

# EMPTYRE

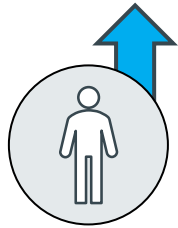
(Energy from Modular Pyrolysis Equipment)

The future of smart sustainable organic waste management

EIC Accelerator 2021 – The Green Deal Topic

woodco

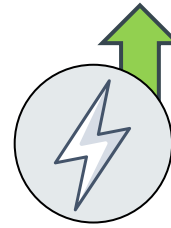
# THE PROBLEM



Population Growth



Rising Volumes of Waste



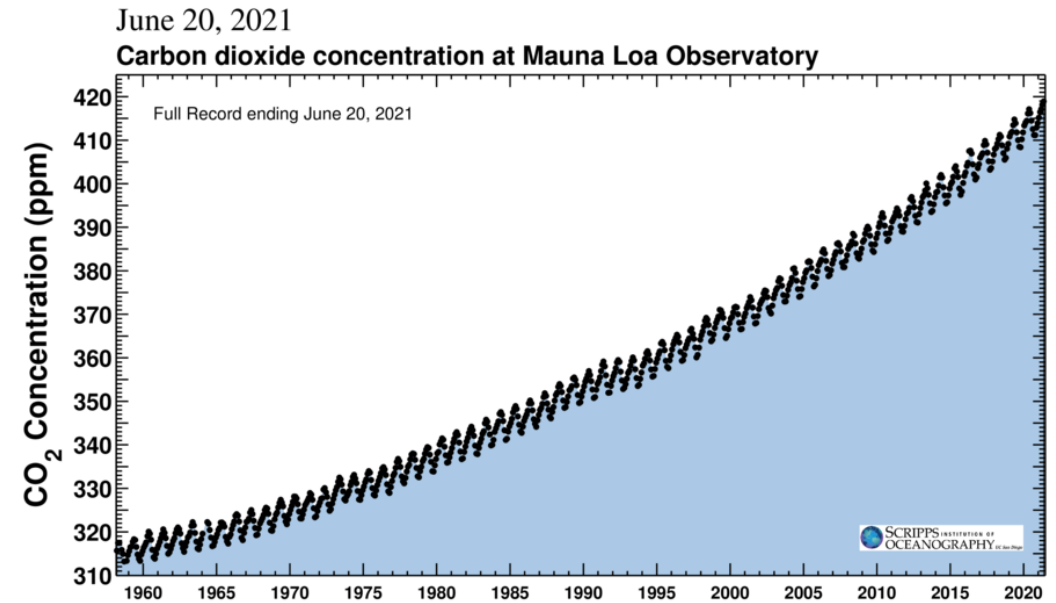
Rising Energy Demands



Increasing emissions

- To limit global temperature increases to 1.5°C, CO2 emissions must be cut by 45% by 2030<sup>1</sup> (compared to 2010 levels).
- On path to achieve only 1%<sup>2</sup>.
- Inefficient management of 140 Gigatonnes of biomass waste annually is a huge contributor to emissions<sup>3</sup>.

Urgent need for large scale carbon-negative biomass waste solutions.

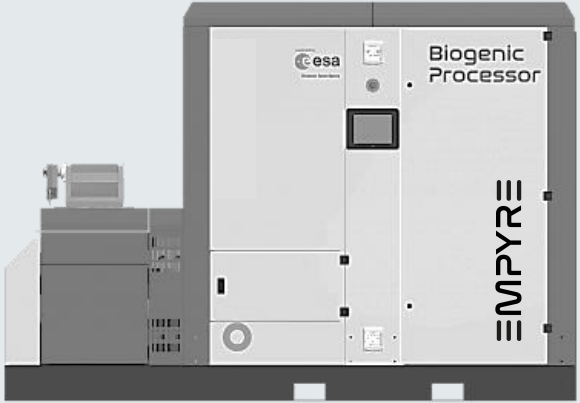


The Keeling Curve<sup>4</sup>

- <https://www.ipcc.ch/sr15/chapter/spm/>
- <https://www.washingtonpost.com/climate-environment/2021/02/26/un-climate-emissions/>
- <https://www.nature.com/articles/s41612-019-0093-5>
- <https://keelingcurve.ucsd.edu/>

# EMPYRE SOLUTION

SUSTAINABLE ORGANIC WASTE MANAGEMENT



**EMPYRE**

Biogenic Processor

- ✓ CARBON NEGATIVE
- ✓ MODULAR DESIGN
- ✓ HUGELY SCALABLE
- ✓ ENERGY POSITIVE
- ✓ GRID-INDEPENDENT
- ✓ RAPIDLY DEPLOYABLE

**RECONGNISED CARBON  
DRAWDOWN TECHNOLOGY**



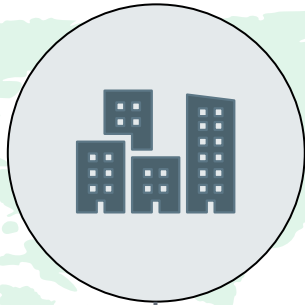
AWARD WINNING TRL-6 PYROLYSIS TECHNOLOGY

Pyrolysis harnesses the energy available in biomass and captures carbon in biochar preventing it from entering the atmosphere.

AGRICULTURE



SMART CITIES



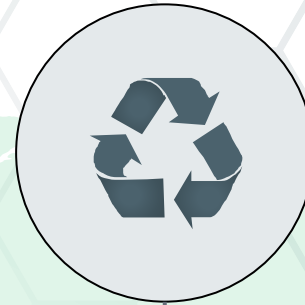
FORESTRY



SANITATION



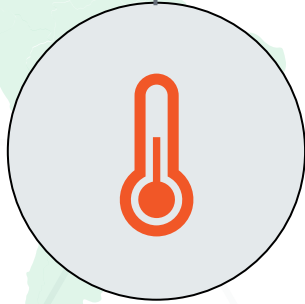
ORGANIC WASTE



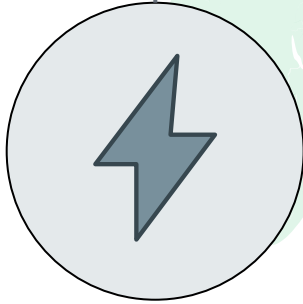
# EMPYRE



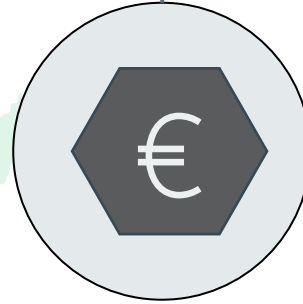
BIOCHAR



THERMAL ENERGY



ELECTRICAL ENERGY



CARBON CREDITS



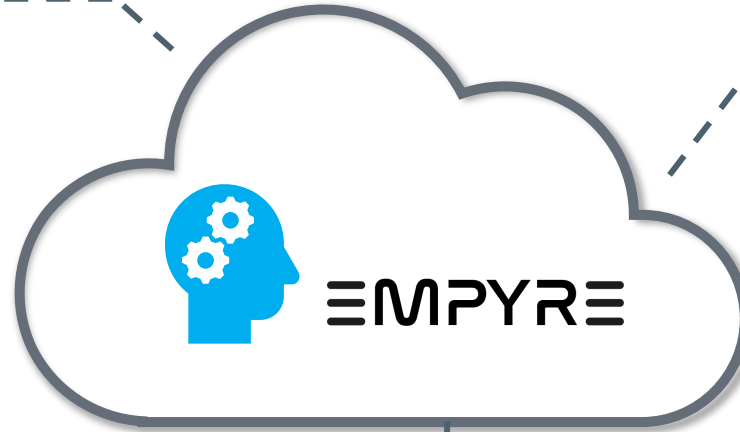
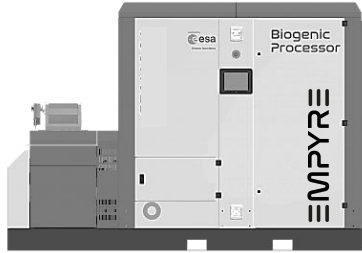
DATA/INSIGHTS

# EMPYRE CLOUD

EMPYRE SMART MANAGEMENT PLATFORM

## PLANT OPERATION

IOT Sensors and controllers



**DATA TRANSMISSION:** Terrestrial, WiFi, LoRa, and Satcom

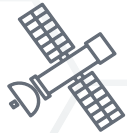
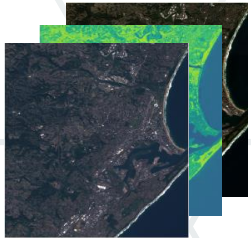


## MOBILE & WEB APPLICATIONS

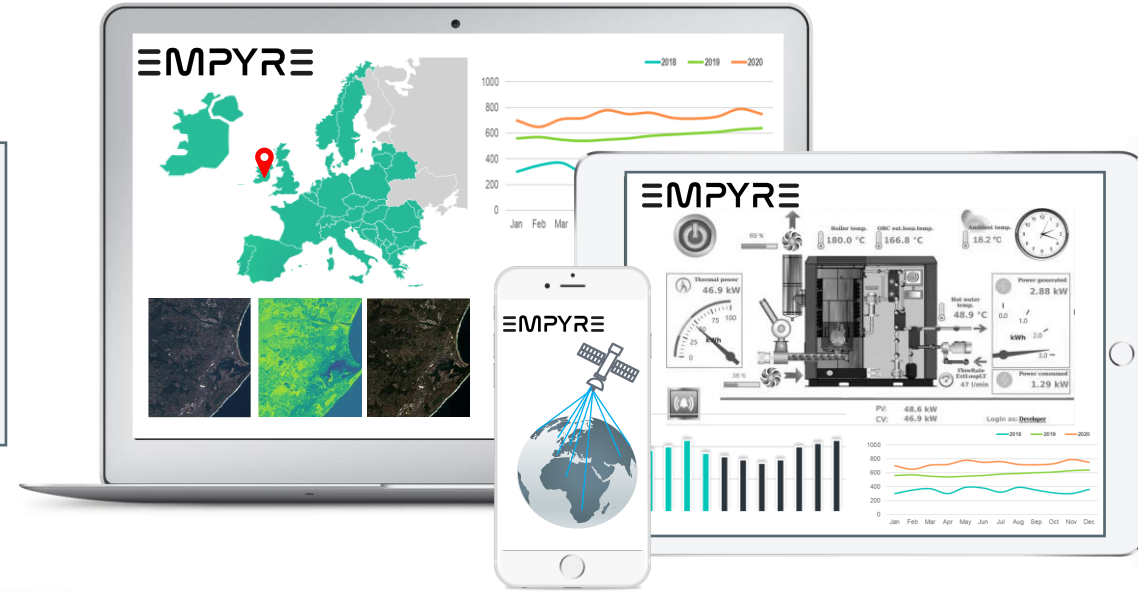
Multi-modal data analyses, actionable insights and visualisations

## DEPLOYMENT ECOSYSTEM

IOT Sensors, controllers, Earth Observation data and GNSS data



- ✓ DATA STORE
- ✓ IOT PLATFORM
- ✓ DIGITAL TWIN ENGINE
- ✓ ANALYTICS/AI ENGINE
- ✓ SERVICES/APPLICATIONS
- ✓ REMOTE MANAGEMENT





# EMPYRE JOURNEY



## CHP INTEGRATION

Combined Heat and Power system integrated with smart management platform

## PLANT DEVELOPMENT

Pyrolysis and smart management platform capability development

## CONCEPT & DESIGN

100kW EMPYRE GPN 100 ideation & design

2017  
TRL1

2017  
TRL3

2018  
TRL5

## TRIAL & DEMOS

System & feedstock testing with live demonstrations of plant on-premise

2019  
TRL6



2020  
TRL6

## SMART MANAGEMENT PLATFORM UPGRADE

IoT, AI and space asset integration and ESA sanitation trial



SEAL OF EXCELLENCE



## ROADMAP TO SCALE

2021  
TRL6

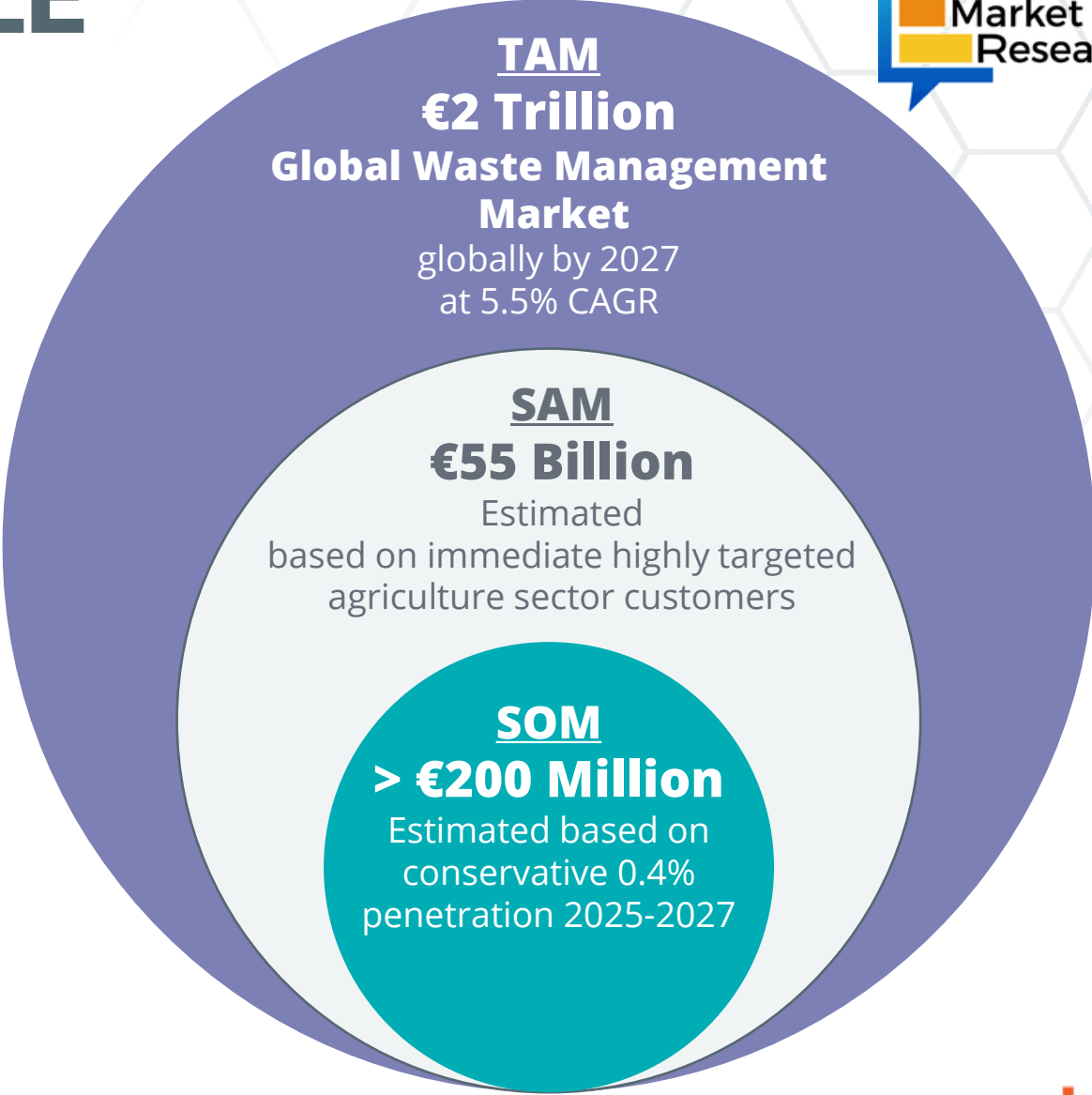
EIC funding needed to take solution from small farm/community level to industrial scale over the next 3 years.

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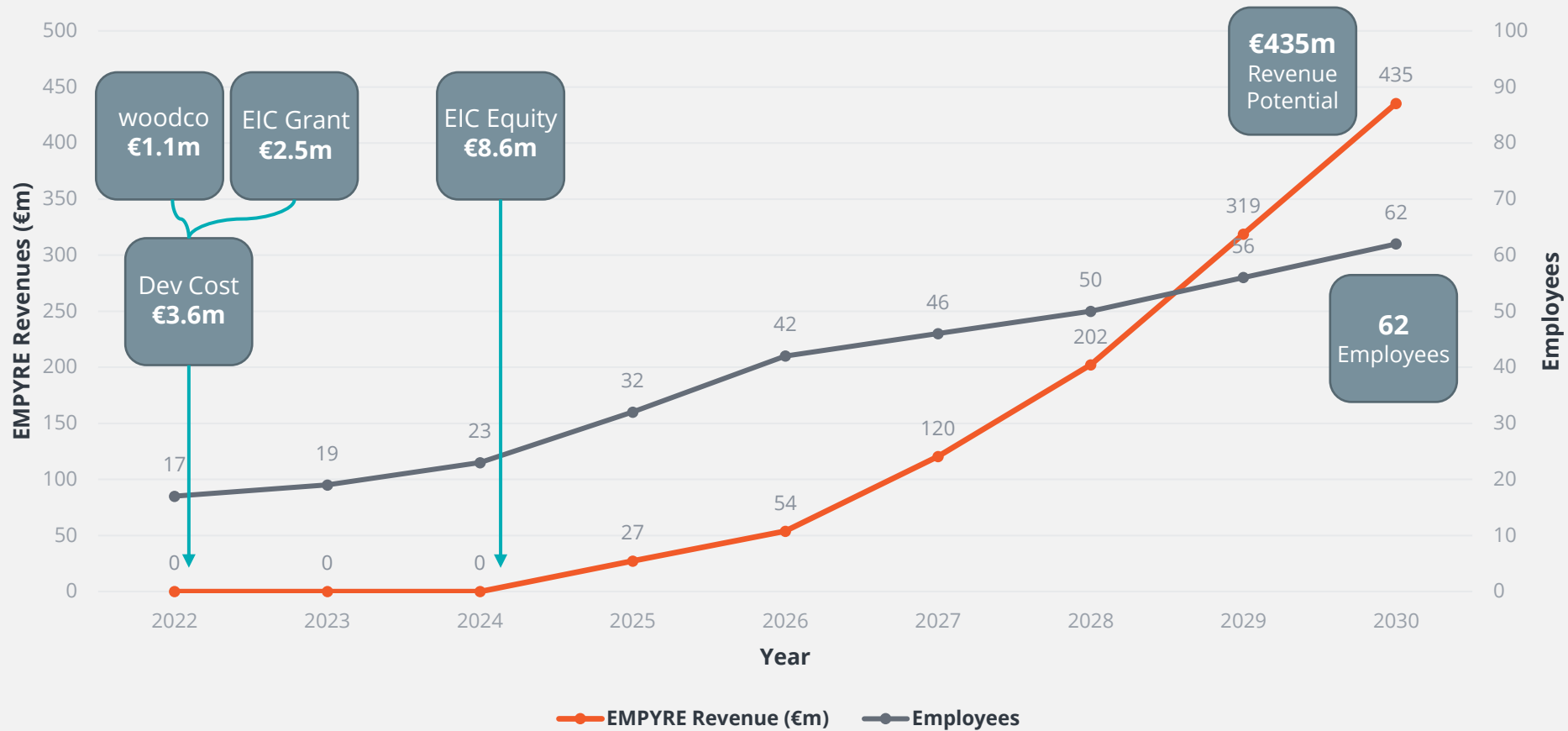
# POTENTIAL TO SCALE



- High risk investment with critical time to market
  - Traditional funding sources insufficient in scale.
  - VC funds are averse to high capital costs.
  - Traditional sales models allow the customer to finance high capital costs over several years.
- EIC funds are needed to reach the addressable market.



# KEY FINANCIAL METRICS





# MEET THE TEAM



**Declan Crosse**  
**Technical Director**

Pyrolysis  
Specialist



**Gerard Crosse**  
**Commercial Director**

Biomass Business  
Specialist



**Dr. Patricia Moore**  
**Senior ICT Systems Engineer**

AI/Machine Learning  
Specialist



**Mark McCarville**  
**Project Coordinator**

ICT and Space  
Technologies Specialist



# BUILDING FOR SUSTAINABLE SUCCESS

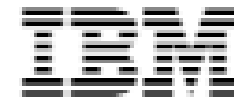
## Green Deal Alignment

- ✓ Increase the EU's Climate ambition for 2030 and 2050
- ✓ Supplying clean, affordable and secure energy
- ✓ Mobilising industry for a clean and circular industry
- ✓ Building and renovating in an energy and resource efficient way
- ✓ Accelerating the shift to sustainable and smart mobility
- ✓ From 'Farm to Fork': designing a fair, healthy and environmentally-friendly food system
- ✓ A zero pollution ambition for a toxic-free environment
- ✓ Preserving and restoring ecosystems and biodiversity

## Agriculture Partners



## Sanitation Partners



Supporting the EU's economy move towards a sustainable future

