Challenge #24

Tools and methodologies for insect detection and tracking

CONTEXT AND PROBLEM

Firm 24* is focused on promoting beekeeping, by disseminating the **most innovative and effective breeding techniques**, specifically in territory nearby the Italian city of Piacenza. Firm 24* is currently facing a serious threat due to the **spread of the Asian Hornet (italian: Vespa Velutina).** This **Asian predator** is invading **Emilia-Romagna** (Italian region), threatening **stationary beekeeping** and posing a **risk** to humans. This species **attacks bees** as they **exit their hives**, leading to **colonies collapse**. The current method to monitor **its spread is through** an **expensive radio tracking system**, which involves **attaching microchips** to wasp specimens to locate and destroy their nests. However, the current method is **not economically sustainable** for **local beekeepers** and often fails as the tracker is frequently too heavy for wasps to transport. For this reason, Firm 24* aims to develop a more **accessible and effective solution** to detect the presence of the Asian Hornet. The ideal solution should include **methodologies and technologies** for **identifying** the presence of hornets in the territory and **tracking their movements**. In addition, the solution could also assist with individual Asian Hornets capture or nest localization. The ultimate goal is to enable Firm 24* to **eliminate the presence of this invasive species from the territory surrounding beekeepers** and **contain its spread**, thereby protecting the regional beekeeping sector.

OBJECTIVES

- Scouting for an accessible solution to detect, track and possibly capture the Asian Hornet, allowing the localization and elimination of nests to protect regional beekeeping.
- Looking for solutions with a TRL 3 (Experimental proof of concept) and above.
- Firm 24* is interested in co-developing a PoC or launching pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDG 2 (Zero Hunger), 13 (Climate Action) and 15 (Life on Land).

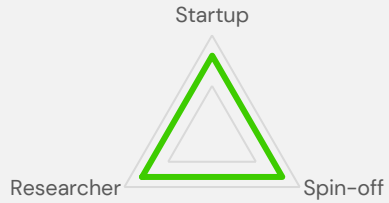
THE CHALLENGE

Tools and methodologies for insect detection and tracking

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#BeekeepingProtection
#InvasiveSpeciesControl
#SustainableBeekeeping

ecosister **Company name anonymized - will be revealed after registration to the program*

Trasferimento Tecnologico

Challenge #25

Methodologies and tools for measuring biodiversity in agricultural soil

CONTEXT AND PROBLEM

Firm 25* is an innovative SME that produces vegetables from organic agriculture, without the use of harmful substances, preserving animal and plant biodiversity. The company is scouting for solutions to accurately **measure soil biodiversity**, acknowledging the critical relationship between soil biodiversity and fertility. Specifically, Firm 25* is seeking a Solver capable of providing reliable and scientifically validated methodologies or tools to **effectively assess the level of biodiversity** in the land used for its agricultural practices. The ideal solution should utilize indicators (such as organic carbon or environmental DNA) to **generate clear and actionable data**, enabling informed decision-making and guiding appropriate corrective actions for soil management. By adopting such a solution, Firm 25* aims to enhance soil fertility and optimize long-term agricultural productivity.

OBJECTIVES

- Scouting for methodologies and tools to accurately measure the biodiversity of soil used for agricultural purposes. The ideal solution should provide data-driven insights to guide corrective actions in soil management, enabling the company to optimize its agricultural practices.
- Looking for solutions with a TRL 3 (Experimental proof of concept).
- Firm 25* is interested in co-developing a PoC or launching pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDG 12 (Responsible Consumption and Production) and 15 (Life on Land).

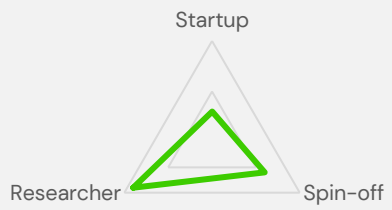
THE CHALLENGE

Methodologies and tools for measuring biodiversity in agricultural soil

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#Biodiversity #Measurement #SoilFertility #EnvironmentalDNA

Challenge #26

Regulations and requirements analysis on Renewable Energy Communities (RECs) in Italy

CONTEXT AND PROBLEM

Firm 26* is one of the largest agri-food centers in Italy. The company is fully oriented towards sustainability: for instance, for its operations, Firm 26* utilizes clean energy generated by its photovoltaic rooftop, one of the biggest in Europe. The company is interested in **creating** its own **Renewable Energy Community (REC)** in the area surrounding its premises. The goal of this community is to promote the production, consumption and exchange of renewable energy among citizens, businesses and firms, fostering self-consumption and collaboration to enhance environmental sustainability. However, Firm 26* is **~96% publicly owned**: this prevents it from establishing an energy community. In fact, according to Italian laws, only fully public entities can do so. Firm 26* is therefore interested in **deepening its knowledge on Energy Communities,** scouting for a partner that could develop a **research assessment** aimed at: 1) **determining the requirements** for the creation of Renewable Energy Communities (RECs) in Italy (e.g., in terms of legal/infrastructure constraints); 2) highlighting the areas in which the company does not meet such requirements; and 3) developing a **roadmap** that would allow Firm 26* to create a REC. The solver is required to only propose an **analytical assessment**, not necessarily including execution of the proposed framework.

OBJECTIVES

- Scouting a solver who can conduct an analysis of the requirements related to the creation of a Renewable Energy Community (REC) in Italy. The research should outline all relevant constraints (e.g., regulatory, infrastructural, …) and lead to the definition of a roadmap that will enable the company to establish a Renewable Energy Community.
- Looking for solutions with a TRL 3 (Experimental proof of concept).
- Firm 26* is interested in launching a joint analysis/assessment.
- The resolution of this challenge contributes to the achievement of SDG 7 (Affordable and Clean Energy), 11 (Sustainable Cities and Communities) and 12 (Responsible Consumption and Production).

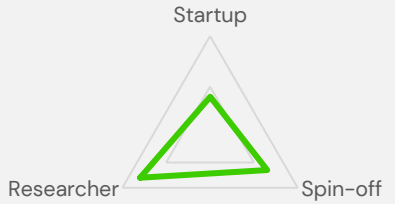
THE CHALLENGE

Regulations and requirements analysis on Renewable Energy Communities (RECs) in Italy

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#RenewableEnergyCommunities #RECs #Laws #Regulations #Infrastructures #Norms #Italy

**Company name anonymized - will be revealed after registration to the program*

Challenge #27

Methodologies for extracting hydrogen from foodservice industry wastewater

CONTEXT AND PROBLEM

Firm 27* is one of the biggest Italian collective and commercial catering companies, producing and delivering meals mainly to businesses, schools and healthcare facilities. The company is looking for a solution to produce **hydrogen from wastewater** deriving from its industrial plants. The goal is to use this hydrogen for **electricity generation**, to cover part of the Firm 27*'s electricity demand and reduce its CO_2 emissions. The company is therefore scouting for a Solver that could offer an effective **methodology for extracting hydrogen** from wastewater, thus contributing to Firm 27*'s know-how on **green hydrogen** production. Said wastewater can be classified as **domestic sewage**, as the industrial meal production process carried out by the company is similar to that of a household kitchen (in fact, it contains substances such as carbohydrates, fats, proteins, soaps, detergents and food residues). Such classification is verified through specific analyses carried out in different industrial plants. Moreover, in some Firm 27* sites, before being released into the sewer system, the wastewater is treated using grease traps. As for the **wastewater volume**, the estimated daily amount released is 10–20 m^3. If feasible, Firm 27* could consider a solution that includes a **hardware** system that allows water filtration and hydrogen extraction, as well as a **software** component to track the amount of hydrogen produced, the energy created and the reduction of CO2 emissions.

OBJECTIVES

- Scouting for methodologies for extracting hydrogen from wastewater deriving from foodservice industry plants. The ideal solution would be a feasibility study and potentially include equipment to produce green hydrogen, thus considered equivalent to domestic sewage.
- Looking for solutions with a minimum TRL 3 (Experimental proof of concept).
- Firm 27* is interested in co-developing a PoC or launching pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDG 7 (Affordable and Clean Energy) and 15 (Life on Land).

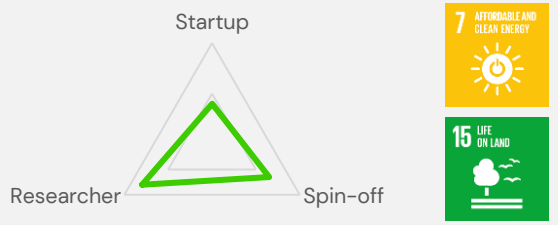
THE CHALLENGE

Methodologies for extracting hydrogen from foodservice industry wastewater

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#HydrogenExtraction #Wastewater #Foodservice Industry #GreenHydrogen

**Company name anonymized - will be revealed after registration to the program*

Challenge #28

Affordable solutions for refining and purifying biomethane used as an energy source

CONTEXT AND PROBLEM

Through its **North American subsidiary** (subsidiary X*), Firm 28* — a global leader in agricultural machinery — manufactures the Methane Power tractor, which runs on compressed natural gas (CNG), significantly reducing emissions compared to diesel-powered models. Ensuring the supply of high-quality CNG is essential, but this requires reviewing and optimizing the supply chain.
Specifically, CNG production involves **upgrading biogas** by removing impurities such as hydrogen sulfide (H_2S) and CO_2. This makes gas **suitable** both for the **tractor's 250-bar** fueling system and for **injection into natural gas pipelines** (potential additional revenue stream for producers). While many **small and medium-sized farms** already use digesters to capture biogas—primarily for heat and electricity—they currently **lack the capability to refine biogas to the standards** needed to meet the requirements for natural gas-fueled tractors (see annex for specific details). In this context, small and medium sized farms need a **cost-effective biogas treatment solution**, that unlocks access to these additional benefits of utilizing the tractor. Thus, Firm 28* is looking for an **accessible, eco-friendly and low-cost solution** for biogas generation, capture, and treatment that can be easily **integrated** into farms with up to 200 heads of cattle (and potentially additional biomass waste), ensuring **adequate purification/refinement** of biomethane according to **North American standards** to produce quality gas for their tractor (primary priority) and for injection into natural gas pipelines (secondary priority).

OBJECTIVES

- Scouting for efficient, accessible and standard-compliant solutions for small to medium sized agricultural farms to upgrade biogas, in order for the company to refine it to the quality needed to run its Methane Power Tractor and pump into natural gas pipelines.
- Looking for solutions with a TRL 7 (System prototype demonstration in operational environment) or above.
- Firm 28* is interested in launching pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDG 7 (Affordable and Clean Energy) and 13 (Climate Action).

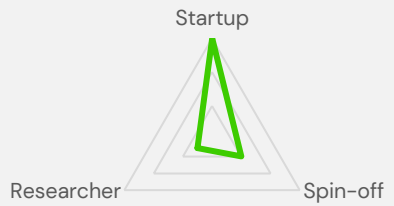
THE CHALLENGE

Affordable solutions for refining and purifying biomethane used as an energy source

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#SustainableAgriculture
#RenewableEnergy
#CleanEnergy

**Companies name anonymized - will be revealed after registration to the program*

Challenge

Affordable solutions for refining and purifying biomethane used as an energy source

ANNEX

Natural Gas Requirements – Tractor Fuel

Element	Composition limits
CH_4	> 83% v/v
NMHC (Nonmethane Hydrocarbon)	< 13% v/v
CO_2	< 14% v/v
N_2	< 14% v/v
H_2	< 5% v/v
H_2O	< 55 mg/Nm^3
H2S	<10 ppm
Total Sulphur (according to ISO 6326-5)	< 10 mg/Nm^3
Methane number (AVL method)	> 70
Contaminations according to ISO TR 15403	
Siloxanes	< 5 mg/Nm^3

Key Aspects:

- The engine can accept methane mixes above 83%.
- H_2S (Hydrogen Sulphide) is very corrosive, so it it must be removed from the gas.
- Excess CO, or N_2, even though inert, take up valuable space in the tanks and therefore reduce vehicle autonomy.
- The engine will de-rate if the fuel quality is not good enough.
- NEF CNG is compatible with CNG of any origin (biogas included), provided that the composition is within the following limits.
- Nm3 refers to standard conditions: 293,2 K and 101,3 kPa.
- Methane number is the measure of resistance of fuel gases to engine knock (detonation).

Challenge #29

Smart systems for underwater animal capture

CONTEXT AND PROBLEM

Firm 29* is a spin-off company, that provides services of applied ecology, environmental monitoring and ecological consulting. The company's main activities are the **monitoring of freshwater fauna** and the management (consisting mainly in the capture and disposal) of **alien animal species**. These species have been exported outside their natural habitat and their spread must be controlled to avoid damages to the ecosystem. Firm 29* is looking for a solution for the containment of a particular invasive species - the **wels catfish** - an activity which is currently carried out manually by operators, resulting in high costs. Although the company has already developed an initial prototype trap, it is looking for a Solver who can provide a **more advanced solution that combines both hardware and software**. The ideal solution would be **an intelligent trap**, able to detect the presence of the fish, recognize it and close automatically when the fish has entered the trap. The trap should be made of **environmentally friendly materials** and should include a set of sensors to gather data to enable remote monitoring. Firm 29*'s ultimate goal is to automate the containment process of the wels catfish in freshwater ecosystems, thereby achieving cost reductions and safeguard local species.

OBJECTIVES

- Scouting for smart systems that allow the automatic capture of wels catfish or other underwater animals, made for the purpose of ecosystem preservation. The ideal solution is a sensor-based trap, combining hardware and software components and made of environmentally friendly materials.
- Looking for solutions with a TRL 4 (Technology validated in lab) and above.
- Firm 29* is interested in co-developing a PoC or to launch pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDGs 8 (Decent Work and Economic Growth) and 14 (Life Below Water).
- The objective of this challenge is to find a solution dedicated to environmental protection and restoration. This does not include the capture of animals for research or experimentation purposes, and is therefore in line with DNSH principles.

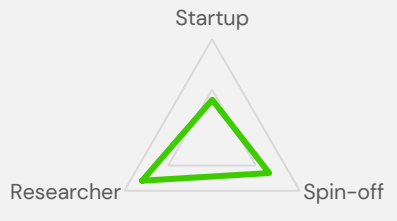
THE CHALLENGE

Smart systems for underwater animal capture

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#UnderwaterSensors #Automation #SmartTraps #WildlifeMonitoring

ecosister **Company name anonymized - will be revealed after registration to the program*

Challenge #31

Solutions to monitor fishing trajectories underwater

CONTEXT AND PROBLEM

Firm 31* is an innovative R&D laboratory in the field of biomechanics and engineering applied to human movement. It is looking for solutions to be integrated into their devices used to collect data during **trawl fishing** activities. This technique uses a **net** attached to long cables, held in place by **diverters** (**weights**). During fishing, the diverters are towed along the **seabed**, moving it and altering **natural** habitats. Firm 31* aims to augment the monitoring of the trajectories and the impact of the diverters and nets, to identify the location and state of the most frequently traveled areas on the seabed during fishing operations. It is important to note that the **boat's trajectory** differs from that of the diverters/nets, as the latter are influenced by **sea currents**. The goal is to inform fishermen about fishing routes to avoid, allowing the seabed to recover, thereby protecting **marine biodiversity**. To achieve this, the company is seeking a **hardware** (primarily) and/or **software** solution that can fit with the mathematical models already implemented. The hardware must be installed on the diverters/nets and present: 1) **resistance** to high underwater pressures; 2) **low cost** for fishermen; 3) **ease of integration in the diverters/net**; and 4) ability to **detect the position** of the boat and other variables (e.g., **seabed** type). The final integrated solution should: 1) analyze data from **individual** boats and **aggregate data** from all boats that have operated in a specific area during a given time period; 2) integrate information from other sources (e.g., satellite databases); and 3) provide **insights to optimize fishing routes**, by identifying areas that have not been recently exploited.

OBJECTIVES

- Scouting for solutions to integrate for the monitoring of underwater trajectories followed during trawl fishing operations. A combination of hardware and software is needed to collect and analyze data on the seabed most frequently traversed. The solution is be applied on the nets and the diverters.
- Looking for solutions with a TRL 3 (Experimental proof of concept) and above.
- Firm 31* is interested in co-developing a PoC or to launch pilot projects together with the Solver.
- The resolution of this challenge contributes to the achievement of SDG 12 (Responsible Consumption and Production) and 14 (Life Below Water).

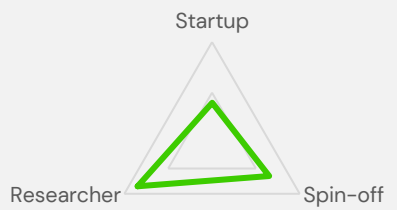
THE CHALLENGE

Solutions to monitor fishing trajectories underwater

THEMATIC CLUSTER

Green Energy & Biodiversity

SOLVER AND KEY SDGs



KEY WORDS

#FishingRoutes #TrawlFishing #Position #Tracking #Underwater #Seabed #Diverters #Nets

ecosister **Company name anonymized - will be revealed after registration to the program*

Trasferimento Tecnologico