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# Science & Technology

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## Economic Development Is Most Efficient Answer to Climate Challenge

“Economic development is the only proven path to climate resilience,” say Ted Nordhaus, Vijaya Ramachandran, and Patrick Brown in “The Obvious Climate Strategy Nobody Will Talk About,” [published](#) Nov. 6, 2022 in *Foreign Policy*. They observe that the greatest determinant of the effects of a changing climate on human life is not the change itself, but the *level of development put in place to make societies independent of weather variations*. They write:

“The world hasn’t, in recent decades, made much progress on cutting overall emissions. But it has become much more resilient to all kinds of climate extremes.... The average resident of Earth today is more than 90% less likely to die from floods, droughts, storms, or other extreme climate events today than in the 1920s—and that’s almost entirely the result of a phenomenal decline in the number of people living in poverty without access to such things as safe housing, functioning infrastructure, and good institutions.”

Flooding in China in 1887 took perhaps 2 million lives; flooding in 1931 killed up to 4 million. Famines have killed millions in China. But today, flooding deaths in China are below 500 per year, and there has been no famine in decades. Why? Development! Even when there are natural disasters, say the authors,

“the human and economic costs of a natural disaster are almost never determined primarily by the intensity of the climate extreme. Rather, those

costs are largely determined by how many people are in harm’s way and how well adapted to the hazard those populations are.”

While Al Gore dismissed *climate adaptation* in his 1992 propaganda book, *Earth in the Balance*, as a “kind of laziness, an arrogant faith in our ability to react in time to save our skins,” it is economic development that is the pathway to climate resilience. Most of the mechanisms that increase this resilience use energy—lots of it: Synthetic fertilizers, made using natural gas, increase crop yields and defend against famine. Cheap and reliable electricity makes possible irrigation by desalination and water pumping. Refrigeration prevents the kind of waste seen in Nigeria, for example, where 45% of fresh produce rots for want of it. Ionizing radiation of food will even further improve safety and shelf life. Roads, dikes, dams, hospitals, transportation—all protect humanity from climate and weather risks.

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## EAST Tokamak Achieves ‘Super I-Mode’ Plasma Confinement

*World Nuclear News* [reported](#) Jan. 9 on a new milestone in fusion work. According to its abstract:

“A new mode of improved plasma confinement was discovered and demonstrated [in December 2022] at the Experimental Advanced Superconducting Tokamak (EAST), the Hefei Institutes of Physical Science, Chinese Academy of Sciences announced. It said the new high-confinement and self-organizing Super I-mode “represents the reliability and advancement of the

machine itself but also offers insights into how to better maintain the plasma operating stably and for long duration.”

“I-mode” refers to a set of Tokamak operating parameters that create a strong energy barrier near the plasma edge, while allowing substantial particle and impurity transport across the barrier to reduce plasma contamination. EAST achieved a “plasma super-I mode,” *maintaining a stable plasma for nearly 20 minutes* not only in the deep plasma, which has been done in other experiments, but at the edges of the plasma as well, preventing them from interacting with and degrading the chamber walls. EAST engineers describe the plasma as “calm” for long durations—it is clearly *self-organizing*. Furthermore no impurities accumulated within the plasma for the entire duration of the pulse. This was at about 70 million degrees Centigrade.

According to *World Nuclear News*, “the researchers said that in addition to improved energy confinement, the Super I-mode also has advantages over other scenarios, such as no metallic impurity central accumulation at the core, the particle flux on the divertor remained extremely stable, and sustained quiet stationary plasma-wall interactions.” Their results were published in *Science Advances*.

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## Parker Solar Probe ‘Touches’ the Sun

For the first time in history, a spacecraft, the Parker Solar Probe (PSP), has “touched” the Sun, passing into its upper atmosphere—the corona—gathering data on particles and magnetic fields. The American Geophysical

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Union made the announcement in a press conference Dec. 14.

The corona is the portion of the Sun visible during a total eclipse, and is hotter, but about 10 million times less dense, than the surface. Scientists are exploring why this is so.

Thomas Zurbuchen, Associate Administrator for the Science Mission Directorate at NASA's headquarters in Washington, said:

"[The] Parker Solar Probe 'touching the Sun' is a monumental moment for solar science and a truly remarkable feat. Not only does this milestone provide us with deeper insights into our Sun's evolution and its impacts on our solar system, but everything we learn about our own star also teaches us more about stars in the rest of the universe."

"The first passage through the corona, which lasted only a few hours, is one of many planned for the 7-year mission. PSP will continue to spiral closer to the Sun, eventually reaching as close as 8.86 solar radii [a little over 6 million km] from the surface."

The complete release and a video are available [here](#).

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## New Satellite for Better Water Management on Earth

A SpaceX rocket launched the Surface Water and Ocean Topography (SWOT) satellite Dec. 16. The first satellite specifically designed to conduct a global survey of Earth's surface water, SWOT was developed by NASA and France's National Center for Space Studies, with contributions from the Canadian and UK space agencies. As [reported](#) by Space.com, the satellite is a game changer. It is designed to study changes in global water levels and provide, in unprecedented detail, 3D volumetric data for Earth's oceans and its millions of lakes

and rivers across 90% of the globe every 21 days. If used to promote the common good, this new capability will enable precision upgrading of water management systems to provide increased food production and escape from the twin evils of droughts and floods.

SWOT's primary instruments are its nadir altimeter and the Ka-band Radar Interferometer (KaRIn). KaRIn consists of two antennas which independently and stereoscopically receive readings of Earth's surface, providing 3D imaging. Using the satellite's position data and subsequent phase differences in signal reception, SWOT is capable of measuring water depths within a margin of error of 1 cm!

SWOT will track nearly 2.1 million km of rivers and millions of lakes, and will be capable of monitoring coastal sea levels to provide oceanic data for articulation with other on-orbit sources. To help sort through the incredible amount of data SWOT will generate, NASA plans to make the mission's information publicly available and is developing tools to make it easy to access.

During the science briefing Dec. 13, Benjamin Hamlington, research scientist for the Sea Level and Ice Group at NASA's Jet Propulsion Laboratory in Southern California, predicted that SWOT data will be useful for coastal communities, civil engineers, water resource professionals, scientists researching flooding and drought, and more:

"Really, anyone who cares about water should be concerned about what SWOT can provide. Some locations have too much water; others don't have enough. We're seeing more extreme droughts, more extreme floods; precipitation patterns are changing. It's really important that we try to understand exactly what is happening using the SWOT data."

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## Djibouti To Get Africa's First Spaceport

The tiny African nation of Djibouti, at the southern end of the Gulf of Aden, in partnership with Touchroad International, has just signed a deal with Hong Kong Aerospace Technology for construction of a facility to launch satellites and rockets that is expected to include seven satellite launch pads and three rocket testing pads. It will be Africa's first spaceport.

The government of Djibouti will provide at least 10 km<sup>2</sup> of land with a lease term of not less than 35 years and all necessary assistance to build and operate the spaceport. The \$1 billion project, to be completed in 5 years, will feature a port facility, a power grid, and an access highway.

Ismail Omar Guelleh, President of Djibouti, presided at the signing. The preliminary deal clears the path for a formal contract signing in March.

Victor Mwongera, Head of the Department of Mechanical Engineering at Kenyatta University, said the spaceport would serve all Africa. He sees the expansion of Africa's space industry as a growing trend. A number of African countries are already building and operating their own microsatellites. He said,

"It will push eastern Africa off the sleeping state as far as active development of space-based innovations are concerned. It has taken time, but we needed time as a continent to be ready for this age.... [T]oday in Africa, there are many young minds interested in the field, it's all promising."

As [reported](#) Feb. 1 in *Quartz*, 14 African countries have launched 52 satellites. South Africa, Egypt, Algeria, and Nigeria have the highest number, each with more than five satellites.

Mwongera said that East African countries, being near the equator, are a good choice for spaceports. He currently leads a team planning a spaceport in Marsabit County, Kenya.