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Mining EU LIFE projects management and restoration costs to prioritise actions on invasive species

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Contents

Abstract

Invasive alien species (IAS) pose a significant threat to European ecosystems, biodiversity, and economies, with estimated management costs amounting to €43,273,609 derived from 18 LIFE-funded projects (from 2010 to 2022). Most of these projects targeted IAS management in aquatic environments, with 82% of the total budget allocated to IAS management. Despite the efforts, challenges such as limited quantitative cost data and language barriers constrain quantification of IAS management efforts. The European Alien Species Information Network (EASIN) is working to assess IAS economic impacts, to complement scientific information and spatial data in support of policy decision-making. This study highlights the need for improving data accessibility of IAS costs by standardising data formats, to help other projects prioritize and enhance IAS management initiatives. In conclusion, by enhancing our understanding of the economic impacts of IAS, this work will inform evidence-based policy decisions, drive innovation in IAS management biosecurity, and ultimately contribute to a more competitive and sustainable Europe, where biodiversity and ecosystems are protected, and economies can thrive.

Acknowledgements

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1. Introduction

Invasive alien species (IAS) are animals, plants, and other organisms introduced accidentally or deliberately into environments outside their native range, posing significant threats to biodiversity, ecosystems, the economy, and human health in the European Union (European Commission, 2014). Over the past decade, there has been a growing awareness of their impacts (Diagne et al., 2021; Turbelin et al., 2025; Magliozzi et al., 2025). IAS have detrimental impacts on terrestrial, freshwater, and marine environments, affecting not only individual species but also entire communities and ecosystem services (Pyšek et al., 2020; Çinar et al., 2014; Gallardo et al., 2024). Recognised as one of the five main drivers of biodiversity loss (Roy et al., 2023), IAS cause substantial economic burdens, estimated as of €612 billion globally (Turbelin et al., 2024), and €116.61 billion in Europe (1960-2020; Haubrock et al., 2021). IAS impact multiple sectors[1](Magliozzi et al., 2025), including animal and human health (Roy et al., 2023; EFSA et al., 2023, Chinchio et al., 2020; Shackleton et al., 2019), water resources (Lamb et al., 2021; Watts and Moore, 2011), energy systems (Booy et al., 2017), transportation systems (Nyumba et al., 2021; Vanderbush et al., 2021), and agriculture (Rojas-Sanadoval et al., 2022). Despite this negative effects, research has also demonstrated that IAS can provide benefits to human well-being, including provisioning services (food, medicines, bioenergy, and construction materials), regulating services (bio-agent control, bioremediation, and shade provision), cultural services (aesthetic and ornamental values), and supporting services (soil and land reclamation through eco-restoration) (Boadie-Ampong et al., 2024; Barcellos et al., 2023; Marchessaux et al., 2023; Cerveira et al., 2022; Katsanevakis et al., 2014). There are examples of IAS with positive as well as negative impacts on the same sector (Magliozzi et al., 2025). A case in point is *Ambrosia trifida* L., a notorious weed that poses significant challenges in many countries due to its resistance to herbicides and ability to outcompete crops for essential resources such as light, water, and nutrients (Kato-Noguchi and Kato, 2024). Nevertheless, this species also has beneficial uses, including producing high-quality forage (Chauvel et al., 2021) and potential applications in phytoremediation and phytostabilization, which involve using plants to clean up pollutants and stabilize contaminated soil (Kang et al., 1998).

Although considerable attention has been given to studying the ecological effects of IAS, assessment of economic impacts remains restricted to a narrow number of species, habitats, or geographic areas. This gap hinders the creation of a robust basis for decision-making by policymakers, managers, and stakeholders. The InvaCost database (Haubrock et al., 2021) has attempted to address this gap, but available data largely focus on direct costs, which are easier to quantify (Haubrock et al., 2021).

The lack of reliable, readily-available data on IAS costs remains a critical knowledge gap in understanding the full spectrum of impacts associated with biological invasions. Without comprehensive data, the absence of reported costs can give the false impression that economic impacts are minimal. This gap perpetuates misconceptions about the true extent of IAS impacts and weakens the economic rationale for decision-making.

To bridge this knowledge gap, the European Alien System Information Network (EASIN) has begun collating economic impact data to complement scientific information and spatial data and foster international collaboration and coordination across EU Member States (MS) (Magliozzi et al. 2024).

The LIFE Programme[2], a key EU initiative funding environmental and climate action since 1992, prioritizes IAS management alongside biodiversity conservation and climate mitigation (European Commission, 2017; IUCN, 2018). Given its extensive project portfolio, LIFE represents a valuable source of data on IAS management costs. This report examines the economic aspects of IAS management within the LIFE-funded projects, assessing resource allocation and strategic priorities. By identifying these costs and identifying best practices, the findings aim to inform policy decisions, optimise resource use and guide future IAS management projects. Ultimately, this work contributes to preserving European biodiversity and mitigating the economic and ecological impacts of IAS.

Box 1. Europe legislation targeting IAS.

The Regulation (EU) 1143/2014 (European Commission, 2014), requires EU MS to adopt necessary measures aimed to prevent, minimise, and mitigate the adverse impacts of IAS on biodiversity, ecosystem services, and human health[3]. A key step of the regulation is the list of IAS of Union concern- the Union list, which outlines species subject to restriction and other measures, including ban on import, breeding, keeping, sale, cultivation, and release in the environment. MS are required to address pathways leading to unintentional introductions, implement early detection and rapid eradication measures, and manage widespread species within their territories. The regulation is supported by secondary legislative acts, which provide technical formats for reporting, risk assessment guidelines, and updates to species listings. Additionally, advisory and coordination bodies, such as the Committee on IAS, the IAS Expert Group, and the Scientific Forum on IAS, support the Commission services, MS competent authorities and stakeholders in refining and enforce management strategies. To enhance effective responses to emerging IAS threats, the European Commission in 2025[4] delegated the management of the of European Rapid Response Fund for IAS to the International Union for Conservation of Nature (IUCN). This fund provides targeted grants, and capacity-building initiatives to frontline conservation organisations, enabling swift action to prevent the establishment and spread of new IAS.

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[2] https://cinea.ec.europa.eu/programmes/life_en

[3] https://environment.ec.europa.eu/topics/nature-and-biodiversity/invasive-alien-species_en

[4] https://iucnsos.org/new-call-for-proposal-european-rapid-response-fund-for-invasive-alien-species/

2. Methodology

2.1. Collection of data

The data used in this analysis were extracted from the online private repository, BUTLER, managed by the European Climate, Infrastructure and Environment Executive Agency (CINEA), which stores technical and financial management information on LIFE projects. A filtered list of LIFE funded projects was used to select those reviewed in this study (Annex 1). This list included environmental LIFE projects related to IAS management, totalling 63 projects. The selection was based on the availability of project information and documents. To analyse a diverse sample, projects were chosen from different EU MS and types of environment. Thirty-five projects had already been completed, while the remaining twenty-eight were still ongoing. Eight projects that started and were concluded before 2010 were excluded (Annex 1). The oldest project included in the analysis was LIFE REDCOHA, which began in 2013 and ended in 2019. The sample of projects analysed comprised 18 projects (Annex 1, 2).

2.2. Project costs classification

The reviewed LIFE projects provide a standardized breakdown of their overall costs in a table with predefined categories. These costs are categorized by project activity and budget type, including: personnel, travel, external assistance, infrastructure, equipment, purchase or lease of land, consumables, and other expenses.

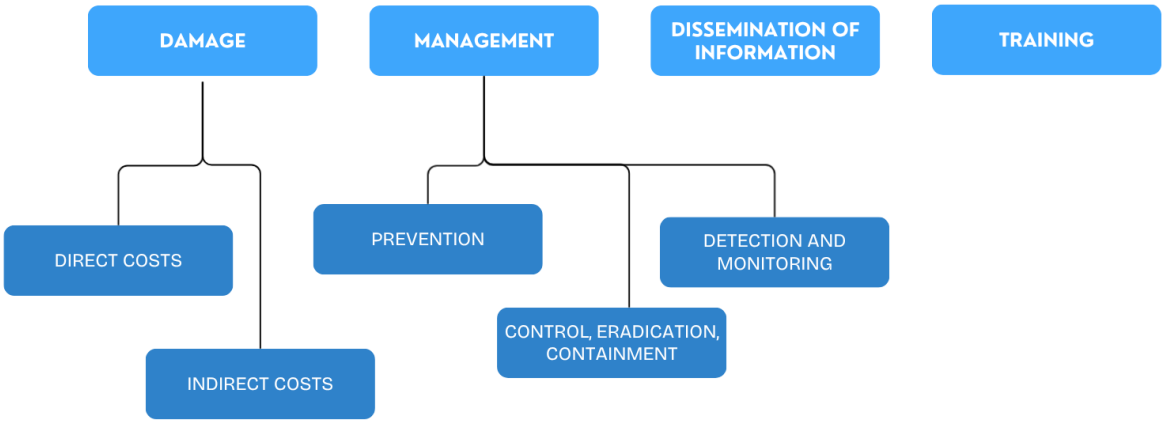
To analyse these costs in relation to IAS management, a classification was developed.

As there is no common template for this purpose, the public database on IAS, InvaCost (Diagne et al., 2020), was used as a reference. InvaCost categorizes costs into four types based on their nature:

- Damage costs - economic impacts resulting from the direct or indirect effects of invaders.
- Management costs - resources allocated to mitigating the spread or impact of invaders.
- Mixed costs - costs that include both "damage" and "management" components.
- Unspecified costs - cases where the nature of the cost is unclear.

Additionally, InvaCost subdivides management costs into four subcategories: prevention, detection, management, and research (understanding or prediction). This classification was adapted to create a customized framework for analysing LIFE-funded projects. In this report, four main categories were used: **damage, management, dissemination of information, and training** (Figure 1, Table 1). Additionally, the categories of damage and management were further subdivided into subcategories (Figure 1, Table 1).

Figure 1. Customised framework for analysing of IAS costs from LIFE-funded projects.



Source: this report.

Quantitative data on the direct impacts caused by IAS were not specified in most projects (83%). As a result, the economic damages and losses, i.e. the 'damage' category, was subdivided into **'direct costs'** and **'indirect costs'** (Figure 1). These subcategories are a conceptual framework tailored to this study and intended to be improved and adapted based on the data availability of future analyses. The costs from the projects were subsequently classified according to this framework, with each cost item referring to the corresponding project activity and budget category (e.g. personnel, travel, etc.).

Table 1. Categories, subcategories, and description.

Cost category	Cost subcategory	Description
Damage	direct	refers to the immediate and tangible costs of IAS in the study area.
	indirect	associated with project activities that could serve as a proxy for measuring the impacts of IAS in the study area. For example, the cost of ecosystem restoration efforts justified by the presence of IAS were considered a proxy for the cost of impact of these species.
Management	prevention	cost of activities intended to prevent the further spread of the targeted IAS. For example, biosecurity plans were included in this category.
	detection and monitoring	cost of activities related to the detection and monitoring of IAS, protected species, and ecosystems impacted by IAS.
	control eradication, containment	cost of measures for controlling, eradicating, and containing IAS.
Dissemination of information	\	cost of the distribution of information collected and developed during the project through websites, reports, workshops, conferences, and networking events.
Training	\	cost of activities focused on capacity building, workshops with project stakeholders, education programmes targeted at the public, and the development of best practice guidelines.

Source: this report.

2.3. Other information

The data collected from each project was loaded into a standardized Excel file, with each sheet containing a summary of the key information relevant to the project supporting our analysis (Annex 2). The aim was to organize the data in a consistent way across projects, though this task presented several challenges (Section 4).

For each project, descriptive information was gathered, including objectives, location, duration, targeted IAS, native species to be protected and ecosystems concerned. Additional information was also collected, where available, on the following topics: i) ecosystem service assessment ii) socio-economic impact iii) innovative tools used iv) Key Project Indicators (KPIs).

KPIs are an essential component of the LIFE programme, providing insights into the outcomes achieved by funded projects. These indicators serve multiple purposes, assessing not only the environmental and climate impacts but also the socio-economic aspects of the LIFE initiative. KPIs have been collected from funded projects since the 2021 calls. The primary purposes of KPIs include:

- Tracking progress towards the LIFE programme goals, as stipulated in Article 19 of the LIFE Regulation 2021/783 (Annex II).
- Providing insights into the impacts of projects in alignment with the specific goals of the corresponding LIFE sub-programme and thematic priorities outlined in the LIFE Call documents.
- Supporting CINEA monitoring of compliance with the Grant Agreement contractual obligations, facilitating policy feedback to relevant Commission services, and serving various informational, communication, dissemination, and promotional purposes.

Submitting KPI values is a mandatory reporting requirement for all LIFE projects. CINEA primarily (though not exclusively) evaluates project progress and outcomes based on these indicators.

Additional project data that could support our analysis, such as results from studies on public perception of IAS and the project itself, were included in a "Notes" section. A separate "Comments on the project" section was created to document missing or incomplete documents, format issues, or valuable additional information provided by the project.

After collecting and organizing the data from all the 18 projects, the cost data were collected into a single dataset. This allowed for cross-project comparisons and carrying out an analysis of IAS management costs, which is provided in the EASIN Collection of the JRC Data Catalogue[5].

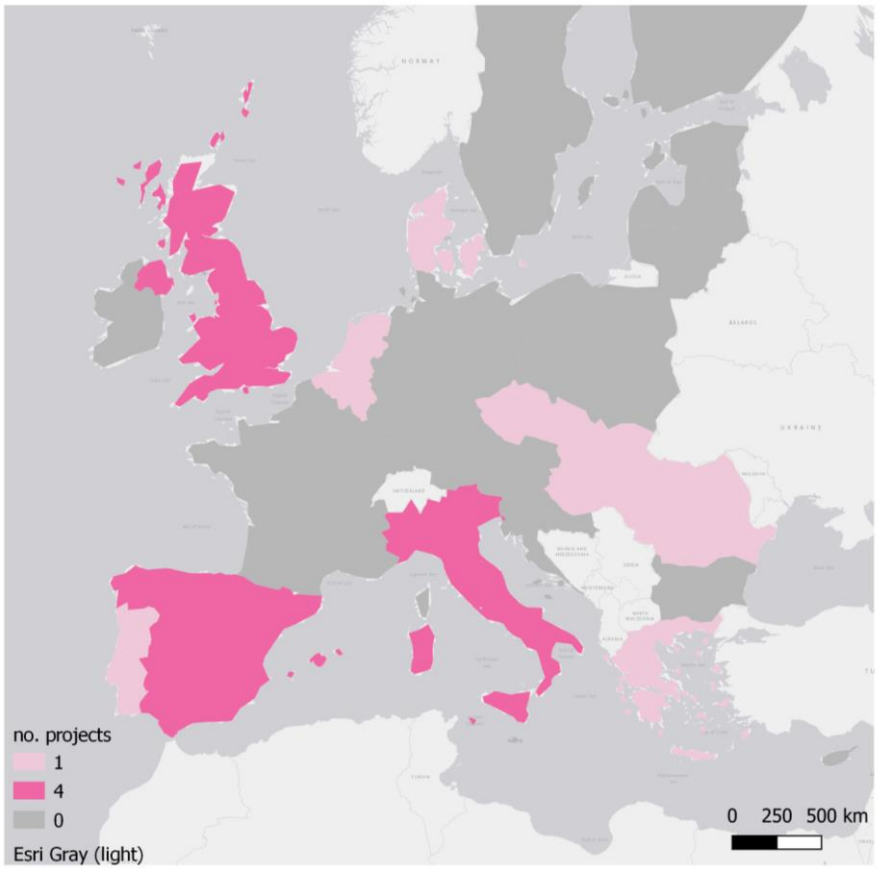
[5] https://data.jrc.ec.europa.eu/

3. Results

3.1. Descriptive information

The 18 projects analysed in this study were implemented in 12 different EU MS and the United Kingdom (UK). Nine LIFE projects were completed, while nine remain ongoing. Only three projects had a transnational focus (e.g. collaboration between EU MS); the majority of projects were limited to a single country (Figure 2). The United Kingdom, Spain, and Italy were the countries that implemented the most projects, collectively contributing to eleven LIFE projects. A more geographically diverse sample was difficult to achieve due to linguistic barriers, as the documentation for some projects was only available in their original languages.

Figure 2. Map showing the countries where the analysed projects took place: Belgium, Denmark, Greece, Hungary, Czechia*, Romania*, the Netherlands, Portugal, Slovakia*, Italy*, Spain*, United Kingdom. (Note: Countries marked with an asterisk '*' were involved in transnational projects.



Source: this report.

The projects covered terrestrial, freshwater, and coastal environments, with more than 60 % focusing on the management of IAS in aquatic environments (e.g. coastal and freshwater). Five projects reported the use of innovative tools (Table 2). Only a quarter of the reviewed projects did a qualitative ecosystem service assessment and reported their results.

Table 2. Summary of projects in the sample that reported the use of innovative tools.

Project acronym	Innovative tools
LIFE medCLIFFS	Risk assessment through the RISKMAPR application. Optimization of chemical treatments for Gazania.
RAPID LIFE	Novel signal crayfish management techniques. Innovative approach to IAS management in freshwater, riparian and coastal environments across England.
LIFE Nat.Sal.Mo	Selective access to spawning ground by fixed traps. Semen cryopreservation. Nesting techniques. River contracts.
LIFE STOP VESPA	New radar tool to locate *Vespa velutina's* nests.
LIFE RESQUE ALPYR	Use of rotenone as a treatment for the elimination of invasive fish.

Source: this report.

The EU contributed between 40 % and 75 % to the total budget for the LIFE projects analysed (Table 3). Among these projects, 61 % focused on habitat restoration, while the remaining 39 % focused on IAS management (Table 3). However, 82% of the total budget was allocated to IAS management (Table 3).

Table 3. Total budget and EU contribution to each project along with the overall objectives.[6]

Project acronym	Total budget	EU contribution	Objectives
LIFE REDCOHA	2,845,912.00	1,422,956.00	restoration
LIFE RESILIAS	3,024,242.00	1,814,545.00	restoration
LIFE ATIAS	1,990,020.00	1,184,410.00	management
LIFE Green Belt	2,568,132.00	1,540,887.00	restoration
LIFE CLAW	3,711,742.00	2,226,389.00	restoration
LIFE medCLIFFS	1,408,408.27	843,814.00	management
LIFE SUBPANNONIC	3,112,940.00	2,330,797.00	restoration

[6] Management might refer to the ongoing processes and practices aimed at controlling or mitigating the impact of IAS, while restoration could involve efforts to return an ecosystem to a healthy state, possibly including the removal of invasive species. Management and restoration might not be mutually exclusive but could be sequential steps in addressing the issue of IAS. For instance, managing an invasive species might be a necessary first step before restoration efforts can be effective. This could imply that while a project might primarily focus on one aspect, it could lay the groundwork for the other.

RAPID LIFE	1,136,136.66	681,698.00	management
Oarkey WILDLIFE	7,621,621.78	3,295,746.00	management
RIPSILVANA NATURA	2,454,454.61	1,221,168.00	restoration
LIFE RIPARIAS	7,010,010.39	3,855,714.00	management
LIFE Nat.Sal.Mo	2,631,631.43	1,538,247.00	restoration
Biosecurity for LIFE	1,350,145.00	810,087.00	management
Celtic Rainforest LIFE	9,512,759.00	5,707,655.00	restoration
LIFE IP GRASSLAND-HU	17,258,306.00	10,354,984.00	restoration
LIFE IP AZORES NATURA	19,087,522.00	11,452,513.00	restoration
LIFE STOPVESPA	2,273,273.74	1,364,254.00	management
LIFE RESQUE ALPYR	4,776,469.00	2,865,865.00	restoration

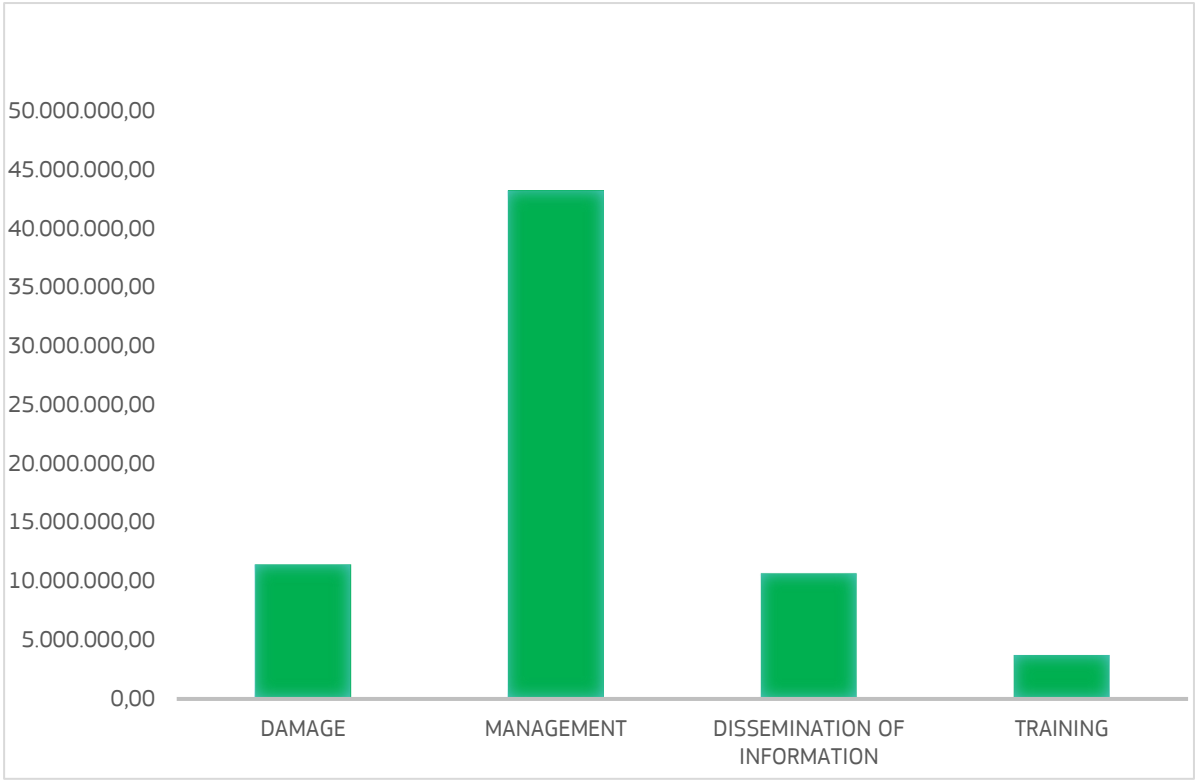
Source: this report.

3.2. Costs of IAS

The costs related to IAS (Figure 3) were categorised as indicated in Figure 1. The highest expense in the total budget of the 18 LIFE projects is allocated to IAS management activities, with a total of €43,273,609.99. The second highest cost category is the economic impact of damages caused by IAS, followed by dissemination activities. Training activities received the smallest percentage of the total project costs.

Figure 4 illustrates the distribution of costs across the different categories and subcategories. The four main categories are displayed at the centre of the doughnut graphic. The categories "Dissemination of Information" and "Training" are not divided into subcategories, while "Management" is split into three subcategories: "Control, Eradication, and Containment", "Detection and Monitoring", and "Prevention". The highest management expenses were allocated to control, eradication, and containment of IAS, followed by costs associated with detection and monitoring activities. Prevention received the least funding.

Figure 3. Costs of IAS from the projects sample classified by IAS cost categories.

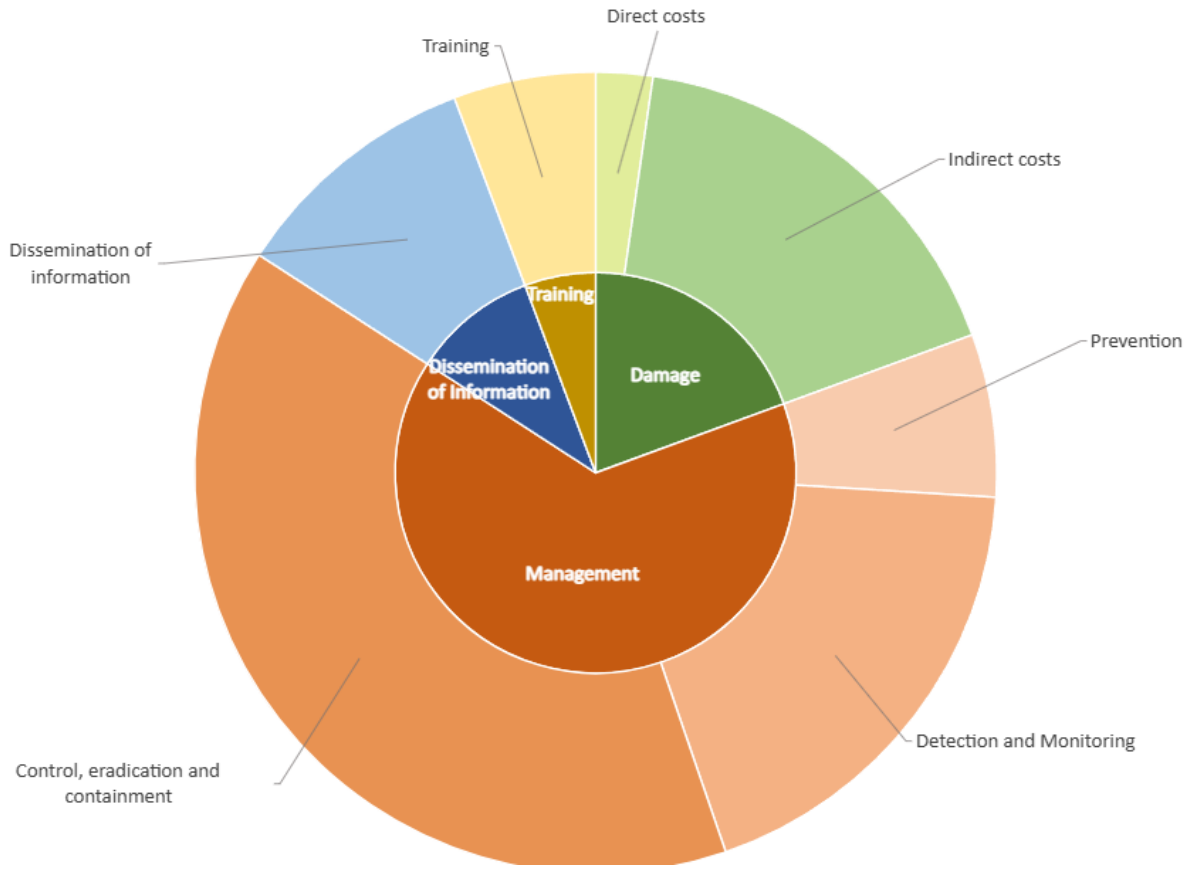


Source: this report.

Expenses associated with indirect costs of IAS impacts, such as external assistance, prototype development, and overhead costs, are substantially higher than those related to direct costs, including personnel, travel, equipment, infrastructure, consumables, and land acquisition. However, we recognize that this finding may be influenced by the selection of projects with specific objectives, such as restoration or management, which could have skewed the relative proportion of costs. Additionally, our definition of direct costs, which only included immediately incurred expenses, may have contributed to this outcome. Unfortunately, the scarcity of detailed data on the direct

economic impacts of IAS in the analysed projects is a limitation of our study, with only one of the 18 examined LIFE-funded projects providing such information.

.**Figure 4.** Proportion of costs by subcategory.



Source: this report.

Table 4 summarises the targeted IAS, the eradication methods used, the area cleared from IAS, and the associated costs. This data is fundamental for assessing the socio-economic impact of IAS in the area. However, 17 out of the 18 projects did not provide this information.

Table 4. Eradication costs of alien species from project LIFE medCLIFFs. '.' is used as decimal separator.

Project acronym	IAS	Eradication method	Area	Cost
LIFE medCLIFFS	*Carpobrotus* sp.	Vertical works (manual and mechanical)	2.08 ha	€ 175,482.25
	Opuntia ficus-indica	Biological treatment	15.00 ha	€ 7,427.17
	Gazania rigens	Chemical treatment	1.42 ha	€ 12,211.22

	Carpobrotus sp.	Non vertical works (manual and mechanical)	7.53 ha	€ 25,277.00
	Opuntia sp.	Chemical treatment	2.61 ha	€ 156,288.97
	Gazania rigens	Manual and mechanical treatment	7.90 ha	€ 28,986.76

Source: this report.

3.3. Key Performance Indicators

The data from projects documenting the use of KPIs in standardised form were merged into a single database. These indicators monitor progress in various aspects of the projects, including habitat improvement, reduction of IAS, employment created during the project, and awareness raising. Table 5 compares the estimated reduction of IAS reported by different LIFE projects. In all cases, except for LIFE Orkney, IAS were reduced by at least 50% compared to the baseline situation.

Table 5. Estimation of reduction of IAS (Key Project Indicator).

Project acronym	IAS	Unit of measure	Reduction of IAS (%)
RESILIAS LIFE	*Fallopia japonica, Lepomis gibbosus, Crassula helmsii, Prunus serotina*	13 populations/ 410 ha	60%
LIFE SUB-PANNONIC	*Ailanthus altissima*	50 individuals/ha on average	90%
LIFE SUB-PANNONIC	*Robinia pseudoacacia*		80%
LIFE SUB-PANNONIC	*Pinus nigra*		95%
LIFE CLAW	*Procambarus clarkii, Pacifastacus leniusculus, Faxonius (Orconectes) limosus*	no information	60%
RAPID LIFE	*Impatiens glandulifera*	41,000 m^2 total decline	58.5%
RAPID LIFE	*Fallopia japonica*	1,640 m^2 total decline	55%
RAPID LIFE	*Pacifastacus leniusculus*	30,000 individuals	75%
LIFE ATIAS	*Neogale (Neovison) vison*	unknown population/ha	80%
LIFE Nat.Sal.Mo	*Salmo trutta*	0.006 individuals/m^2	-90%
Oarkney Native LIFE	*Mustela erminea*		Current population not known accurately but certainly large and growing- e.g. the public reported 700 sightings on Orkney Mainland in 2016 vs 500 in 2015.

Source: this report.

4. Issues encountered while analysing the reports

A notable issue identified in this study analysing 18 LIFE projects was the limited availability of quantitative data regarding the impact of IAS and associated costs. For example, LIFE SUBPANNONIC project monitored the socio-economic impact; however, the repository lacked a comprehensive explanation or quantification of these impacts. The report only described the positive socio-economic effects of restoration activities.

LIFE STOPVESPA was the only project in the sample to estimate the economic impact of *Vespa velutina* on the honey production.

LIFE medCLIFFS stood out as a model for improving data quality in LIFE IAS projects. It provided baseline assessments of the concerned areas, along with costs and methods for eradicating each of the project target invasive species. The reports also included extensive information on ecosystem services assessed, an evaluation of the area users' perceptions regarding the project and IAS, and species perceived by the public as iconic. This project was one of the few that included information on the environmental impact of IAS. Nevertheless, local evidence on the environmental impact of IAS was limited. Therefore, whilst medCLIFFS could be considered a model project in terms of the quantity and availability of information about the project and its impacts, there is still a need to improve certain aspects of the knowledge generated, such as monitoring the impact of IAS in the project area.

The analysis of the projects revealed that the way information was presented in some cases created barriers to accessing and understanding the project data. The document repository for most projects stored a large volume of not self-descriptive files. Also, the format in which documents were uploaded into the BUTLER repository often hindered access to projects information. Several projects submitted scanned documents, which posed several challenges. Some were scanned at an angle, making them difficult to read. For example, the KPIs of the STOP VESPA project could not be analysed because the scanned document was unreadable. Similarly, in the Biosecurity for LIFE project, the KPIs table was cut off, leaving only part of the information accessible.

Some projects in the BUTLER database contained documents that were either partially or entirely in a language other than English. This was one reason why some projects were not selected for the analysis. In the analysed sample, five out of 18 projects uploaded documents in their original language without providing an English translation. For example,

- the GRASSLAND-HU project included documents and deliverables in Hungarian;
- reports from medCLIFFS project, which contained relevant information about the project impact and IAS effects, were only available in Catalan;
- the AZORES NATURA LIFE project provided some documents exclusively in Portuguese;
- key information about actions and impacts in the RESILIAS project were available only in Dutch;
- any LIFE ATIAS documents, such as the ecosystem service assessment report, were solely in Greek.

Translating these documents into English is not a straightforward option.

Additionally, the KPIs file for the LIFE GRASSLAND-HU project was missing from the BUTLER repository, though it was noted that the KPIs were included in the KPI database tool, without

instructions on how to access it. In other projects, such as LIFE REDCOHA, the KPIs file was absent from the repository, with no indication of its location. The same issue occurred with the RIPARIAS project, where only a brief comment about the project KPIs was available instead of complete information.

5. Conclusions

The findings of this report underscore the critical importance of having complete, reliable, and accessible information — including comprehensive economic data — on the impacts and implementation of measures aimed at preventing and managing IAS. Such data forms a robust foundation for informed policymaking, management decisions and optimized resource allocation, and the scaling of successful interventions across Europe.

The LIFE Programme has been a cornerstone in funding IAS management at EU level, financing over 130 projects since 2004, with economic contributions surpassing €500 million (LIFE database). LIFE projects have successfully advanced control techniques and provide valuable case studies for practitioners and policymakers. They also contain a wealth of information which should be made accessible to researchers and managers. Economic data can further enhance our understanding of the sustainability of control measures against IAS.

There is a pressing need for systematic and comprehensive reporting on IAS costs. Enhancing standardized collection and reporting of quantitative data — particularly socio-economic and environmental information — should be prioritized in ongoing and future LIFE projects. The categories used in this study could provide a starting point. However, to ensure effective data collection, it is essential to establish clear definitions and guidance, including a more detailed elaboration of the typology of costs and assessment methods. Acknowledging this need will enable further analysis to support the improvement of processes implemented in LIFE projects, ultimately leading to better decision-making and more accurate evaluation of costs.

The analysis of 18 LIFE-funded projects reveals that most focus on IAS management in aquatic environments, with the highest expenses in the total budget allocated to IAS management activities. However, the analysis also identifies limitations, including the lack of quantitative data on IAS impacts. Detailed cost data associated with different activities (e.g. per unit, area, personnel, tools) would be invaluable for policymakers and managers in decision-making, planning, and budget allocation over time. Such data could facilitate transborder cooperation to achieve savings and increase effectiveness (Magliozzi et al. 2024).

The report also highlights the difficulty in accessing and understanding project data, as well as language barriers that hinder the analysis. It emphasizes the need for a more coordinated and effective approach to managing IAS in European ecosystems and suggests that the LIFE Programme can play a key role in supporting this effort. Effective IAS management requires **access to data and knowledge sharing**, to strengthen collaboration and coordination across governance levels (local, national, European) and sectors including environment, agriculture, transport, and trade (Magliozzi et al., 2024, 2025).

Long-term monitoring frameworks and adaptive management approaches are essential to respond efficiently to evolving ecological and socio-economic conditions linked to IAS. Incorporating comprehensive economic evaluations of affected ecosystem services will better justify investments and help prioritize management actions based on cost-effectiveness and conservation gains.

Overall, enhancing data transparency, standardization, accessibility, will equip decision-makers with the comprehensive evidence and collaborative frameworks needed to design and implement effective, efficient, and sustainable IAS management across Europe.

To address these challenges, we recommend:

1. Standardized data collection and reporting

Future and ongoing LIFE-funded projects should prioritize the collection and reporting of quantitative data on the impact of IAS, including socio-economic and environmental costs, following a standardized approach.

2. Guidelines and templates for economic data reporting

   CINEA should develop and provide guidelines on how to report and fill in economic data on IAS, adopting a template for completion and process simplification.

3. Overcoming language barriers

   To improve accessibility, English translations should be provided for project documents, including at least a summary table for costs. Additionally, developing tools for accurate translation of technical terms and graphics would be beneficial.

4. Training and capacity building

   Training and capacity-building opportunities should be offered to project managers and stakeholders to emphasize the importance of data collection, reporting, and their role in evidence-based decision-making.

5. Enhancing collaboration and knowledge sharing

   Encourage collaboration and knowledge-sharing among European institutions to ensure information is widely accessible to stakeholders, supporting coordinated and effective IAS management. IAS costs could be made available through EASIN online tools and services.

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List of abbreviations and definitions

Abbreviations	Definitions
IAS	Invasive Alien Species
MS	Member State
IUCN	International Union for Conservation of Nature
KPIs	Key Performance Indicators
CINEA	European Climate, Infrastructure and Environment Executive Agency

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Annexes

Annex 1. List of LIFE projects related to IAS management evaluated for review. In bold, the project selected for the analysis.

LIFE Reference	Project Acronym	Year	Country	Status
LIFE05 NAT/UK/000142	ERDUK	2005	UK	Closed
LIFE07 NAT/IRL/000341	CAISIE	2007	IE	Closed
LIFE08 INF/B/000052	AlterIAS	2008	B	Closed
LIFE08 NAT/IT/000353	Montecristo 2010	2008	IT	Closed
LIFE09 NAT/IT/000095	EC-SQUARE	2009	IT	Closed
LIFE09 NAT/ES/000529	LIFE TRACHEMYS	2009	ES	Closed
LIFE09 NAT/SE/000344	MIRDINEC	2009	SE	Closed
LIFE09 NAT/PL/000263	Polskie Ostoje Ptaków	2009	PL	Closed
LIFE10 NAT/ES/000582	INVASEP	2010	ES	Decommitment running
LIFE10 NAT/ES/000565	LAMPROPELTIS	2010	ES	Closed
LIFE11 NAT/NL/000777	Peelvenen	2011	NL	Closed
LIFE11 NAT/IT/000093	Pelagic Birds	2011	IT	Closed
LIFE12 BIO/IT/000213	LIFE Alta Murgia	2012	IT	Closed
LIFE12 NAT/PT/000402	Life Fura-bardos	2012	PT	Closed
LIFE12 NAT/ES/001091	LIFE Potamo Fauna	2012	ES	Closed
LIFE12 NAT/IT/000395	LIFEEMYS	2012	IT	Closed
LIFE12 NAT/DK/001073	**REDCOHA-LIFE**	**2013**	**DK**	**Closed**
LIFE13 NAT/ES/001171	LIFE LUTREOLA SPAIN	2013	ES	Closed
LIFE13 NAT/ES/000899	LIFE Miera	2013	ES	Closed
LIFE13 NAT/ES/000237	LIFE MIGRATOEBRE	2013	ES	Open
LIFE13 BIO/ES/001407	**LIFE RIPISILVANATURA**	**2014**	**ES**	**Closed**
LIFE13 NAT/UK/000209	LIFE Shiants	2013	UK	Closed
LIFE13 BIO/IT/000204	LIFE U-SAVEREDS	2013	IT	Closed
LIFE13 NAT/IT/000471	RESTO CON LIFE	2013	IT	Closed
LIFE14 NAT/ES/001213	CONVIVE-LIFE	2014	ES	Closed
LIFE14 NAT/ES/000699	**Life Anillo Verde**	**2015**	**ES**	**Closed**
LIFE14 NAT/UK/000467	SciuriousLIFE	2014	UK	Closed
LIFE13 BIO/ES/001407	LIFE RIPISILVANATURA	2014	ES	Closed
LIFE15 NAT/IT/000823	IdroLIFE	2015	IT	Open
LIFE15 GIE/SI/000770	LIFE ARTEMIS	2015	SI	Closed
LIFE15 GIE/IT/001039	LIFE ASAP	2015	IT	Closed
LIFE16 NAT/FR/000593	LIFE HABITATS CALANQUES	2015	FR	Closed
LIFE15 PRE/FR/000001	LIFE IAP - RISK	2015	FR	Closed
LIFE14 NAT/IT/001128	**LIFE STOPVESPA**	**2015**	**IT**	**Closed**
LIFE16 NAT/HU/000599	OAKEYLIFE	2016	HU	Closed
LIFE16 NAT/UK/000582	**RAPID LIFE**	**2016**	**UK**	**Closed**

LIFE17 GIE/UK/000572	**Biosecurity for LIFE**	**2017**	**UK**	**Open**
LIFE17 NAT/UK/000020	**Celtic Rainforests LIFE**	**2017**	**UK**	**Open**
LIFE17 NAT/FR/000604	LIFE BIODIV'OM	2017	FR	Open
LIFE17 GIE/ES/000515	LIFE INVASAQUA	2017	ES	Open
LIFE17 NAT/IT/000547	LIFE Nat.Sal.Mo	2017	IT	Open
LIFE17 NAT/FR/000542	Life Oxyura	2017	FR	Open
LIFE17 NAT/SK/000589	**LIFE SUB-PANNONIC**	**2017**	**SK**	**Open**
LIFE17 IPE/PT/000010	**LIFE-IP AZORES NATURA**	**2017**	**PT**	**Open**
LIFE17 IPE/HU/000018	**LIFE-IP GRASSLAND-HU**	**2017**	**HU**	**Open**
LIFE17 NAT/UK/000557	**Orkney Native WildLIFE**	**2017**	**UK**	**Open**
LIFE18 NAT/GR/000430	**LIFE ATIAS**	**2018**	**GR**	**Open**
LIFE18 NAT/IT/000920	LIFE DIOMEDEE	2018	IT	Open
LIFE18 NAT/IT/000803	LIFE DRYLANDS	2018	IT	Open
LIFE18 NAT/IT/000946	LIFE GREEN4BLUE	2018	IT	Open
LIFE18 NAT/IT/000828	LIFE LETSGO GIGLIO	2018	IT	Open
LIFE18 NAT/FR/000698	LIFE VALBONNE	2018	FR	Open
LIFE18 NAT/IT/000806	**LIFE-CLAW**	**2018**	**IT**	**Open**
LIFE17 NAT / IT / 000547	**LIFE Nat.Sal.Mo**	**2018**	**IT**	**Closed**
LIFE19 NAT/DE/000871	LIFE "helle Eifeltler"	2019	DE	Open
LIFE19 NAT/HR/001070	LIFE CONTRA Ailanthus	2019	HR	Open
LIFE19 NAT/NL/000821	**LIFE RESILIAS**	**2019**	**NL**	**Open**
LIFE19 NAT/BE/000953	**LIFE RIPARIAS**	**2019**	**BE**	**Open**
LIFE20 NAT/UK/000100	4 Rivers for LIFE	2020	UK	Open
LIFE20 NAT/BE/001442	LIFE DUNIAS	2020	B	Open
LIFE20 NAT/ES/001223	**LIFE medCLIFFS**	**2020**	**ES**	**Open**
LIFE20 NAT/UK/000349	LIFE RAFT	2020	UK	Open
LIFE20 NAT/ES/000369	**LIFE RESQUE ALPYR**	**2020**	**ES**	**Open**

Annex 2. Categories and costs (in euro) for each LIFE projects analysed in this study. '.' is used as a decimal separator.

	DAMAGE		MANAGEMENT			DISSEMINATION OF INFORMATION	TRAINING
Project Acronym	DIRECT COSTS	INDIRECT COSTS	PREVENTION	DETECTION & MONITORING	CONTROL/ ERADICATION/ CONTAINMENT		
LIFE REDCOHA		905,917.00		103,544.00	1,107,836.00	266,219.00	635.00
LIFE RESILIAS				546,212.00	1,722,136.00	227,330.00	
LIFE ATIAS			39,416.00	664,387.00	491,404.00	318,563.00	42,280.00
LIFE Green Belt		142,931.65		59,259.24	173,977.36	52,885.63	24,474.19
LIFE CLAW		792,846.00	289,829.00	525,248.00	361,651.00	684,250.00	51,807.00
LIFE medCLIFFS			289,743.00	169,689.00	424,774.00	221,298.00	
LIFE SUBPANNONIC	544,060.00	1,076,392.00		142,708.00	716,296.00	65,858.00	199,540.00
RAPID LIFE				46,268.00	91,204.00	197,529.00	527,676.00
Oarkey WILDLIFE			1,331,926.00	864,540.00	3,690,191.00	291,794.00	
RIPSILVANA NATURA		777,627.00		322,585.00	625,522.00	159,922.00	102,299.00
LIFE RIPARIAS			479,314.00	1,714,857.00	2,685,993.00	897,391.00	
LIFE Nat.Sal.Mo		422,292.00		663,251.00	353,928.00	267,980.00	
Biosecurity for LIFE			208,550.00	293,231.00		317,321.00	298,974.00
Celtic Rainforest LIFE		1,187,285.00		489,471.00	5,670,873.00	554,974.00	79,850.00
LIFE IP GRASSLAND-HU	350,861.00	128,833.00		1,017,970.00	6,110,484.00	4,739,373.00	604,878.00
LIFE IP AZORES NATURA	446,343.00	4,577,800.00	1,248,082.00	2,276,556.00	2,490,867.00	1,195,073.00	1,695,778.00
LIFE STOP VESPA				470,750.00	1,013,639.00	210,980.00	127,723.00
LIFE RESQUE ALPYR		102,063.71		709,777.42	575,670.97	9,276.07	

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