Framework for Carbon Neutrality Tech Announced

Policy Express

By SUN Jin

China has released a roadmap report that establishes a scientific framework to support the implementation of its carbon peaking and carbon neutrality goals.

Led by the Administrative Center for China's Agenda 21, the *Roadmap for Carbon Neutrality Technology Development* was released on July 25 after five years of research.

The report indicates that in 2021, China's net greenhouse gas (GHG) emissions reached the equivalent of 12.999 billion tonnes of CO_2 (including both CO_2 and non-CO_2 GHGs). To deliver on the "dual carbon" goal from this baseline, China faces challenges, such as substantial emission reductions within a tight timeframe, complex and diverse decarbonization scenarios, and competition in green industries, while opportunities also exist during this process.

To tackle these challenges, the report proposes four major transformations driven by the "dual carbon" goal: a shift in emission reduction paradigm from "intensity control" to "total amount neutrality"; regulatory system transformation from "energy consumption amount and intensity control" to "carbon emission amount and intensity control"; expanding governance scope from carbon dioxide to all GHGs; and innovation transformation from single-technology breakthroughs to system integration innovations featuring cross-disciplinary and multi-scale technological synergy solutions.

The Laba Mountain Wind Power Project in Dechang county, Liangshan Yi autonomous prefecture, Sichuan province. (PHOTO: XINHUA)

Additionally, the roadmap reveals three key characteristics of China's carbon neutrality technology development. In terms of technological maturity, most technologies remain at a relatively low level, with only about 20 percent of key technologies reaching commercial application, indicating a considerable gap before large-scale deployment. Second, as for economic viability, about 80 percent of emission reduction technologies currently impose higher product costs, with 35 percent of these technologies increasing product costs by over 50 percent. Third, most technologies deliver multifaceted benefits, encompassing pollutants reduction, enhanced energy security, andecological restoration.

Looking ahead, the roadmap further clarifies technological pathways and collaborative solutions for different phases. Prior to 2035, energy efficiency improvement technologies will play a primary role in emission reduction. From carbon peaking to 2050, the contribution of zero-carbon electricity and fuel substitution technologies will significantly increase. After 2035, carbon capture, utilization, and storage (CCUS) as well as carbon removal technologies will become increasingly prominent.

Nie Zuoren, leader of the roadmap's expert group and an academician of Chinese Academy of Engineering, said that the report was developed by over 100 leading experts from key sectors through five years of meticulous research, aiming to establish a carbon neutrality technology system aligned with China's resource endowment and development level, clarify technology development pathways, and overcome implementation bottlenecks.

He added that the roadmap not only supports China's "dual-carbon" goal scientifically but also set the direction for innovation in scientific research and industrial restructuring.

Ethical Innovation in Neurotechnology

By WANG Manxi & LIU Yin

China's Ministry of Science and Technology recently released an ethical guideline for human-related neurotechnology medical research, establishing dynamic and practical ethical requirements to standardize this discipline.

As a global cutting-edge research field and focal for technological transformation, advancements in neurotechnology promise new methods for preventing, treating and rehabilitating neuropsychiatric disorders. They also open novel research pathways to explore fundamental scientific questions about human mental process and the essence of consciousness.

"Neurotechnology can interact with the human brain directly. Particularly when integrated with AI, its ability to decode thoughts and interpret emotions and motivations is redefining the boundaries and paradigms of human privacy," said Zhai Xiaomei, a member of the National Science and Technology Ethics Committee and professor at Chinese Academy of Medical Sciences & Peking Union Medical College.

She emphasized that neuroregulatory interventions — capable of altering cognition, behavior or personality — may threaten essential human traits such as free will, personal identity and mental integrity.

To address these concerns, the guideline outlines seven specific ethical requirements for neural data collection, analysis and neuromodulation medical research, including privacy protection and data security, balancing benefits and risks, mitigating multiple risks. These provisions offer clear ethical guidance for responsible medical research.

"While advancing technology, we must establish robust ethical frameworks to safeguard human dignity and autonomy," Zhai said.

The guideline prioritizes preserving human dignity as a core principle, directly responding to neurotechnology's nature of deep intervention into fundamental human characteristics.

Zhai emphasized that improving health and well-being should be the primary motivation for neurotechnology medical research. From a social justice perspective, the guideline stresses limiting non-medical enhancements and cautions against attributing sociocultural phenomena solely to psychological "defects" — a bias that could medicalize complex societal issues.

Additionally, the guideline calls for standardized information feedback mechanisms, compliance with administrative licensing requirements, rigorous oversight of medical devices, strict adherence to ethical review processes, and clear accountability for all stakeholders.

"Technological feasibility does not equate to ethical justification. Responsible innovation in neurotechnology requires collaborative governance among researchers, regulators, ethicists and the public," Zhai said. She also revealed that the guideline will undergo periodic evaluation and updates to ensure they remain aligned with evolving scientific and ethical standards.

Chen Kangbai: Legendary Scientist Who Revolutionized Education

80 Years On
Salute to Scientists

By LIANG Yilian & ZHANG Qiang

At the end of 1937, a renowned scientist arrived in Yan'an, the revolutionary base of the Communist Party of China (CPC). His arrival caused a stir and caught the attention of the Party's top leadership.

After meeting him for the first time, Chairman Mao Zedong generously offered substantial support: "I can give you 20,000 yuan. Please see if there's something useful to do [with the money]. There's also a small arsenal and a broken-down oil plant. Please take a look and see if they can be of use."

At a time when an Eighth Route Army soldier's monthly stipend was just 1.5 yuan, the gesture highlighted the Party's faith in this scientist — Chen Kangbai, co-founder of the Yan'an Academy of Natural Sciences, the first science and engineering university established by the CPC and the predecessor of Beijing Institute of Technology.

On July 10, 2025, a new exhibition hall dedicated to the school's legacy opened in Yan'an, showcasing the scientific efforts that supported both the resistance against Japanese aggression and the economic development of the border region.

From Germany to Yan'an: joining the revolution

When the Lugou Bridge Incident marked Japan's full-scale invasion of China in July 1937, Chen, then studying in Germany, was overwhelmed with indignation. He gave up favorable research conditions abroad and returned to China to join the resistance.

He had been invited to the University of Göttingen by Nobel Laureate Adolf Windaus, and was highly respected — given his own lab floor and support for his wife to study and care for him. Chen was already a leading figure in Chinese chemistry at the time.

Despite Windaus' repeated efforts to retain him, Chen declined the offer. He packed his books and lab equipment, and with his family, embarked on the long journey home. After arriving in Changsha, a meeting with his mentor Xu Teli would change the course of his life.

"The CPC is the one firmly resisting Japan's invasion. If you want to save the nation, you must go to Yan'an and join the revolution," Xu told him. Inspired by these words, Chen made his way to Yan'an and, in 1938, officially joined the CPC.

Science for nation and survival

In May 1939, Chen was appointed to lead the preparatory committee for the Yan'an Academy of Natural Sciences, the first natural science research institution in the Shaanxi-Gansu-Ningxia border region. As vice president, he tackled numerous local challenges through science.

Yan'an faced a paper shortage, so Chen led the development of a new papermaking technique using malan grass. At a local textile factory, when production stalled, he worked and lived alongside workers to build workshops and calibrate machines, restoring operations in record time.

In 1940, he was also appointed director of the Sanbian Salt Industry Office, tasked with alleviating the region's severe salt shortage. Under his guidance, locals dug wells near brine springs, built salt pans, and used buckets to collect brine, which crystallized into fine white salt within days.

The method quickly spread, boosting production five-to six-fold and easing local fiscal difficulties.

In 1944, Chen moved south with the army, serving as the minister of the Military Industry Department of the Central Plains Military Region. In harsh conditions, he led the improvement of weapons production, developing powerful, easy-to-make wooden-handled grenades and new landmines. His efforts improved firearms repair and ammunition output, meeting the needs of the those on the battlefield.

Founding a school for science and revolution

Despite achievements in research, there was a pressing shortage of trained personnel. On March 15, 1940, the Secretariat of the CPC Central Committee approved the founding of the Yan'an Academy of Natural Sciences, aiming to train professionals who were well-versed in both revolutionary theories and natural sciences.

Chen threw himself into the academy's establishment. The school officially opened on September 1, 1940, offering programs in chemistry, mechanical and civil engineering, agriculture and forestry. It included university, high school, and middle school divisions.

He worked tirelessly to address enrollment and funding, and in May 1944, he was appointed the academy's president.

As *A Concise History of the Communist Party of China* published in 2021 notes, the Academy of Natural Sciences in Yan'an was "the CPC's first institution dedicated to scientific education and research."

Vibrant China

Inner Mongolia Powers Ahead with Green, Tech Breakthroughs

By Staff Reporters

Inner Mongolia in north China is demonstrating significant progress in technological advancement, green development, and ecological protection. The region has become a national frontrunner in driving industrial transformation, energy reform, and environmental sustainability.

Breakthroughs in technologies

A Technological Breakthrough Project integrates innovation with the region's industrial strategy. The initiative focuses on emerging fields such as rare earths, hydrogen energy, energy storage, low-altitude economy, AI, and biotechnology. The dairy industry is also a focus.

Seventeen major tasks have achieved breakthroughs. They include rare earth permanent magnet motors for hypersonic aircraft, sodium-ion hybrid capacitor energy storage, key technologies and equipment for hydrogen production via water electrolysis, and new methods for efficient lactoferrin extraction. These innovations have reached leading levels in China and are expected to drive the next wave of industrial and scientific development.

Advancing low-carbon industries

According to Zhang Guangshou, an official at the Department of Industry and Information Technology, Inner Mongolia, the region is committed to a green and low-carbon transition. Efforts include phasing out restricted production capacities, upgrading energy and water-saving technologies, and launching green manufacturing demonstration projects.

Since the 14th Five-Year Plan period (2021-2025), the autonomous region has saved the equivalent of 12 million tonnes of standard coal and 56 million tonnes of water, reducing carbon emissions by over 30 million tonnes. Energy consumption per unit of industrial output has dropped by 13 percent.

The region also formulated China's first zero-carbon industrial park standard and launched six low- and zero-carbon park pilot projects. The Baotou, Ordos, and Chifeng high-tech zones were selected among the country's first 35 carbon peaking pilot areas, according to Zhang.

Over 65 percent of key industrial processes and R&D tools have been digitalized, placing Inner Mongolia in the national second tier for industrial digital integration.

Leading in energy and ecology

The region's energy economy saw rapid growth in 2024, ranking first domestically in 15 categories, including total and newly installed renewable energy and green hydrogen capacity, power generation, coal production and coal-to-gas output. It was also the first in the country to surpass 100 million kilowatts of new energy capacity, according to Hu Chengdong, deputy director of the region's Energy Bureau.

On the ecological front, the autonomous region continues to lead in afforestation, grass planting, and desertification control. Since the 18th National Congress of the Communist Party of China in 2012, nearly 150 million mu has been afforested, over 360 million mu of grassland planted and more than 180 million mu of desert brought under control. One mu is approximately 666.67 square meters.

Forest coverage and grassland vegetation have steadily increased, while desertified land continues to shrink, marking a historic shift from "desert advancing and humans retreating" to "greenery advancing and desert retreating," according to Tie Niu, deputy director of the Forestry and Grassland Bureau of Inner Mongolia.

On August 3, 2025, tourists take photos at the Chilechuan Grassland in Hohhot, Inner Mongolia autonomous region. (PHOTO: XINHUA)

China, ASEAN Initiatives Popularize Science

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According to Li, the exchanges and cooperation between Guangxi and ASEAN countries on scientific popularization include organizing exchanges between teenagers, sharing resources, and building venues. For instance, through activities such as "Sending Training to ASEAN" and "Teaching the Same Science Lesson Together," high-quality scientific popularization resources are delivered to ASEAN countries.

The exchanges with ASEAN countries have also enriched resources for popular science activities in Guangxi, and enhanced friendship and understanding, said Huang Xinghua, director of the Guangxi Science and Technology Museum.

The museum is preparing for an ASEAN science exhibition. The AI science popularization exhibition by the museum will be moved to the China-ASEAN Technology Transfer and Innovation Cooperation Conference.

In addition, a new science museum is under construction in Pingxiang, Guangxi, where the Youyiguan Port (Friendship Pass) is located on the China-Vietnam border. It is expected to be completed in October and will become a new landmark for science communication between the two countries.