

The ENEA center for the assessment and management of invasive species (ENEA-camis) as a node in the AnaEE distributed European research infrastructure

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Over the last four decades, ENEA has developed innovative approaches to sustainably manage ecosystem problems. Yet global change in the form of agro-technical inputs, pest species, and climate change makes agro-ecosystems increasingly complex and their sustainable management unprecedentedly difficult (see e.g., Soussana *et al.* 2012). A key issue at the interface between global change and biological systems (i.e., global change biology) is the growing problem of invasive species (see e.g., Cristofaro *et al.* 2009) that annually cause worldwide economic losses nearly an order of magnitude higher than those inflicted by natural disasters (Ricciardi *et al.* 2011). An example is the resurgence of human diseases transmitted by invasive arthropod vectors of tropical origin that due to global warming expand their range into increasingly favorable temperate regions including Europe (Medlock *et al.* 2012).

The long term goal of our proposal is to make ENEA a European center of excellence for the assessment and management of invasive species.

ENEA already includes expertise to tackle some of the worst invasives in Europe, and is **updating dedicated research facilities** to trigger a new level of expertise integration (see figure) that we propose as a prospective node in the AnaEE distributed European infrastructure for ecosystem research. All global challenges addressed by AnaEE are linked to invasive species that are both major drivers and effects of global change in ecosystems.

ENEA-camis will offer quarantine facilities, biotechnology labs, rearing facilities for collecting data on species biology and ecology, process-based ecosystem modeling/GIS tools for data analysis, as well as an array of targeted expertise such as field monitoring, arthropod symbioses, insect biotechnology, area-wide integrated pest management (IPM), host plant resistance, biological control, and data management – **all at a single research site with 24h guarded security**: a substantial plus when dealing with quarantine organisms.

It is a **diversified, on-site package of integrated facilities and expertise** suitable for both assessing risks and developing management options in a quarantine context. Additionally, state-of-the-art regional climate modeling is routinely performed within the same ENEA research site (<http://utmea.enea.it/>), and hence high-resolution climate data sets are readily available that further enhance the potential for assessing and managing invasive poikilotherms in a climate change scenario.

In Europe, most of the focus has been on information networks with apparent lack of research infrastructures specifically devoted to **assessing and managing invasive species based on a mechanistic understanding of their potential geographic distribution and relative abundance (i.e., a measure of invasiveness)**. This a specific gap that we aim to fill, in addition to complementing the widely-used correlative (i.e., climate envelope) approaches (see e.g., Dawson *et al.* 2011) that are often the only available option for assessing invasives but tend to overestimate impact, and hence may lead to improper allocation of limited management resources (see e.g., Bradley 2013).

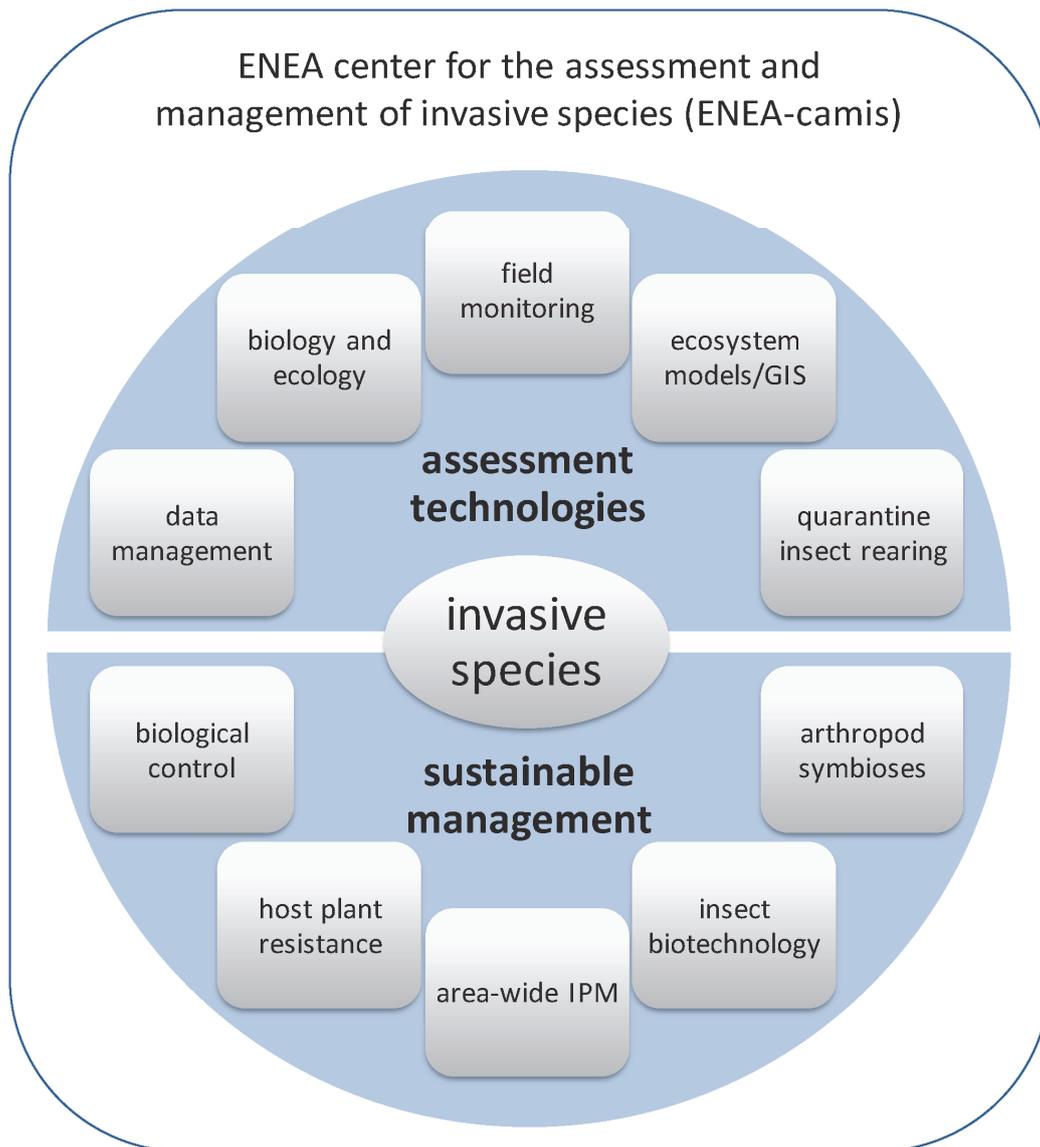


Figure. Conceptual diagram illustrating the ENEA-camis research infrastructure.

References

- Bradley BA (2013) Distribution models of invasive plants over-estimate potential impact. *Biological Invasions*, **15**, 1417–1429.
- Cristofaro M, Arnone S, Calvitti M, de Biase A, Di Ilio V (2009) Socio-economic impact of invasive arthropod crop pest species in developing countries. *I Georgofili. Quaderni 2009-V*, **6**, 69–97.
- Dawson TP, Jackson ST, House JI, Prentice IC, Mace GM (2011) Beyond predictions: biodiversity conservation in a changing climate. *Science*, **332**, 53–58.
- Medlock JM, Hansford KM, Schaffner F, Versteirt V, Hendrickx G, Zeller H, Bortel WV (2012) A Review of the Invasive Mosquitoes in Europe: Ecology, Public Health Risks, and Control Options. *Vector Borne and Zoonotic Diseases*, **12**, 435–447.
- Ricciardi A, Palmer ME, Yan ND (2011) Should biological invasions be managed as natural disasters? *Bioscience*, **61**, 312–317.
- Soussana J-F, Fereres E, Long SP, *et al.* (2012) A European science plan to sustainably increase food security under climate change. *Global Change Biology*, **18**, 3269–3271.