# Carbon Sequestration Tower From NUST A Pioneering Technology For A Sustainable Future

National University of Sciences and Technology

Excess carbon dioxide ($CO_2$) in the atmosphere traps heat, intensifies the greenhouse effect, disrupts ecosystems, and accelerates global warming, making carbon removal an urgent necessity. A team of researchers at the National University of Sciences and Technology (NUST) in Pakiston led by Dr. Faheem Khokhar has made a significant breakthrough in environmental innovation with the development of the Carbon Sequestration (CS) Tower, a state-of-the-art technology designed to capture $CO_2$ emissions from ambient air and various industrial sources. With an impressive efficiency rate of up to 85%, the CS Tower can capture between 3 to 30 kg of $CO_2$ daily. This remarkable capacity far surpasses the carbon sequestration potential of a mature tree, which sequesters approximately 22.3 kg of $CO_2$ annually. This exceptional capacity highlights the CS Tower's capability to make a substantial impact on reducing atmospheric $CO_2$ levels. This significant milestone reflects the potential to address carbon emissions and contributing to global sustainability goals.

Furthermore, the CS Tower's versatility extends beyond carbon sequestration. It produces valuable by-products that are rich in potassium (K), an essential macronutrient for soil health

and plant growth. These potassium-rich by-products play a vital role in enhancing food security by supporting agricultural practices that can boost crop production and improve soil fertility. This dual impact on carbon mitigation and agriculture positions the CS Tower as a multifaceted solution for addressing both environmental and food security challenges.

The technology's scalability is another key advantage, enabling its use in various settings, from individual residences and vehicular fleets to large-scale industrial operations and national-level implementations. Its versatility supports multiple industries, including agriculture, glass manufacturing, food processing, textiles, and more by offering sustainable solutions for fertilizers, optical glass, soaps, detergents, and even energy storage in potassium-based batteries, contributing to eco-friendly practices across diverse sectors. Therefore, in addition to its primary applications, downscaled versions of the CS Tower have been developed:

- $CO_2$-Bins for Buildings: Targeting urban areas, this version captures $CO_2$ emissions from buildings, making it an effective tool for mitigating carbon footprints in residential and commercial properties.
- $CO_2$-Arrestor for Transport: Designed for the transportation sector, this adaptation captures emissions from vehicles, reducing the carbon impact of transportation.

The CS Tower and its derivatives represent scalable, cost-effective carbon capture solutions that address emissions.

Moreover, the CS Tower serves as an educational platform, engaging students, faculty, and the public through workshops and seminars aimed at fostering innovation in sustainability. This aspect of the product highlights NUST's commitment to raising awareness and inspiring the next generation of environmental leaders.

NUST's Technology Transfer Office (TTO) played a pivotal role in securing intellectual property rights and facilitating the successful commercialization of the CS Tower and its downscaled versions. The TTO began by ensuring that the technology was protected through 2x intellectual property (IP) filing, safeguarding the innovative aspects of the CS Tower design and its unique carbon capture capabilities. Once IP was secured, the TTO actively sought industry partners to bring the technology to market and NUST finalized a licensing agreement with Environmental Services & Sustainable Solutions Pvt Ltd. (ES3), a company recognized for its focus on environmental sustainability. This partnership allowed for the seamless transition of the CS Tower from a research prototype to a commercially viable product. The TTO's efforts not only ensured the protection of NUST's innovation but also facilitated its real-world application, contributing to both environmental sustainability and NUST's broader commercialization goals.

The CS Tower directly supports the United Nations Sustainable Development Goals (SDG) 13 by mitigating climate change through $CO_2$ capture, while its potassium-rich by-products enhance agricultural productivity, contributing to SDG 2. It promotes sustainable practices (SDG 12) and indirectly drives innovation, sustainable urban environments, and better public health (SDGs 9, 11, 3). Additionally, it fosters green job creation, supporting SDG 8. These connections emphasize the CS Tower's role in promoting a sustainable future and its alignment with global efforts to address

climate change and enhance quality of life.

Moreover, the university's development of the CS Tower shows its commitment to innovation and environmental stewardship. Its role in fostering technological advancements and driving sustainable solutions is a testament to its dedication to addressing global challenges.

In conclusion, the CS Tower represents a significant step forward in the fight against climate change. Its ability to capture carbon emissions, produce valuable by-products, and adapt to various applications, positions it as a promising solution for a more sustainable future. NUST's pioneering work in this field has the potential to inspire further innovation and contribute to a greener planet.

This story was originally published in 2025.