Steel stacked up at a steel products market in Yichang, Hubei Province, China. Image: VCG/VCG via Getty Images

When demand peaks: why China is unlikely to need more resources

Resource saturation levels for China indicate that appetite for materials is likely to flatten after physical infrastructures and basic industries have been set up, argues ***Raimund Bleischwitz.***

Raimund Bleischwitz
Chair in Sustainable Global Resources and Deputy Director at UCL Institute for Sustainable Resources

Connect

18 May 2017 • 10 min read

For more than a decade, China has been seen as a resource-hungry economy, becoming a dominant player in world metal markets. Recent evidence, however, paints a more nuanced picture, with the overall pace of growth across the country slowing down, while demand for materials continues to rise. Analysts assert that demand is still robust in absolute terms of tonnage rather than percentages: in other words the appetite for materials is expected to continue to grow.

What does this mean on a global scale? The number of uncertainties is enormous. Among the few available forecasts, UNEP's International Resource Panel[1] expects an increase of global resource extractions and resource use (DMC) by 119 per cent by the year 2050 compared to the year 2015. Highest increase rates are expected for non-metallic minerals and for emerging economies – around twice the global average rates. New demand is driven in particular by the growing middle class in emerging economies and their quest for housing, mobility and food. In addition, the bottom of the social pyramid awaits opportunities for lifting up their status and implementing the Sustainable Development Goals (SDGs) on eradicating poverty, promoting industry and sustainable cities for

example. This will mean more demand for minerals in order to fertilize agriculture, to build water infrastructure and to distribute affordable and clean energy.

119%

UNEP's International Resource Panel expects an increase of global resource extractions and resource use by 119 per cent by the year 2050 compared to 2015.

OECD's decoupling work

The OECD's Environmental Strategy (2001) introduced the concept of decoupling as delinking the use of primary resources from economic activity. Decoupling can be relative, where the rate of environmental impacts is lower than the rate of economic growth, or absolute, in which case resource use declines while the economy grows.

These long term trends signal a growth in commodity markets. Also, the current period of low prices on commodity markets has stimulated production cuts and may trigger a rebound to more demand. It is expected that countries make progress in decoupling GDP from using materials through resource efficiency, as illustrated by the work of the OECD[2] and G7[3] on this topic. So,

where does a decoupling trend of economic growth and natural resources come in?

What needs to be added to this picture is the 'saturation effect': over time, countries consume fewer resources as physical infrastructures and basic industries are built. This article examines material-specific demand trends over the past century and the domestic consumption for four key materials – steel, cement, aluminium and copper – for the UK, US, Germany and Japan, as well as China, being the largest emerging economy.

The results are striking: the per capita demand for steel and cement starts to saturate at a per capita average income level of US$12,000 GDP/capita across the four industrialized countries, followed by copper saturating at US$20,000 GDP/capita, reflecting the numerous use of this metal. The evidence for aluminium is weaker as it kicks in at later stages of development.

Comparing these values with those of China's, we see indications of a saturation in the demand for steel and copper. Chinese per capita consumption for cement is extraordinary and dwarfs the levels already witnessed in industrialized countries. It is questionable whether the current 2.5t/capita consumption level

will be maintained and one would expect Chinese cement companies to cut their production rather than continuing to grow.

The G7 Alliance on Resource Efficiency.

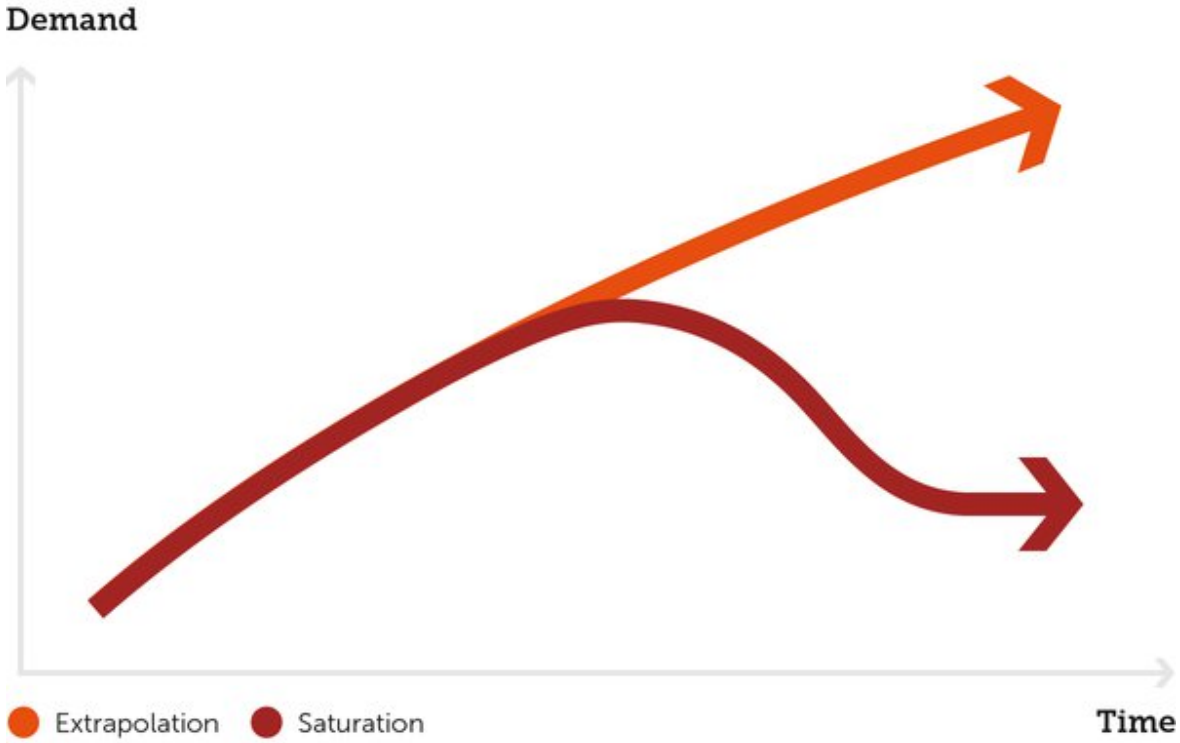
The G7 Alliance on Resource Efficiency was launched in 2015 in Berlin on the basis of a decision taken by the heads of states and government of the G7. It is a voluntary forum convening meetings with stakeholders and experts and has, inter alia, initiated a UNEP report on the topic.

The broader picture: an 'Environmental Kuznets Curve for materials'

The broader implications of this analysis is the 'saturation effect' - often also referred to as the 'Environmental Kuznets Curve (EKC) for materials'. Following growth theories, it hypothesises on the relationship between development, environmental quality and the use of materials. The EKC [4] is portrayed as an inverted 'U' curve and suggests with mixed evidence that environmental quality

decreases with development up to a certain income level and then begins to improve.

China's future demand for resources: insatiable or saturated?



Forecasts suggest China will double its demand for resources by 2040. However, the evidence also indicates a future saturation effect – a stage in development when the intensity in the per capita use of materials decreases. This suggests China will lower its demand for resources by the year 2030-2040.

An inverted 'U' curve suggests that environmental quality decreases with development up to a certain income level and then begins to improve.

The causes for a saturation level in the use of materials in a country are manifold, be it through having established infrastructures, using less material-intensive technologies, structural changes between sectors or general technological and social changes. It is therefore important to explore domestic consumption rather than production. Otherwise, countries importing raw materials or pre-products would appear as performing well in terms of decoupling while in reality they are just shifting parts of their production base abroad.

New analysis from the UCL Institute for Sustainable Resources includes an evaluation of the main indirect flows of materials through the international trade of goods - an issue which has been a major shortcoming in earlier assessments. These hidden flows are usually also underrepresented in key indicators such as 'Domestic Material Consumption' (DMC) that is often used in analyses of decoupling. The UCL research team has used the full range of the UN COMTRADE database from 1962 onwards in

addition to making calculations based on preceding decades. Furthermore, the UCL team makes use of available data on the material intensity of internationally traded goods. This approach still comes with some limitations, but it resolves the shortcomings of previous[5] research on the 'saturation effect' which uses production data rather than a consumption approach which incorporates international trade, and it also surpasses prevailing analysis on decoupling which uses a typical starting date of 1980 or 1990 – much later than any such saturation has taken place in the majority of developed countries.

Read more on land economy trade-offs

The land economy provides a range of important interlinked services. Which viable pathways present the 'lowest regret' options to transform global land use?

Read Tim Benton's article

Our outlook on China's modest demand for resources in the future

It is now more likely that future Chinese consumption for steel, cement and copper will flatten, or perhaps even decline, in absolute terms.

Taking these insights into account, the Chinese economy is unlikely to continue the trajectory it has been on over the last fifteen years in the use of its commodities. Following the pathways of other developed countries and considering the projected stagnation - or even reduction - in population, it is now more likely that future Chinese consumption for steel, cement and copper will flatten, or perhaps even decline, in absolute terms in the future. Such a decline in consumption is even more likely as a result of ongoing efforts towards an ecological civilization and a circular economy in China[6], which will enhance process innovation and resource efficiency in manufacturing, recycling and the use of secondary materials, as well as the development of new goods and services using less primary materials. Therefore a peak in the Chinese demand for materials could be expected.

Comparative findings over time indicate a stock accumulation with a delay of at least 20 years compared to demand for consumer goods, depending on the lifetimes of capital goods. If China begins

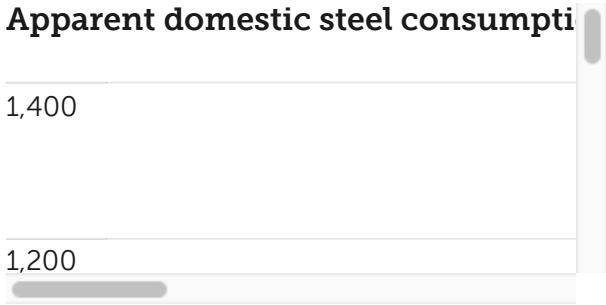
to saturate in the consumption of its key materials, those stocks will also become a potential source of future supply of secondary materials through extended circular economy efforts.

Are we on the cusp of a demand revolution?

Technology and new business models make it possible to do much more with much less. Will governments and companies seize the opportunity?

Read Bernice Lee's article

Two scenarios for China: growth as usual or saturation?



Bleischwitz and Nechifor (2016) Saturation and growth over time: When demand for minerals peak.

Lessons to be learned

Analysts could draw useful lessons from our analysis on saturation levels:

- An extrapolation of previous trends over the last 10-20 years for material consumption should not be regarded as a guiding rule for future market trends and investments. Instead, China and other emerging economies can be expected to decouple GDP from resource use through drivers of such 'saturation effects', as well as through resource efficiency, circular economy and low-carbon economy efforts.
- In particular, for steel, copper and cement in China, it is likely that future scenarios will have a demand that is much flatter than extrapolations from the past 10-20 years forecast.
- The implications of these finding for the 2015 Paris agreement on climate change are significant as it is related to energy-intensive processes in emerging economies, suggesting lower CO2 emissions from such processes in the future compared to business-as-usual scenarios. Indeed, this is not to indicate no action should be taken.

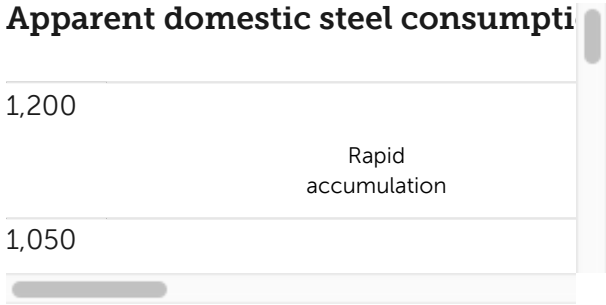
- Future research – such as that facilitated by UNEP's International Resource Panel, the Asian Infrastructure Investment Bank, the G7 Alliance for Resource Efficiency, and the UK's Industrial Strategy for international collaborations – should enlarge its database and develop criteria that translate such saturation levels into realistic assumptions on baseline trends, with clear relevance for the SDGs and their 2030 timeframe for delivery.

- In the same spirit, scenarios and economic modelling efforts should take the 'saturation effect' into account. Our treatment of product groups and sectors fits well into modelling frameworks such as Input-Output Analysis and Computable General Equilibrium (CGE), but probably also for other tools.

With a number or relevant trends in e-mobility, renewable energies and a wide array of clean technology, better insights are needed into how the direction of development and progress can be shaped towards sustainable resource use. Products, components and materials should be maintained at their highest value at all times, with globally interlinked circular use of man-made materials, and the cascading circular use of biological materials to ultimately nourish the earth.

Historic evolution: The building-up of steel stocks in societies

Data for steel in the US over time (1900 - 2013)



Bleischwitz and Nechifor (2016) Saturation and growth over time: When demand for minerals peaks.

Saturation levels need to be governed across industries and meet with consumers' needs. China and other emerging economies will mature, and their material demands will flatten accordingly. The good news is resource efficiency and circular economy efforts are more likely to deliver on top of such promising new trends – with the potential to result in significant reductions of greenhouse gases and the successful implementation of the SDGs.

Footnotes

Related articles

Are we on the cusp of a demand revolution?

By **Bernice Lee**

18 May 2017 • 13 min read

Land-use challenges

By **Tim Benton**

18 May 2017

Lower carbon, less materials: a ‘systems’ approach

By **Simone Cooper-Searle**

18 May 2017 • 13 min read