



**Assessment of Action Plans for
Priority Pathways of Invasive
Alien Species
in Central and Eastern Europe**
ASSESSMENT PAPER

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**Assessment of Action Plans for
Priority Pathways of Invasive Alien
Species in six Central and Eastern
European Member States**

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1. Introduction

The spread of invasive alien species (IAS) is widely recognised as one of the most significant factors in biodiversity loss. Beyond the harmful effects on natural ecosystems and their services, it also has substantial economic and societal consequences. These impacts, as well as the number of newly emerging IAS and their rate of spread, are further exacerbated by climate change as it is hampering the resilience of native species and the ecosystems they inhabit.

Recognising the necessity of action at the EU level, Regulation No. 1143/2014 on the prevention and management of the introduction and spread of invasive alien species (hereinafter referred to as the IAS Regulation) was adopted after extensive negotiations. It provides a comprehensive framework for combating invasive species at the EU, regional and national level, as well. One of its central elements is the list of species of Union concern, to which species may be added after a preliminary risk assessment has been carried out and afterwards by the approval of the Committee. Since the adoption of the first list of species of Union concern in 2016, it has been expanded in three rounds, and currently encompasses 88 species (41 plant and 47 animal species).

Under Article 13 of the IAS Regulation, national action plans targeting the primary pathways of the species of Union concern are fundamental for member states' implementation efforts. These plans provide opportunities to define specific measures for the species affected by unintentional introduction and spontaneous spread pathways tailored to the national conditions.

The IAS Regulation emphasises regional cooperation, also in the context of action plans. Member states can cooperate in implementing emergency measures (Article 10), establishing regional lists (Article 11), developing regional action plans (Article 13(3)), and ensuring the regulation's implementation is carried out in close coordination with neighbouring member states where necessary and appropriate. This is particularly relevant for states within the same biogeographical region, those that share borders, or those within the same river basin, either in the framework of the regional or international agreements (Article 22).



In the context of the worsening global biodiversity crisis, the harmful effects caused by the establishment and spread of IAS, as well as the expected future increase in such impacts are significant. Thus, the EU regulation will only achieve its objectives if member states implement it fully and without delay. The Commission review report of 2021 on the application of the IAS Regulation identified several challenges and areas for improvement, even the short implementation period (2016-2019). These included the need for enhancing coordination among member states regarding shared species on national lists, harmonising differing measures in neighbouring countries, and improving identified priorities. Input for the review was provided by an analysis from the Joint Research Centre (JRC), which examined distribution data from member states' first reports in 2019 on 48 species of Union concern. This analysis also proposed measures to improve coordination among member states, such as organizing joint workshops on the subject.

At the time of the aforementioned review and analysis, many of the action plans required under Article 13 had not yet been completed. Therefore, this study aims to analyse the action plans developed for priority pathways, highlight opportunities for improving these plans, and identify potential collaboration opportunities, focusing on the Central and Eastern European region (CEE region). In addition to addressing action plans, the study also considers the availability of national lists and the potential involvement of citizen science in IAS management.



2. Assessment of action plans for priority pathways of IAS

For the analysis, the action plans for priority pathways of invasive alien species from six Member States – Croatia (HR), Slovenia (SI), Austria (AT), Slovakia (SK), Hungary (HU) and Romania (RO) – in Central and Eastern Europe were assessed. In the case of the selected countries, we have assumed common opportunities for action due to road and rail routes from the south (Mediterranean region) and west, waterways, especially the Danube river basin, and the spread from the Black Sea.

The primary aspects examined include the general content and structure of the plans, the identified priority pathways and associated species, as well as the specific measures proposed.

We note that although several conclusions regarding the action plans of the six CEE Member States examined in this study align with the findings of the Commission's report, the Commission based its conclusions on 10 plans, as many MS had submitted their action plans at the time the report was prepared. At that point, the CEE region was still underrepresented, as in June 2021, 18 MS received formal notices for failing to prepare and submit their action plans to the Commission. Among them were 10 CEE member states, including 4 of those examined in this study (HR, SI, SK, RO).

2.1. General structure

Legal provisions and guideline recommendations

As regards the content of the action plans, the IAS Regulation specifies the following:

- timetable for actions (Article 13)
- description of the adopted measures (if appropriate – voluntary actions and codes of good practice)
- especially the following measures based on cost-benefit analysis (Article 13)
 - awareness-raising
 - minimise contamination of goods, commodities, vehicles and equipment by specimens of invasive alien species, including measures to tackle transportation of invasive alien species from third countries



- ensure appropriate checks at the Union borders, other than the official controls (Art (15))

Additional materials are provided as recommendations to assist in the development of the content of action plans (CBD COP 2024, WGIAS 2018, Scalera and Genovesi 2016), among which the guideline prepared by Scalera and Genovesi on behalf of Bern Convention (hereinafter referred to as guideline) is highlighted and also used in the present analysis. The guideline lists the following elements that, ideally, should be included in an action plan, while allowing for flexibility and appropriate adaptation to specific pathways:

- Description of the target pathway
- Policy and legal background
- Aims and strategies
- Identification of key stakeholders
- Foreseen measures – common and specific
- Time schedule (duration, validity of the plan)
- Financial planning

In addition to the content recommendations of the guideline prepared by Scalera and Genovesi, also highlights the importance of preliminary planning and addressing certain questions that should be examined as part of this process (see in 2.2 chapter).

Implementation in the action plans examined

The examined plans differ significantly in both structure and content. It can be stated that each plan is logical and coherent on its own. However, they vary greatly in terms of structure, objectives, and the thematic approach to the presentation of the measures. The fulfilment of content elements according to the IAS Regulation and the guideline prepared by Scalera and Genovesi for the six plans analysed is presented in Table 1.

In our opinion, the structure of the action plans is important, when adhering to the content elements legally defined and recommended in the guidelines, plans developed with a more coherent logic enhance comparability. Additionally, the transparency and understanding of key data, methods, and measures are facilitated by following more standardized content requirements. This, in turn, can also be beneficial for regional cooperation.



Table 1. Analysis of the implementation of the mandatory and recommended content elements in the six Action Plans (Y=yes, N=no, p=partially completed)

Content elements	Source		Member State					
	1143/2014	Scalera and Genovesi (2016)	HR	SI	AT	SK	HU	RO
Description of the target pathway		x	Y	Y	Y	Y	Y	N
Policy and legal background		x	Y	Y	Y	Y	Y	p
Aims and strategies		x	Y	p	N	Y	N	Y
Identification of key stakeholders		x	Y	Y	Y	Y	Y	Y
Foreseen measures/description of measures adopted	x	x	Y	Y	Y	Y	Y	Y
Measures - voluntary, codes of good practice (if appropriate)	x		Y	Y	Y	N	Y	p
Measure - common and specific		x	N	Y	N	Y	N	N
Measures - especially based on cost-benefit analysis	x		p	p	Y	N	p	N
Time schedule/timetable for actions	x	x	Y	Y	Y	Y	p	Y
Financial planning		x	Y	Y	N	Y	N	Y

Table 1. which compares the content elements of the six plans examined, reveals that the issue is not simply the absence of specific elements. While individual elements can be identified somewhere in the documents, they do not follow a consistent order, and it is not always clear whether the document fully meets or only partially fulfils the expectations associated with a given content element (in such cases, "p=partially completed" is indicated in the table). The "Aims and Strategies" section is an element that is either missing or only partially addressed in several documents. However, this element serves as the organizing principle for defining the measures. An example of the „Aims and Strategies” in the Slovak plan is that it primarily focuses on measures to prevent the further spread of invasive species in the EU, on species that are still present in small populations or in a small area, or that may appear in the next few years, not primarily address the issue of widespread invasive species, their eradication is currently unrealistic. Another example is



that Romania set out six principles and an overall objective as a strategic component in the plan.

Other elements that are incomplete or only partially addressed include the categorization of measures (e.g., voluntary measures, common and specific measures) and financial planning. For example, the time schedule was only partially met in the Hungarian plan, as the timeline for most of the measures is continuous, with only a few specific dates provided. In the case of Croatia, the cost-benefit analysis was assessed as partially completed because the plan mentioned only that the benefits of the measures were considered, such as the effectiveness of the measures in reducing IAS populations, their impact on biodiversity, related ecosystem services, and, where relevant, on human health and the economy.

2.2. Priority pathways and concerned species

Legal provisions and guideline recommendations

The overall objective of the action plans is to prevent the unintentional introduction and spread of invasive alien species of Union concern into or within the Union by addressing priority pathways. These plans serve as tools for implementing measures to mitigate the risks associated with such pathways (Article 13(2)), focusing on actions deemed necessary due to the volume of species or the potential damage they may cause upon entering the Union (Article 13(1)). The identification of priority pathways should be grounded in a comprehensive analysis of pathways of unintentional introduction and spread of invasive alien species of Union concern (Article 13(1)).

Implementation in the action plans examined

In examining the plans, we assessed whether they included references to a comprehensive analysis that grounded the selection process, which pathways were identified as priorities and based on what methodology, as well as how many species were considered in the analysis and which EU-significant species were assigned to the identified priority pathways.

In every case, the plans referenced foundational projects or literature (referred later in the text). However, in comparing the plans, we primarily use the information provided within the plans themselves regarding the details of the preliminary analysis.



There were differences among MS in both the methodology of the prioritization process and the species considered, a finding that was also highlighted in the Commission's report (European Commission 2021).

2.2.1. Method of prioritisation

To select priority pathways, the *number of species included* in the analysis by member states varied significantly. This difference arises partly from the number of species of Union concern currently present in the country and partly from whether and how many invasive species at national level were included. This observation aligns with the findings in the Commission's report (2021). Regarding species of Union concern, the examined action plans, based on their preparation dates, do not yet reflect the latest two expansions of the Union concern species list in 2019 and 2022. Therefore, the analysis typically considered the lists containing 49 or 66 species. Only Slovenia (in the revised document) and Romania took into account all the 88 species deemed a threat to the Union.

During the analysis, some examined member states differentiated among the species on the Union list by focusing primarily or exclusively on those already present in their territory. Among the species already present, those prioritized in the action plans were typically ones that, while already widespread, still existed in smaller populations over a more limited area.

In the extended document, **Austria** examined 66 species of EU concern, 28 of which occur in the country.

In **Croatia**, the project underpinning the action plan analysed 241 species, of which 185 are currently present in the country, while 56 have not yet appeared. The number of species of Union concern involved was 49.

Hungary considered 40 of the 66 species of Union concern that occur in the country during the prioritization of pathways. Among these, 33 species occur in the wild, and an additional 7 species, currently held in captivity, could potentially survive in the wild if released.

In **Romania**, 506 alien species were identified at the time of the plan, of which 72 are considered highly invasive (spread in Romania and has significant impact on nature, health and economy) species based on four categories. These are:

- C3 - Alien species escaped/introduced into the wild that survive and reproduce in environments forming new stable populations
- D1 - A self-sustaining population of the alien species in the wild, from which



new individuals disperse and survive at a significant distance from the original place of introduction

- D2 - Self-sustaining population of the non-native species in the wild, from which new individuals disperse, survive and reproduce at a significant distance from the original site
- E - Fully invasive population, with individuals dispersing, surviving and reproducing in more places, in a greater or lesser variety of habitats.

Of the 14 plant species of Union concern and 29 animal species occurring in Romania, 9 plant species and 15 animal species are considered priorities for intervention.

In **Slovakia**, the analysis covered 83 species—66 of Union concern and 17 invasive species listed under national legislation. However, the action plan focuses on 45 species (27 plants and 18 animals) that are still found in small populations and over limited areas, or species that are expected to be introduced or spread unintentionally in the near future and successfully acclimatise in the wild.

Slovenia has assessed 88 species of EU importance, of which only 23 occur in the country. These are either occasional or established.

During the *prioritisation* different *approaches and methods* were used. In some cases, prioritization was carried out by following legal requirements and ranking pathways based on the number of species associated with each pathway and their expected impact (e.g., Hungary). In other cases, prioritization was performed using scoring systems or other weighting methods (e.g., Slovakia, Slovenia).

In **Hungary**, the identification priority pathways was based on the number of species associated with each pathway and their impact/significance (e.g., dispersal ability; colonization capacity; known negative effects and their extent on native species; whether the species is considered an "ecosystem engineer" (i.e., capable of altering its environment); economic impact; social impact) evaluated by experts.

Romania lists the most frequently used pathways in the plan based on the results of the [foundational project](#) (Proper Management of Invasive Alien Species in Romania in accordance with Regulation (EU) No 1143/2014 on the prevention and management of the introduction and spread of invasive alien species POIM 2014+ 120008), determined by the number of species associated with each pathway.

In **Slovenia**, Institute of the Republic of Slovenia for Nature Conservation has prepared a



[document](#) "Prioritisation of pathways for the inadvertent introduction and spread of invasive non-native species, which proposes the preparation of action plans for the three top priority pathways. For all 88 species of EU concern assessed weight (importance) was assigned, which reflects the importance or impact of each species, and whether the species has been traded in Slovenia or not. The weight was assigned to a species based on its distribution, from not present (0) to widespread (3).

According to the IAS Regulation, action plans can be prepared not only for individual pathways but also for groups of pathways. Croatia, Slovakia, and Austria have also applied this method.

Austria identifies 12 priority pathways, which do not refer to specific pathways but rather to multiple pathways or groups of pathways based on the EU code (Annex II/B). The definition of each pathway was either narrower or broader, so some pathways were separated while others were consolidated. The prioritization of pathways was based on the work of Rabitsch (2020). The numbering of the 12 pathways does not represent a ranking; a ranking will be established during the next revision based on the number of associated species and their impacts. In addition, other (non-priority) pathways will be incorporated into the elaboration, especially when there is a high level of synergy (i.e., low costs and high benefits) or a significant need for research.

For **Croatia**, two action plans have been prepared in the framework of the following project - Development of management and control measures for invasive species KK.06..5.2.02.0001. One for the transport, specifically examining both 3. Transport – Contaminant and 4. Transport – Stowaway categories, while the other plan addresses the 6.1 Natural Dispersal Across Borders category. In the plan developed for the transport categories, all subcategories are analysed and classified into non-priority, priority, and high-priority categories.

In the case of **Slovakia**, the prioritization of dispersal pathways is based on the work of Mered'a et al. (2021). The pathways were assigned scores, and those with scores above 100 were considered priorities. The prioritization score expresses the riskiness of a given pathway in terms of

- (a) the number of introduced individuals or their germs,
- (b) the potential areal distribution of populations that these germs or individuals are capable of establishing in Slovakia in the next 20 years and



(c) the invasive damage that such established individuals may cause to native ecosystems, human health and the economy. Subsequently, the pathways were divided into five groups, each containing multiple (3-8) pathways (Annex II/A), some of which were not considered priorities. Only Group 5 (Pathways associated with botanical and zoological gardens) included a single pathway (2.3) that was also classified as a priority. Identification and detailed analysis of pathways associated with IAS in Slovakia taking into account two aspects, introduction and unintentional spread of invasive non-native species into the territory of the Slovak Republic and into the EU through the territory of the Slovak Republic.

2.2.2. Priority pathways and associated species

According to the Commission's report, member states identified 36 pathways as priorities. Among these, two were recognized as priorities by the majority of member states: "*Escape from confinement: escape of pet, aquarium and terrarium species*" (2.4) and "*Escape from confinement: horticulture*" (2.8), prioritized by 13 and 11 member states, respectively.

For the six CEE member states, out of the 28 priority pathways identified, "*Escape from confinement: escape of pet, aquarium and terrarium species*" (2.4) was also one of the most significant, with five member states prioritizing it. Additionally, another pathway prioritized by five member states was "*Escape from confinement: Ornamental purpose other than horticulture*" (2.9).

The next four most significant pathways, each identified as a priority by four member states, were (Table 2.):

- "*Transport – contaminant: Seed contaminant*" (3.8)
- "*Transport – contaminant: Transportation of habitat material (soil, vegetation, ...)*" (3.10)
- "*Transport – stowaway: Ship/boat hull fouling*" (4.9)
- "*Unaided: Natural dispersal*" (6.1).

There was significant variation in the number of pathways identified as priorities among the six examined member states. Slovenia identified the fewest priority pathways, with 3, followed by Hungary with 6. In contrast, the other member states considered 11 (Romania), and in the case of three Member States (Slovakia, Austria, Croatia) 17 pathways as



priorities. The significant difference in the number of priority pathways was due partly to the number of species considered and partly to the methodology used. Within Category 2 ("*Escape from confinement*"), 6 of the 12 subcategories were involved. In Category 3 ("*Transport – contaminant*"), all 10 subcategories were affected. Within Category 4 ("*Transport – stowaway*"), 9 of the 11 subcategories were involved, meaning that at least one of the examined member states considered each of these subcategories a priority (Table 2.).

In the case of **Austria** all sub-categories assigned to the 12 priority pathway groups were taken into account.

In the case of **Croatia** all sub-categories were classified as priority or high-priority within the two main Transport categories were considered as priority pathways, altogether 16.

In the case of **Romania**, the pathways considered as priority was listed in the action plan based on the foundational project results. These pathways were identified as the most frequently used by alien species present in the country (506 species) and species of Union concern. For the 506 species, the following two main categories were identified as priorities, accounting for 63% of the species: 4. Transportation stowaway and 3. Transportation - contaminant. Within the two main categories predominantly ship/boat ballast water (4.8) or ship/boat hull fouling (4.9) (mostly in case of marine species), and food contaminant (3.3), contaminant on plants (3.6), seed contaminant (3.8), parasites on animals (3.5), parasites on plants (3.7) or transportation of habitat material (3.10). In case of the invasive alien species of Union concern the most common pathway of introduction is 'Escape from confinement', within this pet/aquaria/terraria (2.4), botanical garden/zoo/aquaria (2.3) or ornamental purpose other than horticulture (2.9).

In the case of **Slovakia**, the 17 priority pathways were identified based on the two approaches. For the introduction and unintentional spread of invasive non-native species into the territory of the Slovak Republic 18 (including 1 intentional pathway), and for the introduction and unintentional spread of invasive non-native species into the EU through the territory of Slovakia 15 priority pathways were identified. When considering only the number of species, the priority pathways differed slightly between plants and animals. For plants, the key pathways were 2.9 (ornamental purposes), 6.1 (spontaneous spread), and 3.10 (transportation of habitat materials). For animals, the most important pathways were 6.1 (spontaneous spread), 2.4 (pet/aquaria/terraria), as well as 5.1 (waterways) and 2.11



(live food). All priority pathways were classified into the five groups were taking into account.

The number of species assigned to each pathway is shown in Table 3 for five Member States. Due to the grouping of pathways, only aggregated numbers can be provided for individual pathways in the cases of Austria and Slovakia. The highest species numbers are not necessarily associated with the pathways identified as the most important based on data from the six countries. This is because, in addition to species numbers, the priority status was also influenced by the occurrence patterns of the species and the risks they posed.

The classification of invasive species of Union concern into priority pathways is presented in Annex I for five Member States. The classification of priority pathways for the same species often shows agreement, but there are also clear discrepancies. These differences partly arise from what the member states identified as priority pathways and partly from the methodological approach, such as the grouping of pathways in the cases of Austria and Slovakia. Discrepancies may also result from whether the priority pathway refers to actual or potential introduction.

Hungary was the only member state to identify the 2.8 'Horticulture' pathway as a priority, while other member states classified species under this category as part of 2.9 'Ornamental purpose other than horticulture'. This difference likely stems from varying classifications and does not reflect a genuine divergence. For the same species, classifications such as 6.1 'Natural dispersal' and 2.4 'Pet/aquarium/terrarium' species are also used (e.g., *Elodea nuttallii* and *Hydrocotyle ranunculooides*). Austria was the only member state that did not identify the 6.1 'Natural dispersal' pathway as a priority. As a result, species categorized under this pathway by other member states were assigned to different pathways in Austria, which again does not indicate a genuine difference.



Table 2. Defined priority pathways by Member States according to the list of implementing regulation 2017/1454 (grey tick mark - partly concerned (AT - 3.1, 3.7) or based on score it was considered as priority but not classified into pathway groups (SK - 2.11)

Pathway			Member State						SUM (No. of MS)
Category	Code	Subcategory	HR	SI	AT	SK	HU	RO	
2. Escape from confinement	2.1	Agriculture (including biofuel feedstocks)							
	2.2	Aquaculture/mariculture			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		3
	2.3	Botanical garden/zoo/aquaria (excluding domestic aquaria)			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	3
	2.4	Pet/aquarium/terrarium species (including live food for such species)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5
	2.5	Farmed animals (including animals left under limited control)							
	2.6	Forestry (including afforestation or reforestation)							
	2.7	Fur farms							
	2.8	Horticulture					<input checked="" type="checkbox"/>		1
	2.9	Ornamental purpose other than horticulture		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	5
	2.10	Research and <i>ex-situ</i> breeding (in facilities)							
	2.11	Live food and live bait			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		3
	2.12	Other escape from confinement							
3. Transport - Contaminant	3.1	Contaminant nursery material	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			3
	3.2	Contaminated bait			<input checked="" type="checkbox"/>				1
	3.3	Food contaminant (including of live food)	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	2
	3.4	Contaminant on animals (except parasites, species transported by host/vector)	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			2
	3.5	Parasites on animals (including species transported by host and vector)						<input checked="" type="checkbox"/>	1



Category	Pathway		Member State						SUM (No. of MS)
	Code	Subcategory	HR	SI	AT	SK	HU	RO	
3. Transport - Contaminant	3.6	Contaminant on plants (except parasites, species transported by host/vector)	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	3
	3.7	Parasites on plants (including species transported by host and vector)			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	2
	3.8	Seed contaminant	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	4
	3.9	Timber trade	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			2
	3.10	Transportation of habitat material (soil, vegetation, ...)	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	4
4. Transport - stowaway	4.1	Angling/fishing equipment	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2
	4.2	Container/bulk	<input checked="" type="checkbox"/>						1
	4.3	Hitchhikers in or on airplane							
	4.4	Hitchhikers on ship/boat (excluding ballast water and hull fouling)	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				2
	4.5	Machinery/equipment	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			3
	4.6	People and their luggage/equipment (in particular tourism)	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			
	4.7	Organic packing materials, in particular wood packaging	<input checked="" type="checkbox"/>						2
	4.8	Ship/boat ballast water	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	2
	4.9	Ship/boat hull fouling	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	4
	4.10	Vehicles (car, train, ...)	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			3
	4.11	Other means of transport							
5. Corridor	5.1	Interconnected waterways/basins/seas			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			2
	5.2	Tunnels and land bridges			<input checked="" type="checkbox"/>				1
6. Unaided	6.1	Natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		4
Number of priority pathways			17	3	17	17	6	11	



Table 3. The number of species assigned to each pathway for five Member States (AT: a= as part of priority pathway 5 and 6; b= as part of priority pathway 7; c= partly concerned as part of priority pathway 8 (the main category is 3.10); d= as part of priority pathway 8; SK: e= aggregated data for pathway group 1; f= aggregated data for pathway group 2; g= aggregated data for pathway group 3; h= aggregated data for pathway group 4; i= aggregated data for pathway group 5)

Pathway			Number of associated species				
Category	Code	Subcategory	HR	SI	AT	SK	HU
2. Escape from confinement	2.1	Agriculture (including biofuel feedstocks)					
	2.2	Aquaculture/mariculture			25 ^d	21 ^f	4
	2.3	Botanical garden/zoo/aquaria (excluding domestic aquaria)			30	19 ⁱ	
	2.4	Pet/aquarium/terrarium species (including live food for such species)		26	29	41 ^h	14
	2.5	Farmed animals (including animals left under limited control)					
	2.6	Forestry (including afforestation or reforestation)					
	2.7	Fur farms					
	2.8	Horticulture					11
	2.9	Ornamental purpose other than horticulture		25	47	41 ^h	4
	2.10	Research and <i>ex-situ</i> breeding (in facilities)					
	2.11	Live food and live bait			25 ^d	?	3
	2.12	Other escape from confinement					
3. Transport - Contaminant	3.1	Contaminant nursery material	6		(33) ^c	22 ^g	
	3.2	Contaminated bait			25 ^d		
	3.3	Food contaminant (including of live food)	1				
	3.4	Contaminant on animals (except parasites, species transported by host/vector)	9			39 ^e	
	3.5	Parasites on animals (including species transported by host and vector)					



<i>Pathway</i>			<i>Number of associated species</i>				
Category	Code	Subcategory	HR	SI	AT	SK	HU
3. Transport - Contaminant	3.6	Contaminant on plants (except parasites, species transported by host/vector)	4			39 ^e	
	3.7	Parasites on plants (including species transported by host and vector)			(33) ^c		
	3.8	Seed contaminant	4		27 (25 ^d)	22 ^g	
	3.9	Timber trade	1			22 ^g	
	3.10	Transportation of habitat material (soil, vegetation, ...)	12		33	22 ^g	
4. Transport - stowaway	4.1	Angling/fishing equipment	14		25 ^d		
	4.2	Container/bulk	2				
	4.3	Hitchhikers in or on airplane					
	4.4	Hitchhikers on ship/boat (excluding ballast water and hull fouling)	11		13 ^b		
	4.5	Machinery/equipment	11		28	22 ^g	
	4.6	People and their luggage/equipment (in particular tourism)	4			41 ^h	
	4.7	Organic packing materials, in particular wood packaging	4				
	4.8	Ship/boat ballast water	2				
	4.9	Ship/boat hull fouling	10		13 ^b	21 ^f	
	4.10	Vehicles (car, train, ...)	8		10 ^a	22 ^g	
	4.11	Other means of transport					
5. Corridor	5.1	Interconnected waterways/basins/seas			12	21 ^f	
	5.2	Tunnels and land bridges			10 ^a		
6. Unaided	6.1	Natural dispersal across borders of invasive alien species that have been introduced through pathways 1 to 5	43	34		39 ^e	12



2.3. Measures

Legal provisions and guidelines

The IAS Regulation Article 13(3) and 13(5), in connection with the measures, highlight beyond their descriptions the *voluntary activities* and the *code of good practice*, if these are relevant. Additionally, it particularly emphasizes the following measures based on a cost-benefit analysis: awareness-raising, mitigation of contamination, and appropriate checks at EU borders.

According to the guideline, beyond the aforementioned points, it is recommended to specify *common measures* that are generally applicable to all pathways and *specific measures* that pertain to a particular pathway.

Implementation in the plans examined

The examined Member States address the system of objectives and measures in quite different ways. We review the system of objectives and measures, the main types of measures according to IAS Regulation and guidelines, as well as whether and in what form international cooperation and citizen science are included.

2.3.1. Structure of objectives and measure

In the case of **Austria** for each pathway, standard measures are defined, examined and cited where appropriate for the following topics:

- Public relations,
- Research needs and
- Cross-cutting issues

Cross-cutting issues are understood as connections to other priority and non-priority pathways and their associated measures. The measures specifically address mandatory and voluntary measures, as well as distinguish between ongoing and one-off measures (a measure that has a limited duration or validity). It was the only member State among those examined that explicitly incorporated cost-benefit analysis into the determination of the measures. The plan indicates that no methodology was available for this, so expert estimation was applied. A three-level scale (high, medium, low) was used for both cost and benefit. Measures with low costs and high benefits are recommended for prompt implementation. However, the cost-benefit estimates provided here should not be



interpreted as a prioritization but rather as a guide for the responsible authorities and stakeholders during implementation. For each measure, the criteria for monitoring implementation (indicator) are given. Two path-crossed measures are defined.

Croatia considered the following as the main principles for determining the specific measures:

- Legislative measures
- Institutional and international cooperation
- Information and education of the public and specific stakeholders
- Status of IAS in Croatia especially those that are capable of spontaneous spread
- Measures to control and prevent the spread of IAS

Activities are grouped according to the importance of implementation, and three priority classes are defined:

Class I - activities that must be implemented for the duration of the plan, because failure to implement these activities directly jeopardises the implementation of the overall plan.

Class II - Failure to implement the activities does not jeopardize the overall execution of the plan but contributes to mitigating the negative impacts of IAS.

Class III - Activities that can be implemented when time and/or resources are available.

The plans organize the measures according to the relevant fields (nature conservation, public information and education (only for transport), agriculture, forestry, hunting, horticulture and municipal activities, transport (road, rail, freshwater), water management, fishing, sport fishing, and aquaculture), including those related to transport and spontaneous spread, with slight variations. Each sector has its own specific challenges in the management and control of IAS related to spontaneous spread and transport, therefore a set of specific objectives and measures under each sector were tailored to them. Indicators are also provided here to monitor implementation.

In the case of **Hungary** no specific strategic goal or objective is defined for the pathways. Under each pathway, the measures are simply listed, along with the responsible parties and the timeframe. However, after the measures, the principles of their prioritization are provided, where the current situation is presented, and the specified measures are justified. Beyond the six priority pathways, the plan elaborates on all additional eight pathways affected by the 40 Union concerned species relevant to Hungary. For each pathway, its significance and temporal changes (whether its importance will increase or



decrease over time) are analysed. The measures focus on those that are most critical from a nature conservation perspective.

The National Action Plan for Addressing Priority Pathways of Introductions of **Romania** begins by identifying typical issues related to invasive alien species. The main challenges in managing invasive alien species have been grouped into six major areas of intervention, each accompanied by a detailed description of the problems faced:

- D1. Harmonization of national legislation on invasive alien species with EU rules
- D2. Strengthening institutional capacity
- D3. Increasing data availability
- D4. Management of priority pathways for introduction of invasive alien species and priority intervention areas.
- D5. Public information and communication on invasive alien species
- D6. Promoting national and international collaboration

Based on these areas, the plan outlines seven specific objectives (SO), which align with the provisions of the IAS Regulation, covering prevention, early detection, eradication, monitoring, management and international/regional cooperation. Under these seven specific objectives, the plan includes a total of 41 specific measures. For each measure, both targets and outcome indicator(s) have been defined. However, these measures are not tied to specific priority pathways. To develop detailed plans to address priority pathways is a specific measure under the SO1. (Prevent the establishment of new invasive alien species in Romania by addressing priority pathways of introduction). Priority areas of IAS invasion in Romania include the Danube River, the Port of Constanța, and the borders with Moldova and Ukraine.

Slovakia defines five horizontal strategic objectives, under which a total of 16 horizontal measures are specified. The five priority pathway groups are assigned one specific objective each, along with the specific measures under them.

Slovenia defines a strategic goal for all three priority pathways, under which the operational objectives are listed, followed by the specific activities.

2.3.2. Defined measures

It is difficult to summarize all the measures outlined in the plans in a general way. In this chapter, we focus on the main categories provided in the legislation and guidelines, as well



as the aspects we examined. Additionally, we highlight a few measures as examples that can serve as good practices (see BOX1).

Some general observations that reflect common elements included in most plans:

- The measures typically align with the tools listed in the IAS Regulation, such as early detection and rapid response, eradication, surveillance/monitoring, official control, management measures, and restoration.
- Legal amendments are often necessary, with the plans mentioning the integration of measures to combat IAS introduction and spread into sectoral plans.
- Protected areas and Natura 2000 sites are frequently given priority in the context of measures.
- For common IAS species, the development of dedicated programs or strategies is often considered necessary.
- Collecting and developing best practices, as well as updating guidelines, are highlighted as important activities.
- As part of information sharing and awareness-raising, regular knowledge and experience exchange meetings, as well as training for experts from different sectors, are included.

Awareness-raising

Among the content elements mentioned in the legislation, this is prominently featured in every plan, targeting both professionals and the general public. The associated measures include communication campaigns (sharing information about the legal situation regarding invasive species, as well as the conservation, economic, and health impacts caused by these species), using tools such as dedicated websites and social media platforms. Furthermore, the measures also involve conducting extensive training sessions and preparing informational materials.

Minimise contamination

Measures related to mitigation of contamination are relevant in four of the examined Member States (HR, AT, RO, SK), where a subcategory of Transport – contamination has been identified as a priority pathway. In the case of Austria, activities related to this are



quite extensively covered in the plan. In Croatia and Slovakia, however, there is only a specific reference to it.

Austria, addressing most of the priority pathways, has designated the "Minimise contamination" category under IAS Regulation Article 13(4) for several measures. The following are highlighted as examples: related to labelling obligations of specimens, considerations of relevant code of conducts, early warning system – mapping the occurrence of IAS species of Union concern, adaptation of principles for IAS and potential IAS in botanical gardens and zoological gardens/aquaria, construction works, road and rail infrastructures.

For example **Croatia** has formulated measures aimed at establishing protocols for the early detection and management of species that are not currently present in the country but are listed on the Union list or the Croatian blacklist, and for which there is a high risk of introduction during transport as contaminant (for 50% of the species in the first 4-year period and 50% in the second 4-year period). The following indicator, which serves to monitor implementation, is associated with several measures: To provide capacity building in all relevant sectors and disciplines, and to provide scientific training on the biology, ecology, and prevention of IAS contamination and spread through transport.

In the case of **Slovakia** the pathway group 3 (Pathways associated with commercial movement of goods and services) targets to reduce the potential for invasive species infiltration due to movement of goods by strengthening control activities and dedicated preventive monitoring.

Appropriate check at EU border

The plans prominently feature this, with the associated measures including training sessions, the introduction of new methods for identifying and monitoring the species in question, as well as the development of guidelines.

Voluntary measures

Voluntary measures are only briefly mentioned in the action plans, with examples found in three Member States.

Austria designates several measures as voluntary in character. Here are a few examples:

- Pathway No. 1. (Pets/aquaria/terraria):



- labelling obligations – some listed animal species should be individually marked with unique identification, for animal owners who currently own these animal species and are allowed to keep them until their natural death under certain conditions can implement this measure on a voluntary basis.
- Voluntary measure for retailers to take back animals that are no longer wanted to keep/sell.
- Pathway No. 11 (Fishing): additional voluntary controls by the person authorised to fish or exercise fishing rights and report to the competent authorities in the event of the occurrence of species on the Union list.
- Regarding more pathways in general the public relations, education and training, research, consideration of relevant code of conduct.

Romania mentions the following under the specific objective 5 (SO5) “*Developing a range of voluntary activities geared towards the management of invasive alien species*” and „*Increase the number of invasive alien species control activities carried out through non-governmental organizations and civic initiative groups*”.

In the case of **Slovenia**, voluntary measures appear as operational objectives for pathways 2.9 and 2.4: “*Providers and users of online shops and forums are informed about the limitations and negative consequences of IAS, and thus encouraged to take voluntary measures to prevent the introduction and spread of IAS through their platforms/tools*”.

Common (horizontal) measures

A horizontal objective or measure appears in the action plan for three of the examined Member States.

Austria identified as path-cross measures: 1. Controls on online trading and distance selling and 2. Path-relevant management measures against species on the Union list in accordance with Art. 19 of IAS Regulation.

In the case of **Slovakia** five horizontal strategic objectives and the related horizontal measures were defined, which are the followings in summary:



- 1. Increase awareness of invasive species among the general and professional public: identification manual, good practice guide for the control and eradication of invasive species, awareness campaign for public and municipalities, increase the professional capacities of responsible ministry and other concerned organisations.
- 2. Establish sufficient capacity to control, monitor, eradicate and manage invasive species: establishment of eradication team, increase the capacity of Environmental Inspectorate.
- 3. Increase the level of knowledge on monitoring and eradication of invasive species: develop new methods for the suppression and eradication of IAS, predictive analysis to identify potential sites for the spread of IAS.
- 4. Establish a system that provides an up-to-date overview of the status and abundance of invasive species in Slovakia: establishment and operation of monitoring network, public involvement (citizen science), establish an early warning system.
- 5. Suppress the occurrence of invasive species with localised distribution and eradicate newly introduced species: significant reduction the populations of 3 invasive species (*Heracleum mantegazzianum*, *Trachemys scripta*, *Alopochen aegyptiacus*), with localised distribution in Slovakia, rapid eradication of new invasive species.

Slovenia has formulated a separate horizontal operational objective for communication, in relation to the Communication Plan.

International/regional/transborder cooperation

Three of the examined Member States (AT, HR, RO) have defined objectives and measures for cooperation beyond their national borders. In the case of the other Member States, only national-level cooperation is mentioned, involving relevant institutions, organizations, and the general public.

Austria, regarding Pathways No. 1 and 3, states that coordination with neighbouring German-speaking countries would be beneficial, in line with Article 22 ("Cooperation and Coordination") of the IAS Regulation. Additionally, cooperation with international organizations such as the Convention on Biological Diversity (CBD), the International Plant



Protection Convention (IPPC), the World Organisation for Animal Health (OIE), the SPS Agreement (Agreement on the Application of Sanitary and Phytosanitary Measures), and others is also considered an option.

In **Croatia**, international cooperation includes engagement with the Republic of Slovenia regarding *Elodea nuttallii* to exchange information and establish an interstate platform. This platform aims to facilitate collaboration among Member States managing water resources to implement the objectives of international and European regulations through unified action. As part of international cooperation, an INTERREG project in the Sava River Basin ([Sava TIES](#)) was implemented from 2018 to 2021 in the sub-region encompassing the four countries bordering the Sava River (Slovenia, Croatia, Bosnia and Herzegovina, and Serbia). The project's aim was to reduce habitat degradation and improve the connectivity of the international ecological corridor of the Sava River by developing cross-sectoral measures for managing, controlling, and eradicating invasive species within the network of protected areas along the river. The project also tested various methods for the effective control of certain IAS species.

In **Romania**, ensuring cooperation with other EU countries to coordinate efforts in reducing the impact of IAS is addressed under SO7. This involves collaboration, particularly with neighbouring countries, including those bordering the Black Sea and the Danube Basin. Activities include cooperation with national authorities and experts, the development of joint work programs, and the exchange of best practices related to the management of invasive alien species. Regional cooperation is encouraged in the assessment, prevention, eradication, or control of IAS-related risks, which also includes the establishment of appropriate funding mechanisms.

Citizen science

Citizen science appears as an objective or measure in the action plans of three examined Member States (HR, SK, RO). In the action plans of the remaining Member States, citizen science is not explicitly mentioned, but these documents touch on it indirectly by indicating that awareness-raising efforts target the general public.

In **Croatia**, a mobile application - *The Invasive Species in Croatia* - is operating and currently contains 42 species. It is intended for the public with the aim of developing a network of amateur field investigators who will discover and share the data of invasive species in Croatia and thus contribute to the mapping of IAS and their early detection. The



mobile application is linked to the IAS Information System. As part of the educational and awareness-raising activities, an initiative is established to promote the collection of IAS distribution data. In the action plan on spontaneous spread, under public information and education the citizens are one of the two main target group with activities which aim to promote mobile application (www.invazivnevrste.hr).

In the case of **Romania** under the specific objective 5 (SO5) (*Raise public awareness and education, increase public empowerment and increase public support for strategic actions to combat the spread of invasive alien species*) the following measures are defined addressing to develop citizen science:

- Increased public reporting of invasive alien species, including through methods such as apps installed on mobile devices.
- Development of a national network of invasive alien species observers

In the case of **Slovakia** citizen science is highlighted to promote public involvement in the mapping and monitoring of invasive species through digital applications under the horizontal strategic objective 4. The rationale states that the current capacities of state nature conservation and academic institutions are insufficient for the extensive mapping and monitoring of invasive species. Therefore, it is necessary to develop and encourage greater public participation in invasive species mapping by utilizing existing systems (www.biomonitoring.sk), which need to be further developed or integrated.

BOX1 GOOD EXAMPLES FOR SPECIFIC MEASURES

- Upgrade procedures and recommendations for the management of removed biomass of IAS
- Compile a list of ornamental plants that can replace ornamental IAS
- Agreement with key online retailers and forum editors on IAS notification and examining the possibility of introducing automated controls on the online sale of banned IAS
- Develop a set of good practice examples for sectoral activities to reduce the vulnerability of ecosystems
- Mobil application to collect data on IAS as part of citizen science



3. National list of IAS

The IAS Regulation also encourages the creation of national lists (Article 11). We consider it important to mention this because, in many cases, priority pathways were identified based on species considered dangerous at the national level but not included in the Union list. Additionally, national lists can serve as a basis for regional lists and provide a common point for cross-border collaborations.

Among the examined Member States, Croatia and Slovakia have official national lists announced in legislation. In several other Member States, legislative lists are in preparation. All the examined countries have professional lists.

The blacklist of the Croatian invasive alien species ([OG 13/24](#)) came into force on 10 February 2024 and contains 10 species (1 bird, 4 fish, 1 decapod crustacean, 4 plant). List of invasive alien species of Slovak Republic ([449/2019](#)), with its provisional version effective from December 1, 2023, includes 16 taxa (1 mammal, 1 reptile, 5 fish, 1 mollusc, 7 plant). There is no common species on the official lists of the two countries.

4. Opportunities in citizen science and the current situation of its application

The management of IAS being a rather intricate challenge, and its effectiveness is highly depend on available and reliable data on distribution, first occurrence, and as well as the impact of IAS. Various documents, the European Commission and adjacent organisations (see Adriaens et al., 2021; Cardoso et al., 2021; European Commission, 2021) promote the enhancement of both the quantity and quality of citizen science initiatives which engage citizens in environmental research. In fact, in many EU member states, IAS surveillance systems are already partially, some even predominantly, fed with citizen science data (European Commission, 2021). This is because many states face a lack of data as well as the vast resources needed to set up a comprehensive, reliable data grid on IAS distribution as a point of departure for effective action. In most cases, researchers and other relevant stakeholders cannot assess all affected places directly. Therefore, citizen science emerges as an effective asset for IAS monitoring and other related activities. Within a great variety of approaches and different intensities of collaboration, it can generate substantial datasets across broad spatial areas and extended timeframes. Through the active engagement of the public, it can also be seen as an empowering tool for local communities.



Citizen science raises awareness of biodiversity and enhances the understanding of IAS and its impacts on ecosystems within societies. It is thus an important instrument to examine when considering how to best address the spread of IAS within a certain area.

In the last few years, the development of citizen science smartphone applications as a crowdsourcing tool for IAS reporting has transmuted citizen science approaches greatly by allowing for fast IAS recordings by a potentially high number of people (Adriaens et al., 2021). However, it has to be noted that the emergence of IAS citizen science apps has in parallel also increased the need to continuously address associated challenges such as safeguarding the accuracy of submitted data, managing uneven spatial coverage, or implementing adequate data management practices. When it comes to data accessibility, Price-Jones et al. (2022) contend that there is still a lot of potential. A majority of projects do not yet share the data collected in open databases such as the Global Biodiversity Information Facility (GBIF) or the European Alien Species Information Network (EASIN). This data could potentially not only inform research but also policy processes. Moreover, setting up data management plans is identified as a crucial component of reliably maintaining access to data over extended time frames.

Recognising the potential of citizen science, the creation of EASIN (European Alien Species Information Network), which is conceptualised to facilitate the implementation of the IAS Regulation, also entailed a repository for citizen science projects and organisations across the EU (<https://easin.jrc.ec.europa.eu/easin/CitizenScience/Projects>). So far, the list comprises 78 citizen science projects, 12 citizen science organisations, 11 national organisations and 11 other projects. Projects in the database cover different natural environments (freshwater, marine, estuarine systems, terrestrial, urban areas) dealing with various species types or groups (plants, animals, microorganisms, fungi). The majority of projects – spanning from EU level, regional and national initiatives to cross-border and multiple-country projects – are based in the EU, however, there are also a few outside of it listed.

Currently, the database is in a rather incomplete state, presumably as providing information for the list is voluntary. Further, some of the initiatives listed could be recategorized and links updated. It is noticeable that there is especially little data available on the CEE region (covering Baltic states). Out of a total of 112 initiatives, only 18 specifically affect CEE member states, and noteworthily, out of those, 12 concern Germany (see Figure 1). In addition to those 18 projects, countries in the CEE region are also part



of the projects covering all of the EU and potentially also some global initiatives. Incidentally, it should be highlighted that in accordance with the database list, the UK is still considered part of the EU in the context of this analysis.

Classifying the various initiatives listed into categories in some cases proved to be a challenge, particularly in the case of biodiversity monitoring platforms when the presence of IAS is only of concern in some projects. Based on a cautious estimate, it appears that approximately 40 to 50 percent of the initiatives listed are mainly focused on targeting IAS. For the remaining elements listed, including some citizen science organisations or biodiversity networks, IAS may be incorporated in some form, but they do not seem to be of major concern.

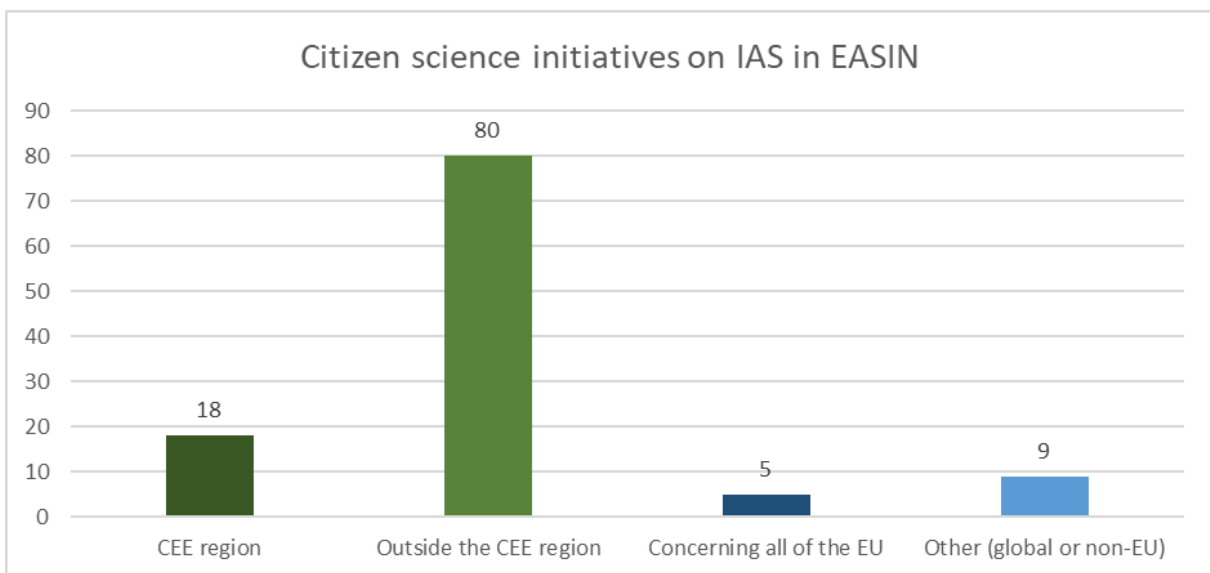


Figure 1 Distribution of citizen science initiatives on IAS in the EASIN database

Pocock et al. (2024, 12) conclude “*Citizen science alone will not meet all our needs for IAS data, yet it has become an important tool for IAS monitoring and research [...]*”. They also highlight that citizen science initiatives on IAS not only are a valuable complementary tool in assembling data on the early detection and spread of IAS but could also bear potential in assessing IAS effects, ecosystem interactions and management strategies. While contributing data for the EASIN repository is optional, assembling a larger number of projects would be highly beneficial. Bringing together existing projects can inform the formation of new initiatives and approaches as well as broaden knowledge exchange



across a multitude of stakeholders, including researchers, practitioners and policymakers. This would be especially valuable for the CEE region, where the EASIN list indicates comparatively little citizen science activity on IAS. Further analysis could help identify gaps in spatial and taxonomic distribution within past and running citizen science projects on IAS. This could also spur more structured approaches, targeting geographical areas and taxonomic groups heretofore underrepresented. However, such advances would require more cooperation and a larger number of awareness-raising campaigns about IAS and the importance of citizen engagement in dealing with their impacts across different scales. Citizen science and the environmental education and awareness accompanying it are great learning opportunities, valuable also for individuals' personal development. It would be advantageous for local governments, municipalities and environmental organisations to increase the active promotion and support of citizen science initiatives, for instance through outreach workshops or training sessions. Concerning both points, for some taxa harder to detect or identify, certain groups with either specific skills or access like fishers, divers or farmers could be targeted more systematically.

5. Summary

In this study, we analysed the action plans for priority pathways of invasive alien species (IAS) based on the IAS Regulation from six Central and Eastern European Member States (Austria, Croatia, Hungary, Romania, Slovakia and Slovenia). We examined how well the content elements prescribed in the IAS Regulation and recommended in the related guidelines have been implemented. We compared the methods used by each Member State to identify priority pathways, the number of pathways identified, and the species associated with them. We reviewed the system of measures provided, how the types of actions required by the regulation and suggested in the guidelines are represented. We also specifically addressed the inclusion of international cooperation and citizen science in the measures. We highlighted a few good examples regarding the content elements and measures used in the plans.

The comparison of the plans clearly shows that although each Member State's plan is logical and coherent on its own, the methods used to identify pathways, the structure of the plans, the system of measures, and the underlying principles vary significantly. This is understandable and justified, as the situations in each Member State differ, whether it concerns the occurrence of species of Union concern, the significance of particular



pathways, the involvement of different sectors in the spread of invasive species, or the available knowledge.

The comparison of the content of the plans was challenging due to their significantly differing structures and the varying levels of detail in the development of specific elements. Taking these circumstances into account, the primary goal of the analysis was to familiarize stakeholders with the plans and, through suggestions for potential future improvements, to support the goal of making the plans easier to understand and compare. This, in turn, could help facilitate the development of regional cooperation. The recommendations are also intended to support and promote this.

We also specifically addressed the topic of citizen science. By now, citizen science has become an established part of endeavours addressing the spread of IAS in the EU. The data collected through according initiatives is important as it fills in on the gaps of data needed for targeted action on IAS control. However, there is still room for improvement on various issues such as verifying the accuracy of submitted data, dealing with uneven spatial distribution, or implementing adequate data management practices.

BOX2 GOOD EXAMPLES FOR CONTENT ELEMENTS OF ACTION PLANS

- **Tables presenting the occurrence patterns of species of Union concern, serving as foundational information for priority pathways, provide data on the presence of EU-listed species in neighboring countries.**
- **Characterization of pathways:**
 - **Explanation of the temporal changes in the pathways, i.e., how the role of a pathway might change in the future.**
 - **Identification of cross-cutting issues, highlighting the connections between different pathways.**



6. Conclusions and recommendations

For decision-makers

Action Plans

- As a first step, making the plans available on the EASIN website in national languages. In a later phase, to avoid potential misunderstandings, it is recommended to publish all action plans in English as well.
- Developing a more structured format for the action plans to promote transparency, comparability, and evaluation while allowing flexibility for Member States. This format should incorporate the recommendations from the guidelines and integrate good examples of content elements derived from the Commission's assessment or this study.

Some considerations for enhancing comparability and establishing more standardized content:

- Incorporating the methodology and results of prioritization into the plans – clearly presenting the species used as the basis for prioritization and their assignment to specific pathways.
- Consistent use of pathway codes.
- Tabular presentation of measures – developing a recommended format for this, including suggestions for the organization of measures, such as grouping them by key intervention areas within a given pathway.
- Providing at least a suggested methodology for cost-benefit analysis with examples and its integration into the plan. The collection of best practices and solutions included in the action plans to support the development of future plans.

Citizen Science

- Ramp up regional and transnational cooperation on citizen science to facilitate data collection and analysis across borders and with it the potential for more structured



approaches that could target specific taxa and geographical areas hitherto underrepresented.

- Together with environmental organisations increase awareness-raising campaigns, educational measures and active support of citizen science on IAS to put IAS on the public's radar, subsequently also empowering communities with environmental knowledge.
- More systematically target groups with specific access or skills, like farmers, fishers, or divers, for citizen science projects on taxa that are hard to detect or identify. Keep them engaged by offering continuous education and communication platforms.

For Non-Governmental Organisations

Action Plans

- Supporting Member States through further analysis of action plans, baseline data and scientific publications, and sharing the results.

Regional cooperation

- Supporting Member States by creating platforms for information sharing and exchange of experiences, such as organizing workshops, meetings, and study trips.
- Widespread sharing and communication of good practices and examples used in prevention and management efforts against the IAS.

Citizen science

- To promote the scaling up and improve the structures citizen science tools are embedded in, such as the EASIN repository for citizen science initiatives.

With potential support from local governments and municipalities create educational programmes like outreach workshops or training sessions on IAS and citizen science projects.



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Bara L.; Iojă C.; Niță M. R.; Rozyłowicz L.; Preda C.; Onose D.; Niță A.; Grădinaru S.; Manolache S. (2022). Planul Național de Acțiune pentru Abordarea Căilor de Introducere Prioritare a speciilor alogene invazive în România, Proiect Managementul adecvat al



speciilor invazive din România, în conformitate cu Regulamentul (UE) nr. 1143/2014 referitor la prevenirea și gestionarea introducerii și răspândirii speciilor alogene invazive - Cod SMIS 2014+ 120008. [Link](#)

Slovakia

Ministerstvo životného prostredia Slovenskej republiky (2021). Akčný plán na riešenie problematiky prienikových ciest neúmyselnej introdukcie a neúmyselného šírenia invázných nepôvodných druhov na územie Slovenskej republiky a na územie EÚ cez územie Slovenskej republiky, Bratislava. [Link](#)

Slovenia

Ministrstvo za Okolje in Prostor, Republica Slovenija (2022). Akcijski načrt za obravnavanje prednostnih poti vnosa in širjenja invazivnih tujerodnih vrst, ki zadevajo Unijo (2022 – 2027). [Link](#)

Useful links

EU

European Commission https://environment.ec.europa.eu/topics/nature-and-biodiversity/invasive-alien-species_en

Invasive Alien Species Portal <https://ias.eea.europa.eu/front-page>

EASIN - European Alien Species Information Network <https://easin.jrc.ec.europa.eu/easin>

Austria

Bundesministerium Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie - Invasive gebietsfremde Arten

https://www.bmk.gv.at/themen/klima_umwelt/naturschutz/biol_vielfalt/gebietsfremde/bioinvasive.html

Neobiota in Österreich <https://www.neobiota-austria.at/>

Croatia

Ministry of Environmental Protection and Green Transition – Invasive Alien Species (Invasivne Strane Vrste) <https://invazivnevrste.haop.hr/>



Hungary

Knowledge base of invasive species <http://www.invaziosfajok.hu/hu>

Ministry of Agriculture, Nature Conservation Website – Invasive Alien Species
<https://termeszetvedelem.hu/idegenhonos-invazios-fajok-jogszabalyi-vonatkozasai-eu-s-jegyzek/>

Romania

Project on invasive alien species <https://invazive.ccmesi.ro/>

Slovakia

Ministry of Environment - Non-native and invasive non-native species
<https://www.minzp.sk/ochrana-prirody/nepovodne-invazne-druhy/>

State Nature Conservancy - Non-native and invasive non-native species
<https://invaznedruhy.sopsr.sk/>

Slovenia

Republika Slovenija Portal GOV.SI - Invasive non-native species of plants and animals
<https://www.gov.si teme/invazivne-tujerodne-vrste-rastlin-in-zivali/>



Annex I

The classification of invasive species of Union concern into priority pathways for five member states (*based on the pathway groups see in Annex IIA and IIB; non-p=not linked to a priority pathway; NI=not identified, there is no current possible pathway)

Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Acacia saligna</i> (<i>A. cyanophylla</i>)		2.9 6.1	2.3 2.9 3.10, (3.1, 3.7) 3.8		
<i>Ailanthus altissima</i>		2.9 6.1	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5		2.9
<i>Alternanthera philoxeroides</i>	3.8, 3.10, 4.4, 4.8, 6.1	2.9	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	
<i>Andropogon virginicus</i>		2.9	3.10, (3.1, 3.7) 4.5	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Asclepias syriaca</i>	6.1	2.4 2.9 6.1	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8		2.9



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Baccharis halimifolia</i>	3.10, 6.1	2.9 6.1	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Cabomba caroliniana</i>	3.4, 4.4, 4.9, 6.1	2.4	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Cardiospermum grandiflorum</i>		2.9	2.3 2.9 3.8		
<i>Celastrus orbiculatus</i>		2.9 6.1			
<i>Cortaderia jubata</i>		2.9	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8	3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Eichhornia crassipes</i>	3.4, 3.10, 4.1, 4.4, 6.1	2.9	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Elodea nuttallii</i>	4.1, 4.9, 6.1	6.1	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1		2.8
<i>Ehrharta calycina</i>		2.4	3.10, (3.1, 3.7) 3.8	3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Gunnera tinctoria</i>	3.10, 6.1	2.9	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	
<i>Gymnocoronis spilanthoides</i>		NI	2.3 2.4 2.9 4.4, 4.9 4.5 2.2, 2.11, 3.2, 3.8, 4.1	2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	2.8
<i>Hakea sericea</i>		2.9			
<i>Heracleum mantegazzianum</i>	6.1	2.9 6.1	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Heracleum persicum</i>	3.4, 3.10, 4.10, 6.1	2.4	2.3 2.9 4.10, 5.2 3.10, 3.8 (3.1, 3.7) 4.5	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	6.1



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Heracleum sosnowskyi</i>	3.4, 3.10, 4.10, 6.1	NI	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Humulus scandens</i>		2.9 6.1	2.9	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	2.9 6.1
<i>Hydrocotyle ranunculoides</i>	3.6, 3.10, 4.1, 4.4, 6.1	2.4	2.3 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	2.8
<i>Impatiens glandulifera</i>	3.10, 4.6, 6.1	2.9 6.1	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1 5.1		2.9 6.1
<i>Koenigia polystachya</i>		2.9 6.1			



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Lagarosiphon major</i>	3.4, 3.6, 3.10, 4.1, 4.9, 6.1	NI	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Lespedeza cuneata</i> (<i>L. juncea</i> var. <i>sericea</i>)		2.4	2.3 2.9 3.10, (3.1, 3.7)	3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Ludwigia grandiflora</i>	4.1, 4.4, 4.9, 6.1	2.9	2.3 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Ludwigia peploides</i>	4.1, 4.4, 4.9, 6.1	2.9	2.3 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Lygodium japonicum</i>		non-p	2.3 2.9 3.10, (3.1, 3.7) 4.5		



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Lysichiton americanus</i>	6.1	2.4 2.9 6.1	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	
<i>Microstegium vimineum</i>	3.8, 3.10, 4.5, 4.6, 4.10, 6.1	non-p	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	
<i>Myriophyllum aquaticum</i>	4.1, 4.4, 4.5, 4.9, 6.1	2.9	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Myriophyllum heterophyllum</i>	4.4, 4.9, 6.1	2.9 6.1	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7) 4.5 3.8 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Parthenium hysterophorus</i>	3.4, 3.6, 3.8, 4.2, 4.5, 4.6, 4.10, 6.1	non-p	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Plants					
<i>Pennisetum setaceum</i>	3.4, 4.5, 4.6, 4.10, 6.1	2.4 2.9	2.3 2.9 4.10, 5.2 3.10, (3.1, 3.7) 4.5 3.8	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6	2.8
<i>Persicaria perfoliata</i>	3.8, 3.10, 4.5, 4.10, 6.1	non-p	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8	3.1, 3.8, 3.9, 3.10, 4.5, 4.10	
<i>Pistia stratiotes</i>		non-p			
<i>Prosopis juliflora</i>		NI	2.3 2.9		
<i>Pueraria lobata</i>	non-p	2.4 2.9 6.1	2.3 2.9 3.10, (3.1, 3.7) 4.5 3.8	3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	
<i>Rugulopteryx okamuræ</i>		non-p			
<i>Salvinia molesta (S. adnata)</i>		2.4 2.9	2.3 2.4 2.9 4.4, 4.9 3.10, (3.1, 3.7)	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6 2.3	2.8
<i>Triadica sebifera (Sapium sebiferum)</i>		2.9	3.10, (3.1, 3.7)		
Animals					
<i>Acridothores tristis</i>		non-p	2.3 2.4	3.4, 3.6, 6.1 2.4, 2.9, 4.6	
<i>Alopochen aegyptiacus</i>	6.1	6.1	2.3 2.4 2.9	3.4, 3.6, 6.1 2.4, 2.9, 4.6	2.4 6.1
<i>Ameiurus melas</i>		6.1			



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Animals					
<i>Arthurdendyus triangulatus</i>		non-p	2.3 3.10, (3.1, 3.7)	3.4, 3.6, 6.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.4, 2.9, 4.6 2.3	
<i>Axis axis</i>		non-p			
<i>Callosciurus erythraeus</i>	6.1	2.4	2.3 2.4 2.9	3.4, 3.6, 6.1 2.4, 2.9, 4.6	2.4
<i>Callosciurus finlaysonii</i>		non-p			
<i>Channa argus</i>		2.4			
<i>Corvus splendens</i>	4.4, 6.1	non-p	2.3	3.4, 3.6, 6.1	
<i>Eriocheir sinensis</i>	3.1, 4.1, 4.8, 4.9, 6.1	6.1	2.3 4.4, 4.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1		6.1
<i>Faxonius rusticus</i>		2.4			
<i>Fundulus heteroclitus</i>		2.4			
<i>Gambusia affinis</i>		2.4			
<i>Gambusia holbrooki</i>		2.4 6.1			
<i>Herpestes javanicus</i>	6.1	6.1	2.3 2.4		
<i>Lampropeltis getula</i>		2.4			
<i>Lepomis gibbosus</i>		2.4 6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1		2.2 2.11
<i>Limnoperna fortunei</i>		non-p			



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Animals					
<i>Lithobates catesbeianus</i>	3.1, 4.1, 6.1	2.4	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.3 2.4, 2.9, 4.6	
<i>Morone americana</i>		non-p			
<i>Muntiacus reevesi</i>	NI	NI	2.3	3.4, 3.6, 6.1 2.3	
<i>Myocastor coypus</i>	6.1	6.1	2.3		6.1
<i>Nasua nasua</i>	non-p	2.4	2.3 2.4	2.4, 2.9, 4.6	2.4
<i>Nyctereutes procyonoides</i>	6.1	6.1	2.3		6.1
<i>Ondatra zibethicus</i>	6.1	6.1	2.3 5.1		6.1
<i>Orconectes limosus</i>	3.1, 4.1, 4.5, 4.9, 6.1	6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1		2.2
<i>Orconectes virilis</i>	3.1, 4.1, 4.5, 4.9, 6.1	non-p	2.3 2.9 2.2, 2.11, 3.2, 3.8, 4.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6	
<i>Oxyura jamaicensis</i>	6.1	2.4 6.1	2.3 2.4 2.9	3.4, 3.6, 6.1 2.4, 2.9, 4.6	2.4 6.1
<i>Pacifastacus leniusculus</i>	3.1, 4.1, 4.5, 4.9, 6.1	6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6	2.4 6.1



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Animals					
<i>Perccottus glenii</i>	3.4, 4.1, 4.8, 6.1	non-p	2.3 2.2, 2.11, 3.2, 3.8, 4.1 5.1		2.2 2.4 6.1
<i>Plotosus lineatus</i>		6.1	2.3		
<i>Procambarus clarkii</i>	3.1, 4.1, 4.4, 4.5, 6.1	6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6	2.4
<i>Procambarus fallax f. virginalis</i>	3.1, 4.1, 4.5, 4.9, 6.1	2.4 6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6	2.4
<i>Procyon lotor</i>	4.10, 6.1	6.1	2.3 2.4		2.4 6.1
<i>Pseudorasbora parva</i>	3.4, 6.1	6.1	2.3 2.2, 2.11, 3.2, 3.8, 4.1 5.1		2.2 2.11
<i>Pycnonotus cafer</i>		2.4			
<i>Sciurus carolinensis</i>	6.1	2.4	2.3 2.4 2.9	2.4, 2.9, 4.6	2.3 2.4
<i>Sciurus niger</i>	non-p	NI	2.3 2.4 2.9	3.4, 3.6, 6.1 2.4, 2.9, 4.6	2.4
<i>Solenopsis geminata</i>		non-p			
<i>Solenopsis invicta</i>		non-p			
<i>Solenopsis richteri</i>		non-p			



Name of species of EU concern	Associated priority pathway(s)				
	HR	SI	AT*	SK*	HU
Animals					
<i>Tamias sibiricus</i>	non-p	6.1	2.3 2.4 2.9	3.4, 3.6, 6.1 2.4, 2.9, 4.6 2.3	2.4
<i>Threskiornis aethiopicus</i>	6.1	6.1	2.3 2.4	3.4, 3.6, 6.1	2.4
<i>Trachemys scripta</i>	6.1	2.4 6.1	2.3 2.4 2.9 2.2, 2.11, 3.2, 3.8, 4.1 5.1	3.4, 3.6, 6.1 2.2, 4.9, 5.1 2.4, 2.9, 4.6	2.4
<i>Vespa velutina nigrithorax</i>	3.3, 3.6, 3.9, 3.10, 4.2, 4.4, 4.5, 4.6, 4.7, 4.10, 6.1	6.1	4.10, 5.2	3.4, 3.6, 6.1 2.2, 4.9, 5.1 3.1, 3.8, 3.9, 3.10, 4.5, 4.10 2.3	
<i>Wasmannia auropunctata</i>		non-p			
<i>Xenopus laevis</i>		2.4			



Annex II

Group of pathways were classified by Member States

II/A

SLOVAKIA

Group of pathways	Included pathways (EU code)	
	Priority	Non-priority
1. Pathways of natural terrestrial spread	3.4 3.6 6.1	5.2
2. Pathways associated with aquatic environments	2.2 4.9 5.1	4.1 4.4 4.8
3. Pathways associated with commercial movement of goods and services	3.1 3.8 3.9 3.10 4.5 4.10	3.3 4.2
4. Pathways associated with non-commercial human activities	2.4 2.9 4.6	
5. Pathways associated with botanical and zoological gardens	2.3	



II/B

AUSTRIA

Priority pathway	Code (EU) compliance
1. Pets, aquariums and terrariums	2.4
2. Botanical garden	2.3
3. Zoos	2.3
4. Ornamental species	2.9
5. Vehicles (cars, lorries)	4.10, 5.2
6. Vehicles (train)	4.10, 5.2
7. Vehicles (ships)	4.4, 4.9
8. Contamination of soil	3.10 (3.1, 3.7)
9. Contamination of devices	4.5
10. Contamination of seed and feed	3.8
11. Fishing	2.2, 2.11, 3.2, 3.8, 4.1
12. Waterways	5.1



In the context of the worsening global biodiversity crisis, the harmful effects caused by the establishment and spread of invasive alien species (IAS), as well as the expected future increase in such impacts are significant.

The EU Regulation on IAS (1143/2014) provides a comprehensive framework for combating invasive species at the EU, regional and national level, as well. Under Article 13 of the IAS Regulation, national action plans targeting the primary pathways of the species of Union concern are fundamental for member states' implementation efforts by defining specific measures for the species affected by unintentional introduction and spontaneous spread pathways.

This study aims to analyse the action plans developed for priority pathways, highlight opportunities for improving these plans, and identify potential collaboration opportunities, focusing on the Central and Eastern European region (CEE region).

