



MINING AND METALS – A POWER BASE  
FOR ALL NATIONS  
LOCUS OF MINING 1850-2030

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## Mining and metals – a power base for all nations <sup>1</sup>

**Abstract:** The paper discusses the locus of mining and its past, present and future. Over the past one hundred and fifty years a succession of countries has built their strength on mining and metals. Europe dominated global metals production in the mid-19<sup>th</sup> century. During the second half of the 19<sup>th</sup> century the USA gradually expanded its production of steel, copper and other metals and became the leading metal producing country. More recently a host of countries take part in the global production of minerals and metals. Australia, Canada, Chile, Brazil, Peru, DRC, South Africa and Zambia as well as China has increased their production and importance as mining countries.

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<sup>1</sup> This technical note was prepared by Magnus Ericsson, Olof Löf and Anton Löf of RMG Consulting. The review of long-term metal production trends is an updated and expanded summary of Magnus Ericsson's chapter in Mineral processing and extractive metallurgy – 100 years of innovation, Corby Andersson, Richard Dunne and John Uhrig editors, Society for Mining, Metallurgy & Exploration (SME) Colorado 2014.

RMG Consulting is a global mineral economics and policy/strategy advisor. RMG Consulting, and its predecessor Raw Materials Group, has established itself as a reputable and independent supplier of data and advice on the world's mining industry. The experience of RMG Consulting dates back more than 30 years.

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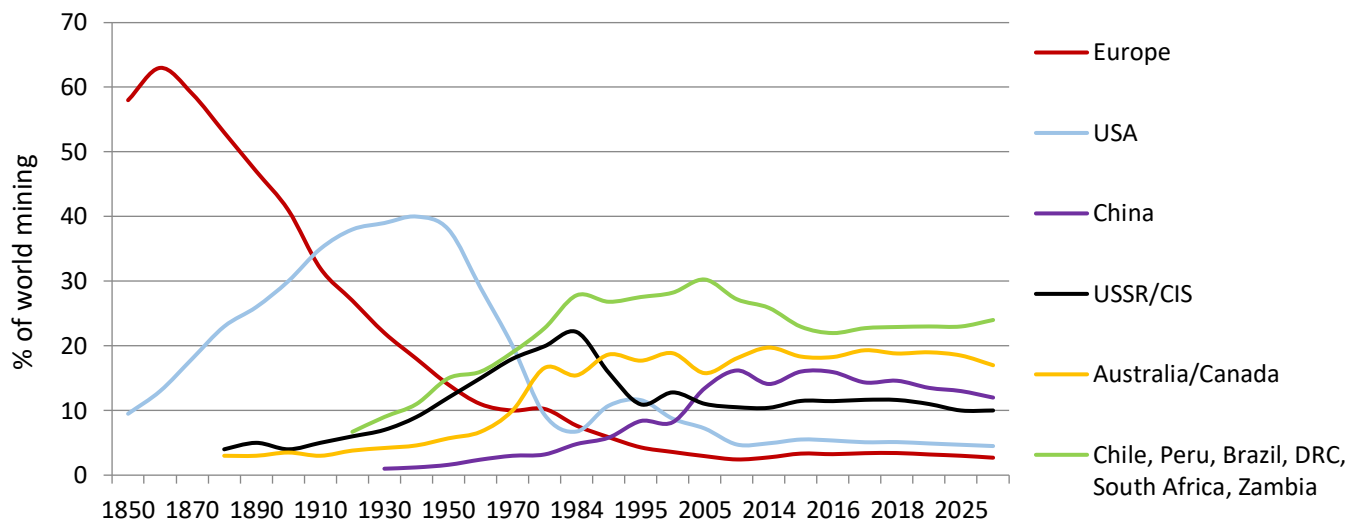
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# 1 Mining and metals – a power base for all nations

## 1.1 Past

Population growth and man's continuous quest for improved living conditions have created need for metals all through mankind's history. In economic terms: development generates demand for metals. Most countries, irrespective of history and political regime, follow a similar path when the national wealth increases: Demand for metals explodes into an almost logarithmical growth phase and peaks around USD 10,000-15,000 per capita and year when infrastructure of all types are constructed.

All powerful nations in modern history have built their domination on a large and profitable mining sector. Over the past one hundred and fifty years a succession of countries has built their strength on mining and metals. See Figure 1. Europe dominated global metals production in the mid-19<sup>th</sup> century. During the second half of the 19<sup>th</sup> century the USA gradually expanded its production of steel, copper and other metals and became the leading metal producing country. The Soviet Union chose a different, but nevertheless metals based, industrialisation strategy exploiting the minerals riches of the Urals and the vast untapped resources of Siberia. After the initial move from Europe to North America the centre of gravity of mining has shifted south of the equator: mineral production in Latin America, Oceania and Asia has grown consistently.<sup>2</sup>



**Figure 1. Locus of world mining 1850-2030, metals and industrial minerals (per cent of value of total world production excluding coal).**

Source: RMG Consulting 2021.<sup>3</sup>

African mine production increased until a peak was reached in the late 1970s, early 80s. In the early 21<sup>st</sup> century emerging economies account for most of the metals mined globally. The period from 1850 coincided with a decline in the traditional Asian economic power houses India being colonised by Britain and ancient imperial China collapsing.<sup>4</sup> Historically both these Asian countries have been important but often overlooked metal producers. The first production of zinc on an

<sup>2</sup> Sames Carl-Wolfgang, Anaconda – Berichte aus der Rohstoffwelt, Wirtschaftsverlag Langen-Müller/Herbig München 1986.

<sup>3</sup> <https://static1.squarespace.com/static/5996f73a49fc2b25db3a28ed/t/6009e7fdc5323d70cefa0aaa/1611261950133/RMG+Consulting+%282021%29+Locus-of+mining+1850-2030%2C+figure.pdf>

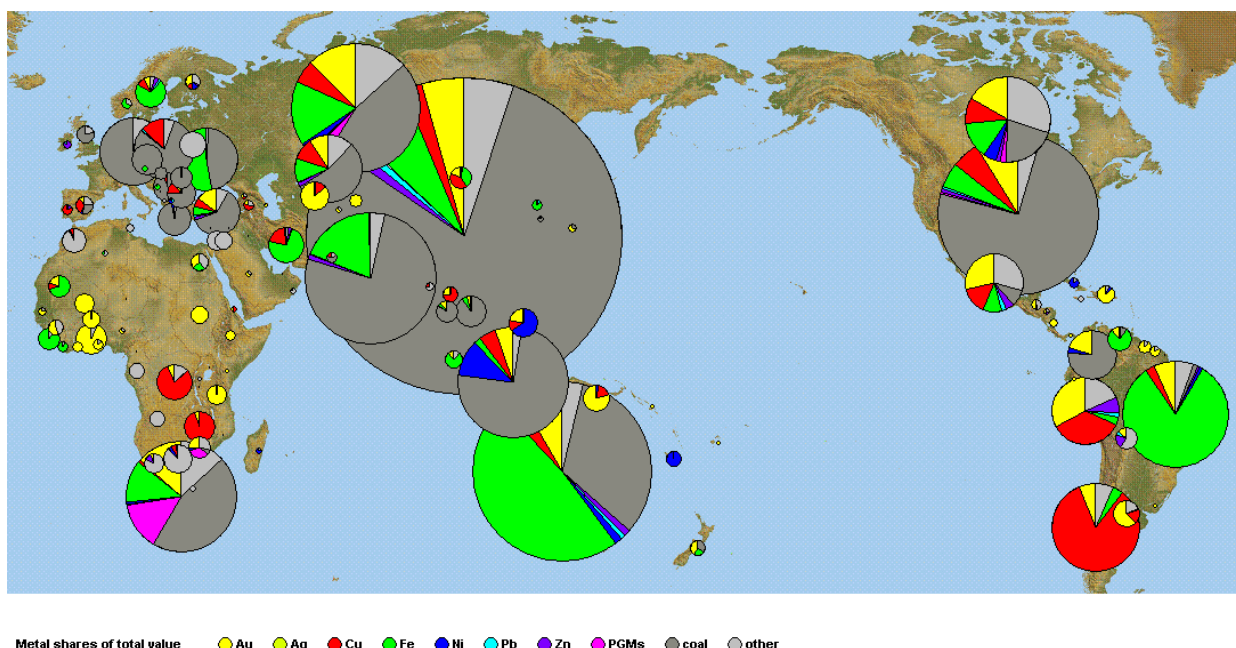
<sup>4</sup> Maddison Angus, The world economy – A millennial perspective, OECD Paris 2001.

industrial scale took place in Rajasthan around 1100 and independently in China three hundred years later, in both countries long before Europe. Copper production in China reached a peak around the late 18<sup>th</sup> century at 5,000-10,000 t annually.<sup>5</sup> Already in the 17th century Japan was another important producer of copper sometimes competing directly with European producers.<sup>6</sup>

## 1.2 Present

When China and India, populous and historically dominant global economies, together with other fast growing Asian countries, began to re-emerge on the world scene in the early 21<sup>st</sup> century the global mining industry was shaken up by its roots. Demand grew by double digit figures annually and production of metals and minerals in Asia and around the world soared. During the 20<sup>th</sup> century metal production increased manyfold, but during this period there have also been several peaks and troughs. Mining is a cyclical industry and historical peaks in production have always been followed by periods of continued growth. Metal prices have also shown cyclical swings even though over the entire century the trend has been downwards. In spite of this the mining industry has been able to meet the continuously increasing demand.

In the 2010s China is once again one of the largest mining countries of the world in a neck-to-neck race with Australia for the top position. Metal production has stagnated, in relative terms, in Europe, including Russia and the former Soviet republics. African mining has also declined but a revival is under way. There is still an important mining sector in the US, contrary to popular belief. If also coal is included China accounts for roughly a third of the value of all mine production in the world. It seems however as if China has reached its limits, as its share is not growing any longer. A snapshot of the situation in the mid-2010s is given in Figures 2 and 3.



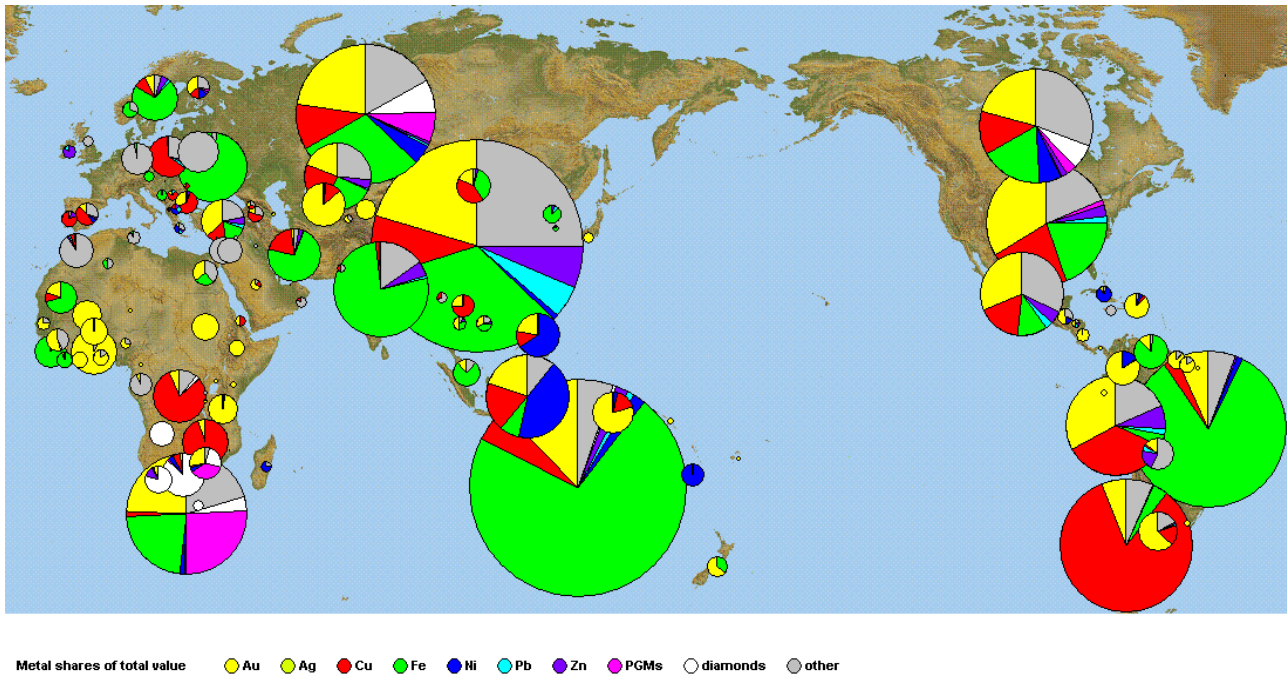
**Figure 2. Value of mine production by country mid 2010s (distributed by metal, including coal).**

Source: Raw Materials Data 2021.

<sup>5</sup> Golas Peter, Science and civilisation in China Volume 5 Part XIII: Mining, Cambridge University Press 1999.

<sup>6</sup> Lynch Martin, Mining in world history, Reaktion Books London 2002

While mine production has moved to the emerging economies smelter and refinery production remains located mainly in developed countries, although this balance has already started to change with the quick growth of Chinese production of aluminium and refined copper.<sup>7</sup>



**Figure 3. Value of mine production by country mid 2010s (distributed by metal, excluding coal).**

Source: Raw Materials Data.

### 1.3 Future

Overall, although there are always uncertainties about the future, this review indicates that future trends for the mining industry remain positive. It is acknowledged that no predictions can be infallible – even ones based on extensive datasets – but nonetheless an optimistic and realistic view remains.

Population growth and economic development in the emerging economies are still positive and provide a strong base for growth in metal demand and hence the need for increased mine production and new investment projects. The mining industry is set, if properly managed, to provide both opportunities for economic and social development and metals necessary for an improved standard of living and for combatting global warming and realising the transition to a carbon-free future.

New mineral resources remain to be discovered and developed. Metals are not running out.<sup>8</sup> New technologies will help find and develop these new deposits. These technologies are only developed if considerable efforts are set aside for R&D. The decision to do so is one, which governments and companies can make together. If new technologies are not introduced, metal prices could remain on too high a level for a long period. Metal prices will however stay high also because of lower grades and larger depths etc of the deposits exploited. These trends will also mean higher environmental and social costs of mining, which must be covered.

<sup>7</sup> Anthony Hodge, Magnus Ericsson Trends in the mining and metals industry, ICMM InBrief 3, London 2012.

<sup>8</sup> John Tilton et al. Public policy and future mineral supplies, Resources Policy vol 57 pp. 55-60 2018.

The trend of metal production moving to the emerging economies will continue. Even if mid-term aspects of political stability will steer investments away from some emerging but resource rich countries. There are two major land areas in the world – excluding Antarctica – which are not fully explored: Africa and the circumpolar Arctic region. The exploitation of the seabed will most probably not take place in the near future. In the last couple of years also space mining from asteroids has been suggested. This is probably more remote. A recent study on space mining concludes: "Earlier hype on sea mining that never came to pass provides a cautionary tale."<sup>9</sup>

While the industry is facing many and difficult challenges, for many remote regions of industrialised countries and for many emerging economies mining remains the only way to kick-start economic growth and hence bring many inspiring opportunities. The results of a survey of all mining countries in the world did not support the widespread view that mineral resources necessarily create a difficult dependency which might not be conducive to economic and social development. It rather showed that the opposite is true. In Figure 4 is a map of the contribution of mining to national economies in all countries of the world.



**Figure 4. Mining's contribution to national economies 2018.**

Source: UNU Wider Working paper 2017/148 Mining's contribution to low- and middle-income countries 2017.

<sup>9</sup> Carol Dahl et al. Mineral scarcity on Earth: are asteroids the answer?, Mineral Economics vol 33 pp. 29-41 2020.

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