Key resource constraints

1.6 – equivalent planets of resources consumed each year

70% – of all fresh water is used for agricultural purposes

Key resource constraints

Economic, physical and political shortages of key resources increase and drive increasing tension between and within countries. As we exceed the Earth's natural thresholds, food and water receive as much focus as oil and gas.

People are concerned about the environmental impact of our continuing to consume more resources than the earth can naturally replenish. We currently consume the equivalent of 1.6 planets a year, meaning 'overshoot day' – the day each year when demand outstrips natural supply - is coming earlier and earlier. Many worry about us physically running out of important materials but others however are more sanguine, seeing the recent drop in oil prices as a reflection of declining demand. The true picture is itself complex but consistent. While we are not necessarily running out of things, access to many important resources is increasingly constrained - be that physically, economically, politically and environmentally. Over the next decade, many resources are going to become more difficult to get hold of and may become more expensive.

When we talk about resource constraints, the usual ones come to mind: food, oil and water. However we should also consider metals, phosphorous, gas and land. All are under pressure – some more extreme than others. At current rates of consumption, there are real physical constraints on several important materials. We have around 8 years production left of antimony, a key ingredient in batteries, 12 years of iridium, important for solar panels, and only 17 years of silver and zinc. We have around 30 years worth of copper, 45 years of titanium. Without a downturn in consumption or a switch to alternatives, these are very big concerns. As we deplete these resources, countries with supplies will seek to keep them and their prices will increase.

Other resources are in more plentiful supply but are under pressure politically, environmentally or economically. We have between 40 and 80 years supply left of coal; given its impact on carbon emissions, it is little surprise that its use is being restricted on environmental grounds. Gas and oil, the other two major fossil fuels, are also under pressure but with different emphasis.

Gas is cleaner than both coal and oil but, with the main global supplies lying in Russia and the Middle East, is evidently prone to political pressures. The same is true of oil, although unlike in the past when low demand dropped OPEC production, recently Saudi Arabia has kept pumping into an over-supplied market and so instigated the low current prices. With producers such as Nigeria, Angola and even Saudi Arabia itself suffering economically, how long oversupply - and low prices - can continue is a source of hot debate. However what is less contested is that over the next decade or so, overproduction will stop, prices will rebound and, within the context of a greener energy mix, oil will become increasingly more constrained by environmental issues.

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Certainties

Questions are also raised about peak supply for copper, zinc, other rare metals, and phosphorous. Essential for fertilizer, phosphate rock is only found in a few countries (the US, China and Morocco). Demand is directly linked to us wanting more efficient food production; we may become more efficient with food waste, but not reduce the need for modern industrial farming and its dependency on phosphorus. At current rates of consumption, we have around 75 years of supply left, but phosphorous cannot be replaced by something else, nor can it be artificially manufactured. It can only be recycled through organic methods. With peak-phosphorous estimated around 2030, it will increasingly feature on news bulletins over the next decade as another key resource of concern.

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Beyond phosphorus, anxiety on food supply and demand continues to grow. Globally we face more of a problem in net food distribution than food supply, at both local and regional levels. With more people increasingly in places where food is not plentiful, getting good quality food to people at affordable levels is already a challenge for many. Add in future population growth, more uncertain weather patterns (hence less predictable harvests), and food as a resource will become subject to more political as well as economic interest. Although there is clearly volatility in prices from year to year as weather impacts supply, the recent general trends for wheat, rice and soy are all upward, and expected to continue in that way. Over the next decade, maintaining global food security will become much more difficult as the population increases. Solutions include changing our diets - eating less meat, wasting less, improving yields and the wider adoption of GMO. Some of these may work in some cultures, but not all. The challenge therefore is how to manage an increasingly constrained food supply at the same time as we add another billion mouths to feed into the system.

Linked to food production for more people, but also driven by mass urbanization, is the quantity of arable land available. The amount of arable land per capita on the planet has already dropped from 0.45ha in 1960 to 0.25ha today – and is set to decline further. More efficient farming has helped manage this transition over the past 50 years, but there are concerns about the next 50. If 2010 was the year of peak farmland, we are going to need to produce more food from less land. As such we must double food production over the next decade - in a sustainable manner.

Lastly, water – a resource that is neither running out, nor becoming more plentiful, but increasingly under pressure. We have the same amount of water today as we did 10,000 years ago, the challenge is how we use it. Globally, around 70% of all fresh water is used for agricultural purposes – while, depending where you live, the other 30% is split between domestic purposes, manufacturing and waste in the system. Given increasing demands on food supply, how we provide more water, or manage with less, is a significant test. More people stress the system, while, as many become wealthier, and so consume more energy, food and hence water, managing 10bn with the same amount of water as worked for 1bn is no easy task. Today few regions value fresh water and have little idea of its true cost. Going forward we can expect the challenge of water supply to be more widely recognized.

It is clear that we face major supply / demand challenges. Some of these will result in higher prices, some in national hoarding, some in greater competition and some in more transparency. Whatever the resource the manifestations of change will vary. However what will be consistent as we look forward is that more resources will be seen to be increasingly constrained. Managing this is one of our major challenges for the next decade.

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Related insights

Energy storage

Storage, and particularly electricity storage, is the missing piece in the renewables jigsaw. If solved, it can enable truly distributed solar energy as well as accelerate the electrification of the transport industry.

Food waste

30-50% of our food is wasted either in the supply chain or in consumption and could feed another 3 billion. Optimising distribution and storage in developing countries and enabling better consumer information in others could solve this

Full cost

Increasing transparency of society's reliance on nature, intensify requirements for business to pay the true cost of the resources provided by 'natural capital' and so compensate for their negative impact on society.

Imbalanced population growth

A growing population adds another billion people but it is also rapidly ageing: a child born next year will live 6 months longer than one born today. While migration helps to rebalance, increasing dependency ratios challenge many.