LIFE SEAForest Final Conference

LIFE17 CCM/IT/000121

Conference Hall, ISPRA – Rome
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Biochar production and reuse in BioReef

Alberto Pierattini – CURSA

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WHO IS CURSA

CURSA – University Consortium for Socioeconomic Research and the Environment is a non-profit public law organization recognized by the Italian Ministry of University and Research (MUR).

Founded in 2008 by three public universities (Molise, Tuscia, and Ferrara), its primary objective is to foster the connection between academic research and practical applications in the fields of social, economic, and environmental sciences.

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CURSA aggregates and transfers expertise from universities for the scientific treatment of practical issues and problems of society

UNIVERSITY

1st MISSION = TEACHING
2nd MISSION = RESEARCH
3rd MISSION = DIRECT INTERACTION WITH SOCIETY

THIRD MISSION

SOCIETY

PRACTICAL ISSUES AND PROBLEMS THAT CAN BE ADDRESSED WITH THE CONTRIBUTION OF UNIVERSITY SCIENTIFIC EXPERTISE

CURSA supports the university's 1st and 2nd missions through the skills acquired in dealing with practical issues and problems of society

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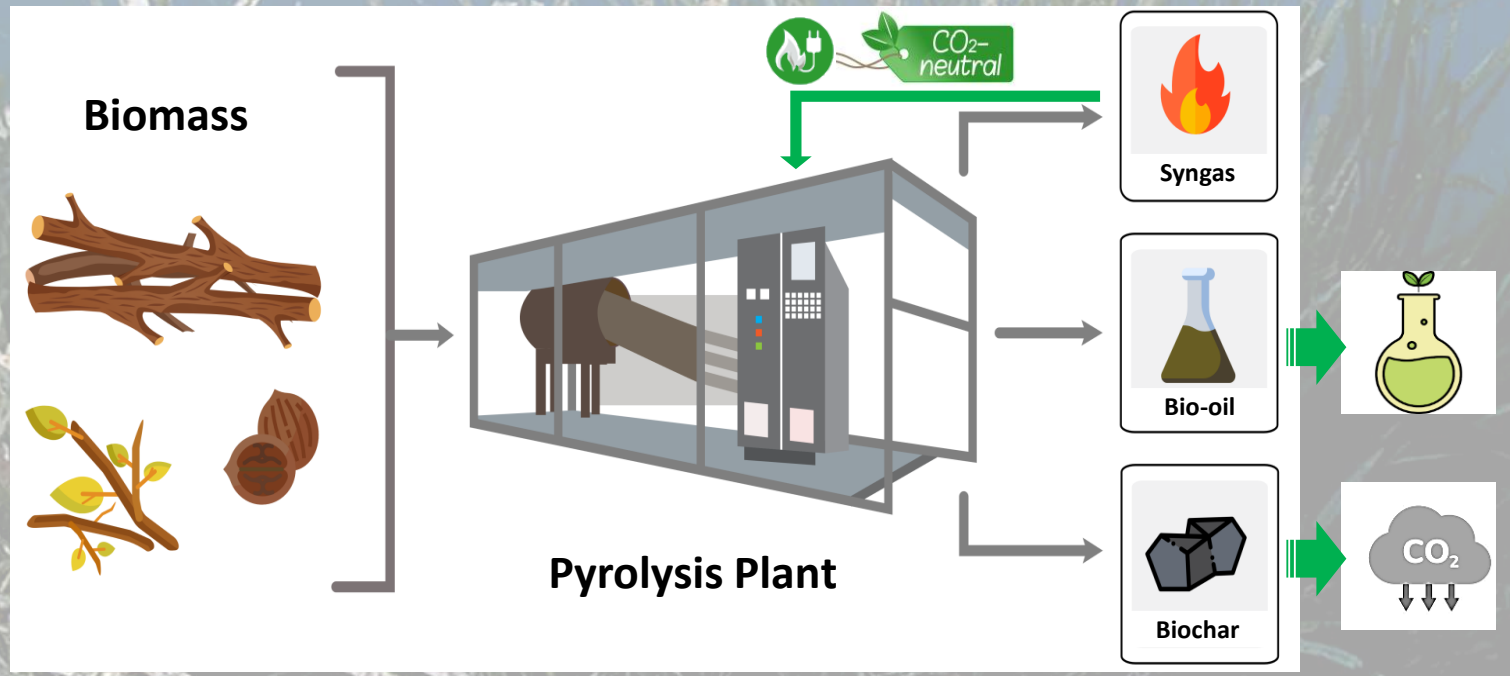
BIOCHAR

- ✓ It is a **carbonaceous material** similar to charcoal
- ✓ It is obtained through a process called **pyrolysis**
- ✓ Thanks to its stable structure, it can **last in the soil for hundreds or thousands of years**, helping to **sequester** carbon and reduce the concentration of CO_2 in the atmosphere
- ✓ The use of biochar is considered an **effective strategy for storing carbon** and has been recognized by the EU as **Carbon Dioxide Removal (CDR)**

BIOCHAR PRODUCTION

Biochar is produced through **pyrolysis**, which consists of the thermal decomposition of plant biomass (such as agricultural residues, wood and other organic materials) in the **absence of oxygen**

- ✓ **low-temperature pyrolysis (350 °C)**
- ✓ **it does not require a chimney**
- ✓ **zero emissions into the atmosphere**
- ✓ **self-sufficient in thermal and electrical energy**



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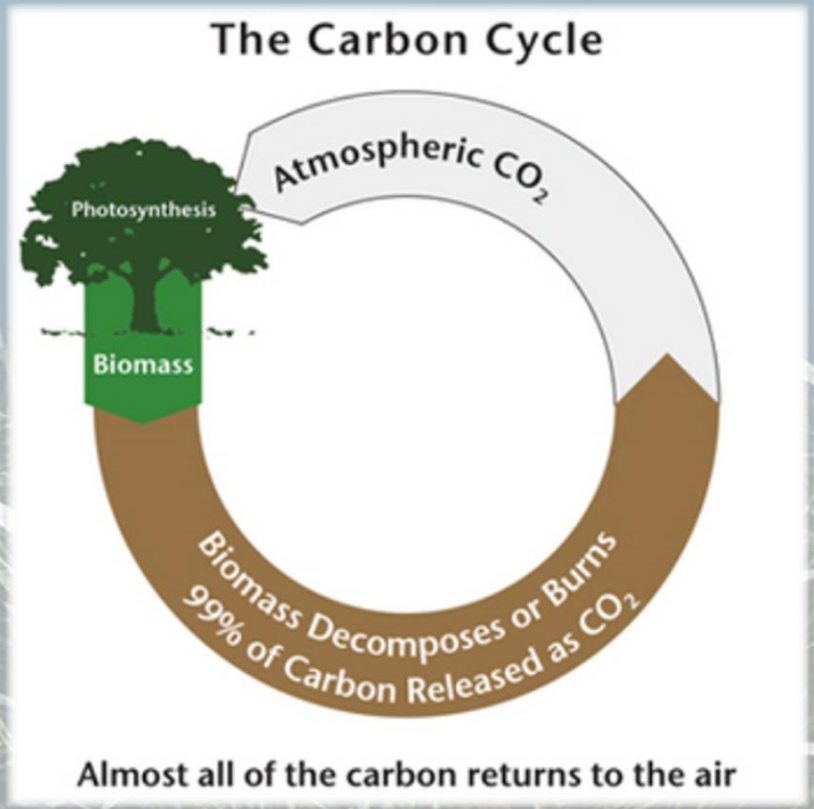
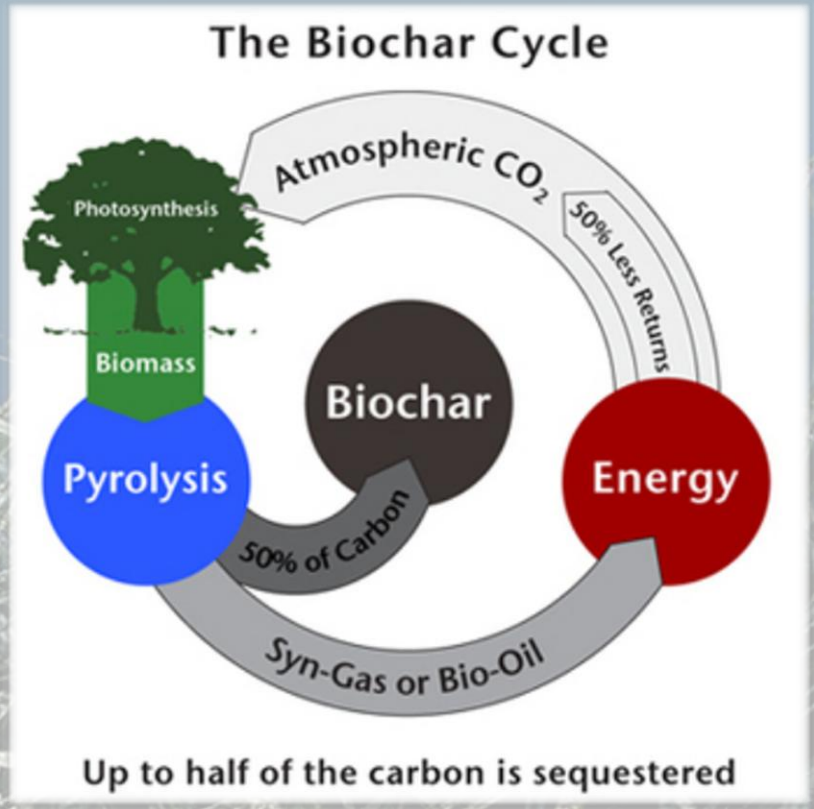
CO_2 neutral

CO_2 negative





1 kg BIOCHAR → 3 kg CO_2

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BIOCHAR APPLICATIONS

CARBON REMOVAL
Carbon sequestration

BIOGAS
Syngas production

SOIL
Soil improver / fertilizer / remediator

FOOD
Food preservative

HI-TECH
Batteries / hi-tech carbons (Graphene)

INDUSTRY
Waste / effluent treatment

ZOOTECHNICS
Livestock / aquaculture feed

MATERIALS
Polymers / bioplastics / paints / aerogels

MEDICAL SCIENCES
Medical applications

PURIFICATION OF POLLUTANTS
Water filtration / air purification

CONSTRUCTIONS
Concrete / tarmac / insulation

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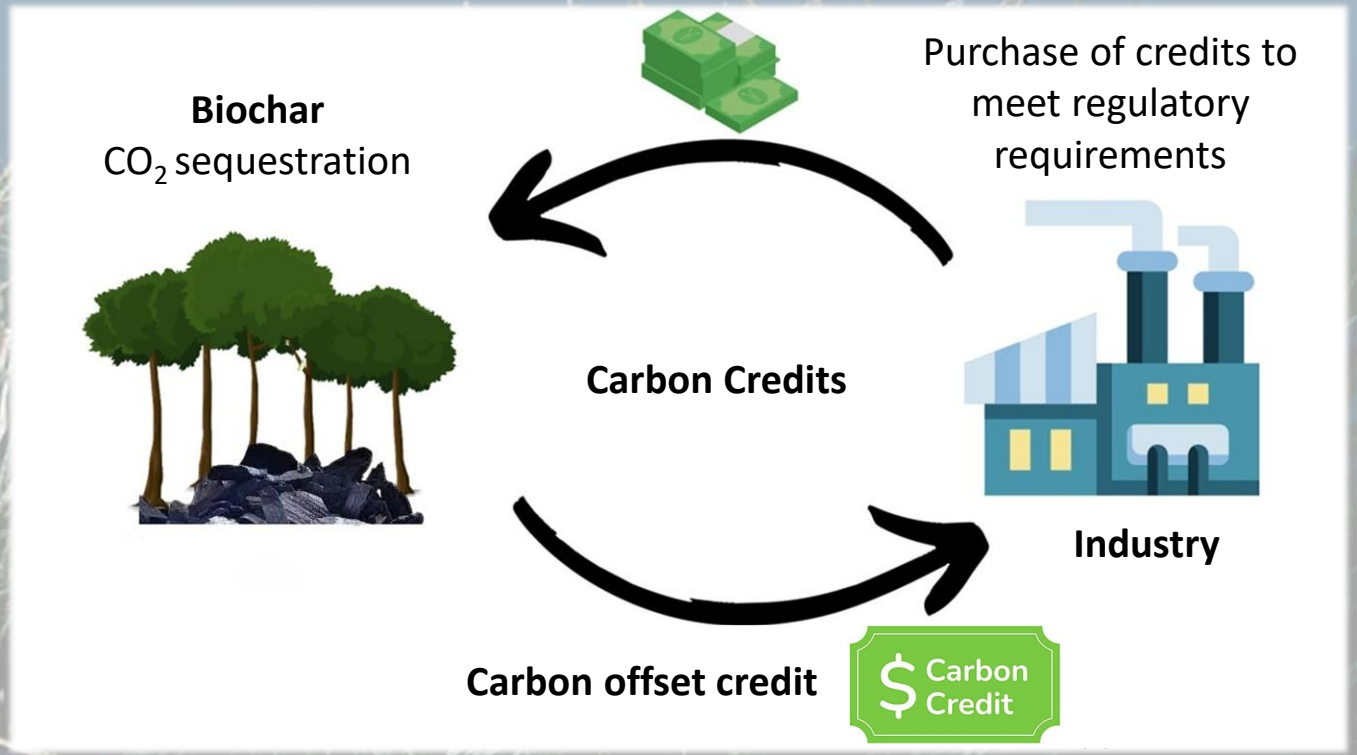
VOLUNTARY CARBON CREDIT MARKET (VCM)

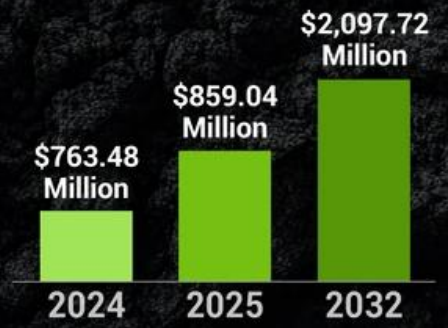
- ✓ It enables private investors, governments, and companies to **offset their greenhouse gas emissions** by financing climate-positive projects and receiving carbon credits in return.
- ✓ The broadest category of buyers includes private companies driven by considerations such as **protecting their reputation**, **ethics**, and **corporate social responsibility**.
- ✓ These markets are expected to **grow more than 30-fold by 2030**, given recent, massive commitments by companies to become net-zero (i.e., achieve carbon neutrality) in the coming decades.



BIOCHAR MARKET

FORTUNE BUSINESS INSIGHTS

Biochar Market to grow at **13.60%** **CAGR** during 2025-2032



INDUSTRY DEVELOPMENT

Ahlstrom collaborated with Black Bull Biochar to produce biochar for agricultural use.

ASIA PACIFIC

$558.03 Million (2023)

$629.67 Million (2024)

North America

Europe | Rest of the World

TRENDS

Rising Trend of Carbon Credits

DRIVERS

Surging Adoption of Sustainable Agriculture Practices

Rising Waste Management

BY APPLICATION

Farming 39.42%

Power Generation

Livestock | Others

BY TECHNOLOGY

Pyrolysis

Gasification

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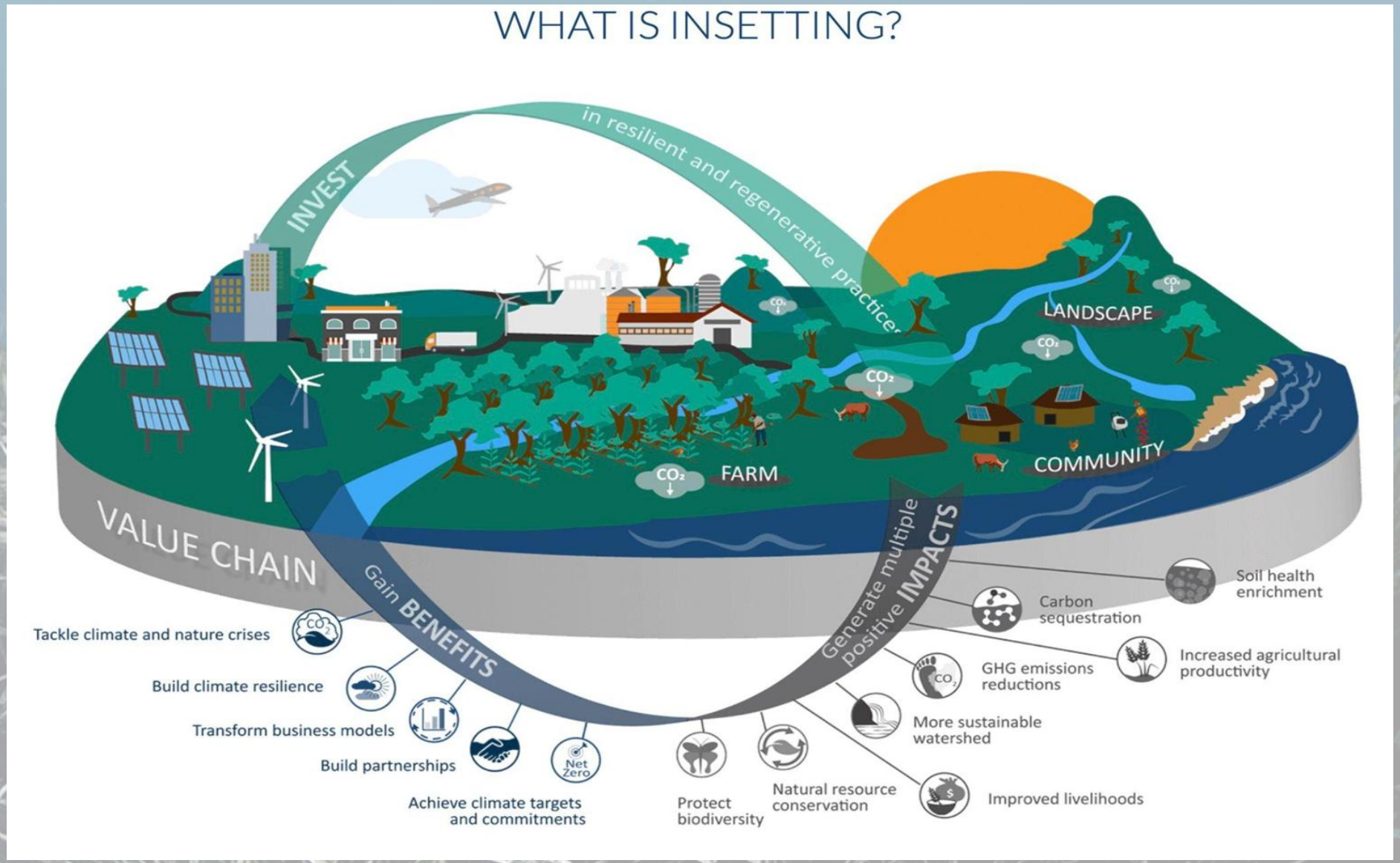
WHAT IS INSETTING?



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OFFSETTING & INSETTING

	OFFsetting	INsetting
DEFINITION	Purchase certified removal credits outside your company perimeter	Reduction / removal projects within your value chain
ADVANTAGES	Rapid implementation, certified climate neutrality	Shared value in the supply chain, reducing transition risks

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A BIOCHAR APPLICATION: THE BIOREEF

Design and testing of submerged reef (BioReefs) made with a **special concrete formulation** (in which part of the cement is replaced by biochar) to **sequester CO_2, increase marine biodiversity**, and (possibly, as accessory function) **protect the coast** from erosion phenomena.

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BIOREEF: A MULTI-BENEFIT APPROACH

- ✓ Thanks to the **concrete's special formulation** (with cement replaced by up to 25% biochar) CO_2 is sequestered and **carbon credits** are generated
- ✓ Supports the **recovery** and **increase of marine biodiversity** and can lead to the generation of **nature credits**
- ✓ Promotes **tourism** and **environmental education**
- ✓ Can also **protect** beaches from **coastal erosion** and increases coastal resilience.

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THE ‘NUVOLA BLU’ PROJECT (PR CALABRIA 21-27)

The NUVOLA BLU project (NUoVi bioreef in ecO-caLcestruzzo per la generAzione di BLUe credits) combines **NbS** (Nature-based Solutions) with engineering. The goal is to design **modular prefabricated elements** with a **special concrete formulation** that can be assembled together to create bioreefs that **promote the generation of carbon credits**, and lead to the generation of future **nature credits**, protecting natural capital and enhancing ecosystem services, to **boost the local economy**.

The 6 Environmental Goals of DNSH

- Climate Change mitigation
- Climate Change adaptation
- Sustainable use of water and marine resources
- Transition to the circular economy
- Pollution prevention and reduction
- Protection and restoration of biodiversity and ecosystems

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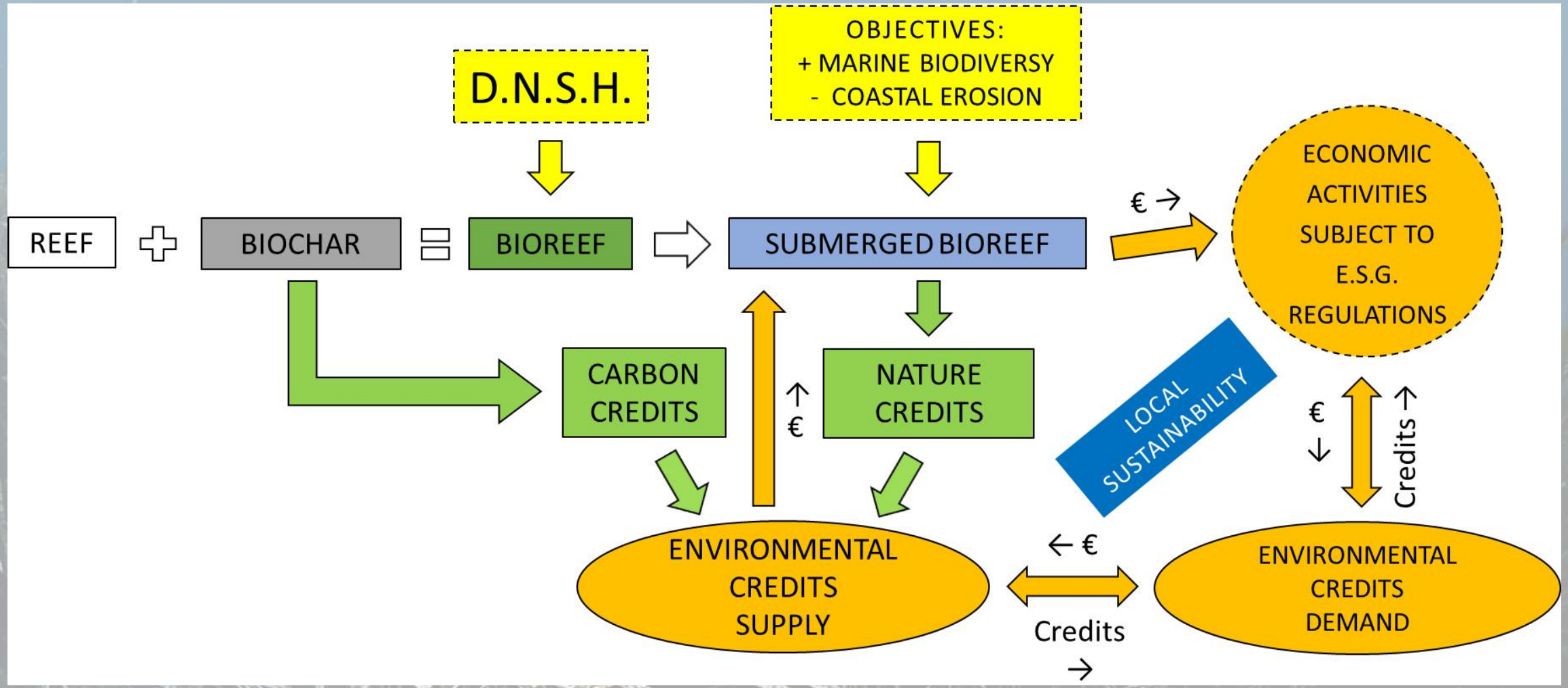
D.N.S.H.
OBJECTIVES:
+ MARINE BIODIVERSY
- COASTAL EROSION
REEF
BIOCHAR
BIOREEF
SUBMERGED BIOREEF
€ →
ECONOMIC ACTIVITIES SUBJECT TO E.S.G. REGULATIONS
CARBON CREDITS
↑ €
NATURE CREDITS
LOCAL SUSTAINABILITY
€ ↓
Credits →
ENVIRONMENTAL CREDITS SUPPLY
← €
Credits →
ENVIRONMENTAL CREDITS DEMAND

BEACHED POSIDONIA: THE BIOCHAR HYPOTHESIS

Beached *Posidonia oceanica* residues treated **as waste:**

- ✓ **high costs for landfill disposal**
- ✓ **waste of biomass**
- ✓ **environmental impact**

VS

Treatment of beached *Posidonia oceanica* waste to produce **biochar:**

- ✓ **environmental mitigation and / or compensation**
- ✓ **economic and social sustainability**
- ✓ **circular economy**

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Thank you for your attention

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