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The need of centralized coordination to counter biological invasions in the European Union

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Abstract
Non-native species monitoring faces global challenges due to resource disparities, hindering effective implementation. Current strategies are fragmented and resource-dependent, inadequately addressing non-native species dynamics and are subjected to reporting biases, being further ridiculed by political borders. To overcome these challenges, a paradigm shift towards targeted, large-scale monitoring is crucial, requiring standardized protocols and advanced technologies like environmental DNA analysis, orchestrated, applied—and enforced—following international collaboration. Despite existing efforts, networks, and laws, even larger political entities like the European Union suffer from the lack of information exchange as well as economic, political, and socio-cultural differences among member status, ultimately hampering united efforts against the threat posed by non-native species. The absence of a comprehensive central hub and authority, guided by scientific input and at the same time empowered by being a political institution, emerges as a compelling solution. Despite potential drawbacks, this institution, possibly bridging gaps in the large-scale approach, could coordinate efforts, standardize reporting, allocate resources, and advocate increased funding. Considering rising introduction rates and accelerating impacts from non-native species, creating a centralized institution becomes imperative for enhancing global non-native species monitoring and management to foster a collaborative response to non-native species threats.

Keywords Centralization, Invasion science, Non-native species, European Union

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Biological invasions and their management
Non-native species can pose significant threats to local ecosystems, economies, and human health [64]. Specific threats include outcompeting native species for resources, spreading diseases, and disrupting local biodiversity. Biological invasions are, however, a population-level issue [30], with the ability of species to spread and populations to locally exert impacts varying widely depending on countless context-dependent factors such as the environment, existing native and non-native species, as well as ecological interactions [29]. Scientists, stakeholders, and politicians must care more about this issue to develop effective management strategies and mitigate the adverse effects of these invasions, ensuring the protection of native species and the stability of ecosystems [27, 81].

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In cases where non-native species have been introduced or successfully established, mitigation and eradication options are frequently constrained by the absence of feasible and effective methodologies [60]. This means that even if the legislature, scientists, or stakeholders are aware of those non-native species that spread (and are thus classified as invasive,[77]) or those that may or may not spread but do actively threaten ecosystems by exerting impacts [25, 40], there is often nothing that can be done aside from resource consuming and thus costly management, underlining the need for preventive management approaches for biological invasions. Yet, even the currently employed non-native species monitoring programs (see e.g., [57]) exhibit significant disparities at the global scale, being influenced by the allocation of available resources, both in terms of financial and human resources, and differences in the willingness to manage non-native species at the national level [23, 54].

Existing strategies to monitor non-native species may include the utilization of cutting-edge technologies, such as satellite imaging, environmental DNA analysis, and predictive modeling such as species distribution models [44, 45]. Proactive surveillance measures, such as the establishment of early warning systems and rapid response teams [65], contribute to the hoped effectiveness of these programs. Advancements in technology already offer innovative and efficient tools for non-native species monitoring. Remote sensing technologies, including satellite imaging and drones, provide a bird's-eye view of ecosystems, aiding in the early detection of non-native species [45, 46]. These technologies, despite being challenged, could cover large areas quickly, allowing for the identification of subtle changes in vegetation, water quality, or other indicators of non-native species' presence. The integration of environmental DNA analysis and machine learning algorithms may enhance the accuracy and speed of non-native species detection [16]. Environmental DNA allows for the identification of species based on genetic material present in the environment, while machine learning algorithms can analyze vast datasets to identify patterns and predict potential invasions [39]. In contrast, the management of non-native species primarily relies on labor-intensive methods such as manual trapping and removal. In some cases, chemical treatments are employed to target entire ecosystems [87], although this approach carries significant ecological risks. Despite these efforts, management remains a continuous and costly endeavor, emphasizing that successful eradication is, in most cases, unattainable [26, 60].

Well-funded initiatives nevertheless continue to serve as models and are often widely presented as stories of success [1], even if these are in reality only small steps forward. Conversely, numerous countries, economically and socio-culturally differing [55, 86], face resource constraints that hinder efforts to match the comprehensive approaches seen in their well-funded counterparts because insufficient funds and a shortage of skilled personnel impede the development and implementation of monitoring systems. This not only leaves these nations vulnerable to biological invasions, but also contributes to the global challenge of managing non-native species on a collective scale as well as the level of the individual ecosystem.

The flaws of current monitoring approaches

Effective non-native species monitoring is crucial for informed management strategies, as it provides the necessary data to detect, assess, and respond to invasions in a timely and targeted manner. Given the diversity of ecosystems within geopolitical entities, there is, however, no ubiquitously applicable management solution for non-native species [50], resulting in a growing awareness of the need for regionally tailored monitoring approaches [2]. The unique characteristics of different (biogeographic, spatial, climatic, etc.) regions, paired with the often species-specific pathways, vectors, and invasion histories of different non-native species [68], demand specific strategies, while simultaneously acknowledging variations in non-native species prevalence and environmental factors [2, 29].

Freshwater ecosystems are an ideal showcase for the complexities of monitoring and managing non-native species, as they present a dynamic landscape for non-native species, with spatial variations playing a crucial role [51, 67]. The effectiveness of non-native species monitoring programs in freshwater ecosystems is hindered, for example, by reporting biases and the lag times associated with the identification and reporting of non-native species due to the inaccessibility of aquatic ecosystems and the fact that many activities of non-native species occur below the water surface and are hidden from view [12, 13]. This introduces challenges for the identification and often also the tracking of spreading non-native species, as well as the quantification of impacts, impeding timely decision-making and intervention efforts.

The interconnected nature of river systems and the relative isolation of lakes further introduce distinct challenges that demand nuanced monitoring strategies [32, 82]. River systems, characterized by high connectance, facilitate the swift dissemination of non-native species along water courses [15, 47], making monitoring a complex task [17]. A robust strategy for monitoring interconnected rivers could, for instance, involve predictive modeling to anticipate potential invasion routes, coupled with the large-scale application of real-time surveillance through technologies like environmental DNA analysis [73]. Rivers, however, flow across national borders, requiring international collaboration and communications [79]. Conversely, intrinsically isolated lakes present other unique challenges as they are less prone to the rapid spread seen in river systems but susceptible to profound impacts on their insular ecology [25, 66]. Monitoring lakes demands a focus on preventative measures, such as strict regulations on the introduction of non-native species and regular surveys of existing populations. Additionally, the spatial isolation of lakes necessitates localized monitoring and management efforts, recognizing that each lake ecosystem is a distinct entity with its own vulnerabilities [6, 11].

While freshwater ecosystems are arguably a special case, monitoring and managing non-native species in any realm or ecosystem presents a multifaceted challenge. The current approach to non-native species monitoring, often embedded within sporadic field campaigns or governmental monitoring (e.g., for water quality; [35]), also falls short of addressing the intricacies of large-scale non-native species dynamics. Relying on sporadic detections as part of routine water quality monitoring proves inadequate [69] in capturing the complexity of non-native species behavior [30]. These sporadic efforts may only scratch the surface, missing the subtle nuances of non-native species introductions and spread, forming the defining characteristic for management-relevant prioritizations [77]. Sporadic reporting based on patchy monitoring and low detectability due to a low number of individuals also ultimately leads to substantial lag times, e.g., between a species' introduction and its reporting, which often happens too late, i.e., after a species is already established and has irreversibly altered the recipient ecosystem [18, 19]. The resulting lag times in reporting, often exacerbated by delays in data collection, analysis, and dissemination, present significant challenges in responding swiftly to non-native species incursions (see also [31]).

To this end, certain countries have made substantial investments in technological advances, trained personnel, and holistic strategies to monitor and manage biological invasions [49, 53], but others—if not all—grapple with limited resources, hindering their willingness to invest resources and thus, the ability to implement robust monitoring or management initiatives [22]. Regional or national governments but also larger political entities like the European Union often employ multifaceted strategies in hope of establishing successful non-native species monitoring programs [4, 9, 62]. According to EU Regulation No. 1143/2014, the competent authorities are obligated to establish an environmental monitoring system for the early detection, monitoring, and assessment of measures for all Union-listed species or integrate it into existing strategies. However, this obligation is challenging due to socio-cultural differences that affect how non-native species are perceived, the fact that not all non-native species are invasive or harmful everywhere, and the varying impacts they can have across different regions [21, 29]. Additionally, differences in economic resources and existing infrastructure further complicate any consistent implementation of these monitoring systems on a larger scale.

Within larger political entities like the European Union, problems begin to arise with differences in the used terminology among countries or regions [77] or even differences in non-native species classifications [30]. In Germany, for instance, there are ~ 1080 known non-native species. Databases like the *Established Alien Species in the European Union* [34] and the *Global Invasive Species Database* [63] suggest that 8.1% of these species are invasive in Germany. The *Global Register of Introduced and Invasive Species* [58] indicates that 6.5% of non-native species in Germany are invasive, which is less than half the average among other European Union member states (14.7%) and slightly lower than the 9.8% reported for the entire European Union, highlighting significant discrepancies in the classification of invasive species across member states [30]. These reporting biases in the context of non-native species monitoring stem from various factors, including underreporting by the public, inconsistencies in reporting standards, and gaps in communication between researchers, local communities, and governmental bodies [30, 72], possibly leading to an inconsistent application of management strategies and an inefficient utilization of resources for non-native species, as differing criteria among countries may result in varied prioritizations and response actions. Consequently, some regions might under-allocate or over-allocate resources, if resources are available, potentially exacerbating the problem or neglecting critical areas needing intervention [59].

Uncoordinated monitoring and management efforts of non-native species therefore continue to pose several challenges [14]. One key challenge is the lack of cross-country collaboration [83], as non-native species do not adhere to national borders, requiring cooperation and coordination between countries for effective management. Unfortunately, this collaboration frequently fails due to a lack of coordination, communication, and differences in resources and willingness to engage in non-native species management [52, 80], resulting in fragmented approaches and inconsistent management efforts, and thus, ineffective control of non-native species and potentially successive ecological damage. A more comprehensive, large-scale approach with a coordinating, centralized European authority is therefore needed.

This new central authority should integrate pre-introduction measures (i.e., biosecurity) with post-introduction management (i.e., containment or eradication), evaluating the effectiveness of various policies and management strategies [38], to ultimately direct and orchestrate the development and application of real-time monitoring technologies, establishing and utilizing streamlined communication channels, and improved data-sharing mechanisms. Additionally, such a supra-national coordination could ensure alignment in goals, criteria, and definitions, facilitating more effective and unified responses to biological invasions across countries. A targeted, systematic approach is therefore essential to enhance existing practices and provide a more accurate representation of the non-native species landscape.

Going forward

In the past, efforts from nature conservation associations, citizen science initiatives, biological field stations, and national focal points for monitoring biodiversity, such as the National Monitoring Centre for Biodiversity in Germany, and other organizations and agencies that participate in coordinating activities to help prevent the introduction of non-native species, have played a pivotal role in the management and monitoring of non-native species [8, 24, 43]. These entities have contributed significantly by raising awareness, providing critical data, and fostering community engagement. On a global level, the Global Biodiversity Information Facility (GBIF) has been instrumental in facilitating data sharing and collaboration across borders, but also scientific endeavors to understand the ecology of non-native species [36, 74]. These collective efforts have laid the groundwork for current strategies, highlighting the importance of comprehensive and coordinated approaches.

Yet, despite these efforts, introduction rates are still increasing globally [71]. This raises critical questions and concerns about the efficiency and effectiveness of past prevention efforts and subsequently applied monitoring efforts (but see [65]) and highlights the need for a systemic change, built upon an improved coordination and streamlined information dissemination [85]. Establishing international standards for the detection, monitoring, and management of non-native species can streamline decision-making processes and contribute to a more coherent global strategy. The monitoring and management of non-native species at larger scale, however, necessitates international collaboration, the development of standardized protocols to ensure a cohesive and coordinated response across borders, and foremost a centralized focus on coordinated prevention [75], data sharing, joint research initiatives, and the establishment of cross-border strategies [3, 78], as non-native species do not adhere to geopolitical boundaries.

To address the inadequacies of current management practices, a paradigm shift towards targeted, large-scale monitoring that considers the context dependencies of *invasiveness* [29, 30, 77] is imperative, requiring a centrally concerted effort from the international community, fostering collaboration and resource-sharing. Common supra-national frameworks (such as the EU Water Framework Directive, the Natura 2000 Network, or the EU Biodiversity Strategy for 2030) enable such seamless information exchange, enhance comparability of data between regions, and facilitate the development of universal best practices. Despite the existence of a comprehensive network of data sharing platforms, the Summary for Policy Makers in the IPBES assessments (Appendix 3, [38]) emphasizes that enhancing existing open information systems is crucial for managing biological invasions. This includes prioritizing actions, enabling early detection and rapid response, and improving regulatory effectiveness. The report further notes that open information systems can significantly lower management costs by ensuring targeted and appropriate responses, preventing effort duplication, and facilitating the assessment of policy instruments through indicators, highlighting the undeniable need for more efficient open information systems. Centrally coordinated international collaborations within a supra-national body like the European Union could provide the required platform for the urgently needed sharing of knowledge, resources, and expertise, creating a collective front against the global challenge of non-native species.

Centralization also offers the advantage of consolidated data, streamlined decision-making, and more effective coordination of monitoring efforts. A centrally coordinated authority could facilitate a holistic understanding of non-native species trends, enabling quicker responses to emerging threats. While larger institutions like the European Union centralize certain aspects, the lack of a comprehensive hub hinders the sharing of critical information among countries and regions. The establishment of an international coordinating body could serve as a focal point for data aggregation, information exchange, and collaborative decision-making, fostering a more united front against non-native species. However, a centralized institution should not only aggregate and disseminate data, but also actively engage in research, risk assessment, and the development of adequate strategies. Such an institution could serve as a nexus for information exchange, collaboration, and strategic planning. It would play a pivotal role in coordinating monitoring efforts, standardizing reporting mechanisms, and fostering a unified approach to combat non-native species while acknowledging and considering the diversity of national realities. By acting as a knowledge hub, such an institution could provide timely and accurate information (and guidance) to policymakers, researchers, and local communities all across the European Union. Additionally, it could serve as an advocate for increased funding, international collaboration, and the development of innovative technologies to enhance non-native species monitoring and control, fairly distributing resources among member states.

This means that such a body would have to be an institution with a governmental setup (i.e., with a mandate to action) so that it can address the issue directly, but potential drawbacks and potential criticism could include the risk of bureaucratic inefficiencies, data bottlenecks, and challenges in accommodating the diverse needs of different regions. However, these potential cruxes and handicaps could be minimized by placing a scientific institution or key invasion scientists within the decision-making process of such a governmental focal point.

Establishing a centralized authority

A centrally coordinated authority, created by the international community, is essential to foster collaboration and resource-sharing for effective management of non-native species. The establishment of such a centralized authority and information hub seems utopic considering that its implementation is challenged by political resistance to outside regulation and the idea that other institutions like the World Trade Organization, the International Plant Protection Convention, and, among others, the World Organization for Animal Health already have this mandate, simultaneously raising concerns about the financing. Establishing such a body would require international agreements, possibly under the auspices of an existing global entity like the United Nations Environment Programme (UNEP) or a new dedicated treaty. However, such a Global Invasive Species Program did once exist [56], with a similar mandate, but it collapsed over a decade ago due to inadequate funding and other issues. However, during its existence it contributed to developing a guide for the prevention and management of invasive species, which included recommendations for enhancing international coordination through a global strategy [84]. Hence, to realize and sustainably finance such a centralized hub, a multifaceted approach backed by adequate monetary and already existing governmental infrastructure would be essential. Scaled down, this means that such an endeavor could be realized under the umbrella of the European Union.

The European Union serves as an ideal case for showcasing the establishment of such a centralized coordination agency at a supra-national level, as it is not only an economic union, but also a political union capable of enforcing its laws across member countries [5]. However, the European Union already has organizations such as the European and Mediterranean Plant Protection Organization (EPPO [7],) and tools like the DAISIE database [37]. Additionally, the Invasive Alien Species Regulation (Regulation (EU) 1143/2014) provides a list of invasive species within the EU and outlines the measures that member states must implement to manage these species [10]. Moreover, data sharing and management are already facilitated through the European Alien Species Information Network (EASIN) [42], which allows for the collection and sharing of data on IAS across Europe. This network helps in creating a more coordinated approach to monitoring and managing non-native species. However, despite these measures, there is a compelling need to establish a centrally coordinated hub within the EU, considering that both EPPO and DAISIE face significant challenges in standardizing protocols and responses across the EU's diverse socio-cultural and economic landscapes, leading to inconsistent implementation and enforcement. Furthermore, the EU list of non-native species often lacks comprehensive integration with national policies, resulting in fragmented and uncoordinated efforts that undermine effective cross-border management. A critical point about the potential ineffectiveness of EASIN is the practical implementation of uniform measures across various member states due to differing national priorities, legislative frameworks, a lack of communication among European Union member states, and differing resource availability. Indeed, resource disparities among member states also hinder the uniform application of monitoring and management strategies, causing significant variations in effectiveness. Finally, biological invasions are population-level phenomena where invasiveness and impacts are highly context-dependent [29], rendering species-level lists potentially obsolete or at least questionable.

Establishing a centrally coordinated hub within the European Union to oversee the threat of non-native species would ensure consistent application of protocols, foster resource-sharing, and enhance the integration of national and EU-wide policies through a comprehensive procedural and legislative framework that requires collaboration across multiple levels of governance. The European Commission would likely initiate a proposal for a centralized hub to manage non-native species, assessing its feasibility through extensive consultations with member states, NGOs, academia, and industry stakeholders. Following consultations, outlining the objectives, functions, and governance of the hub as well as addressing the harmonization of information exchange across member states leading to the coordination of both pre- and post-introduction management of non-native species, a draft would be presented to the Council of the European Union and the European Parliament for consideration. During this legislative process, both bodies would review, possibly amend, and eventually vote on the proposal. After approval, the final step would involve the implementation phase, where the newly established hub would begin operations. This phase includes the development of detailed operational guidelines, the establishment of communication channels with all member states, and the initiation of pilot projects to ensure the hub's effectiveness. The hub would also likely work in close coordination with existing bodies such as the European Environment Agency (EEA) and national bodies such as the Federal Agency for Nature Conservation (BfN) in Germany, the Ministry for the Ecological Transition and the Demographic Challenge (MITECO) in Spain, and the French Biodiversity Agency (OFB) in France to coordinate and leverage existing data and resources. Regular reporting, evaluation, and adaptation strategies would be integral to ensure that the hub remains effective in managing the dynamic challenges posed by non-native species across the European Union. What sounds to be a tedious and long process, could ultimately streamline and enhance the European Union's capability to handle spreading and harmful non-native species more effectively and uniformly across all member states.

Responsibilities and benefits of a centralized European institution

A centralized authority under the European Union, tasked with managing the threat posed by non-native species, would play a multifaceted and crucial role in ensuring the health and integrity of ecosystems across member states. This body would primarily be responsible for the collection and systematic analysis of data regarding both established and emerging non-native species, followed by the distribution of resources following regional prioritization. It could also incorporate advanced technologies to enhance the efficiency and accuracy of targeted monitoring efforts, providing a more comprehensive understanding of non-native species presences and movements. However, such a centralized authority would need to have the political power to make decisions and potentially enforce relevant non-native species management measures, i.e., the ability to shift monetary and other relevant resources. Such a centralized institution would ensure uniformity in the implementation of protocols and responses, directly interacting with national focal points, overcoming the challenges posed by the diverse socio-cultural and economic landscapes of EU member states. This would lead to more consistent and effective management of non-native species across the Union. Moreover, by fostering resource-sharing, the institution could mitigate the resource disparities among member states, ensuring that all countries have access to the necessary tools and information for effective monitoring and management. This coordinated approach would enhance the overall capacity to address invasive species threats comprehensively. Finally, a centralized institution would enhance the integration of national and EU-wide policies, creating a more coordinated and unified approach to handling invasive species. This integration would prevent fragmented and uncoordinated efforts, thereby improving the overall effectiveness of cross-border management of non-native species.

For instance, by utilizing data from long-term biodiversity monitoring stations, the authority could evaluate trends and patterns in non-native species populations, employing time-series analyses to understand their dynamics over time, and thereby covering all stages of the 'invasion curve'—from detecting non-native species before they are introduced, to assessing their current status. This information would be instrumental in identifying regions or countries where data are lacking, enabling the targeted allocation of financial resources to enhance data collection efforts. Hence, in terms of biosecurity, a central authority would coordinate and establish rigorous pre-invasion monitoring systems designed to detect and mitigate the risk of non-native species before they establish populations. This would involve maintaining and updating comprehensive databases that track the presence and spread of these species and subsequently the strategic placement of additional monitoring stations based on predictive modeling, historical invasion data, and known vulnerabilities of ecosystems [28, 76]. This preventative strategy would be complemented by the authority's role in post-invasion management, which would include the deployment of financial resources and trained personnel to manage, and control established harmful non-native species. This could involve direct interventions to remove or contain non-native species and efforts to restore affected ecosystems. Furthermore, the authority would have the responsibility of continuously updating and refining region- or member state-specific species lists that have significant implications for the respective biosecurity policies, such as deny-lists used to regulate species imported through pathways like the pet trade [48]. By keeping these lists current and based on the latest scientific research and (local) trend evaluations, the authority would ensure that legislative and regulatory frameworks remain effective in preventing the introduction and spread of high-risk non-native species.

Financing

The European Union (EU), as of 2019, has allocated approximately €58.4 billion annually, which accounts for about 36% of its budget, to support the Common Agricultural Policy (CAP). Under CAP regulations, member states are obligated to allocate a minimum of 25% of their direct payment allocations to eco schemes, prioritizing environmental, climate, and animal welfare considerations. Additionally, they are required to allocate a minimum of 35% of their rural development spending towards initiatives that promote environmental, climate, and animal welfare efforts [61, 70]. It is worth noting that a relatively small portion of this funding could be designated to establish an institutional centralized hub aimed at coordinating prioritizations and subsequently management actions against harmful non-native species. Additional funding could be sourced from a combination of international grants, contributions from member countries, and possibly private sector partnerships, especially with organizations that have a vested interest in biodiversity and environmental sustainability.

To mitigate the potential bias introduced by private sector financing, it is crucial to establish stringent guidelines and oversight mechanisms. This would ensure that private contributions do not unduly influence the research direction, location, or speed, particularly in situations where economic activities may contribute to the spread of non-native species. Leveraging technology and digital platforms could also play a crucial role in reducing operational costs and increasing efficiency. Crowdfunding—especially to fund local engagement—and public donations could be explored, particularly for specific projects or research endeavors that resonate with the global community. Additionally, the institute could generate income through the provision of specialized services, such as environmental impact assessments, training, and consultancy for both governmental and non-governmental organizations. This economic model would not only ensure a steady stream of funding but also keep the institution actively engaged with the current needs and challenges posed by non-native species. By combining international cooperation, diversified funding sources, and a commitment to adaptability and innovation, the realization of such a centralized institute could mark a significant step forward in global environmental stewardship.

Ensuring equality of opportunity in centralized non-native species management

While the establishment of a centralized authority for managing non-native species within the European Union promises many benefits, it is essential to address potential justice and equality issues that may arise [20]. Historically, disparities in resources and power among EU member states have created imbalances that could impact the effectiveness and fairness of a centralized approach [33]. These disparities often stem from varying economic strengths, historical contexts, and socio-cultural differences, which can affect each country's ability to contribute to and benefit from a centralized system. The redirection of resources to where they are needed must be centrally coordinated to ensure fairness, yet it should remain unaffected by the power of individual countries within the EU itself. A critical concern is the risk of perpetuating power imbalances, where historically and currently more powerful and resource-rich countries might dominate decision-making processes. This could marginalize countries with fewer resources and distinct cultural contexts, leading to inequitable outcomes. To prevent this, it is vital to ensure that all member states, regardless of their economic or political power, have equal opportunities to be included in the centralized institution.

Several measures can be implemented to promote equality of opportunity:

1. Inclusive decision-making: establish governance structures that guarantee representation from all member states. Decision-making bodies should include voices from countries with fewer resources and different cultural backgrounds to ensure diverse perspectives are considered.
2. Resource allocation: develop mechanisms for fair distribution of financial and technical resources. This could involve creating funding pools specifically aimed at supporting countries with limited resources to build their monitoring and management capacities.
3. Capacity building: implement training and capacity-building programs to support member states with fewer resources. These programs should be tailored to address the specific needs and contexts of these countries, empowering them to contribute effectively to the centralized management efforts.
4. Cultural sensitivity: recognize and respect the cultural differences among member states. Policies and strategies should be flexible enough to accommodate these differences, ensuring that they do not impose a one-size-fits-all approach that could be culturally insensitive or impractical.
5. Collaborative frameworks: foster equitable collaboration with developing nations and indigenous groups. This includes respecting indigenous knowledge systems and integrating them into the management strategies for non-native species.

By prioritizing equality of opportunity, the centralized institution can avoid the pitfalls of power imbalances and ensure that all member states benefit from and contribute to the management of non-native species.

Conclusion

The absence of such a central repository or coordination point is arguably a notable gap in the global approach to non-native species monitoring in the European Union. Recognizing the challenges posed by non-native species and the limitations of the current monitoring landscape, there is indeed a compelling case for the establishment of such a dedicated, centralized institution tasked with overseeing and coordinating non-native species management within a geopolitical entity like the European Union. The urgent need for a centralized institution is underscored by the complexities of non-native species dynamics, which transcend geopolitical boundaries, making its establishment a crucial step in elevating the effectiveness of supra-national non-native species monitoring. Finally, it is crucial to recognize that the proposed call for board capacity and knowledge sharing should extend beyond non-native species and encompass biodiversity and nature, aligning with the goals of the Kunming–Montreal Global Biodiversity Framework, notably Target 20 and 21 [41].

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