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## Supply Security – The Circular Economy

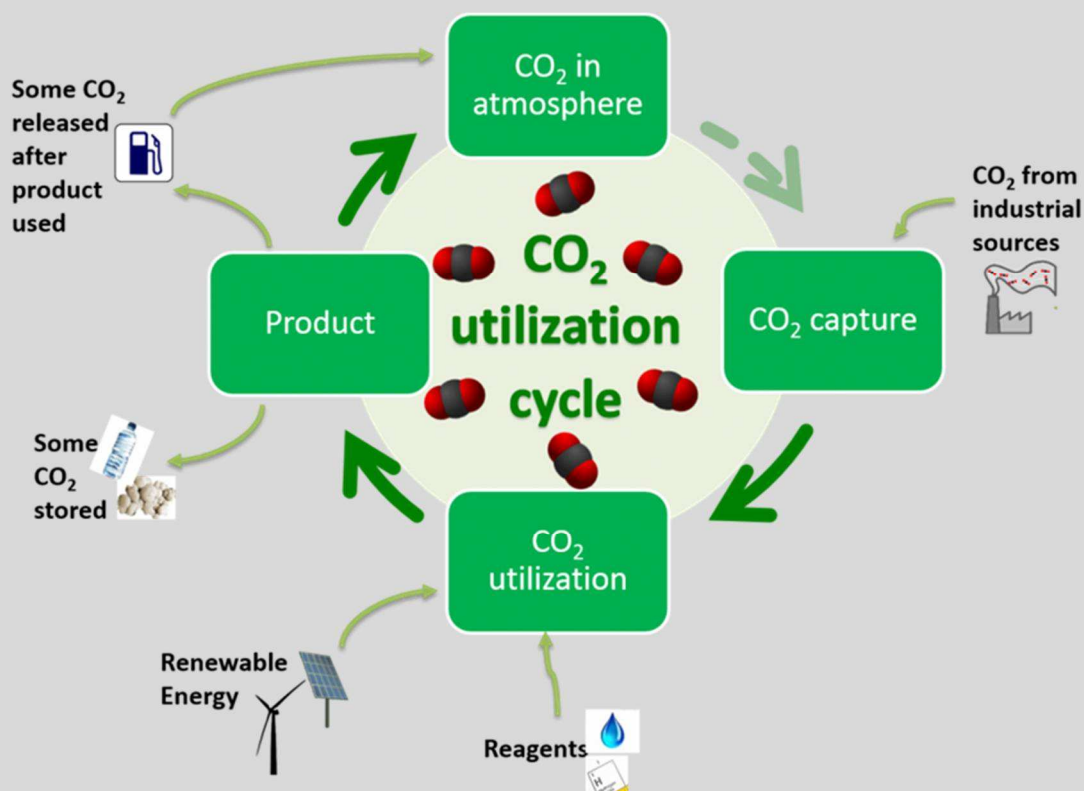
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### Abstract

What are the grand challenges facing science and engineering as we move towards 2050? Will it be an era of innovation or austerity? How can we at least preserve current lifestyles in the developed world while improving lives in developing countries?

Central to these questions are issues surrounding supply and security of energy and chemical feedstocks and commodities. Consider where our materials goods originate. Consider their use and very importantly their end of use. Energy is central as it not only produces predictable power output, it also is a major utility in the chemicals industries. Climate change mitigation issues will necessarily mean we need to reassess how we use energy and chemical feedstocks. However, is there a link between climate change mitigation and resource security?



Nature has evolved to provide energy and resources according to the needs of the environment. Human intervention has disturbed that equilibrium so we now need ways to re-establish equilibrium. Amongst the possible intervention technologies lie the concepts of renewable energy storage, carbon dioxide capture and utilization [1-4], materials recycling and the concept of re-manufacture.

The future is likely to be a compromise. Nature naturally re-cycles commodities. Different nations have different approaches to re-cycling. One of the great advances of the human race has been the development of chemical technologies that accelerate processes that nature carries out as standard. Natural product synthesis has led to drug replication and discovery. Catalysis is essential to over 90% of all industrial chemical processes. Process Intensification has allowed the rapid development of chemical production, from the discovery phase to realistic production over short time periods.

Looking towards 2050, we need to develop strategies and scenarios that will consider supply security. What strategies will be needed? As a starting point in the scenario consider where we were in 1980 and imagine creating a scenario for where we are now. Would the outcome match our expectations? What changed over that period of time?

How will the public respond to different scenario models [5]?

**Keywords:** Carbon Dioxide Utilization; Circular Economy; Energy Security; Re-Manufacturing; Resource Security

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