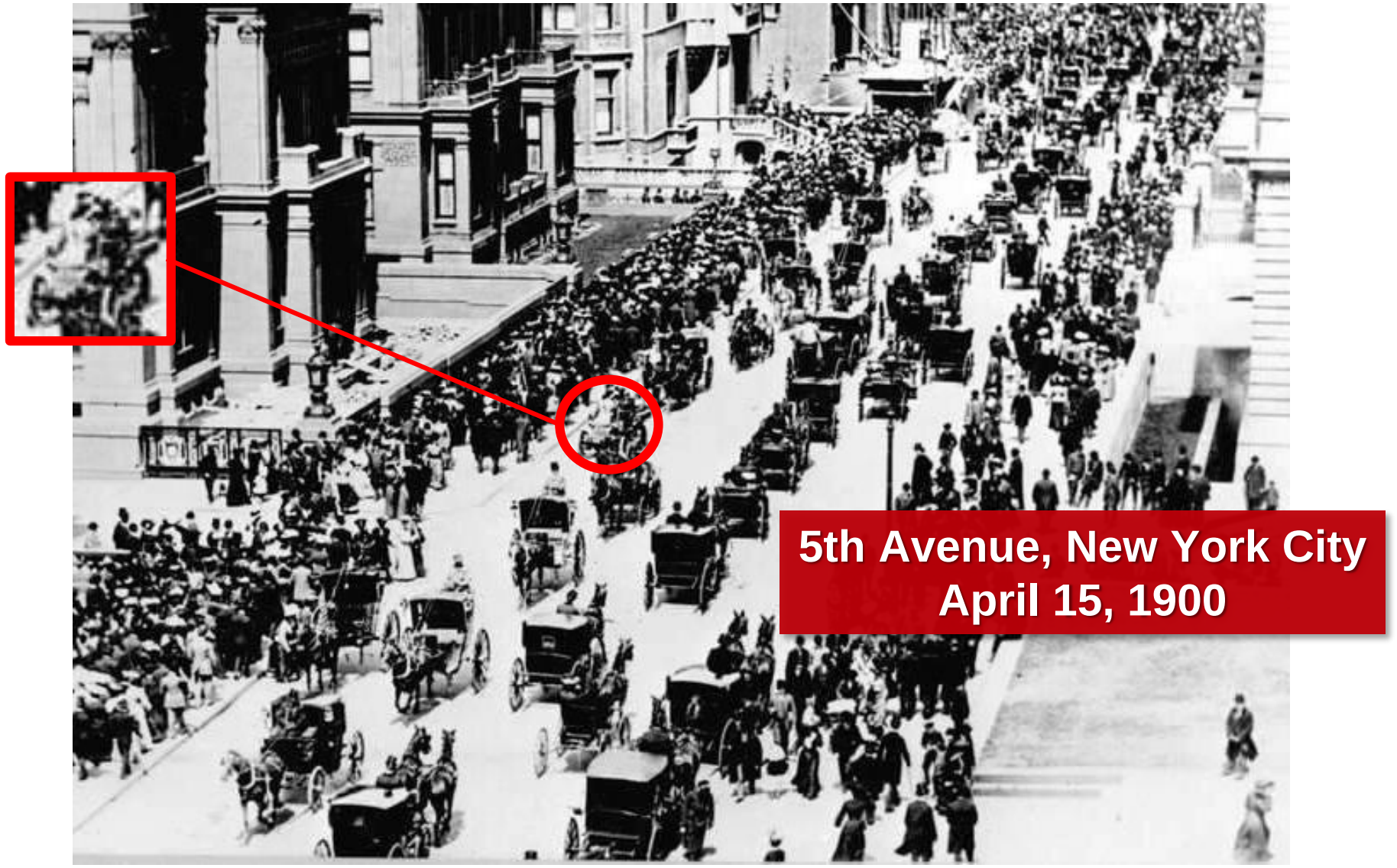
**– Todd Linden, President of the Grinnell Regional Medical Center, USA, which has installed copper surfaces**


Copper counters at Congonhas Airport, Brazil

*Source: Wall Street Journal, July 25, 2016. Bacteria photo 1: Gilbert Grant; bacteria photos 2-5: UIG/Getty Images. Bottom photos: thinkcopper.org; copperconcept.org*

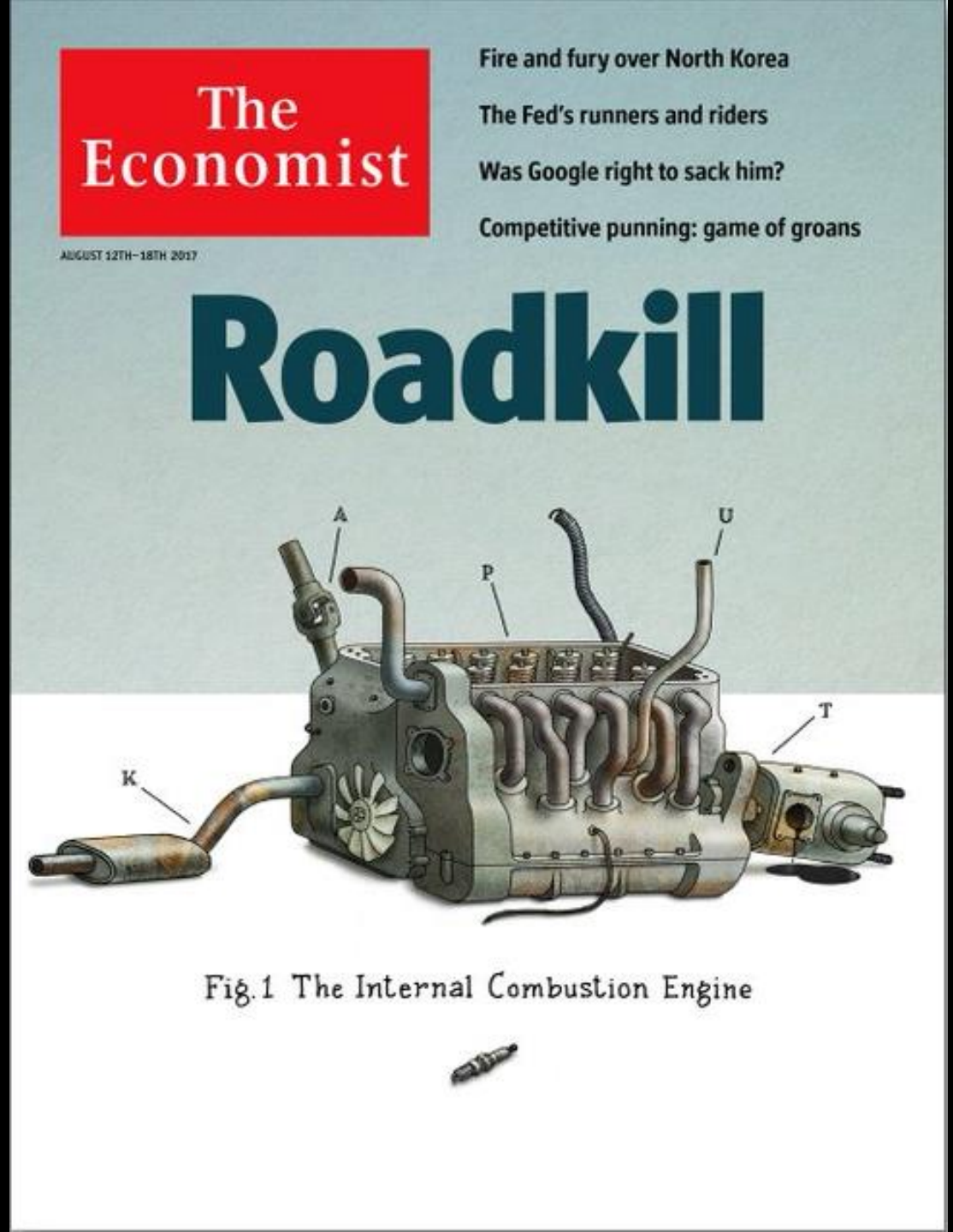
# Disruptions happen – sometimes quickly.

## It's 1900: Can you spot *the car*?




*Source: Tony Seba, U.S. National Archives*

# This disruption *did happen quickly.*
# Now it's 1913: Can you spot *the horse?*




# The death of the internal combustion engine

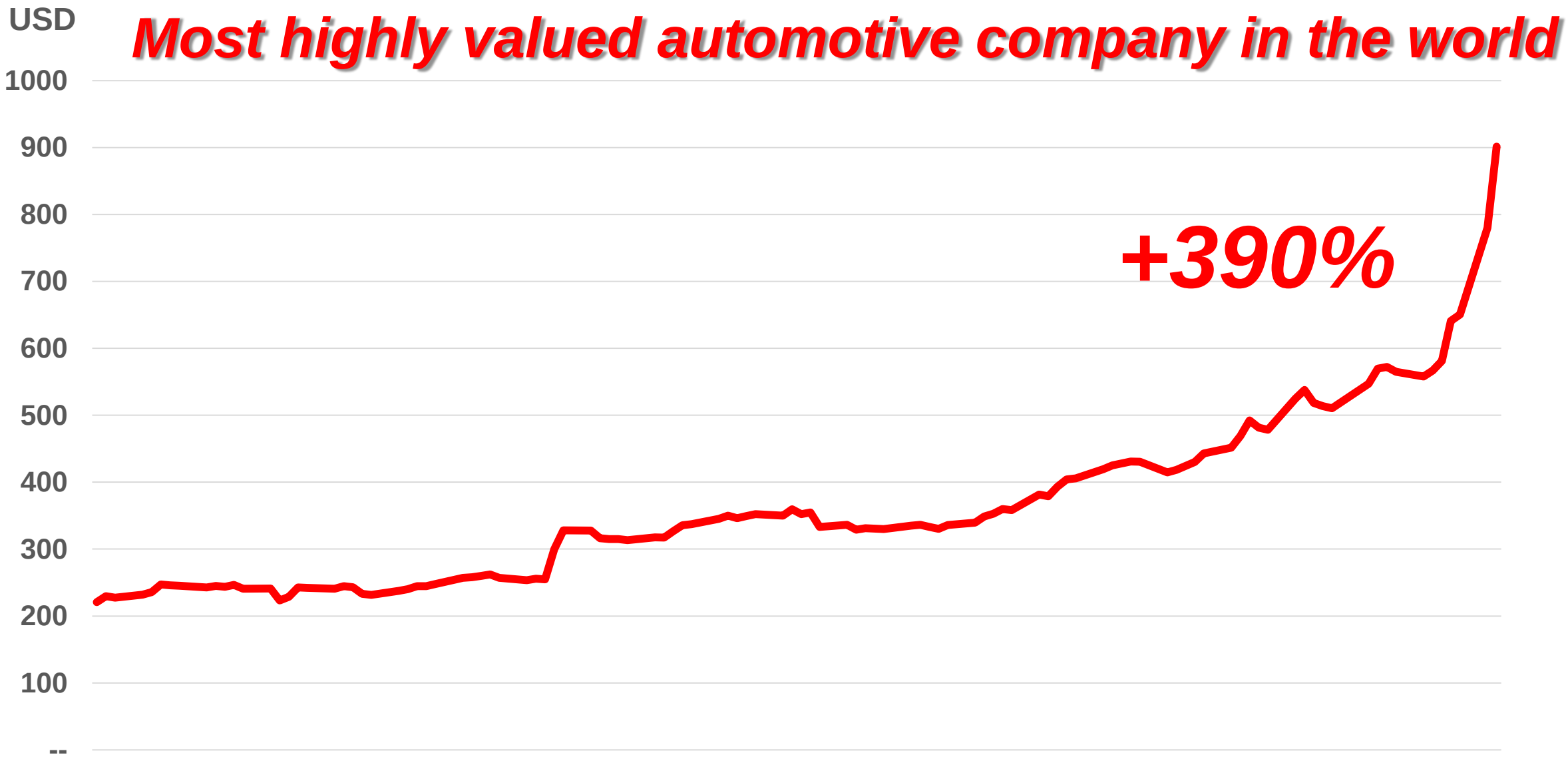
"It had a good run.
But the end is in sight
for the machine
that changed the world."

– The Economist

# Elon Musk Built a Tesla Factory in China in Less Than a Year


Tesla Gigafactory 3 in Shanghai. PHOTO: Getty Images

# Tesla Inc. Share Price – Last 6 months



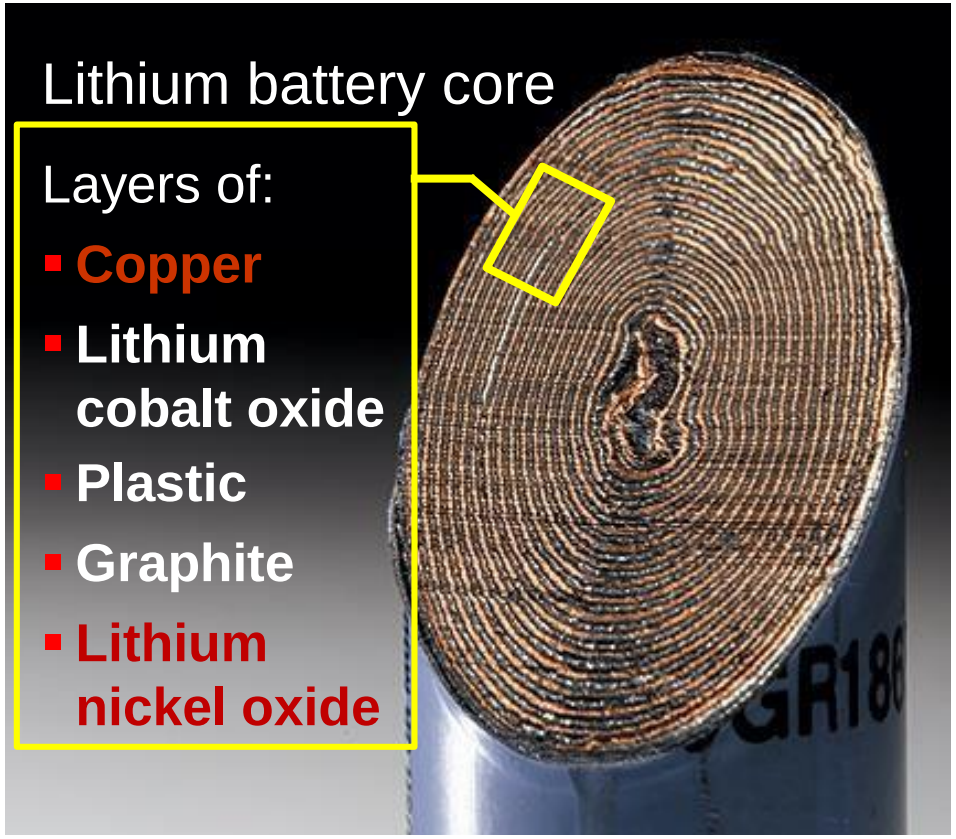
# Copper demand for electric cars to rise 900% by 2027

**– International Copper Association**

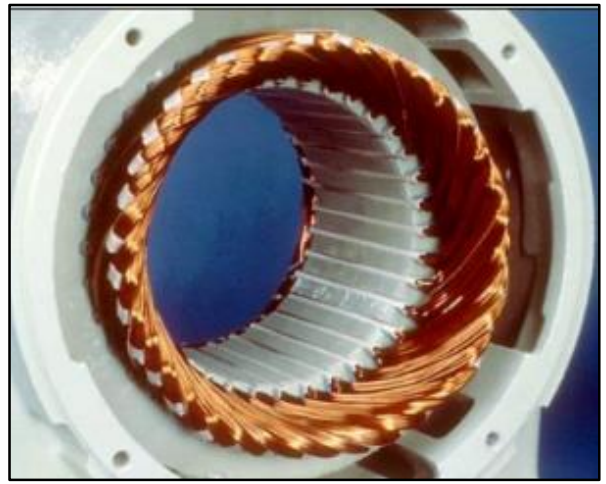
## Copper, a major commodity winner in growing EV market, is at the heart of lithium batteries and induction motors

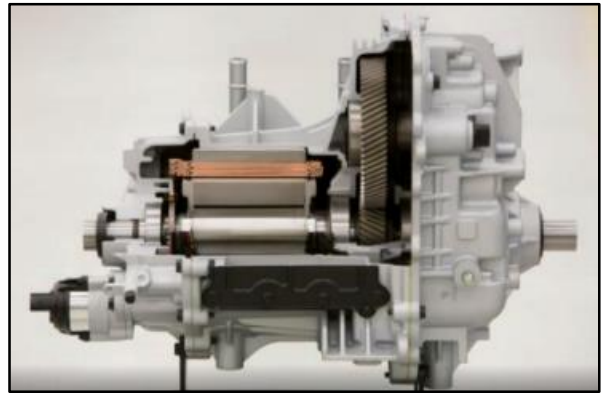
Motor windings contain approx. 40 kg (88 lbs.) of copper.

Battery pack contains approx. 37.5 kg (83 lbs.) of copper.




Copper windings, rotor cages and coils in EV models, including the Chevy Bolt, BMW i3 and Tesla Model 3.
**Kilos of copper!**





*Sources: National Geographic; GM; Bernstein; Cleantechnica; Copper Alliance; BMO.*

# Batteries in Tesla Model 3 EV are 30% more energy-dense than in earlier Model S – requiring more copper, nickel and cobalt

⊕ **CATHODE**

An NCA formulation is used with the approximate ratio:

- 80% Nickel
- 15% Cobalt
- 5% Aluminium
- Lithium

⊖ **ANODE**

- Silicon
- Graphite

**ELECTROLYTE**

- Lithium salt

**OTHER**

- Copper / aluminium foil

*Photo: Tesla Motors club user [wk057]. Figure: visualcapitalist.com*

All-electric cars now use **four times more copper** than conventional gasoline-powered autos. Future, larger electrics could use much more.

**FUTURE PLUG-IN ELECTRICS**

**(Bernstein projection for a generation of bigger, longer-range electrics)**

**360 lbs. / 163 kg**

**PLUG-IN ELECTRIC**

**240 lbs. / 109 kg**

*Tesla Model 3*

**HYBRID**

**88 lbs. / 40 kg**

*Hyundai Hybrid*

**GASOLINE**

**66 lbs. / 20 kg**

*Ford Mustang*

*Sources: BHP via ft.com (2016); Bernstein Research projection (2017)*

**Wind & solar energy (among renewables) up to 37 times more copper intensive than conventionally generated electricity**

**– Bernstein Research**

**Renewable sources supplied 18% of all U.S. electricity in first three quarters of 2018**

*Photo: Electrek*

# Global wind turbine fleet to consume more than 5.5 million tonnes of copper by 2028 – Wood Mackenzie

Wind turbines installed in Denmark are 60 storeys high. *One blade* is 82 metres (270 feet) long – wider than the total wingspan of an Airbus A380, the world's largest passenger jet.


GE is planning an 85-storey-high offshore wind turbine to power up to 16,000 homes. **A wind farm of 62 turbines could power 1 million European households.**

88-metre (290-ft.) moulded blade being delivered for turbine assembly.

*Sources: LM Wind Power, New York Times, Wall Street Journal*

# United States power grid in dire need of an overhaul

**Nov 2018:** A snapped wire from PG&E's 100-year-old power line is believed to have led to the fire that destroyed Paradise, California and killed 85 people.

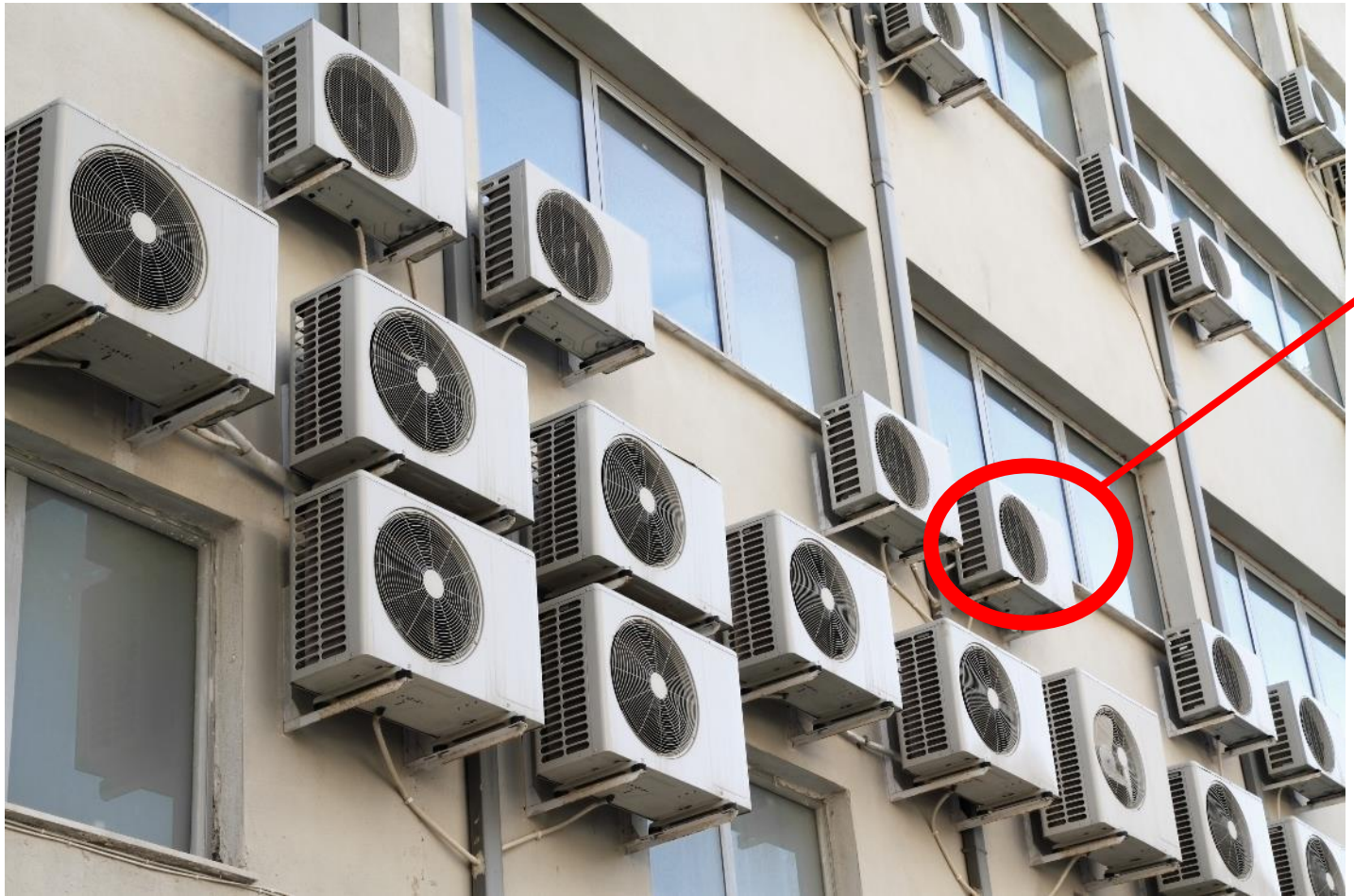
*Photo: John Edelson/Getty*

**Oct 2019:** PG&E rolled out blackouts in Northern California to prevent wildfires. The blackouts impacting millions of people could cost the economy $2.6 billion.

*Photo: Noah Berger/Associated Press*

# Global surge coming in air-conditioning: Keeping cool will heat demand for copper

- **Worldwide demand for air conditioning is expected to triple over the next 30 years.**
  **– International Energy Agency**
- **Demand for copper to grow with increase in air-conditioning units and power grid expansions.**



**52 pounds of copper** in average unit.

**8 billion** cooling units projected to be in use worldwide by 2050, up from **3.4 billion** in 2016.

**China, India & Indonesia** to account for half of major global increase in electricity demand.

*Sources: Copper Development Association; Financial Times. Photo: kanvag / Fotolia.com.*

# Smart homes add to global demand for copper

- Smart-home systems such as Alphabet's Nest thermostat and Amazon Alexa personal assistant, will consume about **1.5 million tonnes of copper by 2030, up from 38,000 tonnes today.**


***Nest thermostat***


***Amazon Echo with Alexa***

- Most smart homes use 1,000 metres (0.62 miles) of wiring to connect those devices, containing about **20 kilograms (44 pounds) of copper** in total.

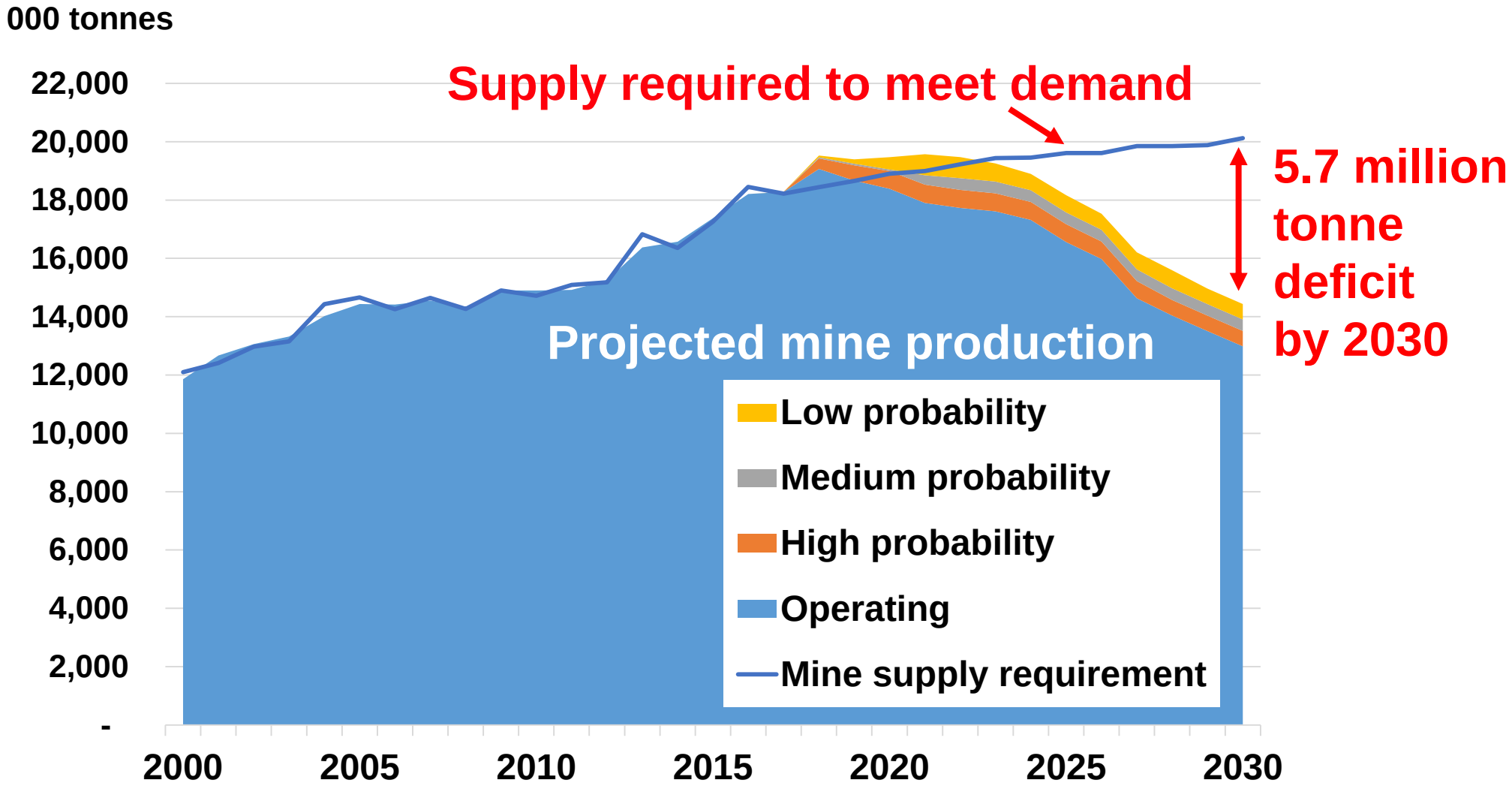
*Source: BSRIA*

# Ivanhoe will produce GREEN COPPER

- **Underground mines with small surface footprint**
- **55% of tailings to go back underground**
- **Powered by clean, green hydro-electricity**
- **High grade = more copper for far less energy**

The Mwadingusha hydropower plant in the Democratic Republic of Congo (DRC) will supply **clean**, **sustainable electricity** for the Congolese people, and for the Kamoa-Kakula and Kipushi mines.

# Not enough copper is being discovered to meet future projected demand




*Source: S&P Global Market Intelligence*


# Escondida

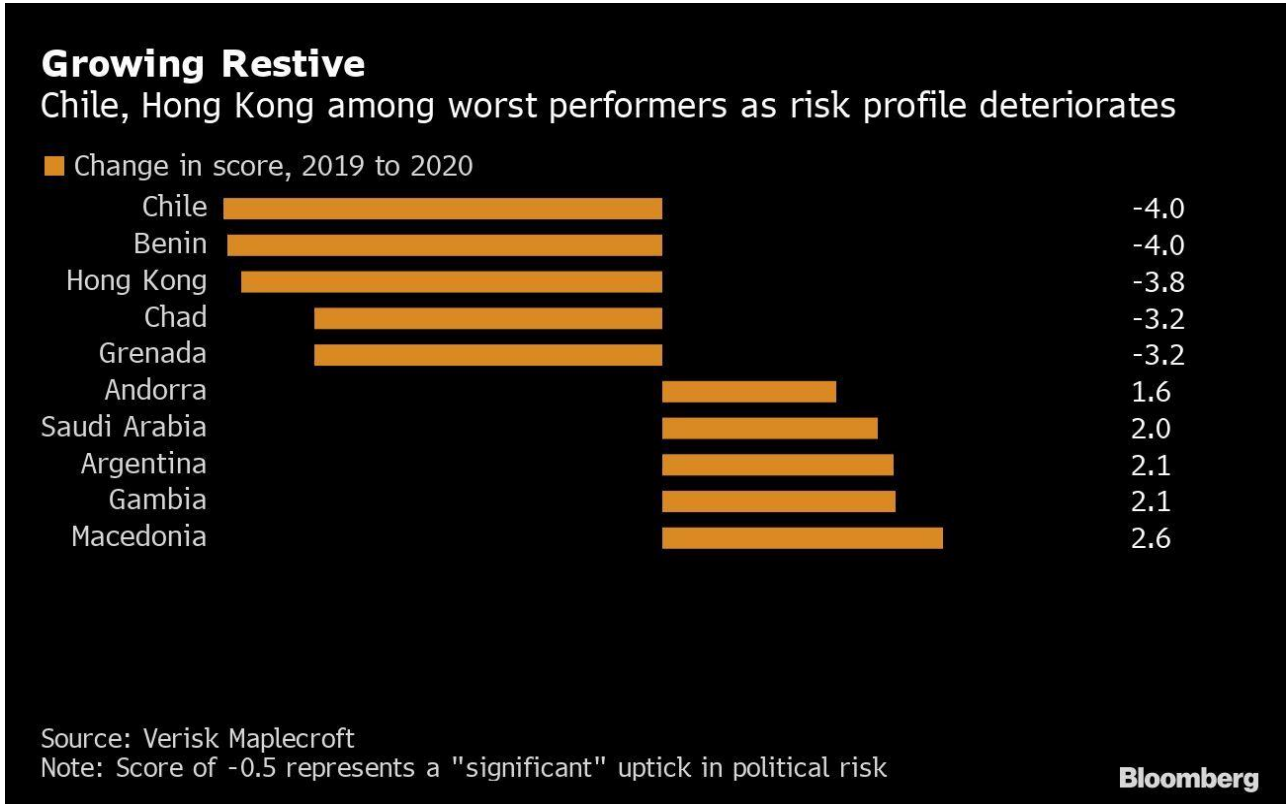
World's largest copper mine produced **6%** of global output in 2016.

However, it is facing the same problem as many large copper mines – **dropping grades**. In 2007, Escondida's copper grade was **1.72%**. Its remaining copper reserve grade is **0.52%**.

*Source: Visual Capitalist*

# Latin America’s ‘Oasis’ Descends Into Chaos

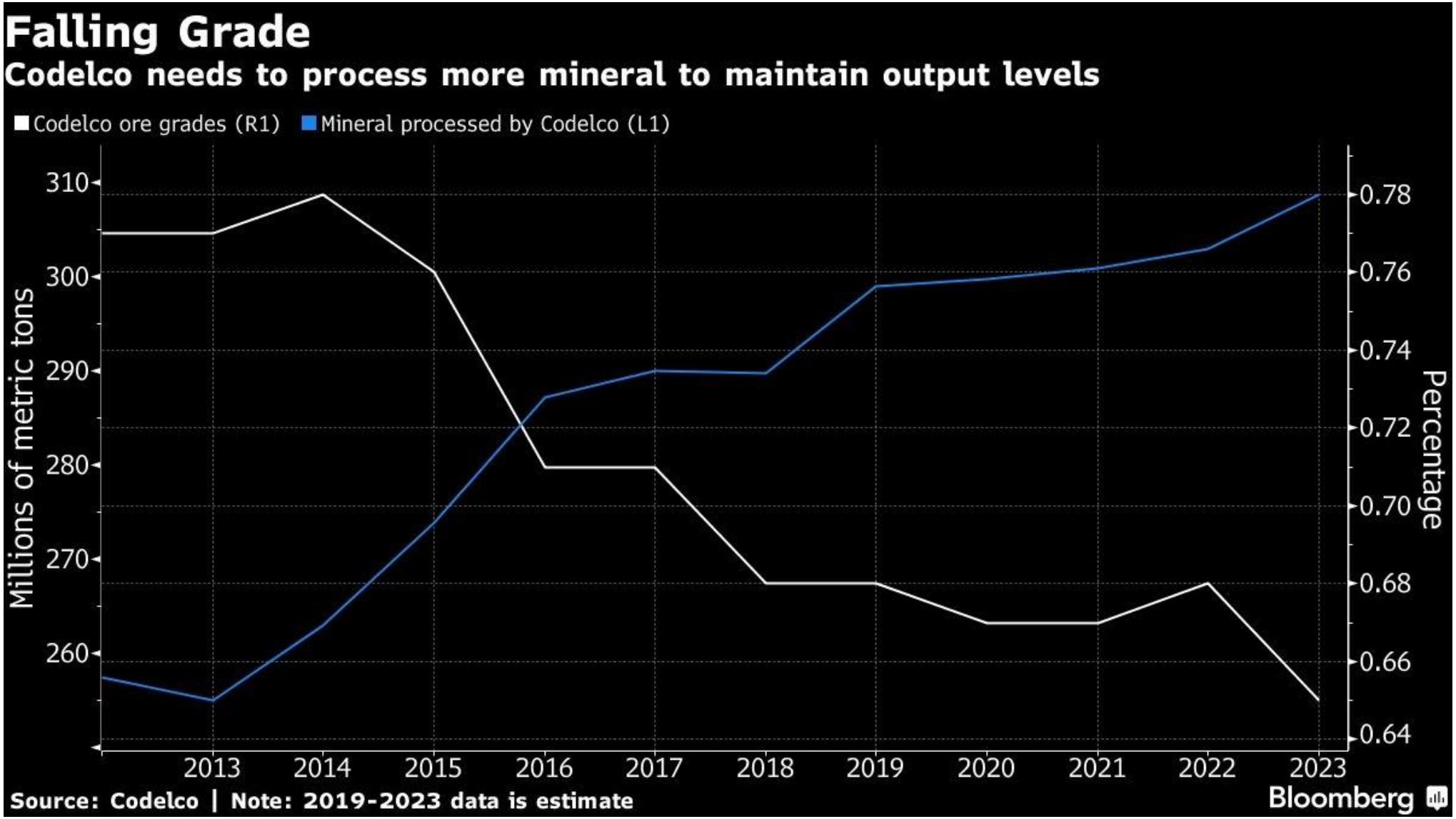
PHOTO: PABLO VERA/AFP VIA GETTY IMAGES



# Chile Shuns Codelco Investment as Social Problems Mount


PHOTO: MOISES AVILA/REUTERS/MOISES AVILA/REUTERS

# Chile’s Grade Problem – Mining More, Producing Less



# Global automakers investing $300 billion (equivalent to Chile's GDP) in electric vehicles

**Large sums planned to develop and procure batteries and EVs over the next five to 10 years; ~45%, or $135 billion, will be spent in China.**

## Volkswagen

- **$91 billion** pledge is almost one-third of entire industry's EV spending.
- **$57 billion** just for batteries.
- **$45.5 billion** to be spent in China.

## Daimler

DAIMLER

- Daimler, maker of Mercedes-Benz cars, will buy battery cells worth >**$23 billion** by 2030 for mass production of hybrid and electric vehicles.

## General Motors

GM

- GM plans to build EV battery modules with its partner, SAIC, in China.
- GM will spend a total of **$8 billion** on electrification and automation over the next several years.

## Tesla

- Tesla will invest **$5 billion** in batteries.
- Its **$5 billion** Nevada Gigafactory reached full production in 2019.

# New Names, Big Names on EV Horizon

**More than 230 electric-vehicle models will be available by 2021.**

Mini Cooper SE

Lucid Motors Air

Rivian R1T

Porsche Taycan


Jaguar XJ

Audi e-tron

## The revolution underway

# Global auto industry racing to market all-electric cars. Driving ranges are rising; prices are falling.

**Volkswagen**, world's #1 in sales, promises 70 EV models over the next decade – and to offer *everything* in some electric form by 2030.


*Image: Volkswagen*

# Jaguar E-Type Zero – world's "most beautiful" electric car – to hit the road in 2020


*Photo: Jaguar*

# Ford to bring 16 EV models to market by 2022

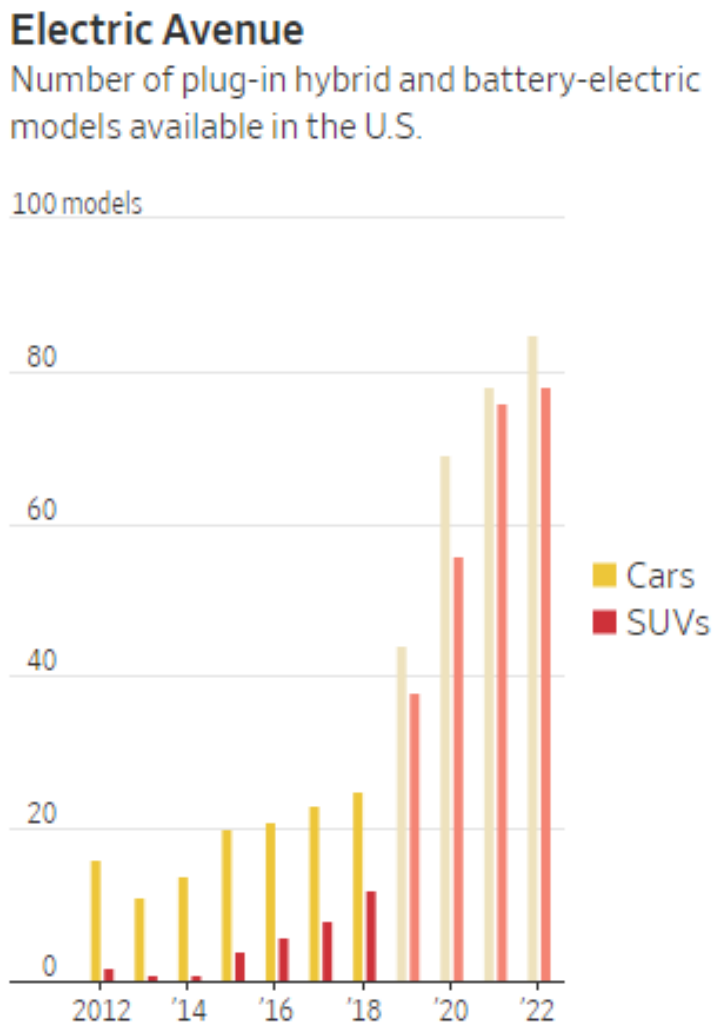
In 2019, Ford showed off an electric prototype of its most important vehicle – the **F-150** pickup truck, towing a one-million-pound (453,592 kg) train over 1,000 feet (304 metres).
A hybrid version of the truck will go on sale in 2020.

# Auto Makers See SUVs, Trucks Charging Electric-Vehicle Sales

SOURCE: ASSOCIATED PRESS

PHOTO: RALPH ORLOWSKI/REUTERS

PHOTO: KYLA GRILLOT/BLOOMBERG NEWS



SOURCE: THE WALL STREET JOURNAL

# Big Rigs are going all-electric, too

**Tesla's** fully-electric, semi-autonomous Class 8 truck capable of sprinting from 0 to 97 km/hr (0 to 60 miles/hr) in just 5 seconds. Production set for 2019.

Range: 800 km (500 miles) on one charge with full 80,000-pound (36-tonne) load.

U.S. truck maker **Cummins**' new Class 7 electric truck can haul 44,090 pounds (20 tonnes) and recharge in an hour.

Range of initial **AEOS** model only 160 km (100 miles); longer-range models coming.

# There are more than 100 different electric-aircraft programs in development worldwide – consulting firm Roland Berger

Among frontrunners:


*Photo: Joe Klamer/AFP*

- **Volocopter,** Germany-made.
- 2 passengers.
- 50 km/h (31 mph) on fully-charged battery.

- **Ehang 216,** China-made.
- 2 passengers.
- 160 km/h (100 mph) on fully-charged battery.

# Platinum- and copper-intensive fuel-cell electric vehicles being backed by Japan


**In Japanese, Mirai (未来) means ‘the future’.**

# Fuel-cell electrics also being developed by Germany's leading automakers

**Mercedes-Benz's** GLC F-Cell, the world's first hydrogen fuel-cell electric vehicle combined with plug-in battery power, has started leasing in Germany and will go on sale in the U.S. in 2020.

Total range: **480 km (300 miles)**, including 50 km under battery power. Refuelling: **3 minutes.**

*Photo: autocar.co.uk*

# Buses hitching up to fuel-cell revolution

Photo: Cleantechnica

- **London** Mayor Sadiq Khan unveiled the upgraded, hydrogen fuel-cell double-decker bus. Fleet to be fully upgraded by Oct. 2020.

  (Double-deckers have been a London icon for 170 years)

- Sales of **Toyota** fuel-cell buses in **Japan** started in 2018.
- Fleet of 100 to be operating for the 2020 Tokyo Olympics.

# Hydrogen-powered fuel cells have taken to the rails in Europe and China

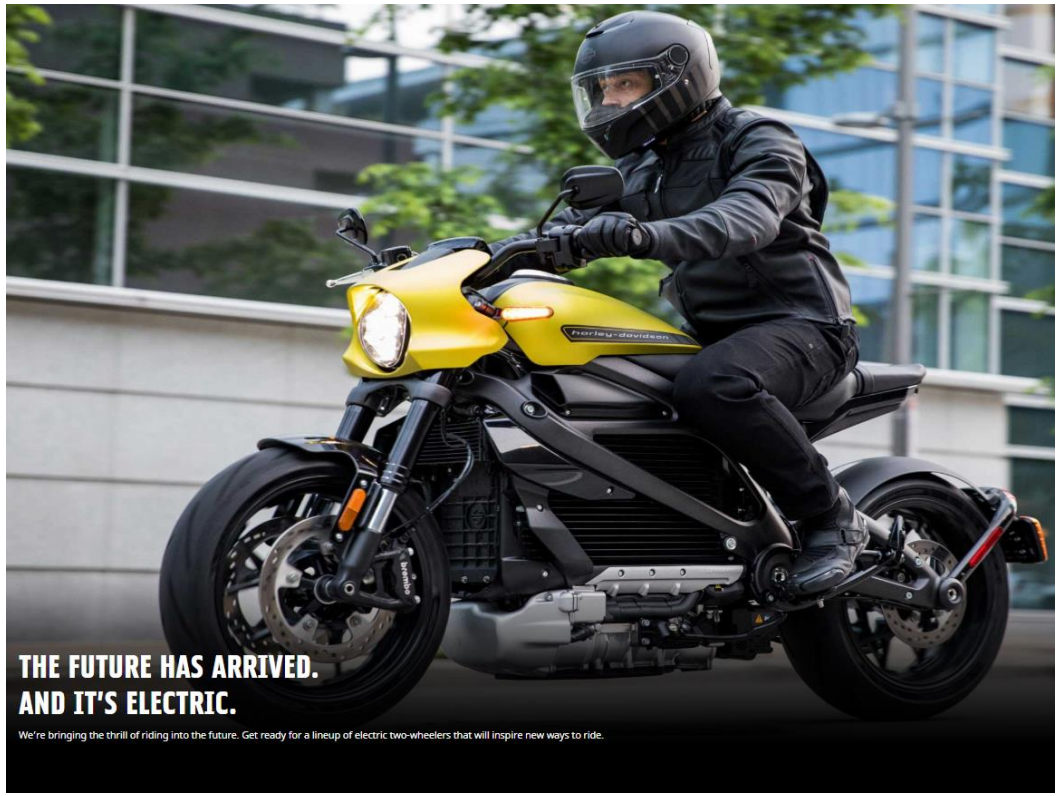
- World's first two hydrogen trains began service in **Germany** in September 2018, replacing diesel trains. Another 14 will be running by 2021.
- Range of 1,000 km (620 miles); top speed 140 km/h (87 mph).

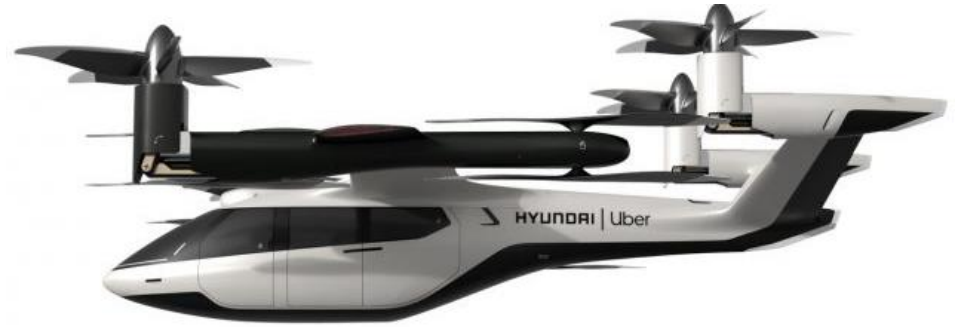

Photo: Alstom

- **China** streetcar driven by hydrogen fuel cells; emits only water.
- Refuels in 30 minutes.
- China to spend US$32 billion extending tracks.

# THE ELECTRIC MOBILITY ERA





# Historical average American's lifetime use of resources BEFORE the New Era of Electrification

## 1,515 tons of minerals, metals and fuels per person.
## Current U.S. population: 328 million.

971 lbs. copper

521 lbs. zinc

+54,336 lbs. other minerals & metals

1.76 troy oz. gold

5,708 lbs. bauxite (aluminium)

24,698 lbs. iron ore

459,784 lbs. coal

12,129 lbs. clays

45,060 lbs. cement

72,080 gallons petroleum

17,343 lbs. phosphate rock

27,442 lbs. salt

6.8 million cu. ft. natural gas

1.18 million lbs. stone, sand & gravel

889 lbs. lead

*Source: Mineral Information Institute*

# IVANHOE MINES

NEW HORIZONS

- **Over 20** years in Southern Africa.
- **3** advanced, unique projects.
- Positioned to realize urbanization's resource opportunities with minerals to help build a better world.

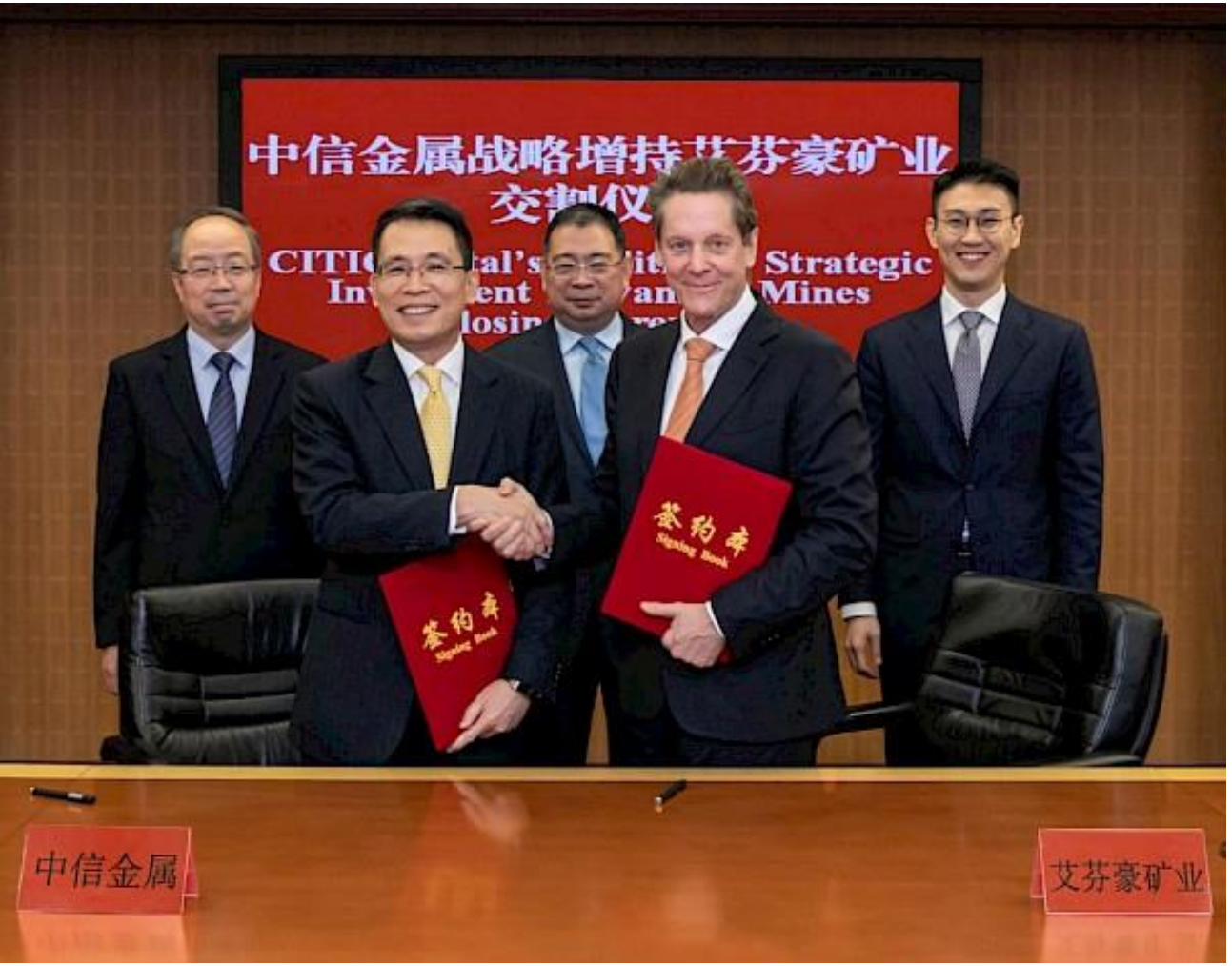
# KAMOA-KAKULA
# Exploration & mine development

Democratic Republic of Congo

**Our world's best copper discovery**

**Hole DD1450, which intersected 22.3 metres of 13.05% copper**

IVANHOE MINES




**August 16, 2019: Ivanhoe Mines completes strategic equity investment of C$612 million (US$459 million) from China-based CITIC Metal, bringing CITIC's investment in Ivanhoe to more than US$1 billion.**

**Additional C$67 million (US$50 million) received from Zijin Mining through the exercise of its anti-dilution rights.**

**Ivanhoe now positioned to fully fund its share of capital costs to bring the Kakula Copper Mine to commercial production.**

## April 6, 2019, Washington, DC

150 metres from the White House,
DRC President Felix Tshisekedi
and Robert Friedland meet, sponsored
by Secretary of State Mike Pompeo

## February 5, 2020

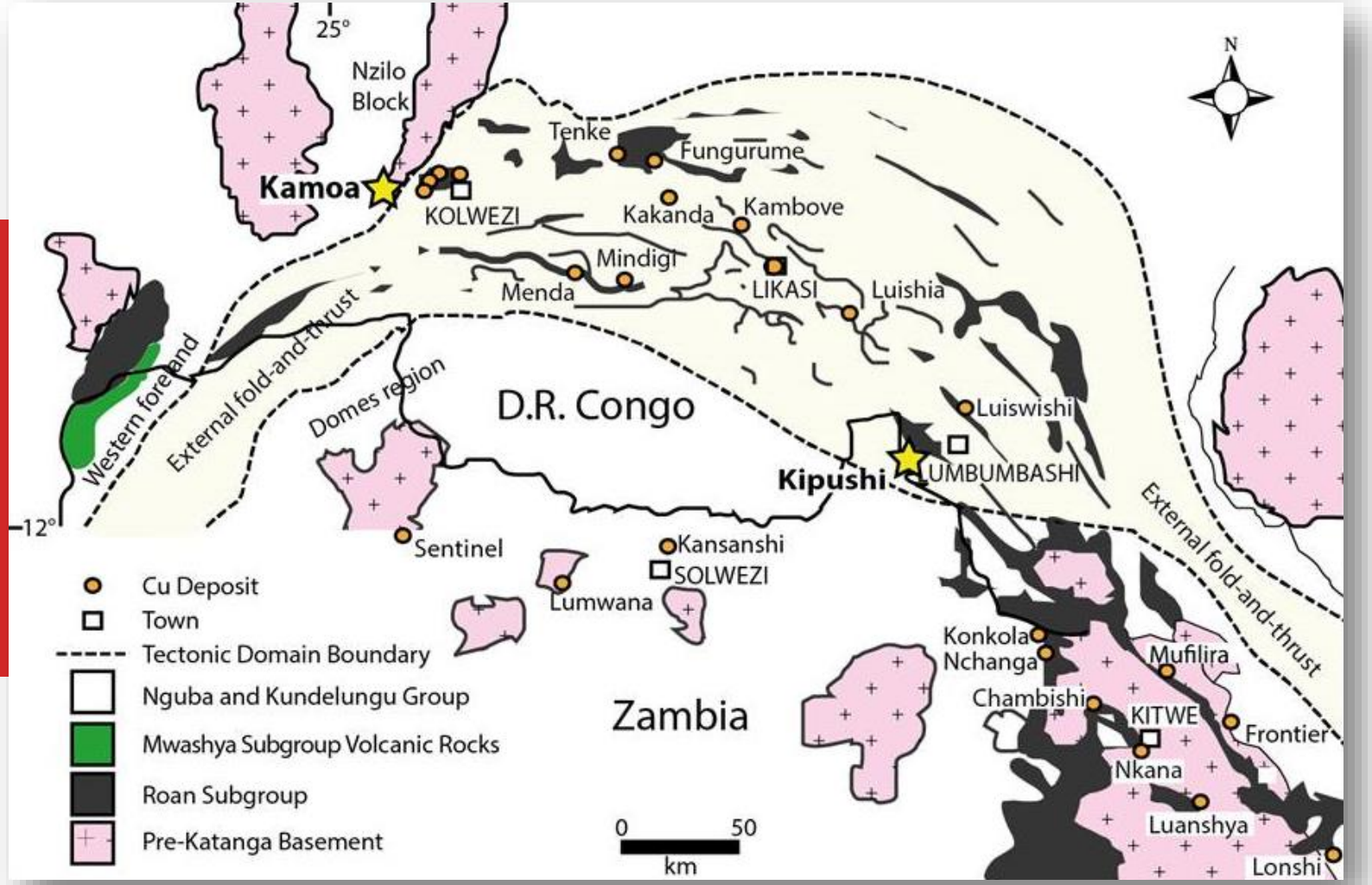
**Updated independently verified Indicated Mineral Resource again increases the Kamoa Copper Discovery to 256 million tonnes grading 4.15% copper, at a 3% cut-off**

**Combined Kamoa-Kakula Project Indicated Mineral Resource now stands at 423 million tonnes grading 4.68% copper, at a 3% cut-off**

**Combined Kamoa-Kakula Project Indicated Mineral Resource now stands at 1.4 billion tonnes grading 2.7% copper, at a 1% cut-off**

**Initial Indicated Mineral Resource estimate for the Kamoa North Bonanza Zone includes 1.5 million tonnes grading 10.7% copper, at a 5% cut-off**

**Kamoa-Kakula is the first world class copper discovery in the DRC in a century!**




**Geologically completely different, yet next door to the renowned Kolwezi deposits!**

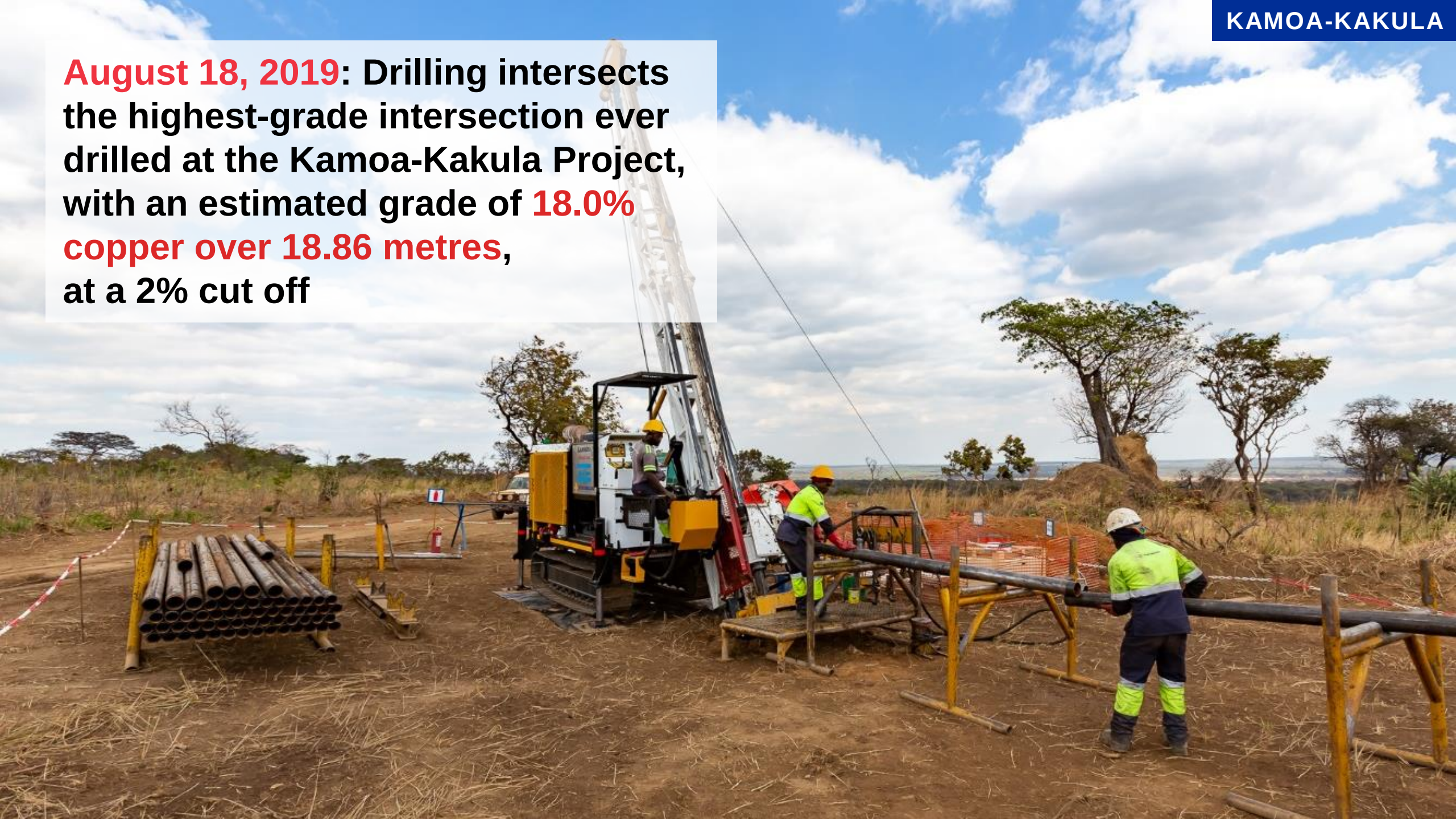
# Independent pre-feasibility study (PFS) for the Kakula copper mine announced on February 6, 2019

**The initial 3.8 Mtpa operation at Kakula, with estimated development capital of US$1.3 billion, is scheduled to begin production in Q3 2021.**

# The Kakula Mine's first stage will average 6.8% copper over the first 5 years, with mine-site cash costs of US$0.43/lb copper

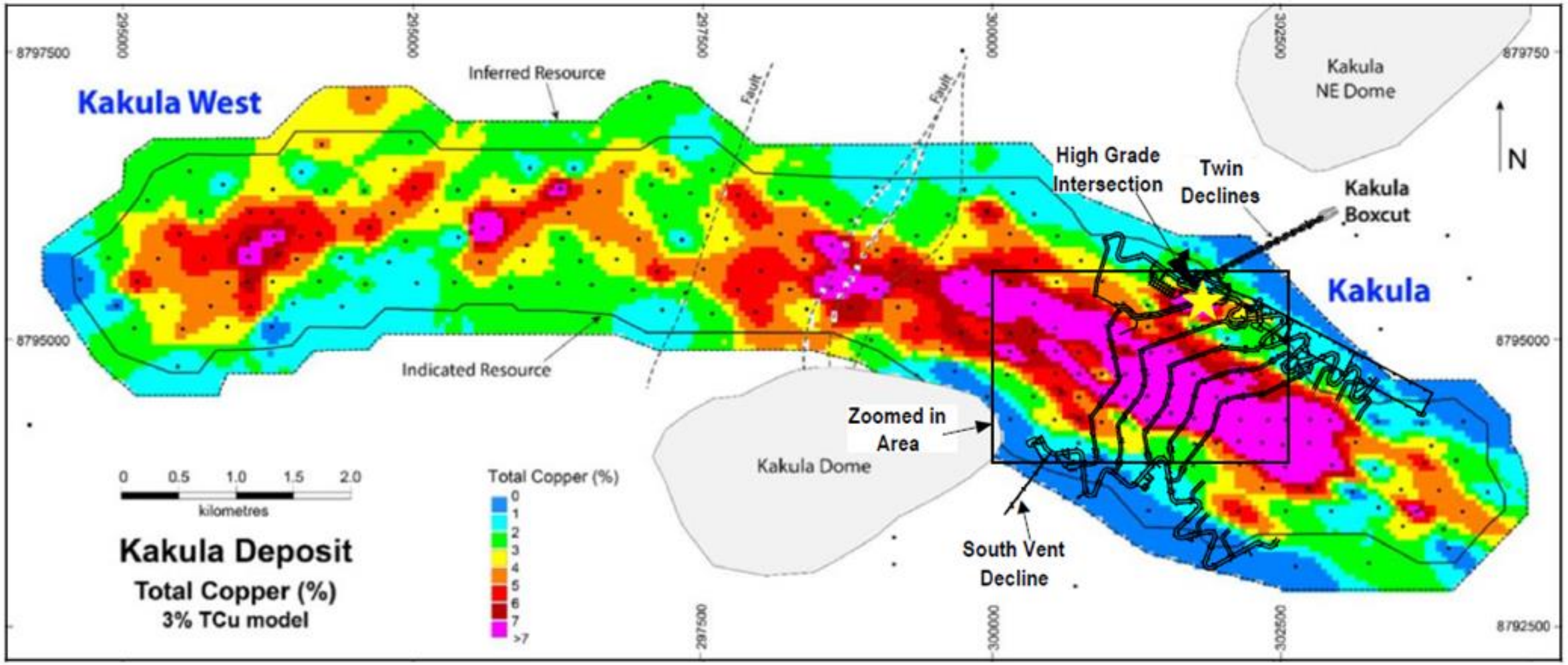
# The PEA envisions the staged mine expansions and smelter will be funded from internal cash flows and yields an after-tax NPV8% of US$10.0 billion and an IRR of 41%

**Once the expanded PEA production rate of 18 Mtpa is achieved, Kamoa-Kakula is projected to become the world's second largest copper mine, with peak annual production of more than 700,000 tonnes of copper**

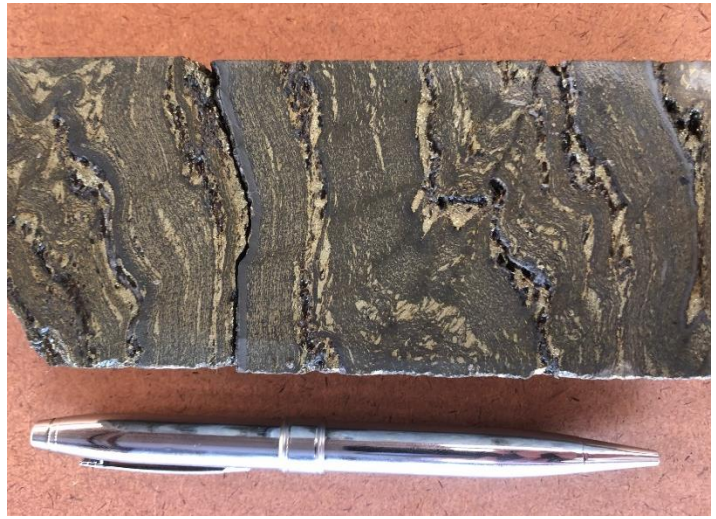


**August 18, 2019: Drilling intersects the highest-grade intersection ever drilled at the Kamoa-Kakula Project, with an estimated grade of 18.0% copper over 18.86 metres, at a 2% cut off**

# Initial Kakula Deposit contains copper grades greater than 8% copper



# Core from the Kamoa North Bonanza Zone



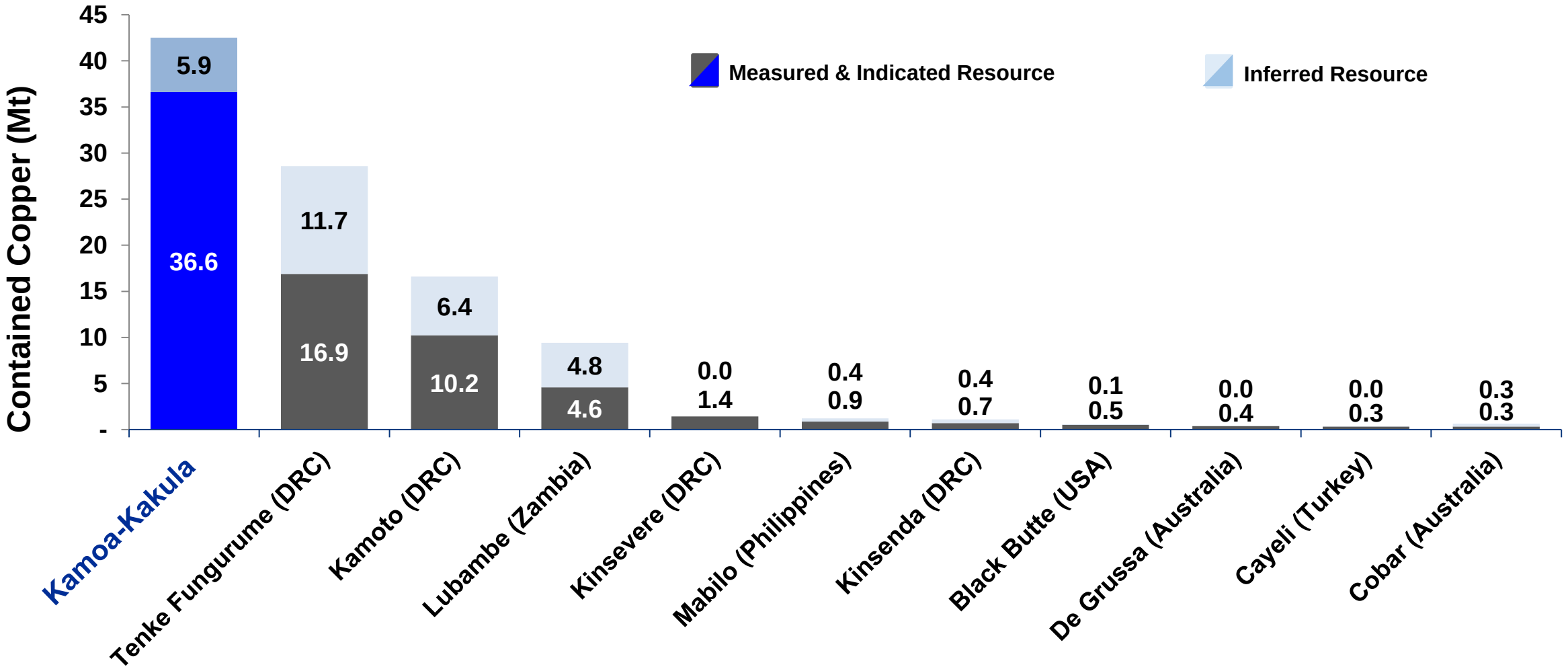
**DD1520 sample from a downhole depth of 197 metres, containing predominantly massive chalcocite, bornite and some copper oxide (CuO).**

**The grade of the sample is 46% copper.**

**DD1522 sample from a downhole depth of 212.1 metres, containing finely disseminated bornite (Cu5FeS4).**

**The grade of the sample is 29.3% copper.**

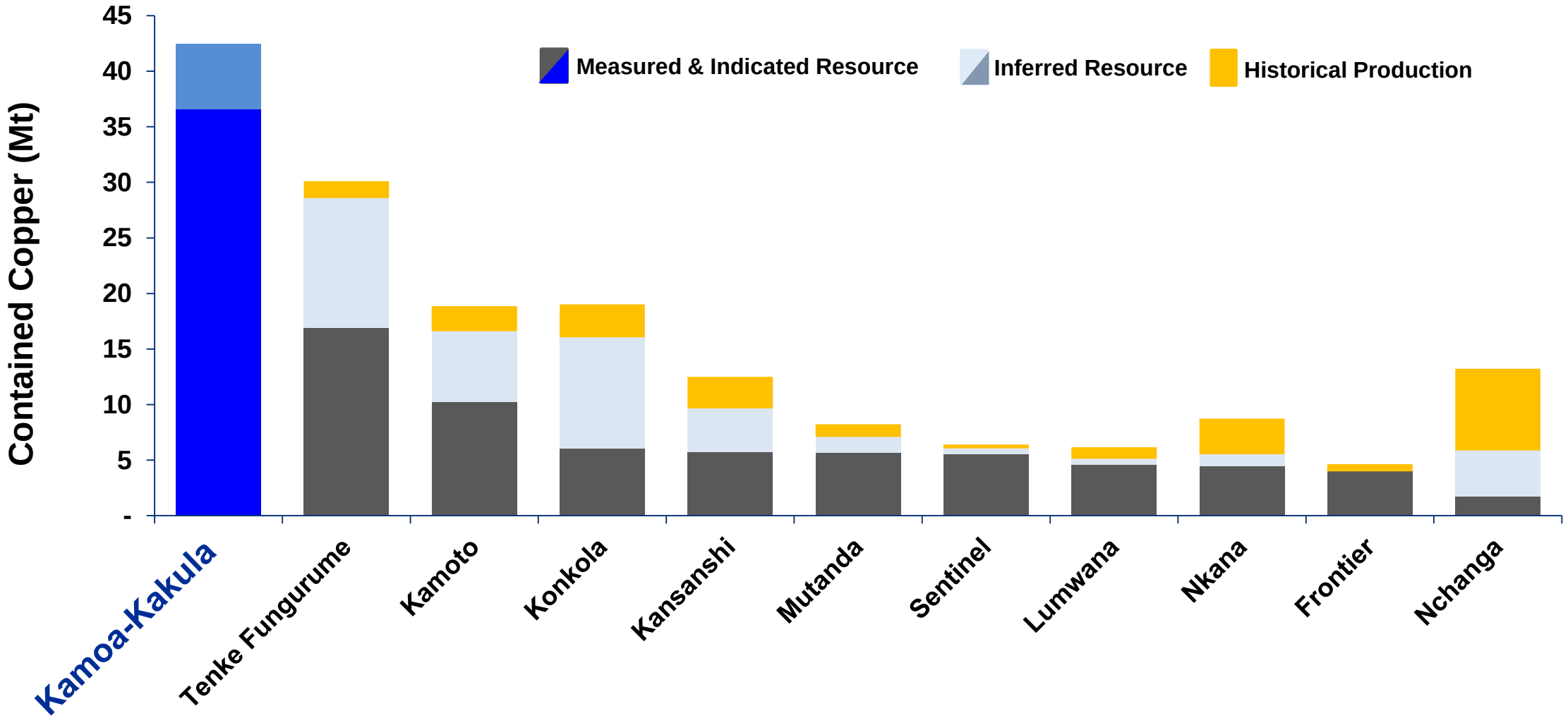
# Kamoa-Kakula is the largest high-grade copper deposit in the world




Source: Wood Mackenzie

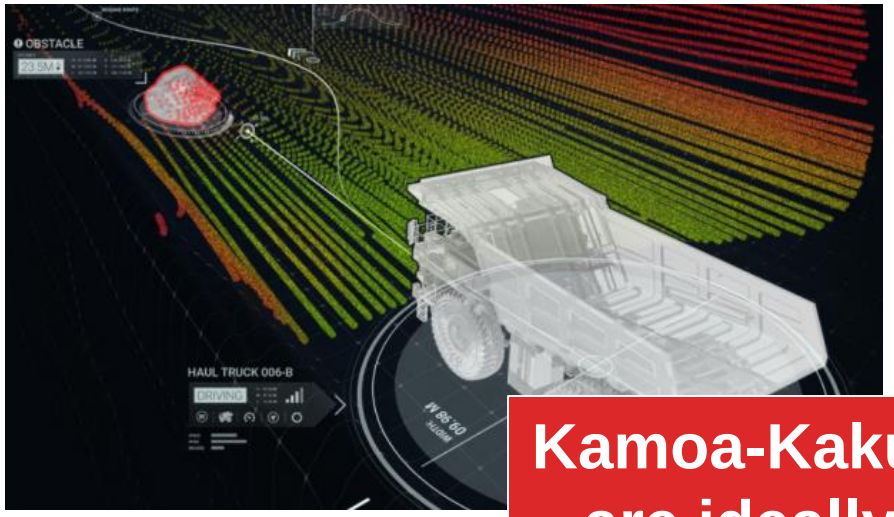
*Note: Contained copper in high-grade deposits (Measured & Indicated Resources, inclusive of Mineral Reserves, and Inferred Resources), with grades above 2.5% copper.

# Kamoa-Kakula is the largest copper discovery ever made on the African continent




Source: Wood Mackenzie and USGS

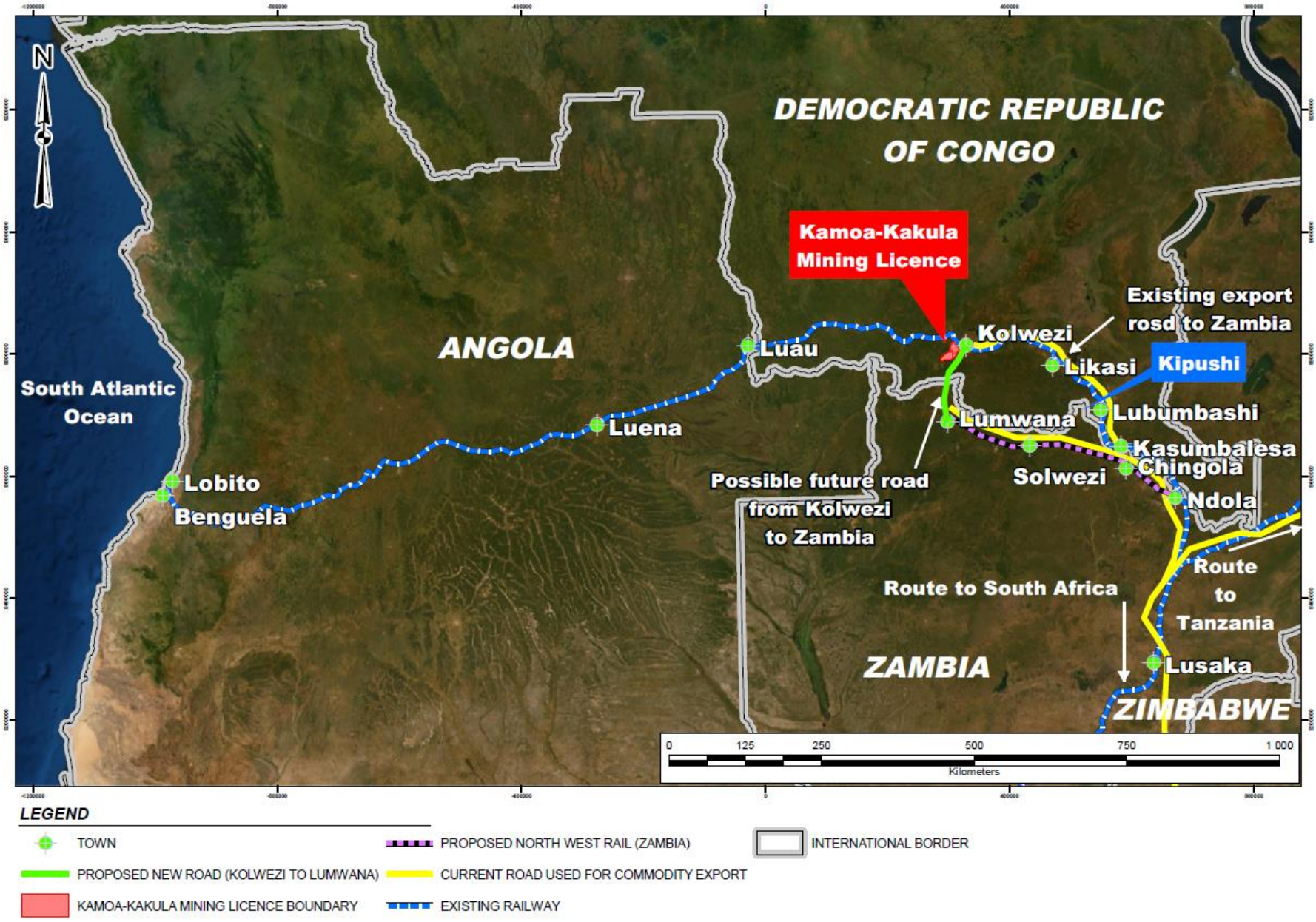
# Automation is the future of underground mining




**Kamoa-Kakula deposits are ideally suited for autonomous mining**

**Self-driving haulage trucks receive remote commands from a central control room and can detect, and avoid, obstacles.**

# New railway linking DRC mines with Angola's Atlantic port of Lobito




Sources: Railwaysafrica.com, enr.com, Stratfor & Grindrod

## Western Foreland

**A drill rig in action on the Makoko exploration area on a portion of Ivanhoe's 100%-owned Western Foreland licences. Makoko is approximately 20 kilometres west of the Kakula copper discovery.**

# KIPUSHI
# Mine development & upgrading for a new era

Democratic Republic of Congo

IVANHOE MINES

# The birth of a spectacularly high-grade mine


1928

In 1924, Kipushi began mining 18% copper from a surface open pit, before transitioning to Africa's richest underground copper, zinc and germanium mine. Mining continued until 1993.

KIPUSHI

# Health benefits from zinc

**Zinc stopped cancer-cell growth in tests; research pursuing potential to block esophageal tumour cells.**

Newsweek Oct. 3, 2017

**Zinc lozenges may help colds go away 3 times faster.**

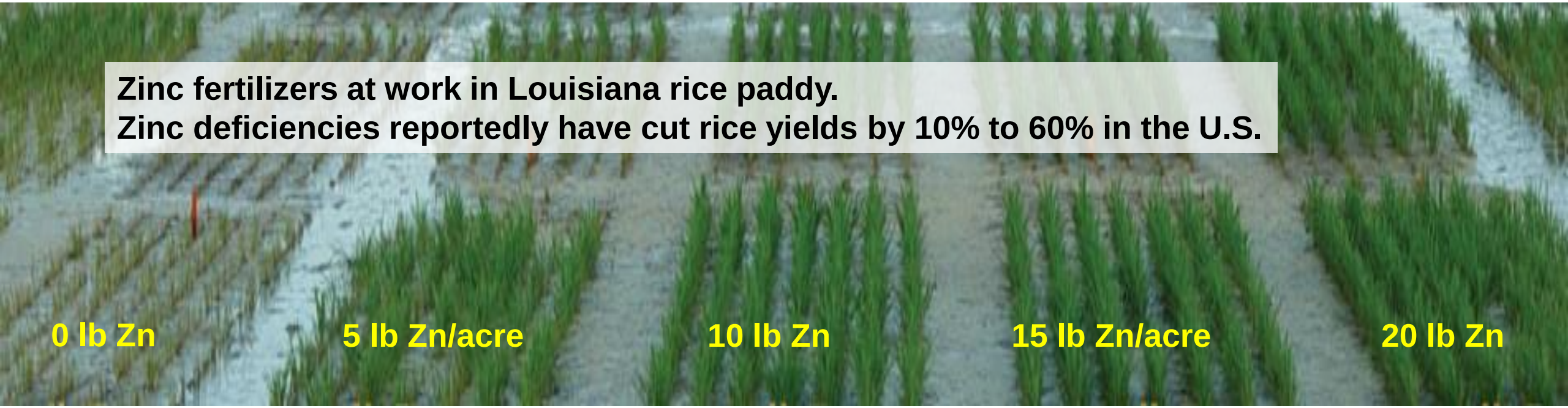
TIME May 16, 2017

**Shortage of zinc in the body can affect cardiovascular health.**

UPI April 18, 2017

KIPUSHI

# Think Zinc: Demand is growing in farming & food




**Zinc fertilizers at work in Louisiana rice paddy.**
**Zinc deficiencies reportedly have cut rice yields by 10% to 60% in the U.S.**

Sources: International Zinc Assn., Sabanci & Louisiana State universities, Bernstein Research

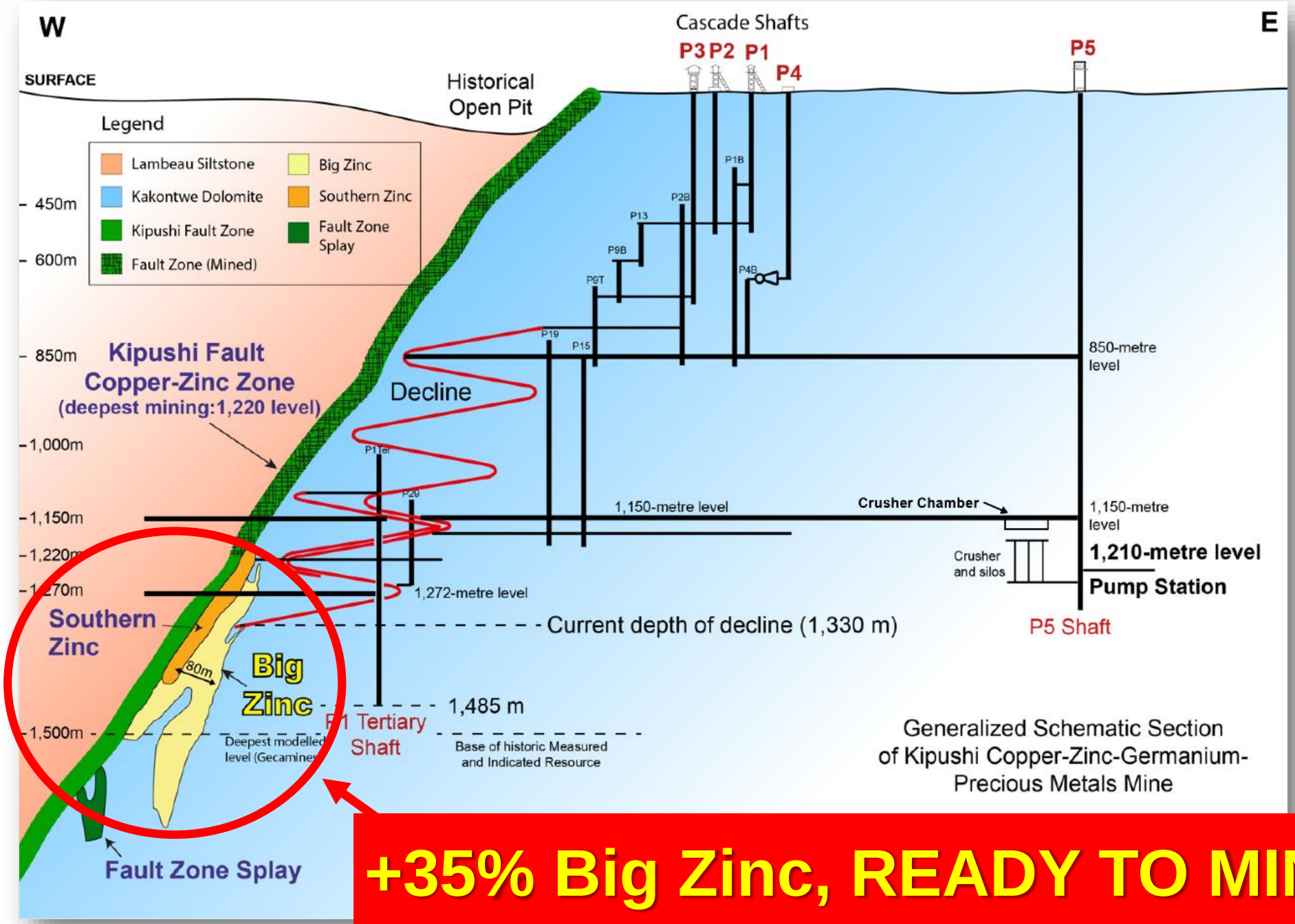
KIPUSHI

# March 2019: LME zinc inventories fall to lowest in more than a decade


Source: Bloomberg, LME

# December 13, 2017: Ivanhoe announced a pre-feasibility study for the rebirth of the historic Kipushi zinc-copper-silver-germanium mine

**The planned return to production would establish Kipushi as the world's highest-grade major zinc mine.**




**+35% Big Zinc, READY TO MINE!**


# New lighting installed at 1,200-metre level

# World’s best drill hole?

## Our geology team holding hands and showing Big Zinc intersection of 44.8% zinc over 340 metres

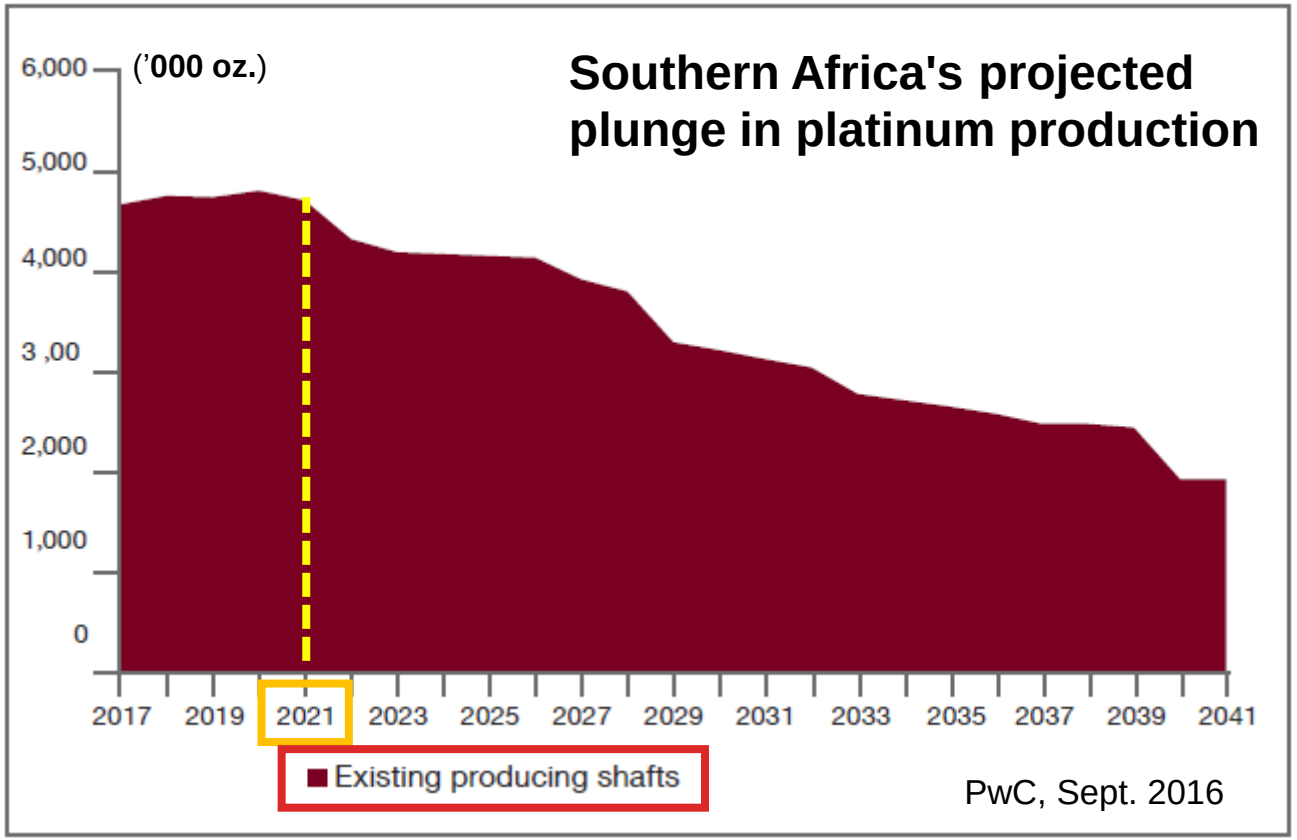
# PLATREEF

## Discovery & mine development

South Africa

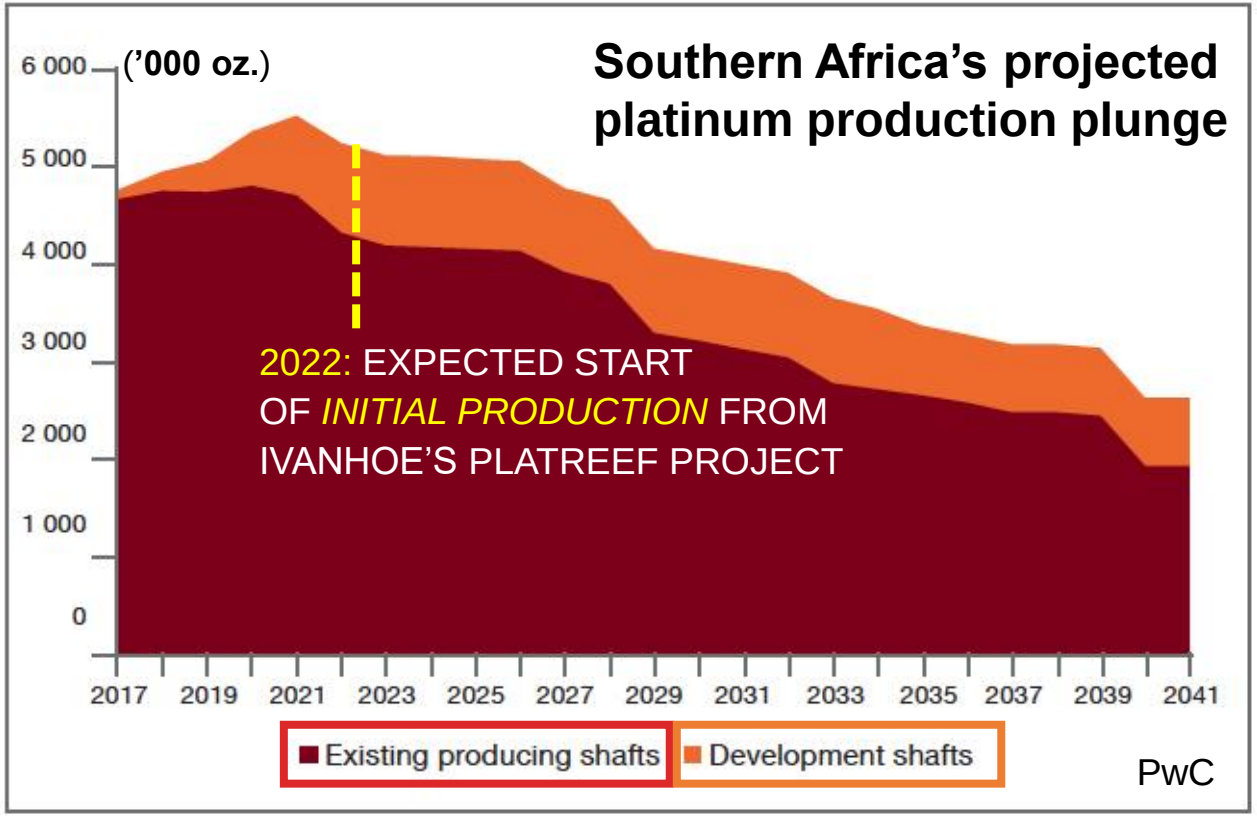
IVANHOE MINES

# The looming platinum “supply cliff” for Southern Africa’s existing producing mines




- Existing shafts alone will barely maintain current production to 2021.
- Then, closures of mined-out shafts will help trigger a long production decline – and higher prices.
- **Filling such a supply-demand gap holds challenges and opportunities.**

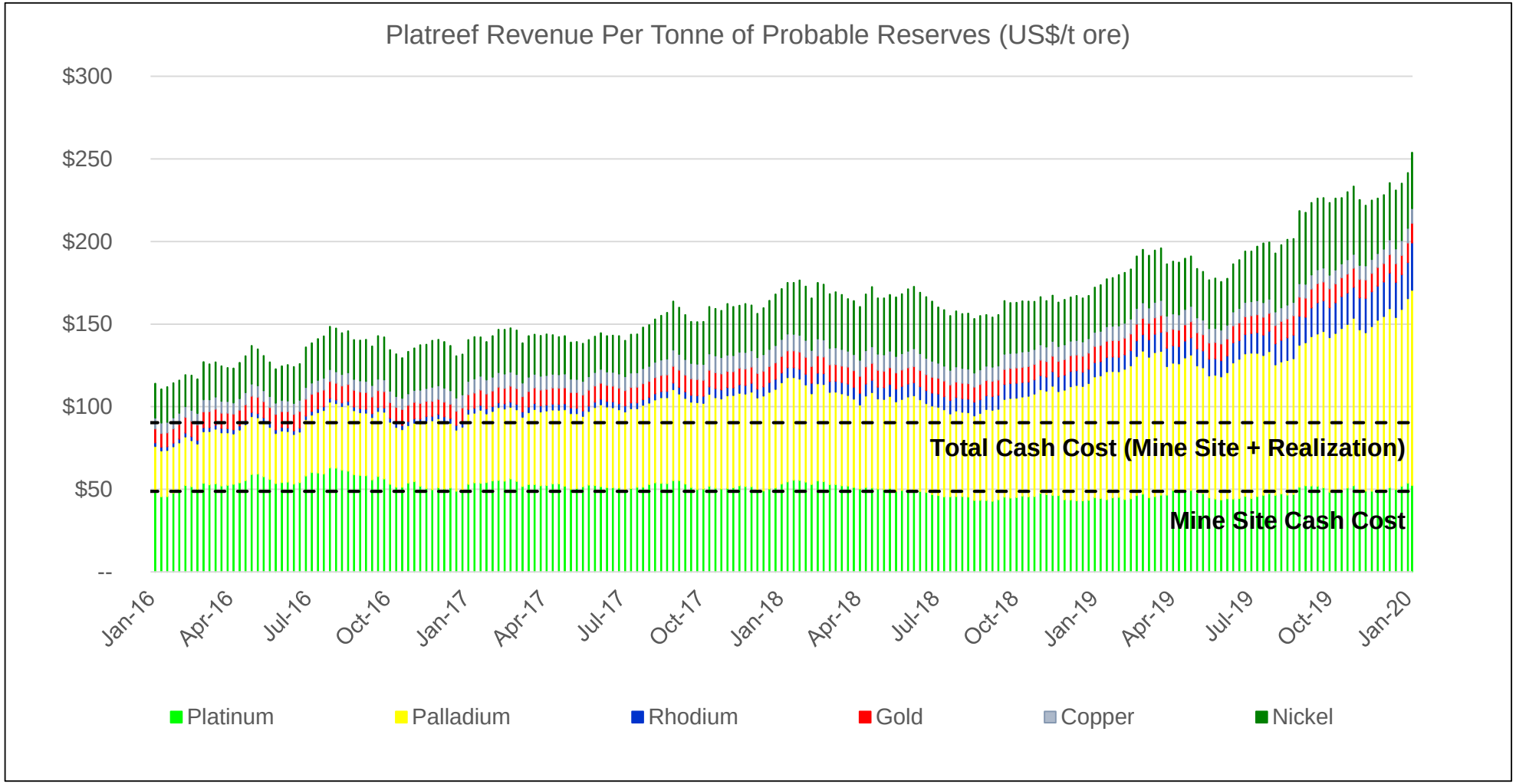
# Even new production now under development likely to provide only short-lived lift in platinum output




Source: *"Platinum on a knife-edge"*, PwC, September 2016

- Ivanhoe's Platreef is among new projects whose ramp-up outputs will slightly lift regional supply until 2021 – when the decline will resume.
- Projected 2021 peak output of 5.5 million ounces, even plus global supply, still will be below the average demand, net of recycling, of the past 3 years.

# Revenue per tonne of ore at the Platreef Project now at all time high




Source: Bloomberg. Based on historical weekly commodity prices at the end of each week.

# 750-metre, 850-metre and 950-metre stations on Shaft 1 will provide access to the high-grade Flatreef orebody

# September 26, 2018: First underground mining intersection of the Platreef mineralized belt on the Northern Limb of South Africa's Bushveld Complex

The first ore from the underground mine development was delivered to a surface stockpile for metallurgical sampling.

# Platreef's Shaft 2 box cut, with the 11.5-metre shaft ring set-up for the 10-metre internal diameter shaft

**Testing the ventilation at Shaft 1's 750-metre-level station. The shaft bottom currently is more than 950 metres below surface and completion of the shaft to a depth of 1,000 metres below surface is planned for mid 2020.**

# July 31, 2017: Definitive feasibility study issued for Platreef Project

- First phase envisages annual throughput rate of four million tonnes of ore per year, producing 476,000 ounces of platinum, palladium, rhodium and gold (3PE+Au), plus 33 million pounds of nickel and copper.

- Projected to be Africa's lowest-cost producer of 3PE+Au, with a cash cost of US$351 per ounce of 3PE+Au.

# January 2020: Ivanplats fast-tracking a feasibility study for smaller, earlier-stage production

With the recent surge in palladium and rhodium prices, Ivanplats is fast-tracking a feasibility study on a smaller-scale, low capital cost, early-stage development plan using Shaft 1 as a production shaft at its Platreef palladium, platinum, nickel, copper, gold and rhodium mining licence.


Thank You
IVANHOE MINES
NEW HORIZONS