Unlimited Trade

2050

In 2050, the world of raw materials has experienced **steady growth, mainly due to ever-growing consumption**. **International cooperation and dialogue** has created new opportunities to produce and trade raw materials. Access to capital has led to **industry integration, technology development and productivity improvements** alike.

Political situation

- **Stakeholders in the raw materials business have learned from the ups and downs** in the raw materials industry, which has experienced a number of shocks in the 2000 and 2010ies.
- The **growth of the BRICS states has been amplified by other fast-growing economies** (Mexico, Indonesia etc.), which entered the material-intensive development phase. While economic growth is not steady, the demand for raw materials increases as the world population growths.
- Under the pressure of large multi-nationals, the **world's economic giants (the U.S., China and India) have opted to intensify dialogue and to cooperate** rather than to pursue their self-interests only.
- They foster constructive relationships with countries that possess critical raw materials. Long-term **trade agreements secure access to raw materials**. Measures have been taken to **increase transparency and to regulate speculation** with raw materials.

Economic situation

- Advanced economies are able to keep **growth rates at 2% due to high levels of consumption**. It is a win-win situation for both governments and the mining businesses, as total employment in mining has gone up, too.
- As capital is available, the **extraction of raw materials goes on and new mines are opened**. Virtually all countries have introduced **more efficient regulatory frameworks** that support governmental bodies, industry, local communities and other stakeholders to resolve conflicts and to reach a consensus on establishing new mines in shorter periods of time.
- Most countries have established **stable tax regimes** as part of the agreements between governments and the mining industry.
- **Secondary raw materials play an increasingly important role** in the provision of raw materials, however, the rate of recycling cannot keep up with the total demand. It has reached a plateau.

Society

- The mining industry and governments **have invested heavily into shaping the public perception of mining**.
- People now have a **much more positive picture than some decades ago**, mainly due to a better understanding of the contribution of mining to sustainable development.
- The **absence of significant mining accidents and the implementation of higher environmental standards** (e.g. reduction of energy consumption, less pollution) has contributed to increased acceptance.
- Student interest in mining increases. Mining is regarded as a **diverse and high-tech industry, requiring advanced skills in geology, engineering and business**. In the advanced, resource-rich countries it is not the blue-collar workers that dominate mining anymore.

Technology

- To achieve economies of scope, we observe a growing trend **towards horizontal and vertical integration**. The **big mining companies have absorbed a range of suppliers (and their technologies)** to enable what was once called "Mine of the Future". Most mines are now partly automated to reduce costs.
- Sites that were previously considered sub-economic are now found feasible due to advanced technology. Better technology has led to a **dramatic reduction of the (relative) need for energy & water**. Technology now allows **to mine in remote and off-shore locations at reasonable costs**.
- Significant **technological progress also happens in downstream processing technologies and in recycling**.
- Advanced **mining technology spreads increasingly fast across borders as good practices are shared**. This happens even in less developed countries, where manual labour is relatively cheap.

Environment

- We see a strong integration of **environmentally-friendly mining and extraction of raw materials**, with **strict environmental policies in the mine closure period** that are followed around the globe.
- **Effective recycling processes have substantially lowered the impact** of the wider mining sector on the environment.

Overview Projections

- **Political situation:**
  - Higher stability - Political integration
  - More Free Trade Agreements - Increased trade
  - Land use planning harmonised w/ mineral planning
- **Economic situation:**
  - Higher integration - Horizontal and vertical
  - More capital available
  - High growth - Above-average global GDP growth
  - High requirements for new infrastructure
  - Frequent up- and downturn
  - Water: High availability and increased use
  - Energy: Lower consumption and higher prices
  - Higher RM demand
- **Social Factors:**
  - Acceptance of mining
  - More mining employees
- **Technology:**
  - Higher - Extensive use of robots
  - Big data becomes mainstream
  - Higher use of high tech for exploration
  - Research & Innovation for primary RM is higher
- **Environment:**
  - Lower environmental impact
  - Higher share mining in extreme environments
- **Law & Regulation:**
  - Permitting and regulation coordinated by single agency and ministry
  - High/moderate benefit of circular economy
  - Stagnating Recycling rate
  - Stable tax regimes

PROTAGONISTS

- Industry leaders with vision / Multi-national companies
- Governments (US, China, BRICS, EU & other source countries of raw materials)

WINNERS & LOSERS

- Winners
  - Integrated mining companies
  - Emerging economies
  - Shareholders
  - Environmental companies
- Losers
  - Semi- and unskilled people
  - Junior and non-diverse mining companies

POTENTIAL DISRUPTIONS

- War
- Over-reliance on technology
- Massive unemployment

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Sustainability Alliance

In 2050, the **circular economy has become the norm** in the big advanced economies, **A new generation of political leaders** have pushed forward a **series of reforms that focus on increasing sustainability, not only in the raw materials industry**. Almost every product is produced in an environmentally-friendly way with the **aid of green technologies**. Decision makers are under pressure to meet public demands for more environmentally-friendly solutions and policies.

2050

Political situation

- Given the emergence of severe environmental problems, the biggest economies have come to a tipping point. Starting with the ratification of the climate change agreement by the U.S. and China in 2020, **a political consensus was reached that a new, distinctly "green" approach** was needed.
- Whether industrialized, resource-rich, or developing country – there is an **unprecedented consensus that sustainable development** is a must. Governments agree to place sustainability above growth and profit.
- **Concerted actions by governments and the industry incentivized the shift towards more sustainable approaches** to provide and use raw materials. In 2050, hydro-carbons are mainly used as raw materials, not as a source of energy anymore.
- The changes have encompassed a transformation of other industries, too. **Agriculture, the energy sector, logistics, infrastructure etc. needed to be transformed to provide sufficient resources for a growing world population in a sustainable manner.**

Economic situation

- Such change in the raw materials sector was only possible because **prices for secondary (recycled) material fell** over time. They became more attractive relative to primary extracted material.
- **Trade with secondary raw materials** has increased dramatically. A truly circular economy has become reality in many aspects.
- The shift towards **green technologies generated its own economic growth**, as spendings in Research & Innovation increased to develop green technologies, to fight environmental degradation, climate change etc. For instance, carbon dioxide has become an asset, it can be recycled to create synthetic fuel.
- **Mining companies want to benefit from the boom in secondary raw materials**. Some of them acquire recycling companies, others have turned into vertically integrated RM companies, which produce further down the value chain. By doing so, they lower the risks of the volatile mining market.
- **Green technologies, in turn, require raw materials**, often these raw materials are regarded as critical.

Society

- An **entire generation has grown up to be environmentally aware and has developed a sustainable lifestyle**, assimilating practices which are not based on ownership of tangible products. **Companies sell usage and service rather products**. Corporate planning aligns commercial with sustainability goals.
- The overall public perception of mining tends to be negative, based on historical desasters. Despite this situation, society understands the need for minerals and mining, and **accepts the need for the production of primary minerals until substitution technologies have reached a new level of maturity** and potential.
- Manufactured products now have to **carry a label that specifies the origin of the (raw) materials used**. Consumers prefer locally-produced products.

Technology

- Only **high-tech and low impact mining is tolerated**. Mining at new frontiers is a sensitive issue, tolerated by the public, but under continous scrutiny by decision makers and environmental organisations.
- **New technologies allow for more accurate exploration and new mines are opened**, some in rather remote (uninhabited) and/or deep (depth at 5000 m below surface) locations.
- We observe **more efficient processes along the whole raw materials value chain** (e.g. less waste, less energy consumption)
- A bigger portion of innovation efforts is focused around **resource efficiency, extended product lifetimes and waste reduction**.
- New technologies are developed that **accomodate the demand for raw materials from the reuse/recycle/substitution perspective**. Recycling at the atomic level is the ambitious goal.

Environment

- Sophisticated **environmental monitoring, prevention and mitigation technologies** are being deployed. Compliance with the strongest environmental standards is now the biggest share of running costs in mining operations. **Mine remediation is given priority**.
- **Mining in extreme environments have become standard practice**, but also a subject to continuous discussion and debate. Lessons learned from past environmental incidents have been transposed to these new environments in an effort to avoid future accidents.

PROTAGONISTS

- Governments
- Younger generations
- NGOs, environmentalists
- Consumers & communities

WINNERS & LOSERS

- Winners
  - High-tech companies
  - Vertically-integrated RM companies
  - Recycling companies
- Losers
  - Slow-moving mining companies

POTENTIAL DISRUPTIONS

- Global consensus breaks down due to
  - War
  - Nationalism
  - Illegal miners

Overview Projections

- **Political situation:**
  - Higher stability - Political integration
  - More Free Trade Agreements - Increased trade
  - Land use planning harmonised w/ mineral planning
- **Economic situation:**
  - Higher integration - Horizontal and vertical
  - More capital available
  - High growth - Above-average global GDP growth
  - High requirements for new infrastructure
  - Frequent up- and downturns
  - Water: Low availability and increased use
  - Energy: Lower consumption and higher prices
  - Higher RM demand
- **Society:**
  - Opposition to mining
  - More mining employees
- **Technology:**
  - Higher - Extensive use of robots
  - Big data becomes mainstream
  - Higher use of high tech for exploration
  - Research and Innovation for primary & secondary RM higher
- **Environment:**
  - Lower environmental impact
  - Higher share mining in extreme environments
- **Law:**
  - Permitting and regulation coordinated by single agency and ministry
  - High benefit of circular economy
  - Increased recycling rate
  - Stable tax regimes

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National Walls

2050

In 2050, the world of raw materials got stuck as **social and demographic pressures triggered a long period of economic standstill**, which eventually lead to **a rise of protectionist measures**. The absence of leadership and insufficient political will didn't help to improve the situation. Each country fights for its own agenda. There is **little progress in mining practices** as **reforms have stalled and private investments are low**.

Political situation

- The world's biggest economies find it difficult to sustain growth. They **focus on solving their own economic and societal problems**.
- Disparities between countries got worse. There is a **widespread tendency towards protectionism** and trade agreement are breached.
- We repeatedly observe **conflicts related to the access to raw materials**. International institutions are weak, they barely manage to settle disputes. A wave of**„neo-colonialism"** can be observed.
- In this world, the dream of a united Europe is long forgotten. Europe is characterized by a number of blocks of countries that engage in cooperation. There is **a free movement of goods (customs union) but otherwise remaining „EU" institutions are weak**, trying to balance between the interests of the different geographical alliances.

Economic situation

- Global **trade has stagnated during the 2030ies and 2040ies** and there is a general sense of global insecurity. There is little and uneven economic development.
- For most countries, **securing access to all required resources is a challenge**. Some old alliances are re-established (e.g. USSR) to cope with shortages of raw materials.
- As demand for commodities stagnates, **governments run national economic development programmes** to boost their domestic economies.
- **Investors don't know where to invest their money**. Growth rates are slow and international investments are risky.
- Europe still benefits from an inheritance of a large amounts of capital from the past. This means that although there are huge differences in the economic performance and the standard of living between the different „European blocks", Europe is still a nicer place to live in than most other countries This higher standard of living is strongly protected against external influence.

Society

- In protectionist, resource-rich countries, **mining has become an important job motor**. Even countries that almost abandoned mining, have re-started. However, globally speaking, we'll see **less mining employees than 30 years ago**, due to stagnating demand.
- **Mining has turned into a somewhat dull industry**. Mining companies fall from the top 20 most attractive employers list as other industries are much more attractive.
- **Society is ageing rapidly.** In the EU, migration is limited and strongly controlled by restrictive immigration policies, aimed to protect national workforce. At the same time the migration pressures increase.

Technology

- Mining has always been a conservative industry, but with a few exceptions **mining practices are basically the same as 40 years ago.** Technologies that are readily available are favoured.
- **High-tech mining and low-tech mining co-exists** as countries /blocks of countries pursue their own agendas with regards to the domestic production of raw materials.
- **Technologies for recycling, reuse & substitution are developed** – especially by resource-poor countries, **but at a slow pace**. Domestic R&D gets a boost.

Environment

- **Environmental permitting procedures for mining are mostly a formality**, any investment that meets basic environmental criteria and generates employment is approved very quickly.
- **Environmental policies are in place, but often ignored**. Land degradation continues at an unsustainable scale globally but this is met by indifference by society, whose primary focus is providing the means for survival.

Overview Projections

- **Political situation:**
  - Reduced stability - Collapse of EU
  - Less Free Trade Agreements – Protectionism
  - Land use planning harmonised w/ mineral planning
- **Economic situation:**
  - Less integration - Horizontal and vertical
  - More capital available
  - Low growth - Below-average global GDP growth
  - Low requirements for new infrastructure
  - Long-term price stability
  - Water: High availability and decreased use
  - Energy: Lower consumption and higher prices
  - Lower demand - stagnating percentage secondary RM
- **Society:**
  - Acceptance of mining
  - Less mining employees
- **Technology:**
  - Moderate - Specialised robots
  - Big data too difficult and costly
  - Limited/higher use of high tech for exploration
  - Research and Innovation primary & secondary RM stagnates
- **Environment:**
  - Lower environmental impact
  - Low share mining in extreme environments
- **Law:**
  - Permitting and regulation coordinated by single agency and ministry
  - Moderate benefit of circular economy
  - Stagnating recycling rate
  - Stable tax regimes

PROTAGONISTS

- National governments of developed countries
- Mining companies
- Military / army / security forces
- …

WINNERS & LOSERS

- Winners
  - Nationalist politicians
  - Resourceful countries
  - Countries better positioned for global trade
  - Military-industrial complex
  - National mines
  - Domestic R&D
- Losers
  - Poor / non-resourceful countries
  - International organisations (WTO, …)
  - NGOs

POTENTIAL DISRUPTIONS

- Global war /bigger military interventions
- RM substitution
- New discoveries in new places
- Changes in demography

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