

FEATURE

# Technology that Simulates Nature for Waste Upcycling

By Dr Corrado Sommariva

CEO and Founder, Sustainable Water and Power Consultants (SWPC)

**In nature there is no waste.** In a natural environment it is not possible to define the concept of pollution because there is no waste. The natural ecosystem recycles all matter completely in order to maintain the required level of nutrients and resources.

If there were no anthropogenic activities introducing elements into the environment, that are alien to the biosphere it would be possible in principle, to consider our planet as one immense biological and chemical reactor where the biological and chemical elements of the biosphere are constant but in continuous transformation from one form to another as schematically indicated in Figure 1.

### Anthropogenic activities and waste generation

The concept of waste and the related alteration and deterioration in the environment is associated with the emission of natural elements (such as CO<sub>2</sub>) that are discharged at a higher rate than the breathing and upcycling capacity of the planet or by the introduction generating an increase in their concentration in the planet.

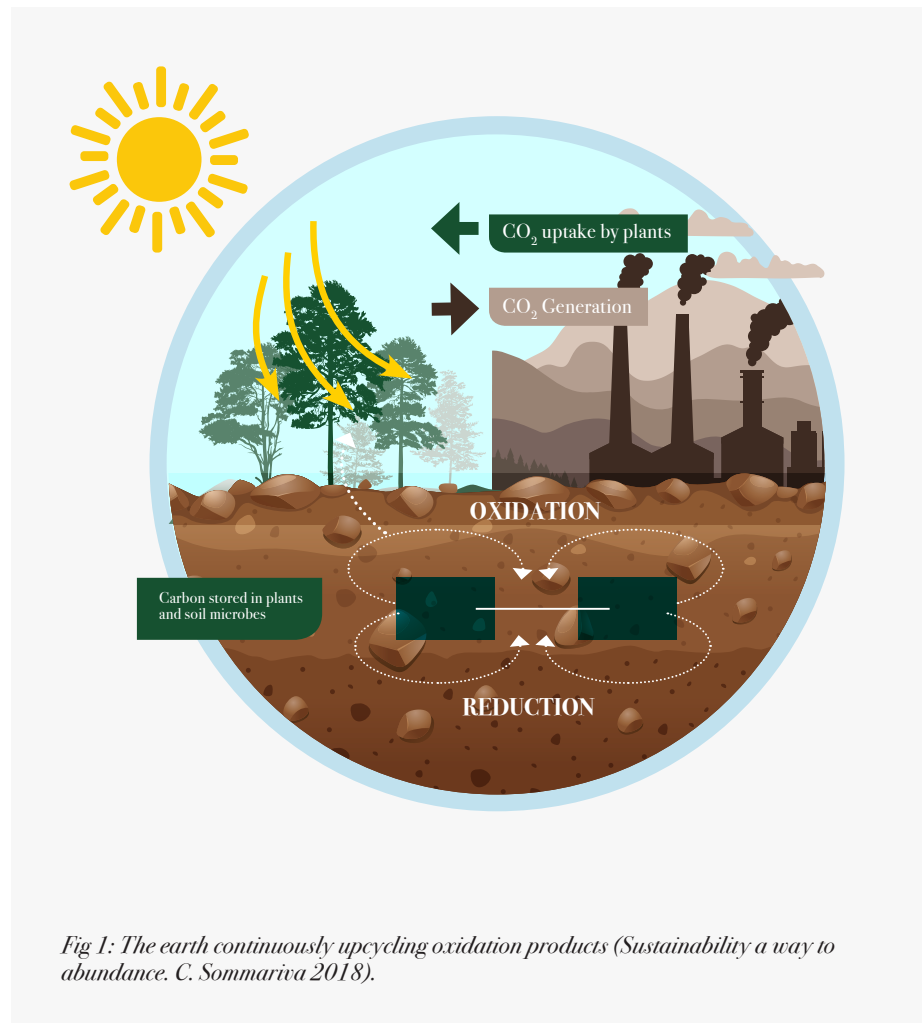


Fig 1: The earth continuously upcycling oxidation products (Sustainability a way to abundance. C. Sommariva 2018).

With the development of non-biodegradable material such as plastic, that is incompatible with the regeneration and upcycling capacity of the environment, waste products and toxins cannot but accumulate to critical levels.

### Technology and the way forward

As humanity progresses, it is impossible to let the natural ecosystem's upcycling mechanism to handle the amount and the typology of waste and pollution generated by anthropogenic activities. Therefore, technology has to imitate nature in upcycling waste and transforming waste into a resource with a process driven by renewable energy as indicated in Figure 2 below.

The scheme indicated in Figure 2 shows an alternative pattern that would reinstate the cycle that was originally in nature and, at the same time, enable the techno sphere to deal with the necessity of current living standards. As seen in Figure 2, while anthropogenic energy requirements are satisfied by renewable energy, more energy is extracted from the organic energy residue of the waste generated by anthropogenic activities. Waste also becomes the source of the material required from the techno sphere in a cycle that does not require withdrawal of more resources from the lithosphere for the manufacturing process.

Treated organic waste is then returned to the biosphere with all the biological nutrients that are necessary to it. In this cycle, the biosphere not only keeps renewing itself, but also storing solar energy in the form of additional resources, of a high chemical potential. At the same time, renewable sources may support humanity to reverse the environmental impact created as a result of this era of industrial development. Most importantly, with abundant and low cost solar energy a new wave of economic development can be driven that reproduces on a technological level, the generation usage production and storage scheme that occurs in nature.

With the scheme indicated above, the

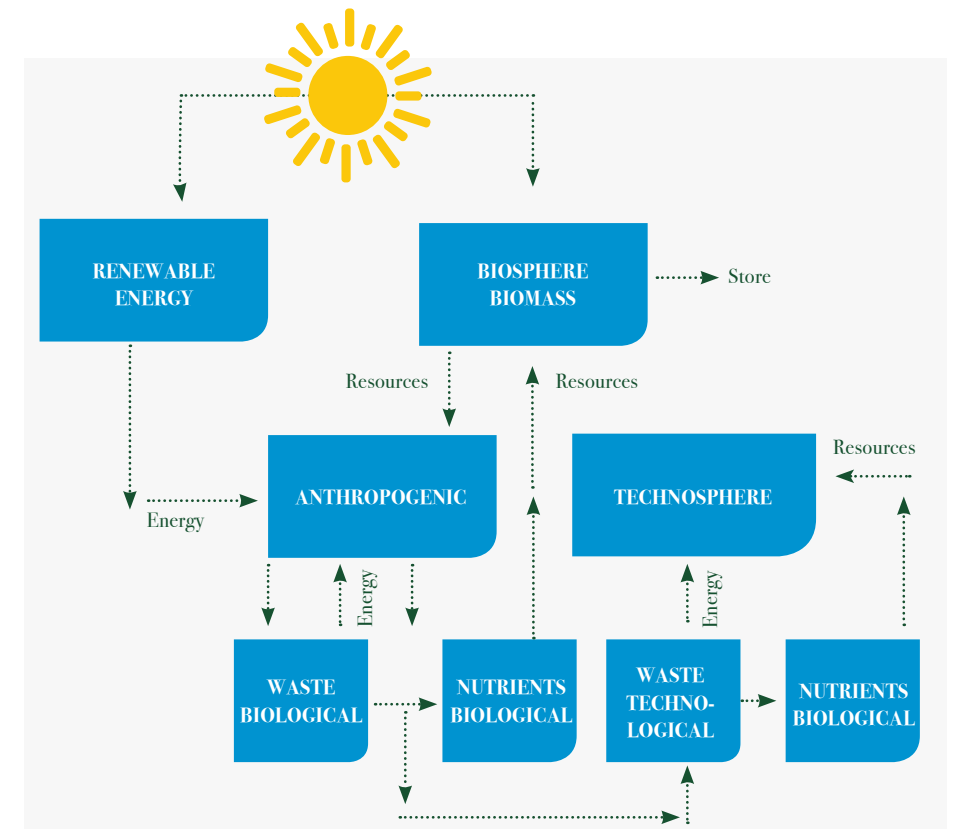


Fig 2: Future scenario generating and abundant flow of exergy and resources in future scenarios [Sustainability a way to abundance, C. Sommariva 2018]

waste in the biosphere and techno sphere are endlessly recycled and therefore, become nutrients for the anthropogenic products forever while solar energy accumulates more and more chemical elements in reduced form.

According to this scheme, the term waste itself would be no longer appropriate. Instead, it would be more apt to define waste as a downcycled element.

In this cycle, renewable resources are harvested for energy, and human waste is mined for resources while, the natural cycle continues enriching the planet by upcycling the nutrients and storing carbon in reduced form as well as other nutrients; both biological and technological.

### A positive trend that progresses

As time goes by, it becomes evident that wealthier societies that are highly tech-

enabled, generate a lower environmental impact, thanks to the support of technology and a cultural awareness of sustainability and the environment.

Countries that have developed higher technology, better economy and affluence, have also in turn managed to decrease environmental impact. For instance Germany and Sweden have no environmental impact related to waste discharge in landfills and recycle and compost majority of their waste.

### UAE LEADING THE WAY

The United Arab Emirates is paving the way to this positive trend in the GCC with the development of the largest waste to energy project plant located at Warsan site in Dubai, that will treat 5,000 tonnes per day of non-recyclable municipal solid waste generating an Yearly Net Power Production.