

German Mineral Resources Agency

at the Federal Institute for Geosciences
and Natural Resources



Imprint

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10 years of

German Mineral Resources Agency (DERA)

at the Federal Institute for Geosciences and Natural Resources (BGR)

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Peter Altmaier
Federal Minister
for Economic Affairs and Energy

As one of the world's leading technology locations and a major trading nation, Germany is highly reliant on a secure and sustainable supply of raw materials. All downstream manufacturing starts with raw materials, making them indispensable to economic success. New technologies slowing the effects of climate change are a recent and pressing example of how important raw materials are. The manufacture of batteries, wind turbines or photovoltaic systems relies on the primary production of raw materials through mining and increased recycling of these raw materials. In the future, global raw material demand is likely to be substantially affected by these key technologies, making sustainable and reliable raw material supply universally important.

Germany is one of the world's largest consumers of raw materials due to the size and strength of its downstream industries. This position comes with a commitment to ensure responsible extraction and the efficient use of raw materials. Germany's involvement in the Extractive Industries Transparency Initiative (EITI) is aimed at precisely this goal.

Ten years ago, the Federal Government published its first German Raw Materials Strategy. One of the institutional measures was the establishment of the German Mineral Resources Agency (DERA) at the Federal Institute for Geosciences and Natural Resources (BGR). As the national information and consultancy platform for raw materials, DERA advises both German industry and the Federal Government on a secure and sustainable raw material supply as well as providing insights into developments on the global raw materials markets. With the update of the Raw Materials Strategy adopted by the Federal Cabinet on January 15th 2020, the raw

materials policy was reviewed as well. As part of this update, successful measures introduced with the first Raw Materials Strategy were maintained and will continue to be implemented and developed. This also includes DERA's successful work. According to the assessment of the German Council of Science and Humanities, which reviewed BGR's work in 2017, DERA is providing outstanding raw material advisory services.

Since DERA was established in 2010, raw material supply has become an increasingly important issue. The economic impact of the COVID-19 pandemic is a current example of how vital a secure raw material supply is to the German manufacturing industry. For small and medium-sized businesses, it is particularly important to have an independent contact who not only monitors current and complex trends on international raw materials markets, but who can also suggest specific mitigation and diversification strategies for raw material supply. In the future, ensuring a sustainable raw material supply is set to become an even greater challenge for the German manufacturing industry. Thus, DERA will continue to remain an important contact for German companies and political stakeholders alike.

A handwritten signature in blue ink, appearing to be 'P. Altmaier', written in a cursive style.



Dr. Volker Steinbach
Vice President of the Federal Institute
for Geosciences and Natural Resources, Head of Department Raw Materials

The sustainability of our society strongly depends on the innovation capacity of German industry and technology, especially with regard to the tremendous challenges of energy transition, digitalisation and increasing global competition. In order to maintain this innovation capacity in the future, a secure and sustainable raw material supply is of crucial significance. As Germany is heavily reliant on imports, particularly for metallic raw materials, monitoring and analysing the global raw materials markets is of vital importance to our economy. The German Mineral Resources Agency (DERA) at the Federal Institute for Geosciences and Natural Resources (BGR) has made substantial contributions to this effort over the past ten years. As part of its raw materials monitoring, DERA provides advisory and information services to German companies and political stakeholders on recent price changes as well as supply and demand developments regarding mineral raw materials, including intermediate products at the first stages of the value chain. This monitoring is aimed at helping to identify critical developments on the international raw materials markets early on. It supports companies in optimising their strategies to ensure secure and reliable raw material procurement. Since DERA's establishment, these advisory services have been greatly appreciated by German industry and the Federal Government alike.

Over the last two decades, global raw materials markets have undergone significant changes, presenting the German economy and our society with new challenges. While many emerging economies were major exporters of raw materials until the turn of the millennium, the situation has changed considerably as a result of rapid economic growth. This is particularly true for China, which has developed

into one of the largest consumers and importers of raw materials today. Moreover, political instability in some of the major producing countries poses additional risks to a secure raw material supply chain. As a response to the changing global economic landscape, the Federal Government adopted its Raw Materials Strategy in 2010 and established the German Mineral Resources Agency at BGR as one of several measures. Right from the start, we put great effort into setting up a target-oriented raw materials consultancy platform for German companies and the Federal Government, closely coordinating both the founding concept and DERA's future development with industry and political stakeholders.

In order to provide tailor-made advice and information, it is essential that we recognise potential raw material supply bottlenecks at an early stage. Market knowledge about key demand drivers and in-depth analysis of current and potential future supply are a cornerstone of our service. Together with our long-term raw material research projects as well as our national and international research and business networks, these science-based advisory services are a quality feature of DERA, which companies and political stakeholders have been using extensively since DERA's establishment. By adopting our current BGR 2025+ – Strategies for the Sustainable Use of the Earth's Resources, we have also firmly established DERA's work as a key focus of activity in the medium and long term, ensuring that we can continue to provide science-based raw material advice for the years to come.

At this point, I would like to express my sincere thanks to DERA's highly motivated team, our industry partners and federal institutions, as well as to our national and international collaboration partners. We look forward to continuing working with you!

A handwritten signature in blue ink, appearing to read 'V. Steinbach', written in a cursive style.

Sparring partner for industry

Ten years ago, the German Mineral Resources Agency (DERA) was established at the Federal Institute for Geosciences and Natural Resources (BGR) on behalf of the Federal Government, to advise German industry on matters relating to secure raw material supply. The German economy, which is closely intertwined with the global economy, is facing tremendous challenges. Peter Buchholz, Head of DERA, explains the situation in an interview and also takes a look into the future.

■ *What are the challenges on the international raw materials markets?*

Supply and demand are very often out of balance. Emerging economies appear on the scene and can cause a boom in demand for new raw materials. Just think of the massive infrastructure expansion in China and the huge demand for raw materials it has generated. In addition, innovation leaps in new technologies – such as the increasing adoption of electric vehicles, digitalisation, and renewable energy technologies – create new demands. If raw materials are sourced from only a few countries and suppliers in high-risk geopolitical regions, extreme price volatility, supply bottlenecks and even shortages may occur in the medium to long term. With our raw materials monitoring, we keep track of these developments and point out trends.

■ *How does this affect the German economy?*

Effective raw material supply risk management has become absolutely essential for industry. Companies should screen their entire supply chain, identify weak points and develop mitigation strategies together with suppliers to hedge against supply shortages and strong price volatility. We provide information to industry and raise the awareness for potential risks on the raw materials markets, enabling businesses to take effective action. And we have ultimately noticed a change in awareness of these issues.

■ *In what respect?*

Large and medium-sized companies, in particular, have established purchasing and strategy departments that keep an eye on raw material supply along the entire value chain. With our risk analyses, we develop scenarios that help to better anticipate market developments. Our evaluations of mineral

resources help companies to diversify sources of supply. In addition, companies are increasingly required to meet new EU regulations on environmental and social standards in the raw materials sector and BGR has strong expertise in this area. Purchasing and strategy departments need reliable and independent information to be able to promptly respond to new developments and plan ahead. This is where we offer advisory services and extensive information.

Our aim is to increase awareness for potential risks.

■ *What kind?*

Since DERA's establishment, we have continuously been approached by large, small and medium-sized enterprises for specific information and have presented our work at numerous business events. As part of our DERA industry workshops, we offer an expert forum fostering networking and discussions and bringing together stakeholders along the entire value chain. At these workshops, we give an in-depth overview of specific raw materials, present our findings and provide an outlook on the market. With our DERA monitors, we also maintain a monitoring platform, and publish specific raw material, country and resource reports. All this is part of our market

The recycling sector is set to become an increasingly important part of our work.



Dr. Peter Buchholz

Head of German Mineral Resources Agency (DERA)
at the Federal Institute for Geosciences and Natural Resources (BGR)

information and research work, which helps German companies to strengthen its position in the markets. Our office is open for enquiries five days a week and our team is ready to quickly answer any questions.

■ *Why do companies contact you?*

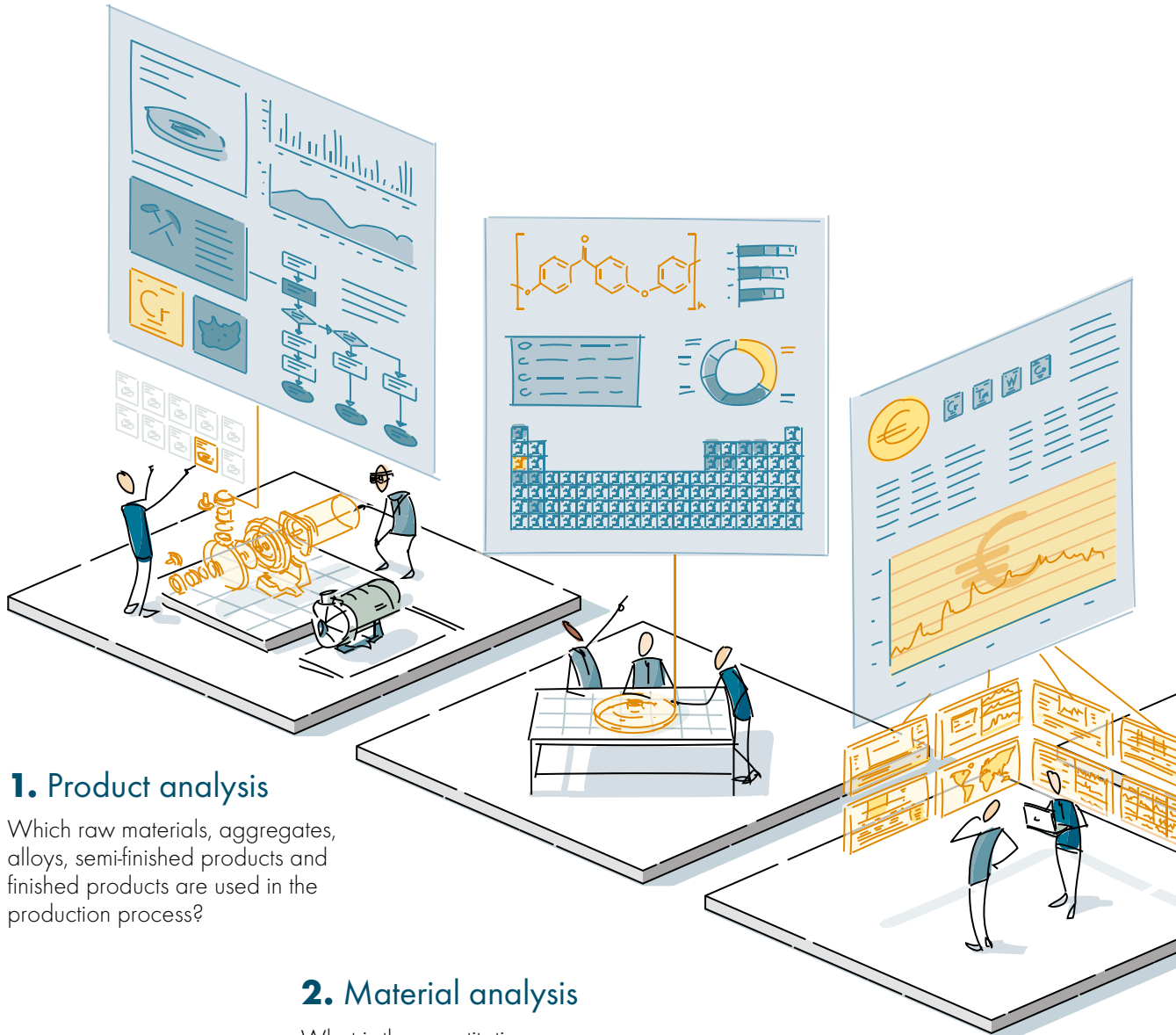
We are 20 internationally experienced experts with geoscientific, mining engineering and economic backgrounds who specialise in raw materials. We continuously evaluate the most important raw material information from all over the world using public and a great number of commercial data sources. This means that we have access to an exceptional wealth of information that companies, especially SME, might not be able to afford. We also obtain information locally in many countries, which we then use to provide neutral and independent advice. While raw materials markets are, of course, nothing new to industry, many companies use us as a sparring partner to compare their information and market observations with us as a neutral institution. Another important advantage is our extensive network within BGR.

■ *What are your plans for the next ten years?*

The risks on the global raw materials markets are steadily increasing. With our research and advisory formats, we have supported German industry in developing more effective strategies to counteract risks on the raw materials markets. While we will, of course, continue this work, we would like to see German companies play a more active and strategic role when it comes to making their supply chains future-proof. We often see that companies in other countries hold their own shares in strategically highly relevant mining operations, refineries or suppliers. In this area, German industry still has much catching up to do.

Besides primary raw materials, currently the main source of supply, we are planning to take a closer look at the challenges and opportunities of the recycling sector and its increasingly important role in terms of supply security, sustainability and the reduction of CO₂ emissions.

Raw material risk management in business



1. Product analysis

Which raw materials, aggregates, alloys, semi-finished products and finished products are used in the production process?

2. Material analysis

What is the quantitative – element- or substance-specific – composition of the relevant product components in the production process?

3. Relevance analysis

What is the financial and strategic relevance of the raw material quantities used for the company's operating results?

Raw materials monitoring on behalf of the Federal Government

Raw materials are at the beginning of the value chain and thus essential for an industrialised country like Germany. However, the situation on the global markets has changed fundamentally in recent years, leaving market participants increasingly faced with supply chain challenges. With its raw materials monitoring, DERA aims to increase market transparency and supports companies in establishing a strong position amid ever growing global competition.

Raw materials are at the beginning of the value chain and thus essential for an industrialised country like Germany. However, the situation on the global markets has changed fundamentally in recent years, leaving market participants increasingly faced with supply chain challenges. With its raw materials monitoring, DERA aims to increase market transparency and supports companies in establishing a strong position amid ever growing global competition.

The German economy is highly reliant on the import of mineral raw materials, which account for about 16 percent of total imports. Since the beginning of the 21st century, changing market conditions such as growing global competition and demand outstripping supply for a number of raw materials have resulted in increased price and supply risks. This uncertainty is especially reflected in rising price volatilities for many raw materials, which in turn endanger the raw material supply and price security for German industry. It has thus made companies well aware of their own vulnerability and reliance.

DERA's raw materials monitoring includes the screening of supply, demand and prices, as well as market analyses of specific raw materials. It provides industry with expert insights into global raw material trends, allowing companies to recognise critical developments at an early stage and enabling them to develop mitigation strategies. "We are a highly skilled team, our expertise includes geoscience, economics and mining engineering. We can also access the knowledge and experience of our colleagues in other departments of the Federal Institute for Geosciences and Natural Resources. We have

a strong network within industry that keeps us up to date with its specific demands", emphasises Maren Liedtke, a geologist in the Mineral Economics unit.

DERA's team continuously monitors global raw materials markets and regularly reports on current and long-term market developments of mineral raw materials and intermediate products at the first stages of the value chain. Especially China's rise to economic dominance on the global stage has notably changed many raw materials markets on the supply side, and, more importantly, also on the demand side. As a result, price and supply risks have increased. But China is not the only critical factor in demand on raw materials markets. Another major development impacting global demand has been the rapid growth of new key and emerging technologies. To evaluate their potential, DERA commissions a study every five years that assesses the future raw material demand for these technologies.

On the supply side, the DERA Criticality List specifies potential price and supply risks of 60 raw materials and more than 200 intermediate products. It evaluates the market concentration on the supply side and the country risk of the main producing countries, both of which can affect the availability and, consequently, the market price of raw materials. The 2019 DERA Criticality List indicates an increased supply risk for 42 percent of the listed products.

DERA Raw Material Risk Assessments are of particular interest to the industry thanks to their in-depth analysis. Their focus is on specific raw materials with

increased procurement risks due either to supply risks or expected demand growth. The results and potential mitigation strategies are discussed with industry stakeholders as part of DERA's industry workshops.

Prices remain a key factor in companies' raw material risk management. In recent years, reliable raw material pricing has become increasingly difficult. High price volatility negatively impacts business planning, and appropriate risk prevention thus puts more strain on procurement departments. By publishing its monthly DERA Price and Volatility Monitors and additional price information, DERA provides a solid foundation for better decision-making. In many cases, DERA's time series span decades, making it much easier to assess current events compared to short time series.

To enhance market transparency and to continue to offer targeted and competent advice to German industry and political stakeholders, DERA is planning to expand its current raw materials monitoring services. In addition to the market evaluation of raw materials for emerging and key industries, products of higher stages in the value chain as well as the recycling of raw materials will also become part of DERA's monitoring services. The recycling of raw materials not only offers ecological advantages, but can also make an essential contribution to meeting local raw material demands.

Maren Liedtke

Geologist



Detailed information for German industry

DERA – RAW MATERIALS MONITORING			
Demand	Supply	Prices	Market Analyses
<p>Study of raw materials for emerging technologies</p> <ul style="list-style-type: none"> • 160 technologies • <p>28 DERA Rohstoffinformationen</p>	<p>DERA Criticality List</p> <ul style="list-style-type: none"> • 160 raw materials • • 200 intermediate products • <p>32 DERA Rohstoffinformationen</p>	<p>Price Monitor</p> <ul style="list-style-type: none"> • 80 price specifications • <p>DERA Rohstoffinformationen</p>	<p>Risk assessments</p> <ul style="list-style-type: none"> Supply scenarios Demand scenarios <p>36 DERA Rohstoffinformationen</p>
<p>Network</p> <p>Conferences / DERA Raw material dialogues / DERA Industry Workshops</p>			



Fundamental changes

on the global raw materials markets

The demand power of OECD countries on mineral raw materials markets has noticeably declined. Since the beginning of the 21st century, China has become the new heavyweight, dominating the markets in a way that previously only the US at the zenith of their power were able to do.

China has been the largest consumer of mineral raw materials since the turn of the century and is currently the dominant player on the global raw materials markets. Even though its economic growth currently appears to be slowing down, no country can at present challenge China's position. "Over the past 30 years, China has established the kind of dominance that was last held by the US around 1950", Johannes Perger, DERA's economic and raw material analyst, explains. According to Perger's data, the country today has an average demand share of about 50 percent in mineral raw materials such as aluminium, lead, copper, nickel, steel, zinc and tin.

The once-dominant industrialised countries in Europe and America have lost their market power and have been virtually pushed aside by the rising player. The US and the EU account for 8 and 13 percent respectively. Germany has a demand share of 3.4 percent in the global market. However, this shift has not been a zero-sum game, as globally produced and processed raw material quantities have increased considerably at the same time. According to DERA's figures, global per-capita demand for copper reached its highest level to date in 2018 (3.2 kilograms), for steel in 2017 (216.4 kilograms) and for aluminium in 2016 (7.9 kilograms).

Today, about five times as much copper and six times as much steel is used compared to 1960. Global demand for aluminium has even risen by a factor of

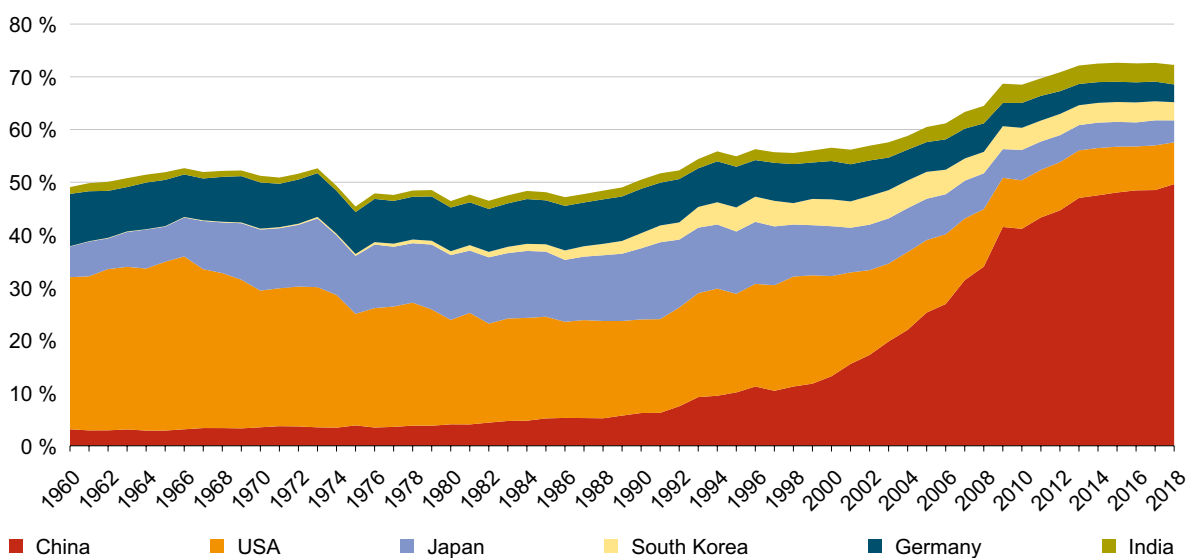
14.2. "While, for example, Germany's global share has declined considerably, it still requires roughly the same amount of steel and about 5.5 times as much aluminium as it did in 1960", Johannes Perger says. When also taking into account that the division of labour in the global economy has increased dramatically over the past few decades, the bigger picture becomes even clearer: first production stages in particular have often been relocated from the industrialised countries to the emerging economies. As a result, demand has also been shifting to these countries. This is particularly true for China, making its rise unique in the history of the modern global economy. However, according to the assessment by DERA's experts, the country is unlikely to gain much more significance globally.

Other members of the BRIC group, on which hopes were once pinned, are not nearly as comprehensively integrated into the industrial value chains, which is why the development of Brazil and India has been far less spectacular. The same applies to a resurging Russia. These countries' shares in raw material demand have been consistently low, and are likely to decrease even more in Brazil and Russia's case, as both countries act more as suppliers of raw materials than as consumers. India is not expected to repeat China's success story either. "We think this is relatively unlikely to happen in the next ten years, since the economy is already seeing the strongest growth in the service sector", Johannes Perger says.

Globalisation of the past 30 years and the associated expansion of trade and division of labour have left their mark on the raw materials markets. With its rapid rise to become the “workbench of the world”, China has managed to establish itself as a dominant player on the raw materials markets in a far shorter timespan than the United States did in the first

of established and emerging industrial countries as well as major technology trends”, Johannes Perger says, “which gives us a good overview of events and demand developments in the global raw materials markets.”

Selected countries and their shares in global mineral raw material demand



half of the 20th century. At that time, the US had to assert themselves in competing with a handful of economic powers such as the Soviet Union, the United Kingdom and Germany. The multipolarity of today's global economy also makes the raw materials markets highly dynamic. DERA keeps track of events with its ongoing supply and demand screening. “We are monitoring the economic and industrial development

Johannes Perger

Economist



Emerging technologies as the main drivers of future demand

The German economy is considered one of the most innovative economies in the world. Numerous technologies in the high-tech sector use specialty metals. An increase in demand for these metals may lead to potentially sudden and significant impacts on the relevant raw materials markets once a corresponding level of market penetration is reached. DERA points to critical developments by conducting regular studies on the raw material demand of emerging technologies.

As progress in digitalisation is made, the use of connected digital technologies continues to increase in our society; modern society can hardly be imagined without smartphones and laptops. Industry is in the middle of the most fundamental structural transformation of the last few decades. On its way to a smarter, more user-friendly and more flexible future, it is dependent on intelligent manufacturing processes, which are simply inconceivable without digitalisation.

Mobile electronic devices and fibre-optic cables, in turn, are inconceivable without a whole range of quite exotic metals. For example, even though gallium, germanium and tantalum are extracted only in small quantities and their share in the raw material demand of the digital industry is relatively small, nothing works without them. Due to its specific properties as a semiconductor, gallium is of essential significance, especially in micro- and optoelectronics. Its major areas of application include component parts for mobile phones. And although fibre-optic cables contain only traces of germanium, their transmission speed would be too low for today's requirements without this metal. Many electrical circuit boards contain tantalum in the form of micro-capacitors, and the metal has significantly helped to enable the miniatur-

isation of electronic devices such as smartphones or tablets in the first place.

There are a large range of emerging technologies that promise strong market growth and will become a noticeable factor on the relevant raw materials markets due to their material consumption. To help better understand the potential influence of these technologies on global demand for raw materials, an extensive study commissioned by DERA is conducted every five years, entitled "Raw materials for emerging technologies". Two reports are already available; the third report will be published in 2021. The 2016 study examined 42 technologies whose market potential could have significant effects on the raw materials markets by 2035. According to the findings, 16 metals will have particular relevance.

Results for gallium, a semiconductor material, showed that demand in 2035 from these technologies could be as high as 65 percent of the production volume in the reference year 2013. For five metals (germanium, cobalt, scandium, tantalum and light rare-earth elements such as neodymium and praseodymium), demand from the examined emerging technologies alone could equal 2013's primary production.

High demand from emerging technologies may lead to supply bottlenecks.

For three other metals (lithium, heavy rare-earth elements, such as dysprosium and terbium, and rhenium), demand could even be more than double the primary production of 2013. Even though supply is expected to increase due to this consistently high demand, the trend is quite obvious.

“Technologically induced demand peaks may result in raw material supply bottlenecks and associated price peaks”, warns DERA project manager Ulrike Dörner.

As part of the latest study, DERA will take an in-depth look at 33 emerging technologies out of 180 technologies screened in total, 23 from the previous study along with ten new candidates. “However, we will change the structure, focusing more on megatrends like mobility and energy transition”, project supervisor Viktoriya Tremareva explains.

DERA together with Fraunhofer Institute for Systems and Innovation Research (ISI) as well as Fraunhofer Institute for Reliability and Microintegration (IZM), the editors of the study, understand megatrends as fields of technology that will trigger profound

changes in the economy and infrastructure in the medium term. The study will focus on five of these fields of technology: mobility, energy transition, digitalisation, circular economy and networks.

Whether the future scenarios described in the studies will actually become reality remains to be seen. Despite the time span of the new study extending to 2040, companies should ensure they are ready and well prepared now. DERA believes that the insights from this report will help industry to respond to possible critical developments on raw materials markets.

Viktoriya Tremareva

Geologist



Raw materials in everyday life

Roof



Roof tile
Clay



Solar cell
Ag, Si

Kitchen



Ceramic stove top
B, Si



Fireproof
baking dis
Li, quartz



Crockery
Feldspar, kaolin,
quarz



Cutlery
Co, Cr,
Fe, Mo,
Nb, Ni

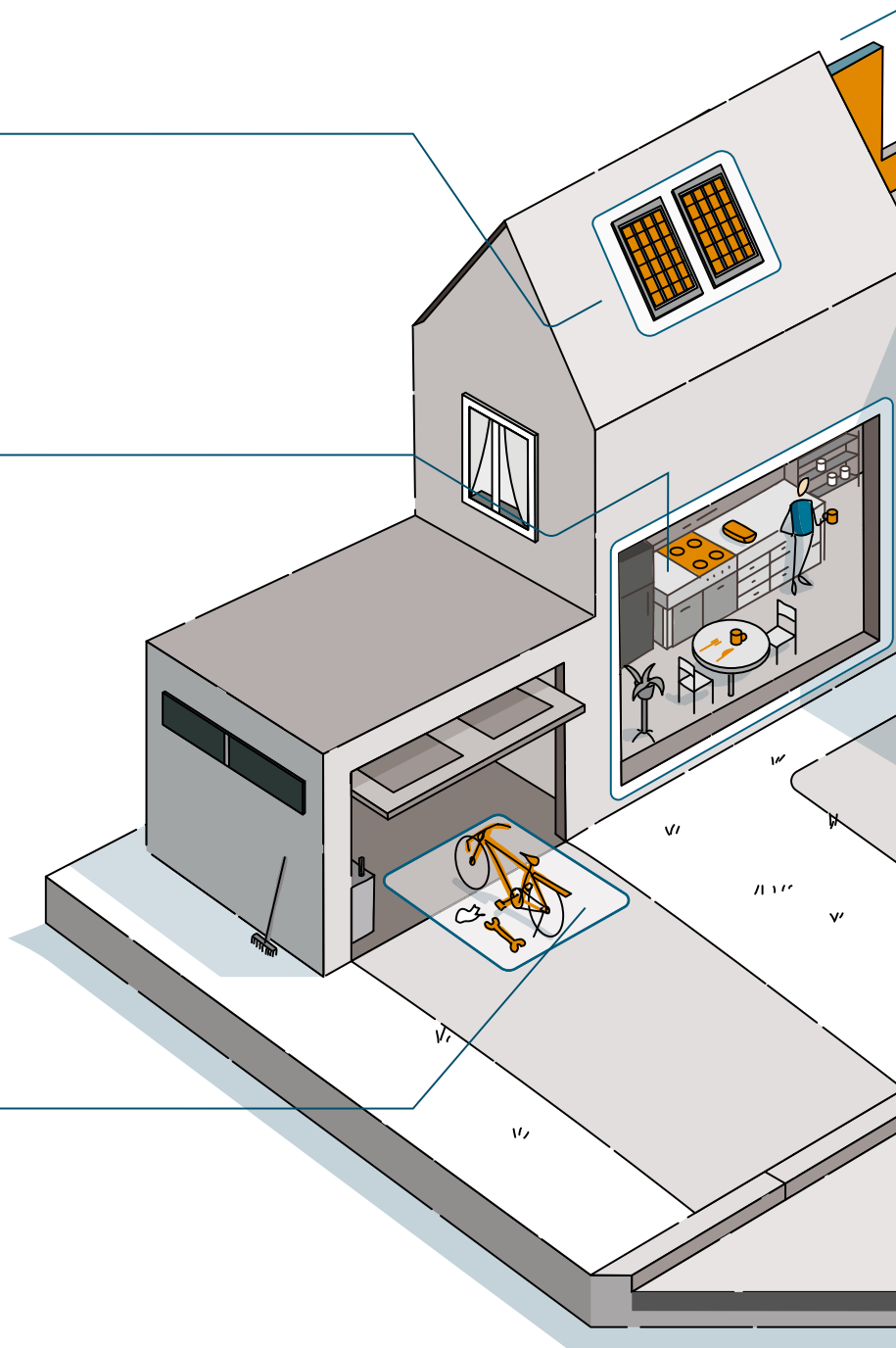
Garage



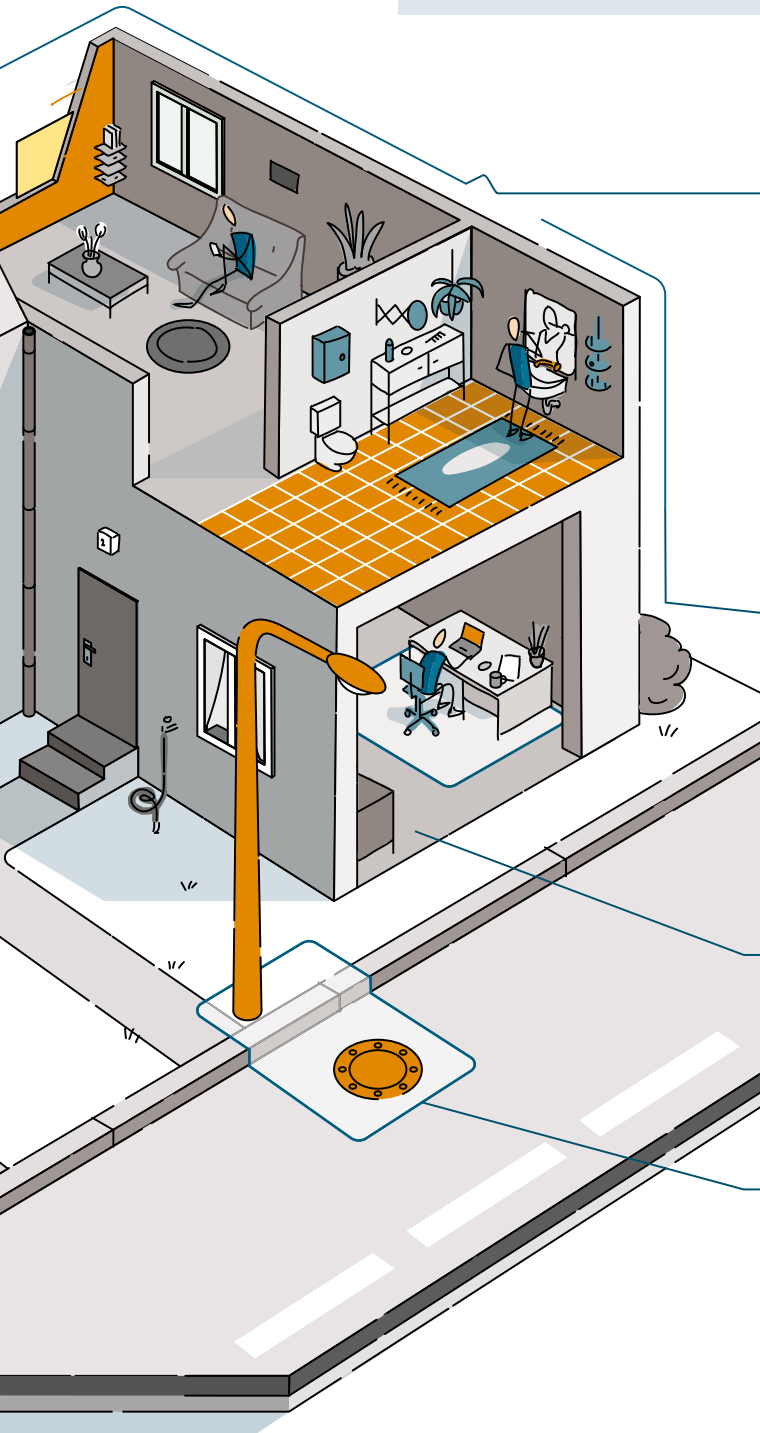
Tools
C, Co, Ta, W






E-Bike
Al, Li, REE




Mineral raw materials are important not only for emerging and key technologies. We are also surrounded by them in our daily lives, ranging from sand and gravel for home and road construction to copper for power lines, and clay for everyday items such as crockery or toothpaste. Many of these applications also employ domestic raw materials.




Living room

-  Wall paint
TiO₂
-  Masonry
Clay, sand and gravel,
limestone
-  Copper wire
Cu

Bathroom

-  Tap
Cr, Zn
-  Tile
Feldspar, kaolin, Zr

Study

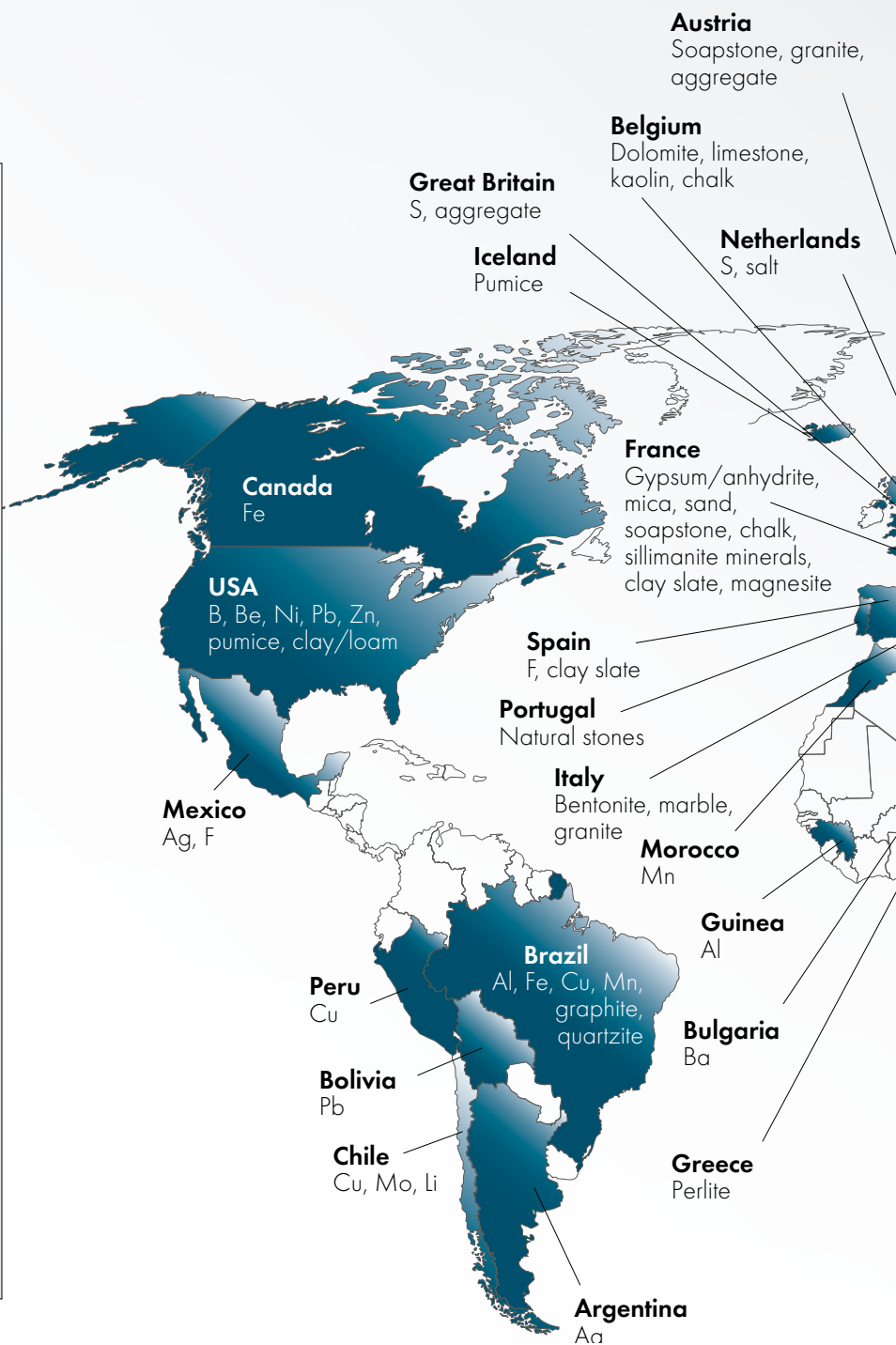
-  Laptop
Au, Ag, Cu, Pd, Pt,
REE, Sn, Zn

Street

-  Street light
Fe, Ga
-  Manhole cover
Fe

Germany's demand on international raw materials markets

Ag:	Silver ore
Al:	Bauxite
As:	Arsenic
B:	Boron
Ba:	Baryte
Be:	Beryllium
Cr:	Chromite ore
Cu:	Copper ore
F:	Fluorite
Fe:	Iron ore
Ga:	Gallium
Ge:	Germanium
Li:	Lithium carbonate
Mg:	Magnesium
Mn:	Manganese ore
Mo:	Molybdenum ore
Ni:	Nickel ore
P:	Phosphate
PGE:	Platinum group elements
Pb:	Lead ore
S:	Sulphur
Se:	Selenium
REE:	Rare-earth elements
Sb:	Antimony
Si:	Silicon
Te:	Tellurium
Ti:	Titanium ore
W:	Tungsten
Zn:	Zinc ore
Zr:	Zircon



Selected raw materials and their major producing countries in 2018



A high concentration of supply requires effective risk management

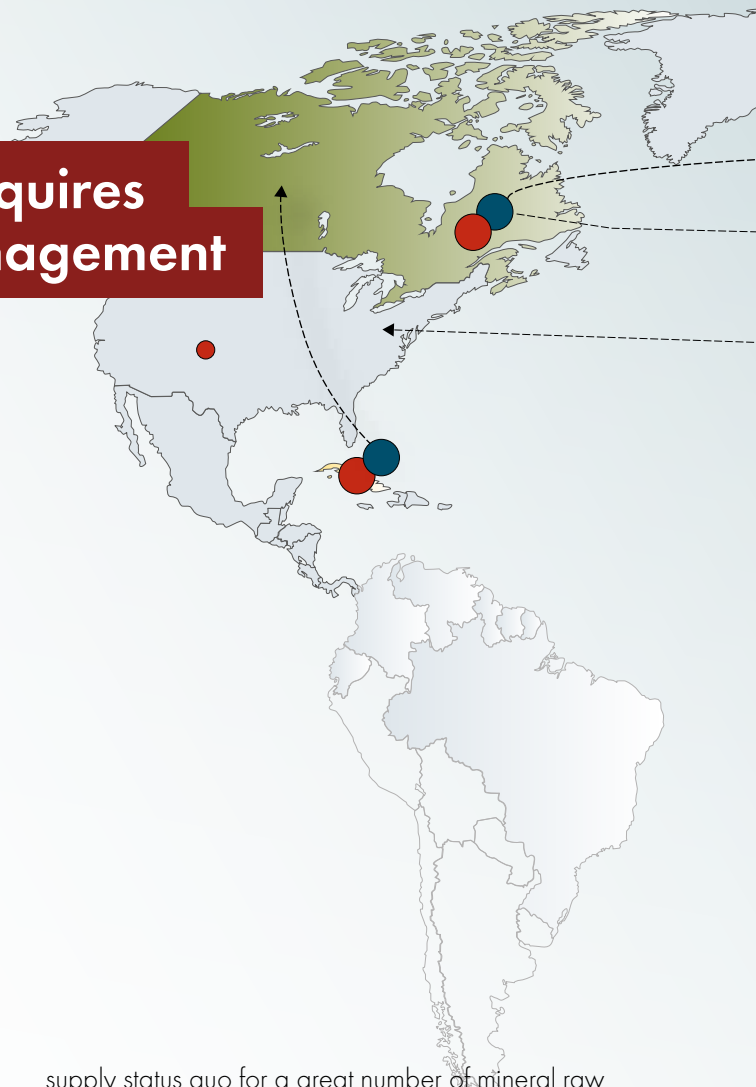
Over the past few years, supply of many raw materials has become increasingly concentrated and many mining and refinery products are now available from only a limited number of producers. In addition, there are political and social risks in a great number of producing countries. DERA's Criticality List, which is updated biennially, shows the situation on the global markets, highlighting potential price and supply risks.

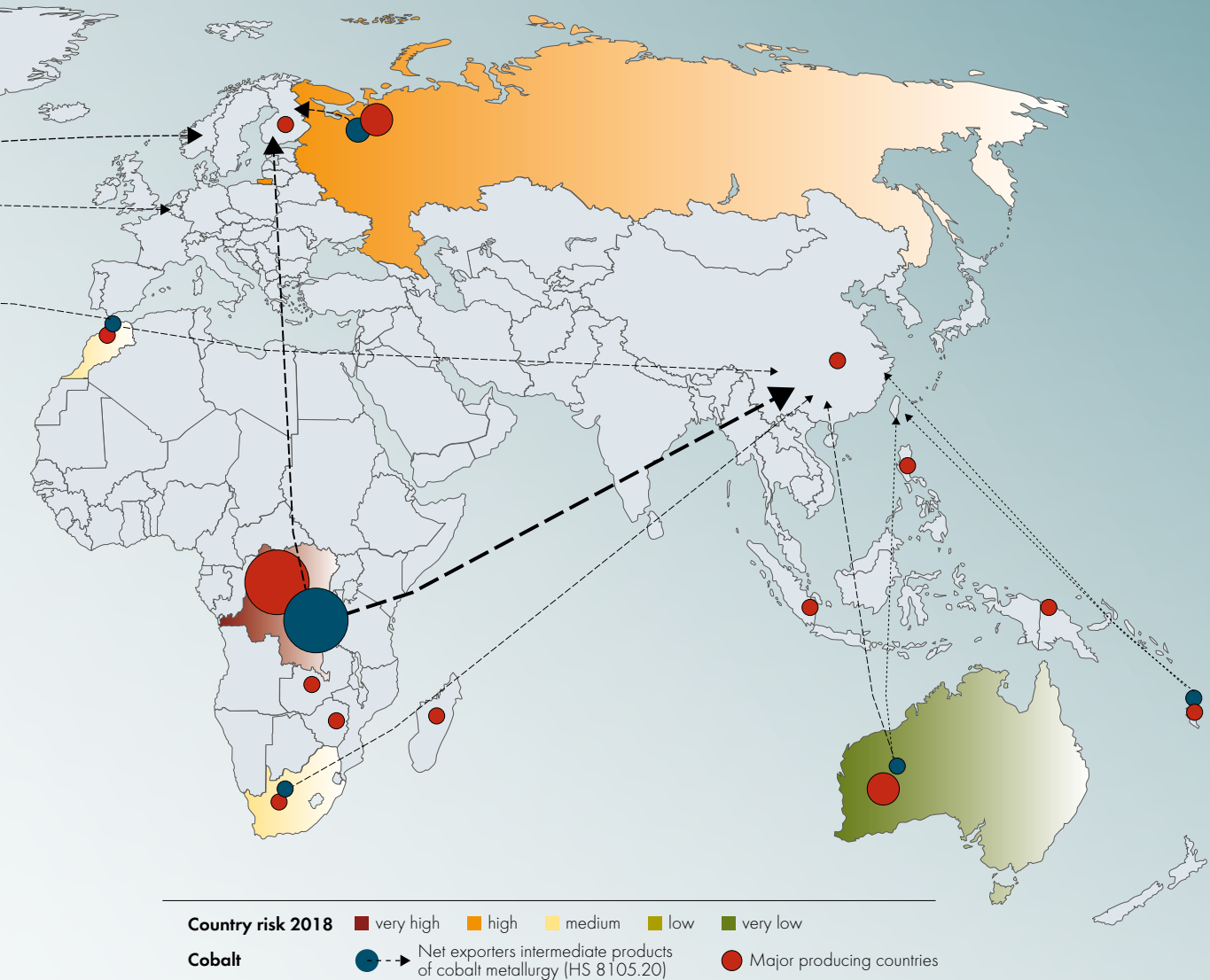
Many lithium-ion batteries contain cobalt in the form of different compounds as part of the cathode. Owing to the widespread use of laptops, tablets and smartphones, 46 percent of global cobalt production in 2017 was used in batteries. The global cobalt market is highly concentrated: according to DERA figures, about 64 percent of the 118,500 tonnes of cobalt produced globally in 2017 were extracted in the Democratic Republic of Congo (DRC). By comparison, the next largest supplier, Russia, had a market share of only 4.6 percent. The DRC has long been associated with political instability and social unrest, which is reflected in the risk assessment of cobalt. In DERA's latest Criticality List, cobalt is classified as risk category 3 due to the high concentration of supply and the high country risk. For mineral raw materials of this category, the probability of supply shortages and associated price risks is particularly high.

For industrialised nations such as Germany, reliable information on the supply situation of their imported goods is of utmost importance. Updated biennially, DERA's Criticality List provides information on the

supply status quo for a great number of mineral raw materials and intermediate products, featuring 34 metals, 27 industry minerals, coking coal and 271 intermediate products in its 2019 publication. "It enables companies to better assess the market situation and changes on the raw materials markets, and to develop alternative strategies on the basis of this information", says Maren Liedtke, DERA's geologist in charge of the Criticality List.

As part of this assessment, two criteria are put in relation to each other: firstly, the country concentration of a specific raw material based on global production data, and, secondly, the political, social, legal and economic stability of the supplying countries. These criteria together express the respective country risk and are based on the Worldwide Governance Indicators, which have been used by the World Bank since 1996 to assess the governmental systems of 200 states and territories. The result: about 42 percent of all examined mining, refinery and intermediate products in 2019 were classified into the highest risk category, where DERA's experts consider the price and supply risks to be particularly high.





China holds a dominant position with respect to most the majority of the examined raw materials and accounts for an even higher share of the examined intermediate products. The country is now the most important producer of 24 out of 53 examined mining products and is one of the top three mining countries for another eleven raw materials. China is also the top producer of 23 out of 26 refinery products, consolidating its status of a raw materials powerhouse. Together with China’s trade dominance, this may lead to supply risks along the entire value chain. The country’s great market power is also combined with a considerable country risk. However, such structures can, of course, change.. A comparison of the current and previous DERA Criticality List data for rare-earth elements (REE) shows an example of such a change. While REE from China were a major focus of attention a few years ago, Australia and the US have now appeared on the scene with new or reactivated additional production facilities, reducing both the concentration of supply and the

country risk to a certain extent. According to DERA’s experts, however, this should not give rise to a false sense of security. “Companies are well advised to increasingly identify and assess raw material risks for their products”, Maren Liedtke says. While DERA’s Criticality List provides a basic overview, DERA’s experts suggest a more detailed look into specific – particularly critical – raw materials, provided in its detailed risk reports. These reports may encourage companies to get in touch with DERA for any additional information.

Maren Liedtke

Geologist



Secondary raw materials on the rise

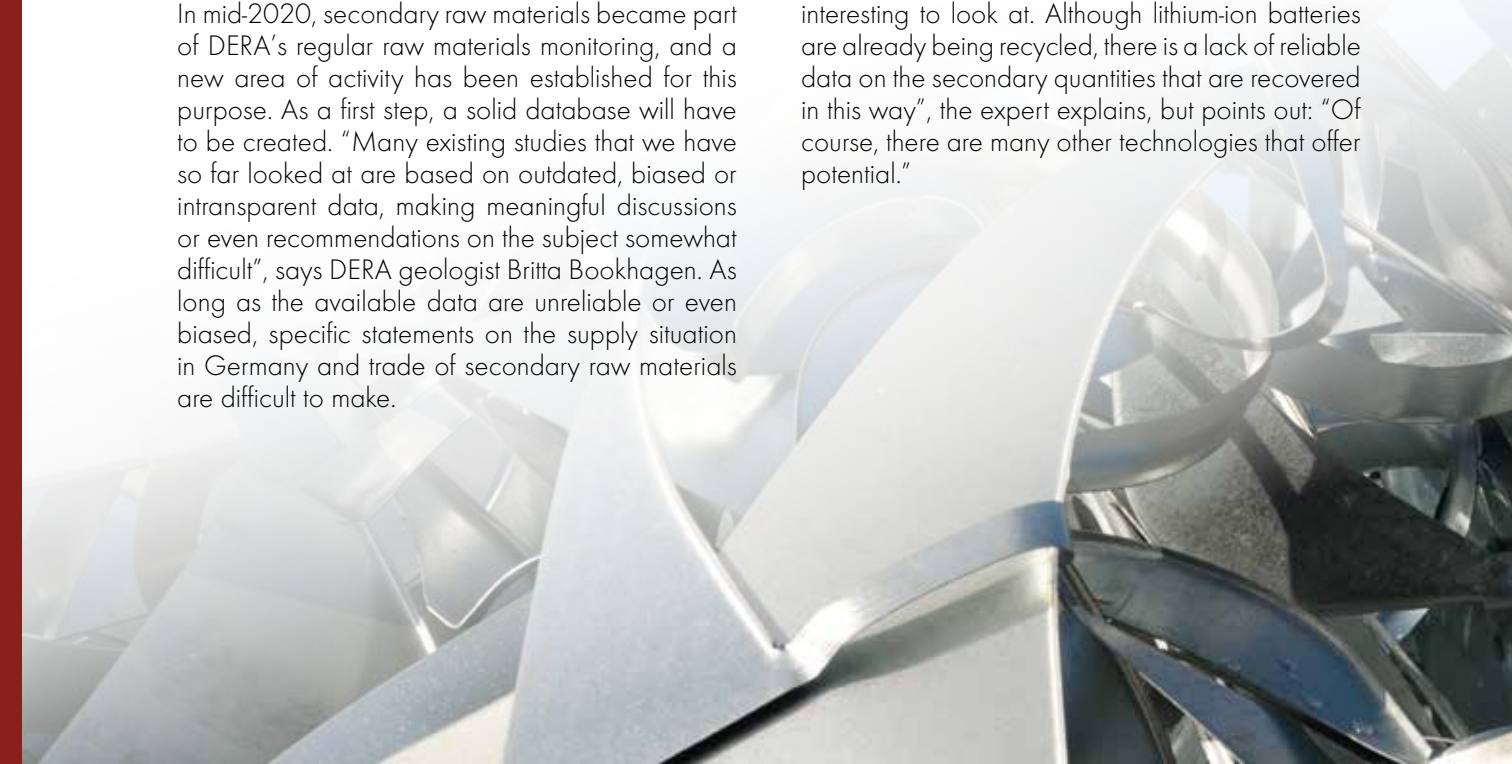
Germany still meets most of its demand for metallic raw materials through imports. The Federal Government intends to reduce this import reliance on primary raw materials by strengthening its domestic circular economy. A new area of DERA's activity will focus on investigating the potential of secondary raw materials.

To reduce its import reliance and to meet its demand for metallic raw materials, Germany's domestic recycling potential is increasingly gaining attention. For aluminium, crude steel and copper, secondary raw materials already account for more than 40 percent of the supply. Other secondary materials, such as those from emerging technologies, are also likely to play a greater role in the future. In spring 2020, the Federal Government requested in its updated Raw Materials Strategy that secondary materials should be given a larger role in securing the raw material supply, also in view of ecological aspects.

In mid-2020, secondary raw materials became part of DERA's regular raw materials monitoring, and a new area of activity has been established for this purpose. As a first step, a solid database will have to be created. "Many existing studies that we have so far looked at are based on outdated, biased or intransparent data, making meaningful discussions or even recommendations on the subject somewhat difficult", says DERA geologist Britta Bookhagen. As long as the available data are unreliable or even biased, specific statements on the supply situation in Germany and trade of secondary raw materials are difficult to make.

"This is why we are going to set up an information platform with neutral, reliable and up-to-date data, to serve as a basis for new recommendations", says Britta Bookhagen. It is quite clear that capacities in the metallurgical industry in Germany and Europe in general need to be at least maintained, probably even expanded, in order to enable recycling.

Which raw materials we are going to focus on initially remains to be seen. "Electric vehicles (EVs) are currently a very relevant issue in our society", Britta Bookhagen says, "Which is why battery raw materials, such as cobalt and nickel, would be very interesting to look at. Although lithium-ion batteries are already being recycled, there is a lack of reliable data on the secondary quantities that are recovered in this way", the expert explains, but points out: "Of course, there are many other technologies that offer potential."



EVs in particular are a prime example of how far we need to look into the future. With emerging technologies such as these, recycling issues will arise 10 or even 20 years after the initial production of the vehicles. By then, recycling facilities with efficient processes and adequate capacities will have to be available on a large scale. "Which is why we need to know what volumes to expect and which raw materials we are actually talking about", the expert explains. Only then can an important question be answered: Are the technical prerequisites and processing capacities actually available in Germany and Europe?

To strengthen its network, DERA will closely collaborate with the relevant research institutions, authorities and industry in the field of circular economy. "By establishing a communication platform, we ensure that the right subjects are addressed", Britta Bookhagen says. The goal is to take a look at the subject from different perspectives. After all, one thing is

evident: "As a result of increased recycling, secondary raw materials are becoming the second main pillar of raw material supply. This will also have an influence on the mining sector. The examples of crude steel, copper and aluminium demonstrate the huge potential of a circular economy. Increasing the share of secondary raw materials in Germany is not only advisable from an ecological point of view, it will also help to reduce Germany's reliance on imports."

Dr. Britta Bookhagen

Geologist



*Reliable data
in the recycling sector
will lead to better
strategic decisions.*



Price volatility represents the greatest risk

German companies cover their raw material demand predominantly on the global market and are therefore directly affected by price volatilities. Having comprehensive information is one of the most effective instruments to reduce risks. DERA offers a broad range of market and price information.

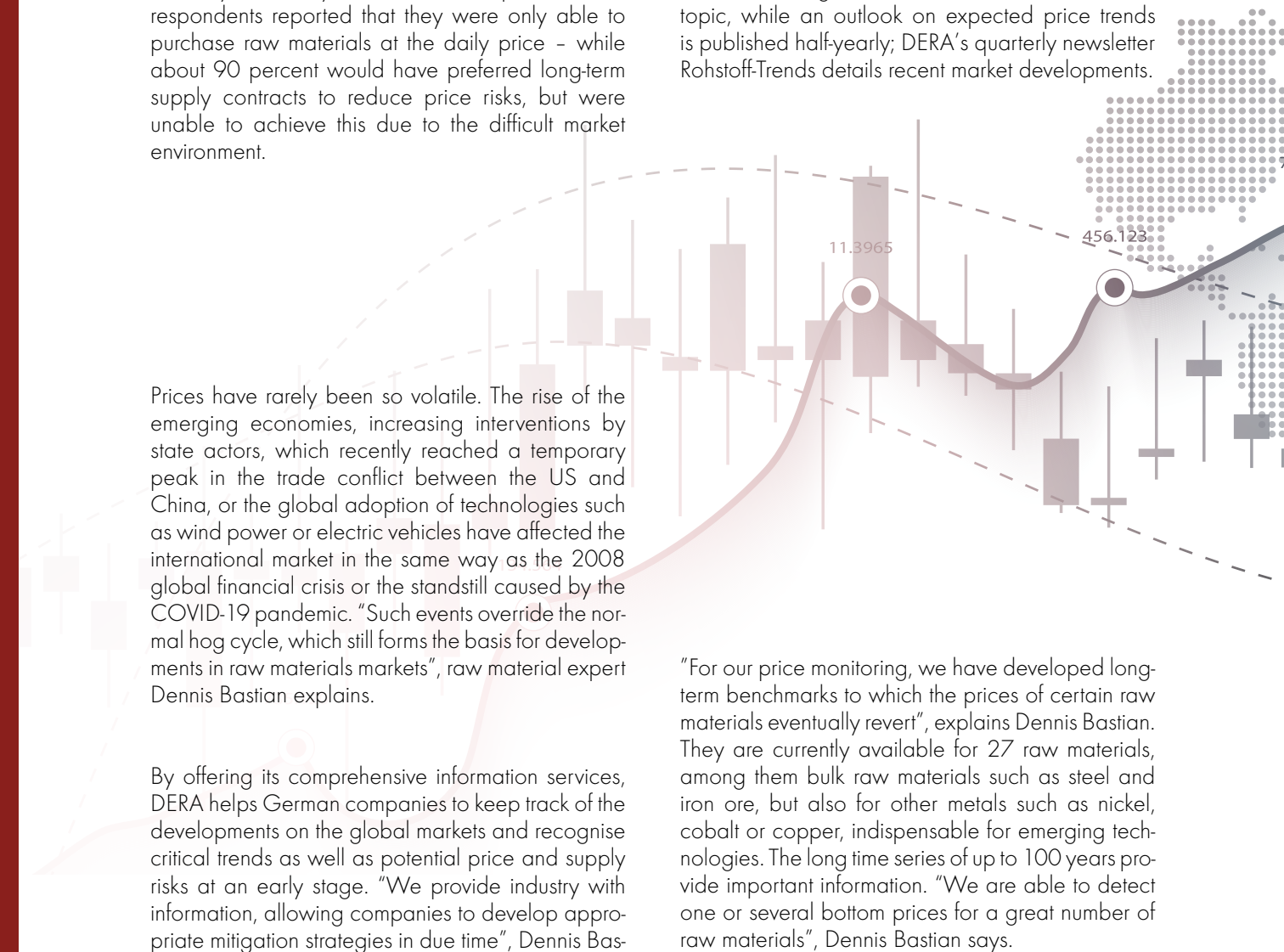
According to an annual assessment by German managers and corporate leaders, raw material prices are a key influencing factor in a company's success. Price risks consistently rank first in surveys conducted by business consultancy firm Inverto. In a survey from early 2020, about 40 percent of all respondents reported that they were only able to purchase raw materials at the daily price - while about 90 percent would have preferred long-term supply contracts to reduce price risks, but were unable to achieve this due to the difficult market environment.

Prices have rarely been so volatile. The rise of the emerging economies, increasing interventions by state actors, which recently reached a temporary peak in the trade conflict between the US and China, or the global adoption of technologies such as wind power or electric vehicles have affected the international market in the same way as the 2008 global financial crisis or the standstill caused by the COVID-19 pandemic. "Such events override the normal hog cycle, which still forms the basis for developments in raw materials markets", raw material expert Dennis Bastian explains.

By offering its comprehensive information services, DERA helps German companies to keep track of the developments on the global markets and recognise critical trends as well as potential price and supply risks at an early stage. "We provide industry with information, allowing companies to develop appropriate mitigation strategies in due time", Dennis Bas-

tian says. At present, price trends for 220 different specifications are being monitored. In its monthly DERA Price and Volatility Monitor, DERA reports on current and historical price trends for about 80 selected raw materials. Additionally, each DERA Chart of the Month gives a brief overview of a current topic, while an outlook on expected price trends is published half-yearly; DERA's quarterly newsletter Rohstoff-Trends details recent market developments.

"For our price monitoring, we have developed long-term benchmarks to which the prices of certain raw materials eventually revert", explains Dennis Bastian. They are currently available for 27 raw materials, among them bulk raw materials such as steel and iron ore, but also for other metals such as nickel, cobalt or copper, indispensable for emerging technologies. The long time series of up to 100 years provide important information. "We are able to detect one or several bottom prices for a great number of raw materials", Dennis Bastian says.



The long-term charts show that the hog cycle theory still applies to the raw materials markets. A surge in demand is generally followed by a high-price phase. This in turn tends to lead to a (somewhat delayed) increase in supply as new mine projects add production capacity to the market when they come on stream or are reactivated. As a result, prices then usually drop. "This can currently be observed with lithium. Many deposits have been explored and projects have entered the market, causing the prices to drastically drop again", Dennis Bastian says.

to make use of DERA's extensive market knowledge. "We can assess the markets relatively well, because we not only keep an eye on one or two raw materials, but cover a broad spectrum, allowing us to detect trends", Dennis Bastian explains.



Sudden and dramatic economic disruptions leave their mark. "This is clearly demonstrated by the example of copper. Copper prices correlate well with global economic development", the price expert says. "The copper price dropped dramatically during the global financial crisis and the COVID-19 recession. The economic slowdowns in the 1990s show a similar trend."

Hedging against these massive price fluctuations is of tremendous importance to the resource-intensive processing industry, and companies are encouraged

Market information aids detection of critical price trends at an early stage.

Dennis Bastian

Geologist



Towards a low-carbon future – how the energy transition is set to increase demand for base and high-tech metals

Urgent measures are needed to combat the effects of climate change as countries around the world are stepping up their efforts towards a global energy transition. Meeting the targets set out as part of the Paris Climate Agreement will require a rapid adoption of renewable energy sources such as wind power and photovoltaics. A successful implementation of these technologies is reliant on a wide range of base and high-tech metals but may also lead to increasing supply risks and price hikes. DERA's detailed analyses provide reliable information on these challenges.

The energy transition towards renewable sources continues to be a defining aspect of German energy policy. In September 2019, the Federal Government presented the key points for its 2030 climate protection programme to achieve its climate targets, seeking to increase the target for renewable energy as a share of gross final energy consumption to 30 percent by 2030, with 60 percent targeted by 2050. According to the Federal Environmental Agency, Germany reached a share of 17.1 percent in 2019 and can achieve the interim target of 18 percent by the end of 2020. However, the 30-percent target planned for 2030 can only be reached "with considerable additional effort".

This objective also applies to electricity generation, where the set goal of a 35 percent share of renewables by 2020 has been more than achieved. The Federal Government has since upped its target and now plans to further increase the share of electricity generation from renewable sources to 65 percent by 2030. The key goal for sector-specific greenhouse-gas emissions such as in the transport sector is a 40 to 42 percent reduction by 2030 compared with 1990. Furthermore, it is Germany's long-term goal to become largely greenhouse gas neutral by 2050. The success of these very ambitious targets essentially depends on highly efficient, low-maintenance technologies such as offshore windfarms,

photovoltaic modules for electricity generation and electric vehicles to drive down emissions in the transport sector.

Their successful implementation requires the secure and sustainable supply of a range of mineral raw materials that currently carry a high supply risk: rare-earth elements for permanent magnets in wind generators; specialty metals like gallium or indium for the semiconductors of thin-layer PV modules, and copper for the necessary electrical wiring; lithium and cobalt for lithium-ion batteries; as well as metals like magnesium or aluminium for lightweighting. Most of these raw materials fall into the high-risk category in DERA's Criticality List, involving either potential risks due to concentration of supply or country risks, or both.

"In our DERA Raw Materials Risk Assessments, we take a closer look at some of those potentially critical raw materials, i.e. those involving elevated supply risks or for which we expect an increasing demand", explains geologist Sophie Damm. As part of the reports, the experts map the status quo for specific raw materials, including current supply from mines, refinery and recycling production, as well as current demand trends and market prices. Potentially disruptive effects of emerging technologies as well as

In detailed risk assessments, we examine potentially critical raw materials involving increased supply risks.

demand from traditional applications contribute to the future market balance of a specific raw material; potential additional supply from exploration projects or the extension of existing mines generally complement the reports.

"We usually take a look at the next five or six, sometimes even eight years, and try to determine the supply needed for a market in equilibrium", says Sophie Damm's colleague, Siyamend Al Barazi. For this reason, information on global reserves and potential recycling capacities also forms part of the reports.

Exploratory trips to the major producing countries are an integral part of these risk reports. The experts obtain local information on the raw material potential as well as the producers' expected offtake rates and any upcoming projects. "Our network within the industry allows us to get a good overview of future trends", Sophie Damm says. The data are regularly updated and results are presented to industry stakeholders at conferences or workshops and in personal communications. To date, DERA Raw Material Risks Assessments have been published for cobalt, antimony, tungsten, tantalum, lithium, PGE, magnesium, gallium, copper, bismuth, tin, zircon and zinc. "These are the raw materials for which we have been - and, to a point, still are - expecting price and supply risks, so we will continue to monitor these markets closely", explains Sophie Damm. The list is continuously expanded.

Sophie Damm

Geologist





No green power supply without copper

The ambitious plans to expand the use of renewable energies in electricity generation can only be implemented with highly efficient high-tech systems and an adequate infrastructure. Many of the technologies depend on the use of speciality and minor metals. Copper plays a crucial role in power transmission.

The triumph of renewable energy in electricity generation is one of the success stories of the green energy transition. About 40 percent of gross electricity consumed in Germany today is from renewable energy sources. According to the plans of the German Federal Government, this is to increase to about 65 percent within just ten years, and this expansion is certainly a challenge. Solar energy and, above all, wind power will carry most of the weight. In 2018, the Berlin-based think tank Agora Energiewende determined how this ambitious goal can be achieved. The capacity of onshore wind power plants needs to be increased by four gigawatts per year, that of photovoltaic systems even by five gigawatts. The capacity of offshore wind parks has to be not tripled to 15 gigawatts within just ten years as previously planned, but increased to 20 gigawatts.

The consequences for raw material demand are massive. The necessary high-efficiency systems require entirely new raw material components and large quantities of established bulk commodities. Many of the low-maintenance generators for such large offshore wind power plants operate with permanent magnets, which use rare earth elements such as neodymium, praseodymium and dysprosium. In photovoltaics, the future most likely belongs to thin-layer PV cells, which require indium, gallium or tellurium. Nonetheless, the classic base metal copper will also be in high demand. In addition to the capacity expansion of solar and wind power, the expansion

and conversion of the electricity grid will spur the demand for this non-ferrous metal. The International Copper Association assumes that about four tonnes of copper on average will be needed for each installed megawatt of solar or wind power. Since DERA's establishment, it has been monitoring the market for the most heavily traded base metal on the commodities exchanges and published its first copper risk assessment in 2013, with an update in 2020.

China now plays a key role in the copper market. Since the turn of the millennium, China has become the largest consumer of copper, accounting for about half of the global copper demand, roughly 12.5 million tonnes, in 2018, with the US and Germany taking second and third places respectively. "China's dominant position with respect to copper demand involves risks", DERA's expert Ulrike Dorner warns.

China's economic developments have a direct impact on the global copper market. For example, quarantine measures in response to the COVID-19 pandemic in China have caused a decline in domestic demand, resulting in a collapse of the global market price for copper.

However, the turbulence resulting from the pandemic

Uses of copper:

Construction 28 %

**Household and
electrical appliances 21 %**

Infrastructure 16 %

Transport 13 %

is not likely to have a long-term impact on copper demand. Megatrends such as the energy and mobility transition will again be the dominant factors after the global economy has recovered from the trough of the quarantine period. DERA's expert Dorner is therefore expecting demand for copper to rapidly increase again and remain stable in the future. "After all, copper as a conductor still plays a central role in decarbonising the energy generation and mobility sectors", Dorner says.

Industry 12 %

Other 10 %

Ulrike Dorner

Geologist



Electric vehicles are one of the most promising solutions to enhance sustainability in the transport sector. However, EVs need powerful energy storage systems, so a dramatic increase in numbers will spark high demand for the battery raw materials lithium, nickel, cobalt and graphite on the raw materials markets. Alongside the difficulties associated with a rise in demand, the implementation of industrial and environmental standards along the supply chain also involves challenges.

Price and supply risks of battery raw materials

Electric vehicles are currently understood as being key to a more climate-friendly mode of transport. When powered with electricity from renewable sources, their CO₂ footprint is likely to be smaller than that of ICEs. The automotive industry, including its suppliers, as one of the main pillars of the German economy, is facing radical changes, since the adoption of EVs is strongly promoted in Germany not only by the Federal Government. The number of electric vehicles is expected to increase from currently about 136,000 to seven to ten million by 2030, the goal being to reduce greenhouse gas emissions by 40 to 42 percent compared to 1990.

Even if these goals may not be fully achieved within the set time frame, there is no doubt that the future belongs to electric vehicles of some kind, at least as a transition technology. This ultimately means demand for energy storage systems will increase significantly. As lithium-ion batteries are the technology of choice for this application, the market will develop accordingly. Currently, demand for lithium-ion batteries is still dominated by applications for the information and communications sector. "These so-called 3C applications are expected to grow by only three to six percent per year until 2025, compared to 20 to 25 percent for electric vehicles. Energy storage systems are set to grow at an even higher rate of 30 to 35 percent", Michael Schmidt, DERA's lithium expert, says. These growth rates present tremendous

challenges for the relevant raw materials markets, for example those for lithium and cobalt. "A mobile phone battery weighs about 50 grams; the energy storage system of an electric vehicle with a relatively high range weighs 600 to 700 kilograms", Michael Schmidt explains. The markets have already seen significant price fluctuations in the past, which were strongly influenced by the expectations for electric vehicles.

German companies should therefore secure sufficient supply quantities in the long term, especially if, as is currently foreseeable, a battery industry is to be established in Germany or in other European countries. The global market for lithium and cobalt is highly concentrated on the supply side. According to a DERA Raw Material Risk Assessment on cobalt, 60 percent of cobalt ore is extracted in the Democratic Republic of Congo. When it comes to further processing into downstream products, the market is dominated by China.

Automobile manufacturers should step up their efforts in securing raw material supply.

For lithium, production is equally highly concentrated. A DERA Raw Material Risk Assessment on the battery metal shows that the global market for lithium is dominated by Australia and Chile, which together account for nearly 80 percent of global mine production. Whether this will entail serious supply and price risks depends mostly on the demand development. In the event of moderate growth, Michael Schmidt expects an excess supply of primary production. In the event of significant two-digit growth in demand per year, however, a deficit may occur by 2025 and especially thereafter, involving corresponding risks. "Europe could very well cover a large part of its demand itself, but its high environmental standards, investment mentality as well as local cost structure represent great challenges", Michael Schmidt says.

In the case of cobalt, the DRC's strong supply position is combined with a very high country risk. In addition to general risks, which are reflected by strongly negative World Bank Governance Indicators, there are precarious mining conditions and inadequate environmental standards in the country. This is becoming a problem for companies in Europe, as sustainability and ethically acceptable mining conditions are given more and more weight in the assessment of supply relationships. "German companies are restructuring their supply chains accordingly", DERA's cobalt expert, Siyamend Al Barazi, says. Automobile manufacturer BMW, for example, announced in 2019 that it would purchase lithium directly in Australia and cobalt in Morocco and Australia in order to supply these materials directly to its battery manufacturers. Together with BASF and Samsung, the group additionally aims to improve the working conditions in Congolese small-scale mining for cobalt.

Michael Schmidt

Geologist



High market concentration for lightweight materials – magnesium metal as an example

Magnesium metal is one of a number of important lightweight materials used, for example, by the automotive industry to achieve set energy efficiency targets. Although magnesium is the eighth most common element found in the Earth's crust, supply is highly concentrated. DERA therefore lists magnesium metal as a potentially critical raw material and does not expect this to change in the medium term.

The Federal Government of Germany considers lightweighting a game changer for the industry. At the first Lightweighting Summit at the HANOVER TRADE FAIR in 2019, Federal Minister for Economic Affairs Peter Altmaier said: "Lightweighting is a strong driver of innovation which can contribute to increasing resource and energy efficiency". In the transport sector, every kilogram of vehicle weight that has to be moved counts. This is also an issue in the increasing adoption of EVs.

Since the energy crisis in the 1970s, the automotive industry has worked towards lightweighting as well as increasing the efficiency of drive trains. In addition to aluminium alloys, magnesium alloys are increasingly used in vehicle construction, as their density is one third lower than that of aluminium. Today, about 40 percent of all magnesium metal is used in the automotive industry, and lightweight applications in the automotive, aviation, shipping and other sectors make up more than 50 percent of global consumption of this material.

"If this trend continues, demand is likely to increase further in the next few years", predicts Martin Schmitz, magnesium expert at DERA. He expects an annual growth rate of at least five percent. Growing demand

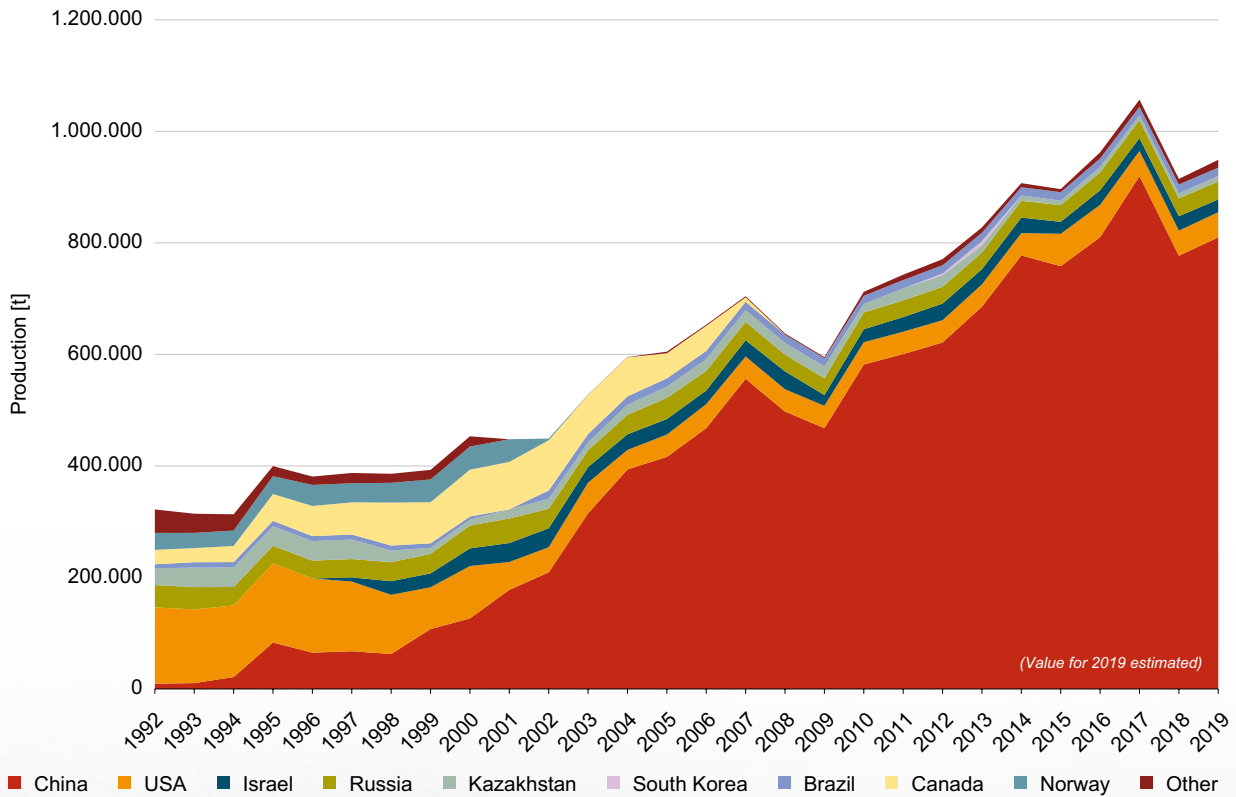
is facing a high concentration of supply, even though large deposits of dolomite and magnesium salts as raw materials exist on all continents. Since the mid-2000s, China has increasingly dominated the market, now accounting for 80 to 85 percent of global production, which has led to magnesium metal falling into category 3 of potentially critical raw materials on DERA's Criticality List. In his 2019 DERA Raw Materials Risk

Assessment on magnesium metal, Martin Schmitz does not see any signs of easing in the medium term: "The market on the supply side will continue to be clearly dominated by China."

The ongoing consolidation of industry in China is not likely also unlikely to change this situation either,

The supply of magnesium metal is highly concentrated despite the global availability of raw materials.

Production of magnesium metal 1992-2019



as the country is expected to initially only reduce some of the overcapacity in the magnesium sector that has built up over the last years. "The trend goes towards larger units with more environmentally friendly production processes", Martin Schmitz says. Due to tighter inspections of environmental standards and working conditions over the last three years, a significant number of mostly smaller facilities have had to close down, or refit and increase their plant sizes. In addition, there are plans to introduce more stringent threshold values for raw material input. In the future, only smaller quantities of dolomite, ferrosilicon, water and coal may be used to produce one tonne of magnesium metal.

120,000 tonnes, the US are the leading recycler of the light metal. In the medium term, DERA's expert Martin Schmitz assumes a moderate price and supply risk for magnesium. Production capacities are expected to be expanded by about 284,000 tonnes by 2025, mostly in China. Assuming a five percent annual growth in demand, significant excess capacities can still be expected. In the event of considerably higher growth in demand, price and supply risks could increase. "In this case, however, numerous currently inactive capacities could be reactivated in China and the commissioning of projects outside China is also likely to be accelerated", Martin Schmitz emphasises. This should reduce potential supply risks.

The potential of the recycling market for magnesium ranges between 270,000 and 280,000 tonnes of secondary capacity per year. By comparison: the primary market had an estimated volume of 900,000 tonnes in 2018. However, the major part of the secondary market consists of new scrap (production scrap), which is often reintroduced into the production of magnesium die casting alloys or the aluminium cycle. By contrast, the recycling of old scrap has a far smaller global volume of only about 50,000 tonnes. With an estimated capacity of

Dr. Martin Schmitz

Geologist





Foto: © Christian Kruppa | Matthias Wachter | Head of Department of Security and Raw Materials in the Federation of German Industries (BDI)

A reliable partner for new challenges on the raw materials markets

Providing high-quality information on all aspects of raw materials makes DERA an important partner for German industry, helping companies with important strategic decisions regarding the supply of raw materials. DERA's well-researched and independent information is proving particularly valuable at a time when global markets are seeing extremely dynamic developments and political risks are significantly increasing. In this interview, Matthias Wachter, Head of the Department of Security and Raw Materials in the Federation of German Industries (BDI), reviews DERA's services.

■ *Why do German companies need a national information platform on raw materials?*

The situation on the global raw materials markets is becoming increasingly complex and difficult. That is why companies need reliable and objective information to set the right course. The quality of information and DERA's national and international networks are very valuable to German industry. It is extremely useful for companies in understanding market developments and aiding their decision-making process on raw material policy.

■ *How high do you rate potential risks on raw materials markets for German industry?*

The situation on the global raw materials markets has changed significantly over the past years. A few years ago, we still had so-called buyer's markets, meaning that those who bought and processed raw

materials were in a stronger negotiating position. Over the past few years, the situation has changed considerably. For many raw materials, there is now a seller's market, meaning that mining corporations and producing countries hold the leverage and can dictate the terms. It can be assumed that the market will continue to develop in this direction in the wake of the global COVID-19 pandemic.

Germany is a country rich in raw materials. But we rely on imports of many metallic raw materials, particularly for emerging technologies. Moreover, the significance of individual raw materials, such as cobalt and lithium, and of their producing countries, such as the Democratic Republic of Congo, is continually increasing. We are seeing an increasing concentration of supply. This is why the challenges for German industry have continuously increased in recent years.

DERA's services are greatly valued across industry.

■ *What do companies think of DERA's services?*

DERA's services are exceptionally valued by industry. We receive a lot of positive feedback from our members. They appreciate the well-researched studies, market observations and trend analyses for individual raw materials as well as the ad-hoc advice. In addition to the technical expertise, the understanding of entrepreneurial processes and challenges is also greatly valued and increasingly sought after. In our opinion, DERA has excellent professional resources and a highly motivated and dedicated team. Against this backdrop, companies would very much welcome further support for DERA.

■ *What could be improved?*

Publications could be released at shorter intervals to even better address the often rapid developments. Raw materials for emerging technologies, for example, which are of critical importance to us at the moment, are subject to particularly high volatility. Political factors like export restrictions also play an increasingly significant role, and highlighting those in more detail would be appreciated.

The situation is complicated by the fact that German companies are no longer locally involved in actual raw material exploration. Our members usually purchase raw materials as primary products on commodity futures exchanges and they also increasingly enter into so-called direct offtake agreements with mining corporations and mining companies.

■ *How can companies prepare?*

Transparency and objective information are essential tools to meet these new challenges and that is exactly what DERA provides, by monitoring and evaluating developments and releasing assessments in the form of publications. On the basis of this verified and independent information, companies can then prepare, make decisions and adjust their supply strategies.

Potential for new sources of supply in the world's leading mining countries

The lion's share of the world's raw material demand is covered by just over a dozen countries. German companies are well advised to know these producing countries and, if necessary, establish new supply relations with them. DERA Raw Material Potential Analyses and further country-specific publications aim to provide companies with relevant and comprehensive information.

German industry is heavily reliant on imports of a number of raw materials, sourcing the majority on the global market. To provide maximum transparency to German offtakers and point out alternative sources of supply, DERA investigates raw material potential worldwide and publishes relevant data as part of its DERA Raw Material Potential Analyses. Owing to their global significance, the main focus is on the major producing countries. "There are not that many of them in terms of value. About 70 percent of global mine production is concentrated in only ten countries", Sven-Uwe Schulz, Head of the Evaluation of Mineral Resources unit, explains.

As part of extensive country studies and together with local partner institutions, the experts assess the potential for expanding current mining activities and interesting future projects in individual mining countries. Additionally, guides for investors and suppliers provide more in-depth insights into individual deposits and projects. "We have close connections with the geological surveys, the local German Chambers of Commerce Abroad (AHKs) and other partners", the DERA expert says. As part of its evaluations of mineral resources, DERA also collaborates closely with other departments and sections of BGR.

"In our studies, we not only compile available information, but also assess it", Sven-Uwe Schulz emphasises. Investigations in the relevant countries and at the specific project sites, including sampling and analyses, therefore form an integral part of our work. DERA's well-established network is highly beneficial in this process, given that raw material issues are still a sensitive topic in many countries. The experts

obtain an overview of the raw material potential in the respective countries and visit promising exploration projects. "We want to see the progress made and the way of working on site to ultimately assess the potential of a project to supply a raw material to Germany in the future", Sven-Uwe Schulz explains.

The studies are aimed predominantly at German companies that purchase raw materials on the global market and are looking for alternative sources of supply. They also address companies seeking to invest into specific local mining projects, to some extent reversing the many years of the industry's withdrawal from the mining industry. The German mining supply industry, which still plays an important role globally, is also interested in information on future projects. Last but not least, the studies are well received in the respective countries.



DERA keeps the information up to date at all times. "We keep an eye on the developments in the leading mining countries", the expert explains. The extensive network in these countries helps to obtain timely and up-to-date information, allowing a soundly based response to even the most detailed enquiries. The most important communication channels include telephone and emails, as well as personal exchange at national and international expert conferences. "Providing advice to companies and political stakeholders is one of our main tasks", Sven-Uwe Schulz says.

DERA's experts do not expect fundamental changes in the global distribution of mining operations in the medium term. "Most materials are likely to come from the traditional mining countries, which have been extensively explored and offer reliable operating conditions", mining engineer Sven-Uwe Schulz emphasises. New projects in other countries tend to take longer to develop than in established mining countries as their success depends on a number of

variables such as a regulatory framework and an attractive and efficient mining jurisdiction.

This is particularly true for numerous promising deposits in Africa. Long-term investments, which usually run into many millions of euros, require stable and predictable operating conditions.

Visits to local exploration and mining companies by DERA's staff members have shown these companies' commitment to collaborate with German partners. "This is a great opportunity for German companies", Sven-Uwe Schulz says.

Dr. Sven-Uwe Schulz

Mining Engineer/
Head of Unit
„Evaluation of Mineral Resources“



China: Transformation process involving risks and side effects

China has dominated the raw materials markets for many years. Besides its great buyer power as the “workbench of the world”, the ongoing transformation process in the country and new statutory regulations and provisions that are often implemented at short notice create planning uncertainty among German companies.



*Only those
who know
the country
can be successful
in China.*

Since taking office, Xi Jinping has consistently pursued an economic reform path. China’s leap to world leadership is to be accelerated by more stringent environmental standards, higher efficiency in production and higher-quality products. As a result, the country’s raw materials industry is also undergoing a transition. Regulatory changes and administrative orders are pushing mining companies and the raw material processing industry to make structural and technological improvements. The government is seeking consolidation across all industry sectors.

For example, following a wave of consolidation of rare earth production, there are only six corporations left. They are allocated production quotas and obtain exclusive rights to mine and process rare earths. This is intended not only to fight illegal mining and enforce compliance with environmental standards, but also to reduce price competition.

The tremendous changes caused by the economic transformation process present great challenges for market participants outside of China. In addition, the state and private institutions have a complex structure. “It is therefore important to precisely understand this process in order to better assess its effects on the raw materials markets”, explains Yun Schüler-Zhou, DERA’s expert on China. Moreover, the implementation of raw material-related measures by the Chinese government, often at short notice, causes additional uncertainty among market participants, making it difficult for companies to prepare for such changes.

DERA has taken these challenges as an opportunity to conduct a special country study focusing on two main aspects: China’s raw material-related political and economic framework conditions and the effects they have on raw material demand and supply, as well as the implications for the global raw materials market. The study’s findings are useful for all those who have ties with the country’s raw materials industry.

In the future, competition for high-tech raw materials is likely to intensify, as China’s ambition to become a technology leader also means that domestic

demand for high-tech raw materials will increase. In this context, the country plays an ambivalent role – being both a supplier to and competitor of western industrialised countries. China is the world's largest producer of 17 out of the 27 critical raw materials listed by the EU in 2017. Supplier reliance is particularly high for rare earths, magnesium, tungsten and natural graphite. The example of rare earths illustrates the risk: more than 80 percent of German imports come from China. "To rely to such an extent on a single supplier involves the risk of supply bottlenecks, especially when unforeseeable events such as the COVID-19 pandemic occur", Yun Schüler-Zhou points out.

China itself also depends on other countries for raw material supply, for example for cobalt and copper. This is why Chinese companies have made strategic investments into numerous raw materials projects worldwide. By the end of 2018, about 20 Chinese companies were involved in more than 40 copper mining and refinery projects abroad. The Chinese government is thereby pursuing a twin-track raw material policy and keeping an eye on both domestic and foreign raw materials markets. "China is enhancing its added value along the supply chains and wants to be perceived as a manufacturer of high-quality products in the future", the economist Yun Schüler-Zhou says.

Dr. Yun Schüler-Zhou

Economist



Canada: Stable framework conditions

and a high raw material potential

Canada is among the world's largest producers of mineral raw materials. However, trade relations are still dominated by its immediate neighbour, the US. After entering into the Comprehensive Economic and Trade Agreement with the EU, trade with Europe could now start to flourish. German companies should give this country more consideration when looking for new sources of supply.

Canada is one of the world's most resource-rich countries. It ranks ninth by the total value of mineral raw materials extracted, and the country is among the five largest suppliers of numerous products that are of strategic importance to German industry, such as nickel, cobalt or aluminium. "In addition, northern Canada, which is still largely untapped, offers huge potential", explains DERA geologist Inga Osbahr, author of an extensive DERA Country Report on the world's second largest country published last year.

According to DERA's findings, the North American country could be an interesting partner for German industry, especially when it comes to finding alternative suppliers for high-tech raw materials. Although the US as the immediate neighbour are likely to remain by far Canada's most significant trading partner, the Comprehensive Economic and Trade Agreement (CETA) recently signed by the EU and Canada, is likely to substantially enhance the country's attractiveness as a raw material supplier. "Raising awareness of alternative supply chains is precisely what our evaluations of mineral resources are aimed at", Inga Osbahr says. "And Canada offers huge potential, especially for the battery raw materials nickel and cobalt." Canada, already the world's fourth largest producer of both raw materials, is planning to significantly expand its capacities in the next few years. The country will also play a role in the market for another battery raw material, namely lithium. "There are large deposits that could become an alternative source of supply for German companies", Inga Osbahr says.

One great advantage of Canada is its political stability, offering investors and trading partners legal and investment security. Establishing business relations with Canada would also be a logical move for companies that attach great importance to compliance with environmental and social standards. "The local standards are very high", Inga Osbahr says, "and, what's more, the local indigenous population is involved and their rights are respected in an exemplary manner." This is also reflected by Canada's high score in the World Bank's Worldwide Governance Indicators, used by DERA to assess the country risk. Canada shares fifth place with the Netherlands, outranked only by the Scandinavian countries and Switzerland.





The combination of low country risk and high raw material potential makes the country highly attractive to investors. In the Investment Attractiveness Index by the Canadian Fraser Institute, which reflects both criteria from the mining industry's perspective,

some of the country's provinces have held top positions for many years. According to the most recent figures of S&P Global, in terms of specific investments in non-ferrous metals exploration, Canada attracted more investors than any other country in 2017 for the 16th time in a row. Two provinces, Québec and Ontario, are particularly successful and are already important producers of mineral raw materials. And while only accounting for seven percent of Canadian mine production, the three northern territories Nunavut, Northwest Territories and Yukon recently accounted for one fifth of Canadian exploration investments. "This can be interpreted as an indicator of the growing interest in northern Canada", Inga Osbahr says.

This is where attention will be directed to in the future. "Although these regions are difficult to access, they will be gradually explored", Inga Osbahr predicts. The Canadian government and the two provinces Ontario and Québec have all made substantial infrastructure investments to ensure the sustainable development of their remote regions that currently lack the relevant infrastructure. DERA recommends that German companies take a very close look at Canada's potential. "We can offer contact details and professional expertise, and are also happy to provide direct advice to interested parties on matters relating to raw materials", Inga Osbahr explains.

Dr. Inga Osbahr

Geologist



Brazil: Nickel and cobalt extraction in the South American savannah

Brazil contributes about four percent to German imports of mineral raw materials. Iron ore accounts for the lion's share, followed by copper, ferro-niobium, silicon and tin. However, Brazil also has the potential to become a source of supply for a whole range of critical raw materials that are currently sourced from countries associated with high country risks, such as cobalt used in lithium-ion batteries or tantalum used in electronic components and alloys. Together with Brazilian partners, DERA explores environmentally friendly extraction processes of these metals.

Nickel is currently extracted in several mines in Goiás in the so-called Cerrado, the savannah of Central Brazil. The Barro Alto open-pit mine, for example, produces about 36,000 tonnes of nickel per year, with reserves for at least another 20 years. The valuable ore is found in the form of nickel laterite just a few metres below the surface. Currently only profitable saprolite is smelted; limonite, which exists above the saprolite, is more difficult to process and is therefore stockpiled. "There must be several millions of tonnes waiting to be processed", says Herwig Marbler, resource geologist at DERA, recalling his visit.

Together with colleagues from BGR and the Geological Survey of Brazil (CPRM), DERA's experts had investigated the tin and tantalum potential of the state of Rondônia in the northwest of Brazil as part of an earlier project. The focus has now shifted to battery raw materials for promising battery applications such as EVs. In addition to nickel as the main product in Barro Alto, cobalt is of particular interest to the partners. Initial analyses of ore samples from the Barro Alto stockpiles have shown an average cobalt content that, at 0.2 to 0.3 percent, is of potential commercial interest.

Samples from another commercial nickel exploration licence, currently under exploration in the northern state of Pará, show cobalt values of up to 0.6 percent and extensive ore resources of up to 500 million tonnes. Herwig Marbler thinks this is promising enough to start testing new extraction processes. As part of a joint research project with the Geological Survey of Brazil, the Brazilian Centre for Mineral Technology (CETEM) and other partner companies, there are plans to test various methods for bioleaching and the extraction of cobalt there.

Brazil is a very interesting partner for the German experts, as it has the capacity to supply a number of high-tech metals including tin, tantalum and cobalt as well as iron and manganese ore. "Brazil holds considerable potential for a wide range of raw materials that are highly attractive to German buyers, which could help them to diversify their supply structures", Herwig Marbler says. With its analyses, DERA contributes to the assessment of these new potential sources of supply, some of which will only become commercially viable by establishing new or optimised processing methods, enabling Brazilian and German companies to build an important, lasting partnership.

The bioleaching tests conducted by the German-Brazilian research consortium are an important part in this context. Bacterial cultures are used to extract cobalt from the ore minerals. Compared to conventional methods, such organic approaches can significantly lessen the environmental impact. "We are developing a sustainable and environmentally friendly process that employs significantly smaller amounts of acid", DERA geologist Herwig Marbler explains. The acid used is then recirculated to avoid environmentally harmful waste products. Initial tests in BGR's laboratories were promising and are now continued in Brazil. There are plans to transfer the

laboratory tests to a pilot plant run by project partner CETEM in Brazil as part of a further project.

Such research projects also provide starting points for the German mining supply industry, which enjoys a good reputation worldwide. It is enhancing its competitiveness on the international market with sustainable and eco-friendly processes. "The involvement of these suppliers in foreign mining projects would contribute to a sustainable raw materials supply for Germany", Sven-Uwe Schulz, Head of DERA's Evaluation of Mineral Resources unit, emphasises.

Brazil is an important partner for German companies in the technology and raw materials sectors.

Dr. Herwig Marbler

Geologist





Australia and South Africa are two of the world's most resource-rich countries. Although trade with Germany is still limited, the potential is huge. A greater involvement of German companies could reduce the reliance on China and other market leaders.

At the Southern Cape, the South African province of Gauteng is further expanding its fluorspar production. In August 2019, the Nokeng fluorspar open-pit mine started operations as the second mine of its kind in the northeast of the province. According to the South African operator, the capacity ranges between 130,000 and 185,000 tonnes of acid grade fluorspar for the chemical industry and up to 30,000 tonnes of metallurgical grade fluorspar for the steel industry. "We visited the project in 2013 while it was still in an early exploration phase and took samples", DERA's resource geologist Herwig Marbler explains. Back then, the experts travelled through the country to investigate supply and investment opportunities for nine strategically important raw materials which are of interest to buyers from Germany. Nokeng was one of the projects featured in the Investors' and Procurement Guide South Africa.

South Africa is one of the world's leading mining countries and in urgent need of investments. Therefore, DERA's experts were strongly supported by the country's geological survey during the field work. "For our DERA Raw Material Potential Analyses,

we are looking for the most promising raw material projects. The goal is to identify economically viable projects for German industry", Herwig Marbler explains.

Australia is also interested in forging a stronger relationship with Germany in the raw materials sector, as it seeks to curb its significant reliance on its biggest trading partner, China. Following extensive research and exploratory trips down under, DERA published its Investors' Guide Australia listing 15 strategic raw materials. Although German raw material imports from Australia are currently worth only about EUR 1.3 billion, DERA expert Siyamend Al Barazi and three co-authors believe that Australia could become an even more important trading partner for those commodities.

"One of the crucial criteria in our assessments is investment security. Australia meets these requirements, but South Africa has a less favourable risk classification, ranking two categories lower", Siyamend Al Barazi says. With regard to political and social risks, the World Bank's most recent cross-country comparison

Australia and South Africa: Down Under and Rainbow Nation on the lookout for partners

ranks the rainbow nation in the middle and thus at a position comparable to Brazil or China. German companies are therefore rather hesitant to invest. The Nokeng Fluorspar Mine did not attract any German investors either, despite initial interest. South Africa specialist Herwig Marbler knows why: "The political situation is difficult, although the country has huge raw material potential, a well-developed infrastructure and a great number of skilled workers."

Australia's problem, by contrast, is mostly geographical: Europe is situated literally on the other side of the globe, while Asia's raw material-hungry countries like China, Japan and South Korea are virtually right on the doorstep. The German experts are nevertheless seeing continuous growth in exports to the Old World. One example is nickel, an important alloying element and a key raw material for battery technologies. "In 2015, Germany imported one percent of its demand from Australia; today, it imports as much as five percent and this figure is trending upwards", Michael Szurlies, BGR's nickel expert, says.

DERA's advice to German industry? The experts suggest that companies should try and diversify their raw material procurement, mainly to reduce their strategic reliance on China and other countries. Australia and South Africa could very well qualify as reliable trading partners. It is quite possible that the COVID-19 pandemic could bring a change of mindset in this regard.

Siyamend Al Barazi

Geologist





From exploration projects to new sources of supply – DERA project evaluations

Exploration, capacity expansions and increasing recycling ensure a constant and secure supply of raw materials to economies worldwide. Developing a project into a mine or tapping additional recycling potential, however, is generally associated with considerable investments and project risks. As a neutral and independent institution, DERA evaluates national and global mining and raw material projects to identify the most interesting emerging supply sources. This is a crucial component in diversifying the sources of supply for German companies.

One of DERA's main tasks is the assessment of mining and exploration projects. The results are integrated into supply scenarios of DERA's Raw Material Risk Assessments and its DERA Raw Material Potential Analyses. Project evaluations also provide support for specific measures taken by the German government as part of its Raw Materials Strategy. For example, as part of bilateral country partnerships, raw material projects are analysed and investigated for their feasibility. This expertise is also required on a regular basis for assessing applications for untied loan guarantees (UFG), an integral element of the Federal Government's support programme. "All project assessments serve to increase awareness among companies about new developments on the global raw materials markets. They also help to develop possible mitigation strategies for potential price and supply risks. The goal is to show companies new and alternative sources of supply", emphasises Sven-Uwe Schulz, head of the Evaluation of Mineral Resources unit.

Existing mining operations and capacity expansions, production increases through technical optimisations, and also new mines are all potential new sources of raw material supply for German companies. Assuming they are economically viable, mine dumps and tailings reprocessing together with secondary raw materials from the recycling industry are an additional pillar in a secure and sustainable supply.

"Economic viability is also one of the main criteria when it comes to whether an exploration project makes it into production, thus hopefully contributing to the diversification of supply for German companies", explains Franz-Michael Roth, mining engineer at DERA. Mining projects, ranging from exploration projects to existing operations, involve large capital expenditure. This includes costs for additional exploration work, mine planning, the construction of processing facilities and related infrastructure, and for mining equipment. Much of the expenditure also goes towards the planning and implementation of extensive environmental protection measures. A greenfield exploration project usually has a lead time of ten to twenty years from discovery to production. Until the final product can be sold on the market, a long time frame is required – an economic challenge for investors. „This results in a special risk structure for project companies and investors, which must definitely be taken into account in the evaluation of these projects“, says Franz-Michael Roth.

DERA experts analyse the projects using a holistic approach, assessing their prospectivity, technical feasibility of a project, economic performance and the associated opportunities and risks for the local population and the environment. „In order to be able to give a reliable assessment of the projects, we also look at the cost and financing structure of the project companies, their parent corporations and affiliated

entities”, Franz-Michael Roth points out. „In many cases, this may provide indications as to whether a project can be realised as planned and, in the event of any unexpected cost increases, whether further funding can be provided in order to bring the project into production.”

At the request of the German Federal Government and based on this methodology, DERA experts assess the eligibility of raw material projects for funding from guarantees for untied loans (UFK). UFK guarantees have enabled German companies to facilitate access to certain raw materials since 1961. Under the programme, lenders to raw material projects abroad are insured against economic and political credit default risks. A prerequisite for this is the conclusion of a long-term raw materials supply contract with a German buyer. The financed project must be deemed worthy of supporting the

raw materials economy, i.e. result in an increase in the security of supply of raw materials for the Federal Republic of Germany. It also has to be technically and commercially sound and the financed period should correspond with the economic nature of the project. The granting of a UFK guarantee must also be justifiable in terms of risk, i.e. a full repayment of the loan must be feasible, taking into account the creditworthiness of the borrower and the political risks associated with the granting of the loan.

The Federal Government’s exposure from all existing guarantees amounted to EUR 4.2 billion by the end of 2019. Between 2015 and 2019, DERA attested to the eligibility of eleven raw materials in 15 countries. With around 20 applications per year for mineral raw material projects, interest from companies continues to be strong.

Natural resource projects must be technically and economically feasible and environmentally and socially responsible.

Dr. Franz-Michael Roth

Mining Engineer



ROSYS —

Access to a wealth of data

With ROSYS, providing extensive information on 80 raw materials, DERA can offer direct, web-based and free access to verified details about raw materials markets. Interested companies can use the web portal to obtain comprehensive data on a great number of raw materials ranging from high-tech metals to petroleum.

Since its establishment in 1958, BGR has been collecting comprehensive information on raw materials, with datasets sometimes covering time spans of over a century, providing information on deposits, reserves and outputs, as well as trade flows, exports, imports and global market prices. When DERA was established within BGR ten years ago, an effort was made not only to continue collecting data but to prepare and communicate the information to the public. All DERA reports, analyses, risk studies, presentations and seminars are based on these data.

DERA has been providing web-based access to this raw materials information for several years now. ROSYS offers information on 80 raw materials online, including both various elements of relevance to emerging technologies, such as lithium, cobalt and rare earths, as well as data on conventional energy resources. "It is designed as an entry tool that serves to provide a first overview, while also allowing quick access to information on specific raw materials", explains Arne Schumacher, responsible for ROSYS at DERA. The portal provides access to various datasets such as time series on raw materials production, consumption and reserves, with historical data often available for up to 60 years for most raw materials. Other features of ROSYS help to identify the risk profiles of individual countries or provide import and export data for Germany.

Interactive maps and charts allow for monitoring, analysing and assessing current developments in the raw materials markets.

Information is obtained from a wide range of sources, including BGR and its European and international counterparts, scientific publications, as well as freely accessible and proprietary databases. Given the multitude of data sources, however, quality assurance is indispensable, which is why all data are reviewed for plausibility before publication. "Our in-house raw materials experts check all data sources to identify the most plausible one", explains Arne Schumacher. The result is a high-quality online database. "There are certainly other valuable databases, but I am not aware of any other system that offers such an extensive list of raw materials, which also includes a classification of the country risk and concentration of supply in order to assess the price and supply risks of these raw materials", Arne Schumacher says.

There are plans to expand ROSYS, with additional macroeconomic indicators to be included next year. "We are aiming to integrate the World Bank indicators to enable better analyses", Arne Schumacher says. "These will include growth and perhaps also environmental and social indicators." But first of all,

Web-based access to data about global raw materials markets.

a technical and visual makeover is on the agenda. "The whole portal will feature a more modern and intuitive user interface, including improved graphics, better maps and more straightforward navigation", Arne Schumacher emphasises.

Designed to provide users with optimum access to fundamental raw material and economic data, ROSYS aims to deliver verified and objective information to those active on the global raw materials markets, including science, industry, society and other stakeholders. "ROSYS is a tool that allows a broad overview", Arne Schumacher underlines. DERA's experts can be contacted for more in-depth insights on specific raw materials.

Arne Schumacher

GIS Specialist
Political Scientist





Keeping in touch with the world

DERA has a broad network of partners in business, science and politics, and collaborates with entities from various fields of work. The ongoing professional exchange together with its wide-ranging expertise allow DERA to continually improve and expand its services. Numerous commercial and non-commercial partners from Germany and abroad support DERA in collecting, preparing and making available up-to-date information.

At the national level, DERA collaborates closely with various German industry associations, such as the Federation of German Industries (BDI), German Chambers of Industry and Commerce (DIHK), as well as a multitude of other professional organisations. This close-knit network allows for a continuous exchange on individual subjects in various formats. As part of research projects and commissioned studies, DERA also collaborates with universities and other research facilities as well as with private institutions.

As part of BGR's national and international technical cooperation, DERA maintains international relations with partners and is involved in the close global collaboration between other geological surveys, such as the American, British and French geological surveys. Within the EU, DERA maintains ongoing contact with EuroGeoSurveys the Geological Surveys of Europe (EGS) and the EU Commission through BGR.

Together with its respective geological survey counterpart, DERA also conducts local evaluations of mineral resources as part of its special country collaborations. The overall goal is to support German companies in diversifying their sources of supply while also contributing to strengthening the local mining sectors. Over the past ten years, multi-year projects have been conducted with the national geological surveys of South Africa, Chile, Brazil and Peru, some of which are ongoing. New partnerships are continuously sought and developed.

As part of its collaboration with industrial associations and institutions, DERA is also in continuous exchange with the German Chambers of Commerce Abroad (AHKs) in the world's leading mining countries. The Competence Centres for Mining and Mineral Resources in Australia, Brazil, Chile, Canada, Peru, Western and Southern Africa are important partners in this respect. These have been established



Networks promote exchange and help obtain local information.

at some AHKs in collaboration with the German Federal Ministry for Economic Affairs and Energy (BMWi). They have joined forces to create the German Mining Network, which unites DERA and the Competence Centres, GTAI and other partners.

Together with its extensive business network and its comprehensive services, the German Mining Network offers German companies engaged in raw material procurement and the mining supply industry access to information and broad expertise.

Its contacts and activities allow DERA to promptly respond to any unforeseen developments on the raw materials markets (such as the COVID-19 pandemic) and to offer reliable raw materials monitoring services. These services contribute to an effective risk management in the raw materials processing and manufacturing industry.

Sonja Göcke

Business Administration



Events

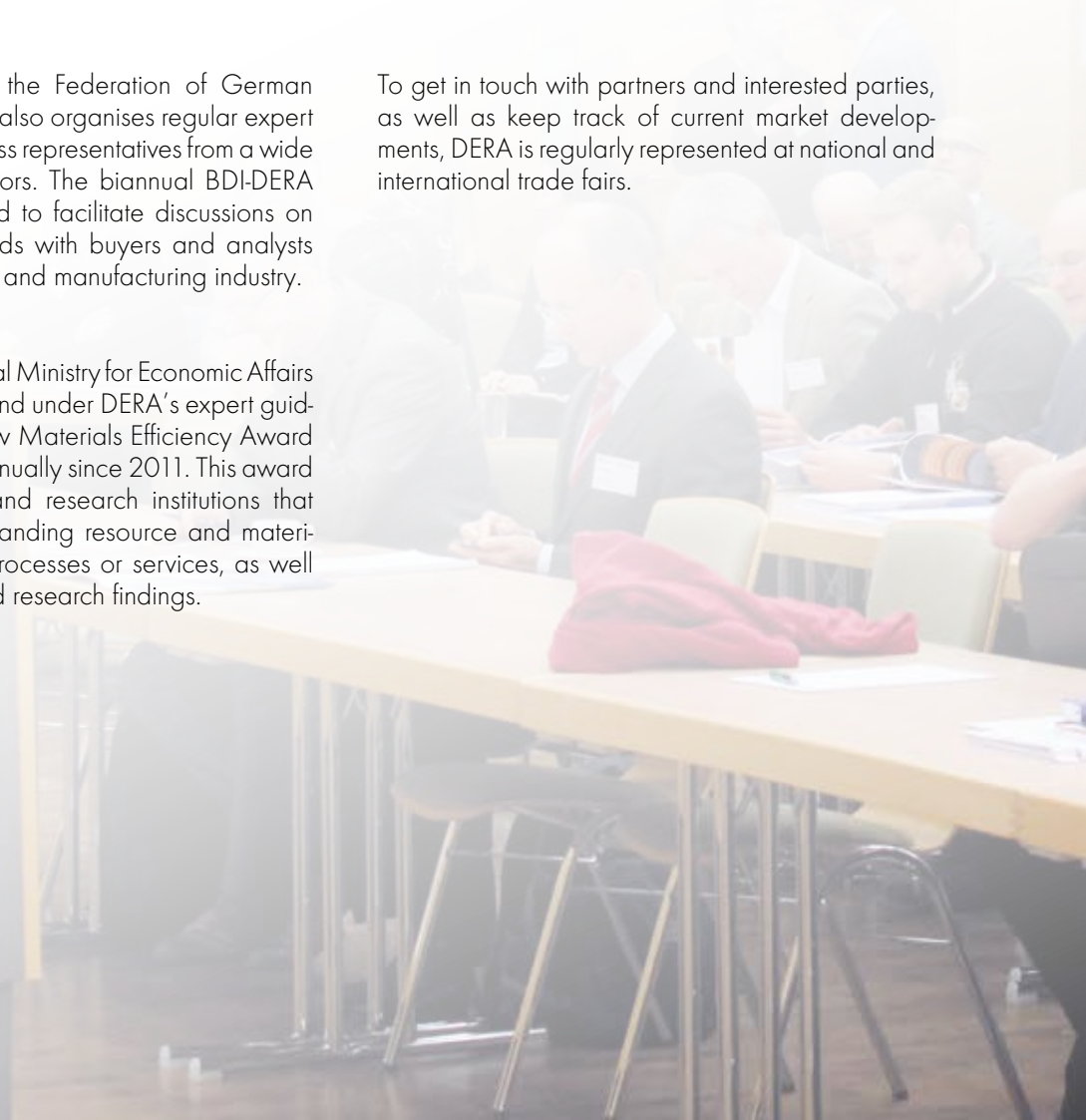
DERA's varied event formats are an essential component of its advisory services. As many as 60 own and 48 external events were attended by more than 5,600 visitors during its first ten years.

DERA industry workshops are definitely one of the highlights, designed to launch and present the results of DERA's latest Raw Material Risk Assessments. Aimed specifically at industry representatives, they serve as a forum for expert discussions on potential price and supply risks on the international raw materials markets and also provide extensive networking opportunities.

In collaboration with the Federation of German Industries (BDI), DERA also organises regular expert discussions with business representatives from a wide range of industry sectors. The biannual BDI-DERA meetings are designed to facilitate discussions on market and price trends with buyers and analysts from the raw materials and manufacturing industry.

To get in touch with partners and interested parties, as well as keep track of current market developments, DERA is regularly represented at national and international trade fairs.

On behalf of the Federal Ministry for Economic Affairs and Energy (BMWi) and under DERA's expert guidance, the German Raw Materials Efficiency Award has been conferred annually since 2011. This award honours companies and research institutions that have developed outstanding resource and material-efficient products, processes or services, as well as application-oriented research findings.



The annual Hanover Trade Fair, the Trade Fair for Mining and Construction Machinery (BAUMA) every three years, the Purchasing and Logistics Symposium organised by the BME (Association for Supply Chain Management, Procurement and Logistics), as well as the Resource Efficiency and Circular Economy Congress in Baden-Wuerttemberg are just some of the events DERA has been actively involved in over the last 10 years.

With its regular presence at major international trade fairs such as the annual Prospectors & Developers Association of Canada Convention (PDAC) in Toronto or the African Mining Indaba in Cape Town, DERA continues to offer a platform for German companies to showcase their activities on the global raw materials markets. DERA collaborates with the local German Chambers of Commerce Abroad (AHKs) to maximise visibility and reach.

In collaboration with the local Competence Centres for Mining and Mineral Resources at the AHKs and as part of its strong trade fair presence, DERA regularly hosts German Days at these events.

From time to time, DERA also attends trade fairs in Brazil, Peru and Chile as an exhibitor.

Marcell Kutzsch

Administrative Assistant

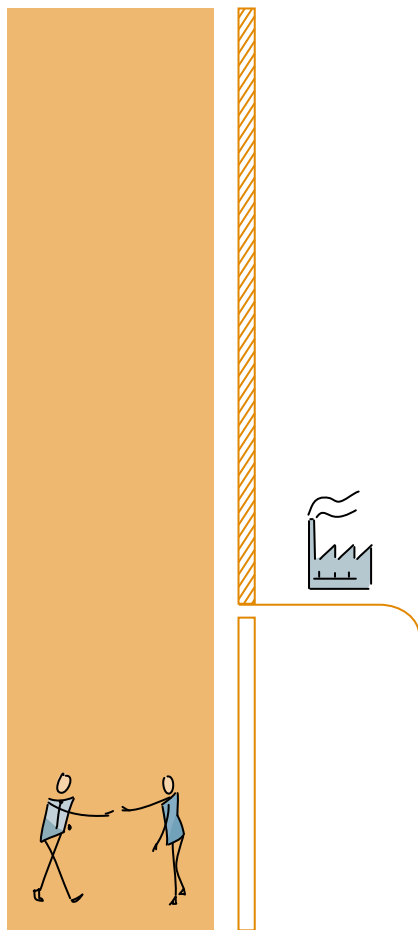


DERA – Statistics

Advisory requests

about 2,500

advisory requests processed
(since 2012)



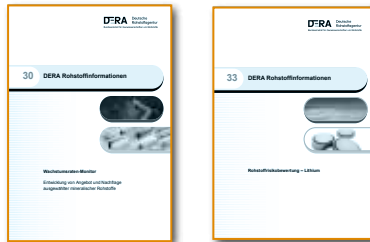
about 65%

from industry

Publications

44

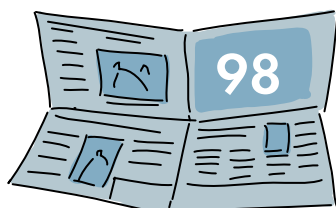
DERA publication series



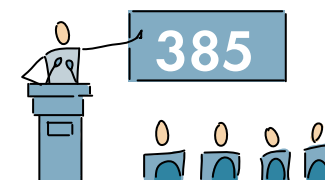
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- DERA Rohstoffinformationen 43: Supply and Demand of Natural Graphite
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- DERA Rohstoffinformationen 41: Einblicke in die chinesische Rohstoffwirtschaft
- DERA Rohstoffinformationen 40: DERA Rohstoffliste 2019
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- DERA Rohstoffinformationen 33: Rohstoffrisikobewertung Lithium
- DERA Rohstoffinformationen 32: DERA Rohstoffliste 2016
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- DERA Rohstoffinformationen 29: Mineralische Rohstoffe in Australien – Investitions- und Lieferpotenziale
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- DERA Rohstoffinformationen 22: Investor´s and Procurement Guide South Africa Part 2
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- DERA Rohstoffinformationen 06: Deutscher Auslandsbergbau
- DERA Rohstoffinformationen 05: In der grobkeramischen Industrie nutzbares Rohstoffpotenzial der bei Gewinnung und Aufbereitung in der deutschen Steine- und Erden-Industrie anfallenden Feianteile
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- DERA Rohstoffinformationen 03: Das mineralische Rohstoffpotenzial der nordeuropäischen Arktis
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