CANTABRIA COOPERA

Science, Technology, Education and Culture towards a sustainable and inclusive Colombia: biofuels from waste in a vulnerable area

Presented by: Prof. Dr. Fernando Colmenares, CEO of BERSTIC

PROF. DR. FERNANDO COLMENARES

I am **founder and CEO** of the BERSTIC Network, an international platform that connects territories through innovation, scientific cooperation, knowledge diplomacy and diaspora engagement. I also direct the Engineering Research Institute at the Cooperative University of Colombia. With more than **20 years of international experience in Europe, Latin America and Asia .**

My work focuses on the integration of advanced technologies with social and **territorial impact,** fostering sustainable solutions through the articulation of science, technology and culture.

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This project brings together science, culture and international cooperation to transform waste from La Guajira into sustainable solutions. Through an innovative approach based on **bioeconomy, biofuels and circular economy** , we seek to take advantage of local waste - such as fishing, agricultural and plastic waste - to produce clean energy and biochar, strengthening energy security and soil quality. But we go further: **we integrate indigenous communities, especially Wayuu women, in training, co-creation and decision-making processes, connecting scientific knowledge with education, culture and social empowerment** . This alliance between the University of Cantabria and the Cooperative University of Colombia is a real commitment to a more sustainable, just and inclusive Colombia.

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LA GUAJIRA

La Guajira, in northern Colombia, is one of the country's most vulnerable regions, facing severe social, economic, and environmental pressures. The Wayúu people, who make up the majority of the population, live under conditions marked by structural deficiencies and climate stressors:

- Only 22.2% of households have access to electricity.
- Just 9.4% have running water.
- Frequent droughts worsen desertification and threaten livelihoods.
- Strong distrust towards externally imposed projects due to past failures.
- Wayúu women carry the main responsibility for water collection and domestic tasks, limiting their opportunities for education and economic participation.

PURPOSE

Colombia –Spain cooperation : Universidad Cooperativa de Colombia, University of Cantabria, and Ethnoeducational Institution La Paz.

General Objective : Build trust with the Wayúu people in the joint search for sustainable energy and environmental solutions.

Specific Objective : Identify and assess local residues for the production of biofuels and biochar, using an inclusive approach that respects the cultural context.

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Territorial recognition and diagnosis

- Field visits carried out in Manaure, Uribia, Bahía Portete, Media Luna and La Paz (July 2025)
- Identification of strategic resources: constant wind, solar radiation, and seawater, validating technical feasibility for green hydrogen and ammonia production.

Community engagement

- First direct dialogues with Wayúu traditional authorities, fishermen, community leaders, and teachers.
- Confirmation of openness to participate in energy and educational projects, provided there is prior consultation and fair benefit-sharing.

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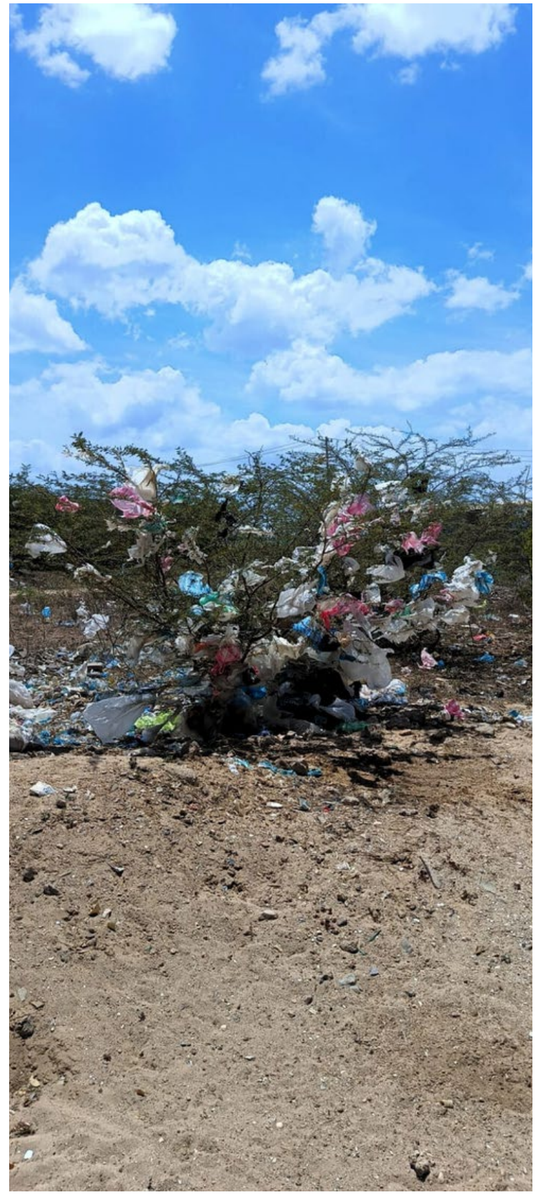
Educ ational alliances

- The La Paz Rural Ethnoeducational Institution in Manaure recognised as a strategic hub for training youth.
- Commitment to launch biomass and AI laboratories in October 2025.

Waste valorisation

- Mapping of available residues (sargassum, fish waste, cacti, plastics) and validation of their potential for transformation into biofuels, fertilisers, biochar, and biogas.
- Local associations, women, and young people identified as key actors in circular economy initiatives.



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Gov ernance and cultural lessons

- Strong emphasis from communities on the need for culturally relevant prior consultation and decision-making in Wayuunaiki.
- Recognition of risks of repeating “green extractivism” models if projects are not co-created with local governance structures.

Strategic partnerships

- Strengthened cooperation between Universidad de Cantabria, Universidad Cooperativa de Colombia, BERSTIC and local institutions.
- Meetings in Bogotá with Polish Embassy and Minciencias (Orchids Programme) to secure diplomatic, technical, and financial support for ongoing initiatives.

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Defined follow -up actions

- Next community visit scheduled for October 2025 (pre-consultation agenda).
- Launch of IAI and biomass laboratories in October 2025.
- Mapping and territorial definition for the hydrogen and ammonia project.

ORCHID PROGRAMME: WOMEN IN SCIENCE 2024

Study of the possibilities of using endogenous Colombian biomass in the production of bio -products through thermo - and electro -catalytic methods.

As part of the ORCHID: Women in Science 2024 Programme, this project led by **Dr Sara Piedrahita Rodríguez** and young researcher **Laura Stefanía Corredor Muñoz,** explores the potential of using endogenous Colombian biomass to produce high-value **bioproducts through thermo - and electrocatalytic methods,** integrating artificial intelligence and data analysis to optimise processes. Focused on regions such as **La Guajira** , it promotes sustainable innovation not only for urban areas but also for **remote communities,** combining scientific research, territorial impact and a strong commitment to empowering women through science.

THANK YOU