A new study has concluded that the benefits of carbon capture and storage (CCS) to human health and ecosystems from reduced climate change related impacts considerably outweigh any negative impacts from using the technology in power plants. However, CCS has a large impact on the depletion of natural resources.

**CCS is seen as a greener** way to operate power stations, whilst ensuring an energy supply, allowing society time to make the transition to a low-carbon future. Nevertheless, energy is required to drive the CCS technology, which can lead to other environmental impacts, including eutrophication, acidification and toxicity effects.

This study used life cycle impact assessment modelling to evaluate the potential damage to human health, ecosystems and resource depletion from three systems of power stations fitted with CCS technology: a pulverised coal (PC) combustion plant; a natural gas combined cycle (NGCC) power plant with post-combustion CO2 capture, and a coal-based integrated gasification combined cycle (IGCC) power plant with pre-combustion CO2 capture. All power plants were assumed to be newly constructed with an output of 400 megawatts. The captured CO2 was assumed to be transported 300 km by pipeline and injected into a storage site beneath the seafloor.

The study suggests that CCS produces climate change benefits as a result of reduced CO2 emissions. These benefits significantly reduce climate-related damage to human health, by 74% for PC, 78% for IGCC, and 68% for NGCC power plants with CCS, compared with conventional power plants without CCS.

However, CCS also appears to cause some damage to human health (calculated in terms of disability adjusted life years (DALY), a measurement of disease burden) in other ways, by increasing other non-greenhouse gas pollutants from the extra energy and materials needed for the technology: for example, from fuel extraction, transportation, infrastructure building, burning of fuel, CO2 capture, solvent production and waste treatment. The damage to human health is caused by the effects of ozone depletion, formation of particular matter, ionising radiation and photochemical oxidation. This damage offsets some of the climate-related health benefits, so that overall health benefits from CCS technology are reduced to 67% for the PC, 71% for the IGCC, and 63% for the NGCC power plants, compared with conventional power plants without CCS.

Similarly, climate-related ecosystem damage (measured by loss of species from a region in a year) is significantly reduced through the use of CCS technology, but the benefits are partly offset by emissions related to the CCS life cycle chain that increase acidification (for the IGCC and NGCC systems), eutrophication, terrestrial and freshwater ecotoxicity, and agricultural land occupation. Overall, however, CCS technology reduces ecosystem damage by 68% for PC, 73% for IGCC, and 66% for NGCC power plants compared with conventional power plants without CCS.

However, building and operating CCS technology significantly depletes natural resources. For example, extra energy is required for capturing the CO2 and this is mainly responsible for the depletion of fossil fuels, whilst the infrastructure required to transport the CO2 to storage is largely responsible for the increase in metal depletion.

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