RAW MATERIAL MANAGEMENT AT THE BMW GROUP – RESPONDING TO GLOBAL TRANSFORMATIONS.

WORLD MATERIALS FORUM

BMW GROUP

THE NEXT 100 YEARS

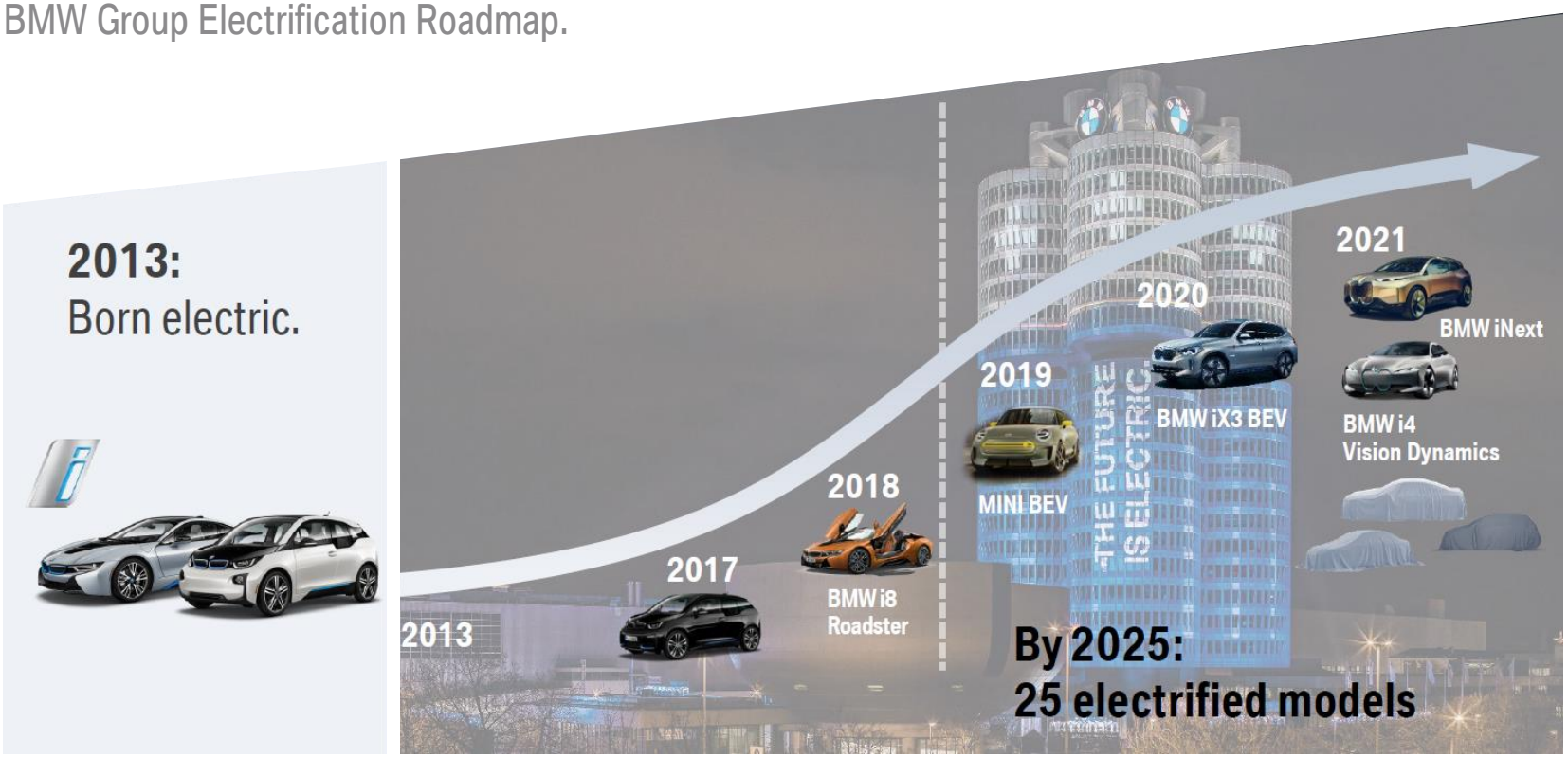
Rolls-Royce Motor Cars Limited

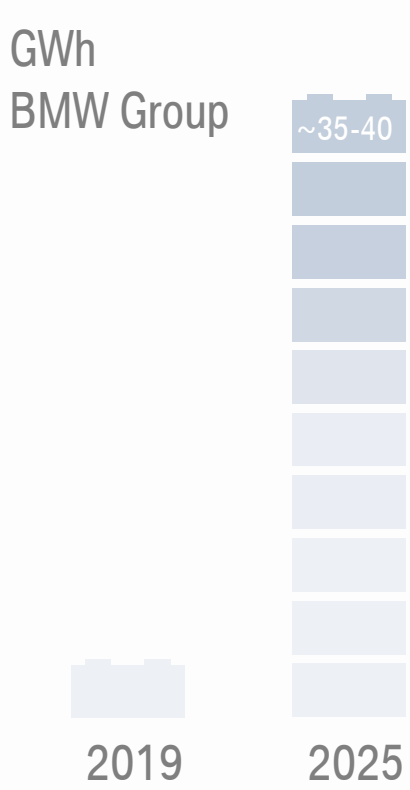
OUR ENVIRONMENT IS HIGHLY VOLATILE.
THE CHALLENGES FOR THE INDUSTRY ARE IMMENSE.

THE BMW GROUP DEVELOPS DYNAMIC AND INNOVATIVE SOLUTIONS TO KEEP ITS LEADING POSITION.

THE BMW GROUP IS COMMITTED TO ELECTRIFICATION.
THE PATH OF SUCCESS OF E-MOBILITY IS IRREVERSIBLE.

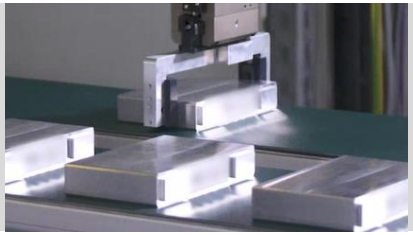
BMW Group Electrification Roadmap.





BMW GROUP IS WELL PREPARED FOR FUTURE OPPORTUNITIES BY STRENGTHENING INNOVATION, REDUCING COSTS AND MITIGATING RISKS.

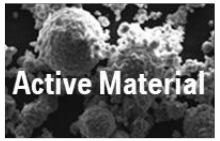
ACCESS TO KEY TECHNOLOGIES AND CRITICAL RAW MATERIALS WILL BECOME INCREASINGLY IMPORTANT.

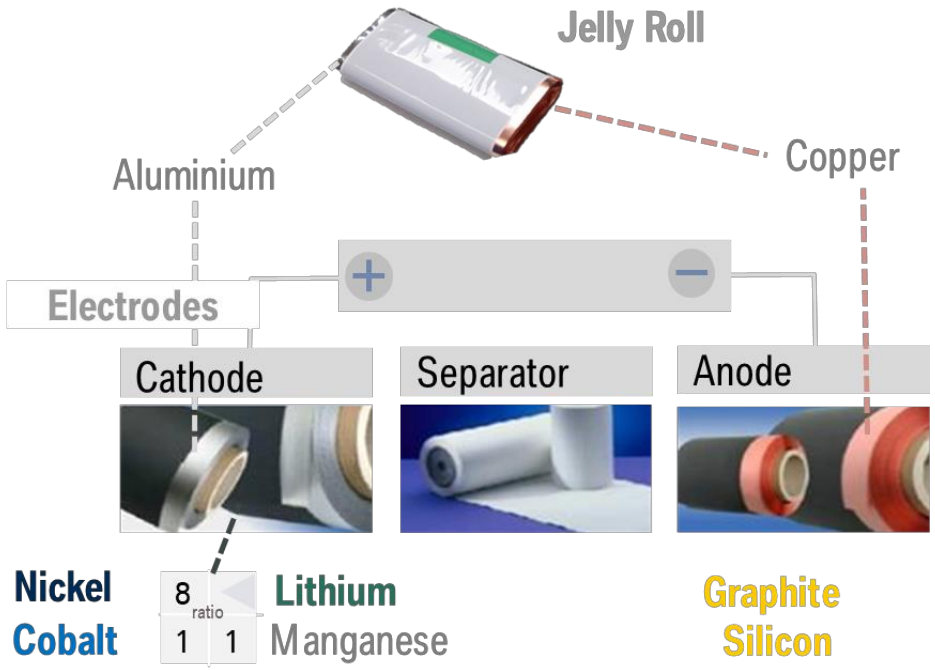


BATTERY CELL AND CELL MATERIALS ARE KEY FACTORS IN PERFORMANCE AND COSTS.

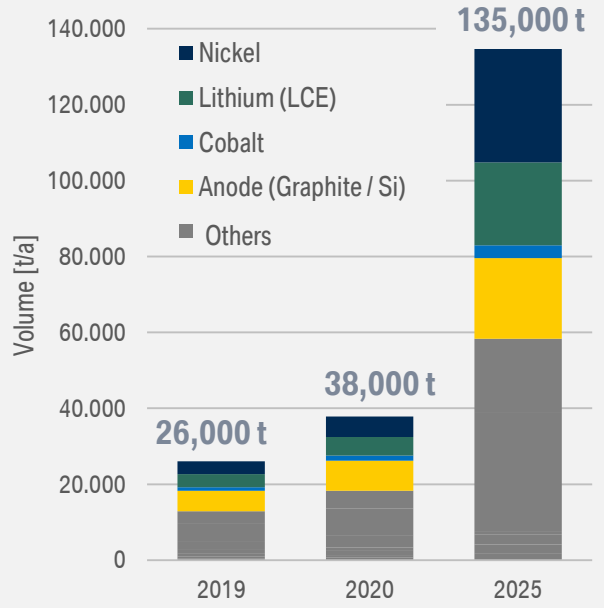
80% of battery cell costs are **material** costs.

Battery Cell





BMW GROUP DEMAND SCENARIO BATTERY RAW MATERIALS



RAW MATERIALS USED FOR ELECTRIFICATION AND AUTONOMOUS DRIVING ARE CREATING CRITICAL CHALLENGES REGARDING SUSTAINABILITY AND SECURITY OF SUPPLY CHAIN.

Compliance and Human Rights

RIGHTS OF INDIGENOUS PEOPLE

SECURITY ON RULE OF LAW

CORRUPTION

CHILD LABOUR

Working Conditions

WORKING CONDITIONS ASM

Environmental Protection

RIVER-DUMPING

SEDIMENTS

SENSIBLE ECOSYSTEMS

Health / Climate Change

CHEMICALS

WATER

EMISSIONS

LAND USAGE

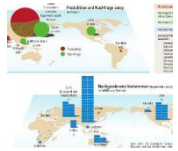
RADIOACTIVITY

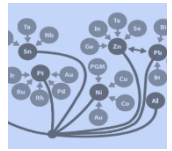
RISK MAPPING

SUSTAINABILITY

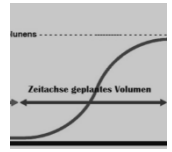
SECURITY OF SUPPLY

Production


RESOURCE CONCENTR.

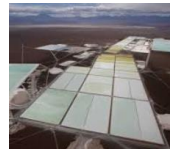

BY-PRODUCTS

Strategies



REACTION TIME

INDUSTRIAL POLITICS


MONOPOLIES

Secondary Resources

RECYCLING

Continuity / Stability

WEATHER RISKS

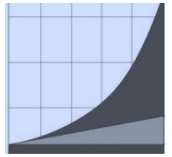
POL. RIOTS

STRIKES

Raw Material Demand

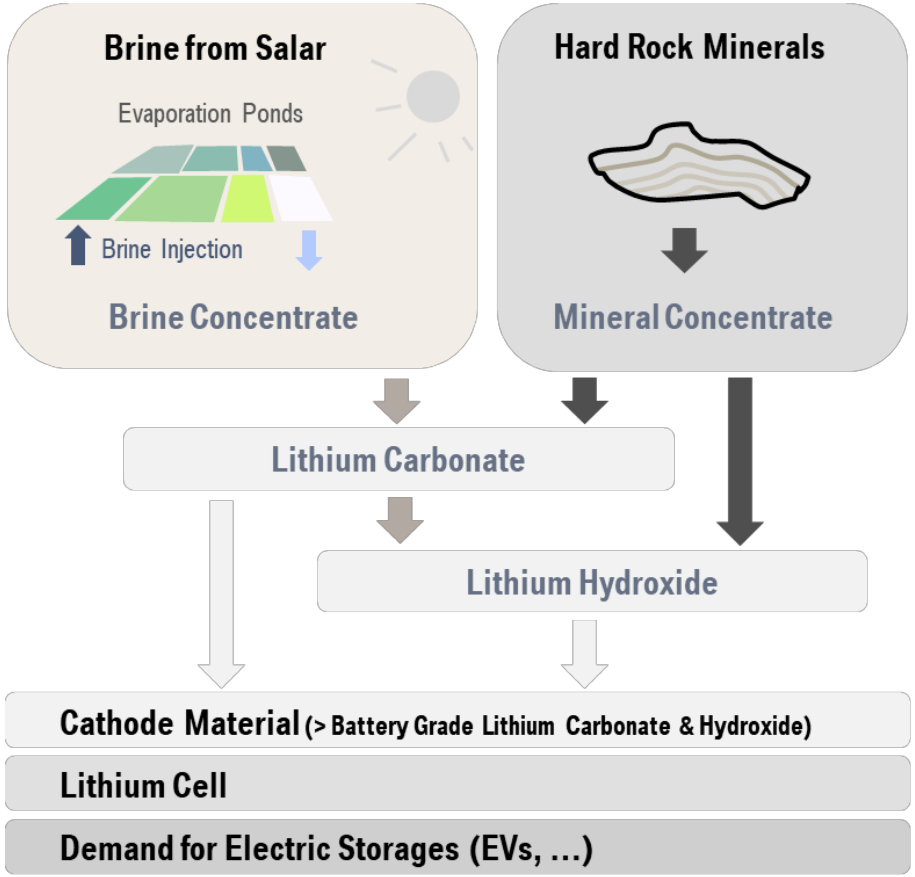
INNOVATION

COMPANY STRATEGIES


RAW MATERIAL DEMAND

FINANCIAL MARKET

ASSESSMENT OF CRITICAL COMMODITIES – CHARACTERISTIC FEATURES BASED ON PROCESS UNDERSTANDING, DATA COLLECTION AND ANALYSIS OF THE SUPPLY CHAIN.



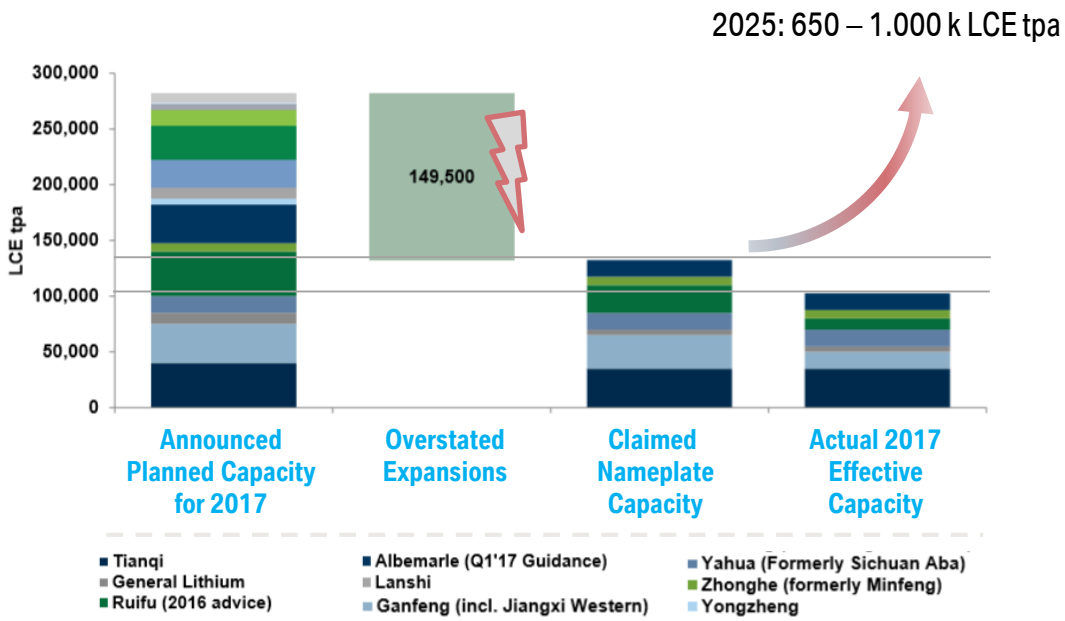
IMPORTANT FACTORS FOR EFFICIENT EVALUATION OF CRITICALITY

- **Understanding processes from mining to components.**
  Exploration - Financing - Engineering - Production - Processing - Technology - Sustainability
- **Design features of criticality characteristic of the different commodities.**
- **Analysis of the stability and elasticity embedded in the technological, economic, ecological, political and social systems.**
- **Investigation of**
  - the influence of perturbations and
  - interventions necessary to keep the supply chain under control.
- **Balancing the ratio between costs of risk mitigation and benefits.**

COMPARED TO INDUSTRY STANDARDS, LITHIUM MARKET IS STILL VERY YOUNG, HISTORY IS SHOWING HIGH UNDERPERFORMANCE AND MARKET UNCERTAINTY.

CAPACITY PLANNED VS. DELIVERED VS. EFFECTIVE

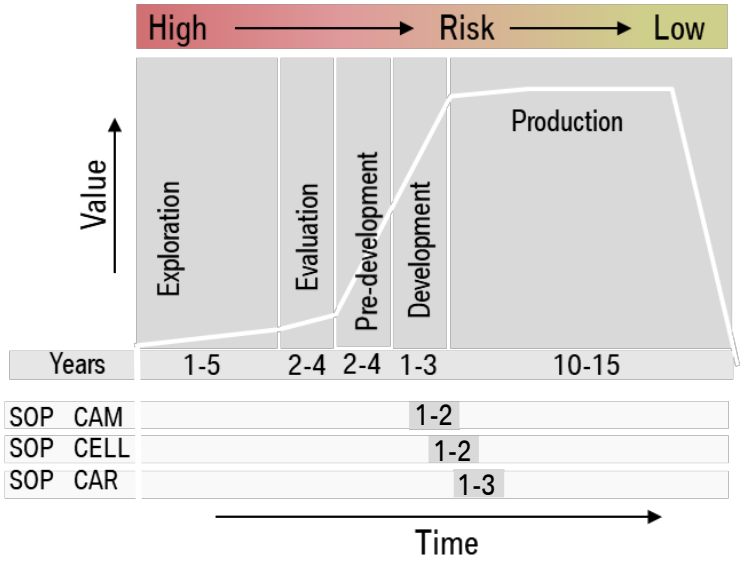
SOURCE: OROCOBRE



- Realized projects fall short of expectations.
- Project extensions for the most part from existing projects.

PROJECT DEVELOPMENT (REACTION TIME)

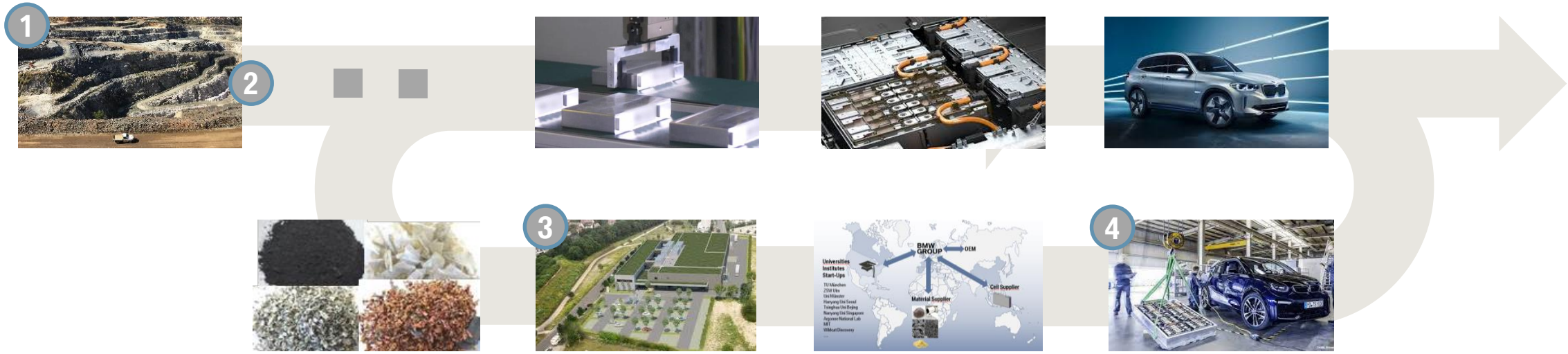
SCHEMATIC REPRESENTATION



- Financing of the projects mostly not yet secured.
- High volatility and falling prices lead to uncertainty among investors.

The interplay between financial markets and lithium mining and processing industry is crucial to support future growth!

THE BMW GROUP IS STRONGLY ENGAGED ACROSS THE BATTERY VALUE CHAIN TO MANAGE RISK OF CRITICAL MATERIALS AND SECURE LONG-TERM PROFITABILITY.



RAW MATERIAL SOURCING

- Securing access to critical raw materials (e.g. Lithium and Cobalt).
- Enhancing sustainability throughout the supply chain (e.g. implementation of new standards).
- Cost reduction in the supply chain (e.g. using in-depth market expertise).
- Managing raw material price risks (e.g. using financial instruments).

TECHNOLOGY, MECHANICAL ENGINEERING, PRODUCTS AND SERVICES.

- Strengthening expertise in battery-cell development and production.
- Entering into new partnerships to secure future prospects.

1 THE BMW GROUP SECURED SHARES OF CRITICAL RAW MATERIALS LITHIUM AND COBALT TO MEET FUTURE STRONG DEMAND UNTIL 2025.

GENERAL APPROACH

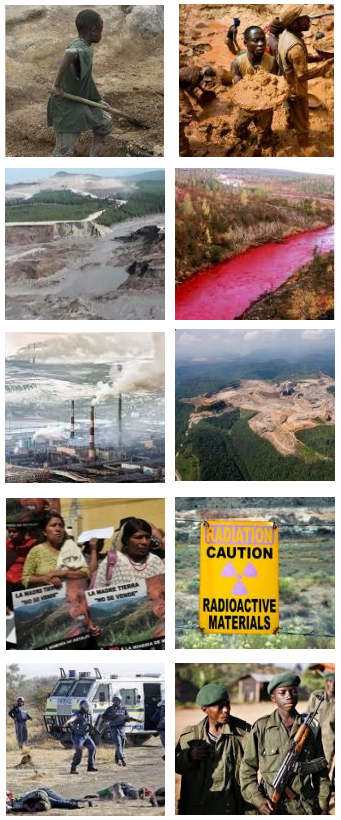
- The BMW Group is working closely with its Tier supplier to secure long-term supply of raw materials and to improve Environmental-, Social- and Governance (ESG) Standards.
- The BMW Group retains the option to directly involve into risk mitigation activities.

STRATEGIC CORNERSTONES FOR BATTERY MATERIALS

- Procuring from large scale mines (outside of DR Congo),
- Selecting mines with high ESG Standards,
- Ensuring transparency and traceability along the supply chain,
- Engaging to develop global industry standards,
- Promoting lighthouse projects (e.g. BMW Group DR Congo project).

SETTING NEW STANDARDS FOR LONG TERM, SUSTAINBLE GROWTH.

2 THE BMW GROUP ENHANCES SUSTAINABILITY ALONG THE SUPPLY CHAIN.



APPROACHES TO GUARANTEE SUSTAINABILITY

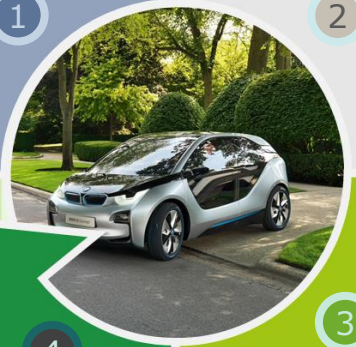
1 Sustainability risk assessment along the value chain.

Examples

- Transparency,
- Supplier evaluation (incl. mining companies),
- Visits on the ground,
- Supply chain audits.

2 Leadership through raw material specific activities.

- Recycling and closed-loop agreements with suppliers,
- Lighthouse projects (e.g. cobalt ground project).



3 Development of global, cross-industry standards and initiatives.

- Aluminium Stewardship,
- Battery Cell Initiative ,
- Responsible Minerals.

4 Strong media presence, regular exchange with key stakeholders.

- Communication via different channels,
- Stakeholder dialogues.

SUCCESS STORIES

✓ Top placement in sustainability rankings.

FTSE4Good

Dow Jones Sustainability Indexes

CDP DRIVING SUSTAINABLE ECONOMIES

✓ Excellent recognition by stakeholders, e.g.

WWF

Brot für die Welt

MISEREOR IHR HILFSWERK

2 CROSS-INDUSTRY PILOT PROJECT TO ENHANCE SUSTAINABLE COBALT MINING.

Professionalising artisanal mining

Supporting mining communities

Facts & Figures:

- 3 years
- Kolwezi, DR Congo
- GIZ
- Up to 10.000 miners

Initiated with partners of our supply chain and of the electronics industry, implemented by GIZ.

Main aims:

- improve artisanal mining working conditions and living conditions for surrounding communities.
- if proven effective, the approach could be transferred to further mine sites.

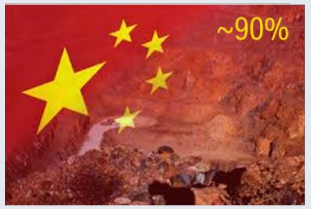
3 THE BMW GROUP CONTINUOUSLY INCREASES TECHNOLOGICAL LEADERSHIP.

RARE-EARTH-FREE ELECTRIC DRIVETRAIN TECHNOLOGY

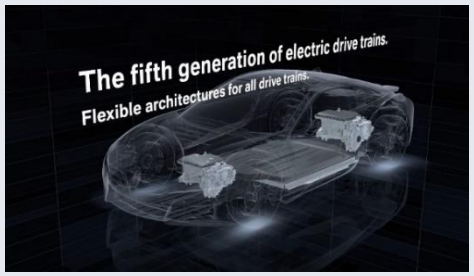
The BMW Group reduces its dependence on critical resources introducing rare-earth-free electric drivetrains (2021).

Sustainability

High Dependency



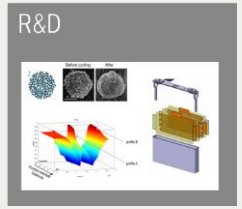
Price Risk



BMW GROUP BATTERY CELL COMPETENCE CENTER

The BMW Group accelerates the development of battery cells, leveraging the expertise in cell chemistry, design and production.

In-house technological expertise is key



Analysis of cell design and cell technology

- enabling higher performance capabilities,
- gaining build-to-print expertise,
- leveraging cost benefits and economies of scale.

4 PROVIDING SOLUTIONS TO RE-USE BATTERIES END-OF-LIFE, INCREASE RECYCLING AND CLOSED-LOOP APPLICATIONS.

BMW Group.

Battery „2nd Life“

New business development

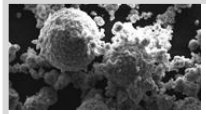
Recycling / Closed-Loop

Cell & battery design, development

Entering into new partnerships.

northvolt®

Cell manufacturing scale up



umicore
materials for a better life

Material development, recycling

The BMW Battery Storage Farm Leipzig

700 x 2nd Life batteries are used to

- store the electricity produced in four wind turbines,
- optimize local energy management,
- contribute to the public power grid stabilization through the bi-directional supply of control energy.

- The BMW Group, Northvolt and Umicore work closely together to develop a sustainable value chain for battery cells for electrified vehicles.
- Focus is a closed life cycle loop from materials, recyclable cell design, energy efficient manufacturing process, primary use as a drive battery, secondary use e.g. stationary energy storage, recycling and reuse of materials.

Raw material management on the road to transformation. The BMW Group is a leader amongst competition.

KEYS TO THE BMW GROUP SUCCESS

- strengthen strong interplay between cross-functional innovations (from purchasing to research, development and production),
- enhance exchange with crucial partners (from suppliers to universities and research institutions),
- be electrified.