



*Supplement of*

## **Harmonising the land-use flux estimates of global models and national inventories for 2000–2020**

**Giacomo Grassi et al.**

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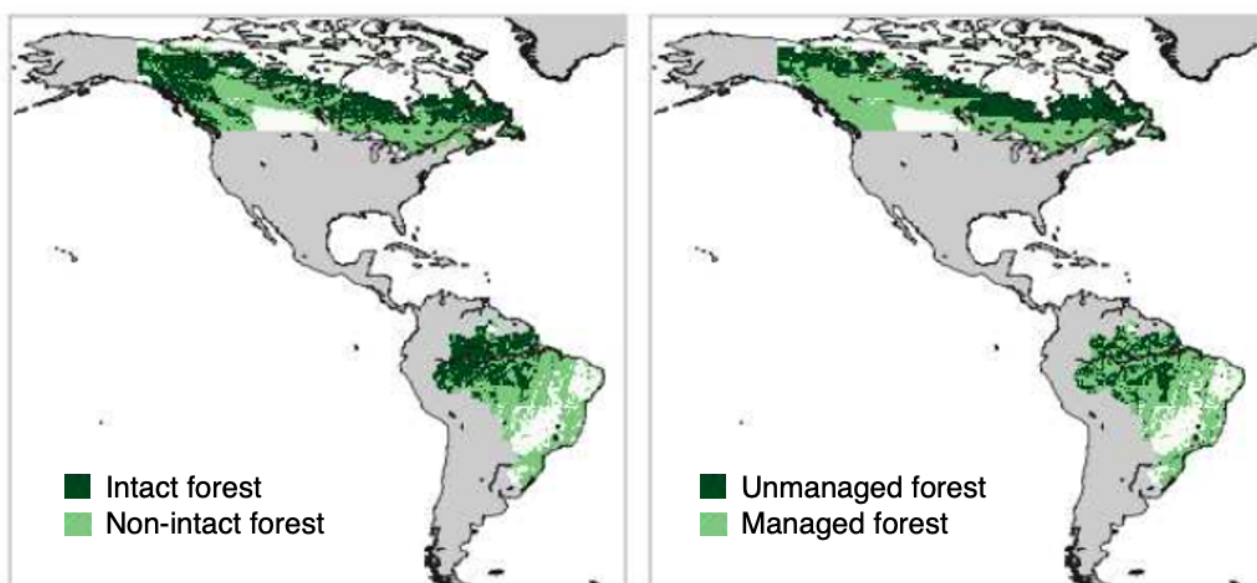
**Table S1.** Key data on forest area and LULUCF fluxes for the 42 countries having a non-intact (managed) forest area greater than 10 Million ha in both our study and National GHG inventories (NGHGs). The data includes the area of non-intact (managed) forest and the CO<sub>2</sub> fluxes (Mt CO<sub>2</sub> yr<sup>-1</sup>, 2000-2020 average) from bookkeeping models (BMs), Dynamic Global Vegetation Models (DGVMs), and NGHGs for LULUCF, forest land, deforestation, and other fluxes. The countries listed represent nearly 90% of the global area of non-intact (managed) forest. BM values are averages of three models and DGVM values are averages of 16 models, consistent with the Global Carbon Budget 2022 (Friedlingstein et al., 2022). Results for all countries, including the yearly values of CO<sub>2</sub> fluxes, are available in the online repository (Grassi et al. 2023).

	Areas of managed forest (Mha, around 2015)		C fluxes (Mt CO <sub>2</sub> yr <sup>-1</sup> , average 2000-2020)											
			LULUCF (sum of all categories)			FOREST				DEFORESTATION		Other land uses + org. soils		
	Used in this study (1)	Based on country data (2)	BMs	NGHGs	BMs + DGVMs	BMs	DGVMs	NGHGs	BMs + DGVMs	BMs	NGHGs	BMs	NGHGs	
Angola	71	53	104	55	-104	-11	-208	2	-219	102	52	13	0	
Argentina	37	49	130	74	76	-3	-54	-11	-57	101	79	32	5	
Australia (3)	44	144	71	14	16	-6	-55	-53	-61	43	65	35	1	
Bolivia	46	53	75	38	-7	-21	-82	15	-103	90	24	6	-1	
Brazil	338	338	1344	771	844	-76	-499	-356	-576	1331	1120	89	8	
Cameroon	34	20	31	-77	-43	-39	-74	-108	-113	67	21	3	10	
Canada	283	283	111	-20	-302	43	-413	-7	-370	51	7	17	-20	
Central African Republic	55	20	9	-229	-107	-15	-116	-333	-130	24	104	-1	0	
Chile	12	18	12	-68	1	6	-11	-71	-5	9	3	-3	1	
China	173	214	3	-943	-320	-331	-324	-790	-655	223	0	111	-153	
Colombia	45	28	68	86	-36	-86	-104	32	-190	149	54	5	0	
Congo	20	24	14	-21	-42	-12	-56	-24	-68	24	3	2	0	
Cote d'Ivoire	20	3	70	28	19	-61	-50	-13	-111	128	41	3	0	
Dem. Rep Congo	154	156	416	271	-16	-224	-432	-292	-656	626	563	13	0	
Ethiopia	19	17	81	62	27	-13	-54	-87	-67	45	149	49	0	
Finland	20	22	11	-22	-15	6	-26	-41	-20	3	3	2	15	
France	17	24	-30	-39	-62	-22	-32	-55	-54	-14	11	6	5	
Gabon	19	18	8	-110	-36	-7	-44	-118	-51	14	8	1	0	
Germany	13	11	-36	-14	-64	-25	-28	-61	-53	-16	1	5	45	
India	38	71	64	-255	-16	-101	-80	-71	-181	131	0	35	-184	
Indonesia	110	121	986	535	654	-427	-331	-401	-758	1004	347	408	589	
Japan	23	25	-23	-71	-66	-32	-43	-77	-75	4	2	6	4	
Lao People's Dem Rep	19	23	39	35	-10	-21	-49	-6	-69	58	42	2	0	
Madagascar	17	9	42	34	0	-54	-41		-95	88	34	7	0	
Malaysia	23	18	99	-225	23	-60	-76	-248	-137	112	23	47	0	
Mexico	53	97	63	-180	-50	-53	-112	-196	-165	107	16	9	0	
Mozambique	43	34	48	39	-31	-11	-78		-89	46	39	13	0	
Myanmar	37	40	133	50	36	-133	-97	-3	-230	255	54	11	0	
Nigeria	15	14	49	287	12	-36	-37	-5	-73	83	292	2	0	
Norway	10	12	2	-21	-13	0	-14	-26	-15	2	5	0	1	
Papua New Guinea	27	9	34	-9	-46	-18	-80	-19	-98	33	8	19	2	
Peru	25	18	58	94	-10	-35	-68	16	-103	85	79	8	0	
Russian Federation	666	686	-63	-628	-1012	-164	-949	-675	-1113	109	6	-8	41	
Spain	12	16	-15	-38	-32	-10	-17	-37	-27	0	1	-6	-1	
Sudan	24	7	10	3	-26	0	-36	0	-36	2	3	8	0	
Sweden	25	28	11	-41	-28	9	-39	-53	-30	2	3	0	10	
Thailand	19	17	52	-16	7	-38	-45	-32	-83	81	15	8	0	
Turkey	11	23	-11	-77	-44	-9	-32	-79	-41	5	1	-7	0	
Ukraine	12	11	-1	1	-14	-12	-12	-31	-24	8	1	3	31	
United Rep of Tanzania	40	48	148	77	59	-32	-90	0	-121	143	77	37	0	
United States of America	247	282	-112	-818	-598	-173	-486	-781	-659	83	125	-22	-161	
Viet Nam	16	15	97	-39	60	-66	-37	-55	-103	131	16	32	-1	
Zambia	37	48	51	39	-60	-4	-110	-71	-115	40	109	15	0	
<i>Sum of countries above</i>	2969	3166	4249	-1367	-1376	-2375	-5625	-5220	-8000	5610	3605	1014	248	
<i>Rest of countries</i>	358	525	557	-564	-250	-823	-807	-1439	-1630	1154	749	225	127	
<b>World</b>	3327	3691	4806	-1932	-1626	-3197	-6432	-6660	-9630	6764	4354	1239	374	
Annex I	1474	1670	-233	-1981	-2509	-571	-2276	-2292	-2847	310	249	28	62	
Non Annex I	1853	2021	5039	49	882	-2627	-4157	-4368	-6783	6454	4105	1211	312	
Developed Countries	802	968	-205	-1413	-1517	-414	-1312	-1645	-1725	200	249	9	-17	
E. Europe and W.-C. Asia	686	727	-40	-675	-1041	-191	-1001	-770	-1192	123	10	29	84	
Asia and developing Pacific	510	592	1635	-939	391	-1390	-1243	-1781	-2634	2312	585	713	256	
Africa and Middle East	662	682	1434	242	-248	-676	-1682	-1664	-2358	1795	1870	314	36	
Latin Amer. and Caribbean	667	722	1983	854	788	-526	-1194	-800	-1720	2334	1639	175	14	

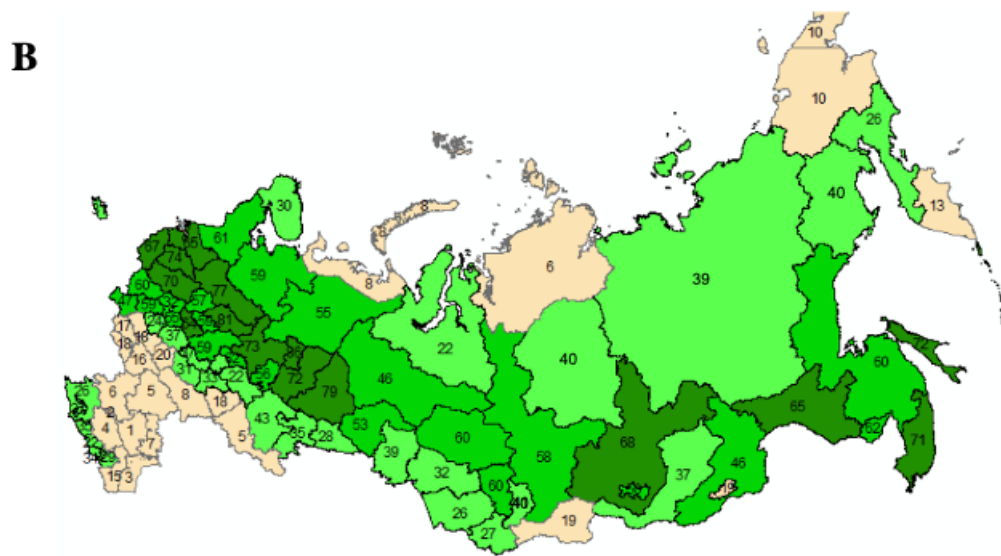
(1) Based on non-intact forest map (Potapov et al. 2017) and Hansen et al. (2013), except for Canada and Brazil, where the country maps of managed forest were used (see Figure S1). For Russia, the tree cover thresholds of Hansen were adjusted to match better the regional distribution of managed forest (see Figure S2).

(2) Based on Grassi et al. (2022), using information on the area of managed forest from country reports to UNFCCC, gap-filled with information on the area of secondary forest and plantations from country reports to FAO-FRA 2020. Gap-filling was applied to about 2% of total forest area.

(3) A large part of the forest area reported as managed in the NGHGI (about 120 Mha of 'other native forests') is assumed to be in carbon equilibrium.



**Figure S1.** Difference between intact/non-intact forest (dark/light green, left panel) and unmanaged/managed forest (dark/light green, right panel) for Canada and Brazil. The intact/non-intact map is from Potapov et al. (2017), the managed/unmanaged map is from the NGHGIs of Canada (Canada, 2022) and Brazil (Brazil, 2020).



**Figure S2.** A: Share of managed forest lands in each region of the Russian Federation (relative to the total area), from the Russian NGHGI (Russian Federation, 2022). B: Share of non-intact forest in each region, as used in our study and obtained by adjusting the tree cover threshold in Hansen et al. (2013) to allow a better match with the distribution of managed forest in the Russian NGHGIs. At national level, the area of managed forest in the Russian NGHGI is 686 Mha. In our study, the area of non-intact forest is 666 Mha.

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