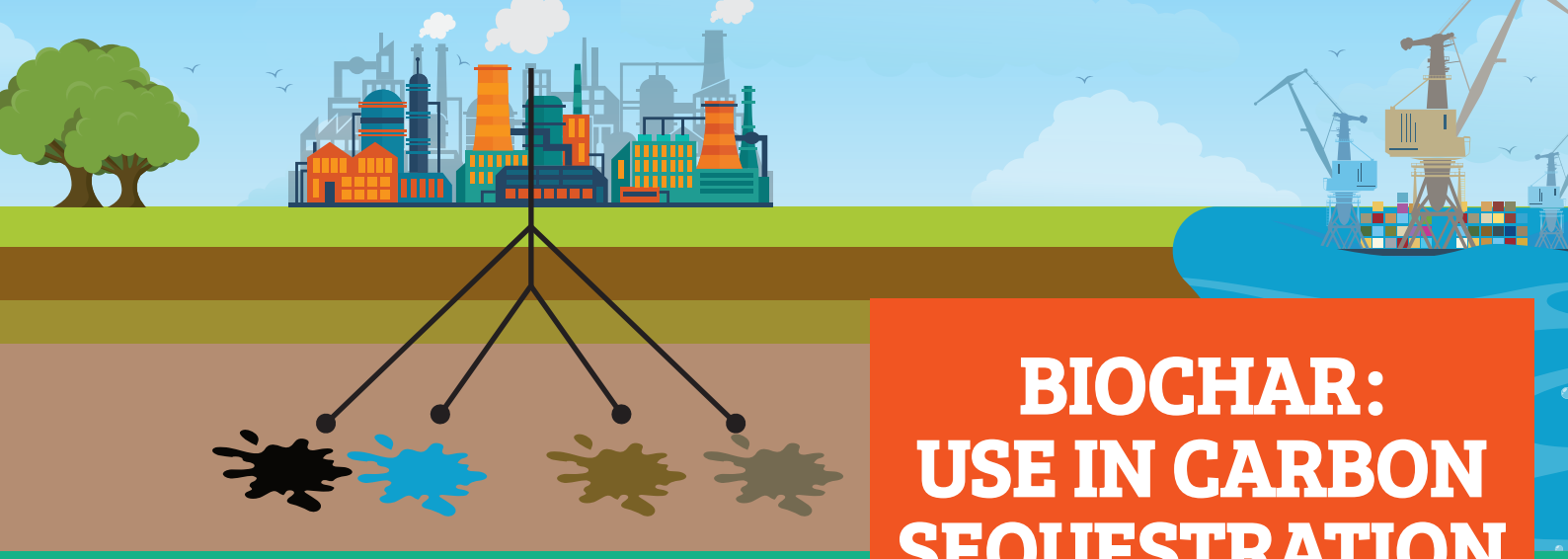

BIOCHAR: USE IN CARBON SEQUESTRATION

CARBON SEQUESTRATION AND CARBON SINKS

A carbon sink is a reservoir that stores more carbon than it releases, over an indefinite period of time. The main natural carbon sinks are plants, the ocean and soil. However, carbon sinks can be made artificially, for example, by capturing CO2 and storing it in the ground or ocean bed. Carbon sequestration is this process of capturing and storing atmospheric carbon dioxide, long-term. It is one method of reducing the amount of carbon dioxide in the atmosphere. The aim is to either mitigate or defer global warming and avoid dangerous climate change.

HOW CAN WE ARTIFICIALLY SEQUESTER CARBON?

Subsea sequestration

There are a number of subsea carbon storage schemes in operation, for example in Japan and Norway[1]. The process involves collecting CO2 emitted from industry, such as power plants and cement works, and compressing the gas to a liquid, then piping it under the seafloor for storage.

Rock sequestration

Dissolved carbon dioxide is turned into solid rock, mimicking the natural process of carbon being absorbed by basalt rock. This is being trialled in Iceland, where the CO2 from the powerplant is diluted in water, and piped under the ground where it mineralises into rock.[2]

Geological sequestration

This is where biochar comes in. If biomass is not converted to biochar it naturally degrades, contributing to greenhouse gases. Instead, biochar may be added to soils with the intention to improve soil functions and to reduce emissions from biomass otherwise naturally degrading into greenhouse gases. Furthermore, when natural ecosystems are converted to agricultural land, most carbon in the soil is lost to the atmosphere, as soil microbes decompose. If biochar is returned to agricultural land it can increase the soil's carbon content permanently and would establish a carbon sink for atmospheric CO2.[3]

WHAT IS BIOCHAR?

Biochar is made from biomass, via pyrolysis. Organic waste is burned in the presence of little or no oxygen. This process produces oil, synthetic gas (known as syngas), and a solid residue resembling charcoal: 'biochar'[4]. Biochar can be made from a much broader range of materials than charcoal can. Biochar can be made from wood chips, agricultural by-products, switchgrass, manure, bones, even human excreta.

SLASH AND CHAR VERSUS SLASH AND BURN

Studies of the unusual fertility of soil in the Amazon suggests that indigenous populations thousands of years ago produced a kind of biochar, through their particular method of burning biomass[5]. 'Slash-and-burn' methods use open fires to reduce biomass to ash, whereas 'slash-and-char' uses low-intensity smouldering fires covered with dirt and straw, for example, which partially exclude oxygen. Slash and char, rather than releasing CO2 into the atmosphere, sequesters carbon for thousands of years.

DOES IT REALLY WORK?

While subsea and rock sequestration are currently very new technologies: high tech and high risk, soil sequestration is more down to earth. Making minor changes to agricultural methods could make the world of difference. While more research is needed into how the sequestration varies by biochar type and soil type, evidence suggests it can be very successful in very low carbon soils[6]. The key questions are: is there enough biomass around to have significant impact on the atmospheric CO2 levels and, is there enough soil area for biochar dispersal?[7] Results appear positive. Some studies suggest, up to 50 percent of the biomass carbon can retained using the biochar sequestration method,[8] and estimates of up to 12 percent of global greenhouse gas emissions could be offset with biochar production[9].

OXFORD biochar