Malvern Panalytical
a spectris company

21st Ore and Mineral Analysis – Virtual event

21st / 22nd July 2020

Ore and Mineral Analysis (OMA)

Workshop's

Malvern Panalytical
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1st OMA
2015 Brazil, Belo Horizonte
In cooperation with:
Universidad Federal Minas Gerais

UFMG
LabCri

2nd OMA
2016 Brazil, Nova Lima
In cooperation with:
Vale

VALE

3rd OMA
2016 Peru, Lima
In cooperation with:
Enviroequip

enviroequip

4th OMA
2017 Mexico, Zacatecas
In cooperation with:
Universidad Autonoma de Zacatecas

5th OMA
2017 Brazil, Belo Horizonte
In cooperation with:
SGS Geosol

SGS
GEOSOL

6th OMA
2017 Canada, Sudbury
In cooperation with:
Laurentian Univ. / Goodman School of mining

GOODMAN

7th OMA
2017 Canada, Quebec
In cooperation with:
Claisse

CLAISSE

8th OMA
2017 Brazil, Belem
In cooperation with:
Universidade Federal do Para

LCM

9th OMA
2018 Canada, Vancouver
In cooperation with:
University of British Columbia

UBC

10th OMA
2018 Brazil, Currais Novos
In cooperation with:
IFRN

funcem

11th OMA
2018 Canada, Quebec
In cooperation with:
Claisse

CLAISSE

12th OMA
2018 South Africa, Kathu
In cooperation with:
Industrial Analytical (Pty) Ltd

Industrial Analytical

13th OMA
2019 Mexico, Durango
In cooperation with:
University of Durango

UJED

14th OMA
2019 India, Bhubaneswar
In cooperation with:
IMMT

immt

15th OMA
2019 Brazil, Ouro Preto
In cooperation with:
Universidade Federal do Ouro Preto

UFOP

16th OMA
2019 Australia, Perth
In combination with:
Opening new application laboratory

17th OMA
2019 Indonesia, Bandung
In combination with:
Center for Mineral Research - tekMIRA

18th OMA
2019 Canada, Montreal
In combination with:
Mc Gill University

McGill UNIVERSITY

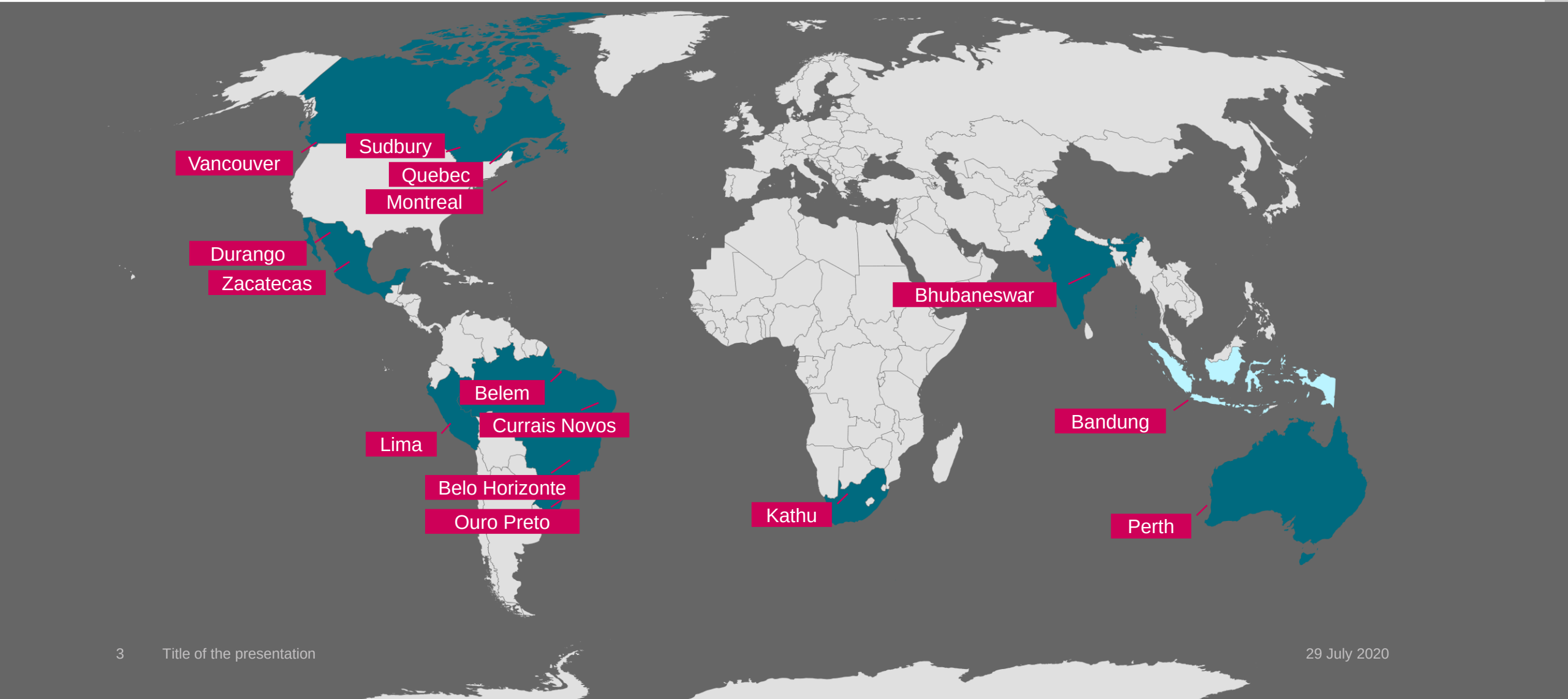
19th OMA
2019 Canada, Sudbury
In combination with:
Laurentian University

20th OMA
2019 Brazil, São Paulo
In combination with:
LCT / USP

USP
Universidade de São Paulo

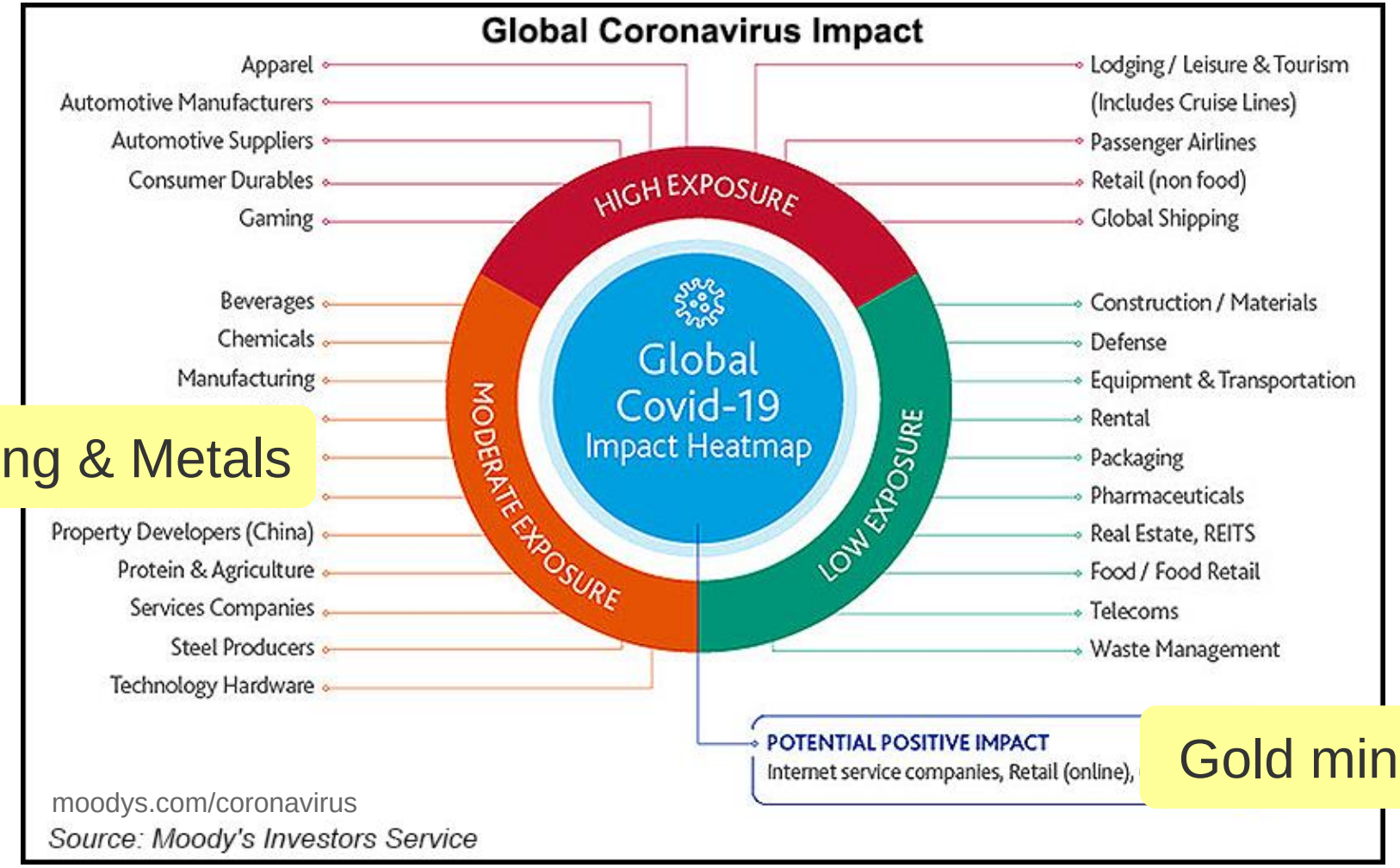
Ore and Mineral Analysis (OMA)

Workshop's



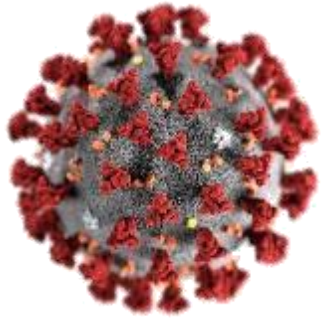
Mining industry

Covid-19 impact



Mining & Metals

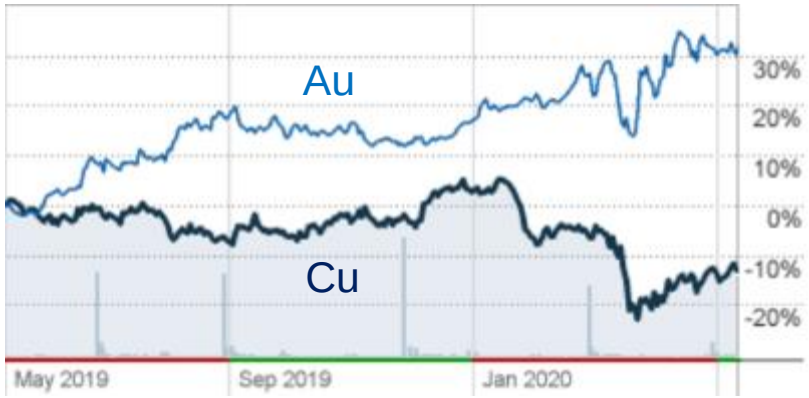
Gold mining

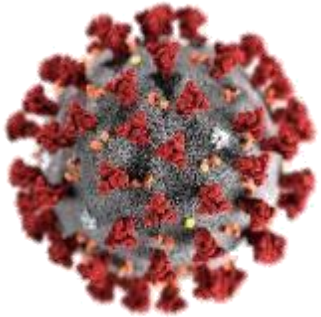


Mining industry

Covid-19 impact

- Isolated outbreaks and government mandated shutdowns
  - E.g. South Africa and Peru
- Demand for commodities like Cu, Fe, Zn remain low
  - Exception gold, benefiting from higher levels of uncertainty
- Lower energy prices impact mining industry positive
  - Energy typically constituting 20-25% if direct operating costs
- Companies likely to use crisis as a catalyst to rethink:
  - How and where work is done,
  - How to improve the ability to collaborate remotely,
  - How to accelerate adoption of automation and digital capabilities and
  - How to operate safe with a minimal workforce or no human intervention.





Mining Industry

Trends

GEOPOLITICAL

Global

- 2016 turning point for mining sector
- Challenges from technological disruption, CO_2 restrictions and environmental restrictions, health and safety

Rebound expected beginning 2021

Increased need for digitalization / automation

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GEOLOGICAL

Mining industry

- Decreasing grades require more frequent and accurate monitoring, remote locations
- Reduce costs - Stabilize margins – Increase efficiency
- Increase of secondary and recycled materials in supply chain

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TECHNOLOGICAL

Industry 4.0

- Big data, predictive analytics
- Multiple sensors, combined technologies
- On-line analysis of ores (ore sorting), liquids and slurry
- Automated sample preparation and analysis (standardization, cost saving)

Analytical environments

Bring the laboratory to the sample

Field

- Geologists exploring new or existing deposits

Mine

- Mine operators, geologist monitoring ore grades and blending

Laboratory

- Chemists, mineralogists, quality managers analyzing routine samples (feed, concentrates, tailings)

Remote

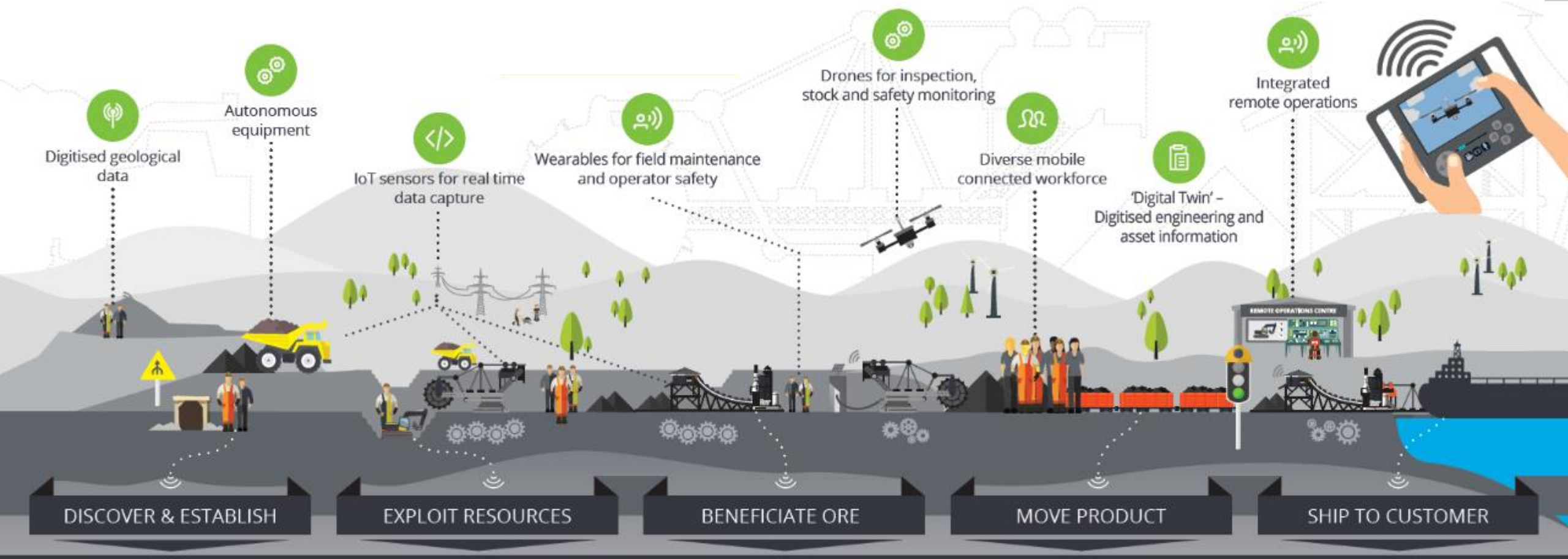
- Operators analyzing on-site at remote areas or underground mines

Automation

- Quality managers close to processing and beneficiation plants

Digital mine - future

From ore discovery towards metal shipment

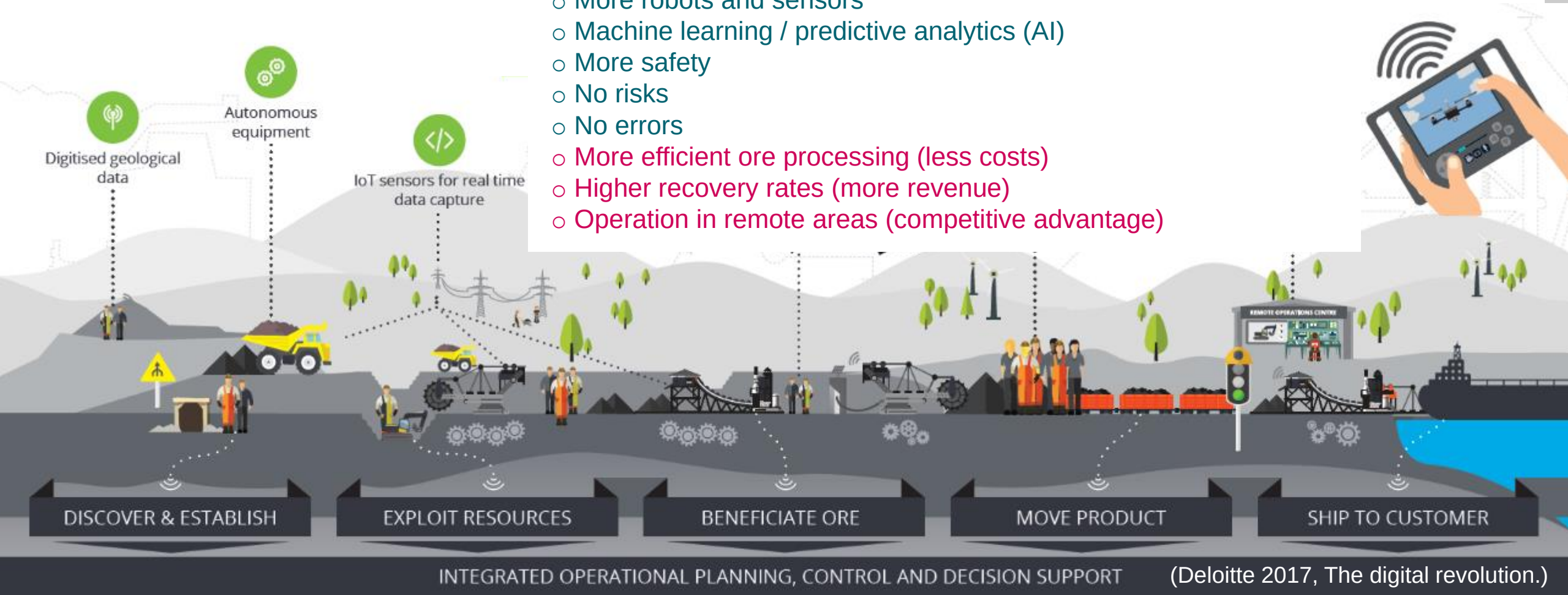


(Deloitte 2017, The digital revolution.)

Digital mine - future

From ore discovery towards metal shipment

- Autonomous mining process
  - Less / no people
  - More robots and sensors
  - Machine learning / predictive analytics (AI)
  - More safety
  - No risks
  - No errors
  - More efficient ore processing (less costs)
  - Higher recovery rates (more revenue)
  - Operation in remote areas (competitive advantage)



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Value predictive monitoring

Mining and metals industry - Examples

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Time	Downtime	OPEX	Penalties	Energy
EXAMPLE **IN-SITU measurements in oil well drill cuttings** **Lab reports** on a side wall core suite cost about $40k – $70k and information is **untimely**. In-situ analysis will reduce lab costs plus result in **more efficient use** of the rig.	EXAMPLE **MINERLOGY for ore processing** A copper mine suffered from stopping ore processing due to NOT checking mineralogy • Ration **oxides/sulfides** • Presence of hard minerals during **milling** • Missing awareness of **clay** minerals	EXAMPLE **ACID consumption for ore processing** Reduction of **1kg H2SO4 per ton ore** due to accurately and online monitoring **of clay minerals** results of huge savings.	EXAMPLE **MOISTURE for shipment of Fe-ore** **1% moisture deviation** from the agreed-upon moisture content results in a **$0.8 per ton penalty.** 2% lower target for moisture content of iron ores will cost less profit.	EXAMPLE **COKE consumption for sinter production** Saving in **coke consumption** (1kg coke / ton sinter) due to frequent and online monitoring of sinter raw mix and sinter represents a significant saving in energy.
Save (per drilling rig) **>100k** USD/y	Loss >**70m** USD/y	Save >**3m** USD/y	Loss >**69m** USD/y	Save >**1.4m** €/y

www.malvernpanalytical.com