Renewable Gas Injection in the DEDA Natural Gas Network in the region of Eastern Macedonia & Thrace

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9th International Conference on Sustainable Solid Waste Management

Corfu, 15-18 June 2022

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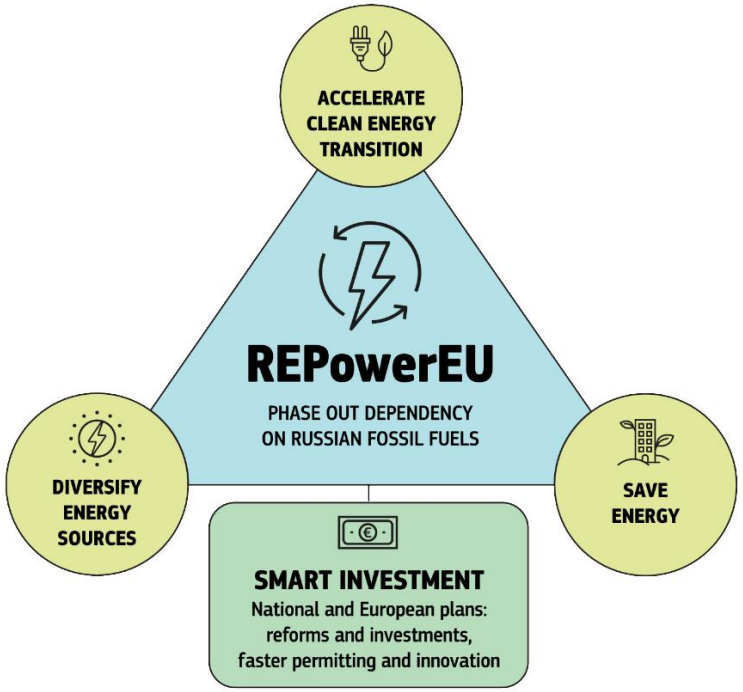
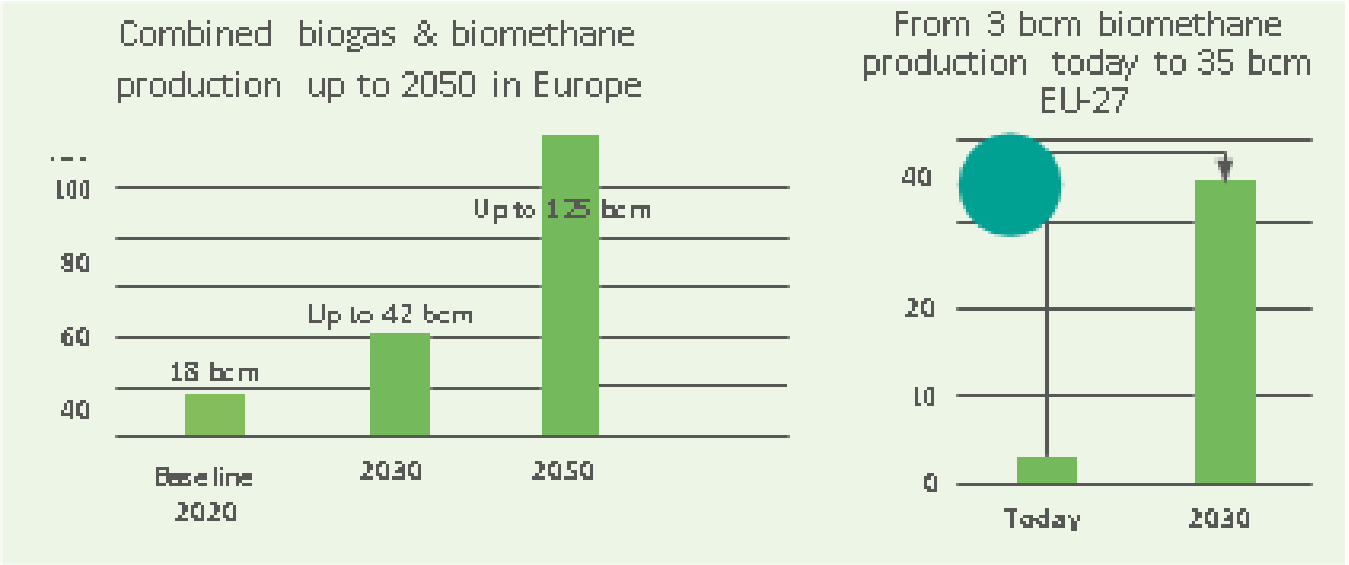
RATIONALE & OVERALL OBJECTIVE

RePowerEU calls for urgent action to mitigate the impact of rising energy prices, diversify the EU gas supply and accelerate the clean energy transition.

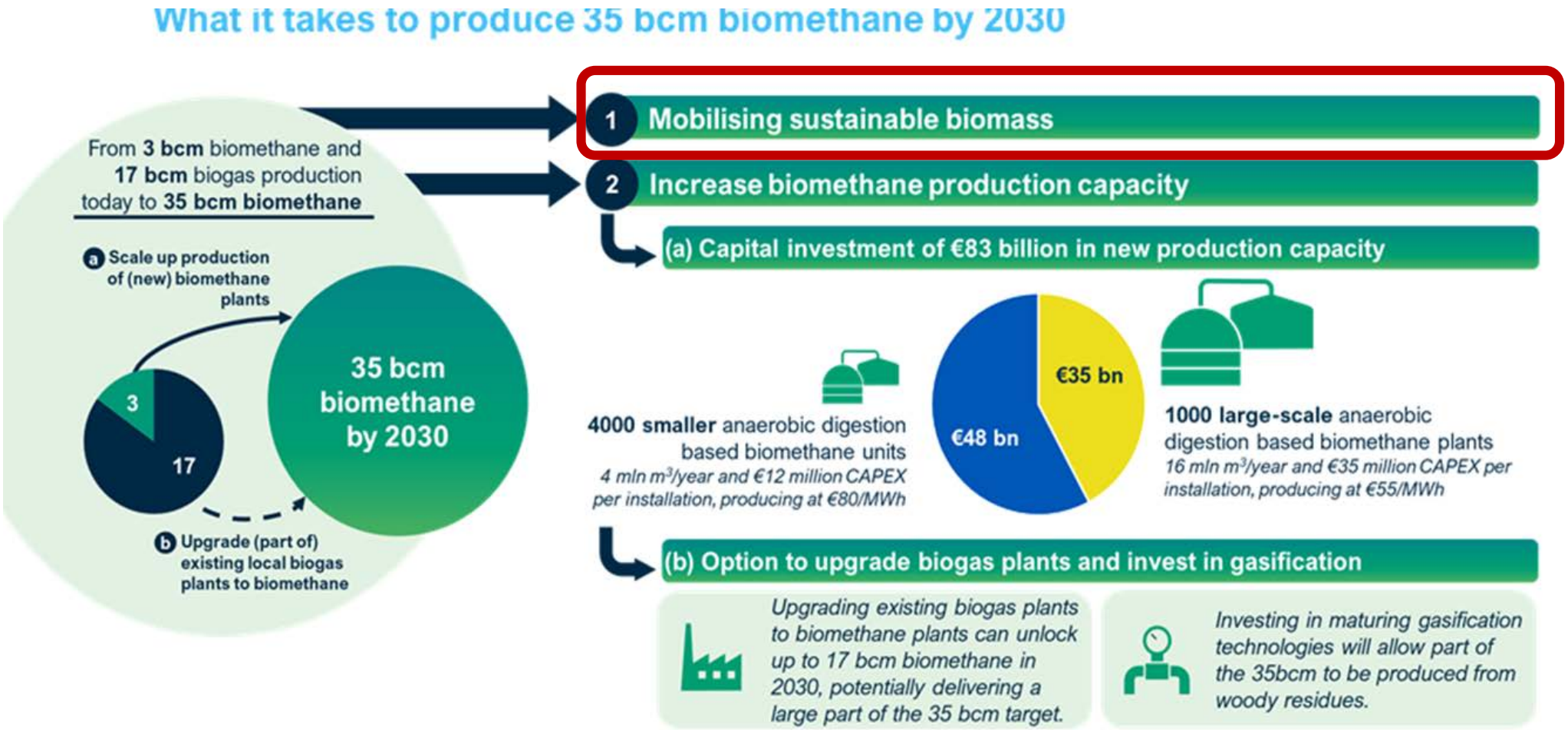
The European biogas and biomethane sectors are committed to delivering **35 bcm of biomethane by 2030**, supporting the EU in the achievement of climate goals and energy security alike.

In 2020, 18 bcm of biogas and biomethane were produced in the EU, according to EBA.





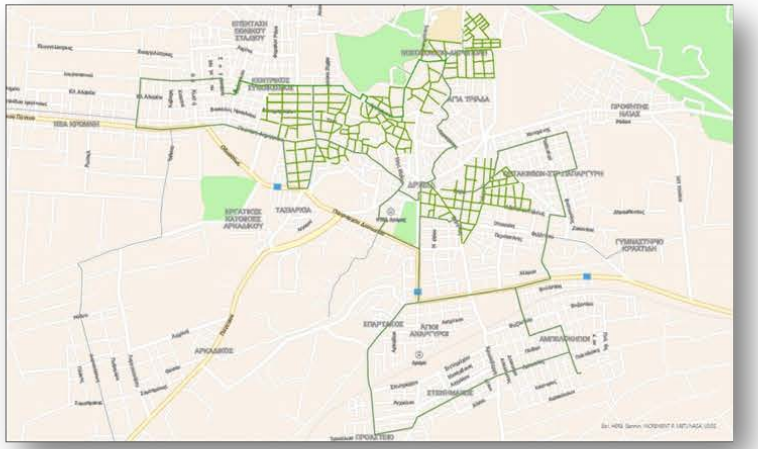
RATIONALE & OVERALL OBJECTIVE

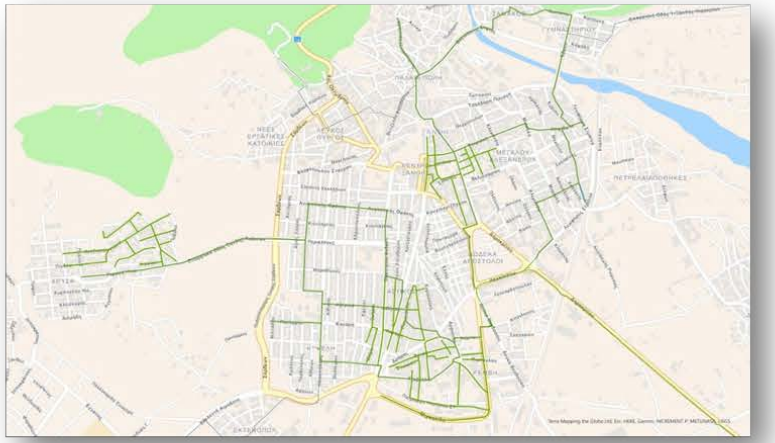


Source: EBA

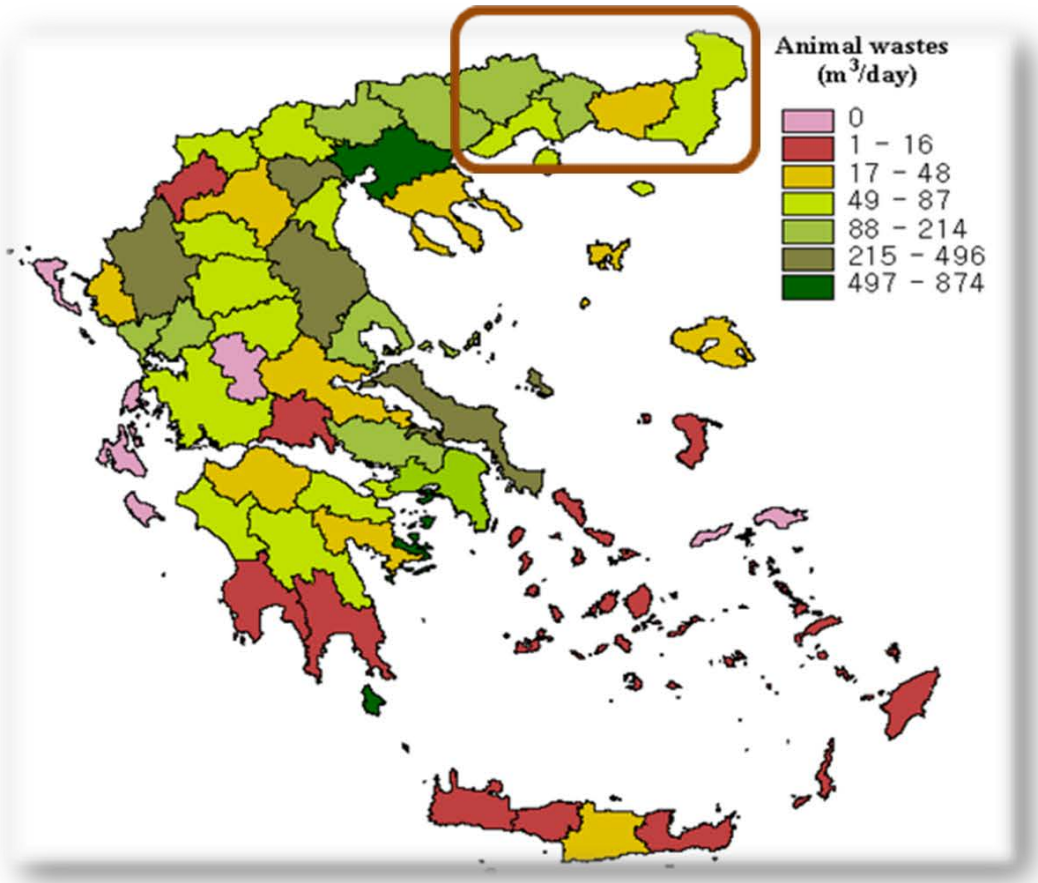
OBJECTIVE

- To assess the biomass availability and the possibility of producing and using biomethane, a renewable gas deriving from the upgrading of biogas, in the distribution networks of the Public Gas Distribution Networks SA (DEDA) in the wider area of 20 Municipalities in the Region of Eastern Macedonia & Thrace.
- The ultimate goal of this endeavour is the gradual upgrade of DEDA networks to "BHR" (Biomethane & Hydrogen Ready) networks ready to receive biomethane and "green" hydrogen that will be distributed as a "mixture of renewable gas" together with Natural Gas (PV).
- DEDA S.A. is a leading Greek company that owns, develops, operates, and provides maintenance services to the natural gas low and mid- pressure distribution networks in the majority of regions in Greece. The company is strategically planning to extend the gas network to 39 Greek cities, including the Region of Eastern Macedonia and Thrace targeting to build a 1.880 km natural gas pipeline in more than 50.000 connections.

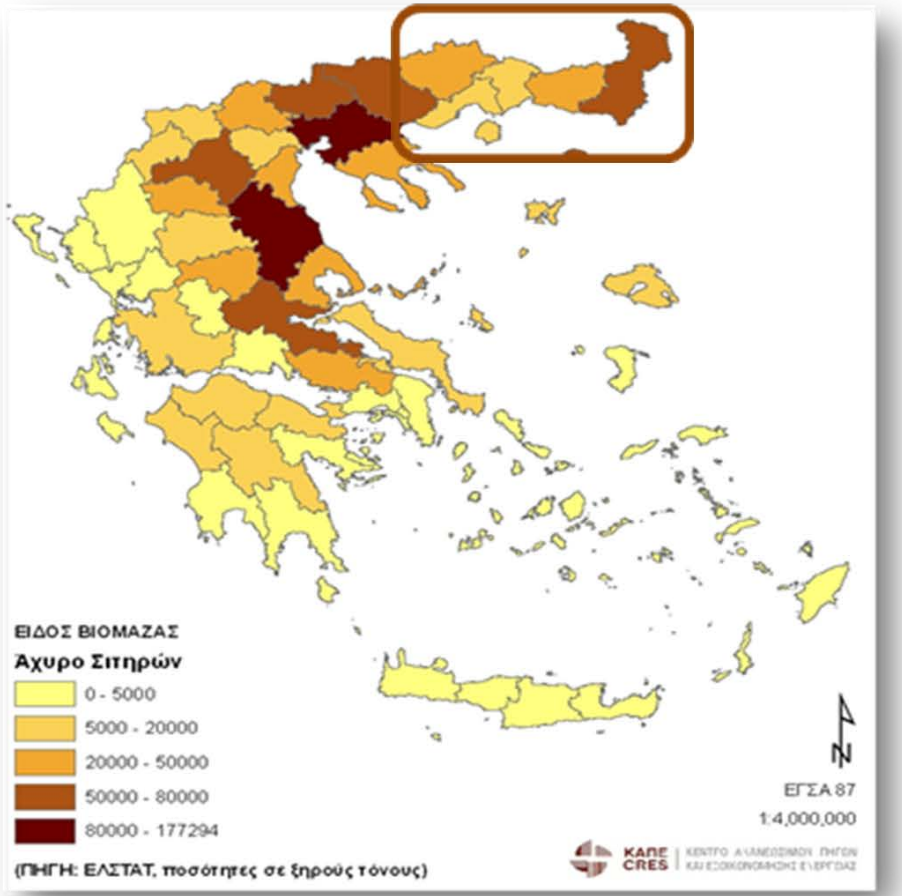




THE STUDY AREA

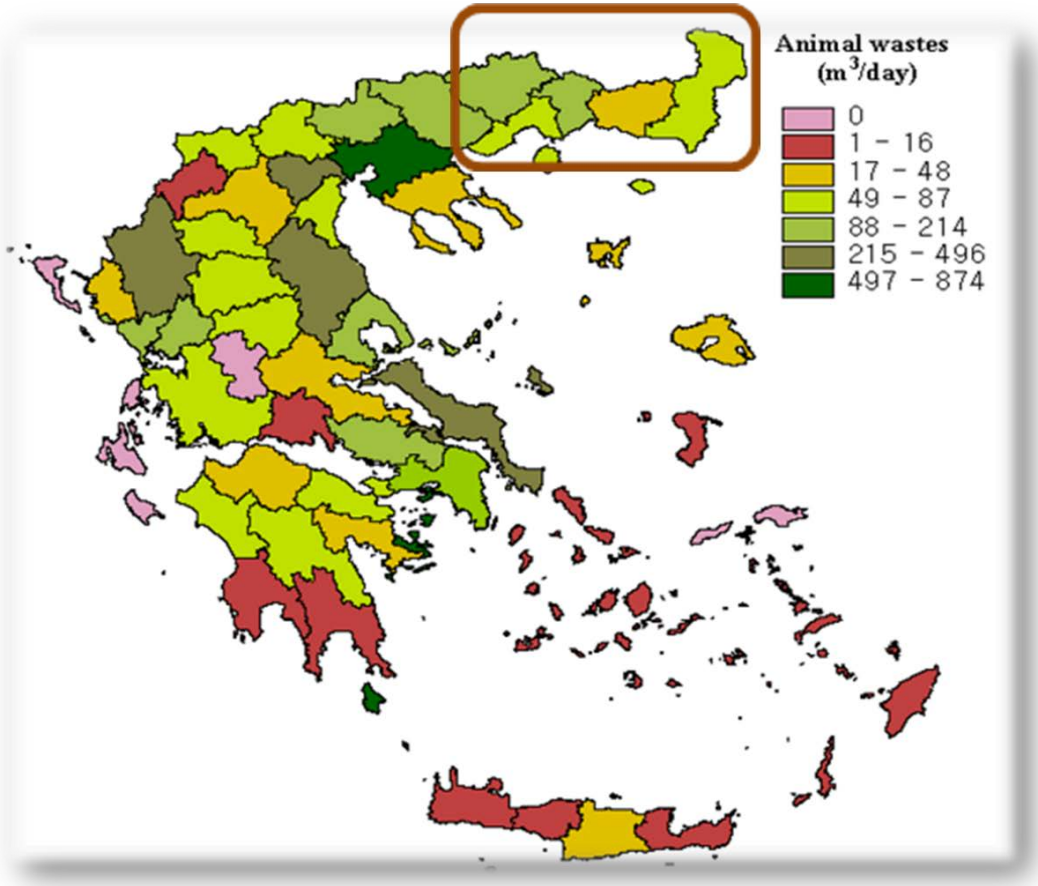


Animal wastes availability

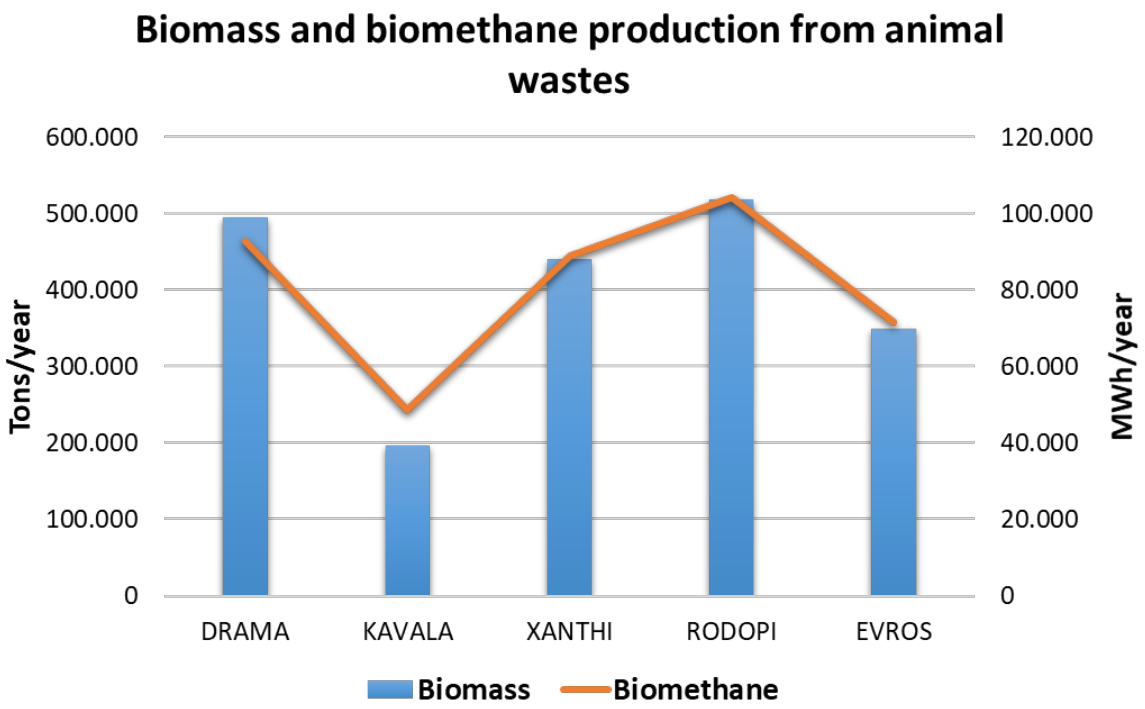


Straw availability

THE STUDY AREA



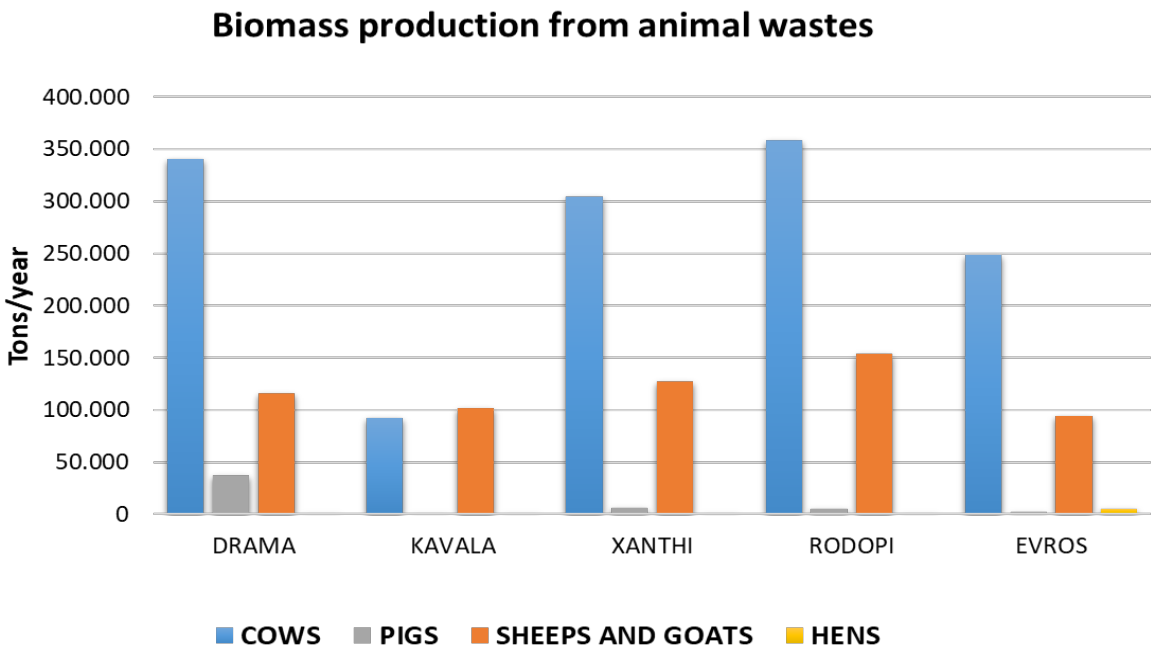
Animal wastes availability

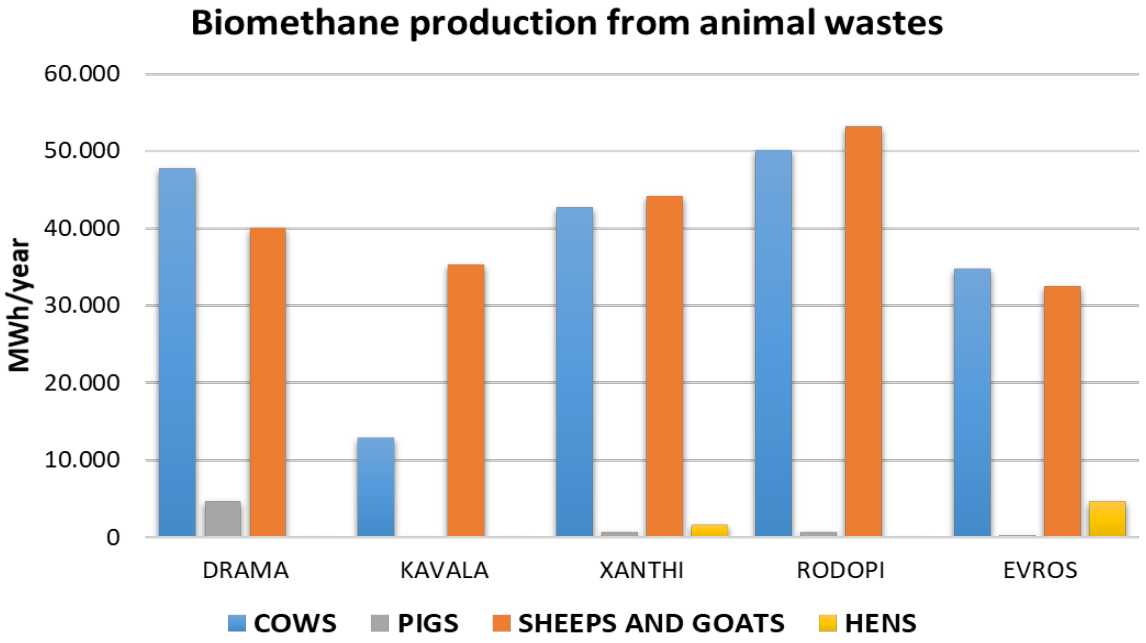


According to our results:

- the theoretical biomass potential from livestock manure amounts to 1,997,108 tons/year and 405,885 MWh/year
- 40% availability

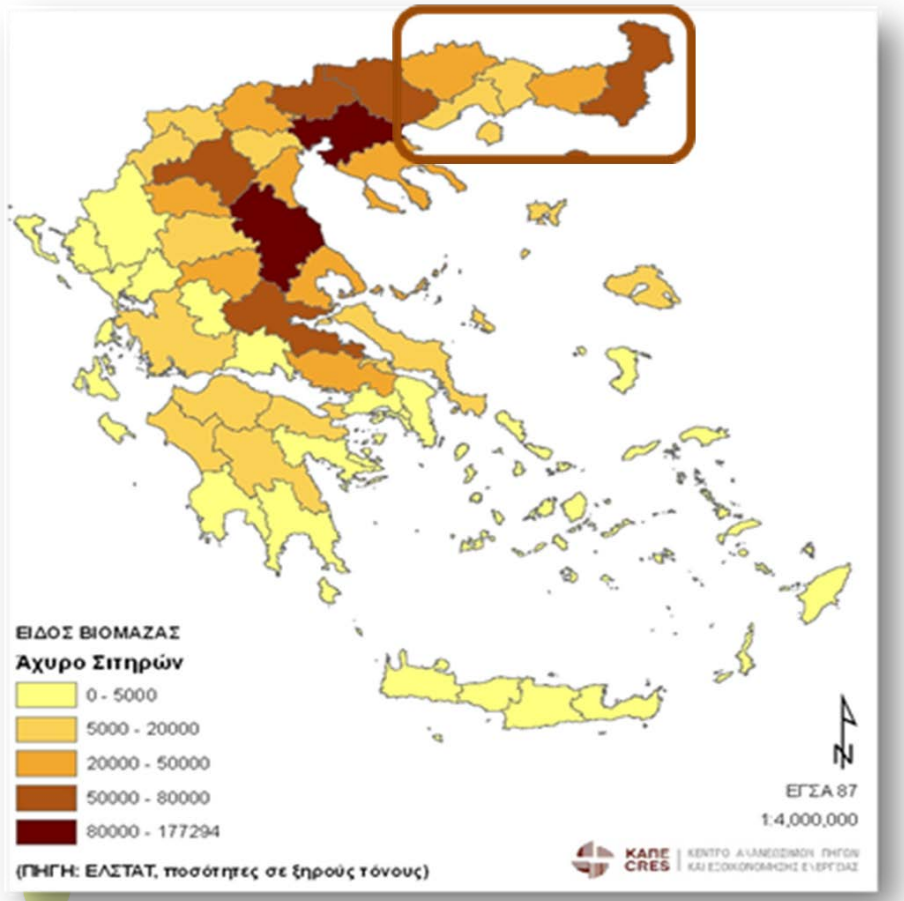
BIOMASS AVAILABILITY



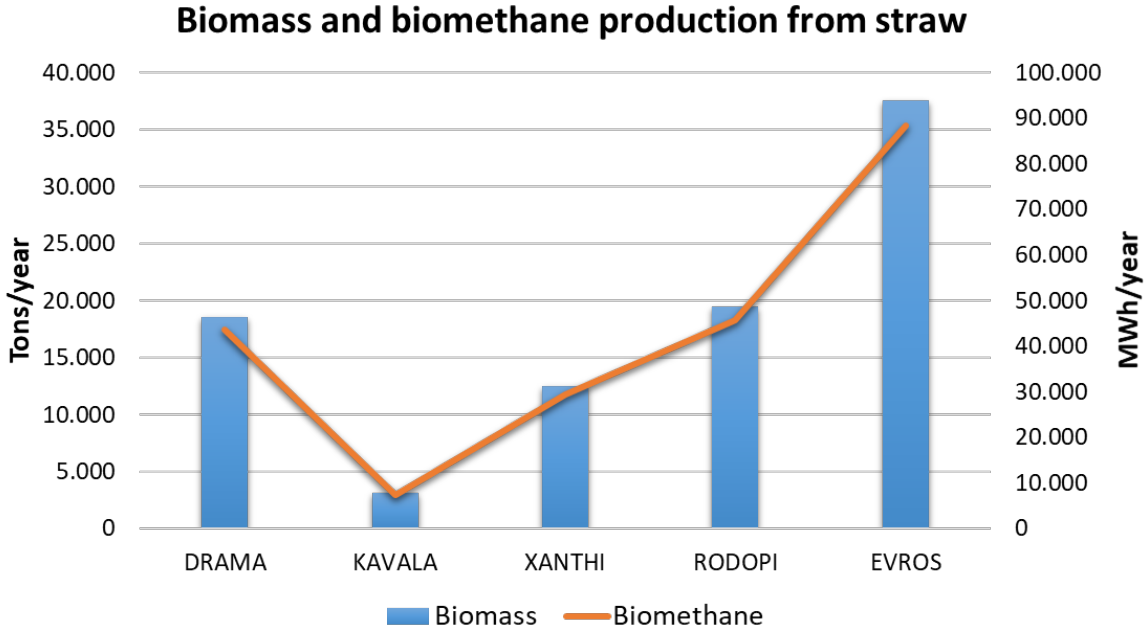


- Biomass production from cows manure account for the 67% of all animal wastes
- Biomethane production from cows and sheep/goats does not significantly differ

BIOMASS AVAILABILITY

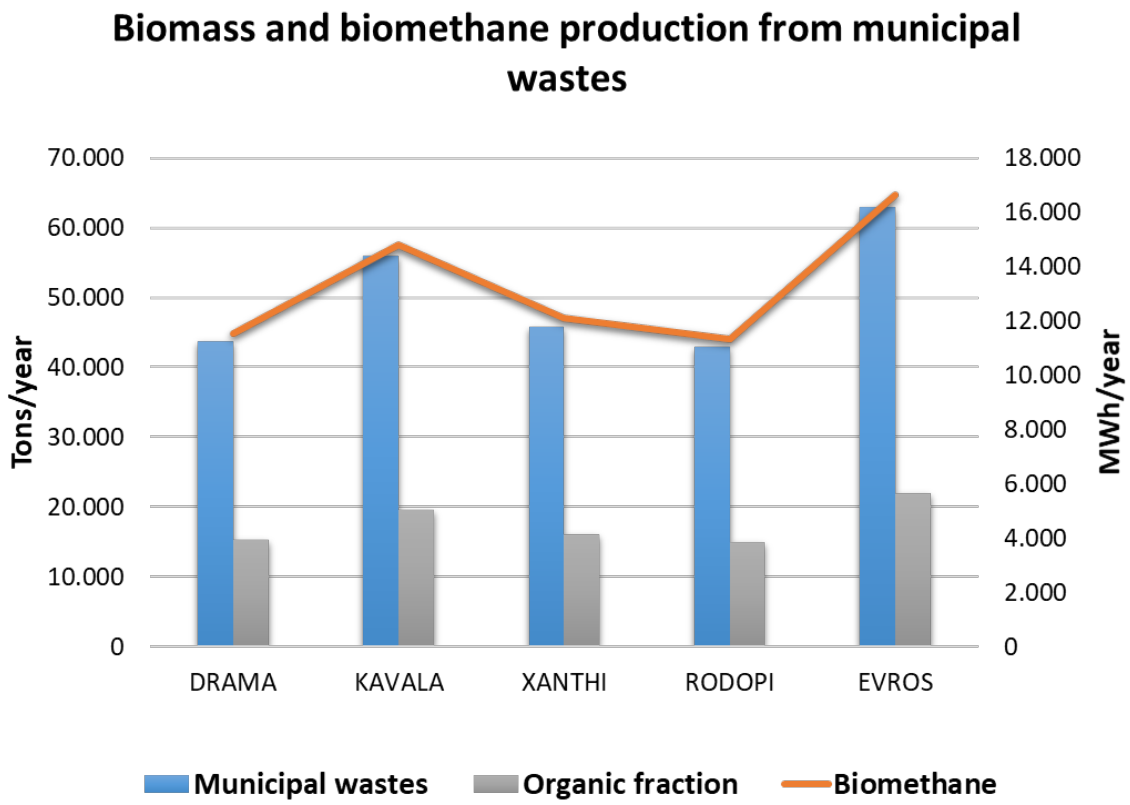


Straw availability



- Straw is estimated at 91.220 t/y biomass and 214.324 MWh/y biomethane. The total fuel capacity of only the animal waste and straw in the 20 municipalities is expected to amount to 76 MW.
- Crop rotations with sorghum grown in 2100 hectares (0.10% of the agricultural land coved by cereals) can amount to 21700 tons of biomass that could add another 20,917 MWh/year

BIOMASS AVAILABILITY



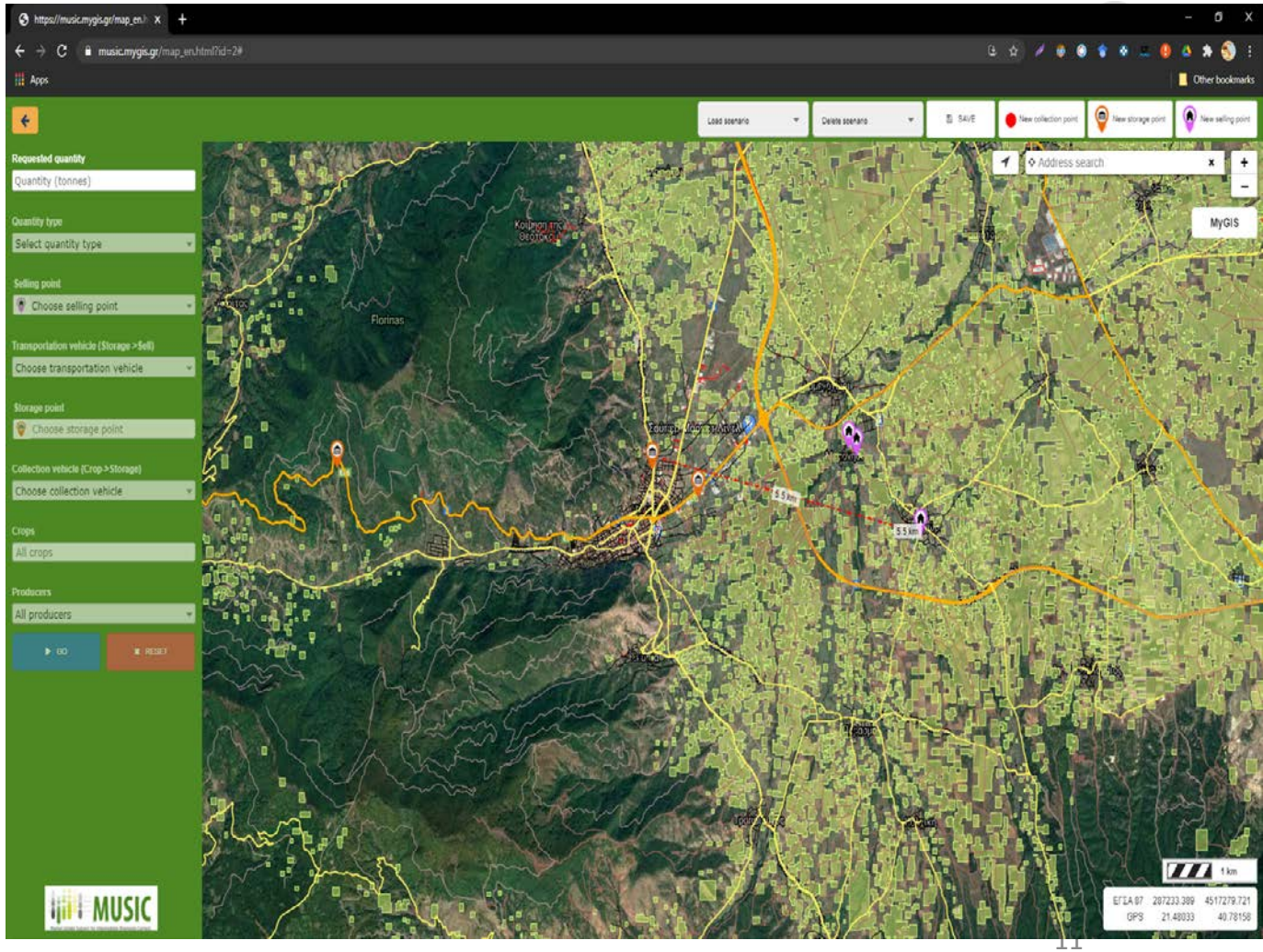
The theoretical potential of the organic fraction of the municipal wastes amounts to 87,979 tons/year, with a biomethane energy content of 66,436 MWh/year.

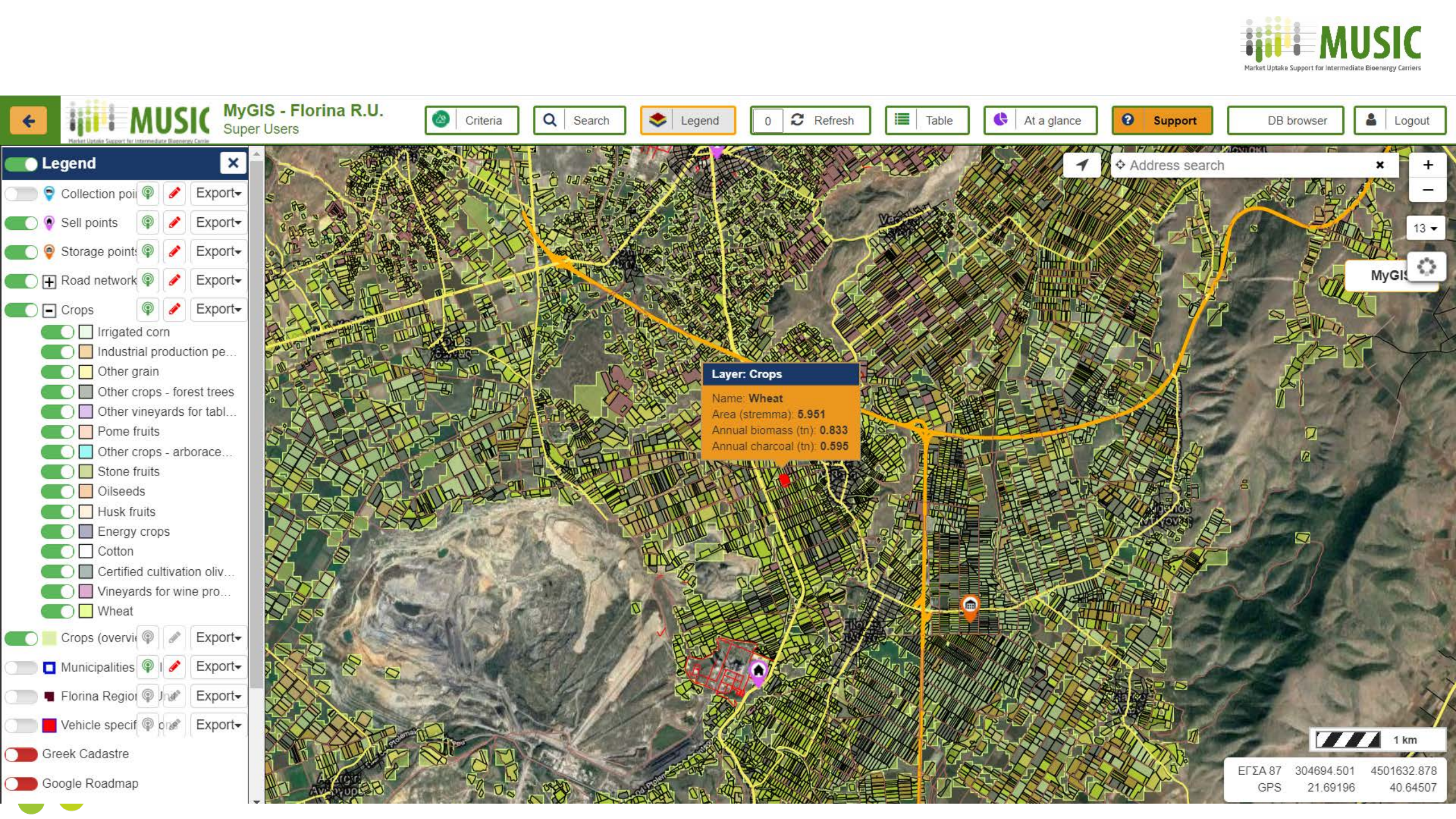
Music-mygis model

Objective: A GIS application to help the user select the fields where the biomass will be collected, places to be stored/torrefied and sold and calculate the related logistics costs.

MODEL PARAMETERS

- **Selling point**: the final destination of the biomass (client).
- **Transportation vehicle**, which will transport the biomass from the storage point to the selling point. Each vehicle type takes into consideration:
  - Capacity (volume)
  - Maximum payload (weight)
  - Biomass packaging type (e.g.. Big bags, rectangular bales, etc.)
  - Transportation cost (Fuel/oil consumption and costs, service costs etc.)
  - Time and cost to load/unload
- **Storage point**: is the collection point of all biomass before it is transported to the client.
- **Collection vehicle**, which will transport the biomass from the collection points to the storage point. It has similar functionality to the transportation vehicle.
- **Crops**: Crop residues (maize, vineyards, pome fruits, stone fruits and other tree species).

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MyGIS - Florina R.U.
Super Users
Criteria
Search
Legend
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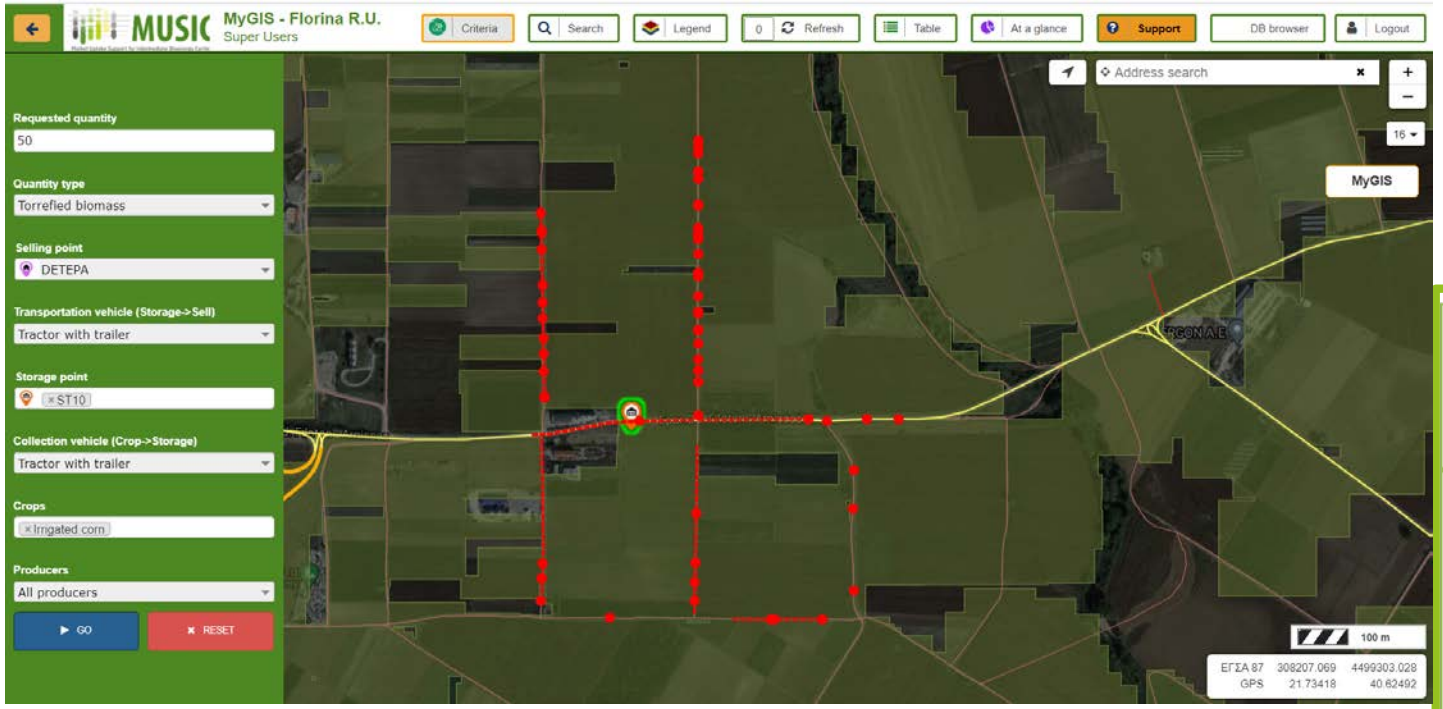
Refresh
Table
At a glance
Support
DB browser
Logout
Legend
Collection poi
Sell points
Storage point
Road network
Crops
Irrigated corn
Industrial production pe...
Other grain
Other crops - forest trees
Other vineyards for tabl...
Pome fruits
Other crops - arborace...
Stone fruits
Oilseeds
Husk fruits
Energy crops
Cotton
Certified cultivation oliv...
Vineyards for wine pro...
Wheat
Crops (overvi
Municipalities
Florina Regio
Vehicle specif
Greek Cadastre
Google Roadmap
Export
Address search
13
MyGIS
Layer: Crops
Name: Wheat
Area (stremma): 5.951
Annual biomass (tn): 0.833
Annual charcoal (tn): 0.595
1 km
ΕΓΣΑ 87 304694.501 4501632.878
GPS 21.69196 40.64507



The model output consists of the **total biomass transportation cost** (as a sum of fixed, working, fuel and service cost), and the total **distance, routes and time for the specific collection-storage-sale supply chain**.

Individual costs for the two stages: (Field->Storage Point Storage Point ->Selling Point)	Total Cost
Type of the vehicle selected Transport method Total quantity (t) Routes Total distance (km) Distance based-time (hours) Transport time (hours) Fixed cost (€/h) Work cost (€/h and €/t) Fuel cost (€/h and €/t) Service cost (€/h and €/t) Energy content (MJ) Cost (€) Cost per ton (€/t) Cost per MJ (€/MJ)	Collection-storage trips Collection-Storage total (km) Storage - Sell trips (km) Storage Sell total (km) Total routes Total distance (km) Total time (hours) Total cost (€) Grand total per ton (€) Grand total per MJ (€)

CONCLUSIONS

- The theoretical biomass potential from livestock manure, grain straw, agro-industrial waste and sludge amounts to 2.2 mtons/year, with energy content of biomethane 643,080 MWh/year.
- The results indicate that at least 5 biogas upgrading plants could be established in the region with the following technical characteristics:
  - 240 m^3 raw biogas flow
  - 60% input methane
  - 98% methane recovery
  - 95% availability
  - 1,202,247 m^3 /year biomethane output
  - 11,592 MWh/year energy output
- Biomass mobilization can be challenging, as biomass is scattered, seasonally available and difficult to transport and store
- The MUSIC-MyGIS model is a GIS application contains cartographic backgrounds, administrative layers, road network, data bases with data on crop types, yields and energy potentials, biomass forms and transport means.
  - Logistics are processed in two stages: Field → storage/torrefaction unit → end user.
  - Total routes, distances, and times, costs per ton and per MJ for each stage are calculated.

Thank you for your attention!

For more info:

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The work is carried out for an internal study assigned by DEDA

MUSIC project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 857806.