



# TRACKS

Mexico – Netherlands

## Innovation for Social Welfare

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## MESSAGE FROM THE EMBASSY

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This issue of Tracks is dedicated to two priority topics for sustainable development and technology: Climate change and the exploration of outer space. Climate change poses a common challenge for humanity, requiring global attention and action from all states through mitigation and adaptation policies. Both Mexico and the Netherlands have highlighted their commitment to combat the environmental crisis and achieve the Sustainable Development Goals (SDGs) set by the United Nations. This issue aims to showcase the initiatives implemented by both countries to address the climate crisis in the public and private sectors.

The "Common Tracks" section highlights innovations in the solar panel sector by both countries. Mexico has developed solar cells using perovskite, significantly increasing efficiency. Meanwhile, the Netherlands leads in solar energy capacity with notable advancements like the innovative 'Powerfoil', a solar film that detects panel defects. In the "Innovating in Mexico" section we explore initiatives to improve water policies and management, including a project led by the Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO, a university in Guadalajara, and efforts by the NGO Espacio de Encuentro de las Culturas Originarias (EECO), recognized at COP28 with the Global Climate Action Award. Similarly, in the "Innovating in the Netherlands" section, initiatives promoting environmental sustainability such as innovative sustainable pavement contributing to urban green areas, and smart windows developed by Brightlands Materials and TNO, committed to a more sustainable future, are presented.

Human creativity has led us to explore space as an alternative source for resources. Hence, the "News from Mexico" section highlights the 'Colmena' initiative, aiming to make mining in space viable through mini robots as a sustainable long-term option. Lastly, the "News from the Netherlands" section addresses the development of space microchips contributing to more sustainable space research.

We hope that this publication is of interest to you. Do not hesitate to share your comments with us via this email address: [cooperacionpba@sre.gob.mx](mailto:cooperacionpba@sre.gob.mx).

**Embassy of Mexico in the Netherlands**

# COMMON TRACKS

Mexico and the Netherlands share a strong determination to drive innovation in the field of solar energy.

## MEXICO

### **Developing More Efficient Solar Cells with Perovskite Mineral.**

The innovation in perovskite solar cells emerges as a ray of hope in Mexico's energy landscape. Due to the unique properties of perovskites, solar cells produced with this mineral will be more efficient and less costly, making them a competitive alternative to solar cells made with traditional technologies.

These cells, composed of titanium trioxide and calcium, offer key advantages such as high conversion efficiency, processing versatility, and reduced material requirements. In this regard, the joint project between the National Autonomous University of Mexico's Institute of Renewable Energies (IER)



## THE NETHERLANDS

### **The Netherlands, Leader in Solar Energy Capacity.**

In the transition towards cleaner and more efficient energy, the Netherlands stands out as a global leader, solidifying its position as the nation with the highest per capita solar energy capacity in the world. In 2023, the total solar panel capacity reached 24.4 gigawatts, representing a 17% increase from the previous year.

This innovative landscape is supported by various initiatives, among which three stand out: "Powerfoil"; a machine that detects defects in solar panels without cutting them; and the resilient and recyclable panels from SAM Panels. Powerfoil is a thin solar film that could revolutionize the industry for several reasons.



## MÉXICO

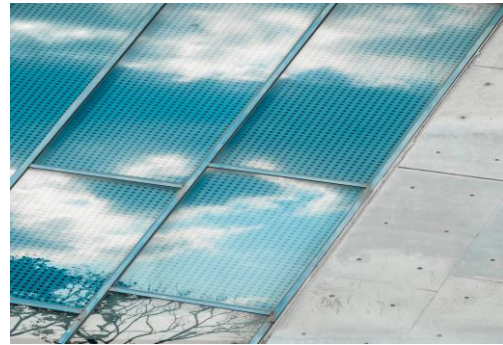
and Solarever, led by Diego Solís Ibarra from the Institute of Materials Research (IIM) of UNAM, aims to overcome the limitations of conventional solar panels while making significant advances in solar energy efficiency and sustainability. Furthermore, the joint Project, IER-UNAM/Solarever, is developing printable technologies for the large-scale manufacturing of perovskite solar cells, using green solvents and being environmentally friendly. This approach represents a significant advancement for the solar panel manufacturing industry at both the national and international levels, as it will contribute to making this process more environmentally friendly.

The innovation in perovskite solar cells has emerged as a crucial catalyst, bringing a significant change in Mexico's energy landscape and reinforcing the trend towards a more sustainable matrix.



## PAÍSES BAJOS

First, its flexibility and durability. Second, it's more cost-effective than conventional solar panels, estimating a savings of 25% to 33%. Third, it contributes to relocating solar production to Europe, reducing emissions associated with transportation. Powerfoil has been developed by HyET Solar, securing a €29 million investment for the project.



Meanwhile, TNO, Holland Innovative, and Stogger are developing a machine that enhances the quality and reliability of solar panels. By detecting defects without cutting them, using electroluminescence and photoluminescence

Lastly, the SAM Panels project enables the manufacturing of resilient and recyclable panels using natural fibers like hemp, grass, and cow dung. This innovation provides an eco-friendly alternative to traditional materials and advocates

This initiative represents a unique opportunity to lead the transition towards cleaner and more efficient energy sources while promoting close collaboration between the scientific research sector, businesses, and the innovation ecosystem, in line with the triple helix model.



[https://www.dgcs.unam.mx/boletin/bdboletin/2023\\_844.html](https://www.dgcs.unam.mx/boletin/bdboletin/2023_844.html)

<https://energiahoy.com/2023/08/04/colaboran-ier-unam-y-solarever-en-innovacion-para-paneles-solares>

<https://factorenergetico.mx/sector-energetico-balance-2023-escenario-2024/>

[http://www.anuies.mx/noticias\\_ies/elaboran-celdas-solares-ms-eficientes-con-mineral-perovskita](http://www.anuies.mx/noticias_ies/elaboran-celdas-solares-ms-eficientes-con-mineral-perovskita)

for a fair income model for farmers and a CO2 tax to promote the use of eco-friendly materials.

These innovations demonstrate the essential role of flexible technology and agricultural integration in the transition towards a more sustainable future in solar energy.



<https://innovationorigins.com/nl/tientallen-miljoenen-naar-hyet-solar-impuls-voor-solar-maakindustrie-in-nederland>

<https://www.tno.nl/nl/newsroom/2023/11/solarmilk-zonnesystemen-landbouw/>

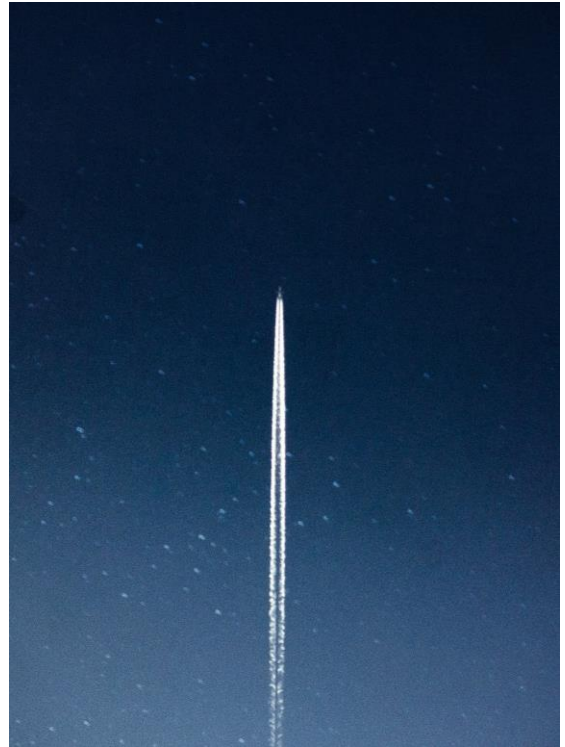
<https://www.change.inc/infra/koemest-hennep-en-gras-dit-bedrijf-maakt-er-panelen-van-en-wil-flink-opschalen-40654>

## NEWS FROM MEXICO

### The Colmena Mission: Opening New Borders.

In a bold step towards the future of space exploration, the "Misión Colmena", led by the Space Instrumentation Laboratory (LINX) at the National Autonomous University of Mexico (UNAM), emerges as a groundbreaking initiative. Directed by Dr. Gustavo Medina Tanco, this project not only marks a milestone in the history of space exploration but also provides a unique opportunity for over 250 Mexican students, who contribute to the development of technological and aerospace skills.

The central innovation of the Colmena Mission lies in developing autonomous micro-robots capable of conducting lunar exploration. Beyond data collection, these micro-robots aim to prospect natural resources, engage in mining activities, and contribute to the construction of structures on the surface of the Moon and asteroids. If successful, this project would not only expand our cosmic frontiers but also open new perspectives for future



missions and technological applications in space.

The micro-robots developed by LINX are designed with advanced features, including wheels, fins, flexible solar panels, and a variety of sensors and microprocessors. They weigh 57.4 grams and measure 12 centimeters by 5.4 centimeters. Despite their lightness and small size, they are capable of overcoming obstacles on the lunar surface, moving, and operating in challenging extraterrestrial environments.

The Colmena Mission is part of a series of three space missions, with the fundamental goal of developing a unique technological capability at an international level. This project, along with the missions planned for 2027 and 2030, aims to position Mexico as a relevant player in future strategic alliances on the Moon and asteroids, within the framework of NASA's ambitious Artemis project.

Although the first phase of the Colmena Mission did not succeed in reaching the Moon, due to a failure of the Peregrine module carrying the robots, the Mission has managed to achieve over 75% of its objectives, marking a significant milestone in the country's technological advancement in space. The Peregrine spacecraft reached deep space, reaching a lunar distance of approximately 385,000 kilometers from Earth. In this context, the Colmena micro-robots carried out pioneering tests to operate miniaturized technology in conditions similar to those on the Moon.

The Colmena Mission, supported by the Mexican Space Agency (AEM), CONACyT, and UNAM,

stands out for its resilience and long-term vision, reinforcing the commitment to the project's future phases and highlighting the importance of international cooperation in the fields of innovation and space exploration.

In addition to its technological feat of employing micro robots on the Moon, the Colmena Mission paves the way for new frontiers in space mining and construction. Mexico emerges as a prominent player in space exploration, promoting a narrative of global scientific and technological collaboration in the pursuit of cosmic discoveries.



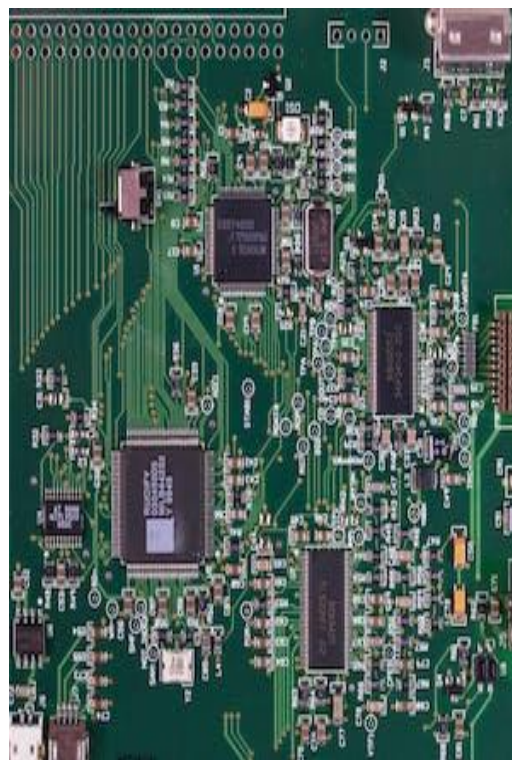
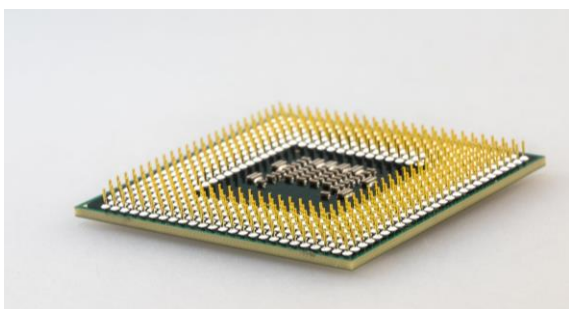
Dr. Gustavo Alonso Cabrera Rodríguez. – Representante de México ante la Agencia Latinoamericana y Caribeña del Espacio. [cabrerarodriguezgustavoalonso@gmail.com](mailto:cabrerarodriguezgustavoalonso@gmail.com) y <https://elpais.com/mexico/2024-01-09/mision-colmena-unam-que-es-fases-y-a-donde-se-dirige-el-proyecto-espacial-peregrine.html> <https://elpais.com/mexico/2024-01-22/con-polvo-lunar-simulado-y-250-estudiantes-asi-crearon-en-la-unam-los-primeros-robots-en-explorar-el-espacio-profundo.html> <https://innovationorigins.com/nl/met-hulp-van-holland-innovative-en-stogger-kan-tno-nu-defecten-in-volledige-zonnepanelen-ontdekken/> <https://elpais.com/mexico/2024-01-19/la-unam-se-despide-del-proyecto-colmena-1-tras-la-desintegracion-de-la-mision-peregrino.html> <https://spacehub.cl/culmina-la-mision-colmena-de-la-unam-hacia-la-luna/>



## NEWS FROM THE NETHERLANDS

### Spherical Systems: Streamlining Space Microchips.

The startup Spherical Systems is designing space microchips with the potential to transform the economy and efficiency in the space sector. They do so by producing high-performance microchips for satellite applications at a substantially lower cost than traditional alternatives. The central goal of this project is to streamline the manufacturing process of space microchips, offering more affordable and efficient solutions through the use of emerging techniques in the semiconductor industry. This technological improvement results in more compact, lightweight, and reliable systems with software configuration capability. This represents a significant advancement in resource optimization and democratization of access to space.



Once consolidated, this technology will foster space exploration and research by making it more sustainable and efficient.

<https://innovationorigins.com/nl/een-miljoen-voor-ruimtevaart-start-up-spherical-systems/>  
<https://commercialisation.esa.int/2023/11/spherical-systems-chip-design-drives-satellite-power-management/#:~:text=Spherical%20Systems%2C%20a%20start%2Dup,the%20extreme%20conditions%20in%20space.>

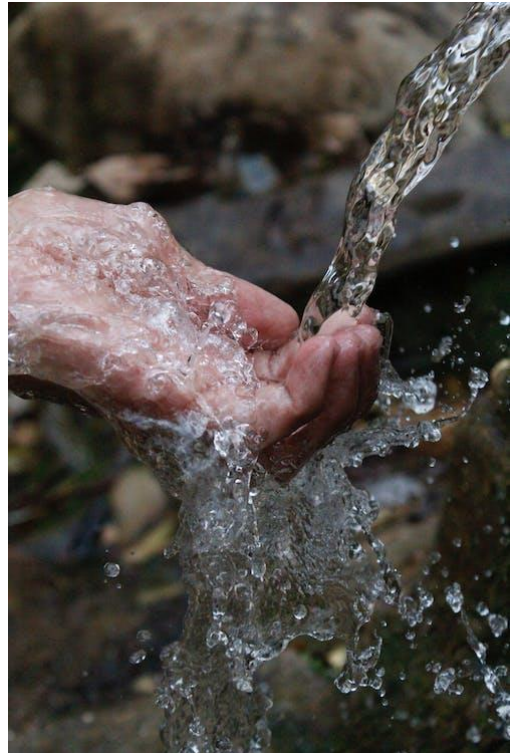
# INNOVATING IN MEXICO

## ITESO Project Revolutionizes Aquifer Monitoring in Guadalajara

The research group in hydrological engineering and systems at the Instituto Tecnológico y de Estudios Superiores de Occidente (ITESO) is developing a technological system based on sensors that will revolutionize the monitoring of aquifers in the Guadalajara Metropolitan Area (ZMG). It will provide real-time information on various variables such as temperature, piezometric level, and electrical conductivity (an indicator of contamination).

The proposed system aims to measure the fundamental variables of aquifers in detail, allowing for a better understanding of their behavior and facilitating informed decision-making on the management of this natural resource. This technological innovation represents a key tool for addressing groundwater issues, which constitute approximately 97% of usable water resources worldwide, yet are largely unknown.

The project also addresses technical challenges such as variable sensing distance and real-time transmission,



through the design of specialized circuits by ITESO. These circuits are designed to prevent possible water contamination by heavy metals such as lead, cadmium, or mercury, and are characterized by low energy consumption, aligning with the university's sustainability goals.

The multidisciplinary approach of GIISH, involving academics from different departments including Electronics, Systems and Informatics, Technological Processes and Industries, and Habitat and Urban Development, provides a comprehensive perspective to this project. Additionally, the project is supported by a grant of one million Mexican pesos from the State Council of Science and Technology (Coecytjal) and 430 thousand pesos from ITESO.

Currently, the installation of sensors in at least 12 water extraction wells is planned, in collaboration with the Intermunicipal System of Drinking Water and Sewerage Services.



<https://www.portalam biental.com.mx/ciencia-y-tecnologia/20230915/desarrollan-proyecto-para-monitorear-el-agua-en-los-acuiferos-de>

## Environmental Success Stories: Empowering Communities in Mexico at the United Nations Climate Change Conference COP28

At the United Nations Climate Change Conference COP28 in Dubai last December, the extraordinary work of two Mexican activists from the NGO Espacio de Encuentro de las Culturas Originarias (EECO), Michelle Zárata Palomec and Tzinnia Carranza López, was highlighted as they were honored with the prestigious UN Global Climate Action Award.

EECO's mission is to advise communities on improving food production processes, restoring watersheds, and recovering mangroves, all through the implementation of ecotechnologies adapted to local conditions.

The organization has dedicated itself to the construction, management, and maintenance of various ecotechnologies aimed at reducing the effects of droughts and frosts on homes and agriculture. They rescue ancestral, innovative, and affordable techniques, using local materials for construction. Their goal is for the population to be able to replicate these technologies autonomously, without depending on external



personnel for maintenance and repair.

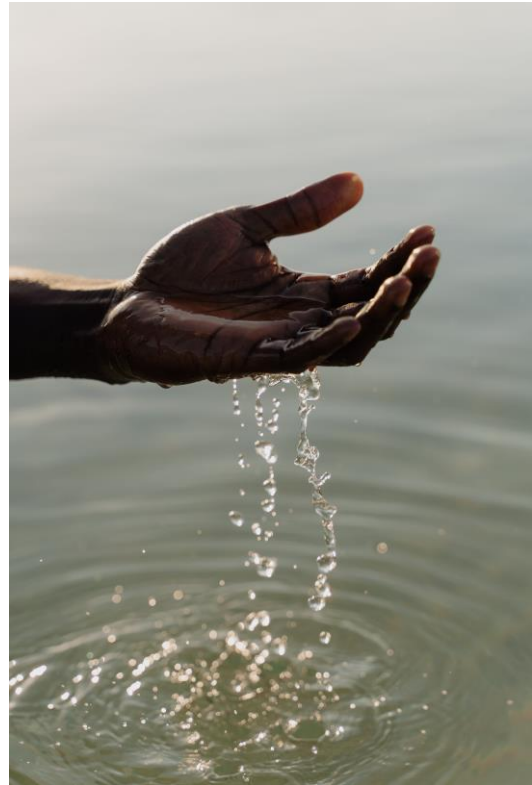
Additionally, EECO promotes environmental education to foster a water culture and the strengthening of local capacities in replicating and using the implemented technologies.

In this context, Tzinnia Carranza López, founder of the NGO, has been recognized for her impactful work over the past five years, focused on empowering farmers and addressing the challenges of climate change through nature-based solutions. On the other hand, Michelle Zárata received the award in the "resilient nature" category for her innovative approach addressing water scarcity and inequalities in marginalized indigenous communities in Oaxaca.

During the award conference, the work of both women was highlighted for providing access to clean water with the project "Clean and sufficient water for Santa María Yucuhiti, Oaxaca," implementing innovative and affordable ecotechnologies.

This project has been fundamental in addressing water pollution and scarcity in the municipality, and in teaching self-construction of rainwater harvesting cisterns, dry toilets, and biodigesters.

Both activists, recognized at an internationally significant event, stand out for their commitment to combating climate change and their innovative approach to promoting sustainable, nature-based solutions that strengthen the capacity of Mexican communities in the face of climate challenges.



<https://unfccc.int/news/un-global-climate-action-awards-ceremony-celebrates-youth-led-climate-solutions> y <https://elpais.com/mexico/2023-12-05/la-tecnologia-sostenible-que-transformo-la-cocina-de-dona-elia-en-oaxaca-es-premiada-en-la-cop28.html>

# INNOVATING IN THE NETHERLANDS

## Innovative and Sustainable Pavement for Cities.



In the Netherlands, an innovative pavement called Greenflow is being developed, contributing to sustainable green urbanization and addressing the changing needs of cities.

Greenflow pavement transforms the urban landscape sustainably by providing aesthetic solutions and redefining urban planning, offering the flexibility to design aesthetically pleasing green parking spaces for municipalities and landscape architects.

Moreover, it promotes the growth of green areas by up to 37% and facilitates better rainwater infiltration. The pavement proves to be an eco-friendly option, with an impressive average lifespan of 135 years and a remarkable 90% reuse rate.

This circular approach reduces the use of raw materials by up to 47%, leading to



a significant decrease in energy consumption and emissions.

Developed by Vandersanden, a leading Dutch company in brick production, Greenflow represents not only an advancement in adaptive urban development to climate change but also reflects Vandersanden's long-term commitment, as the company aims to be completely carbon neutral by 2050, consolidating its position as a leader in the sustainable green paving industry.

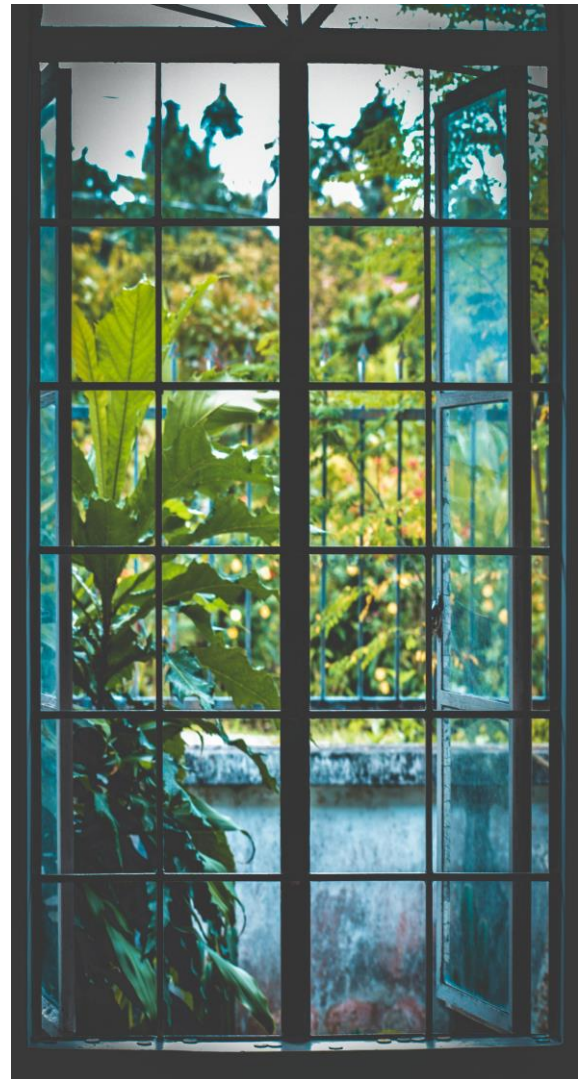
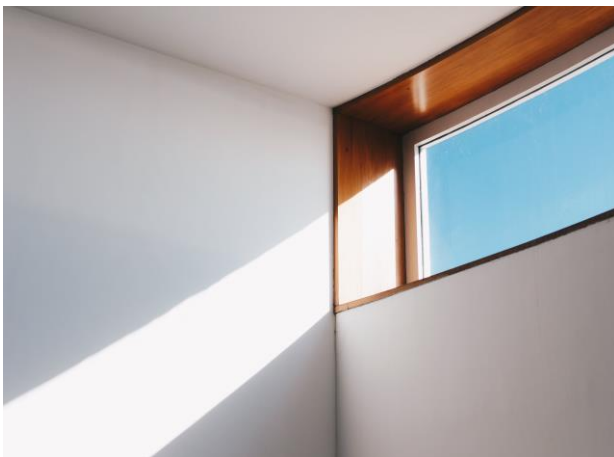


<https://www.duurzaam-ondernemen.nl/vandersanden-introduceert-greenflow-groenbestrating-een-duurzame-bijdrage-aan-stedelijke-ontwikkeling/>

## Smart Windows for a Sustainable Future.

Brightlands Materials Center and TNO are developing a line of windows equipped with a unique thermochromic coating, which automatically adjusts to allow or block solar heat based on the ambient temperature.

The thermochromic coating demonstrates substantial potential for energy savings compared to standard glass and associated heating costs, allowing for maintaining a stable temperature around 20°C. The technology not only promises energy efficiency but also tangible economic savings and a significant reduction in CO<sub>2</sub> emissions. Offering a concrete contribution to a more sustainable and climate-conscious built environment, these smart windows present an innovative response to energy challenges in buildings.



Additionally, this technology provides a technological solution that marks a crucial step towards climate neutrality, considering that buildings represent a significant portion of global energy consumption. It is anticipated that this technology will bring both economic and environmental benefits with a projected saving of 500 euros and 400 kilograms of CO<sub>2</sub> per household annually.

In the current phase, the project is in the demonstration process, with a market launch expected prior to 2025. The demonstration line is actively dedicated to applying this innovative coating on a glass surface of dimensions 1x1 meter.



<https://unfccc.int/news/un-global-climate-action-awards-ceremony-celebrates-youth-led-climate-solutions> y <https://elpais.com/mexico/2023-12-05/la-tecnologia-sostenible-que-transformo-la-cocina-de-dona-elia-en-oaxaca-es-premiada-en-la-cop28.html>



# FINAL MESSAGE

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YEAR 2024

NUMBER 9

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