

Strategic materials for a low-carbon future:
From scarcity to availability of resources

*A conference of the Veolia Institute and Oxford Martin School
Concluding remarks by Antoine Frérot, November 3, 2017*

Professor Steve Cowley, Acting Director of the Oxford Martin School,
Dear Julian,
Lord Stern,
Dear guests,
Ladies and Gentlemen,

With the scarcity of raw materials, energy and water, modern man is living on ecological credit. Demand for raw materials is exploding as a result of demographic growth and increasing standards of living, and already a number of shortages are on the way. Now, as we are all aware, endlessly drawing on the natural environment is no longer possible. Overcoming the conflict between the increasing scarcity of resources and growing needs is one of the major challenges that man must face in this century.

Of course, another major challenge is that of climate change. Once an abstract concept, the climate crisis has become a reality, with its heatwaves and hurricanes of unprecedented strength. While the earth can accomplish some of the work of reducing CO₂ pollution, it is up to us to do the rest.

Raw materials and energy are closely connected. You need a lot of raw materials to produce energy; and you need a lot of energy to produce raw materials. On a global scale, nearly 10% of the primary energy consumed is used to extract and process mineral resources.

Is it possible for these concomitant challenges – the increasing scarcity of natural resources and the reduction of emissions of greenhouse gases – to be resolved? Is there not a risk that the energy transition to a low-carbon world will cause further scarcities, and if so, how can they be averted or offset? The richness and variety of the discussions that have taken place here over the last two days have proved that solutions do exist and that they can be implemented.

This forward-looking conference was the 11th organized by the Veolia Institute, at the interface between the worlds of science, economics and politics. It was organized in partnership with the Oxford Martin School, and I would like to express my warmest thanks to its Acting Director, Professor **Steve Cowley**, and all the staff who have worked so hard to ensure its success. This conference has also received financial support from the Prince Albert II of Monaco Foundation, and I would also like to express my warmest thanks to that organization and to all those involved who have contributed to the success of the conference.

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There is, in fact, nothing inevitable about the over-consumption of natural resources and greenhouse gas emissions! In order to meet this dual challenge, we must, among other things, fundamentally revise our economic model: in other words we must free ourselves from our current model, which is based on the linear logic of “*extract - manufacture - discard*”, and

make the transition to the circular economy, which systematically transforms waste into new raw materials and constantly recycles the same resources, in an almost never-ending cycle.

By giving a value to things that no longer had any value, this alternative economy makes things available that were previously scarce. It works its “magic” on obsolete electronic equipment which is turned into precious metals, on wastewater which is turned into bioplastics, on organic waste which is turned into fertilizer, and on used cooking oils which are turned into biofuels. As can be seen from these examples, one of the features of the environmental revolution is the hybridization of businesses. The water, waste and energy sectors increasingly overlap, to the point where the boundaries become blurred. The interaction between different kinds of know-how is always fruitful, and the future depends upon it.

There is a lot of talk about the energy transition for a low-carbon world, but less is said about the transition already underway in the mineral resources and water sector. However, just as the world of energy has found alternatives to fossil fuels in solar, wind or biomass, raw materials will, in the future, be produced in another way, from recycled waste. Water is evolving in a similar way: it will increasingly be an “*alternative*” water, obtained from unconventional resources such as wastewater, rather than coming from rivers or groundwater.

The potential of the circular economy is enormous. During this conference, several experts have dealt with the subject of mines. I can tell you that the garbage cans in the cities of developed countries are themselves a mine of another kind, with two remarkable characteristics: cumulatively, they constitute the biggest mine on earth; and they are continuously replenished, so they never become exhausted. But much remains to be done before the circular economy becomes genuinely widespread! On a global scale, three quarters of waste is not recycled; as for wastewater, 95% of it is not re-used...

Natural resources have now become too rare to be used only once: when one thinks waste, one must automatically think resources. When seen from this point of view, there is no such thing as waste, there are only resources that are little or poorly used. So let’s not call them waste any more, they are resources!

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The second merit of the circular economy is that it drastically reduces greenhouse gas emissions. In fact, failure to recycle waste increases the need for natural resources, the energy required to extract them from the ground, and thus CO₂ emissions into the atmosphere. Producing new raw materials by recycling waste emits a much smaller amount of greenhouse gases than extracting virgin raw materials from the earth.

The low carbon society is therefore not a utopia. Of course, we cannot master the climate, but we can decarbonize growth, we can produce in other ways, we can consume less oil and we can make the economy circular.

Being more frugal and efficient, this economy extends the cycle of raw materials, water and energy and provides an antidote both to over-exploitation of the environment and to environmental disaster-mongering. It teaches us something that is not theoretical but is based on facts – it draws inspiration from nature, in which everything is a resource. Seven centuries ago, Leonardo da Vinci was already giving this advice: “*Learn from nature, that’s where our future lies*”.

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But the natural cycles of materials are complex; to reproduce them artificially requires a high level of know-how and cutting-edge technologies. Hence the necessity for us to continue with our research efforts. Without this research, how would we increase the availability of scarce resources, and how would we detox an economy addicted to carbon? If the future had to happen with unchanging technologies, the fight against exhaustion of the environment and global warming would be lost in advance. By innovating, we will make the economy economical again¹.

The already substantial role of innovation will increase even further, since new scarcities call for the invention of new resources. Historically, scarcity stimulated extraordinary advances in human activities. Man organized himself to mitigate the insufficiency of goods, resulting in the birth of agriculture, animal husbandry and trading systems. The same now applies to raw materials, energy and water, where the dynamic link between scarcity and innovation has been unleashed once more.

Until now, mankind has always found the means to overcome the obstacles successively placed in its way by scarcities of various kinds. Will that be the case this time? In the end, our century must face up to very simple alternatives: innovation or lack of resources, new business models or climatic upheavals. Faced with a lack of strategic materials, with the extension of water stress and with climatic disturbances, the future may appear to be worrying; but it will appear to be even more worrying if we do not prepare for it. If we want to stabilize the increase in temperatures at 2°C, we must make the transition from a carbon-rich economy to a low-carbon one. And if we really want to protect the environment, we must change our current growth model, which is polluting and consumes so many natural resources, into a clean and abstemious one. This will require a three-fold effort on the economy: to decarbonize it, to dematerialize it and to dehydrate it.

There is a long way to go before less carbon-intensive modes of production and consumption, which are less expensive in terms of natural resources, become more widespread, whether in the scientific and technical fields, in the economic and financial sphere, or in the area of governance. The latter is a vital area, because the crisis in natural resources and the climate crisis are also crises of governance.

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Half a century ago, the biologist Jean Rostand warned us that: “*Man has become too powerful to play with the environment. His excessive strength condemns him to virtue*”. Today, the environment is affected by many ills, and it is no coincidence that it is our short-term-minded society that has invented the concept of sustainable development. Yet, in the face of shortages of resources or foodstuffs, and in the face of a deteriorating climate, neither man nor nature has had its final say. Solutions exist or are in the process of being invented, provided that we take account of the realities of the situation, and that we innovate and persevere. We know the way to be friends with the environment and to achieve a low-carbon world; all we have to do is to follow that path with determination.

Thank you for your attention.

¹ Cf. *Essai sur l'économie*, Pierre Calame, Éditions Charles Léopold Mayer, 2009