Supplementary information

Contents:

1 List of countries covered

UN code	Name	Sectors (Number of industries/products)
4	Afghanistan	26/0
8	Albania	26/0
12	Algeria	26/0
20	Andorra	26/0
24	Angola	26/0
28	Antigua and Barbuda	26/0
32	Argentina	125/196
51	Armenia	26/0
533	Aruba	26/0
36	Australia	345/345
40	Austria	61/61
31	Azerbaijan	26/0
44	Bahamas	26/0
48	Bahrain	26/0
50	Bangladesh	26/0
52	Barbados	26/0
112	Belarus	26/0
56	Belgium	61/61
84	Belize	26/0
204	Benin	26/0
60	Bermuda	26/0
64	Bhutan	26/0
68	Bolivia	37/37
70	Bosnia and Herzegovina	26/0
72	Botswana	26/0
76	Brazil	56/111
92	British Virgin Islands	26/0
96	Brunei Darussalam	26/0
100	Bulgaria	26/0
854	Burkina Faso	26/0
108	Burundi	26/0
116	Cambodia	26/0
120	Cameroon	26/0
124	Canada	49/0
132	Cape Verde	26/0
136	Cayman Islands	26/0
140	Central African Republic	26/0
148	Chad	26/0
152	Chile	75/75
156	China	0/123
170	Colombia	60/60
178	Congo	26/0
188	Costa Rica	26/0
191	Croatia	26/0
192	Cuba	26/0
196	Cyprus	26/0
203	Czech Republic	61/61
384	Côte d'Ivoire	26/0
408	Democratic People's Republic of Korea	26/0
180	Democratic Republic of the Congo, previously Zaïre	26/0
208	Denmark	131/0
262	Djibouti	26/0
214	Dominican Republic	26/0
218	Ecuador	49/61
818	Egypt	26/0
222	El Salvador	26/0
232	Eritrea	26/0
233	Estonia	61/61
231	Ethiopia	26/0

242	Fiji	26/0
246	Finland	61/61
250	France	61/61
258	French Polynesia	26/0
266	Gabon	26/0
270	Gambia	26/0
268	Georgia	47/68
276	Germany	0/72
288	Ghana	26/0
300	Greece	61/61
304	Greenland	31/0
320	Guatemala	26/0
324	Guinea	26/0
328	Guyana	26/0
332	Haiti	26/0
340	Honduras	26/0
344	Hong Kong	38/38
348	Hungary	61/61
352	Iceland	26/0
356	India	116/116
360	Indonesia	0/77
364	Iran	100/148
368	Iraq	26/0
372	Ireland	61/61
376	Israel	163/163
380	Italy	61/61
388	Jamaica	26/0
392	Japan	0/402
400	Jordan	26/0
398	Kazakhstan	0/121
404	Kenya	51/51
414	Kuwait	55/0
417	Kyrgyzstan	89/87
418	Lao People's Democratic Republic	26/0
428	Latvia	61/61
422	Lebanon	26/0
426	Lesotho	26/0
430	Liberia	26/0
434	Libyan Arab Jamahiriya	26/0
438	Liechtenstein	26/0
440	Lithuania	61/61
442	Luxembourg	26/0
446	Macao Special Administrative Region of China	26/0
450	Madagascar	26/0
454	Malawi	26/0
458	Malaysia	0/98
462	Maldives	26/0
466	Mali	26/0
470	Malta	61/61
478	Mauritania	26/0
480	Mauritius	57/67
484	Mexico	80/80
492	Monaco	26/0
496	Mongolia	26/0
499	Montenegro	26/0
504	Morocco	26/0
508	Mozambique	26/0
104	Myanmar	26/0
516	Namibia	26/0
524	Nepal	26/0
528	Netherlands	61/61
530	Netherlands Antilles	16/41
540	New Caledonia	26/0
554	New Zealand	127/210
558	Nicaragua	26/0

562	Niger	26/0
566	Nigeria	26/0
578	Norway	61/61
275	Occupied Palestinian Territory	26/0
512	Oman	26/0
586	Pakistan	26/0
591	Panama	26/0
598	Papua New Guinea	26/0
600	Paraguay	34/47
604	Peru	46/46
608	Philippines	0/77
616	Poland	61/61
620	Portugal	61/61
634	Qatar	26/0
410	Republic of Korea	0/78
498	Republic of Moldova	26/0
642	Romania	61/61
643	Russian Federation	49/0
646	Rwanda	26/0
882	Samoa	26/0
674	San Marino	26/0
678	Sao Tome and Principe	26/0
682	Saudi Arabia	26/0
686	Senegal	26/0
688	Serbia	26/0
690	Seychelles	26/0
694	Sierra Leone	26/0
702	Singapore	154/154
703	Slovakia	61/61
705	Slovenia	61/61
706	Somalia	26/0
710	South Africa	95/96
724	Spain	76/119
144	Sri Lanka	26/0
736	Sudan	26/0
740	Suriname	26/0
748	Swaziland	26/0
752	Sweden	61/61
756	Switzerland	43/43
760	Syrian Arab Republic	26/0
761	Taiwan	0/163
762	Tajikistan	26/0
764	Thailand	0/180
807	Macedonia	61/61
768	Togo	26/0
780	Trinidad and Tobago	26/0
788	Tunisia	26/0
792	Turkey	61/61
795	Turkmenistan	26/0
800	Uganda	26/0
804	Ukraine	0/121
784	United Arab Emirates	26/0
826	United Kingdom	511/511
834	United Republic of Tanzania	26/0
840	USA	429/429
858	Uruguay	84/103
860	Uzbekistan	0/123
548	Vanuatu	26/0
862	Venezuela	122/122
704	Viet Nam	0/113
887	Yemen	26/0
894	Zambia	26/0
716	Zimbabwe	26/0

2 International trade balances expressed in numbers of threats to species

International trade balances are most well-known in monetary terms, but they can also be expressed in physical units, such as tonnes of carbon emissions, litres of water, or the number of threats to species. Internationally traded commodities are then said to "embody" carbon, water or biodiversity. A physical trade balance is meant to give an indication of the magnitude in the embodiments in exports compared to the embodiments in imports. Let **Q** be a threatened-species satellite account matching an MRIO table (*see SI Section 8*), **x** gross economic output (*see SI Section 3*), and $\mathbf{q} = \mathbf{Q}\hat{\mathbf{x}}^{-1}$ a threats coefficients matrix. Let **L** be the Leontief inverse of the MRIO table, and **y** a bundle of final demand (*see SI Section 3*). A national accounts balance of country *s* in terms of threatened species reads

$$\underbrace{F_j^s}_{\text{production}} = \sum_r q_i^r \left[\underbrace{\sum_{it} L_{ij}^{rt} y_j^{ts}}_{\text{consumption}} \overbrace{- \underbrace{\sum_{it \neq s} L_{ij}^{rt} y_j^{ts}}_{\text{imports}} + \underbrace{\sum_{it \neq s} L_{ij}^{rs} y_j^{st}}_{\text{exports}}}^{\text{net trade balance}} \right]$$

$$= \sum_r q_i^r \left[\sum_i L_{ij}^{rs} y_j^{ss} + \sum_{it \neq s} L_{ij}^{rs} y_j^{st} \right] = \sum_r q_i^r \sum_{it} L_{ij}^{rs} y_j^{st} \ ,$$

where "exports" cover the number of threats to species inhabiting regions *r* required to produce final goods *j* in country *s*, which are then exported by country *s* to countries $t \neq s$, and "imports" cover the number of threats to species inhabiting regions *r* required to produce final goods *j* in countries *t* which are then sold by countries *t* to country *s*.

This trade balance considers trade destined only for final consumption because trade in intermediate consumption is considered endogenous in an MRIO [1].

3 Table S3.1 -Top-ranking net importers and net exporters of species threats

Country	Total national threat records	Threats due to imports	Species threatened due to production of export goods	Imports - Exports = Net Imports
USA	2,424	1262	267	995
Japan*	573	792	71	721
Germany*	321	395	91	304
France*	179	296	51	245
UK*	197	285	58	227
Italy	256	242	60	182
Hong Kong*	67	184	26	158
Singapore	240	237	117	120
Spain	312	175	58	117
South Korea	147	147	35	112
Canada	163	156	59	97

Tab. SI3.1a: Developed countries import consumer items whose production causes a significant number of threats to species elsewhere. In countries marked with * the biodiversity footprint rests more abroad than domestically. Note that Singapore and Hong Kong have been excluded from Figure 1 in the main text as results for these two countries are of lower confidence due to occasional data errors relating to re-imports/re-exports.

Country	Total national threat records	Threats due to imports	Species threatened due to production of export goods	Exports – Imports = Net Exports
Indonesia	709	50	238	188
Madagascar	359	5	183	178
Papua New Guinea	288	2	171	169
Malaysia	488	125	276	151
Philippines	464	22	161	139
Sri Lanka	273	21	150	129
Thailand	453	73	189	116
Russia	681	112	206	94
Cambodia	193	4	90	86
Cameroon	246	3	88	85
Sudan	102	0	79	79

Tab. SI3.1b: Tropical-latitude low and middle-income countries export many products associated with species threats

4 Table S3.2 - Top-ranking international trade flows

Threat suffered in	Driven by	# of threats	Causes
Papua New Guinea	Japan	91	Agricultural products
Malaysia	Singapore	70	Biological resource use, pollution
China	USA	68	Pollution from manufacturing
Mexico	USA	57	Coffee & tea
Canada	USA	42	Many causes, including habitat loss due to forestry, agriculture, grazing; pollution from manufacturing and mining
USA	Japan	41	Fishing
Indonesia	Japan	39	Pollution and sprawl associated with manufactured goods
Thailand	Japan	37	Fishing, urban sprawl
India	USA	36	Pollution from manufacturing and chemical products, mining
Costa Rica	USA	35	Electronics, bananas, pineapples, coffee, melons, ornamental plants, sugar
Philippines	USA	35	Fishing, forestry, agriculture
Honduras	USA	35	Coffee, bananas, palm oil, rare metals, pineapple, lumber, sugar, tobacco
Malaysia	Japan	34	Lumber, marine foods, tobacco
Indonesia	USA	33	Marine pollution, fishing
Indonesia	Singapore	33	Many causes
Malaysia	USA	32	Pollution from manufactured goods
Panama	USA	31	Biological resource use, pollution

Tab. S3.2: Top-ranking internationally traded implicated commodities/threat causes, with countries of production and final consumption.

5 Figure 3S - High-resolution flow map of threats to species caused by Malaysian exports/ German imports

This image is provided in a separate PDF file.

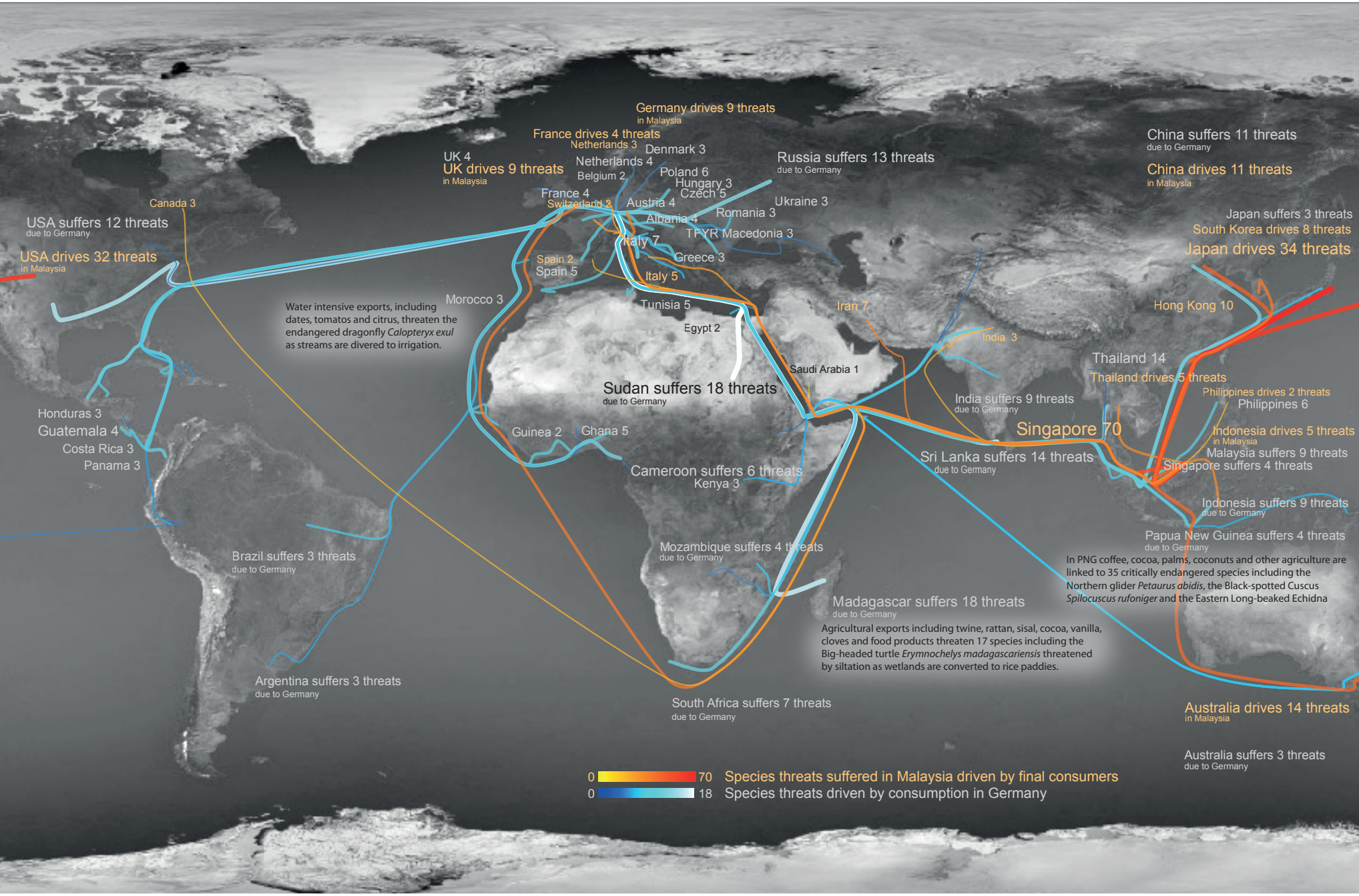


Figure 3S: Flow map of threats to species caused by exports from Malaysia (reds), and imports into Germany (blues). Note that the lines directly link the producing countries where threats are recorded, and final consumer countries. Processing stops in intermediate countries are accounted for but not explicitly visualized. Malaysia suffers 488 species threats domestically; exports, including palm oil, rubber, and cocoa, are linked to 276 of those. Germany suffers 321 species threats domestically and drives an additional 395 through its imports. Regional trade patterns can be observed (consumption in Southeast Asia drives impacts in Malaysia; German consumption drives impacts in Europe) but drivers and impacts are linked globally.

6 Figure 4S - Interactive map of implicated trade flows

An interactive global flow map (similar to Figure 3) is available online at:

www.worldmrio.com/biodivmap/

Note that this interactive figure is only supported Safari, Chrome, Firefox, and iPad, and may not work on other browsers.

7 Table S3.3 - Top-ranking international supply chains causing threats to species

# of Threats	Broad threat cause	Path
60.1	harvesting & hunting	Papua New Guinea agriculture industry -> Japan timber products -> Final demand in Japan in the residential construction (wooden) sector
33.9	accidental mortality	Samoa fishing industry -> USA food services and drinking places industry -> Final demand in USA in the food services and drinking places sector
22.4	harvesting & hunting	Singapore livestock industry -> Singapore livestock products -> Hong Kong SAR trade and transport industry -> Final demand in Hong Kong SAR in the trade and transport sector
21.2	accidental mortality	Fiji fishing industry -> USA food services and drinking places industry -> Final demand in USA in the food services and drinking places sector
16.5	accidental mortality	Papua New Guinea fishing industry -> Australia hotels, clubs, restaurants and cafes industry -> Final demand in Australia in the hotels, clubs, restaurants and cafes sector
12.0	harvesting & hunting	Papua New Guinea agriculture industry -> Japan timber products -> Final demand in Japan in the residential construction (non-wooden) sector
11.6	accidental mortality	Papua New Guinea fishing industry -> Australia retail trade industry -> Final demand in Australia in the retail trade sector
11.6	accidental mortality	Samoa fishing industry -> USA seafood product preparation and packaging industry -> Final demand in USA in the seafood product preparation and packaging sector
9.7	accidental mortality	French Polynesia fishing industry -> USA food services and drinking places industry -> Final demand in USA in the food services and drinking places sector
9.0	accidental mortality	Samoa fishing industry -> USA seafood product preparation and packaging industry -> USA seafood product preparation and packaging products -> USA food services and drinking places industry -> Final demand in USA in the food services and drinking places sector
8.1	agriculture	Papua New Guinea agriculture industry -> Japan timber products -> Final demand in Japan in the residential construction (wooden) sector
8.0	harvesting & hunting	Papua New Guinea agriculture industry -> Japan plywood products -> Final demand in Japan in the residential construction (wooden) sector
7.8	pollution	Papua New Guinea agriculture industry -> Japan timber products -> Final demand in Japan in the residential construction (wooden) sector
7.7	accidental mortality	Mozambique fishing industry -> South Africa meat industry -> Final demand in South Africa in the meat products sector
7.3	accidental mortality	Fiji fishing industry -> USA seafood product preparation and packaging industry -> Final demand in USA in the seafood product preparation and packaging sector
6.8	harvesting & hunting	Singapore livestock industry -> Singapore livestock products -> Hong Kong SAR trade and transport industry -> Hong Kong SAR trade and transport products -> Hong Kong SAR trade and transport industry -> Final demand in Hong Kong SAR in the trade and transport sector
6.4	harvesting & hunting	Papua New Guinea agriculture industry -> Japan plywood products -> Final demand in Japan in the residential construction (non-wooden) sector
6.4	harvesting & hunting	Papua New Guinea agriculture industry -> Japan plywood products -> Final demand in Japan in the non-residential construction (non-wooden) sector
6.3	harvesting & hunting	Papua New Guinea agriculture industry -> Japan timber products -> Final demand in Japan in the non-residential construction (non-wooden) sector
6.1	residential & commercial development	Malaysia buildings & constructions products -> Hong Kong SAR ownership of dwellings industry -> Final demand in Hong Kong SAR in the ownership of dwellings sector

8 Series expansion of the Leontief inverse and Structural Path Analysis

The Leontief inverse matrix **L** is the backbone of input-output analysis in that it enables calculating gross output **x** = **Ly** required to satisfy a final demand bundle **y**. Even if this final demand **y** included expenditure on only one commodity produced by one industry, gross output would be required by virtually all industries of the world economy. This is essentially due to the complexity of the global supply chain network that is captured in the multi-region input-output (MRIO) table **T**, from which the Leontief inverse is derived via $(\mathbf{I} - \mathbf{T}\hat{\mathbf{x}}^{-1})^{-1}$.

The ability of the Leontief inverse to capture multi-stage supply chains can be demonstrated mathematically. Call $\mathbf{A} = \mathbf{T}\hat{\mathbf{x}}^{-1}$ the MRIO coefficients matrix. Then we find that $\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1}$, which can be expanded into the infinite series $\mathbf{L} = \mathbf{I} + \mathbf{A} + \mathbf{A}^2 + \mathbf{A}^3 + \ldots = \sum_{n=0}^{\infty} \mathbf{A}^n$. Each term $\mathbf{A}^n$ represents the contribution of *n*-stage supply chains to gross output. As each element of **A** is smaller than 1, each consecutive power of **A** diminishes in magnitude, and the infinite series converges[2].

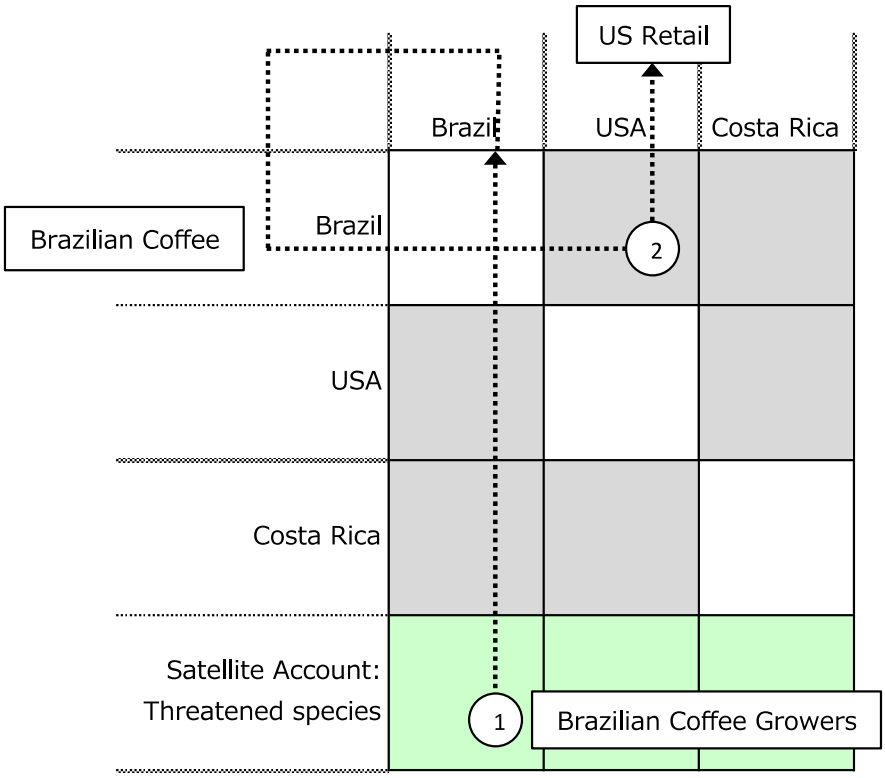
Using the series expansion of the Leontief inverse, biodiversity footprints can be unravelled and broken down into individual supply chains, or structural paths. Let $\mathbf{F} = \mathbf{Q}\hat{\mathbf{x}}^{-1}(\mathbf{I} - \mathbf{T}\hat{\mathbf{x}}^{-1})^{-1}\,\mathbf{y}$, and call $\mathbf{q} = \mathbf{Q}\hat{\mathbf{x}}^{-1}$ an threats coefficients matrix. We find that $\mathbf{F} = \mathbf{q}(\mathbf{I} - \mathbf{A})^{-1}\,\mathbf{y}$ and $F_i = \sum_{lm} q_{il}(\delta_{lm} + A_{lm} + \cdots)y_m$. This sum breaks down into

$$F_i = \sum_m q_{im}y_m + \sum_{lm} q_{il}A_{lm}y_m + \sum_{klm} q_{ik}A_{kl}A_{lm}y_m + \sum_{jklm} q_{ij}A_{jk}A_{kl}A_{lm}y_m + \cdots.$$

Each term $q_{ij}A_{jk} \ldots A_{lm}y_{lm}$ represents a supply chain starting with an expenditure y_m on a commodity produced by industry *m*, proceeding with an input A_{lm} by another industry *l* that is required by industry *m* to produce a commodity worth y_m. The supply chain continues via additional upstream suppliers of inputs *k*, and ends with a producing industry *j* that causes threats to species *i*. In particular,

- $\sum_m q_{im}y_m$ describes threats to species occurring directly at the place of final demand (for example because of pollutants emitted by a household),
- $\sum_{lm} q_{il}A_{lm}y_m$ describes threats facilitated indirectly through one-stage supply chains (for example because of emissions from a factory producing consumer goods),
- $\sum_{klm} q_{ik}A_{kl}A_{lm}y_m$ describes threats facilitated indirectly through two-stage supply chains (for example because of overfishing of marine species destined for processing and canning, and then finally sold),
- $\sum_{jklm} q_{ij}A_{jk}A_{kl}A_{lm}y_m$ describes threats facilitated indirectly through three-stage supply chains (for example because of habitat destruction by wheat grown for a flour mill making flour for a bakery selling bread to consumers),
- and so on.

9 Input-output tables and matching satellite accounts



1 Number of species threatened by Brazilian coffee growers

2 Value of coffee exported by Brazil for US retailers

Fig. S5: MRIO table (grey: international trade blocks; white: domestic inter-industry blocks) with matching threatened–species satellite accounts (green). Data point (1) is an element of the satellite account, describing the number of threats to species exerted by Brazilian coffee growers. Data point (2) describes the value of coffee exported by Brazil for US retail outlets. These two data points make up a supply chain (dotted arrow) along which consumers of retailed coffee in the USA indirectly cause threats to species in Brazil. The integrated analysis of threats to species and monetary transactions is possible because the United Nations' System of Environmental-Economic Accounts (SEEA, [3]) stipulates in its Chapter 4 the standard structure of hybrid flow accounts. Here, the satellite accounts containing information on environmental pressure (for example threats), expressed in physical units, are arranged underneath a monetary input-output table, and match the input-output table in its industry classification.

10 Detailed description of procedures applied to integrate the IUCN Red List with the MRIO table

We integrated the Red List of Threatened Species compiled by the International Union for Conservation of Nature and Natural Resources (IUCN)[4] plus a compatible list of threatened bird species from Bird Life International[5] with a new global multi-region input-output (MRIO) database[6]. The combined list provides country-wise information on K = 197 – 31 = 166 detailed threat causes (197 old and new threat cause classifications, of which we omitted 31 causes that could not be linked to specific human industrial activities; these covered invasive species, geological events, intrinsic population factors, fires, and some natural system modifications, see *SI Section 11*). Threats driven by illegal activities (bushmeat hunting, illegal forestry or fishing practices, etc) were treated identically to threats due to legal hunting, forestry, fishing, etc, as no regular data exist with which to distinguish either the legality of threats or the share of illegal activity in various economic sectors. IUCN distinguishes 8 levels of threat of which we excluded five (Extinct, Extinct in the Wild, Data Deficient, Least Concern, and Near Threatened) and summed over the remaining L = 3: Critically Endangered, Endangered, and Vulnerable. The combined Red List covers 19,416 Animalia species. Excluding the 31 threat causes and the 5 threat levels, P = 6,964 species, R = 24,864 country/species threat records, and S = 171,825 country/species/cause sub-records were available for analysis. The MRIO tables contain the intra- and inter-national monetary transactions between T = 15,909 industry sectors.

We constructed a binary $K \times T$ concordance matrix $\mathbf{B}$ by assigning for each threat cause listed in the Red List a value of 1 to those industry sectors in the MRIO database that exert the respective threat, and 0 otherwise. For species threatened by climate change responsibility was allocated to all sectors worldwide. We normalized the binary concordance according to $\mathbf{N} = (\widehat{\mathbf{Bx}})^{-1}\mathbf{B}\hat{\mathbf{x}}$, using $T \times 1$ normalization weights $\mathbf{x}$, with the hat symbol denoting diagonalization of a vector. Sectors are weighted by their gross industrial output for all causes except for climate change, where the weights are based on their GHG emissions. This normalization ensures that concordance rows sum to 1, and that threat causes are not multiple-counted. We converted the original l=1,…,L $S \times K$ Red List sub-records $\mathbf{S}^{(l)}$ into l=1,…,L $S \times T$ matrices $\mathbf{C}^{(l)} = \mathbf{S}^{(l)}\,\mathbf{N}$. We aggregated those rows referring to the same country/species record, to create an $R \times T$ matrix $\mathbf{C}_{\mathrm{ag}}^{(l)}$, with row sums being the number of causes listed for each record. We normalized each $\mathbf{C}_{\mathrm{ag}}^{(l)}$ according to $\mathbf{R} = (\widehat{\mathbf{C}_{\mathrm{ag}}^{(l)}\mathbf{1}})^{-1}\mathbf{C}_{\mathrm{ag}}^{(l)}$, using a $T \times 1$ summation operator $\mathbf{1} = \{1,1,\ldots,1\}^{\mathrm{t}}$. This operation weights all threat causes equally as there are no data with which to weight threat severity. Finally, we aggregated those rows referring to the same species, and summed over all threat levels, to create a $P \times T$ matrix $\mathbf{R}_{\mathrm{ag}}$ with row sums being the number of records listed for each species. The matrix $\mathbf{R}_{\mathrm{ag}}$ shows species threats against exerting industry sectors, and therefore conforms to the standard format of satellite accounts that is required for integrated environmental-economic analysis (*Section 9*). Further details on all data processing are in *SI Section 10.* Following Leontief's environmentally extended input-output calculus[7], we determined the biodiversity footprint $\mathbf{F}$ ($N \times 1$) resulting from monetary expenditure $\mathbf{y}$ ($T \times 1$) of final consumers as $\mathbf{F} = \mathbf{R}_{\mathrm{ag}}\hat{\mathbf{x}}^{-1}(\mathbf{I} - \mathbf{T}\hat{\mathbf{x}}^{-1})^{-1}\,\mathbf{y}$, where $\mathbf{T}$ denotes the $T \times T$ MRIO table, and $\mathbf{I}$ is a $T \times T$ identity matrix. Whilst elements of the satellite account $\mathbf{R}_{\mathrm{ag}}$ represent threats to species caused directly by a particular industry in producing its gross output, biodiversity footprints $\mathbf{F}$ quantify threats caused indirectly as a consequence of the expenditure of a final consumer. For example, whilst $\mathbf{R}_{\mathrm{ag}}$ may specify the number of species threatened in Mexico caused directly by coffee and tea growing activities there, $\mathbf{F}$ contains the number of species threatened in Mexico caused indirectly by consumer spending on Mexican coffee beans in the USA. Such international indirect threats are facilitated by complex, multi-stage, global supply chains. These supply chains are captured by the Leontief inverse matrix $(\mathbf{I} - \mathbf{T}\hat{\mathbf{x}}^{-1})^{-1}$, through the usage of the international trade transactions contained in the MRIO table $\mathbf{T}$ (*Sections 2, 8 and 9*). It is possible to identify the main implicated-commodity flows along individual supply chains by using Structural Path Analysis (SPA, *SI Section 8*). In our most detailed view on trade-driven biodiversity loss we use SPA to trace, extract, and rank international multi-stage supply chains linking producers and consumers in different parts of the world. SPA queries a global input-output table (*Sections 8* and *9*) and is therefore able to capture supply chains of any length and complexity, so that species threats are attributed to countries where commodities are finally consumed, and not simply to immediate trading partners.

After excluding 40 threat causes (covering natural disasters, intrinsic factors, and invasive species, *see Section 11*) and 5 threat levels (Extinct, Extinct in the Wild, Data Deficient, Least Concern, and Near Threatened), the remaining IUCN dataset available for our analysis counted $K = 197 - 31 = 166$ detailed threat causes, $P = 6{,}964$ species, $R = 24{,}864$ country/species threat records, and $S = 171{,}825$ country/species/cause sub-records. This means that each species is (on average) threatened in $R/P \approx 3.5$ countries, and each country/species record contains (on average) $S/R \approx 7$ threat causes.

10.1 Constructing a threat-cause / industry sector concordance matrix

Each of the 157 IUCN threat causes (e.g. "Accidental mortality -> Collision" or "Agricultural effluents -> Herbicides and pesticides") can be linked to a subset of the $T = 15{,}909$ industry sectors in the MRIO table. For each of the $c = 1,\ldots,187$ countries in the MRIO database, we constructed a binary $K \times T$ concordance matrix $\mathbf{B}^{(c)}$ that for each threat cause lists a value of 1 to those industry sectors in the MRIO database that exert the respective threat, and 0 otherwise. This concordance matrix was constructed in a number of steps.

In a first step, each of the 157 threat causes was allocated to zero, one, or multiple sectors in the economic Common Product Classification (CPC V1.0). This allocation is accomplished using a $K \times C$ concordance matrix $\mathbf{B}_1$ with $K = 157$ rows and $C = 3{,}660$ (uncompressed; C=71 compressed) columns, where each row contains values of 1 in those columns that belong to the economic sector(s) to which that threat is attributed. This concordance matrix is attached in a separate file. The Common Product Classification (CPC V1.0, not to be confused with CPC V1.1), is available online at http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=3&Lg=1.

136 threats were attributed to one or more sectors. The IUCN threat cause "2.3.1 Nomadic grazing" was attributed to the Common Product Classification (CPC V1.0) sector "02.1 – Live animals". Species threats due to nomadic grazing are attributed to the live animals sector, and will flow through domestic and international supply chains identically as live animals. The CPC live animals sector is further divided into sheep and bovines; since the threat "2.3.1 - Nomadic grazing" does not differentiate between sheep and bovines the threat will be attributed between the two proportional to their monetary turnover. In Mongolia these sheep and beef supply chains are likely to be short and end in domestic consumption, whereas in New Zealand sheep and beef exports are likely to end with foreign consumption. The IUCN threat cause "3.2 – Mining and quarrying" was allocated to multiple sectors: coal and lignite, uranium ores, metal ores, sand, stone, and clay, and other minerals (CPC codes 11, 13, 14, 15, 16). Species threatened by Mining and Quarrying will be attributed to these five sectors proportional to their monetary turnover. Thus in a country with no uranium mining industry species threatened by Mining and Quarrying will not be attributed to uranium mining.

22 threats could not be linked to specific sectors and were instead allocated across all sectors in the economy either on the basis of monetary turnover or GHG emissions. The IUCN threat causes "6. Human intrusion & disturbance", "9. Pollution", and a number of "Other causes"/"Unknown causes" threat causes were allocated across all sectors on the basis of monetary turnover. IUCN threat causes "11. Climate change and severe weather" and its subordinates were allocated to all sectors worldwide weighted on the basis of each sector's GHG emissions.

In a second and final step, the CPC concordance matrix $\mathbf{B}_1$ was post-multiplied with $C \times T$ concordance matrices $\mathbf{B}_2^{(c)}$ that relate CPC sectors to the sector classification of countries $c = 1,\ldots,187$ in the MRIO table, yielding 187 $K \times T$ binary concordance matrices $\mathbf{B}^{(c)}$ for countries c. The two-step procedure was chosen because changes in the allocation of threat causes to generic (i.e. not country-specific) industries could be made easily in the $\mathbf{B}_1$ matrix only, rather than for every of the 187 MRIO countries represented by the $\mathbf{B}_2^{(c)}$. Table S4.1 provides an example for three $K \times T$ binary concordance matrices $\mathbf{B}^{(c)}$, each listing $K = 4$ threat causes, and $T = 13$ industry sectors.

Table S4.1: Numerical example for three countries' $K \times T$ binary concordance matrices $\mathbf{B}^{(c)}$, each listing $K = 4$ threat causes, and $T = 13$ industry sectors.

$\mathbf{B}^{(c)}$ matrix, binary concordance	Country 1				Country 2				Country 3				
	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Country 1 Agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0
Country 1 Forestry	0	1	0	0	0	0	0	0	0	0	0	0	0
Country 1 Pollution	0	0	1	1	0	0	0	0	0	0	0	0	0
Country 1 Climate change	1	1	1	1	1	1	1	1	1	1	1	1	1
Country 2 Agriculture	0	0	0	0	1	0	0	0	0	0	0	0	0
Country 2 Forestry	0	0	0	0	0	1	0	0	0	0	0	0	0
Country 2 Pollution	0	0	0	0	0	0	1	1	0	0	0	0	0
Country 2 Climate change	1	1	1	1	1	1	1	1	1	1	1	1	1
Country 3 Agriculture	0	0	0	0	0	0	0	0	1	0	0	0	0
Country 3 Forestry	0	0	0	0	0	0	0	0	0	1	0	0	0
Country 3 Pollution	0	0	0	0	0	0	0	0	0	0	1	1	1
Country 3 Climate change	1	1	1	1	1	1	1	1	1	1	1	1	1

Table S4.2: Numerical example for three countries' $K \times T$ normalised concordance matrices $\mathbf{N}^{(c)}$, each listing $K = 4$ threat causes, and $T = 13$ industry sectors.

$\mathbf{N}^{(c)}$ matrix, normalised concordance	Country 1				Country 2				Country 3				
	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Country 1 Agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0
Country 1 Forestry	0	1	0	0	0	0	0	0	0	0	0	0	0
Country 1 Pollution	0	0	0.09	0.91	0	0	0	0	0	0	0	0	0
Country 1 Climate change	0	0	0	0	0	0	0	0	0	0	0	0	0
Country 2 Agriculture	0	0	0	0	1	0	0	0	0	0	0	0	0
Country 2 Forestry	0	0	0	0	0	1	0	0	0	0	0	0	0
Country 2 Pollution	0	0	0	0	0	0	0	1	0	0	0	0	0
Country 2 Climate change	0	0	0	0	0	0	0	0	0	0	0	0	0
Country 3 Agriculture	0	0	0	0	0	0	0	0	1	0	0	0	0
Country 3 Forestry	0	0	0	0	0	0	0	0	0	1	0	0	0
Country 3 Pollution	0	0	0	0	0	0	0	0	0	0	0.18	0.24	0.59
Country 3 Climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17
Weighting variables													
Sectoral GHG emissions (Mt CO_2)	20	60	400	40	30	80	600	100	100	20	1000	150	550
Sectoral gross output ($bn)	5	1	1	10	10	5	3	20	20	5	15	20	50

10.2 Normalisation steps

We normalized the binary concordances $\mathbf{B}^{(c)}$ according to $\mathbf{N}^{(c)} = (\widehat{\mathbf{B}^{(c)}\mathbf{x}})^{-1}\mathbf{B}^{(c)}\hat{\mathbf{x}}$, using $T\times1$ normalization weights $\mathbf{x}$, with the hat symbol to denoting diagonalization of a vector. Sectors are weighted by their gross industrial output for all causes except for climate change, where the weights are based on their GHG emissions. This normalization ensures that concordance rows sum to 1, and that threat causes are not multiple-counted. An example for this normalisation step is given in Table S4.2.

10.3 Conversion of IUCN Red List

The processing stages related to the IUCN data conversion are shown in Table S4.3.

For each of the threat levels l=1,…,L, we converted the original $S\times K$ Red List sub-records $\mathbf{S}^{(l)}$ into l=1,…,L $S\times T$ matrices $\mathbf{C}^{(l)} = \mathbf{S}^{(l)}\ \mathbf{N}$. During this conversion, we processed each sub-records individually, by choosing the appropriate $\mathbf{N}^{(c)}$ to match that sub-record's country c. An example for a $\mathbf{C}$ matrix appears in Table S4.4.

We aggregated those rows referring to the same country/species record, to create an $R\times T$ matrix $\mathbf{C}_{\mathrm{ag}}^{(l)}$, with row sums being the number of causes listed for each record. An example for a $\mathbf{C}_{\mathrm{ag}}$ matrix appears in Table S4.4.

We normalized each $\mathbf{C}_{\mathrm{ag}}^{(l)}$ according to $\mathbf{R} = (\widehat{\mathbf{C}_{\mathrm{ag}}^{(l)}\mathbf{1}})^{-1}\mathbf{C}_{\mathrm{ag}}^{(l)}$, using a $T\times1$ summation operator $\mathbf{1} = \{1,1,\ldots,1\}^{\mathrm{t}}$. This operation weights all threat causes equally as there are no data with which to weight threat severity. An example for an $\mathbf{R}$ matrix appears in Table S4.4.

Finally, we aggregated those rows referring to the same species, and summed over all three threat levels, to create a $P\times T$ matrix $\mathbf{R}_{\mathrm{ag}}$ with row sums being the number of records listed for each species. The matrix $\mathbf{R}_{\mathrm{ag}}$ shows species threats against exerting industry sectors, and therefore conforms with the standard format of satellite accounts that is required for integrated environmental-economic analysis (*SI Section 9*). An example for an $\mathbf{R}_{\mathrm{ag}}$ matrix appears in Table S4.4.

Table S4.3: Characteristics of various processing stages during the IUCN data conversion

Matrix	Row dimension	Normalised ?	Total sum of elements
$\mathbf{C}$	S country/species/cause sub-records	Yes	S country/species/cause sub-records
$\mathbf{C}_{\mathrm{ag}}$	R country/species threat records	No	S country/species/cause sub-records
$\mathbf{R}$	R country/species threat records	Yes	R country/species threat records
$\mathbf{R}_{\mathrm{ag}}$	P species	No	R country/species threat records

10.4 Sector attribution problems related to the concordance matrix

The IUCN threat causes and CPC sectors cannot be perfectly linked, because IUCN threat causes may be more or less aggregated than CPC sectors, and because threats to species may not be proportional to industry turnover. These issues may lead to a threatened species being attributed incorrectly to a particular sector. Consider threat cause "2.4.1- Subsistence/artisanal aquaculture". We have attributed this threat to CPC sector "04 – Fish and other fishing products". It is conceivable that a country's fishing sector is comprised of some high-impact subsistence aquaculture with relatively low monetary turnover and exports, and also some relatively low-impact, high turnover and export-intensive open ocean fishing. In this case a portion of the species threat that should be attributed to domestic subsistence aquaculture would be instead attributed to the fish exports because of its larger monetary turnover. Whilst in rare cases, such attribution errors may be significant, they are impossible to avoid entirely. There is no other consistent way to apportion this, since the only information that exists consistently for all industries and countries in the world is monetary turnover. The use of monetary

turnover can be further justified because high-turnover activities drive expanded environmental degradation more quickly than lower turnover activities.

Another potential source of error is mistakes in the concordance matrix attributing threats to particular industries. The concordance matrix used in this work is published so that readers can review our attributions of threats to sectors.

10.5 Country attribution problems

Offshore fish species are registered as threatened against the territory of the country where the threat occurs. However, this country might not, or only in part, be the one that threatens these species, since fleets from other nations may contribute to stock depletion. Whilst it is impossible to unravel such national contributions to fish threats (since geographical information on the fishing grounds used by each nation's fleets is not available), threatened marine fish species are recorded against particular countries on the basis of threats occurring in these countries' Exclusive Economic Zones. These zones are predominantly exploited by national fleets, which supports the assumptions made in this work [8].

Migratory birds may be listed as threatened in many countries, due to several threats, and these are recorded and treated separately, in accordance with our practice of treating each country/species pair as a separate record, even if listed against the same species.

Table S4.4: Numerical example for matrices **C**, $\mathbf{C}_{ag}$, **R** and $\mathbf{R}_{ag}$, following the example given in Tabs S4.1 and S4.2. The elements of matrices **C** and $\mathbf{C}_{ag}$ sum up to *S* country/species/cause sub-records, whilst the elements of **R** and $\mathbf{R}_{ag}$ sum up to *R* country/species threat records.

C matrix, weighting of each cause	Country 1				Country 2				Country 3				
Total: 9 species-country-cause sub-records	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Species A, Country 1, forestry	0	1	0	0	0	0	0	0	0	0	0	0	0
Species A, Country 2, climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17
Species A, Country 3, agriculture	0	0	0	0	0	0	0	0	1	0	0	0	0
Species A, Country 3, forestry	0	0	0	0	0	0	0	0	0	1	0	0	0
Species A, Country 3, pollution	0	0	0	0	0	0	0	0	0	0	0.18	0.24	0.59
Species A, Country 3, climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17
Species B, Country 1, agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0
Species B, Country 2, agriculture	0	0	0	0	1	0	0	0	0	0	0	0	0
Species B, Country 2, climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17

$\mathbf{C}_{ag}$ matrix, accumulation of causes	Country 1				Country 2				Country 3				
Total: 9 species-country-cause sub-records	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Species A, Country 1, forestry	0	1	0	0	0	0	0	0	0	0	0	0	0
Species A, Country 2, climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17
Species A, Country 3, ag/for/poll/cc	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	1.03	1.01	0.49	0.28	0.76
Species B, Country 1, agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0
Species B, Country 2, ag/cc	0.01	0.02	0.13	0.01	1.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17

R matrix, normalisation of each record	Country 1				Country 2				Country 3				
Total: 5 species-country records	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Species A, Country 1, forestry	0	1	0	0	0	0	0	0	0	0	0	0	0
Species A, Country 2, climate change	0.01	0.02	0.13	0.01	0.01	0.03	0.19	0.03	0.03	0.01	0.32	0.05	0.17
Species A, Country 3, ag/for/poll/cc	0.00	0.00	0.03	0.00	0.00	0.01	0.05	0.01	0.26	0.25	0.12	0.07	0.19
Species B, Country 1, agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0
Species B, Country 2, ag/cc	0.00	0.01	0.06	0.01	0.50	0.01	0.10	0.02	0.02	0.00	0.16	0.02	0.09

$\mathbf{R}_{ag}$ matrix, accumulation of records	Country 1				Country 2				Country 3				
Total: 5 species-country records	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Industry	Agriculture	Forestry	Energy	Metals	Other industry
Species A	0.01	1.02	0.16	0.02	0.01	0.03	0.24	0.04	0.29	0.26	0.44	0.12	0.37
Species B	1.00	0.01	0.06	0.01	0.50	0.01	0.10	0.02	0.02	0.00	0.16	0.02	0.09

11 Table S.5: List of 197 total and 166 used threat causes

Broad Threat Class	General/specific IUCN Threat Cause	Included in analysis?
1	1. Residential & commercial development	
1	1.1 Housing & urban areas	
1	1.2 Commercial & industrial areas	
1	1.3 Tourism & recreation areas	
2	2. Agriculture & aquaculture	
2	2.1 Annual & perennial non-timber crops	
2	2.1.1 Shifting agriculture	
2	2.1.2 Small-holder farming	
2	2.1.3 Agro-industry farming	
2	2.1.4 Scale Unknown/Unrecorded	
2	2.2 Wood & pulp plantations	
2	2.2.1 Small-holder plantations	
2	2.2.2 Agro-industry plantations	
2	2.2.3 Scale Unknown/Unrecorded	
2	2.3 Livestock farming & ranching	
2	2.3.1 Nomadic grazing	
2	2.3.2 Small-holder grazing, ranching or farming	
2	2.3.3 Agro-industry grazing, ranching or farming	
2	2.3.4 Scale Unknown/Unrecorded	
2	2.4 Marine & freshwater aquaculture	
2	2.4.1 Subsistence/artisinal aquaculture	
2	2.4.2 Industrial aquaculture	
2	2.4.3 Scale Unknown/Unrecorded	
3	3. Energy production & mining	
3	3.1 Oil & gas drilling	
3	3.2 Mining & quarrying	
3	3.3 Renewable energy	
4	4. Transportation & service corridors	
4	4.1 Roads & railroads	
4	4.2 Utility & service lines	
4	4.3 Shipping lanes	
4	4.4 Flight paths	
5	5. Biological resource use	
5	5.1 Hunting & trapping terrestrial animals	
5	5.1.1 Intentional use (species in the target)	
5	5.1.2 Unintentional effects (species is not the target)	
5	5.1.3 Persecution/control	
5	5.1.4 Motivation Unknown/Unrecorded	
5	5.2 Gathering terrestrial plants	
5	5.2.1 Intentional use (species in the target)	
5	5.2.2 Unintentional effects (species is not the target)	
5	5.2.4 Motivation Unknown/Unrecorded	
5	5.3 Logging & wood harvesting	
5	5.3.1 Intentional use (subsistence/small scale)	
5	5.3.2 Intentional use (large scale)	
5	5.3.3 Unintentional effects (subsistence/small scale)	
5	5.3.4 Unintentional effects (large scale)	
5	5.3.5 Motivation Unknown/Unrecorded	
5	5.4 Fishing & harvesting aquatic resources	
5	5.4.1 Intentional use (subsistence/small scale)	
5	5.4.2 Intentional use (large scale)	
5	5.4.3 Unintentional effects (subsistence/small scale)	
5	5.4.4 Unintentional effects (large scale)	
5	5.4.5 Persecution/control	
5	5.4.6 Motivation Unknown/Unrecorded	
5	5.2.3 Persecution/control (NOTE, this threat is not used in the current dataset)	Unused

6	6. Human intrusion & disturbance	
6	6.1 Recreational activities	
6	6.2 War, civil unrest & military exercises	
6	6.3 Work & other activities	
7	7. Natural system modifications	Unused
7	7.1 Fire & fire suppression	Unused
7	7.1.1 Increase in fire frequency/intensity	Unused
7	7.1.2 Supression in fire frequency/intensity	Unused
7	7.1.3 Trend Unknown/Unrecorded	Unused
7	7.2 Dams & water management/use	
7	7.2.1 Abstraction of surface water (domestic use)	
7	7.2.10 Large dams	
7	7.2.11 Dams (size unknown)	
7	7.2.2 Abstraction of surface water (commercial use)	
7	7.2.3 Abstraction of surface water (agricultural use)	
7	7.2.4 Abstraction of surface water (unknown use)	
7	7.2.5 Abstraction of ground water (domestic use)	
7	7.2.6 Abstraction of ground water (commercial use)	
7	7.2.7 Abstraction of ground water (agricultural use)	
7	7.2.8 Abstraction of ground water (unknown use)	
7	7.2.9 Small dams	
7	7.3 Other ecosystem modifications	
8	8. Invasive & other problematic species & genes	Unused
8	8.1 Invasive non-native/alien species	Unused
8	8.1.1 Unspecified species	Unused
8	8.1.2 Named species	Unused
8	8.2 Problematic native species	Unused
8	8.3 Introduced genetic material	Unused
9	9. Pollution	
9	9.1 Domestic & urban waste water	
9	9.1.1 Sewage	
9	9.1.2 Run-off	
9	9.1.3 Type Unknown/Unrecorded	
9	9.2 Industrial & military effluents	
9	9.2.1 Oil spills	
9	9.2.2 Seepage from mining	
9	9.2.3 Type Unknown/Unrecorded	
9	9.3 Agricultural & forestry effluents	
9	9.3.1 Nutrients loads	
9	9.3.2 Soil erosion, sedimentation	
9	9.3.3 Herbicides and pesticides	
9	9.3.4 Type Unknown/Unrecorded	
9	9.4 Garbage & solid waste	
9	9.5 Air-borne pollutants	
9	9.5.1 Acid rain	
9	9.5.2 Smog	
9	9.5.3 Ozone	
9	9.5.4 Type Unknown/Unrecorded	
9	9.6 Excess energy	
9	9.6.1 Light pollution	
9	9.6.2 Thermal pollution	
9	9.6.3 Noise pollution	
9	9.6.4 Type Unknown/Unrecorded (NOTE, this threat is not used in the current dataset)	
10	10. Geological events	Unused
10	10.1 Volcanoes	Unused
10	10.2 Earthquakes/tsunamis	Unused
10	10.3 Avalanches/landslides	Unused
11	11. Climate change & severe weather	
11	11.1 Habitat shifting & alteration	
11	11.2 Droughts	
11	11.3 Temperature extremes	
11	11.4 Storms & flooding	

11	11.5 Other impacts	
12	12. Other options (NOTE, this threat is not used in the current dataset)	
12	12.1 Other threat (NOTE, this threat is not used in the current dataset)	
13	OLD 1 Habitat Loss/Degradation (human induced)	
13	OLD 1.4.5 Habitat Loss->Infrastructure->Transport - water	
13	OLD 1.4.9 Habitat Loss/Degradation (human induced)->Infrastructure development->Other	
13	OLD 1.4.10 Habitat Loss/Degradation (human induced)->Infrastructure development->Unknown	
13	OLD 1.8 Habitat Loss/Degradation (human induced)->Other causes	
13	OLD 1.9 Habitat Loss/Degradation (human induced)->Unknown causes	
13	OLD 1.1 Habitat Loss/Degradation (human induced)->Agriculture	
13	OLD 1.1.8 Habitat Loss/Degradation (human induced)->Agriculture->Other	
13	OLD 1.1.9 Habitat Loss/Degradation (human induced)->Agriculture->Unknown	
13	OLD 1.3 Habitat Loss/Degradation (human induced)->Extraction	
13	OLD 1.3.7 Habitat Loss/Degradation (human induced)->Extraction->Other	
13	OLD 1.4 Habitat Loss/Degradation (human induced)->Infrastructure development	
13	OLD 1.4.4 Habitat Loss->Infrastructure->Transport - land/air	
14	OLD 3 Harvesting (hunting/gathering)	
14	OLD 3.1 Harvesting (hunting/gathering)->Food	
14	OLD 3.3.1 Harvesting (hunting/gathering)->Fuel->Subsistence use/local trade	
14	OLD 3.3.3 Harvesting (hunting/gathering)->Fuel->Regional/international trade	
14	OLD 3.4 Harvesting (hunting/gathering)->Materials	
14	OLD 3.4.1 Harvesting (hunting/gathering)->Materials->Subsistence use/local trade	
14	OLD 3.4.2 Harvesting (hunting/gathering)->Materials->Sub-national/national trade	
14	OLD 3.4.3 Harvesting (hunting/gathering)->Materials->Regional/international trade	
14	OLD 3.5 Harvesting (hunting/gathering)->Cultural/scientific/leisure activities	
14	OLD 3.5.1 Harvesting (hunting/gathering)->Cultural/scientific/leisure activities->Subsistence use/local trade	
14	OLD 3.5.2 Harvesting (hunting/gathering)->Cultural/scientific/leisure activities->Sub-national/national trade	
14	OLD 3.1.1 Harvesting (hunting/gathering)->Food->Subsistence use/local trade	
14	OLD 3.5.3 Harvesting (hunting/gathering)->Cultural/scientific/leisure activities->Regional/international trade	
14	OLD 3.6 Harvesting (hunting/gathering)->Other	
14	OLD 3.7 Harvesting (hunting/gathering)->Unknown	
14	OLD 3.1.2 Harvesting (hunting/gathering)->Food->Sub-national/national trade	Unused
14	OLD 3.1.3 Harvesting (hunting/gathering)->Food->Regional/international trade	
14	OLD 3.2.1 Harvesting (hunting/gathering)->Medicine->Subsistence use/local trade	
14	OLD 3.2.2 Harvesting (hunting/gathering)->Medicine->Sub-national/national trade	
14	OLD 3.2.3 Harvesting (hunting/gathering)->Medicine->Regional/international trade	
15	OLD 4 Accidental mortality	
15	OLD 4.1 Accidental mortality->Bycatch	
15	OLD 4.1.1 Accidental mortality->Bycatch->Fisheries related	
15	OLD 4.1.1.1 Accidental mortality->Bycatch->Fisheries related->Hooking	
15	OLD 4.1.1.2 Accidental mortality->Bycatch->Fisheries related->Netting	
15	OLD 4.1.1.3 Accidental mortality->Bycatch->Fisheries related->Entanglement	
15	OLD 4.1.1.4 Accidental mortality->Bycatch->Fisheries related->Dynamite	
15	OLD 4.1.1.5 Accidental mortality->Bycatch->Fisheries related->Poisoning	
15	OLD 4.1.3 Accidental mortality->Bycatch->Other	
15	OLD 4.1.4 Accidental mortality->Bycatch->Unknown	
15	OLD 4.2 Accidental mortality->Collision	
15	OLD 4.2.2 Accidental maortality->Collision->Vehicle collision	
15	OLD 4.2.3 Accidental mortality->Collision->Other	
15	OLD 4.2.4 Accidental mortality->Collision->Unknown	
16	OLD 5 Persecution	
16	OLD 5.1 Persecution->Pest control	
16	OLD 5.2 Persecution->Other	
17	OLD 6 Pollution (affecting habitat and/or species)	
17	OLD 6.1.1 Pollution (affecting habitat and/or species)->Atmospheric pollution->Global warming/oceanic warming	
17	OLD 6.2 Pollution (affecting habitat and/or species)->Land pollution	
17	OLD 6.2.4 Pollution (affecting habitat and/or species)->Land pollution->Other non-agricultural	
17	OLD 6.2.6 Pollution (affecting habitat and/or species)->Land pollution->Other	

17	OLD 6.3 Pollution (affecting habitat and/or species)->Water pollution	
17	OLD 6.3.4 Pollution (affecting habitat and/or species)->Water pollution->Other non-agricultural	
17	OLD 6.3.11 Pollution (affecting habitat and/or species)->Water pollution->Other	
17	OLD 6.5 Pollution (affecting habitat and/or species)->Unknown	Unused
18	OLD 7.7 Natural disasters->Other	Unused
19	OLD 9 Intrinsic factors	Unused
19	OLD 9.1 Intrinsic factors->Limited dispersal	Unused
19	OLD 9.2 Intrinsic factors->Poor recruitment/reproduction/regeneration	Unused
19	OLD 9.3 Intrinsic factors->High juvenile mortality	Unused
19	OLD 9.4 Intrinsic factors->Inbreeding	Unused
19	OLD 9.5 Intrinsic factors->Low densities	Unused
19	OLD 9.6 Intrinsic factors->Skewed sex ratios	Unused
19	OLD 9.7 Intrinsic factors->Slow growth rates	Unused
19	OLD 9.8 Intrinsic factors->Population fluctuations	Unused
19	OLD 9.9 Intrinsic factors->Restricted range	Unused
19	OLD 9.10 Intrinsic factors->Other	Unused
19	OLD 9.11 Intrinsic factors->Unknown	Unused
20	OLD 10 Human disturbance	
20	OLD 10.4 Human disturbance->Transport	
21	OLD 11 Other	
22	OLD 12 Unknown	

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References

1 Kanemoto, K., Lenzen, M., Peters, G. P., Moran, D. & Geschke, A. Frameworks for comparing emissions associated with production, consumption and International trade. *Environ*. *Sci*. *Technol*. **46**, 172–179 (2012).

2 Waugh, F. V. Inversion of the Leontief matrix by power series. *Econometrica* **18**, 142-154 (1950).

3 UNSD. Handbook of National Accounting: Integrated Environmental and Economic Accounting (SEEA 2003). (United Nations Statistics Division, New York, USA, http://unstats.un.org/unsd/envAccounting/seea2003.pdf, 2003).

4 Anon. IUCN Red List of Threatened Species. Version 2011.2. *International Union for Conservation of Nature* <http://www.iucnredlist.org> (2011).

5 Anon. Threatened Birds of the World. *Bird Life International* <http://www.birdlife.org> (2011).

6 Lenzen, M., Kanemoto, K., Moran, D. & Geschke, A. *The Eora global multi-region input-output tables*. ISA, Univ.Sydney, Australia <http://www.worldmrio.com> 2011).

7 Leontief, W. & Ford, D. Environmental repercussions and the economic structure: an input-output approach. *Rev*. *Econ*.*Stat*. **52**, 262-271 (1970).

8 Pauly, D. Beyond duplicity and ignorance in global fisheries. *Sci*. *Mar*. **73**, 215-224 (2009).