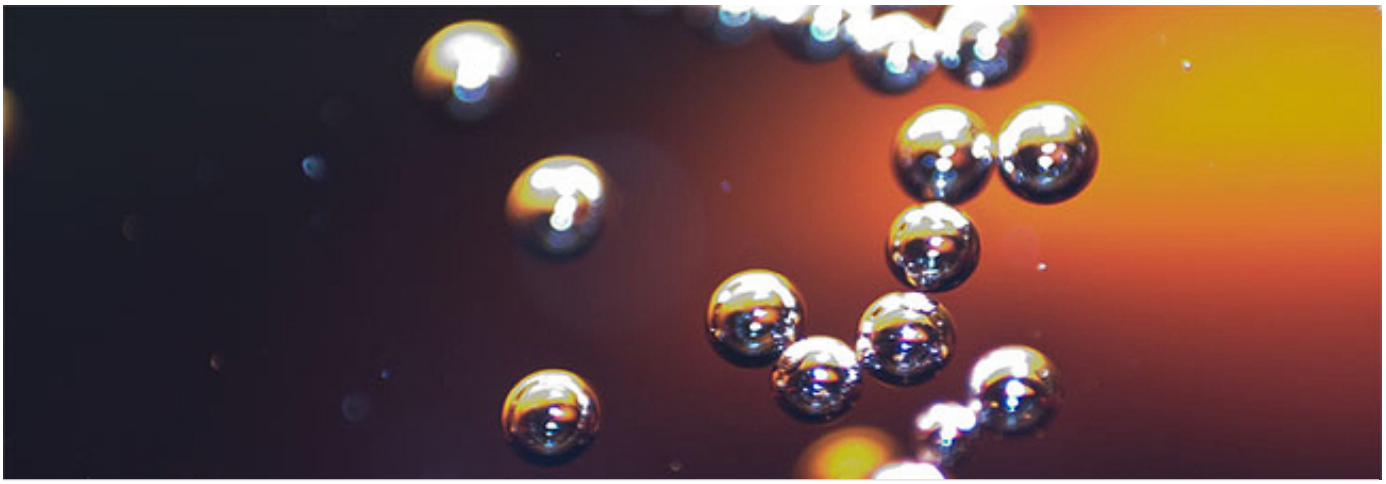
ELLEN MACARTHUR FOUNDATION
Rethink the future

Point of view: Treat emissions as resources, By Braungart & Mulhall

A wave of recent developments has rendered emissions trading schemes and EU carbon emissions taxes impotent. China banned its airlines from paying the EU carbon tax on airlines, nations failed to reach significant agreement on emissions in Durban, and Canada put the nail in the coffin of Kyoto by quitting it. The question arising from this string of failures is: How to solve the immovable object of emissions meeting the unstoppable force of economic growth?



Carbon bubbles in soda drink.

The answer is to see greenhouse emissions as resources instead of problems.

Surprisingly, this is not a new solution. For example, greenhouse growers globally have been using CO2 emissions as nutrients in their greenhouses for years and have actually been manufacturing the stuff. In this sense they have been making profits from turning greenhouse gases into true greenhouse gases.

Recently the respected German Fraunhofer Institute for Environment, Safety and Energy Technology calculated that up to 80 percent of CO2 emissions from German industry could be captured and reused by rooftop greenhouses that profitably produce crops. Fraunhofer has a joint venture with U.S. based organization Brightfarms to put CO2-capturing greenhouses on urban rooftops, and Fraunhofer is building its own facility in Duisburg.

The message is clear from this eye-popping CO2-capture calculation especially in the context of a calculation alongside a commercially successful history of CO2 reuse. Instead of relying on

ineffective emissions trading, or only attempting to minimise greenhouse gas emissions, the effective way to meet emission targets is to maximise their reuse as industrial resources.

The lesson has not been lost on schools. New York Sunworks is working with schools to put greenhouses on roofs as science teaching tools. In The Netherlands, the happyhealthyschool.com pilot project is building a rooftop greenhouse to use polluting CO2 from classrooms as a nutrient for plants.

Why is CO2 reuse a superior approach to emissions trading?

Various experts have already described the futility of emissions trading, but a short review is still instructive. Emissions trading is open to broad abuse as governments simply print certificates in the same way the ECB and Federal Reserve have been printing money to kick their problems down the road.

Nor will waiting for renewable energy to overtake fossil fuels bring short-term solutions. By the time renewables take over it will be too late for billions whose health is degrading due to poor air quality from emissions, causing financially ruinous strains on healthcare systems.

Nor will the conventional green approach of “eco-efficiency” being adopted by the EU and U.S. work. As industrial processes become more eco-efficient they become cheaper and as they become cheaper their growth rate exceeds savings from minimization.

This gusher of eco-efficiency leading to accelerated consumption is commonly referred to as the “rebound effect”, where efficiency accelerates the very problem it is intended to solve.

Scientists have been arguing for some time how to compensate for the rebound effect, but as the argument continues so do emissions.

One of the few effective ways out of this vicious cycle is to apply the rebound effect to the re-use of CO2. This is done by using efficiency to consume large amounts of CO2 for industrial production.

Simply put, CO2 is food. Its use can be accelerated as a resource for many industrial and agricultural processes.

In this way eco-efficiency is transformed into eco-effectiveness by accelerating the reuse of resources.

The seemingly counter-intuitive approach works this way:

Nature has been reusing CO2 since time began, to rebuild soil, grow forests and support life in our lakes and oceans. Through biomimicry it is possible for us to adapt and accelerate that process for profit. That basic transformation in approach and psychology leads to more productive solutions and investments.

Examples of biomimicry for greenhouse gas reuse include:

• Algae is one of the most effective carbon sinks on earth if the CO2 “release” side of its cycle is adapted for industrial reuse. Large scale algae production is feasible and profitable where algae is captured and reused in products before it can release its carbon back into the atmosphere. Algae can double profitably as a feedstock and purifier of agro-industrial effluent. This combination makes it financially attractive. A Florida-based company Hydromentia has been using algae to clean wastewater for two decades. Seaweed, which is a form of algae, has been harvested for centuries and the technology is now being optimized, also for removing nutrient pollution from waterways. Algae production is the focus of corporate investments globally and airlines such as Virgin prove that it works as a feedstock for biofuels, while the pharmaceuticals and agro-foods industries are lining up to produce profitable products from it.

• Micro-algae have a very interesting characteristic: they can store fatty acids for up to 50% of their dry weight, and have 30 times more productivity than terrestrial crops (soy, colza…). They do not require any chemical additives, and can be used in the water clean-up process, acting as filters to rid contaminated water of its toxic elements. In New-Zealand, the Aquaflow company has used the 60-hectare Marlborough sewage pond to carry out its tests, proving that many industries generating waste water could produce valuable micro-algae whilst purifying their discharge, since the organisms directly consume CO2… (1)

• Greenhouse agriculture is a bright light for feeding our growing population with its high productivity. Studies show that greenhouse production can be 5 – 10 times more productive than open field agriculture. Its existing re-use of CO2 as a nutrient for plants can be

greatly expanded with the added benefit of cleaning the air.

• Biodigestion for re-use of methane and nutrients is already being profitably expanded, instead of the counter-productive policy of subsidising burning of raw wood for “green” energy that is anything but green.

• Another less well-known approach is substituting the use of rare resources such as metals with nano-structured carbon based materials. These are not the nano-particles which are the focus of criticism for their potential health effects, but rather carbon-based structures as stable as steel or glass.

Micro-algae feed on CO2 and have 30 times more productivity than terrestrial crops (soy, colza…)

Skeptics claim CO2 reuse cannot keep up with the massive production of CO2 by society. However the earlier described Fraunhofer study challenges that assumption, and rapid scale-up of these technologies is proving large-scale CO2 reuse is feasible.

There is no doubt that reducing emissions with renewable energies and methods such as energy smart-grids are part of the solution. But the missing part of the equation is to start treating emissions as a resource for industrial and agro-industrial processes.

The fossil fuels industry took a halfway approach to this by capturing CO2 to put it in the ground at taxpayer expense. Known as Carbon Capture and Storage (CCS) it is largely done at taxpayer expense because no smart business would stick a valuable commodity unproductively into the ground.

Nor is CCS a solution for many other toxic aspects of fossil fuel production and use. The arguments on each side of the CCS debate are well advanced so no need to revisit them here.

The more important thing is to transform CCS into CCR; Carbon Capture Reuse.

Only through large-scale industrial reuse of emissions as resources will the emissions challenge be manageable.

About the authors

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(1) *Ellen MacArthur Foundation, this paragraph.*