



## Population and resource security

**Water scarcity, energy challenges and food security are three increasingly-recognized — and increasingly-discussed — global challenges. Resource security, however, remains largely unaddressed, in part because the majority of minerals and metals are not currently scarce and the importance of these resources is not as obviously visible. Yet, as the world is faced with other more pressing challenges, resource security is gradually diminishing.**

**This briefing will examine resource demand, security and scarcity. It will be argued that, while there are many ways in which resource security can be improved in theory, these are often not viable due to conflicting challenges the world faces. This means that, even though optimising resource use and spreading risk have the potential of improving resource security, these measures will not be sufficient in the long term. It is therefore necessary to reduce and ultimately reverse population growth to guarantee resource security for all in the long term.**

### Resource security

Resources are fundamental for maintaining and improving our quality of life. Although the role of fossil fuels for the **generation of energy** is often highlighted, the essential role of metals, minerals, rocks and biotic materials is much less discussed. Nevertheless, non-energy raw materials are widely used. All products, and many services as well, depend on the existence of such resources. Thus society relies heavily on the availability of resources to maintain or improve our quality of life.

Although some resources are naturally renewable, many cannot replace themselves at a rate sufficient to keep up with human consumption. Additionally, there are resources that are considered non-renewable. This means that many resources are limited, and may over time become scarce. It is therefore necessary to create a resource security strategy.<sup>1</sup>

### Biotic and non-biotic

In analyses of resources, a distinction is made between biotic and abiotic materials. This distinction is relevant because they have different qualities:

- Biotic resources are related to, or produced by, living organisms. They are organic, but not of fossil origin.<sup>2</sup> They are renewable, and include timber, fish and all crops that are harvested to meet food demand.<sup>3</sup>
- Abiotic resources are non-living. They are considered non-renewable, and include minerals and metals. These raw materials are important in high-technology, to give one example.<sup>4</sup>

## Limited resource availability

The availability of resources is limited in multiple ways.

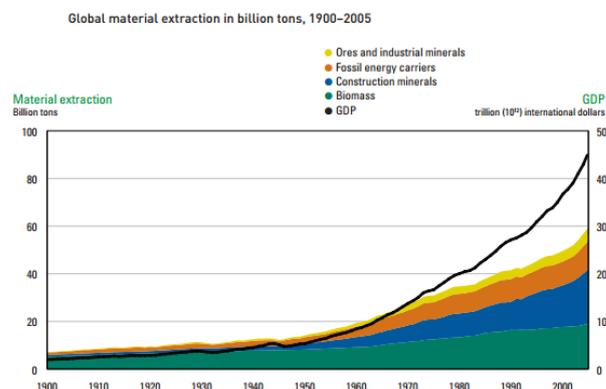
- Quantities of resources are finite. This means that many resources will, in the long term, deplete.<sup>5</sup> Population growth and growing affluence both increase demand. The more demand grows, the faster resources deplete.<sup>6</sup>
- Resources can only be used for one purpose at a time. In a situation of scarcity, it may be the case that you have competing demands that cannot all be met.<sup>7</sup>
- Resources are not evenly distributed over the globe. Most countries therefore rely on trade to fulfil resource demand. Such interdependence means that resource security is by definition a global concern. Political unrest, environmental disruption, demographic changes and economic trouble can all adversely influence the availability of, and access to, resources.<sup>8</sup>



## Global resource security

All countries are dependent on resources, and resource depletion and environmental degradation are global challenges. Yet, not all people are affected by these problems in the same way. Resource extraction, the conversion of raw materials into commodities and the

consumption and disposal of products often occur in different locations. Consequently, benefits and costs are spread unevenly across the globe.<sup>9</sup>



Graph: UNEP

The global use of resources — including those used for the generation of energy — has increased by a factor of eight in the last century. While biomass resources were the predominant source for most of recorded history, they are only a third of total material abstraction today. Instead, mineral resources and fossil fuels have gained in importance. In other words, we have shifted from relying on renewable sources to predominantly using non-renewable alternatives.<sup>10</sup>

## Global resource-demand forecast

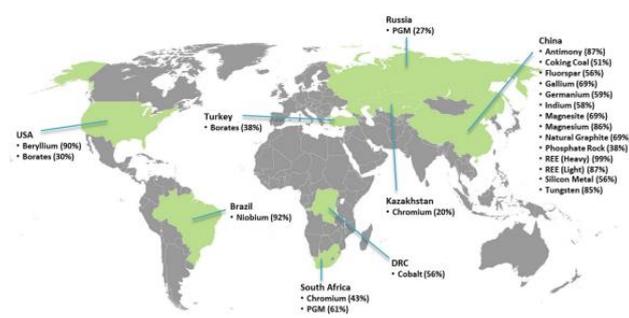
Population growth and growing affluence are major drivers for increased resource abstraction. The amount of resources each country needs is heavily linked to the size of its human population. The world population is projected to grow by more than 2.5 billion people by 2050.

At the same time, affluence is an important factor because resources are used for the production of goods and services. The more affluent a society, the more goods and services its citizens will demand. One additional person in India means that an additional 4 tonnes of resources is required, but an additional Canadian would

require, on average, 25 more tonnes.<sup>11</sup> As countries develop, resource use increases. The United Nations estimates that three billion more people than currently will start to enjoy ‘middle class’ living conditions in two decades’ time. Currently, 1.8 billion people live in these circumstances.<sup>12</sup>

## European Union

European countries are highly dependent on trade to meet non-energy resource demand. An estimated 30 million jobs in the European Union (EU) are directly dependent on access to raw materials, yet the vast majority of raw materials is supplied by non-EU countries. China is the biggest supplier. Only nine per cent of all resources used in the EU are extracted in the EU, with France, Germany and Italy contributing most.<sup>13</sup>



Map: EU

In 2013, the EU presented a list of 54 non-energy and non-agricultural resources that are important for the EU’s economy, but that could potentially be limited in supply. In comparison to the 2010 version of the list, 13 extra elements were added to the release.<sup>14</sup>

- Three biotic resources are present in the 2013 list. These are natural rubber, pulpwood and sawn softwood.
- The remaining resources are abiotic. Two groups of materials are particularly important: platinum group metals (PGMs) and rare earth

elements (REEs). While there are six PGMs, there are 17 REEs present in the list.

Although only around nine per cent of raw materials are indigenous to the EU — the EU has not exploited most of its resource reserves for economic and climate reasons — supply is more limited for the critical raw materials.<sup>15</sup> The table below shows how small the EU’s contribution is to global resource supply:

Category	EU Supply	Materials
Critical Raw Materials	>20%	Gallium, Magnesite
	<20%	Silicon Metal, Coking coal, Fluorspar, Germanium, Indium
	<10%	Chromium, Tungsten
	<3%	Antimony, Beryllium, Borate, Cobalt, Magnesium, Natural Graphite, Niobium, PGMs, Phosphate Rock, REEs (Heavy), REEs (Light)
	<1%	Clays (& Kaolin), Diatomite, Feldspar, Hafnium, Limestone, Perlite, Sawn Softwood, Silica sand, Tellurium
Non-Critical Raw Materials	>20%	Bentonite, Gypsum, Potash, Pulpwood, Selenium, Talc
	<20%	Aluminium, Copper, Rhenium, Silver, Zinc
	<10%	Barytes, Bauxite, Iron, Lithium, Nickel
	<3%	Gold, Manganese, Molybdenum, Natural Rubber, Scandium, Tantalum, Tin, Titanium, Vanadium
	<1%	

Table: EU

## EU resource-demand forecast

Alongside its list of critical resources, the EU has projected resource demand until 2020. The demand for all critical resources will grow by between two and eight per cent per year, depending on the material. Although this does not mean that all materials will inevitably be scarce by 2020, it is a worrying trend: four resources, all PGMs and all heavy REEs will be at risk of deficit by 2020.<sup>16</sup>

## UK resource security

The UK, like other EU countries, is heavily reliant on both renewable and non-renewable resources. This means that a significant proportion of critical resources are sourced abroad. For many elements the UK relies heavily on one trade partner — over 97 per cent of all REEs are imported from China. Such dependence on one country poses a potential accessibility risk for the UK. Other

countries can control market pricing and availability.<sup>17</sup> In fact, China already severely restricts export of certain minerals.<sup>18</sup>

This is problematic, considering that the availability of some resources is very important for the UK. The chart below illustrates how 14 critical resources are used in the UK, and the gross value added (GVA) by all sectors for which they are relevant to the UK economy in 2008.

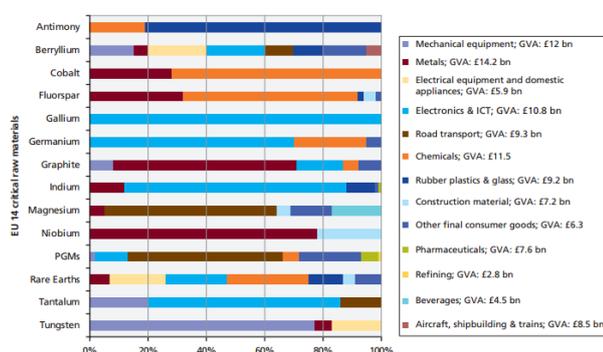


Chart: GOV

The resources that the UK can access with greatest ease have a comparatively high carbon impact. Mining precious and speciality metals is more damaging than the extraction of other materials. This means that it will be increasingly difficult to meet demand as well as climate change targets.<sup>19</sup> It is, therefore, expected that resources will become increasingly expensive.

## Improving resource security

In order to improve resource security, various factors must be considered. Among these are the availability of resource reserves, consumption patterns, geopolitical factors, regulations, and the emergence of substitutes for scarce materials. Considering these, there are various ways in which resource security can be improved.

## Reducing resource demand

Resource demand is predominantly driven by the total number of consumers, and the expectations of each consumer.

### Reducing population growth

The most obvious measure that would reduce resource-demand growth is reducing population growth. Even if it were possible to limit resource use per capita, each additional person will increase resource demand by consuming and using services.

### Mindful living

The existing throwaway culture in much of the developed world means that we use many resources in an unsustainable fashion. In developed countries, people consume much more than in developing countries. To allow the poorest to improve their lives, it is necessary that people in affluent societies consume less than they currently do. Very high levels of material consumption do relatively little to enhance quality of life, but such a lifestyle affects the environment adversely.<sup>20</sup>

Though technology may allow us to reverse some of these devastating effects, hi-tech equipment relies heavily on the availability of many of the resources that are listed as critical by the EU. In summary, this means that it is important to reduce resource demand per capita, and this can be achieved by adopting a more mindful lifestyle.



## Reducing dependency

Resource security depends on both availability and accessibility. From a strategic point of view, a state's resource security is more stable when it does not rely on one trade partner, but has multiple sources for acquisition.

### *Exploiting secondary supplies*

There are many unexplored resource deposits in the EU. In theory, these could be exploited to decrease dependency. Yet, in practice this is not easy to achieve. Existing climate regulations and economic incentives make exploitation difficult, and growing land competition is a serious problem. Land exploited for resource purposes cannot usually be used for agriculture or urban development, when both are also necessary in densely-populated Europe.

### *Developing alternatives*

Developing alternatives for those resources that are increasingly scarce and difficult to access is an option. Yet, the use of all materials is increasing substantially. This means that the solution of substitution is suitable only for the short term, unless the substitute is truly renewable. However, the qualities of minerals and metals are often very specific, and in many cases no renewable alternatives have been discovered.

## Optimising resource use

Using the resources we have in the most optimal way will allow us to do more with less. Technology and sustainability practices can achieve this.

### *Improving resource efficiency*

Technological advancement can allow industries to optimise resource use. There are many products that use more material than they would ideally need. To give an example, the use of 3D printers could eliminate the need for certain parts in products.

### *Reusing and recycling*



Reusing and recycling would allow us to collect and process unwanted materials into useful products. Dismantling complex products is, however, expensive and labour intensive. This means that both have limited applicability at present. Designing new products in a way that makes recycling or reusing easier would make a big difference. Moreover, laws and regulations, or even taxes and levies, would incentivise businesses to recycle more.<sup>21</sup>

### *Increasing renewable resource availability*

To overcome the problem of running short of biotic resources, such as natural rubber and wood, it is possible to develop plans to increase

yields. We can learn to optimise the growth of the natural resources we require in order to increase their availability. However, due to land competition, this may not be possible on a large scale. Even so, reforestation would have environmental benefits as well as resource benefits in the long term.



## Conclusion

Although the world currently does not face significant resource scarcity, it is necessary to increase resource security. Our societies do, after all, depend heavily on the availability and accessibility of many metals and minerals, and these are not distributed evenly across the globe. Projected population growth and increased affluence will cause demand for resources to grow. This will cause greater competition, which means that a country as dependent on trade as

the UK could end up in a particularly vulnerable position.

In theory, there are various ways in which resource security can be improved. However, in practice many of these solutions will be difficult to realise. One reason is that solutions for different challenges compete with one another. Land could be used to exploit extra minerals and metals, but the same land could also be used by farmers to increase crop yields, or by the building sector to develop residential properties. At the same time, there are conflicting scarcity problems that appear more urgent than impending metal and mineral scarcity. Water scarcity will be a serious problem, and the increasing demand for energy will be difficult to meet. Yet, when considering possible solutions for these global challenges, it becomes obvious that much trust is placed in technology. Technology, however, relies heavily on the availability of metals and minerals, and all these solutions would consequently influence resource security adversely.

What this shows, more than anything, is that the complicated and intertwined nature of the challenges the world faces can in the long term only be solved by actively reducing demand for everything we need. This means that we ought to reduce per capita demand, but more importantly, that population stabilisation policies are of paramount importance.

<sup>1</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>

<sup>2</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>

<sup>3</sup> DEFRA. (2010). Review of the Future Resource Risks Faced by UK Business and an Assessment of Future Viability. Retrieved July 27, 2016, from [http://randd.defra.gov.uk/Document.aspx?Document=EV0458\\_9878\\_EXE.pdf](http://randd.defra.gov.uk/Document.aspx?Document=EV0458_9878_EXE.pdf)

<sup>4</sup> DEFRA. (2010). Review of the Future Resource Risks Faced by UK Business and an Assessment of Future Viability. Retrieved July 27, 2016, from [http://randd.defra.gov.uk/Document.aspx?Document=EV0458\\_9878\\_EXE.pdf](http://randd.defra.gov.uk/Document.aspx?Document=EV0458_9878_EXE.pdf)

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- <sup>5</sup> Economics Online. (n.d.). Retrieved July 27, 2016, from [http://www.economicsonline.co.uk/Competitive\\_markets/The\\_economic\\_problem.html](http://www.economicsonline.co.uk/Competitive_markets/The_economic_problem.html)
- <sup>6</sup> UNEP. (2011). Decoupling natural resource use and environmental impacts from economic growth. Retrieved July 27, 2016, from <http://www.unep.org/resourcepanel/Portals/50244/publications/DecouplingENGSummary.pdf>
- <sup>7</sup> Economics Online. (n.d.). Retrieved July 27, 2016, from [http://www.economicsonline.co.uk/Competitive\\_markets/The\\_economic\\_problem.html](http://www.economicsonline.co.uk/Competitive_markets/The_economic_problem.html)
- <sup>8</sup> Climate change and resource scarcity. (n.d.). Retrieved July 27, 2016, from <http://www.pwc.co.uk/issues/megatrends/climate-change-and-resource-scarcity.html>
- <sup>9</sup> UNEP. (2011). Decoupling natural resource use and environmental impacts from economic growth. Retrieved July 27, 2016, from <http://www.unep.org/resourcepanel/Portals/50244/publications/DecouplingENGSummary.pdf>
- <sup>10</sup> UNEP. (2011). Decoupling natural resource use and environmental impacts from economic growth. Retrieved July 27, 2016, from <http://www.unep.org/resourcepanel/Portals/50244/publications/DecouplingENGSummary.pdf>
- <sup>11</sup> UNEP. (2011). Decoupling natural resource use and environmental impacts from economic growth. Retrieved July 27, 2016, from <http://www.unep.org/resourcepanel/Portals/50244/publications/DecouplingENGSummary.pdf>
- <sup>12</sup> [http://www.unep.org/resourcepanel/Portals/50244/publications/IRP%20DECOUPLING%20\\_Summary%20-%20web.pdf](http://www.unep.org/resourcepanel/Portals/50244/publications/IRP%20DECOUPLING%20_Summary%20-%20web.pdf)
- <sup>13</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>
- <sup>14</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>
- <sup>15</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>
- <sup>16</sup> European Commission. (2014). REPORT ON CRITICAL RAW MATERIALS FOR THE EU. Retrieved July 27, 2016, from <http://ec.europa.eu/DocsRoom/documents/10010/attachments/1/translations/en/renditions/native>
- <sup>17</sup> Ricardo Energy & Environment website: UK Government's resource scarcity action plan — what's in it for UK business? (n.d.). Retrieved July 27, 2016, from <http://ee.ricardo.com/cms/uk-government-s-resource-scarcity-action-plan-what-s-in-it-for-uk-business/#.V49BrrgrKUK>
- <sup>18</sup> BBC News - Resource depletion: Opportunity or looming catastrophe? (2012). Retrieved July 27, 2016, from <http://www.bbc.co.uk/news/mobile/business-16391040>
- <sup>19</sup> Ricardo Energy & Environment website: UK Government's resource scarcity action plan – what's in it for UK business? (n.d.). Retrieved July 27, 2016, from <http://ee.ricardo.com/cms/uk-government-s-resource-scarcity-action-plan-what-s-in-it-for-uk-business/#.V49BrrgrKUK>
- <sup>20</sup> Population Matters. (2016). Sustainable consumption (affluence). Retrieved July 27, 2016, from [http://www.populationmatters.org/wp-content/uploads/2016/07/SI\\_19\\_sustainable\\_consumption\\_affluence.pdf](http://www.populationmatters.org/wp-content/uploads/2016/07/SI_19_sustainable_consumption_affluence.pdf)
- <sup>21</sup> Minerals and the environment. (n.d.). Retrieved July 27, 2016, from <http://www.bgs.ac.uk/mineralsUK/mineralsYou/mineralsEnvironment.html>