WBG SCORECARD FY24-FY30 METHODOLOGY NOTE

WBG Client Context & Vision Indicators

The purpose of this note is to ensure the rigor, transparency, and reproducibility of the WBG client context and vision indicators included in the new WBG Scorecard FY24-FY30, as well as their alignment with the WBG's vision. Technical teams were asked to provide a sufficiently detailed methodology so that anyone who reads this note can understand its rationale, theory of change, data sources, and method of calculation.

Definitions included in this template are aligned to the WBG Scorecard paper endorsed by the Board on Dec 19th, 2023. The methods notes are living documents and will be subject to updating and revision pending operational inputs and implementation lessons over time.

OVERVIEW	
INDICATOR NAME	**Global greenhouse gas emissions (gigatons of CO_2 equivalent)**
SUB-INDICATORS	N/A
VISION / CLIENT CONTEXT	☒Vision indicator ☐Client context indicator
OUTCOME AREA	☐Protection for the Poorest ☐Healthier Lives ☐Green and blue planet and resilient populations ☐Sustainable food systems ☐Affordable, reliable, and sustainable energy for all ☐Digital services ☐More and Better Jobs ☐No Learning Poverty ☐Effective Macroeconomics and Fiscal Management ☐Inclusive and equitable water and sanitation services ☐Connected Communities ☐Digital connectivity ☐Gender equality and youth inclusion ☐Better Lives for People in Fragility, Conflict, and Violence ☐More private investments
SDG ALIGNMENT	**See https://sdgs.un.org/ for further details on SDGs:** ☐ 1. No Poverty ☐ 2. Zero Hunger ☐ 3. Good Health and Well-being ☐ 4. Quality Education ☐ 5. Gender Equality ☐ 6. Clean Water and Sanitation ☐ 7. Affordable and Clean Energy ☐ 8. Decent Work and Economic Growth ☐ 9. Industry Innovation and Infrastructure ☐ 10. Reduced Inequalities ☐ 11. Sustainable Cities and Communities ☐ 12. Responsible Consumption and Production ☒ 13. Climate Action ☐ 14. Life Below Water ☐ 15. Life on Land ☐ 16. Peace, Justice and Strong Institutions ☐ 17. Partnerships for the Goals List of specific UN targets (if applicable):
UNIT OF MEASURE	☐Number of people ☐Number of countries ☐USD ☐GW ☐Hectares ☐tCO2eq/year ☒Other: Gigatons of carbon dioxide equivalent
LEGACY INDICATOR NAME	☐WB Old Scorecard indicator ☒WBG Old Scorecard indicator: [CO2 emissions (metric tons per capita)] ☐N/A
RATIONALE	
DEFINITION	A measure of annual emissions of greenhouse gasses (GHG) disaggregated at the global level by four gas categories—carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and F-gasses—and 13 subsectors within the energy, industry, waste, agriculture, and land use, land use change, and forestry sectors, standardized to carbon dioxide equivalent values. At the country level, data are further disaggregated by the six greenhouse gases covered by the Kyoto Protocol—CO2, CH4,

	N2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and Sulphur hexafluoride (SF6)—plus hydrochlorofluorocarbons (HCFCs) and nitrogen trifluoride (NF3) and 15 subsectors that further disaggregate the agriculture and the waste sector.
DEVELOPMENT RELEVANCE	Because of its effect on the climate and thus on development, Global greenhouse gas (GHG) emissions is an indicator relevant to the WBG's new vision to create a world free of poverty on a livable planet. Human-induced GHG emissions are driving atmospheric concentration increases of GHGs and thus atmospheric warming, leading to myriad climatic changes. Climate change is already causing more frequent and extreme weather events and higher temperatures globally, with major impacts across the globe and particularly in developing countries, that often have a limited means to adapt and build resilience. The international scientific community has warned that emissions need to decline to net zero by the middle of the 21st century to limit global warming to well below a 2-degree Celsius increase and help avoid the most consequential climate change impacts. WBG-supported development must be aligned to the low-emissions development transition. The World Bank has committed to aligning its activities to the goals of the Paris Agreement, including limiting average global warming to 1.5 degree Celsius Global-, regional-, and country-level emissions levels provide relevant context for the design and tracking of WBG compliance with this requirement. Different data sources can be used to derive an indicator of global and country anthropogenic GHG emissions. To be consistent with the urgency of emissions reduction, and to best reflect global progress on emissions reduction, this indicator is based on data that are as up to date as possible and permit meaningful, annual updates. The global estimate is based on data that provide a uniform and consistent estimation of emissions, whereas the country estimates are based on data derived more closely from country-submitted estimates for the land use, land use change and forestry (LULUCF) subsectors, and that include further sectoral and GHG disaggregation. This approach permits the high-level reporting of global GHG emissions consistent with the best scientific understanding, while also permitting more granular reporting of emissions and opportunities for mitigation at the country level.
LIMITATIONS	Global GHG emissions are currently not directly measurable, but approaches for their estimation exist, and there are numerous sources to inform this indicator. Reputable scientific organizations produce these data for research, policy analysis, climate negotiations, and broader public communications. Methodologies differ for emissions from fossil fuel combustion and industrial processes, and from LULUCF. The estimated accuracy of emissions from fossil fuel combustion and industrial processes is high, as quantities of fossil fuels and other emissive materials produced (e.g., cement and steel) are well known. For these sectors, emissions estimates are roughly accurate to within 10% when aggregated to the global level, and between 4% and 35% at the country level (Crippa et al., 2023). For non-combustion and non-industrial process emissions, the accuracy is lower. Agricultural emissions, for example, depend upon many factors including the type of crops grown and livestock raised, specific agricultural practices, and other climate and non-climate factors. For these emissions, the accuracy is lower—around 30% for CH4 and fluorinated gases (HFCs, PFCs, and SF6) (McGlynn et al. 2022). Furthermore, anthropogenic emissions from the LULUCF subsectors are more challenging to quantify because of the complexity of terrestrial ecosystems and the difficulties of disentangling natural from anthropogenic fluxes. Two predominant approaches are used to arrive at national LULUCF GHG fluxes. One approach is based on modelling work by the scientific community; the other is based on country submissions to national greenhouse gas inventories. The first approach ("modeling") is used by the scientific community in global carbon-cycle modeling that simulates GHG exchange between the terrestrial biosphere and atmosphere. It distinguishes between managed and unmanaged forests, estimating the latter using vegetation models, and is not attributed to specific countries. Notably this approach also does not attribute any changes in emissions in the LULUCF sectors due to environmental changes such as carbon fertilization—called anthropogenic (indirect) emissions (Gidden et al., 2023). The second approach ("inventory") is based on country submissions of anthropogenic GHG emissions and removals, in accordance with the reporting requirements of parties to the United Nations

Framework Convention on Climate Change (UNFCCC) and Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+). Countries have different reporting obligations depending on whether they are an Annex 1 or non-Annex 1 country. Non-Annex 1 countries, which have more limited reporting obligations, often lack monitoring and reporting capacity, and their data is often less complete than for Annex 1 countries. Additionally, reporting countries often include larger estimates of managed land than what is estimated using the modeling approach. As such, LULUCF emissions from this approach are not well-standardized across countries, and summing emissions across all countries does not equal the global emissions estimates (Grassi et al., 2022). For the LULUCF subsectors, country-level uncertainty around emissions based on the inventory approach ranges from around 10% to 102% (McGlynn et al., 2022).

Globally, the modeling and inventory approaches yield annual GHG fluxes that differ by around 4 gigatons per year (Gidden et al., 2023), and there is no one single way to reconcile these two approaches. However, a hybrid inventory approach based on satellite data to estimate the area of countries' managed forests, along with the IPCC tier 1 approach (Crippa, 2023; Grassi et al., 2023), can reduce global biases, and still largely reflects country inventory submissions. The global emissions difference between the hybrid inventory approach and regular inventory approach is lower—around 0.6 gigatons per year (based on 2020). The CSC GHG emissions indicator uses the hybrid inventory approaches for global emissions and standard inventory approach for the country estimates. Data that are used to estimate country-level emissions are not available in real time and are generally compiled with a 2-to-3-year delay. To present the most up-to-date estimate of global GHG emissions, this indicator is based on a source that includes preliminary estimates for the most recent two years. As such, these figures may be modified in the future, although future changes are not expected to be major, and are unlikely to change the overarching conclusions from the indicator. Using the most recent data, even though it is preliminary, seems to be an acceptable choice for this global indicator, which is expected to change slowly over time.

DATA AND CALCULATION

DATA SOURCE(S)

This GHG emissions indicator is based on four data sources: (i) the global non-LULUCF emissions dataset underlying the EDGAR Report (Crippa, 2023); (ii) a global level LULUCF emissions dataset included in the EDGAR Report (Crippa, 2023), based on a hybrid inventory approach (iii) the country-level non-LULUCF emissions disaggregated by subsector and GHG in the EDGAR v8.0 dataset; and (iv) country-level disaggregated LULUCF emissions estimates from Grassi et al. (2023). For the global level data (i and ii), this indicator is based directly on data from the Joint Research Center's Emissions Database for Global Atmospheric Research (EDGAR), augmented by preliminary estimates for the land use, land use change and forestry using a hybrid-inventory approach that was developed for the Research Center's annual report, GHG Emissions of all World Countries, 2023, hereafter the EDGAR Report dataset.[1] The source data are disaggregated by 13 subsectors and 4 GHG categories.[2]

Non-LULUCF GHG emissions estimates in the EDGAR Report dataset are based on international statistics from the International Energy Agency (IEA), Food and Agriculture Organization (FAO), United States Geological Survey (USGS) and other reputable sources, which are harmonized via a consistent Intergovernmental Panel on Climate Change (IPCC) methodology. This harmonization permits an unbiased cross-country and sector-by-sector comparison, as countries' own self-reported data may use different methodologies and exclude different types of data.[3] To provide the most recent estimates for combustion and industrial processes, EDGAR uses a "Fast-Track" approach to extrapolate emissions to the most recent year. As such, the most recent GHG estimates are usually subject to adjustment, but year-to-year variations have historically been only to within +/- 2 percent. The Fast-Track approach, explained in detail in Crippa et al. (2023), uses emissions data by fuel type from Energy Institute to extrapolate GHG estimates, assuming the same sectoral

[1] https://edgar.jrc.ec.europa.eu/report_2023.
[2] EDGAR subsectors are Agriculture, Buildings, Deforestation, Fires, Forest Land, Fuel Exploitation, Industrial Combustion, Organic Soil, Other Land Power Industry, Processes, Transport, and Waste. The global data are disaggregated by the following GHG categories—CO2, CH4, N2O, and F-gases.
[3] Data for the non-LULUCF data are available from 1970 to 2022 and were downloaded from https://edgar.jrc.ec.europa.eu/report_2023.

composition from two years prior observed in the last year of IEA's energy balance statistics. For agriculture emissions, USGS data are used to extend the FAOSTAT statistics. For sectors with lower contributions to GHG, extrapolation is based on relative trends of proxy data.

For LULUCF emissions, the EDGAR Report dataset uses a methodology described in Grassi et al. (2022) and obtained in Grassi et al. (2023). It includes estimates of forestry emissions based on the IPCC tier 1 methodology, which relies on non-country specific emissions factors to ensure global consistency and satellite data to distinguish between managed and unmanaged land based on disturbance. Global emissions estimates for the LULUCF sector are available from 1990 to 2022 and are obtained from https://edgar.jrc.ec.europa.eu/report_2023.

For more highly disaggregated, country-level non-LULUCF emissions (iii and iv), a more granular EDGAR dataset (EDGAR v8.0)[4] is used, which includes national estimates of annual emissions disaggregated by 37 subsectors and 28 GHGs (CO2, CH4, N2O, and 25 different F-gases) from 1970 to 2022. EDGAR v8.0's GHG estimates for combustion and industrial processes are based on the application of IPCC GHG accounting methodology across all countries. EDGAR uses data from the IEA, Energy Institute, UNFCCC, FAO, and other reputable sources to derive GHG emissions at subnational and sub-sectoral levels, based on activity and emission factors. These data, when aggregated to the global level, are nearly identical to the EDGAR Report data.

The disaggregated country-level data for LULUCF are based on a dataset produced by Grassi et al. (2022; 2023).[5] This method draws data from submissions and briefs to the UNFCCC and REDD+ to report emissions and removals under four primary categories (managed forest land, deforestation, organic soils, other land uses). These estimates are comparable to a country's own emissions estimates and are better aligned with countries' available emissions mitigation strategies (such as the management of forests for mitigation) and link directly to their mitigation commitments and plans through their Nationally Determined Contributions (NDCs) and Long-term Strategies (LTSs). These data are currently only available from 2000-2020, although there are plans to update these data in 2024 and annually thereafter.

The emissions estimates from EDGAR used in this new indicator are also used in numerous reputable publications. The European Commission produces an annual report, *GHG Emissions of All World Countries*, which summarizes these data and describes notable updates from prior years. The United Nations Environment Program's (UNEP) Emissions Gap Report also uses EDGAR data to both describe emissions trends and relate them to global progress towards the Paris Agreement's GHG emissions reductions targets, and to countries' Nationally Determined Contributions (NDCs) and Long-term Strategies (LTS). Additionally, EDGAR data are used in the IPCC's 6th Assessment Report, Working Group 3, Mitigation of Climate Change, serving as the definitive scientific assessment of the state of global GHG emissions. The underlying sources used by EDGAR v8.0 and Grassi et al. (2023)'s LULUCF estimates are presented in the following table.

Sector	Source	Notes
Energy	IEA, Greenhouse Gas Emissions from Energy, 2022 (https://www.iea.org/data-and-statistics)	Combustion sources with modifications by the Joint Research Centre (JRC) of the European Commission
	Energy Institute, 2023 Statistical Review of World Energy (https://www.energyinst.org/statistical-review)	Fuel oil regional consumption, last access April 2023
	IEA World Energy Balances 2022 Edition (https://www.iea.org/data-and-	Combustion sources emissions for CH_4 and N_2O

[4] https://edgar.jrc.ec.europa.eu/dataset_ghg80.
[5] National level LULUCF emissions estimates were obtained from the *National inventories LULUCF data 2000-2020 (Dec 2022).xlsx* file available at https://zenodo.org/records/7650360.

	statistics/data-product/world-energy-balances)	
	International Air Transport Association Statistics, 2023 (https://www.iata.org/en/iata-repository/pressroom/fact-sheets/industry-statistics)	International aviation transport emissions, last access July 2023
	FAOSTAT, 2023 (https://www.fao.org/faostat)	Biofuel combustion related emissions, last access April 2023
	GGFR/NOAA, 2023 (https://www.worldbank.org/en/programs/gasflaringreduction/global-flaring-data#indicators-by-country)	Gas consumption for flaring; last access June 2023
	UNFCCC, GHG Review Tools, 2023 (https://rt.unfccc.int/locator)	CH4 emissions from venting; last access June 2023
	U.S. EPA, Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory, 2023 (https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systemsghg-inventory-additional-information-1990-2021-ghg)	CH4 emissions from venting; last access July 2023
	Höglund-Isaksson, L., Bottom-up simulations of methane and ethane emissions from global oil and gas systems 1980 to 2012, Environ. Res. Lett. 12, 024007, 2017 (https://doi.org/10.1088/1748-9326/aa583e)	CH4 emissions from venting
	U.S. Energy Information Administration, 2023 (https://www.eia.gov/opendata)	For the countries belonging to “Other Africa”, “Other Non-OECD Asia” and “Other Non-OECD Americas; last access May 2023
	World Steel Association, Steel Statistical Yearbook 2022 (https://worldsteel.org/wpcontent/uploads/Steel-Statistical-Yearbook-2022.pdf)	Fugitive emissions
	GGFR/NOAA, 2012-22022 data for gas consumption for flaring, 2023 (https://www.worldbank.org/en/programs/gasflaringreduction/global-flaring-data#indicators-by-country)	CO2 flared at oil and gas extraction facilities for 1994 onwards; last access June 2023
Industry	World Steel Association, Steel Statistical Yearbook 2022 (https://worldsteel.org/wpcontent/uploads/Steel-Statistical-Yearbook-2022.pdf)	Metal industry; non-metallic minerals

	USGS Commodity Statistics, 2023 (https://www.usgs.gov/centers/nmic/commodity-statistics-and-information)	Ferro-alloys production up to 2019; pig iron production; non-metallic minerals except for China for the latest years; Clinker production of US up to 2022; lime production; chemicals production; ammonia production; last access May 2023
	British Geological Survey, British Geological Society for non-ferrous metals, 2023 (https://www.bgs.ac.uk/datasets/uk-and-world-mineral-statistics-datasets/)	Ferro-alloys production up to 2021; pig iron production; last access March 2023
	National Bureau of Statistics of China, 2023 (http://www.stats.gov.cn/english/)	Pig iron production for China; last access June 2023
	UNFCCC, National Inventory Submissions, 2023 (https://unfccc.int/ghg-inventories-annex-i-parties/2023)	Clinker production; last access June 2023
	World Cement,2022 (https://www.worldcement.com/)	Clinker production of China
	Global Cement and Concrete Association, GNR project - Reporting CO2, 2022 (https://gccassociation.org/gnr/)	Clinker production ratios for Brazil, Egypt, Philippines and Thailand up to year 2019; last access July 2023
	International Fertilizer Association, Urea consumption (updates 2010-2019) and production (updates 2020) statistics, 2022 (https://www.ifastat.org/)	Urea consumption and production; last access June 2023
	Olivier, J.G.J, Trends in global CO2 and total greenhouse gas emissions: 2021 Summary Report, PBL Netherlands Environmental Assessment Agency, The Hague, 2022	Fluorinated gases (F-gases)
Waste	UNFCCC, GHG Review Tools, 2023 (https://rt.unfccc.int/locator)	Waste incineration, including open burning of municipal solid waste (MSW), industrial solid waste, biogenic waste, clinical waste, sewage sludge waste, waste from cremation and other waste for Annex I countries; landfills emissions; waste composting for Annex I countries; last access June 2023
	The Cremation Society (https://www.cremation.org.uk/)	GHG emissions from waste from cremation
	Janssens-Maenhout, G., et al. EDGAR v4.3.2 Global Atlas of the three major greenhouse gas emissions for the period 1970–2012, Earth Syst. Sci. Data, 11, 959–1002, 2019	CH4 and N2O emissions associated with wastewater handling until 2021

	(https://doi.org/10.5194/essd-11-959-2019)	
	FAOSTAT, 2023 (https://www.fao.org/faostat)	Meat, pulp, sugar production, average protein supply
	United Nations Statistics Industrial Commodity and Energy Statistics Database, 2023	Alcohol production
	Renewable Fuels Association, Industrial statistics, 2023 (https://ethanolrfa.org/)	Alcohol production
	UNDP, population statistics (2019), World Population Prospects (WPP), The 2019 Revision Report United Nations, Department of Economic and Social Affairs, Population Division, 2019 (https://www.un.org/development/desa/pd/news/world-population-prospects-2019-0)	Population
	Janssens-Maenhout, G., et al., EDGAR v4.3.2 Global Atlas of the three major greenhouse gas emissions for the period 1970–2012, Earth Syst. Sci. Data, 11, 959–1002, 2019 (https://doi.org/10.5194/essd-11-959-2019)	Urban population
	UNSD/ENVSAT, UN Environment Statistics, 2023 (https://unstats.un.org/unsd/envstats/index.cshtml)	Waste composting for non-Annex I countries; last access May 2023
	Eurostat (https://ec.europa.eu/eurostat)	Hazardous waste
	UNSD/ENVSTAT, UN Environment Statistics, 2023 (https://unstats.un.org/unsd/envstats/index.cshtml)	Hazardous waste
	U.S. EPA, Natural Gas and Petroleum Systems in the GHG Inventory: Additional Information on the 1990-2021 GHG Inventory, 2023 (https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systemsghg-inventory-additional-information-1990-2021-ghg)	Hazardous waste for US
Agriculture (Including livestock)	FAOSTAT,2023 (https://www.fao.org/faostat)	Application of urea and agricultural lime, enteric fermentation, rice cultivation, manure management, fertilizer use (both synthetic and from manure), and agricultural waste burning in fields; last access April 2023

	USDA, Foreign Agricultural, 2023 (www.fas.usda.gov)	Crop and livestock data at macro regional level; last access May 2023
	International Fertilizer Association, Urea consumption (updates 2010-2019) and production (updates 2020) statistics, 2022 (https://www.ifastat.org/))	Application of urea; last access June 2023
Land use, land use change, and Forestry (LULUCF), including wildfires for global results	Grassi G., et al., Carbon fluxes from land 2000–2020: bringing clarity on countries' reporting, Earth Syst. Sci. Data, 14, 4643–4666, 2022 (https://essd.copernicus.org/articles/14/4643/2022/) Grassi G., et al., Harmonizing the Land-Use flux estimates of global models and national inventories for 2000-2020, Earth System Science Data, 15, 1093-1114, 2023 (https://zenodo.org/records/7650360#.Y--pNuzMJcA)	Deforestation, non-biomass forest pools and non-forest categories (cropland, grassland, wetlands, settlements), organic Soils; data coverage year 2000-2020
	Global Wildfire Information System (GWIS) (https://gwis.jrc.ec.europa.eu/)	Wildfire emissions in non-tropical regions
	Copernicus Climate Change Service (C3S), Land cover classification gridded maps from 1992 to present derived from satellite observations (https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-land-cover?tab=overview)	Emissions from forest (biomass only, estimated with an IPCC tier 1 approach)
	FAOSTAT, 2023 (https://www.fao.org/faostat)	Country harvest production statistics
	FAO, Global Ecological Zones (GEZ) (https://www.fao.org/forest-resources-assessment/remote-sensing/global-ecological-zones-gez-mapping/en/)	Spatial and statistical forest data
	FAO, Global Forest Resource Assessment (FRA) (https://www.fao.org/forest-resources-assessment/en/)	Spatial and statistical forest data
Land use, land use change, and Forestry (LULUCF), including wildfires for national-level results	Grassi G., et al., Harmonizing the Land-Use flux estimates of global models and national inventories for 2000-2020, Earth System Science Data, 15, 1093-1114, 2023 (https://zenodo.org/records/7650360#.Y--pNuzMJcA)	Forest land (forest land remaining forest land (FL-FL) plus land converted to forest land (L-FL), including Harvested Wood Products but excluding organic soils); deforestation (forest land converted to other land used, excluding organic soils); organic soils (organic soils from all land use categories, including peat fires; other land uses including cropland, grassland, wetland, settlement, and other land, if not included in categories above; data coverage year 2000-2020

METHOD OF CALCULATION (CORE)

As mentioned above, this GHG emissions indicator is based on four data sources: (i) the global non-LULUCF emissions dataset underlying the EDGAR Report (Crippa, 2023); (ii) a global level LULUCF emissions dataset included in the EDGAR Report (Crippa, 2023); (iii) the country-level non-LULUCF emissions disaggregated by subsector and GHG in the EDGAR v8.0 dataset; and (iv) country-level disaggregated LULUCF emissions estimates from Grassi et al. (2023). The new WB indicator of Global GHG Emissions is the sum of the annual global non-LULUCF emissions (i) and annual global LULUCF emissions from the EDGAR Report (ii). This indicator is thus available from 1990 to 2022.

For the GHG emissions disaggregated at the country level, the non-LULUCF estimates from the EDGAR v8.0 dataset (iii) and Grassi et al. (2023) LULUCF datasets (iv) are added together to provide total GHG emissions at the country, subsector, and individual GHG level. The country-level LULUCF data are currently available only through 2020. As such, the 2021 and 2022 values are set equal to the 2020 values. This temporary calculation will be replaced by data updates scheduled for later in 2024. In future years, the LULUCF data will be updated annually, consistent with the EDGAR v8.0 dataset's update schedule. In additional, global non-tropical fires which are included in the global dataset but not included in the Grassi dataset are added.

The summation of the country-level emissions across all countries, subsectors, and gases is about 2% lower than the global emissions figure in 2022. This discrepancy is due primarily to the difference between the standardized methodology used to estimate forestry net emissions across countries for the global dataset (in the EDGAR Report dataset) versus country-specific forestry emissions estimates in the Grassi et al. (2023) dataset, as well as the approach for identifying land that is managed versus unmanaged. The country-level data are based on country estimates, whereas the global-level data are based on satellite imagery. Other small differences exist in the Other Land sector and Organic Soils sector. Small residual terms to account for these differences are added at the sub-sectoral and gas level (0.1% in 2022).[6]

METHOD OF CALCULATION (DISAGGREGATION)

For the global data from the EDGAR report, emissions are disaggregated by 13 sectors and 4 GHG categories (CO2, CH4, N2O, and F-Gasses). This disaggregation is preserved, although Fuel Exploitation as Fugitive Emissions is renamed, consistent with the IPCC sector names presented in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. For the country-level indicator, disaggregated data derived from the EDGAR v8.0 dataset and Grassi et al. (2023) are provided at the national level, disaggregated by 37 subsectors and 28 GHGs. For the WB indicator, these data are aggregated to 15 sectors—the 13 used for the global dataset, with agriculture disaggregated into livestock and crops and waste disaggregated into solid waste and wastewater treatment—and the six Kyoto Protocol GHGs (CO2, CH4, N2O, HFC, PFC, and SF6) plus HCFC, and NF3. The table below shows the EDGAR and Grassi et al. (2023) sectors and mapping to the sectors used for the WB indicator.

Country-level Emissions Disaggregation

IPCC Code (2006)	EDGAR/Grassi Sector	EDGAR/Grassi Subsector	CSC Indicator Sector	CSC Indicator Subsector
1.A.1.a	Power Industry	Main Activity Electricity and Heat Production	Energy	EN - Electricity/Heat
1.A.1.bc	Fuel Exploitation	Petroleum Refining - Manufacture of Solid Fuels and Other Energy Industries		EN - Fugitive Emissions
1.A.2	Industrial Combustion	Manufacturing Industries and Construction		EN - Manufacturing/ Construction
1.A.3.a	Transport	Civil Aviation		EN - Transportation
1.A.3.b_noRES		Road Transportation no resuspension		EN - Transportation
1.A.3.c		Railways		EN - Transportation

[6] The data compiled for this indicator is presented in the following internal World Bank dashboard: https://tab.worldbank.org/t/WBG/views/CSCIndicator-Global_GHG_emissions-581659/START.

1.A.3.d		Water-borne Navigation		EN - Transportation
1.A.3.e		Other Transportation		EN - Transportation
1.A.4	Buildings	Residential and other sectors		EN - Building
1.A.5		Non-Specified		EN - Building
1.B.1	Fuel Exploitation	Solid Fuels		EN - Fugitive Emissions
1.B.2		Oil and Natural Gas		EN - Fugitive Emissions
2.A.1	Processes	Cement production	Industrial Processes	IN - Industrial Processes
2.A.2		Lime production		
2.A.3		Glass Production		
2.A.4		Other Process Uses of Carbonates		
2.B		Chemical Industry		
2.C		Metal Industry		
2.D		Non-Energy Products from Fuels and Solvent Use		
2.E		Electronics Industry		
2.F		Product Uses as Substitutes for Ozone Depleting Substances		
2.G		Other Product Manufacture and Use		
3.A.1	Agriculture	Enteric Fermentation	Agricul-ture	AG – Livestock
3.A.2		Manure Management		AG – Livestock
3.C.1		Emissions from biomass burning		AG – crops
3.C.2		Liming		AG – crops
3.C.3		Urea application		AG – crops
3.C.4		Direct N2O Emissions from man-aged soils		AG – crops
3.C.5		Indirect N2O Emissions from man-aged soils		AG – crops
3.C.6		Indirect N2O Emissions from ma-nure management		AG – crops
3.C.7		Rice cultivations		AG – crops
4.A	Waste	Solid Waste Disposal	Waste	Waste – Solid Waste
4.B		Biological Treatment of Solid Waste		Waste – Solid Waste
4.C		Incineration and Open Burning of Waste		Waste – Solid Waste
4.D		Wastewater Treatment and Dis-charge		Waste – Wastewater Treatment
5.A	Processes	Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	Industrial Processes	IN - Industrial Processes
5.B	Fuel Exploitation	Fossil fuel fires	Energy	EN - Fugitive Emissions
3.B.2.b.i 3.B.3.b.i 3.B.5.b.i 3.B.6.b.i	Land Use, land use Change and Forestry (LULUCF)	Deforestation	Land Use, land use Change and For-estry	LULUCF - Deforestation
3.B.1 3.D.1		Forest Land		LULUCF - Forest Land
3.B		Organic Soils		LULUCF - Organic Soil
3.B.2 3.B.3 3.B.4 3.B.5 3.B.6		Other Land Uses (including cropland, grassland, wetland, set-tlement, and other land)		LULUCF - Other Land

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