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Supplementary information

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Using species ranges and macroeconomic data to fill the gap in costs of biological invasions

In the format provided by the authors and unedited

Table-of-Contents

Supplementary Material

Supplementary Figures:

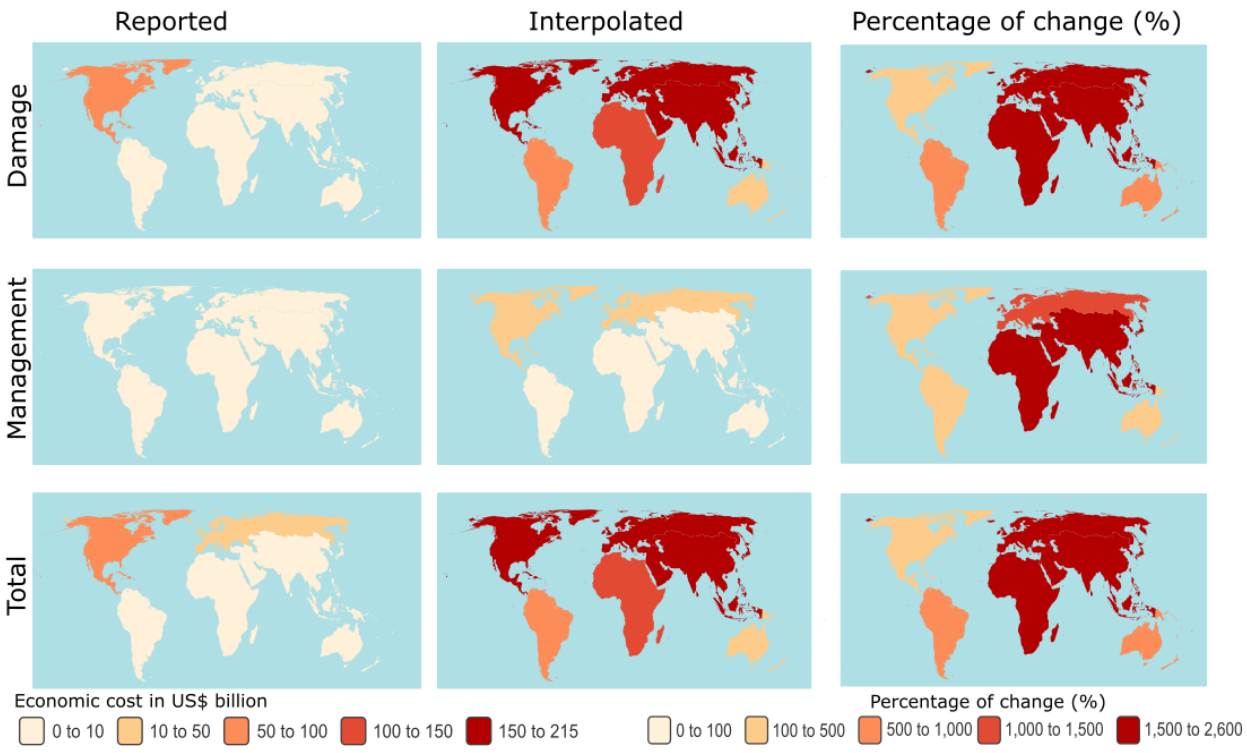

Figure S1: Global distribution of costs associated with invasive species in US$ billions at continental level quantified in *InvaCost* split into a) damage costs and d) management expenditures and g) total costs (i.e., damage + management); b) the monetary cost taking into account the interpolated costs, split into b) damage costs, and e) management expenditures and h) the total costs (i.e., damage + management); and the percentage discrepancy between reported and interpolated costs, split into c) damage costs, f) management expenditures and i) total costs (i.e., damage + management).

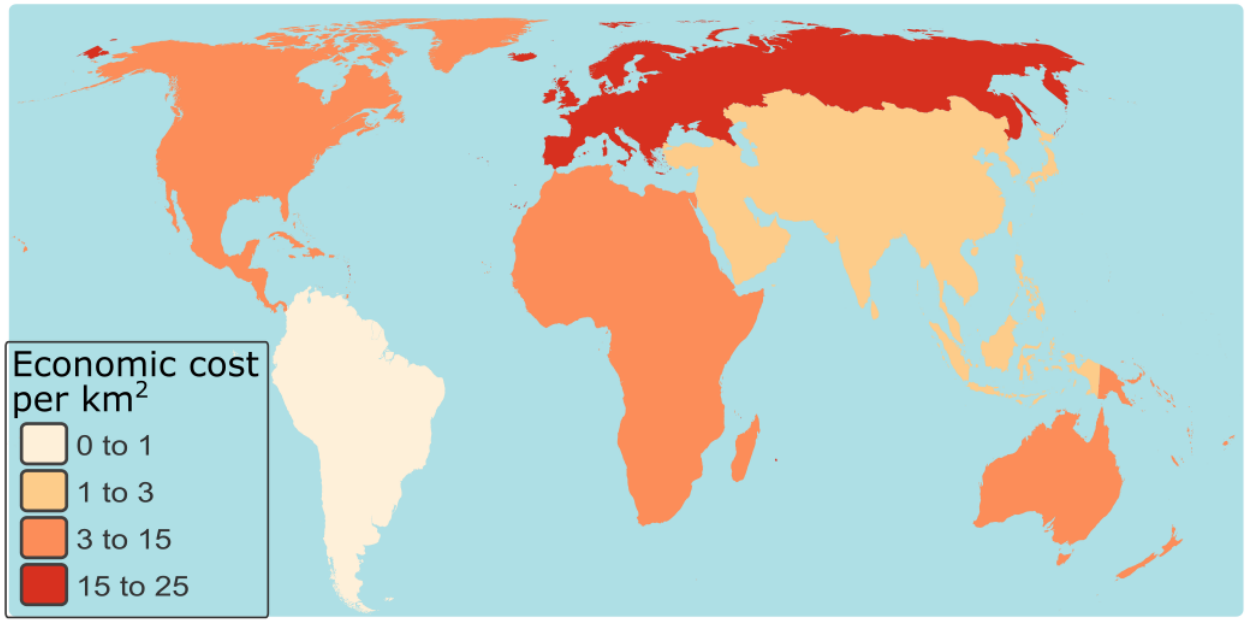

Figure S2: Economic cost of invasive species per km2 at continental scale.

Supplementary Material 1

To extract only 'highly reliable' (e.g., peer-reviewed articles with replicable methodologies) and 'observed' (i.e., costs already incurred, not just predicted) cost estimates from the *InvaCost* database, we excluded cost estimates with low reliability based on the 'Method reliability' and 'Implementation' columns, respectively. We also selected only the cost entries applying to country-level to ensure the comparability among cost scales (from the 'Spatial_scale' column). We removed marine species and microorganisms (e.g., viruses) due to poor representation in the database. We also excluded the oak processionary moth (*Thaumetopoea processionea*) because its cost entry was classified as geographically "Diverse/Unspecified", thus making it impossible to attribute to any country.

Supplementary Material 2

Model validation of the species distribution models

To evaluate the performance of the models, we applied 5-fold cross-validation in the *trainControl* and *createFolds* functions of the `caret` R package[1]. Cross-validation is a powerful statistical method to assess the performance of species distribution models by providing a robust estimate of the model's prediction error[2,3]. This process involves dividing the dataset into '*k*' subsets, or 'folds'; in our case, we split the original dataset into 5 equal-sized folds[4]. We trained and tested the model five times, where one of the five subsets becomes a validation test set, and the remaining four sets are combined to form the training set. This process is repeated five times, with each of the five subsets serving as the test set exactly once[5]. This leads to a better estimate of the model's performance and its ability to generalize to unknown data[3]. In

addition, to characterize the trade-off between true positive and false positive rates (i.e., model performance) we used the area under the receiver operating characteristic curve (AUC) and the true skill statistic (TSS) and Boyce index. While AUC has been criticized for equally weighing omission and commission errors and for focusing on discrimination over calibration, it remains valuable in our study for its prevalence-independence and its utility in dealing with pseudo-absences. Given these specific advantages[6,7], AUC offers a robust measure for relative model performance in our analysis. An AUC = 1 indicates a perfect model that has no false positives or false negatives, while an AUC = 0.5 indicates that the model's ability to discriminate between positive and negative classes is no better than random[8]. Similarly, TSS provides a measure that considers both sensitivity and specificity, ranging from −1 to +1, where +1 indicates perfect fit and ≤ 0 indicates no better than random[8]. Lastly, the Boyce index compares predicted species distributions with actual presence data, quantifying how well the model predictions match with known species locations ranging from -1 to +1, where a score of 1 indicates perfect model performance and negative values suggest performance worse than random.

Table S1: Total economic cost reported and interpolated (in $US million) of invasive species worldwide. Type of cost refers to the type of economic impact (damage costs or management expenditures). Type refers to the origin of the cost data (reported costs in *InvaCost* or interpolated based on our model average combining ratio-scalar and mixed model weighted by R-square. Range of Estimation [min-max costs] indicates the estimated range of economic costs, showing minimum and maximum values and range of estimation [80% costs] representing the central 80% of estimated values.

Species	Type of cost	Type	Economic cost	Range of estimation [min-max costs]	Range of estimation [80% costs]
Acacia mearnsii	Damage	Interpolated	27160.95052	7675.20018-7675200.19244	7675200.19244-7675200.19244
Acacia mearnsii	Damage	Invacost	2144.310778		
Adelges piceae	Damage	Interpolated	6026.277176	970.8801-970880.10234	970880.10234-970880.10234
Adelges piceae	Damage	Invacost	1092.204356		
Adelges tsugae	Management	Interpolated	18.78227147	0.21347-213.47371	213.47371-213.47371
Adelges tsugae	Management	Invacost	4.9129727		
Aedes aegypti	Damage	Interpolated	3234.89177	455.58169-455581.69419	455581.69419-455581.69419
Aedes aegypti	Damage	Invacost	3989.394189		
Aedes aegypti	Management	Interpolated	2204.138311	375.41248-375412.47085	375412.47085-375412.47085

Aedes aegypti	Management	Invacost	2119.121		
Aedes albopictus	Management	Interpolated	94.05924411	3.69911-3699.14414	3699.14414-3699.14414
Aedes albopictus	Management	Invacost	3.52961082		
Aedes camptorhynchus	Management	Invacost	3.63687859		
Ageratina adenophora	Management	Interpolated	179.1199633	3.88608-3886.06144	3886.06144-3886.06144
Ageratina adenophora	Management	Invacost	0.00334889		
Agrilus planipennis	Management	Interpolated	57.20731528	1.55477-1554.77258	1554.77258-1554.77258
Agrilus planipennis	Management	Invacost	332.1271298		
Ailanthus altissima	Management	Interpolated	317.9301036	6.05553-6055.55786	6055.55786-6055.55786
Ailanthus altissima	Management	Invacost	0.00415525		

Alopochen aegyptiaca	Damage	Interpolated	5559.723356	0.91019-910.17871	910.17871-910.17871
Alopochen aegyptiaca	Damage	Invacost	0.07968154		
Alternanthera philoxeroides	Management	Interpolated	89.24099185	6.06678-6066.8054	6066.8054-6066.8054
Alternanthera philoxeroides	Management	Invacost	7.51040374		
Ambrosia artemisiifolia	Damage	Interpolated	9294.206307	2140.93106-2140931.03743	2140931.03743-2140931.03743
Ambrosia artemisiifolia	Damage	Invacost	6810.264007		
Ambrosia artemisiifolia	Management	Interpolated	283.8159388	6.4195-6419.52309	6419.52309-6419.52309
Ambrosia artemisiifolia	Management	Invacost	0.04192474		
Anolis carolinensis	Management	Interpolated	38.15878735	3.45349-3453.48975	3453.48975-3453.48975
Anolis carolinensis	Management	Invacost	0.03566239		

Anoplophora chinensis	Management	Interpolated	36.50963265	5.34633-5346.32688	5346.32688-5346.32688
Anoplophora chinensis	Management	Invacost	1.65480695		
Anoplophora glabripennis	Damage	Interpolated	9422.05677	1546.06699-1546066.99381	1546066.99381-1546066.99381
Anoplophora glabripennis	Damage	Invacost	317.5880455		
Anoplophora glabripennis	Management	Interpolated	224.3501779	22.34525-22345.2436	22345.2436-22345.2436
Anoplophora glabripennis	Management	Invacost	163.007014		
Apis mellifera	Damage	Interpolated	3867.443472	110.75555-110755.53544	110755.53544-110755.53544
Apis mellifera	Damage	Invacost	48.89902843		
Arctotheca calendula	Management	Interpolated	114.3726656	0.01316-13.16465	13.16465-13.16465
Arctotheca calendula	Management	Invacost	0.00217411		

Arion lusitanicus	Damage	Interpolated	4781.465018	635.33163-635331.61727	635331.61727-635331.61727
Arion lusitanicus	Damage	Invacost	43.2909782		
Artemisia vulgaris	Damage	Interpolated	3646.150199	202.13994-202139.95854	202139.95854-202139.95854
Artemisia vulgaris	Damage	Invacost	11.04147158		
Azolla filiculoides	Management	Interpolated	165.6795133	8.5279-8527.88761	8527.88761-8527.88761
Azolla filiculoides	Management	Invacost	6.23093149		
Bactrocera tryoni	Damage	Interpolated	294.521439	40.92513-40925.13072	40925.13072-40925.13072
Bactrocera tryoni	Damage	Invacost	116.541947		
Bactrocera tryoni	Management	Interpolated	15.84731907	9.56134-9561.34228	9561.34228-9561.34228
Bactrocera tryoni	Management	Invacost	8.39784788		
Bemisia tabaci	Management	Interpolated	268.6437364	6.79513-6795.14539	6795.14539-6795.14539

Bemisia tabaci	Management	Invacost	0.07495769		
Boiga irregularis	Management	Interpolated	7.40666669	0.08745-87.44628	87.44628-87.44628
Boiga irregularis	Management	Invacost	1.3627228		
Branta canadensis	Damage	Interpolated	6954.474618	114.61422-114614.22751	114614.22751-114614.22751
Branta canadensis	Damage	Invacost	2.2998964		
Branta canadensis	Management	Interpolated	208.0672939	22.95272-22952.73234	22952.73234-22952.73234
Branta canadensis	Management	Invacost	3.67121006		
Buddleja davidii	Management	Interpolated	265.8334865	7.17745-7177.45495	7177.45495-7177.45495
Buddleja davidii	Management	Invacost	0.60567407		
Cabomba caroliniana	Management	Interpolated	136.0704635	7.96416-7964.14626	7964.14626-7964.14626
Cabomba caroliniana	Management	Invacost	0.56180812		

Cactoblastis cactorum	Damage	Interpolated	2632.23631	191.32114-191321.15022	191321.15022-191321.15022
Cactoblastis cactorum	Damage	Invacost	26.12278336		
Cactoblastis cactorum	Management	Interpolated	112.4507572	7.79079-7790.79754	7790.79754-7790.79754
Cactoblastis cactorum	Management	Invacost	0.90362903		
Callosciurus erythraeus	Damage	Interpolated	1156.77555	4.78378-4783.77119	4783.77119-4783.77119
Callosciurus erythraeus	Damage	Invacost	0.99136305		
Camelus dromedarius	Damage	Interpolated	240.4538141	4.53958-4539.58963	4539.58963-4539.58963
Camelus dromedarius	Damage	Invacost	10.79121952		
Camelus dromedarius	Management	Interpolated	8.832999357	1.36559-1365.59123	1365.59123-1365.59123
Camelus dromedarius	Management	Invacost	8.60796312		

Cameraria ohridella	Management	Interpolated	349.4403684	78.56919-78569.18634	78569.18634-78569.18634
Cameraria ohridella	Management	Invacost	28.8741573		
Canis lupus	Damage	Interpolated	4640.905131	894.8557-894855.69373	894855.69373-894855.69373
Canis lupus	Damage	Invacost	1408.517388		
Canis lupus	Management	Interpolated	71.33468854	9.36279-9362.78968	9362.78968-9362.78968
Canis lupus	Management	Invacost	1691.069771		
Capra hircus	Damage	Interpolated	9974.243691	1240.48511-1240485.09524	1240485.09524-1240485.09524
Capra hircus	Damage	Invacost	56.41130413		
Capra hircus	Management	Interpolated	371.2362756	63.88817-63888.17589	63888.17589-63888.17589
Capra hircus	Management	Invacost	8.57574174		
Carduus platypus	Damage	Interpolated	467.4226702	4.16677-4166.768	4166.768-4166.768

Carduus platypus	Damage	Invacost	11.02289116		
Carduus platypus	Management	Interpolated	9.932261402	0.04353-43.53331	43.53331-43.53331
Carduus platypus	Management	Invacost	0.05431669		
Castor canadensis	Damage	Interpolated	2523.791583	49.21461-49214.61336	49214.61336-49214.61336
Castor canadensis	Damage	Invacost	0.21135007		
Cenchrus clandestinus	Damage	Interpolated	34245.304	12362.44038-12362440.36504	12362440.36504-12362440.36504
Cenchrus clandestinus	Damage	Invacost	1192.906325		
Cenchrus setaceus	Management	Interpolated	134.2234551	10.36657-10366.5757	10366.5757-10366.5757
Cenchrus setaceus	Management	Invacost	0.8986961		
Ceratitis capitata	Damage	Interpolated	9026.930083	1626.51484-1626514.87206	1626514.87206-1626514.87206
Ceratitis capitata	Damage	Invacost	116.7957082		

Ceratitis capitata	Management	Interpolated	558.1724912	130.20262-130202.62446	130202.62446-130202.62446
Ceratitis capitata	Management	Invacost	12.9773018		
Cereus jamacaru	Management	Interpolated	168.3472155	26.59336-26593.3469	26593.3469-26593.3469
Cereus jamacaru	Management	Invacost	37.76453863		
Ceutorhynchus obstrictus	Damage	Interpolated	13304.78562	2137.88511-2137885.12535	2137885.12535-2137885.12535
Ceutorhynchus obstrictus	Damage	Invacost	260.5058083		
Chelydra serpentina	Management	Interpolated	71.55809376	7.25029-7250.27765	7250.27765-7250.27765
Chelydra serpentina	Management	Invacost	0.01831801		
Chlorocebus pygerythrus	Management	Interpolated	104.2292318	0.09673-96.73571	96.73571-96.73571
Chlorocebus pygerythrus	Management	Invacost	0.04514824		

Chondrilla juncea	Damage	Interpolated	2608.550536	927.68355-927683.55472	927683.55472-927683.55472
Chondrilla juncea	Damage	Invacost	423.8185047		
Chondrilla juncea	Management	Interpolated	102.7539168	17.51591-17515.90457	17515.90457-17515.90457
Chondrilla juncea	Management	Invacost	12.17310578		
Chromolaena odorata	Management	Interpolated	911.9301095	176.36436-176364.3441	176364.3441-176364.3441
Chromolaena odorata	Management	Invacost	57.68553942		
Cirsium arvense	Damage	Interpolated	7127.662691	1794.88896-1794888.95655	1794888.95655-1794888.95655
Cirsium arvense	Damage	Invacost	487.0024921		
Clematis vitalba	Management	Interpolated	101.2899724	2.05223-2052.24234	2052.24234-2052.24234
Clematis vitalba	Management	Invacost	0.2886768		
Columba livia	Damage	Interpolated	21212.62991	4468.5045-4468504.48472	4468504.48472-4468504.48472

Columba livia	Damage	Invacost	373.77045		
Columba livia	Management	Invacost	2946.465304		
Coptotermes formosanus	Damage	Interpolated	2850.983635	907.23139-907231.38583	907231.38583-907231.38583
Coptotermes formosanus	Damage	Invacost	2678.604822		
Corbicula fluminea	Damage	Interpolated	6503.955987	9.04215-9042.12119	9042.12119-9042.12119
Corbicula fluminea	Damage	Invacost	0.29776223		
Coreopsis lanceolata	Management	Interpolated	133.8704951	3.92824-3928.22621	3928.22621-3928.22621
Coreopsis lanceolata	Management	Invacost	0.00854488		
Cortaderia selloana	Management	Interpolated	174.6300618	9.24918-9249.17138	9249.17138-9249.17138
Cortaderia selloana	Management	Invacost	0.00124691		
Crassula helmsii	Management	Interpolated	148.9563792	26.99915-26999.144	26999.144-26999.144

Crassula helmsii	Management	Invacost	5.44656883		
Cryptostegia grandiflora	Damage	Interpolated	6883.471081	506.58921-506589.21792	506589.21792-506589.21792
Cryptostegia grandiflora	Damage	Invacost	24.31863125		
Cryptostegia grandiflora	Management	Interpolated	208.2878901	14.34989-14349.8715	14349.8715-14349.8715
Cryptostegia grandiflora	Management	Invacost	1.48942835		
Cryptotermes brevis	Management	Interpolated	721.9543945	108.51451-108514.54052	108514.54052-108514.54052
Cryptotermes brevis	Management	Invacost	124.2494996		
Cydia pomonella	Damage	Interpolated	1640.192871	112.7901-112790.0938	112790.0938-112790.0938
Cydia pomonella	Damage	Invacost	396.4908265		
Cygnus olor	Damage	Interpolated	5311.217086	0.30345-303.4571	303.4571-303.4571

Cygnus olor	Damage	Invacost	0.04397352		
Cygnus olor	Management	Interpolated	159.0978835	2.54219-2542.19014	2542.19014-2542.19014
Cygnus olor	Management	Invacost	0.12113198		
Cytisus scoparius	Management	Interpolated	174.0723389	18.24027-18240.28225	18240.28225-18240.28225
Cytisus scoparius	Management	Invacost	2.57608852		
Dendroctonus micans	Damage	Interpolated	310.8385885	0.12668-126.67826	126.67826-126.67826
Dendroctonus micans	Damage	Invacost	0.42375676		
Dendroctonus micans	Management	Interpolated	7.11576779	0.03173-31.73369	31.73369-31.73369
Dendroctonus micans	Management	Invacost	0.10997238		
Dreissena polymorpha	Management	Interpolated	242.7398752	38.15158-38151.5815	38151.5815-38151.5815
Dreissena polymorpha	Management	Invacost	7.47274565		

Drosophila suzukii	Damage	Interpolated	3500.576482	97.55827-97558.27181	97558.27181-97558.27181
Drosophila suzukii	Damage	Invacost	28.99703221		
Echium plantagineum	Management	Interpolated	182.093665	12.09913-12099.14186	12099.14186-12099.14186
Echium plantagineum	Management	Invacost	1.60972677		
Elaeis guineensis	Damage	Interpolated	24314.26134	8519.74058-8519740.53546	8519740.53546-8519740.53546
Elaeis guineensis	Damage	Invacost	1355.764213		
Elatobium abietinum	Damage	Interpolated	1157.682005	7.99498-7994.9868	7994.9868-7994.9868
Elatobium abietinum	Damage	Invacost	6.19972403		
Elodea nuttallii	Management	Interpolated	245.9415095	57.07506-57075.04697	57075.04697-57075.04697
Elodea nuttallii	Management	Invacost	14.72542991		
Ephestia kuehniella	Damage	Interpolated	3994.915487	11.74853-11748.53752	11748.53752-11748.53752

Ephestia kuehniella	Damage	Invacost	1.1730136		
Ephestia kuehniella	Management	Interpolated	187.1997659	19.22649-19226.49301	19226.49301-19226.49301
Ephestia kuehniella	Management	Invacost	5.15937092		
Equus caballus	Management	Interpolated	150.3886215	13.54532-13545.30012	13545.30012-13545.30012
Equus caballus	Management	Invacost	0.47719449		
Euphorbia esula	Damage	Invacost	5689.680631		
Fallopia baldschuanica	Management	Interpolated	149.5762173	10.55111-10551.106	10551.106-10551.106
Fallopia baldschuanica	Management	Invacost	0.00087024		
Felis catus	Damage	Interpolated	7113.268732	337.31704-337317.04327	337317.04327-337317.04327
Felis catus	Damage	Invacost	41272.55106		
Felis catus	Management	Interpolated	169.3860383	4.42155-4421.56303	4421.56303-4421.56303

Felis catus	Management	Invacost	0.72473378		
Frankliniella occidentalis	Damage	Interpolated	43525.18951	4199.47521-4199475.22986	4199475.22986-4199475.22986
Frankliniella occidentalis	Damage	Invacost	96.5026875		
Haematobia irritans	Damage	Interpolated	14865.94908	1751.62925-1751629.2548	1751629.2548-1751629.2548
Haematobia irritans	Damage	Invacost	2214.299363		
Hakea sericea	Management	Interpolated	39.58239768	0.79146-791.4506	791.4506-791.4506
Hakea sericea	Management	Invacost	0.00029075		
Heliotropium europaeum	Management	Interpolated	86.66975852	0.06341-63.42006	63.42006-63.42006
Heliotropium europaeum	Management	Invacost	0.01803827		
Hemitragus jemlahicus	Management	Interpolated	13.10755159	0.54589-545.88818	545.88818-545.88818

Hemitragus jemlahicus	Management	Invacost	0.33723567		
Heracleum mantegazzianum	Damage	Interpolated	5296.848906	79.62267-79622.66315	79622.66315-79622.66315
Heracleum mantegazzianum	Damage	Invacost	1.35298262		
Heracleum mantegazzianum	Management	Interpolated	226.3237163	25.08093-25080.94154	25080.94154-25080.94154
Heracleum mantegazzianum	Management	Invacost	13.61720919		
Herpestes edwardsi	Damage	Interpolated	370.8018625	3.78474-3784.74381	3784.74381-3784.74381
Herpestes edwardsi	Damage	Invacost	62.75730845		
Herpestes javanicus	Damage	Interpolated	5178.765284	4.04597-4045.98629	4045.98629-4045.98629
Herpestes javanicus	Damage	Invacost	0.24444494		
Homarus americanus	Management	Interpolated	45.87802056	7.77042-7770.42467	7770.42467-7770.42467

Homarus americanus	Management	Invacost	0.17350372		
Hyblaea puera	Management	Interpolated	49.01421839	0.01352-13.51947	13.51947-13.51947
Hyblaea puera	Management	Invacost	0.013001		
Hydrocotyle ranunculoides	Management	Interpolated	271.1115895	64.76386-64763.86355	64763.86355-64763.86355
Hydrocotyle ranunculoides	Management	Invacost	24.2467835		
Hypera postica	Management	Interpolated	119.8800477	43.6628-43662.7968	43662.7968-43662.7968
Hypera postica	Management	Invacost	118.2197012		
Impatiens glandulifera	Management	Interpolated	205.3589632	14.21539-14215.3691	14215.3691-14215.3691
Impatiens glandulifera	Management	Invacost	1.736947		
Lagarosiphon major	Management	Interpolated	160.279734	30.85036-30850.37249	30850.37249-30850.37249

Lagarosiphon major	Management	Invacost	7.2990416		
Lantana camara	Damage	Interpolated	20860.53642	5050.11258-5050112.53782	5050112.53782-5050112.53782
Lantana camara	Damage	Invacost	187.0933399		
Lantana camara	Management	Interpolated	2473.175771	517.46276-517462.78304	517462.78304-517462.78304
Lantana camara	Management	Invacost	156.6398742		
Leptinotarsa decemlineata	Damage	Interpolated	5629.719695	64.10571-64105.70485	64105.70485-64105.70485
Leptinotarsa decemlineata	Damage	Invacost	1.300001		
Leptinotarsa decemlineata	Management	Interpolated	114.4063687	7.56733-7567.33563	7567.33563-7567.33563
Leptinotarsa decemlineata	Management	Invacost	5.37767246		
Linepithema humile	Management	Interpolated	176.6158844	7.6105-7610.52676	7610.52676-7610.52676

Linepithema humile	Management	Invacost	0.68171824		
Lissachatina fulica	Management	Interpolated	219.9739567	9.99887-9998.85632	9998.85632-9998.85632
Lissachatina fulica	Management	Invacost	0.41406601		
Lithobates catesbeianus	Management	Interpolated	147.8191917	7.10659-7106.60586	7106.60586-7106.60586
Lithobates catesbeianus	Management	Invacost	0.05037243		
Lonicera japonica	Management	Interpolated	249.8096315	9.15141-9151.4565	9151.4565-9151.4565
Lonicera japonica	Management	Invacost	0.00002997		
Ludwigia grandiflora	Management	Interpolated	36.27463532	0.05541-55.40864	55.40864-55.40864
Ludwigia grandiflora	Management	Invacost	0.03742981		
Marrubium vulgare	Damage	Interpolated	3920.269638	176.26967-176269.65562	176269.65562-176269.65562

Marrubium vulgare	Damage	Invacost	1.9811152		
Marrubium vulgare	Management	Interpolated	119.0323397	0.0517-51.69035	51.69035-51.69035
Marrubium vulgare	Management	Invacost	0.01021004		
Melia azedarach	Management	Interpolated	2359.8687	551.92035-551920.35305	551920.35305-551920.35305
Melia azedarach	Management	Invacost	70.97475097		
Mimosa diplotricha	Damage	Interpolated	3524.151404	65.4005-65400.50189	65400.50189-65400.50189
Mimosa diplotricha	Damage	Invacost	5.34418409		
Mimosa diplotricha	Management	Interpolated	124.6008001	0.46133-461.32686	461.32686-461.32686
Mimosa diplotricha	Management	Invacost	0.01802562		
Mimosa pigra	Management	Interpolated	371.5957788	29.49018-29490.17986	29490.17986-29490.17986

Mimosa pigra	Management	Invacost	5.34501281		
Muntiacus reevesi	Damage	Interpolated	1133.224145	1.34663-1346.62424	1346.62424-1346.62424
Muntiacus reevesi	Damage	Invacost	0.29947445		
Mus musculus	Damage	Interpolated	13023.10188	918.88773-918887.73333	918887.73333-918887.73333
Mus musculus	Damage	Invacost	22.05588408		
Mustela erminea	Management	Interpolated	26.31334217	3.66784-3667.84201	3667.84201-3667.84201
Mustela erminea	Management	Invacost	1.54750004		
Mustela vison	Damage	Interpolated	8060.780822	546.77727-546777.29302	546777.29302-546777.29302
Mustela vison	Damage	Invacost	18.0382915		
Mustela vison	Management	Interpolated	217.9507056	24.75365-24753.66338	24753.66338-24753.66338

Mustela vison	Management	Invacost	16.04501176		
Myiopsitta monachus	Management	Interpolated	35.49343712	0.25996-259.95174	259.95174-259.95174
Myiopsitta monachus	Management	Invacost	0.64127481		
Myocastor coypus	Damage	Interpolated	5215.293361	161.50948-161509.493	161509.493-161509.493
Myocastor coypus	Damage	Invacost	21.97110912		
Myocastor coypus	Management	Interpolated	288.7405164	12.91559-12915.57456	12915.57456-12915.57456
Myocastor coypus	Management	Invacost	0.66465021		
Myriophyllum aquaticum	Management	Interpolated	299.3795325	42.69117-42691.17029	42691.17029-42691.17029
Myriophyllum aquaticum	Management	Invacost	7.22488388		
Nassella neesiana	Management	Interpolated	122.9730192	14.34161-14341.59617	14341.59617-14341.59617

Nassella neesiana	Management	Invacost	1.79530611		
Nassella trichotoma	Management	Interpolated	103.4356177	10.77839-10778.39757	10778.39757-10778.39757
Nassella trichotoma	Management	Invacost	2.63048666		
Nyctereutes procyonoides	Management	Interpolated	196.1687508	9.81785-9817.87469	9817.87469-9817.87469
Nyctereutes procyonoides	Management	Invacost	1.77216551		
Nymphoides peltata	Management	Interpolated	353.0690193	39.82103-39821.029	39821.029-39821.029
Nymphoides peltata	Management	Invacost	8.32230345		
Ondatra zibethicus	Damage	Interpolated	9768.724879	1688.88658-1688886.5906	1688886.5906-1688886.5906
Ondatra zibethicus	Damage	Invacost	183.2207071		
Ondatra zibethicus	Management	Interpolated	702.9124644	133.46743-133467.42058	133467.42058-133467.42058

Ondatra zibethicus	Management	Invacost	83.5411048		
Opuntia aurantiaca	Management	Interpolated	69.61686113	0.75651-756.5209	756.5209-756.5209
Opuntia aurantiaca	Management	Invacost	0.4153015		
Oryctolagus cuniculus	Damage	Interpolated	52573.98554	10774.53855-10774538.55952	10774538.55952-10774538.55952
Oryctolagus cuniculus	Damage	Invacost	3258.137421		
Oryctolagus cuniculus	Management	Interpolated	590.0043499	94.38418-94384.17981	94384.17981-94384.17981
Oryctolagus cuniculus	Management	Invacost	34.92233515		
Oxyura jamaicensis	Management	Interpolated	134.3441809	18.96859-18968.60803	18968.60803-18968.60803
Oxyura jamaicensis	Management	Invacost	3.22416223		
Pacifastacus leniusculus	Damage	Interpolated	4102.879476	2.87791-2877.92594	2877.92594-2877.92594

Pacifastacus leniusculus	Damage	Invacost	0.3473902		
Pacifastacus leniusculus	Management	Interpolated	76.10200961	5.59114-5591.15241	5591.15241-5591.15241
Pacifastacus leniusculus	Management	Invacost	4.29185999		
Paguma larvata	Damage	Invacost	56.65212233		
Panicum repens	Management	Interpolated	106.515387	3.30384-3303.8606	3303.8606-3303.8606
Panicum repens	Management	Invacost	0.00014587		
Parkinsonia aculeata	Management	Interpolated	318.220089	20.65899-20658.97375	20658.97375-20658.97375
Parkinsonia aculeata	Management	Invacost	1.89671574		
Parthenium hysterophorus	Damage	Interpolated	4112.807171	513.25536-513255.39587	513255.39587-513255.39587
Parthenium hysterophorus	Damage	Invacost	252.5477593		

Parthenium hysterophorus	Management	Interpolated	413.4695319	83.89047-83890.48184	83890.48184-83890.48184
Parthenium hysterophorus	Management	Invacost	11.22484225		
Passer domesticus	Damage	Interpolated	11448.19994	118.28301-118283.03992	118283.03992-118283.03992
Passer domesticus	Damage	Invacost	0.20152626		
Petromyzon marinus	Damage	Interpolated	1214.825623	251.21785-251217.8503	251217.8503-251217.8503
Petromyzon marinus	Damage	Invacost	349.7927407		
Petromyzon marinus	Management	Interpolated	8.726506597	0.33653-336.53138	336.53138-336.53138
Petromyzon marinus	Management	Invacost	20.68371426		
Phascolarctos cinereus	Management	Invacost	0.38198722		
Phasianus colchicus	Damage	Interpolated	11079.65633	248.54327-248543.2691	248543.2691-248543.2691

Phasianus colchicus	Damage	Invacost	4.67680946		
Phelipanche aegyptiaca	Management	Interpolated	80.27132612	7.32358-7323.57593	7323.57593-7323.57593
Phelipanche aegyptiaca	Management	Invacost	2.76187918		
Phoxinus phoxinus	Management	Interpolated	29.23638231	1.44152-1441.50747	1441.50747-1441.50747
Phoxinus phoxinus	Management	Invacost	0.40336648		
Phragmites australis	Management	Interpolated	5.313028978	0.02503-25.0334	25.0334-25.0334
Phragmites australis	Management	Invacost	0.96803345		
Pistia stratiotes	Management	Interpolated	89.53834361	7.37547-7375.49093	7375.49093-7375.49093
Pistia stratiotes	Management	Invacost	0.03163041		
Pomacea canaliculata	Damage	Interpolated	4763.00584	854.38372-854383.70072	854383.70072-854383.70072

Pomacea canaliculata	Damage	Invacost	138.570755		
Pontederia crassipes	Damage	Interpolated	20899.02311	2262.45933-2262459.31957	2262459.31957-2262459.31957
Pontederia crassipes	Damage	Invacost	1513.514052		
Pontederia crassipes	Management	Interpolated	280.6310736	29.55006-29550.06606	29550.06606-29550.06606
Pontederia crassipes	Management	Invacost	0.97841418		
Procambarus clarkii	Damage	Interpolated	6793.94634	50.83231-50832.27114	50832.27114-50832.27114
Procambarus clarkii	Damage	Invacost	1.21526847		
Procambarus clarkii	Management	Interpolated	196.8346717	19.36585-19365.83225	19365.83225-19365.83225
Procambarus clarkii	Management	Invacost	1.02791121		
Procyon lotor	Damage	Interpolated	5812.820155	713.17617-713176.17504	713176.17504-713176.17504

Procyon lotor	Damage	Invacost	45.47311667		
Procyon lotor	Management	Interpolated	136.4293291	11.28967-11289.67658	11289.67658-11289.67658
Procyon lotor	Management	Invacost	0.07371308		
Prunus serotina	Damage	Interpolated	5770.304984	71.81189-71811.91035	71811.91035-71811.91035
Prunus serotina	Damage	Invacost	1.8039765		
Prunus serotina	Management	Interpolated	190.3385496	25.77732-25777.3144	25777.3144-25777.3144
Prunus serotina	Management	Invacost	4.38108435		
Pseudorasbora parva	Management	Interpolated	184.3352058	9.2604-9260.3836	9260.3836-9260.3836
Pseudorasbora parva	Management	Invacost	0.45288295		
Psittacula krameri	Damage	Interpolated	4918.1393	256.46646-256466.49336	256466.49336-256466.49336

Psittacula krameri	Damage	Invacost	56.36414103		
Psittacula krameri	Management	Interpolated	299.6198678	10.87175-10871.74917	10871.74917-10871.74917
Psittacula krameri	Management	Invacost	0.14503599		
Pteridium aquilinum	Damage	Interpolated	7481.658264	3100.99361-3100993.61814	3100993.61814-3100993.61814
Pteridium aquilinum	Damage	Invacost	683.6240169		
Rattus exulans	Management	Interpolated	121.6738327	4.88035-4880.34931	4880.34931-4880.34931
Rattus exulans	Management	Invacost	0.14752365		
Rattus norvegicus	Management	Interpolated	922.4354711	171.80434-171804.33694	171804.33694-171804.33694
Rattus norvegicus	Management	Invacost	55.59453209		
Rattus rattus	Damage	Interpolated	12077.13969	262.8801-262880.0842	262880.0842-262880.0842

Rattus rattus	Damage	Invacost	23850.61079		
Reynoutria japonica	Damage	Interpolated	6986.554013	98.77105-98771.06831	98771.06831-98771.06831
Reynoutria japonica	Damage	Invacost	1.93843273		
Reynoutria japonica	Management	Interpolated	4947.486673	1150.3801-1150380.11212	1150380.11212-1150380.11212
Reynoutria japonica	Management	Invacost	517.6445253		
Rhinella marina	Management	Interpolated	104.7466531	16.84554-16845.54608	16845.54608-16845.54608
Rhinella marina	Management	Invacost	1.5517708		
Rhododendron ponticum	Management	Interpolated	128.7027296	40.09512-40095.11676	40095.11676-40095.11676
Rhododendron ponticum	Management	Invacost	14.97500101		
Rhynchophorus ferrugineus	Management	Interpolated	129.7524884	6.91477-6914.78476	6914.78476-6914.78476

Rhynchophorus ferrugineus	Management	Invacost	0.53434923		
Rosa rugosa	Management	Interpolated	253.3177602	26.57246-26572.45623	26572.45623-26572.45623
Rosa rugosa	Management	Invacost	1.40793627		
Rumex lunaria	Management	Interpolated	8.148245214	0.01197-11.97364	11.97364-11.97364
Rumex lunaria	Management	Invacost	0.01246014		
Salvinia molesta	Damage	Interpolated	8550.218693	1.77937-1779.32618	1779.32618-1779.32618
Salvinia molesta	Damage	Invacost	0.04439956		
Salvinia molesta	Management	Interpolated	197.6116728	6.48606-6486.04055	6486.04055-6486.04055
Salvinia molesta	Management	Invacost	0.32741379		
Sciurus carolinensis	Damage	Interpolated	1759.027085	83.90653-83906.53939	83906.53939-83906.53939

Sciurus carolinensis	Damage	Invacost	27.36628518		
Sciurus carolinensis	Management	Interpolated	86.22915824	24.01215-24012.15313	24012.15313-24012.15313
Sciurus carolinensis	Management	Invacost	12.79019286		
Senecio inaequidens	Management	Interpolated	137.8891091	12.63206-12632.05228	12632.05228-12632.05228
Senecio inaequidens	Management	Invacost	0.00284052		
Senecio jacobaea	Management	Interpolated	50.73414872	0.01085-10.84661	10.84661-10.84661
Senecio jacobaea	Management	Invacost	0.00932643		
Senecio madagascariensis	Management	Interpolated	84.23384129	0.04325-43.2469	43.2469-43.2469
Senecio madagascariensis	Management	Invacost	0.01519491		
Senna obtusifolia	Management	Interpolated	294.5667881	2.10479-2104.83335	2104.83335-2104.83335

Senna obtusifolia	Management	Invacost	0.00844633		
Sirex noctilio	Management	Interpolated	104.7015485	1.58183-1581.81845	1581.81845-1581.81845
Sirex noctilio	Management	Invacost	0.70179308		
Solanum mauritianum	Management	Interpolated	237.6784364	15.51547-15515.50265	15515.50265-15515.50265
Solanum mauritianum	Management	Invacost	1.47056391		
Solenopsis invicta	Management	Interpolated	123.5962615	22.30591-22305.89824	22305.89824-22305.89824
Solenopsis invicta	Management	Invacost	21.22197258		
Spodoptera frugiperda	Damage	Interpolated	1891.3172	860.14835-860148.34674	860148.34674-860148.34674
Spodoptera frugiperda	Damage	Invacost	2909.141801		
Spodoptera frugiperda	Management	Interpolated	52.07721007	8.50844-8508.43377	8508.43377-8508.43377

Spodoptera frugiperda	Management	Invacost	4.000001		
Sporobolus pyramidalis	Management	Interpolated	4.732438314	0.06788-67.886	67.886-67.886
Sporobolus pyramidalis	Management	Invacost	0.45781182		
Stomoxys calcitrans	Damage	Interpolated	8782.037223	1008.79861-1008798.60657	1008798.60657-1008798.60657
Stomoxys calcitrans	Damage	Invacost	3188.591082		
Sturnus vulgaris	Damage	Interpolated	7273.930171	1288.65185-1288651.85615	1288651.85615-1288651.85615
Sturnus vulgaris	Damage	Invacost	2278.716082		
Sus scrofa	Damage	Interpolated	30020.11669	7344.80555-7344805.52121	7344805.52121-7344805.52121
Sus scrofa	Damage	Invacost	4811.390122		
Sus scrofa	Management	Interpolated	251.0769811	23.61599-23615.9869	23615.9869-23615.9869

Sus scrofa	Management	Invacost	6.22807099		
Tamarix aphylla	Management	Interpolated	80.62300563	1.60163-1601.61687	1601.61687-1601.61687
Tamarix aphylla	Management	Invacost	0.75229404		
Tinca tinca	Management	Interpolated	136.9697642	1.58813-1588.12591	1588.12591-1588.12591
Tinca tinca	Management	Invacost	0.12537061		
Trachemys scripta	Management	Interpolated	218.0315552	19.86804-19868.0599	19868.0599-19868.0599
Trachemys scripta	Management	Invacost	0.83042581		
Trichosurus vulpecula	Management	Interpolated	192.2848197	85.79208-85792.07951	85792.07951-85792.07951
Trichosurus vulpecula	Management	Invacost	151.6404417		
Tuta absoluta	Damage	Interpolated	2064.246318	491.25342-491253.41949	491253.41949-491253.41949

Tuta absoluta	Damage	Invacost	848.6637994		
Ulex europaeus	Damage	Interpolated	6892.549036	12.38379-12383.77605	12383.77605-12383.77605
Ulex europaeus	Damage	Invacost	0.3413954		
Ulex europaeus	Management	Interpolated	974.9438323	246.47759-246477.58915	246477.58915-246477.58915
Ulex europaeus	Management	Invacost	34.62152249		
Vulpes vulpes	Damage	Interpolated	1764.130579	600.92061-600920.59456	600920.59456-600920.59456
Vulpes vulpes	Damage	Invacost	238.7700004		
Vulpes vulpes	Management	Interpolated	38.57430696	11.37236-11372.36337	11372.36337-11372.36337
Vulpes vulpes	Management	Invacost	4.26873751		
Xanthium chinense	Damage	Interpolated	783.9169345	3.96196-3961.9532	3961.9532-3961.9532

Xanthium chinense	Damage	Invacost	1.53951995		
Xanthium chinense	Management	Interpolated	22.93931034	0.00897-8.97831	8.97831-8.97831
Xanthium chinense	Management	Invacost	0.00601402		
Xanthium strumarium	Management	Interpolated	265.0925632	11.47949-11479.4895	11479.4895-11479.4895
Xanthium strumarium	Management	Invacost	0.64093614		
Xenopus laevis	Management	Interpolated	111.6612484	4.28623-4286.2387	4286.2387-4286.2387
Xenopus laevis	Management	Invacost	0.00218626		

Table S2: Summary of the significant coefficients of the "best" models (ratio-scalar model based on AIC) and mixed model (based on the statistically significant effects) (See Table S3) for damage costs and management expenditures. Type of cost refers to the type of economic impact (damage costs or management expenditures). Model refers to ratio-scalar, mixed (GLMM) and ensemble models used. Ensemble model combines the ratio-scalar and mixed models, weighting by the fitted R2. R2 and R2 val refer to the coefficient of determination in the fitted dataset and the jackknifed validation dataset, respectively. GDP refers to Gross Domestic Product, while population size, agriculture and suitability refer to the predictors tested in each model. Time-dependent coefficient refers to the time since the invasion predictor. Standard errors generated using 1,000 bootstrapped estimates are shown between parentheses.

Type of cost	Model	R^2	R^2 val	GDP	Population size	Agriculture area	Suitability	time-dependent coefficient	Lag phase
Damage	Ratio-scalar	0.34	0.15		0.42 (±0.16)	0.38 (±0.31)	0.002 (±0.001)	266.62 (±57.70)	47.39 (±33.54)
Damage	Mixed	0.52	0.24	0.04 (±0.02)		6.68 (±2.07)	0.005 (±0.003)		
Damage	Ensemble		0.23						
Management	Ratio-scalar	0.26	0.23	0.27 (±0.20)		0.69 (±0.33)			
Management	Mixed	0.23	0.10	0.004 (±0.003)					
Management	Ensemble		0.24						

Table S3: Top-5 ranking of models for damage costs and management expenditure based on the Akaike Information Criterion (AIC), with ΔAIC representing the difference in AIC between the model with the lowest AIC and the model under consideration, and 'weight' indicating the probability of the model being the best model among those considered. Likelihood refers to the probability of observing the data given a specific model. Pop_size refers to human population, *b1*:time-dependent coefficient and *b2*: lag phase.

Model	AIC	Likelihood	Predictors	ΔAIC	Weight
Damage costs					
29	1601.440	793.722	Pop_size;Agriculture;suitability;b1;b2	0	0.399
31	1601.469	792.730	GDP;Pop_size;Agriculture;suitability;b1;b2	0.014	0.397
27	1603.901	794.950	GDP;Pop_size;suitability;b1;b2	2.455	0.117

21	1604.641	796.320	suitability;Pop_size;b1;b2	3.195	0.080
28	1612.660	800.330	Pop_size;Agriculture;suitability;b1	11.214	0.001
Management expenditures					
7	1100.667	547.333	GDP;Agriculture	0	0.442
12	1102.260	547.129	GDP;Pop_size;Agriculture	1.592	0.199
11	1102.497	547.248	GDP;Agriculture;suitability	1.829	0.177
15	1104.192	547.096	GDP;Pop_size;Agriculture;suitability	3.524	0.075
24	1104.893	546.446	GDP;Agriculture;suitability;b1	4.225	0.053

Table S4: Geographic distribution of the economic cost by invasive species at the continent level, split into damage costs and management expenditures (i.e., type). *InvaCost* refers to the cost reported in the *InvaCost* database. Total cost refers to the sum of reported costs in InvaCost and interpolated costs. Percentage refers to the percentage increase from reported costs in *InvaCost* to total costs.

Continent	**Type**	***InvaCost***	**Total costs**	**Percentage**

Africa	Damage	5.970186	111.9379	1775
Africa	Management	0.290521	4.990068	1618
Africa	Total	6.260707	116.928	1768
Asia	Damage	5.21737	150.7826	2790
Asia	Management	0.489268	7.833042	1501
Asia	Total	5.706638	158.6156	2679
Europe	Damage	9.570592	199.1819	1981
Europe	Management	0.896237	14.27156	1492
Europe	Total	10.46683	213.4535	1939
North America	Damage	87.18261	188.7854	117
North America	Management	6.037991	12.47839	107
North America	Total	93.2206	201.2638	116
Oceania	Damage	3.390868	26.73188	688
Oceania	Management	0.339187	1.382057	307
Oceania	Total	3.730055	28.11394	654
South America	Damage	6.404198	65.04401	916
South America	Management	1.023513	2.483305	143
South America	Total	7.427711	67.52731	809

Table S5: Economic costs of invasive species at the country level, divided into damage and management costs, in US$ billion. The *InvaCost* columns refer to the initial costs reported in the *InvaCost* database. Total costs represent the sum of the initially reported costs and the interpolated costs based on our average cost model (i.e., a combination of the ratio-scalar and mixed models, weighted by R^2). Percentage increase indicates the percentage increase from the initial costs reported in *InvaCost* to the total costs.

Country	*InvaCost* Damage	*InvaCost* Management	Total costs Damage	Total costs Management	Percentage Increase Damage	Percentage Increase Management
Afghanistan	0	0	0,923791008	0,066215213		
Albania	0,010769526	0	1,989680571	0,050582804	18375,09873	
Algeria	0	0	2,308402601	0,035373166		
Andorra	0	0	0,517250022	0,016173951		
Angola	0	0	1,449121501	0,092264887		
Argentina	2,554219447	0,027113945	10,18830557	0,219257939	298,8813718	708,6537637
Armenia	0	0	2,09212748	0,089213652		
Australia	2,903663631	0,136815446	9,531149845	0,623948789	228,2456598	356,0514225
Austria	0,126200633	8,63518E-05	4,345880276	0,260519879	3343,627965	301596,0852
Azerbaijan	0	0	2,906948545	0,146107373		
Bahrain	0	0	0,077640996	0,001213644		

Bangladesh	0	0	3,718338982	0,123094615		
Belarus	0,001820202	0	3,078398097	0,158707427	169023,9436	
Belgium	0	0	5,231818992	0,450132923		
Belize	0,00081444	0,000144772	0,418434493	0,006253263	51276,94113	4219,372105
Benin	0,159113522	0	0,921066803	0,052094007	478,8739972	
Bhutan	0,000310403	0	0,546686951	0,027261689	176021,8358	
Bolivia	0,043592594	0,000402144	4,395627544	0,074094411	9983,427424	18324,8441
Bosnia and Herzegovina	0,132723021	0	2,223263239	0,130823897	1575,115005	
Botswana	0	0	1,854213989	0,102016938		
Brazil	0,246217973	0,876365159	10,33827563	1,097493629	4098,830616	25,23245794
Brunei Darussalam	0,000669206	0	0,268579833	0,013716159	40034,10172	
Bulgaria	0,306855623	0	3,639113146	0,199215009	1085,9366	
Burkina Faso	0	0	0,796497002	0,059151022		
Burundi*	0	0	2,949473418	0,137156101		
Cambodia	0,0256575	0,00123331	1,496254043	0,054562612	5731,643921	4324,0784

Cameroon	0,177855727	0	1,515779231	0,047093321	752,2521365	
Canada	13,11335578	0,045484603	23,63014632	0,357549724	80,19907883	686,089575
Cape Verde	0	0	1,086752245	0,036118902		
Central African Republic	0	0	0,228870236	0,013965128		
Chad	0	0	0,350431125	0,04899315		
Chile	0,064752958	0,000105942	4,641644172	0,15855214	7068,234969	149559,6059
China	1,895464531	0,004539119	37,82164025	2,266007094	1895,375784	49821,73336
Colombia	3,248623925	0,111013992	9,272312946	0,269012287	185,422787	142,3228659
Costa Rica	0	0	6,375323937	0,074805836		
Croatia	0,185508862	0	2,150846677	0,142499976	1059,430688	
Cuba	0,16175062	0,116335344	6,54546148	0,25530789	3946,637654	119,4585771
Cyprus	0	0	1,529997242	0,040129275		
Czechia	0,006219023	0,000135824	4,292723957	0,343442149	68925,70218	252759,058
Democratic Republic of the Congo	0,090099252	0	1,560719176	0,065991709	1632,222128	
Denmark	0,000151684	0,000808015	6,598184512	0,482737865	4349841,284	59643,6488

Djibouti	0	0	1,03963546	0,076886128		
Dominica*	0	0	1,219546886	0,068486264		
Dominican Republic	0	0	5,306052039	0,224524567		
Ecuador	0,065747115	0,001664042	7,188904208	0,082277838	10834,17441	4844,458214
Egypt	0	0	2,10098031	0,067988316		
El Salvador	0	0	0,627395966	0,02841135		
Equatorial Guinea	0	0	0,215448107	0,021522771		
Estonia	0	0	1,393342397	0,092058411		
Eswatini	0	0	2,205425629	0,161006457		
Ethiopia	0,409308079	0	3,365510142	0,1057637	722,2437613	
Fiji	0	0	1,674968087	0,066377975		
Finland	0,000455051	0,00026959	1,080556451	0,095593786	237358,1354	35358,93003
France	0,376478327	0,000862153	16,7849997	1,546300047	4358,423893	179253,2764
Gabon	0	0	0,577531826	0,016988932		
Gambia	0	0	0,685029671	0,061046661		

Georgia	0	0	1,812563676	0,139847996		
Germany	0,354683636	0,054280926	6,611339948	0,870615432	1764,010425	1503,906755
Ghana	0,17307256	0,004000001	1,559443137	0,155881756	801,0343065	3797,042926
Greece	0,026999655	0	4,221650317	0,286036368	15535,9415	
Greenland	0	0	0,39578315	0,001677745		
Guatemala	0,038016877	0,003378002	1,216513629	0,043909251	3099,930442	1199,858466
Guinea	0	0	0,789487229	0,058992376		
Guinea-Bissau	0	0	0,424320028	0,024295002		
Guyana	0	0	0,607926917	0,036540073		
Haiti	0	0	3,232401474	0,105549591		
Honduras	0	0	0,540468981	0,018421905		
Hungary	0,917684882	0	5,557360664	0,286701794	505,5848551	
Iceland	0	0,000546919	0,823344821	0,010669532		1850,841726
India	1,171544319	1,1039E-07	22,66034407	1,074180354	1834,228496	973077492,5
Indonesia	0,345037606	0,000514891	8,892041376	0,250009114	2477,122384	48455,70386

Iran	0	0	1,452015564	0,085356565		
Iraq	0	0	1,428380531	0,06780655		
Ireland	0	0	8,61076445	0,634698529		
Israel	0	0	2,434915931	0,124510231		
Italy	0,343272606	0,003089298	9,224692823	0,806320606	2587,279048	26000,4503
Ivory Coast	0	9,67E-08	0	9,67E-08		0
Jamaica	0	0	4,338609363	0,083787792		
Japan	0,122129957	0,002826797	8,09455716	0,756271006	6527,822841	26653,63323
Jordan	0	0	0,226374541	0,017752817		
Kazakhstan	0	0	2,941349793	0,122289227		
Kenya	0,113955517	0	4,037822772	0,160364823	3443,332428	
Kiribati*	0	0	1,965483511	0,035709448		
Kuwait	0	0	0,216382142	0,004234344		
Kyrgyzstan	0	0	1,617885894	0,054566982		
Laos	0,005358902	0	0,231939498	0,044905719	4228,115736	

Latvia	0	0	3,015951005	0,117008574		
Lebanon	0	0	0,74437596	0,051595829		
Lesotho*	0	0	2,265494462	0,133318979		
Liberia	0	0	0,310868203	0,020703218		
Libya	0	0	0,126064582	0,026794098		
Liechtenstein	0	0	1,231516262	0,071129142		
Lithuania	0	1,83993E-05	3,133938854	0,144270169		784005,5561
Luxembourg	0	0	3,370918482	0,223732917		
Macedonia	0,004247138	0	1,990491036	0,097327107	46766,64772	
Madagascar	0	0	7,754118256	0,238029303		
Malawi	0,254972096	0	3,67749389	0,101907437	1342,312294	
Malaysia	0,343767091	0,106354516	2,514847795	0,173527178	631,5557134	63,15919963
Mali	0,011421033	0	0,46698893	0,040350619	3988,850273	
Malta	0	0,000148738	1,650831833	0,108049479		72544,16073
Mauritania	0	0	0,280029681	0,019649412		

Mauritius	0	0	4,491517812	0,129039836		
Mexico	0,050251048	0,291642029	10,85261903	0,566880925	21496,80132	94,37559326
Micronesia, Federated States of*	0	0	1,786068145	0,05430131		
Moldova	0,233440833	0	3,498998067	0,109683095	1398,880049	
Mongolia	0	0	1,888925392	0,059256544		
Montenegro	0,001971886	0	0,432950679	0,047550226	21856,17343	
Morocco	0	0	4,399545171	0,140609179		
Mozambique	0,141249857	0	3,513617912	0,092633163	2387,51963	
Myanmar	0,015231781	0	1,110389166	0,069756134	7189,949557	
Namibia	0	0	2,521446297	0,106539731		
Nepal	0	0	2,087635215	0,045746431		
Netherlands	8,00952E-05	0,078844981	9,104586329	0,746601242	11367105,94	846,9229767
New Zealand	0,487204018	0,202371951	10,25813684	0,579140696	2005,511541	186,1763668
Nicaragua	0	0,000804287	1,908976772	0,032786355		3976,449285
Niger	0,03709395	0	1,227063601	0,030469487	3207,988467	

Nigeria	1,34055581	0	5,530508939	0,251049447	312,5534274	
Norway	0,096654372	0,001101859	2,01108267	0,125902034	1980,694985	11326,32599
Oman	0	0	0,286347663	0,014876071		
Pakistan	0,056363727	0	1,664994318	0,071925463	2854,017408	
Panama	0	0,002081493	1,514881035	0,035630041		1611,753792
Papua New Guinea	0	0	1,516074655	0,022578538		
Paraguay	0,002522878	0,000297587	0,997440374	0,035386024	39435,80885	11790,99091
Peru	0,136741241	0,003009105	3,589060312	0,071321079	2524,709483	2270,175508
Philippines	0,294978583	0,157305275	5,206776824	0,311224532	1665,137241	97,84748641
Poland	0,024724404	0	7,865042474	0,380676834	31710,84812	
Portugal	0,003029866	0	5,728241865	0,364622779	188959,2346	
Qatar	0	0	0,111335929	0,00087197		
Romania	1,165383958	0	6,84664648	0,319772017	487,5013493	
Russia	0,399837579	0	5,010337401	0,283289456	1153,093172	
Rwanda	0,020011211	0	2,32999294	0,144559018	11543,43824	

Saint Kitts and Nevis*	0	4,51482E-05	0,97040574	0,043179357		95539,07011
San Marino	0	0	0,543124792	0,010794036		
Saudi Arabia	0	0	3,07143034	0,192860053		
Senegal	0,012201958	1,42446E-06	1,323397627	0,086356336	10745,78084	6062291,108
Serbia	0,582616138	0	3,525589876	0,126514739	505,1308308	
Sierra Leone	0	0	0,63507868	0,052518926		
Singapore	0,128540064	0,054485751	0,645678024	0,087984718	402,3165573	61,48206944
Slovakia	0,150621668	0	2,931648187	0,164820968	1846,3655	
Slovenia	0,027303022	0	2,920477586	0,155779151	10596,53593	
Somalia	0	0	0,845667837	0,059380536		
South Africa	2,144310778	0,286519344	19,7319542	0,920704641	820,2002994	221,3411794
South Korea	0	0	1,492244557	0,029527224		
Spain	0,014409929	0,003531358	7,651538783	0,655839343	52999,07385	18471,8731
Sri Lanka	4,43996E-05	0,000103871	5,064659793	0,184711564	11406904,47	177728,6873
Sudan	0	0	1,799713267	0,068677659		

Suriname	0,001461966	0	0,173993102	0,002894712	11801,30764	
Sweden	0,059049733	0,025508161	2,654457041	0,307099566	4395,290504	1103,926721
Switzerland	0,00743249	0	4,634385609	0,356185704	62253,06787	
Syrian Arab Republic	0	0	0,990865595	0,081604985		
Tajikistan	0	0	0,4166177	0,026062653		
Tanzania	0,44413977	0	4,182731391	0,136255779	841,760157	
Thailand	0,616747969	0,154319692	4,091076987	0,317068762	563,3304357	105,4622831
Timor-Leste	0,000381953	0	0,30130284	0,047853281	78784,80905	
Togo	0	0	0,82897491	0,07835793		
Trinidad and Tobago	0	0	0,509294512	0,05585343		
Tunisia	0	0	3,853640488	0,101578279		
Turkey	0,098139194	0	6,345199569	0,246343626	6365,510166	
Uganda	0,195809683	0	4,263515163	0,247530952	2077,377083	
Ukraine	1,510312127	0	10,43365023	0,370574762	590,8274152	
United Arab Emirates	0	0	1,701523833	0,03021768		

United Kingdom	2,499654336	0,727004563	20,04214572	2,114835868	701,7966896	190,8971931
United States of America	73,85725143	5,581598249	120,3057798	10,47465395	62,88959781	87,66406119
Uruguay	0,001486798	1,60867E-05	8,503349194	0,188328603	571823,8176	1170608,529
Uzbekistan	0	0	1,734797907	0,044195949		
Venezuela	0	2,18626E-06	3,51221925	0,197984183		9055738,857
Vietnam	0,097002782	0,007584417	3,849036208	0,116696802	3867,96476	1438,638978
Yemen	0	0	1,673587221	0,059881869		
Zambia	0,163994305	0	1,662777428	0,061101508	913,9238873	
Zimbabwe	0,081020996	0	1,829466383	0,100997022	2158,015181	
Afghanistan	0	0	0,923791008	0,066215213		

** Cost exceed annual GDP of the given country

Table S6: Overview of the unique identifier (Taxa key), taxonomic group and the digital object identifier (DOIs) linked to the source of the data, associated with each species.

The species records were downloaded using the *occ_download* function of `rgbif` R package[9]. To minimize the inherent errors present in public data aggregators such as GBIF, e.g., data-entry errors[10], we limited our species data to records classified as "present" status, recorded from

"observation", "human observation", and "occurrence" with a geographic uncertain of < 10 kilometers. In addition, we used the *clean_coordinates* function of the `CoordinateCleaner` R package[11] as an additional cleaning step to flag errors that are common to biological collections and to remove them as they are potentially erroneous. Lastly, species with occurrence data in less than 10 grid cells (resolution 5 X 5 arc-min, 0.0833 degrees) were removed as a minimum threshold to build SDMs[12].

Species	**Taxonomic group**	**Taxa key**	**DOIs**
Lithobates catesbeianus	Amphibia	2427091	10.15468/dl.afu4ph
Rhinella marina	Amphibia	5216933	10.15468/dl.ypecw2
Xenopus laevis	Amphibia	5217334	10.15468/dl.4yjfty
Adelges piceae	Arthropods	2049681	10.15468/dl.paemdc
Adelges tsugae	Arthropods	2049739	10.15468/dl.sj8hhc
Aedes aegypti	Arthropods	1651891	10.15468/dl.94bp5x
Aedes albopictus	Arthropods	1651430	10.15468/dl.d67tjh

Aedes camptorhynchus	Arthropods	1652230	10.15468/dl.bgfe5r
Agrilus planipennis	Arthropods	5878492	10.15468/dl.xftmn9
Anoplophora chinensis	Arthropods	7987143	10.15468/dl.hnkqpb
Anoplophora glabripennis	Arthropods	7572133	10.15468/dl.h6fcrr
Apis mellifera	Arthropods	1341976	10.15468/dl.5xe6ba
Bactrocera tryoni	Arthropods	5087530	10.15468/dl.nhyp34
Bemisia tabaci	Arthropods	8347721	10.15468/dl.uzaj4v
Cactoblastis cactorum	Arthropods	1870532	10.15468/dl.aawh6j
Cameraria ohridella	Arthropods	1749449	10.15468/dl.b6cgk3
Ceratitis capitata	Arthropods	1626096	10.15468/dl.ed3529
Ceutorhynchus obstrictus	Arthropods	4464290	10.15468/dl.38ba9q
Coptotermes formosanus	Arthropods	2007383	10.15468/dl.uvcyve

Cryptotermes brevis	Arthropods	2007322	10.15468/dl.vsz8v2
Cydia pomonella	Arthropods	1737847	10.15468/dl.rg4xj2
Dendroctonus micans	Arthropods	1228061	10.15468/dl.r2gqze
Drosophila suzukii	Arthropods	5073820	10.15468/dl.mjzznz
Elatobium abietinum	Arthropods	2076533	10.15468/dl.g7bb4t
Ephestia kuehniella	Arthropods	1878490	10.15468/dl.rnfjy6
Frankliniella occidentalis	Arthropods	8351995	10.15468/dl.pxenqx
Haematobia irritans	Arthropods	10134580	10.15468/dl.gnzfmc
Homarus americanus	Arthropods	5972004	10.15468/dl.h8j77q
Hyblaea puera	Arthropods	1992315	10.15468/dl.w3uwfz
Hypera postica	Arthropods	1191191	10.15468/dl.upamrr
Leptinotarsa decemlineata	Arthropods	1047536	10.15468/dl.364csk

Linepithema humile	Arthropods	1316908	10.15468/dl.6k9w82
Pacifastacus leniusculus	Arthropods	2226990	10.15468/dl.yyfcyf
Procambarus clarkii	Arthropods	2227300	10.15468/dl.xbd8d5
Rhynchophorus ferrugineus	Arthropods	6132234	10.15468/dl.azdxew
Sirex noctilio	Arthropods	4492199	10.15468/dl.k2fpkt
Solenopsis invicta	Arthropods	5035230	10.15468/dl.wgvtav
Spodoptera frugiperda	Arthropods	5109855	10.15468/dl.t5uue8
Stomoxys calcitrans	Arthropods	1526081	10.15468/dl.3fmvwj
Tuta absoluta	Arthropods	4528099	10.15468/dl.j9zw2e
Alopochen aegyptiaca	Birds	2498252	10.15468/dl.d68hhb
Branta canadensis	Birds	5232437	10.15468/dl.v8njzt
Columba livia	Birds	2495414	10.15468/dl.jhv5xt

Cygnus olor	Birds	2498343	10.15468/dl.k3r8gu
Myiopsitta monachus	Birds	2479407	10.15468/dl.79tfhc
Oxyura jamaicensis	Birds	2498305	10.15468/dl.mz7a25
Passer domesticus	Birds	5231190	10.15468/dl.szf26w
Phasianus colchicus	Birds	9752149	10.15468/dl.sjymtv
Psittacula krameri	Birds	2479226	10.15468/dl.z9hpgr
Sturnus vulgaris	Birds	9809229	10.15468/dl.cp5mdk
Petromyzon marinus	Fish	8236498	10.15468/dl.stc76q
Phoxinus phoxinus	Fish	4409653	10.15468/dl.enft83
Pseudorasbora parva	Fish	2362868	10.15468/dl.snama3
Tinca tinca	Fish	2362524	10.15468/dl.gq9rdx
Callosciurus erythraeus	Mammalia	4263753	10.15468/dl.rv3u6e

Camelus dromedarius	Mammalia	9055455	10.15468/dl.6knez9
Canis lupus	Mammalia	5219200	10.15468/dl.t7wvd5
Capra hircus	Mammalia	2441056	10.15468/dl.yaz4sg
Castor canadensis	Mammalia	2439838	10.15468/dl.vdyhyt
Chlorocebus pygerythrus	Mammalia	4267120	10.15468/dl.65tqh9
Equus caballus	Mammalia	2440886	10.15468/dl.a2tzpt
Felis catus	Mammalia	2435035	10.15468/dl.5598fk
Hemitragus jemlahicus	Mammalia	5220174	10.15468/dl.8umq8d
Herpestes edwardsi	Mammalia	10937769	10.15468/dl.z2q6x5
Herpestes javanicus	Mammalia	10504616	10.15468/dl.727f5s
Muntiacus reevesi	Mammalia	2440946	10.15468/dl.s58645
Mus musculus	Mammalia	7429082	10.15468/dl.awdhcw

Mustela erminea	Mammalia	5219019	10.15468/dl.xhd7hr
Myocastor coypus	Mammalia	4264680	10.15468/dl.p6dqyx
Neovison vison	Mammalia	2433652	10.15468/dl.a7y8nb
Nyctereutes procyonoides	Mammalia	2434552	10.15468/dl.v9zh3r
Ondatra zibethicus	Mammalia	5219858	10.15468/dl.qysztu
Oryctolagus cuniculus	Mammalia	2436940	10.15468/dl.sqyy7e
Paguma larvata	Mammalia	2434654	10.15468/dl.e86hpb
Phascolarctos cinereus	Mammalia	2440012	10.15468/dl.hcgp6p
Procyon lotor	Mammalia	5218786	10.15468/dl.uh8ubq
Rattus exulans	Mammalia	2439244	10.15468/dl.74mvee
Rattus norvegicus	Mammalia	2439261	10.15468/dl.6yscy7
Rattus rattus	Mammalia	2439270	10.15468/dl.n57xej

Sciurus carolinensis	Mammalia	5219681	10.15468/dl.9pb6n8
Sus scrofa	Mammalia	7705930	10.15468/dl.azmx62
Trichosurus vulpecula	Mammalia	2440254	10.15468/dl.w5ukd5
Vulpes vulpes	Mammalia	5219243	10.15468/dl.he94qx
Corbicula fluminea	Molluks	8190231	10.15468/dl.zubgcs
Dreissena polymorpha	Molluks	2287072	10.15468/dl.ycsap4
Lissachatina fulica	Molluks	8790531	10.15468/dl.aufhcj
Pomacea canaliculata	Mollusk	2292582	10.15468/dl.xukp46
Arion lusitanicus	Mollusks	5779455	10.15468/dl.nenerb
Acacia mearnsii	Plants	2979775	10.15468/dl.k59hwr
Ageratina adenophora	Plants	5400613	10.15468/dl.yugwpb
Ailanthus altissima	Plants	3190653	10.15468/dl.3u2yca

Alternanthera philoxeroides	Plants	3084923	10.15468/dl.ay7cgx
Ambrosia artemisiifolia	Plants	8002952	10.15468/dl.5msz59
Arctotheca calendula	Plants	3114986	10.15468/dl.azxx28
Artemisia vulgaris	Plants	3120946	10.15468/dl.ba67nk
Azolla filiculoides	Plants	2650107	10.15468/dl.krrxek
Buddleja davidii	Plants	3173338	10.15468/dl.hkme7j
Cabomba caroliniana	Plants	2882443	10.15468/dl.havvn3
Carduus platypus	Plants	3114515	10.15468/dl.vhs2ry
Cenchrus clandestinus	Plants	5828201	10.15468/dl.d7swut
Cenchrus setaceus	Plants	5828232	10.15468/dl.gvyujk
Cereus jamacaru	Plants	7282182	10.15468/dl.s344bq
Chondrilla juncea	Plants	8537667	10.15468/dl.4b4765

Chromolaena odorata	Plants	3087725	10.15468/dl.e2wuxh
Cirsium arvense	Plants	3113414	10.15468/dl.h22skm
Clematis vitalba	Plants	3033558	10.15468/dl.nw5cxh
Coreopsis lanceolata	Plants	3133938	10.15468/dl.4rr74m
Cortaderia selloana	Plants	2704523	10.15468/dl.9wcpwr
Crassula helmsii	Plants	5362054	10.15468/dl.8f7qx6
Cryptostegia grandiflora	Plants	3170473	10.15468/dl.qe3g4t
Cytisus scoparius	Plants	5354656	10.15468/dl.yrtbqz
Echium plantagineum	Plants	2925895	10.15468/dl.ha4vmj
Pontederia crassipes	Plants	2765940	10.15468/dl.7h9umj
Elaeis guineensis	Plants	2731882	10.15468/dl.pp53mw
Elodea nuttallii	Plants	5329212	10.15468/dl.zhee3f

Euphorbia esula	Plants	8203538	10.15468/dl.p65466
Fallopia baldschuanica	Plants	5334351	10.15468/dl.m9kq2b
Hakea sericea	Plants	7287606	10.15468/dl.jkf9e4
Heliotropium europaeum	Plants	2925767	10.15468/dl.veqbm9
Heracleum mantegazzianum	Plants	3034825	10.15468/dl.f3387y
Hydrocotyle ranunculoides	Plants	7978544	10.15468/dl.fscv5r
Impatiens glandulifera	Plants	2891770	10.15468/dl.2cm2hp
Lagarosiphon major	Plants	11342546	10.15468/dl.cfvcfe
Lantana camara	Plants	2925303	10.15468/dl.4zhxe5
Lonicera japonica	Plants	5334240	10.15468/dl.zq263k
Ludwigia grandiflora	Plants	5421039	10.15468/dl.rxarv2
Marrubium vulgare	Plants	2927069	10.15468/dl.e68ywd

Melia azedarach	Plants	5914287	10.15468/dl.cjb84p
Mimosa diplotricha	Plants	7808904	10.15468/dl.7uu5ra
Mimosa pigra	Plants	2969431	10.15468/dl.em5uf5
Myriophyllum aquaticum	Plants	5361785	10.15468/dl.ezku3j
Nassella neesiana	Plants	5289831	10.15468/dl.zfb6v4
Nassella trichotoma	Plants	9613389	10.15468/dl.p7ytub
Nymphoides peltata	Plants	8810827	10.15468/dl.m63e5t
Opuntia aurantiaca	Plants	5384186	10.15468/dl.c92d9w
Panicum repens	Plants	2705093	10.15468/dl.h4a8nz
Parkinsonia aculeata	Plants	5357217	10.15468/dl.66h6gz
Parthenium hysterophorus	Plants	3086784	10.15468/dl.g3ga4v
Phelipanche aegyptiaca	Plants	3729265	10.15468/dl.gbarrv

Phragmites australis	Plants	5290149	10.15468/dl.wyjvvu
Pistia stratiotes	Plants	2870583	10.15468/dl.7c3azk
Prunus serotina	Plants	3021850	10.15468/dl.ujdmjs
Pteridium aquilinum	Plants	5275012	10.15468/dl.kjdcg6
Reynoutria japonica	Plants	2889173	10.15468/dl.xjy44r
Rhododendron ponticum	Plants	7327990	10.15468/dl.gbvy2m
Rosa rugosa	Plants	3003979	10.15468/dl.896jj7
Rumex lunaria	Plants	4032398	10.15468/dl.amjj27
Salvinia molesta	Plants	5274863	10.15468/dl.nf7thz
Senecio inaequidens	Plants	3109086	10.15468/dl.rxw2gq
Senecio jacobaea	Plants	8965572	10.15468/dl.uebqnu
Senecio madagascariensis	Plants	3107722	10.15468/dl.j2w7dj

Senna obtusifolia	Plants	2957408	10.15468/dl.wxf998
Solanum mauritianum	Plants	2931469	10.15468/dl.7wuwgx
Sporobolus pyramidalis	Plants	4117345	10.15468/dl.awkksm
Tamarix aphylla	Plants	2874704	10.15468/dl.ufs22k
Ulex europaeus	Plants	2951984	10.15468/dl.6eqk7c
Xanthium chinense	Plants	3089169	10.15468/dl.b77dmw
Xanthium strumarium	Plants	3089154	10.15468/dl.b44mvn
Anolis carolinensis	Reptilia	2466939	10.15468/dl.2gwphr
Boiga irregularis	Reptilia	2457884	10.15468/dl.49pef9
Chelydra serpentina	Reptilia	2441905	10.15468/dl.rnqs4y
Trachemys scripta	Reptilia	6157026	10.15468/dl.xvavss

Table S7: Description of the predictors, sources and rationale used for species distribution models. Variables retained after the collinearity analysis are in *italics* and **bold**.

Predictors	Description	Source	Rationale
species occurrences (See Table S1)	Records of species presence worldwide	Global Biodiversity Information Facility (GBIF; gbif.org)	Location where the species is found.
Elevation	Vertical position of a location or feature on the Earth's surface	EarthEnv[13]	Elevation often imposes physiological limits on species
Slope	Measure of the steepness or incline of a surface or terrain	EarthEnv[13]	Steepness of terrain can affect species dispersal and establishment
Rugosity	Deviation of the land surface from a perfectly flat plane	EarthEnv[13]	Roughness of the terrain can impact a species' ability to move and establish new populations
Evapotranspiration	Represents loss of water to the atmosphere from the land, bodies of water, and vegetation	The Global Evapotranspiration CHELSA database[14]	For species depending on specific moisture conditions; can also be a limiting factor in arid or extremely humid areas
Density of roads	Proxy for proximity and accessibility to transportation infrastructure	The Global Roads Open Access Data Set, Version 115	Roads facilitate human movement and can act as corridors for species spread
Distance to major cities	Locations of main cities of the world, such as provincial capitals	hub.arcgis.com	Cities often serve as primary introduction points for invasive species and have high concentrations of transportation networks, which can facilitate the spread of invasive species
Bioclimatic variables	19 bioclimatic variables derived from the monthly temperature and rainfall values:infrastructure BIO1: annual mean temperature ***BIO2: mean diurnal range (mean of monthly (max temp - min temp)*** ***BIO3: isothermality (bio2/bio7) (×100)*** BIO4: temperature seasonality (standard	WorldClim[16]	Climate is a major determinant of species distribution. Bioclimatic variables can indicate the potential range of an invasive species

	deviation ×100) BIO5: maximum temperature of warmest month BIO6: minimum temperature of coldest month BIO7: temperature annual range (bio5-bio6) ***BIO8: mean temperature of wettest quarter*** ***BIO9: mean temperature of driest quarter*** BIO10: mean temperature of warmest quarter BIO11: mean temperature of coldest quarter BIO12: annual precipitation ***BIO13: precipitation of wettest month*** ***BIO14: precipitation of driest month*** ***BIO15: precipitation seasonality (coefficient of variation)*** BIO16: precipitation of wettest quarter BIO17: precipitation of driest quarter ***BIO18: precipitation of warmest quarter*** ***BIO19: precipitation of coldest quarter***		

*To do this, we rasterized the roads layer using the *rasterize* function in the `terra` R package (Hijmans et al., 2022), and generated a density raster layer summing the number of roads in each cell grid (Hijmans et al., 2022).

Supplementary Material 3:

Importance of spatio-temporal predictors

The species distribution models generally performed well (area under the receiver operating characteristic curve [mean AUC ± sd] = 0.88 ± 0.07; true skill statistics [mean TSS ± sd] = 0.70 ± 0.09) and Boyce index [mean ± sd] = 0.76 ± 0.09 (Table S8). Additionally, the inclusion of suitable area and time since invasion as predictive factors significantly improved estimates of interpolated damage and management costs (Table S2; Table S3). In the case of damage, the best-fitting model included three predictor variables (i.e., GDP, population size, agriculture area and suitable area) (AIC = 1601.440; $AIC_{weighted}$ = 0.399), all of them with a positive effect (Table S2). For the damage model, the suitable area was adjusted by both time since invasion and lag phase (equation 1). This lag phase was estimated to be 46 years of delay to the start of the economic damage. For management expenditure, the most optimal model included only GDP and suitable area (adjusted by the time since invasion, equation 1) as predictors (AIC = 1100.66; $AIC_{weighted}$ = 0.442), both with a positive effect (Table S3).

Table S8: Performance of the species distribution models (GAMs and maxent) based on area under the receiver operating curve (AUC), true skill statistic (TSS) and Boyce index.

Species	AUC	TSS	Boyce index
Acacia mearnsii	0.949	0.817	0.919
Adelges piceae	0.911	0.698	0.641
Adelges tsugae	0.95	0.624	0.833
Aedes aegypti	0.886	0.811	0.888
Aedes albopictus	0.831	0.637	0.957
Aedes camptorhynchus	0.767	0.613	0.839
Ageratina adenophora	0.97	0.81	0.860
Agrilus planipennis	0.945	0.627	0.745
Ailanthus altissima	0.828	0.681	0.833
Alopochen aegyptiaca	0.891	0.707	0.747
Alternanthera philoxeroides	0.967	0.792	0.908
Ambrosia artemisiifolia	0.849	0.637	0.755

Anolis carolinensis	0.952	0.836	0.846
Anoplophora chinensis	0.942	0.732	0.845
Anoplophora glabripennis	0.816	0.689	0.891
Apis mellifera	0.714	0.685	0.823
Arctotheca calendula	0.967	0.852	0.841
Arion lusitanicus	0.971	0.641	0.795
Artemisia vulgaris	0.793	0.54	0.826
Azolla filiculoides	0.85	0.595	0.835
Bactrocera tryoni	0.706	0.532	0.791
Bemisia tabaci	0.565	0.545	0.891
Boiga irregularis	0.911	0.696	0.809
Branta canadensis	0.829	0.592	0.716
Buddleja davidii	0.782	0.63	0.695
Cabomba caroliniana	0.882	0.705	0.818

Cactoblastis cactorum	0.688	0.576	0.804
Callosciurus erythraeus	0.906	0.585	0.807
Camelus dromedarius	0.985	0.86	0.770
Cameraria ohridella	0.94	0.701	0.768
Canis lupus	0.773	0.484	0.762
Capra hircus	0.88	0.578	0.614
Carduus platypus	0.973	0.578	0.807
Castor canadensis	0.877	0.618	0.703
Cenchrus clandestinus	0.972	0.815	0.740
Cenchrus setaceus	0.92	0.631	0.697
Ceratitis capitata	0.894	0.541	0.805
Cereus jamacaru	0.979	0.558	0.867
Ceutorhynchus obstrictus	0.954	0.652	0.590
Chelydra serpentina	0.943	0.798	0.689

Chlorocebus pygerythrus	0.983	0.821	0.866
Chondrilla juncea	0.843	0.554	0.689
Chromolaena odorata	0.972	0.793	0.806
Cirsium arvense	0.77	0.566	0.564
Clematis vitalba	0.797	0.523	0.653
Columba livia	0.829	0.575	0.675
Coptotermes formosanus	0.774	0.591	0.654
Corbicula fluminea	0.838	0.5	0.676
Coreopsis lanceolata	0.891	0.601	0.688
Cortaderia selloana	0.874	0.566	0.667
Crassula helmsii	0.932	0.694	0.666
Cryptostegia grandiflora	0.978	0.807	0.732
Cryptotermes brevis	0.79	0.516	0.629
Cydia pomonella	0.887	0.562	0.574

Cygnus olor	0.926	0.719	0.769
Cytisus scoparius	0.803	0.695	0.565
Dendroctonus micans	0.945	0.522	0.887
Dreissena polymorpha	0.892	0.539	0.721
Drosophila suzukii	0.886	0.587	0.774
Echium plantagineum	0.897	0.644	0.766
Elaeis guineensis	0.768	0.545	0.645
Elatobium abietinum	0.698	0.466	0.569
Elodea nuttallii	0.839	0.617	0.533
Ephestia kuehniella	0.893	0.505	1.146
Equus caballus	0.787	0.692	0.659
Euphorbia esula	0.822	0.682	0.713
Fallopia baldschuanica	0.841	0.668	0.766
Felis catus	0.733	0.587	0.532

Frankliniella occidentalis	0.724	0.53	0.693
Haematobia irritans	0.855	0.581	0.661
Hakea sericea	0.985	0.833	0.855
Heliotropium europaeum	0.9	0.665	0.865
Hemitragus jemlahicus	0.707	0.633	0.699
Heracleum mantegazzianum	0.835	0.621	0.678
Herpestes edwardsi	0.9	0.732	0.790
Herpestes javanicus	0.945	0.654	0.741
Homarus americanus	0.98	0.868	0.758
Hyblaea puera	0.794	0.578	0.740
Hydrocotyle ranunculoides	0.894	0.514	0.758
Hypera postica	0.88	0.557	0.836
Impatiens glandulifera	0.795	0.504	0.622
Lagarosiphon major	0.898	0.576	0.760

Lantana camara	0.949	0.787	0.824
Leptinotarsa decemlineata	0.88	0.58	0.855
Linepithema humile	0.915	0.52	0.838
Lissachatina fulica	0.977	0.817	0.825
Lithobates catesbeianus	0.857	0.611	0.691
Lonicera japonica	0.881	0.598	0.755
Ludwigia grandiflora	0.917	0.456	0.762
Marrubium vulgare	0.847	0.522	0.724
Melia azedarach	0.921	0.703	0.867
Mimosa diplotricha	0.922	0.583	0.789
Mimosa pigra	0.974	0.683	0.759
Muntiacus reevesi	0.981	0.885	0.866
Mus musculus	0.841	0.699	0.705
Mustela erminea	0.914	0.697	0.821

Mustela vison	0.964	0.858	0.833
Myiopsitta monachus	0.866	0.546	0.776
Myocastor coypus	0.902	0.692	0.891
Myriophyllum aquaticum	0.881	0.604	0.834
Nassella neesiana	0.967	0.649	0.916
Nassella trichotoma	0.975	0.823	0.855
Nyctereutes procyonoides	0.955	0.698	0.863
Nymphoides peltata	0.82	0.655	0.682
Ondatra zibethicus	0.89	0.624	0.717
Opuntia aurantiaca	0.982	0.819	0.913
Oryctolagus cuniculus	0.888	0.652	0.789
Oxyura jamaicensis	0.778	0.645	0.637
Pacifastacus leniusculus	0.907	0.873	0.816
Paguma larvata	0.841	0.634	0.789

Panicum repens	0.969	0.691	0.870
Parkinsonia aculeata	0.957	0.777	0.895
Parthenium hysterophorus	0.97	0.841	0.765
Passer domesticus	0.813	0.551	0.667
Petromyzon marinus	0.96	0.727	0.825
Phascolarctos cinereus	0.96	0.807	0.800
Phasianus colchicus	0.906	0.683	0.733
Phelipanche aegyptiaca	0.888	0.678	0.823
Phoxinus phoxinus	0.94	0.786	0.765
Phragmites australis	0.784	0.583	0.620
Phthorimaea absoluta	0.929	0.682	0.779
Pistia stratiotes	0.889	0.516	0.677
Pomacea canaliculata	0.934	0.643	0.864
Pontederia crassipes	0.854	0.653	0.787

Procambarus clarkii	0.877	0.555	0.724
Procyon lotor	0.755	0.674	0.634
Prunus serotina	0.885	0.693	0.731
Pseudorasbora parva	0.954	0.718	0.713
Psittacula krameri	0.942	0.671	0.782
Pteridium aquilinum	0.794	0.493	0.674
Rattus exulans	0.651	0.555	0.554
Rattus norvegicus	0.893	0.64	0.837
Rattus rattus	0.864	0.57	0.736
Reynoutria japonica	0.816	0.517	0.725
Rhinella marina	0.938	0.742	0.708
Rhododendron ponticum	0.939	0.757	0.792
Rhynchophorus ferrugineus	0.97	0.792	0.781
Rosa rugosa	0.807	0.676	0.598

Rumex lunaria	0.929	0.804	0.757
Salvinia molesta	0.904	0.754	0.658
Sciurus carolinensis	0.872	0.65	0.650
Senecio inaequidens	0.829	0.667	0.713
Senecio jacobaea	0.865	0.542	0.704
Senecio madagascariensis	0.98	0.848	0.866
Senna obtusifolia	0.968	0.799	0.865
Sirex noctilio	0.874	0.525	0.796
Solanum mauritianum	0.981	0.856	0.782
Solenopsis invicta	0.954	0.777	0.776
Spodoptera frugiperda	0.827	0.582	0.753
Sporobolus pyramidalis	0.889	0.668	0.801
Stomoxys calcitrans	0.788	0.570	0.608
Sturnus vulgaris	0.873	0.75	0.753

Sus scrofa	0.807	0.751	0.691
Tamarix aphylla	0.961	0.748	0.747
Tinca tinca	0.924	0.771	0.550
Trachemys scripta	0.853	0.578	0.636
Trichosurus vulpecula	0.952	0.749	0.796
Ulex europaeus	0.911	0.696	0.706
Vulpes vulpes	0.836	0.686	0.677
Xanthium chinense	0.974	0.783	0.654
Xanthium strumarium	0.843	0.64	0.635
Xenopus laevis	0.952	0.709	0.718

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