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REVIEW OF GLOBAL AGRICULTURAL EMISSION DATABASES

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1. EXECUTIVE SUMMARY

Since the Industrial Revolution, the concentration of greenhouse gases (GHG) has consistently risen, leading to a 1.15°C increase in global mean temperatures by 2022. The Intergovernmental Panel on Climate Change (IPCC) confirms human activities as the primary cause of global warming, with emissions continuing to rise. Climate change has resulted in adverse impacts on various fronts, disproportionately affecting vulnerable communities. International efforts, including the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, aimed at stabilizing greenhouse gas concentrations. These efforts were followed by the Paris Agreement in 2015, focusing on limiting global temperature increases and relying on Nationally Determined Contributions (NDC) from countries.

The United Nations Framework Convention on Climate Change mandates Countries to develop and regularly update national inventories of greenhouse gas emissions and removals. These inventories, aligned with IPCC methodologies, serve as crucial tools for transparent reporting, building mutual trust among countries for effective climate change agreements. National GHG inventories play a vital role in policy development, monitoring impact, and tracking progress toward achieving NDCs outlined in international agreements, such as the Paris Agreement.

Varying capacities for GHG inventory development among developing and developed countries, coupled with diverse reporting requirements, create challenges in data comparability. Developed countries face rigorous annual submission requirements, producing comprehensive National Inventory Reports and Common Reporting Format tables. In contrast, developing countries submit their national GHG inventories through Biennial Update Reports (BURs), and flexibility is granted to Least Developed Country Parties (LDCs) and Small Island Developing States (SIDS) regarding submission timelines. The reporting landscape is progressing, with the introduction of the biennial transparency report (BTR) for Paris Agreement Parties. The BTR, due by December 31, 2024, will convergence in methodologies between countries.

Transparency, consistency, comparability, completeness, and accuracy are key principles governing these reports. Fundamental methodological criteria when developing inventories include the selection of the IPCC guidelines version to use, the Tier number employed (higher Tiers being highly recommended for key categories), and the choice of global warming potential sources (WGP), enabling the summation of values for different gases.

GHG inventories categorize emissions into 4 sectors: (i) energy, (ii) industrial processes, (III) agriculture, forestry, and other land uses (AFOLU), and (iv) waste. In this work we will concentrate on the emissions of the AFOLU sector, which encompasses various categories like enteric fermentation, manure management, land, biomass burning, liming, urea application, direct and indirect nitrox emissions, rice cultivation, and harvested wood products.

The AFOLU sector plays a substantial role, representing 23% of total net anthropogenic emissions during 2007–2016[1]. Despite a 16% growth in agricultural emissions between 1994 and 2014, the sector's share in global GHG emissions decreased, demonstrating a positive trend attributed to reduced emissions from deforestation and improved agricultural practices. In this sense, the evidence indicates that

[1] See https://www.ipcc.ch/site/assets/uploads/sites/4/2022/11/SRCCL_SPM.pdf

the sector has become more efficient in relation to emissions per unit of product, since in the same period it increased more than 63% in the same period (FAOSTATS, 2023). Although efforts still need to be deepened in order to achieve more sustainable agricultural production at a global level, future projections indicate potential increases in agricultural emissions due to population and income growth and shifts in consumption patterns.

Any mitigation proposal in the agriculture sector must include a real dimension of sectoral emissions. Much of the current discussion on emissions from agri-food systems is based on a comprehensive view of the value chain, much more comprehensive than those included in the AFOLU category. This includes emissions up to the farm-gate, those from changes in land use and those from pre- and post-production processes, accounting with 31% of global GHG emissions.

Without a doubt, the discussion on emissions from the agricultural sector has several aspects that are constantly evolving. It is worth clarifying that it is not the purpose of this work to focus on the debate about the sectoral cut that is proposed for the sector. But it is proposed to offer a summary of the calculation methodologies and existing databases in order to contribute to the discussion.

In addition to the official base where countries upload their national GHG inventories within the framework of the UNFCCC, other sources that regularly update information on greenhouse gases emissions from the agriculture sector have been identified. These organizations, encompassing the Food and Agriculture Organization of the United Nations (FAO), the Emissions Database for Global Atmospheric Research (EDGAR), Climate Watch, and the Organization for Economic Co-operation and Development (OECD), play a vital role in monitoring and providing insights into emissions data.

The report describes and presents the characteristics of each database for clarity and comprehension. There is observed that, while some datasets aim to provide comparable information (using Tier 1 methodology approach), they lack official status and may lead to higher estimation uncertainties. That is to say, although this methodology enables comparability, it threatens the most efficient production systems since it applies the same calculation methodology. On the contrary, in those cases in which refined calculation methodologies are respected, which allows for a better reflection of the real sectoral impact by country, comparability is quite complex (not only the Tiers vary, but also the GWP and IPCC guideline version used and the way in which that the categories are reported). Therefore, promoting consistency in greenhouse gas emission estimation methodologies, as proposed in the Biennial Transparency Report from 2024, is essential for enhancing comparability.

2. RECENT BACKGROUND

Since the first industrial revolution in the second half of the 18th century, there has been a constant increase in the concentration of GHG such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). Consequently, global mean temperatures have been rising rapidly. In 2022, the global mean temperature exceeded the 1850-1900 average by 1.15 °C, and the years from 2015 to 2022 ranked as the eight warmest in the instrumental record dating back to 1850 (WMO, 2023).

In 2023, the IPCC released its Sixth Evaluation Report, scientifically affirming that human activities, primarily through GHG emissions, unequivocally caused global warming. Furthermore, GHG emissions continued to rise between 2010 and 2019 (IPCC, 2023). Climate change has already manifested in numerous adverse impacts on weather patterns, climate extremes, food and water security, human health, economies, and society, resulting in significant losses and damages to both nature and people.

Notably, vulnerable communities who have historically contributed the least to current climate change are disproportionately affected.

In 1994, the UNFCCC came into force, the establishing a multilateral forum with the objective of stabilizing GHG concentrations in the atmosphere to prevent dangerous anthropogenic interference with the climate system (UNFCCC, 1992). This stabilization must be achieved in a sufficient time to allow ecosystems to adapt naturally to climate change, ensure that production of food is not threatened and allow the development economy continues in a sustainable manner.

The Kyoto Protocol, inaugurated in 1997 and enforced in 2005, marked the first instrument outlining concrete actions with quantifiable commitments to reduce GHG emissions. Developed countries, listed in Annex I of the Convention[2], assumed commitments acknowledging their historical responsibility for the majority of GHG emissions (UNFCCC, 1997). The Protocol specifically mandated developed countries to achieve emission reduction targets of at least 5% between 2008 and 2012 compared to 1990 levels. The Doha Amendment in 2012 sought to extend this commitment until 2020.

In 2015, recognizing the need for increased ambition in GHG reduction, the UNFCCC adopted the Paris Agreement. Its primary objective is to limit the increase in the global average temperature to well below 2ºC above pre-industrial levels, with efforts to limit it to 1.5ºC, acknowledging the substantial risk reduction at this level (UNFCCC, 2015). To achieve its targets, the Agreement relies on individual commitments from countries, known as Nationally Determined Contributions (NDC). Each country must prepare, communicate, and maintain successive NDCs, outlining their intended contributions and implementing domestic mitigation measures. NDCs are submitted every five years, with a requirement for each subsequent NDC to surpass the previous one in ambition. The Agreement encourages countries to include quantifiable information, such as reference points, time frames, and methods, and emphasizes the need for fairness and ambition based on national circumstances.

Simultaneously, the Agreement encourages the development of long-term strategies for economic development with low GHG emissions. Currently, 68 parties, representing 72.4% of total emissions, have submitted their visions for achieving a low-carbon economy by 2050, aligning with sustainable development goals. Several parties have proposed ambitious targets, including the aim to achieve GHG emission neutrality by 2050.

The Paris Agreement was initially signed by 195 countries and, as of the date hereof, has already been ratified by 176 of them. Effectively, the Agreement came into force on November 4, 2016, 30 days after at least 55 member countries of the Convention, accounting for not less than 55% of global GHG emissions, accepted, approved, and ratified the agreement.

The structure of the Agreement takes into account the initial gap between developed and developing countries, in the understanding that the first one should take the lead by undertaking economy-wide absolute emission reduction targets. Meanwhile, developing counties are encouraged to intensify their mitigation efforts, gradually transitioning towards economy-wide emission reduction or limitation targets, considering their distinct national circumstances.

[2] Include the industrialized countries that were members of the OECD (Organization for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

3. GREENHOUSE GAS INVENTORIES

3.1. Definition

The UNFCCC, from its inception, mandated that all Parties shall develop, periodically update, and publicly disclose national inventories detailing anthropogenic emissions from sources and removals by sinks of GHG. The Paris Agreement further emphasized that each party shall regularly submit a national inventory report of GHG emissions, employing methodologies endorsed by the IPCC.

National GHG inventories are essential tools for countries to transparently report their anthropogenic emissions and removals of GHG. These inventories provide a fundamental basis for mutual trust and confidence among countries that are needed for effective implementation of international agreements to address climate change. Additionally, national GHG inventories are an essential tool in developing policies and in monitoring impact, providing invaluable information for those developing policies related to climate change and to track progress made in implementing and achieving the NDCs.

3.2. Methodology

3.2.1. IPCC guidelines

The International Panel on Climate Change (IPCC) developed a global, standard methodology for the estimation of national GHG inventories. In response to ongoing research and evolving knowledge, the IPCC guidelines have undergone updates aimed at enhancing the preparation of these inventories. The initial version was published in 1996, followed by a second iteration 2006 (IPCC, 1996; IPCC, 2006). Subsequently, in 2019, the IPCC introduced the “Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories,” providing supplementary methodologies and updated default factors to the existing 2006 guidelines (IPCC, 2019).

Annex I countries, are mandated to employ the methodology outlined in the 2006 IPCC Guidelines. Conversely, non-Annex I Parties[3] have the flexibility to utilize the 1996 version. Furthermore, nations that wish to, have the option to adopt the latest iteration, the 2019 Refinement to the 2006 IPCC Guidelines on National Greenhouse Gas Inventories. However, from 2024 the guidelines on the methodology to be used will have some changes (see section 5).

3.2.2. Principles

- Transparency. Data sources, assumptions and methodologies used for an inventory should be clearly explained, in order to facilitate the replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of the information.

[3] Are mostly developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures. The Convention emphasizes activities that promise to answer the special needs and concerns of these vulnerable countries, such as investment, insurance and technology transfer.

- Consistency. A GHG inventory should be internally consistent for all reported years in all its elements across sectors, categories and gases. An inventory is consistent if the same methodologies are used for the base and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances, an inventory using different methodologies for different years can be considered to be consistent if it has been recalculated in a transparent manner, in accordance with the IPCC Guidelines for National Greenhouse Gas Inventories.
- Comparability. The national greenhouse gas inventory is reported in a way that allows it to be compared with national greenhouse gas inventories for other countries. For that purpose, Parties should use the methodologies and formats agreed for making estimations and reporting their inventories.
- Completeness. A GHG inventory covers at least all sources and sinks, as well as all gases, for which methodologies are provided in the IPCC Guidelines or for which supplementary methodologies have been agreed. Completeness also means the full geographical coverage of the sources and sinks.
- Accuracy. Emission and removal estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, as far as can be judged, and that uncertainties are reduced as far as practicable.

3.2.3. Tiers

Parties may employ different methods (Tiers) outlined in the Guidelines, giving priority to the approach which are believed to produce the most accurate estimates, depending on national circumstances and the availability of data. The Tiers are linked with the methodological complexity of the calculation, with Tier 1 representing the basic method, Tier 2 as the intermediate, and Tier 3 being the most demanding in terms of complexity and data requirements. Typically, the Tier 1 approach is linked to default (D) emission factors, while higher Tiers are associated with country-specific (CS) emission factor values. IPCC Guidelines encourage the development and use of local emission factors (associated to higher Tier level) that are in line with national circumstances. Generally, transitioning to higher Tiers enhances inventory accuracy and diminishes uncertainty, albeit with increased complexity and resource demands for conducting inventories. It´s encouraged to opt for higher Tier methods for key categories, those significantly impacting a country's total GHG emissions, while considering their temporal trends and uncertainty values.

Tier 1 methods are designed to be the simplest to use; equations and default emission parameter values (e.g., emission and stock change factors) for these methods are provided by IPCC guidelines, as default values. Country-specific activity data are essential, but for Tier 1 activity data sources are often globally accessible (e.g. deforestation rates, agricultural production statistics, global land cover maps, fertilizer use, livestock population data, etc.), even though these data tend to be spatially coarse or from non-official sources. Utilizing data from official international sources is a best practice in cases where national data is lacking.

Tier 2 generally employs the same methodological approach as Tier 1 but applies emission and stock change factors that are based on country- or region-specific data. Country-defined emission factors are more appropriate for the climatic regions, land-use systems and livestock categories in that country. Higher temporal and spatial resolution and more disaggregated activity data are typically employed in Tier 2 to align with country-defined coefficients for specific regions and specialized land-use or livestock categories. The predominant option for the development of a Tier 2 involves obtaining values from field studies representative of regional agroecologial and productive conditions. An alternative approach proposed by the IPCC for the development of Tier 2 emission factors is presented for livestock emissions in cattle, sheep and goat, as well as for soil carbon in croplands. equations are provided to estimate emission factors for enteric fermentation and manure from the food intake of a typical animal in each subcategory (e.g., steers, cows) and specific coefficients, such as a methane conversion factor for enteric fermentation emissions. For estimates of soil carbon, the Steady-State simulation model can be used, considered a Tier 2 calculation.

Tier 3 encompasses higher-order methods, which are added to the information from field studies, including models and inventory measurement systems, tailored to meet national circumstances that repeat over time. These methods are based on high-resolution activity data and disaggregated to the sub-national level. They provide more certain estimates than lower levels and may involve field sampling at regular intervals and/or age, class/production data systems based on Geographic Information Systems, soil data and land use and management activity data. These systems are often climate-dependent, allowing estimates from sources with interannual variability. They can be based in direct measurements, models or a combination of both approaches.

3.2.4. Global warming potentials

The Global Warming Potential (GWP) was devised to facilitate comparisons of the global warming impacts of different gases, including CO_2, N_2O and CH_4. The warming potential and life cycles of GHGs differ among them. Therefore, it provides a standardized of measure, enabling to add up emissions estimates of different gases (e.g., for compiling a national GHG inventory). Additionally, it allows policy-makers to assess emissions reduction opportunities across sectors and gases. Specifically, GWP is a metric indicating how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO_2). The magnitude of the GWP signifies how much a particular gas contributes to warming the Earth compared to CO_2 during that time frame.

Currently, developing countries are enable to use the global warming potentials (GWP) outlined by the IPCC in its Second Assessment Report based on the effects of GHGs over a 100-year time horizon (IPCC, 1995). In contrast, developed countries are instructed to employ the GWP defined by the Fourth Assessment Report of the IPCC, based on the effects of GHG for the same time horizon (IPCC, 2007). Starting from the 2024 inventories, all Parties are mandated to use the 100-year time-horizon GWP values from the IPCC Fifth Assessment Report or those from a subsequent IPCC assessment report agreed upon by the UNFCCC, which will result in greater possibilities of comparison (IPCC, 2013).

Table 1: Global warming potential values over a 100-year time horizon defined by IPCC Assessment reports.

Report number edition	CO_2	N_2O	CH_4
Second	1	310	21

Fourth	1	298	25
Fifth	1	265	28
Sixth[4]	1	273	29.8 / 27.2

Source: Author's based on IPCC reports.

3.3. Categories

Greenhouse gas emission and removal estimates are categorized into main sectors, each comprising related processes, sources and sinks: (i) energy, (ii) industrial processes and product use, (iii) agriculture, forestry and other land use (AFOLU), and (iv) waste. The AFOLU sector is often subdivided into (i) agriculture and (ii) land use change and forestry

Each sector encompasses individual categories (e.g., transport) and sub-categories (e.g., cars). Ultimately, countries construct an inventory from the sub-category level, and total emissions calculated by summation. A national total is calculated by summing up emissions and removals for each gas.

The AFOLU Sector include the following categories:

- Enteric fermentation. A digestive process wherein carbohydrates are broken down by microorganisms into simple molecules for absorption into the bloodstream. This process produces methane as a by-product of the normal livestock digestive process, primarily dependent on the type of digestive system and the quantity and quality of feed consumed.
- Manure management. CH4 and N2O are emitted during the storage and treatment of manure, and methane emissions occur from manure deposited on pasture, range and paddock. The term 'manure' is used here collectively to include both dung and urine produced by livestock. Decomposition of manure under anaerobic conditions, during storage and treatment, produces CH4. These conditions occur most readily when large numbers of animals are managed in a confined area (e.g., dairy farms, beef feedlots, and swine and poultry farms), and where manure is disposed of in liquid-based systems. Direct N2O emissions result from the decomposition of manure under anaerobic conditions, with factors like the nitrogen and carbon content of manure influencing emissions during storage and treatment. The N2O emissions generated by manure in the system 'pasture, range, and paddock' are reported under the category N2O Emissions from Managed Soils.
- Land. Includes CO2 emissions and removals resulting from changes in carbon stocks in biomass, dead organic matter and mineral soils on all managed lands, including forest, cropland, grassland, wetlands, settlements and other land. A distinction is made between emissions and removal belonging to a specific land use or those associated with changes in land use.

[4] In the AR6 report, an additional GWP for methane has been included to differentiate between methane which originates from fossil fuel sources, and methane from non-fossil fuel sources, like agriculture. 29.9 corresponds to fossil and 27.2 to non-fossil fuel sources.

- GHG emissions from biomass burning. Involves emissions from fires resulting from incomplete combustion of fuel, including the burning of crop residues.
- Liming. Used to reduce soil acidity and enhance plant growth, particularly in agricultural lands and managed forests. The addition of carbonates to soils in the form of lime leads to CO_2 emissions as the carbonates dissolve.
- Urea application. This fertilizer is converted into ammonium, a hydroxylion, and bicarbonate, leading to CO_2 emissions as the bicarbonate evolves into CO_2 and water. This source category is included because the CO_2 removal from the atmosphere during urea manufacturing is estimated in the Industrial Processes and Product Use Sector.
- Direct N_2O from managed soils. Nitrous oxide is naturally produced in soils through processes like nitrification and denitrification. Nitrification is the aerobic microbial oxidation of ammonium to nitrate, and denitrification is the anaerobic microbial reduction of nitrate to nitrogen gas. Human-induced net nitrogen (N) additions to soils, including synthetic N fertilizers, organic N from fertilizers, urine and dung N from grazing animals, and N in crop residues, contribute to direct N_2O emissions.
- Indirect N_2O from managed soils. In addition to the direct emissions of N_2O from managed soils that occur through a direct pathway, emissions of N_2O also take place through two indirect pathways, volatilization of NH_3 and NO_x, and leaching and runoff of N, mainly as NO_3^-, from managed soils.
- Indirect N_2O emissions from manure management. Nitrous oxide emissions from manure management can also result in indirect emissions due to other forms of nitrogen loss from the system. Resulting from nitrogen loss through volatile nitrogen losses, primarily in the forms of ammonia and nitrate, during manure collection and storage.
- Rice. Refers to the anaerobic decomposition of organic material in flooded rice fields, producing methane emissions influenced by various factors such as rice species, the number and duration of harvests, the soil type and temperature, the irrigation method, and fertilizer use.
- Harvested wood products. This category allows quantifying the carbon remaining sequestered in post-harvest timber products from the forest. Wood harvested from different types of land use, remaining in products for varying lengths of time, constitutes a carbon reservoir.

Although emission categories are well identified, unfortunately, not all countries report with the same structure. Even the structure proposed for reporting in the AFOLU sector of the IPCC Guidelines differs from that defined by the reporting guidelines on annual inventories for Parties included in Annex I to the Convention (Decision 24/CP.19). The main difference, lies in the fact that while the IPCC presents the AFOLU sector in an aggregated form, the reporting guidelines disaggregate it into two major sectors: i) Agriculture and ii) Land Use Change and Forestry. In general, with minor exceptions, the presentation of information among Annex I countries is very similar because they must submit Common Reporting Format (CRF) tables, a series of standardized data tables that define how to classify and report subcategory data. However, non-Annex I countries have greater flexibility in presenting information, and it is common aggregated values to be reported without the possibility to extract information by subcategories. Fortunately, starting from the reports submitted in 2024, the presentation requirements for all countries will be unified, facilitating a standardized approach (see section 5.3). This will improve the comparison of national GHG inventories with those of other countries, enabling access to data for all subcategories.

3.4. Global emissions trends

In 2022, GHG emissions set a new record, reaching 57.4 GtCO2eq, marking a 1.2% increase (equivalent to 0.6 GtCO2eq) compared to the preceding year. Although this growth rate slightly surpassed the average rate of the 2010–2019 decade, which stood at 0.9% per year, it remained slower than the emissions growth observed in the 1990s (1.2% per year) and the 2000s (2.2% per year). It is imperative for global GHG emissions to decrease significantly, aiming for levels between 33 and 41 GtCO2eq by 2030, to align with the least-cost pathway required to achieve the temperature goal outlined in the Paris Agreement (UNEP, 2023).

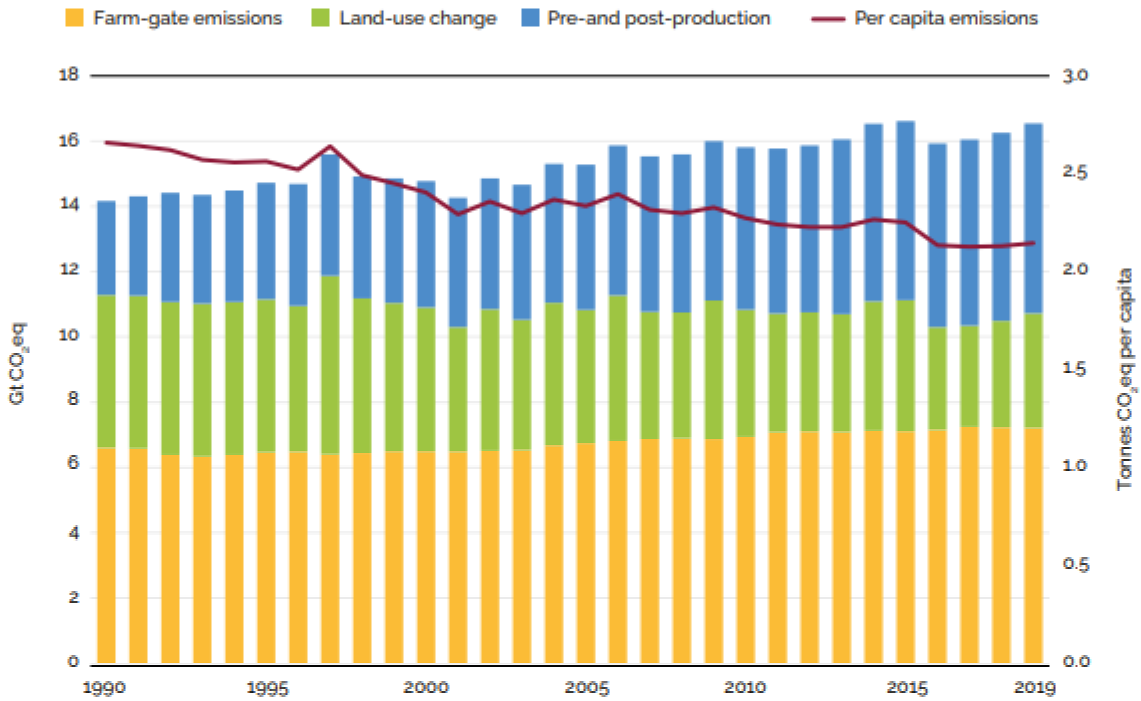
In accordance with the categories established in the UNFCCC framework to report national GHG inventories, it is estimated that total net GHG emissions from AFOLU represent 12.0 GtCO2 eq yr-1 during 2007–2016. This represents 23% of total net anthropogenic emissions (IPCC, 2019b). Global models estimate net CO2 emissions of 5.2 GtCO2 yr-1 from land use and land-use change during 2007–2016. These net emissions are mostly due to deforestation, partly offset by afforestation/reforestation, and emissions and removals by other land use activities. Global AFOLU emissions of methane in the period 2007–2016 were 161 MtCH4 yr-1 (4.5 GtCO2eq yr-1). The globally averaged atmospheric concentration of CH4 shows a steady increase between the mid-1980s and early 1990s, slower growth thereafter until 1999, a period of no growth between 1999–2006, followed by a resumption of growth in 2007. Anthropogenic AFOLU N2O emissions are rising, and were 8.7 MtN2O yr-1 (2.3 GtCO2eq yr-1) during the period 2007-2016. Anthropogenic N2O emissions from soils are primarily due to nitrogen application including inefficiencies (over-application or poorly synchronized with crop demand timings). Cropland soils emitted around 3 MtN2O yr-1 (around 795 MtCO2eq yr-1) during the period 2007–2016. There has been a major growth in emissions from managed pastures due to increased manure deposition.

An alternative approach to inform GHG emission from agriculture sector consist on the global food system. It includes all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socioeconomic and environmental outcomes at the global level. If emissions associated with pre- and post-production activities in the global food system are included, the emissions are estimated to be 21–37% of total net anthropogenic GHG emissions. Given the diversity of food systems, there are large regional differences in the contributions from different components of the food system.

Looking at sectorial GHGs evolution, emissions of the Agriculture sector have not increased significantly and almost all the increase on GHG emissions in agri-food systems between 1990 and 2019 was observed in pre- and post-production processes (FAO, 2021, Tubiello et al, 2022)[5] (Graph 1), that for the purposes of GHG accounting under the Paris Agreement, belong to other sectors.

[5] Land use emissions decreased by 25% while farm-gate emissions increases by 9% between 1990 and 2019.

Figure 1: Global agrifood system GHG emissions by life-cycle stage and per capita emissions



Source: FAO, 2021.Note/Source (8pt)

In fact, between 1990 and 2019, agricultural emissions grew 9% (measured in $MtCO_2eq.$), while emissions from Land-Use Change and Forestry (LUCF) fell 14% during the same period. On the other hand, emissions from Industrial Processes, Energy and Waste grew 203%, 62% and 20%, respectively, so that the relative share of Agriculture and LUCF in total GHG emissions dropped in recent years. Thus, the share of Agriculture in global GHG emissions fell from 15.4% in 1990 to 11.6% in 2019, with a continuing downward trend. Furthermore, the share of LUCF in global emissions fell from 5.9% in 1990 to 3.3% in 2019, albeit with a certain acceleration in emissions in the last five years. For their part, given their quicker annual evolution rate, the Energy and Industrial Processes sectors together increased their share from 74.6% to 81.8% between 1990 and 2019 (Elverdin, 2023).

In other words, even in a context of an increase in world food production of about 83% between 1990 and 2019[6], AFOLU increased its GHG emissions by only 7.5% in the same period, which not only shows a marked reduction in emissions due to deforestation, but also entails improvements in agricultural productivity and in the use of more environmentally sustainable production systems. However, emissions from agricultural production are projected to increase, driven by population and income growth and changes in consumption patterns. Therefore, continuing to make efforts to improve the sustainability of food systems is extremely necessary.

4. MAIN SOURCES OF INFORMATION

Five key data sources that regularly update information on greenhouse gas (GHG) emissions from the agriculture sector have been identified. These organizations actively engaged in this field include the

[6] Gross Production Index. See FAOSTATS https://www.fao.org/faostat/en/#data

United Nations Framework Convention on Climate Change (UNFCCC), the Food and Agriculture Organization of the United Nations (FAO), the Emissions Database for Global Atmospheric Research (EDGAR), Climate Watch and the Organization for Economic Co-operation and Development (OECD). The characteristics of each database are thoroughly described and presented for clarity and comprehension.

Table 2: UNFCCC

Description	**All Parties shall develop, periodically update and publish national inventories of anthropogenic emissions by sources and removals by sinks of GHG. This database represent the official submissions presented by each party to the Convention.**
Link	Annex 1 parties: https://unfccc.int/ghg-inventories-annex-i-parties/2023 Non annex I parties: https://unfccc.int/BURs
Temporal coverage	1990- last year of presentation of official report by each country.
Geographic coverage	The 197 countries that are part of the UNFCCC are committed to presenting their inventories. However, there can be delays respect to the required frequency.
Sector coverage	Energy, industrial processes, waste, agriculture forestry and other land use
Disaggregation by agricultural products	No
Disaggregation by livestock categories	Yes, for Annex I Parties. It is not always provided for Non-Annex I Parties.
Global warming potential	Annex I Parties shall use the Fourth Assessment Report of the IPCC, over a 100-year time horizon. Non-Annex I should use GWP provided by the IPCC in its Second Assessment Report based on a time horizon of 100 years. From 2024 reports each Party shall use the 100-year time-horizon GWP values from the IPCC Fifth Assessment Report, or from a subsequent IPCC assessment report as agreed upon by the CMA.
Tier	It is good practice to present key categories of each country with Tier 2 or 3. Since higher levels require greater resources, this has not been applied yet in all cases.

Activity data	Each country defines the source of information for its activity data. Ideally, official data is usually used, and in cases where it is not available, international sources or extrapolations can be used.
Use of country reported data to the UNFCCC	Not applicable.
AFOLU GHG Categories included	It includes all categories presented from each country, including crop residues, enteric fermentation, manure management, manure left on pasture, manure applied to soils, synthetic fertilizers, rice cultivation. It is a good practice that inventories were complete and estimates are reported for all relevant categories of sources and sinks, and gases.

Table 3: FAO

Description	**Provides free access to food and agriculture data for over 245 countries and territories and covers all FAO regional groupings from 1961 to the most recent year available.**
Link	https://www.fao.org/faostat/en/#data
Temporal coverage	From 1961 to the most recent year available. The latest year available is 2020. Some visualizations also present projections for 2030 and 2050. Some categories present information since 1990 such as forest.
Geographic coverage	Over 245 countries. It also has groupings by region or total emissions.
Sector coverage	(I) Agricultural emissions called "Emissions at Farm gate". They include Emissions from Energy use in agriculture. (II) Emissions from Land use and change, including categories of forestry, fires and drained organic soils. Additionally, it presents information on emissions from pre and post agricultural production, emissions intensity indicators and the proportion represented by the emissions of a certain sector.
Disaggregation by agricultural products	It allows agricultural emissions to be disaggregated by crops (barley, beans, maize, millet, oats, potatoes, rye, sorghum, soybeans, wheat and paddy rice) for crop residues. For burning it can be disaggregated into sugar cane, corn, wheat and rice. Fertilizers do not have disaggregation.
Disaggregation by livestock categories	It allows agricultural emissions to be disaggregated by livestock species (asses, buffaloes, camels, cattle (dairy and non-dairy), goats,

	horses, llamas, mules, sheep, swine (breeding and market)) and relevant species aggregates (all animals, camels and llamas, cattle, mules and asses, sheep and goats, swine).
Global warming potential	Although no specific mention was found, it is considered that values from the 4th Assessment Report of the IPCC are used.
Tier	Estimates are computed at Tier 1 following the 2006 IPCC Guidelines for National greenhouse gas (GHG) Inventories.
Activity data	Activity data are derived directly from FAOSTAT
Use of country reported data to the UNFCCC	Also for Annex I countries, the official values presented to the Convention are offered. This FAOSTAT domain also disseminates the activity data and emissions reported by countries to the UNFCCC. Activity data are sourced from the most recently available GHG National Inventories or from National Communications. Emission data are sourced directly from the UNFCCC data portal or from Biennial Update Reports. UNFCCC data are disseminated in FAOSTAT with permission, formalized via a FAO-UNFCCC Memorandum of Understanding. However, at the moment of writing this document, this information was not available for each category.
AFOLU GHG Categories included	Crop residues, burning biomass from crop residues, enteric fermentation, manure management, manure left on pasture, manure applied to soils, rice cultivation, synthetic fertilizers, forest, fires, drained organic soils, drained organic soils, energy use in agriculture, emissions from pre and post agricultural production.

Table 4: OECD

Description	**This dataset presents trends in man-made emissions of major greenhouse gases and emissions by gas.**
Link	https://stats.oecd.org/Index.aspx?DataSetCode=air_ghg
Temporal coverage	1990-2020
Geographic coverage	OECD member countries and 202 non-OECD member countries.
Sector coverage	Energy, industrial processes and product use, agriculture, waste, land use change and forestry, other.

Disaggregation by agricultural products	No
Disaggregation by livestock categories	No
Global warming potential	For Annex I countries these calculations were based on defaults from Fourth Assessment Report (AR4). As regards the non-Annex I countries the factors from the following reports were used: Costa Rica, Israel, Korea, Peru - Second Assessment Report (AR2), Chile - AR4 and for Colombia, Mexico - AR5.
Tier	Although no specific mention was found, it is considered that countries make their emissions presentations directly to the OECD. In this case, it is very likely that Tier 2 or 3 has been used when it is developed by a country.
Activity data	Although no specific mention was found, it is considered that countries make their emissions presentations directly to the OECD. In this case, it would not be necessary to have activity data in order to make estimates.
Use of country reported data to the UNFCCC	For Annex I countries: Data source(s) used National Inventory Submissions 2022 to the United Nations Framework Convention on Climate Change (UNFCCC, CRF tables), and replies to the OECD State of the Environment Questionnaire. No description is found for Non-Annex I countries, it is believed that consultations are made with the Governments, who report their emissions.
AFOLU GHG Categories included	It was not identified.

Table 5: EDGAR

Description	**A multipurpose, independent, global database of anthropogenic emissions of greenhouse gases and air pollution on Earth. Provides independent emission estimates compared to what reported by European Member States or by Parties under the United Nations Framework Convention on Climate Change, using international statistics and a consistent IPCC methodology. EDGAR provides both emissions as national totals and gridmaps at 0.1 x 0.1 degree resolution at global level, with yearly, monthly and up to hourly data.**

Link	https://edgar.jrc.ec.europa.eu/
Temporal coverage	From 1970 onwards till year t_{-1} for CO_2 and with 2 or even 4 years delay for other GHG respectively air pollutants and particulate matter
Geographic coverage	Over 220 countries
Sector coverage	Power Industry - Power and heat generation plants (public & autoproducers) / Other industrial combustion - Combustion for industrial manufacturing and fuel production / Buildings – Small scale non-industrial stationary combustion / Transport – Mobile combustion (road & rail & ship & aviation) / Other sectors – Industrial process emissions & agriculture & waste. Large scale biomass burning with Savannah burning, forest fires, and sources and sinks from land-use, land-use change and forestry (LULUCF) are excluded
Disaggregation by agricultural products	No
Disaggregation by livestock categories	No
Global warming potential	IPCC AR5 (GWP-100)
Tier	The global default values recommended in the IPCC 2006 guidelines were used (Tier 1) and where recommended, region-specific values were applied for other sources (Tier 2).
Activity data	Whereas the activity data for the agricultural sectors originate primarily from FAO. United States Geological Survey (USGS), International Fertiliser Association (IFA), Gas Flaring Reduction Partnership (GGFR)/U.S. National Oceanic and Atmospheric Administration (NOAA), UNFCCC and World Steel Association (worldsteel) recent statistics are also used for activity data.
Use of country reported data to the UNFCCC	It is not indicated.
AFOLU GHG Categories included	Enteric fermentation, manure management, emissions from managed soils, emissions from biomass burning. At a macroregion level includes CO2 emission from Forest Land (Rossi et al., in prep.), Deforestation, Drainage of Organic Soils, Other Land use and their conversion.

Table 6: Climate Watch

Description	**Compiles a number of data sources to create a full gas, all sector inventory, comparable across countries by applying a consistent methodology, not to replace existing sources of GHG emissions data, but to complement them. Uses four different historical emissions data sources that are all slightly different in their scope and methodology.**
Link	https://www.climatewatchdata.org/ghg-emissions?breakBy=countries&end_year=2019&regions=WORLD&source=Climate%20Watch&start_year=1990
Temporal coverage	1990-2019. It has 3-year lag.
Geographic coverage	193 countries
Sector coverage	Energy, Industrial Processes, Agriculture, Land Use Change and Forestry, Waste, and International Bunkers
Disaggregation by agricultural products	No
Disaggregation by livestock categories	No. But it offers emissions intensity, emissions per unit of meat produced by each livestock category.
Global warming potential	100-years from the 4th Assessment Report of the IPCC.
Tier	It is not mentioned explicitly. Since the database focuses on harmonizing methodologies so that they are comparable between countries, could be inferred that Tier 1 is being used.
Activity data	International Energy Agency, FAO, The U.S. Environmental Protection Agency, Global Carbon Project, Forest Resource Assessment.
Use of country reported data to the UNFCCC	In order to emphasize comparability of data across countries, it does not use countries' official inventories reported to the UNFCCC. Due to the differences in data sources and methodologies used, Climate Watch estimated country GHG emissions are inevitably different than official inventories prepared by countries.

AFOLU GHG Categories included	Enteric fermentation, manure left on the pasture, crop residues, synthetic fertilizers, manure management, burning-savannas, rice cultivation, manure applied to soils, cultivation of organic soils, burning from crop residues, cropland, grassland, forestland.

5. COUNTRIES OFFICIAL SUBMISSIONS

Due to variations in capacity and resources among Annex I and non-Annex I Parties to the Convention, not all countries possess a complete time-series of greenhouse gas (GHG) data. The diverse reporting requirements and guidelines further complicate the comparability of inventories submitted by parties to the UNFCCC.

5.1. Developed countries

Developed countries face more stringent requirements, requiring an annual submission. These annual inventory comprise a national inventory report (NIR) and CRF tables. The NIRs provide comprehensive descriptive and numerical information, while the CRF tables encompass all GHG emissions and removals values, implied emission factors, and activity data. Adherence to reporting requirements established under the Convention, such as the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual greenhouse gas inventories" (Decision 24/CP.19), governs these submissions.

For generally key agricultural categories, Tier utilization was identified for each country (see Appendix I). For these countries, the UNFCCC has made progress in building a time series database where all updates to national inventories are periodically uploaded. Currently covers from 1990 to 2021. In this database it is possible to observe information on emissions and absorptions by sector (with openings by category in some cases) and by gas.[7] The opening by category for the same time series has also been systematized, but in this case the information can be downloaded by country.[8] Despite the systematization in reporting and the categorization of Annex I countries, there is space for the existence of some minor differences. For instance, in the development modality of a Tier 2 in bovine livestock, presentation can occur in a disaggregated manner through various options: i) dairy and non-dairy cattle, ii) growing cattle, mature dairy cattle, other mature cattle, or iii) other structure defined by the country. Finally, the UNFCCC database allows for a comparison by sector, category or gas between two member countries of the Convention for two different years.[9]

5.2. Developing countries

Non-Annex I countries submit their national GHG inventories through Biennial Update Reports (BURs). These reports not only detail GHG emissions and removals but also encompass information on mitigation actions, needs, and support received. They serve as updates on actions taken to implement the Convention, shedding light on the status of GHG emissions and removals by sinks, as well as efforts to

[7] See https://di.unfccc.int/time_series?_gl=1*1dun1th*_ga*MTg4ODEz-NDI5Ny4xNjg3ODAwODg2*_ga_7ZZWT14N79*MTcwMjczNzY1MS4zOC4xLjE3MDI3NDA1OTQuMC4wLjA.

[8] See GHG Profiles https://di.unfccc.int/ghg_profile_annex1

[9] See https://di.unfccc.int/comparison_by_category and https://di.unfccc.int/comparison_by_gas

reduce emissions or enhance sinks. Submissions adhere to reporting requirements established under the Convention, such as the "Guidelines for the preparation of national communications for non-Annex I Parties" (Decision 17/CP.8) and the “UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention” (Decision 2/CP.17).

The initial BUR was expected in December 2014, followed by subsequent submissions every two years. Nevertheless, flexibility is granted to Least Developed Country Parties (LDCs) and Small Island Developing States (SIDS), allowing them to submit reports at their discretion. As of June 30, 2023, 91 Parties have submitted their BURs. Some countries have chosen to complement the BUR presentation with a National Inventory Report (NIR), providing detailed descriptive and numerical information. The syntheses of annual presentations are provided in Appendix II.

Unlike what happened with Annex I countries, there is still no systematized database in the UNFCCC that contains all the information by sector of all non-Annex I countries. Recently progress has been made in systematizing the information by country, which can be downloaded in individual files, which has been annexed during the preparation of this report. Without a doubt, this reduces the difficulties of constructing a time series, which previously had to be done by extracting the information report by report. However, as can be seen in Appendix II, not all countries have been respecting the commitments of biennial presentation of their inventories. Likewise, the years reported, the way of reporting sector (in many cases it does not have opening by category), the global warming potentials and even the unit of measurement used differ between countries.

As with Annex I countries, it is possible to download the information by country in GgCO_2eq. according to what was reported in the BUR.[10] Although it must be kept in mind that the methodology proposed by the successive IPCC guidelines and the GWP may vary between countries, which is not reported in the profiles. Taking these observations into account, the UNFCCC database also allows for some comparison by sector, category or gas between two member countries of the Convention for two different years.[11] Although it should be noted that the comparison parameters do not cover the entire spectrum of categories.

In an effort to systematize the information from Non-Annex I countries, the GHG emission values from the AFOLU sector by category was consolidated in Appendix III. The values correspond to the most recent reporting year up to July 2023. This information is supplemented with details about each country's chosen methodologies, including the version of the IPCC guidelines, the Tier (1, 2, or 3), and the selected global warming potential.

5.3. Biennial transparency report

Reporting under the Convention will be superseded by reporting of the biennial transparency report (BTR) for Paris Agreement Parties (Decision 18/CMA.1) The first BTR should be submitted by 31 December 2024 at the latest, with some flexibility for the least developed countries and small island developing States. The report, includes a national GHG inventory report and information necessary to track progress in implementing and achieving its NDC. The national inventory reports (NIRs) information of

[10] See GHG Profiles https://di.unfccc.int/ghg_profile_non_annex1?_gl=1*1qxfo7f*_ga*MTg4ODEz-NDI5Ny4xNjg3ODAwODg2*_ga_7ZZWT14N79*MTcwMjc0Mzc1Ni4zOS4wLjE3MDI3NDM3NTYuMC4wLjA.

[11] See https://di.unfccc.int/comparison_by_category and https://di.unfccc.int/comparison_by_gas

anthropogenic emissions by sources and removals by sinks of GHG will be electronically reported on common reporting tables (CRTs).

The introduction of the BTR signals a convergence in methodologies between developing and developed countries. Notably, the 1996 IPCC guidelines will no longer be applicable, and all countries will be required to use either the 2006 IPCC Guidelines or the 2019 Refinement. Additionally, GWPs will be standardized to a single value for all countries, utilizing either the 100-year time-horizon GWP from the IPCC Fifth Assessment Report or from a subsequent IPCC assessment report. However, developed countries will maintain the practice of submitting an annual GHG inventory, while developing countries will transition to a biennial reporting schedule.

6. COMPARING GHG DATABASES: A PRACTICAL EXAMPLE

As shown in section 4, there are various information bases on GHG emissions with different functionalities and degrees of openness, both at the level of countries, emission categories and type of gas that can be consulted.

Although they all broadly show similar emission data, given the need for more precise analysis, the characteristics differ between them. While the UNFCCC reflects the emission data provided by the countries themselves, which for key categories should reflect calculation methodologies that more accurately reflect the GHG emissions of the agroecological and productive characteristics of local agriculture. In the rest of the bases, mostly, the need to contribute to comparability of the data prevails, so it is necessary to make some sacrifice in the sense of the accuracy of the value of the emissions.

As for practical examples, we present in Table 2, emissions by category in the AFOLU sector for Annex I countries. In this case, the official emission data reported by the countries in the UNFCCC are compared versus the data estimated by FAO. The selection of FAO data for comparison is not accidental, since it comes from the interpretation that it is the estimation base that has the greatest openness by category and that has wide geographical coverage (it has estimates for countries that are not members of UNFCCC) and a long time series (since 1961).

Emission values were extracted from official submissions under the UNFCCC for the year 2020, as well as values from the FAO database for the same categoriesand subcategories. It's crucial to note that while the UNFCCC database relies on the Tier number selected by each country (Appendix II), the FAO database values were estimated using Tier 1. Therefore, any comparisons between databases should be approached with caution.

Significant disparities are evident between the two information sources, even in categories officially categorized under Tier 1. For instance, in the case of direct emissions from crop residues, while FAO reports a value of 3.0 kg N_2O, the UNFCCC indicates a value of 7.4 kt N_2O, resulting in an almost 150% difference. In this scenario, the discrepancy arises from the estimated activity data, as the FAO calculated a value of 188 million, whereas the country officially reported 468 million kg N in crop residues returned to soils. It is evident that the magnitude of differences between the two databases varies depending on the analyzed categories. On average, for crop residues, the difference in values falls within the range of 100%, while for fertilizers, the difference is much lower, averaging 12%.

In cases where the country applies a Tier 2 calculation, the reported emission differences between the two databases are generally attributed to the emission factor. This is exemplified in the case of enteric fermentation emissions from non-dairy (beef) cattle in Canada, where the difference is 40%, with emissions values of 545.1 kt CH_4 in FAO and 765.7 kg CH_4 in UNFCCC. In this instance, FAO used a default emission factor with a value of 53 kg CH_4 head-1 yr^{-1} for the North American region, while the average emission factor in Canada was 71.05 $head^{-1}$ yr^{-1}. Although the values of bovine stock were similar in this case, there was still a difference (10.2 million in FAO compared to 10.7 million in UNFCCC).

Table 7: GHG emissions for Annex I Countries from dairy and non-dairy cattle, and direct N2O from managed soils. UNFCCC vs FAO databases. Year 2020

Country	Direct N2O Emissions From Managed Soils						Non Dairy Cattle						Dairy Cattle					
	Crop Residues (kt N_2O)		Inorganic N Fertilizers (kt N_2O)		Urine and Dung Deposited by Grazing Animals (kt N_2O)		Enteric Fermentation (kt CH_4)		Manure Management (kt CH_4)		Manure Management (kt N_2O)		Enteric Fermentation (kt CH_4)		Manure Management (kt CH_4)		Manure Management (kt N_2O)	
	FAO	UNFCCC	FAO	UNFCCC	FAO	UNFCCC	FAO	UNFCCC (kt CH4)	FAO	UNFCCC	FAO	UNFCCC	FAO	UNFCCC	FAO	UNFCCC	FAO	UNFCCC
Australia	5,8	11,3	21,0	8,1	62,1	9,4	1.326,6	—	44,2	—	4,3	—	125,4	—	40,4	—	0,1	—
Austria	0,9	1,3	1,7	1,7	1,2	0,3	75,8	72,0	8,0	9,1	0,5	0,6	61,4	68,4	11,0	9,0	0,5	0,4
Belarus	1,4	6,2	7,3	6,8	1,5	1,5	162,8	130,1	16,8	5,7	1,3	0,5	147,0	174,1	16,3	8,8	1,1	0,7
Belgium	0,5	3,0	2,8	2,5	1,3	1,6	102,5	85,5	10,8	5,2	0,7	1,0	62,9	63,7	11,3	13,0	0,6	0,4
Bulgaria	1,5	3,5	5,7	5,7	0,5	0,4	20,1	—	2,1	—	0,2	—	24,0	—	2,8	—	0,2	—
Canada	13,1	14,0	48,4	32,1	12,3	0,7	545,1	765,7	10,3	40,2	3,0	7,5	125,5	139,2	47,1	37,9	0,8	0,9
Hungary	2,4	0,6	7,0	1,6	0,5	0,2	41,0	—	4,2	—	0,3	—	22,4	—	2,6	—	0,2	—
Cyprus	0,0	0,0	0,1	0,1	0,3	NO	1,3	2,5	0,0	0,3	0,0	0,0	1,7	4,8	0,1	0,7	0,0	0,0
Czechia	1,5	3,1	4,5	4,5	0,5	0,6	57,0	61,6	5,9	3,7	0,5	0,3	35,3	57,4	3,9	4,8	0,3	0,2
Denmark	1,8	3,1	3,7	4,0	0,9	0,6	53,3	38,1	5,6	13,4	0,4	0,3	66,1	89,3	11,9	27,7	0,6	0,5
Estonia	0,3	0,5	0,7	0,7	0,2	0,1	9,6	—	1,0	—	0,1	—	9,9	—	1,8	—	0,1	—
Finland	0,6	1,4	2,2	2,2	0,5	0,4	33,0	33,6	3,5	3,9	0,2	0,3	29,9	41,9	5,4	8,4	0,3	0,2
France	9,9	13,4	32,7	32,1	11,8	25,3	817,1	767,0	93,9	48,8	5,8	2,7	404,2	431,2	76,4	37,7	3,6	1,4
Germany	7,7	5,4	19,9	13,0	7,0	3,5	420,7	357,5	44,3	56,6	3,0	2,4	458,8	552,1	82,3	91,1	4,0	2,4
Greece	0,5	0,8	3,2	3,2	3,0	3,2	25,8	27,0	3,6	1,6	0,2	0,1	10,1	10,8	2,5	1,0	0,1	0,1
Hungary	2,4	3,0	7,0	7,0	0,5	0,5	41,0	38,4	4,2	6,8	0,3	0,3	22,4	30,7	2,6	7,3	0,2	0,3
Iceland	0,0	0,0	0,2	0,2	0,2	0,1	3,1	—	0,3	—	0,0	—	3,0	—	0,5	—	0,0	—
Ireland	0,3	0,7	6,0	7,2	4,4	4,3	289,2	273,1	30,4	29,0	2,0	0,9	170,4	184,8	30,6	17,2	1,5	0,2
Italy	3,0	7,4	9,0	8,8	5,5	2,6	258,1	208,9	32,9	43,9	1,8	1,4	218,9	222,3	47,7	36,8	1,9	1,1
Japan	2,0	1,8	5,8	3,8	4,3	0,1	144,2	155,2	3,1	6,3	2,0	2,2	57,0	135,5	8,3	81,1	0,3	2,1
Latvia	0,7	0,6	1,3	1,3	0,3	0,2	15,0	—	1,6	—	0,1	—	15,9	—	2,9	—	0,1	—
Lithuania	1,2	1,4	2,9	3,1	0,4	0,5	22,6	23,9	2,4	3,0	0,2	0,1	27,2	31,0	4,9	3,2	0,2	0,2
Luxembourg	0,0	0,0	0,2	0,2	0,1	0,1	7,8	—	0,8	—	0,1	—	6,3	—	1,1	—	0,1	—
Malta	0,0	0,0	0,0	0,0	0,0	NO	0,5	—	0,1	—	0,0	—	0,7	—	0,3	—	0,0	—
Monaco	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO	-	NO
Netherlands	0,4	1,1	3,4	4,0	2,5	3,0	121,0	—	12,7	—	0,9	—	183,6	—	32,9	—	1,6	—
New Zealand	0,2	0,9	7,4	5,2	26,6	13,1	314,8	239,2	5,2	3,3	1,0	NO	435,3	561,4	113,0	55,5	0,4	NO
Norway	0,2	0,2	1,7	1,7	1,0	0,6	37,0	—	3,9	—	0,3	—	25,7	—	4,6	—	0,2	—
Poland	4,8	6,4	14,3	16,2	2,3	1,7	240,9	—	24,9	—	1,9	—	210,4	—	23,4	—	1,5	—
Portugal	0,2	0,6	1,7	1,6	1,5	3,0	83,1	83,2	14,7	2,7	0,6	0,1	27,2	31,6	8,0	6,2	0,2	0,1
Romania	3,3	6,5	7,4	7,4	3,3	4,4	44,7	48,6	4,6	1,9	0,4	0,1	112,8	138,5	12,5	7,5	0,8	0,4
Russian Federation	26,9	38,8	30,1	41,2	11,4	8,3	670,2	592,0	69,3	30,7	5,4	1,4	650,6	693,1	72,3	29,7	4,7	5,3
Slovakia	0,8	1,1	2,0	2,0	0,2	0,2	18,6	19,6	1,9	0,7	0,2	0,1	12,1	14,9	1,3	1,0	0,1	0,1
Slovenia	0,1	0,1	0,4	0,4	0,3	0,1	22,0	—	2,3	—	0,2	—	11,6	—	2,1	—	0,1	—
Spain	4,8	2,6	16,6	16,4	7,6	8,7	332,1	364,9	46,6	24,2	2,3	0,8	94,9	101,1	22,2	29,7	0,8	0,3
Sweden	1,1	1,4	3,4	3,4	0,9	1,2	61,9	57,3	6,5	4,4	0,4	0,3	35,6	44,6	6,4	2,8	0,3	0,2
Switzerland	0,2	0,6	0,7	0,6	1,0	0,7	55,3	—	5,8	—	0,4	—	63,7	—	11,4	—	0,6	—
Türkiye	7,1	11,6	32,3	32,3	43,0	23,7	361,3	529,3	11,7	11,2	0,3	2,8	290,2	565,8	12,6	134,9	0,2	3,7
Ukraine	12,0	31,2	27,0	30,6	1,5	3,3	76,9	—	8,0	—	0,6	—	174,8	—	19,4	—	1,3	—
United Kingdom	3,6	5,5	15,2	10,9	12,2	2,4	442,1	415,8	46,5	52,8	3,1	4,4	217,5	229,4	39,0	71,2	1,9	1,0
United States of Americ	80,6	234,1	182,6	214,3	105,7	41,6	4.475,9	—	84,5	—	24,8	—	1.195,9	—	448,4	—	7,6	—

Note:

- Empty cells from UNFCCC database responds to difference on data opening reporting
- “NO” (not occurring) for categories or processes, including recovery, under a particular source or sink category that do not occur within an Annex I Party;

Source: Author’s based on UNFCCC and FAOStat

7. FINAL REMARKS

Responding to climate change will only be possible if all the countries of the world are committed to it. Finding the solution to the problem requires responsibility, because all contaminating activities cannot be suddenly discontinued; rather, a gradual conversion process must be commenced towards more sustainable production and consumption systems.

The Paris Agreement represented a great step forward not only towards the acknowledgement of the problem, but also for the attempt to find a global solution to it. Despite commendable progress, projections indicate that more ambitious commitments are imperative to reach the established targets. Global emissions are currently deviating from the projected global mitigation pathways aligned with the temperature objective of the Paris Agreement (UNFCCC, 2023). The timeframe for enhancing ambition and enacting established commitments to constrain the temperature rise to 1.5 °C above pre-industrial levels is rapidly narrowing. There is an urgent need for heightened commitment to implement domestic mitigation measures and establish more ambitious targets in NDCs. Generating proposals based on a full understanding of the dynamics of sectoral emissions is a priority. Even more, it is necessary that these proposals be based on science and respect the principle of Common But Differentiated Responsibilities (CBDR) in order not to generate policies that unjustifiably attack small producers and the development possibilities of the least developed countries.

Due to lower emissions growth rates than those reflected in other sectors, the proportion of global GHG emissions attributable to agriculture has declined from 15.4% in 1990 to 11.6% in 2019, showing a consistent downward trend. Remarkably, this reduction occurred amid a substantial 83% increase in world food production over the same period, although the agricultural sector experienced a 15.8% rise in emissions during this time. Even emissions from land-use change and forestry (LUCF) fell 14.1 percent. Meanwhile, emissions from industrial processes, energy, and waste grew 203.0%, 62.0%, and 19.9%, in the same period, respectively.

However, it should be noted that consumer demand for products set apart by their lesser environmental impact will be ever growing. Also, it is expected that due to population growth and changes in consumption trends, sectoral emissions are expected to continue increasing. Therefore, this fact should not be ignored and the promotion of environmental efficiency in food production must be deepened, while creating tools that allow academics, policy makers and the general public to correctly interpret the carbon footprint and provide a coherent justification for their decision.

Recognizing the differences between the existing GHG emissions bases and the calculation methodologies used is a substantial factor to generate substantive contributions to the discussion. Errors of judgment concerning sector emissions are generating considerable pressure for the establishment of a growing number of new environmental barriers to trade that lack scientific basis, but have significant implications for global food security and environmental sustainability, as well as on the livelihoods of millions of small farmers around the planet.

The comprehensive vision of agri-food systems, although it is logical when integrating agriculture with its value chain, in order to explain sectoral GHG emissions complicates the situation, since it naturally tends to think that most of the increase in Emissions are related to farm-gate production and land use change, when we have seen that this is not the case.

Beyond the responsibilities of the agricultural sector, on which work must continue in order to increase the mitigation capacity of the sector, it is necessary to recognize and reflect in the case studies, as well as in public policy, that not all agriculture and not all countries emit GHG in the same amount, with relatively important differentials in some cases.

When examining and comparing GHG emission values across different countries, the ideal scenario involves to promote the consistency throw the use of similar methodologies to estimate these emissions. In such cases, differences in the results between countries would reflect real differences in emissions rather than variations due to differing methodological approaches. Consequently, some datasets have been developed with the goal of creating a comparable dataset across countries, employing a fixed GWP, a specific version of the IPCC guidelines, and a Tier 1 approach. Depending on the study's objectives, these databases may be deemed acceptable. However, it is crucial to note that they do not provide official information, and the use of default emission factors fails to capture the unique productive characteristics and trends of a country over time, potentially leading to higher estimation uncertainties.

Currently, the UNFCCC's requirements for the use of global warming potentials and IPCC guidelines versions differ between developed and developing countries. Given that the majority of emissions from the agricultural sector involve CH^4 and N_2O gases, variations in warming potential values could impact the comparability of emissions between different countries. This is especially relevant unless the comparison is made directly between categories in units of the specific gas itself, without converting it to the common unit of CO_2 equivalent. Fortunately, many of these variations in methodological criteria are set to be standardized with the presentation of inventories through the Biennial Transparency Report from 2024.

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APPENDIX I: TIER UTILIZATION FOR ANNEX I COUNTRIES FOR GENERALLY KEY AGRICULTURAL CATEGORIES IN YEAR 2020.

Country	Field Burning of Agricultural Residues	Rice Cultivation	Direct N_2O Emissions From Managed Soils						Indirect N_2O Emissions from Managed Soils	
			Crop Residues	Cultivation of Organic Soils	Inorganic N Fertilizers	Urine and Dung Deposited by Grazing Animals	Mineralization Associated with Loss Organic Matter	Organic N Fertilizers - Animal Manure Applied to Soils	Atmospheric deposition	Nitrogen Leaching and Run-off
Australia	CS	T1	T2	T1	T2	T2	T2	T2	T1	CS,T2
Austria	T1	NA	T1	T1	T1	T1	T1	T1	T1	T1
Belarus	NA	NA	T1	T1	T1	T1	NA	T1	T1	T1
Belgium	NA	NA	T1	T1	T1	T1	T1	T1	T1	T1
Bulgaria	D	T1	T1	T1	T1	T1	T1	T1	T1	T1
Canada	T1	NA	T2	T2	T2	T2	T2	T2	T1	T1
Hungary	NA	NA	T1	T1	T1	T1	T1	T1	T1	T1
Cyprus	T1	NA	T1	NA	T1	NA	NA	T1	T1	NA
Czechia	NA	NA	T1,T2	NA	T1	T1	NA	T1	T1	T1
Denmark	T1	NA	CS,NA,T1	NA,T1	NA,T1	T1,T2	NA,T2	NA,T1,T2	T1,T2	NA,T1,T2
Estonia	NA	NA	T1	T1	T1	T1	NA	T1	T1	D,T1
Finland	CS	NA	T1	T2	T1	T1	T1	T1	T1	T1
France	T2	T1	T1,T2	T1,T2	T1,T2	T1,T2	NA	T1,T2	T1,T2	T1,T2
Germany	NA	NA	T2	T2	T2	T1	T1	T2	T1	T1

Greece	T1	T1	T1	T1	T1	T1	NA	T1	T1	T1
Hungary	T1	T1	T1	NA	T1	T1	T2	T1	T1	T1
Iceland	NA	NA	T1b	T2	T1	T1	NA	T1	T1b	T1b
Ireland	NA	NA	T1	T1	T1	T1	T1	T1	T1	T1
Italy	T1	T2	CS	T1	T1	T1	NA	T1	T1	T1
Japan	T1	T3	CS,T2	T2	T2	T2	T2	T2	T2	T2
Latvia	NA	NA	T1	T1	T1	T1	NA	T1	T1	T1
Lithuania	NA	NA	T2	T1	T1	T1	NA	T1	T1	T1
Luxem-burg	NA	NA	T1	NA	T1	T1	T1	T1	T2	T1
Malta	NA	NA	T1	NA	T1	NA	T1	T1	T1	T1
Monaco	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nether-lands	NA	NA	T1b	T2	T1b	T1	NA	T1b	T1	T1
New Ze-land	T2	NA	T2	T1	T2	T1,T2	T1	T1	T1	T1
Norway	T1	NA	T1	T1	T1	T1	NA	T1	T1	T1
Poland	D	NA	T1	T1	T1	T1	T1	T1	T1	T3
Portugal	T1,T2	T1	T1	NA	T1	T1	NA	T1	T2	T1
Romania	T1	T1	T1	T1	T1	T1	NA	T1	T1	T1
Russian Federa-tion	NA	T1	CS	T1	T2	T1	T1	T1	T1	T1

Slovakia	NA	NA	T1	NA	T1	T1	T1	T1	T1	T2
Slovenia	NA	NA	T1	T1	T1	T1	T2	T1	T1	T1
Spain	T2	T1	CS,T1	NA	CS,T1	CS,T1	NA	CS,T1	CS,T2	CS,T2
Sweden	NA	NA	T2	T1	T2	T1	T2	T2	CS	CS
Switzer-land	NA	NA	T1	T1	T1	T1	T1	T3	T3	T3
Türkiye	T1	T1	T1	T1	T1	T1	NA	T1	T1	T1
Ukraine	NA	T1	CS	T1	T1	T1	T2	T1	T2	T1
United Kingdom	NA	NA	T1	T1,T2	T2	T2	T1	T2	T1	T1
United States	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER	OTHER

T1: Tier 1; T2: Tier 2; T3: Tier 3; NA: (not applicable) for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas; CS: country-specific information.

Country	Non Dairy Cattle			Dairy Cattle		
	Enteric Fermentation	Manure Management CH_4	Manure Management N_2O	Enteric Fermentation	Manure Manage-ment CH_4	Manure Manage-ment N_2O
Australia	—	—	—	—	—	—
Austria	T2	T2	T2	T2	T2	T2
Belarus	T2	T2	T1	T2	T2	T1
Belgium	T2	T2	T2	T2	T2	T2
Bulgaria	—	—	—	—	—	—
Canada	T2	T2	T1	T2	T2	T2
Hungary	—	—	—	—	—	—
Cyprus	T1	T2	T1	T2	T2	T1
Czechia	T2	T1,T2	T2	T2	T1,T2	T2
Denmark	NA,T2	CS,NA,T2	NA,T2	NA,T2	CS,NA,T2	NA,T1,T2
Estonia	—	—	—	—	—	—
Finland	T2	T2	T2	T2	T2	T2
France	T2,T3	T2	T2	T2,T3	T2	T2
Germany	T2	T2	T2	T3	T2	T2
Greece	T2	T2	D	T2	T2	D
Hungary	T2	T2	T2	T2	T2	T2
Iceland	—	—	—	—	—	—

Ireland	CS,T2	T2	T2	CS,T2	T2	T2
Italy	T2	T2	T2	T2	T2	T2
Japan	CS	CS	CS	CS	CS	CS
Latvia	—	—	—	—	—	—
Lithuania	T2	T2	T2	T2	T2	T2
Luxemburg	—	—	—	—	—	—
Malta	—	—	—	—	—	—
Monaco	NA	NA	NA	NA	NA	NA
Netherlands	—	—	—	—	—	—
New Zeland	T2	T2	NA	T2	T2	NA
Norway	—	—	—	—	—	—
Poland	—	—	—	—	—	—
Portugal	T2	T2	T2	T2	T2	T2
Romania	T2	T2	T2	T2	T2	T2
Russian Federation	CS,T2	CS,T2	T1	CS,T2	CS,T2	T1
Slovakia	T2	T2	T2	T2	T2	T2
Slovenia	—	—	—	—	—	—
Spain	CS,T2	T2	T2	CS,T2	T2	T2
Sweden	CS	T2	CS,NA,T2	CS	T2	CS,NA,T2

Switzerland	—	—	—	—	—	—
Türkiye	T2	T1	T1	T2	T1	T1
Ukraine	—	—	—	—	—	—
United Kingdom	T3	T2	T2	T3	T2	T2
United States	—	—	—	—	—	—

T1: Tier 1; T2: Tier 2; T3: Tier 3; NA: (not applicable) for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas; CS: country-specific information. Empty cells (-) responds to difference on data opening reporting

APPENDIX II: BIENNIAL UPDATE REPORT SUBMITTED BY NON-ANNEX I COUNTRIES.

Country	BUR1	BUR2	BUR3	BUR4	BUR5	Last NIR
Afghanistan	2019	-	-	-	-	2020
Albania	2021	-	-	-	-	2021
Algeria	-	-	-	-	-	-
Andorra	2014	2017	2019	2021	-	-
Angola	-	-	-	-	-	-
Antigua and Barbuda	2020	-	-	-	-	2020
Argentina	2015	2017	2019	2021	-	2022
Armenia	2016	2018	2021	-	-	2021
Azerbaijan	2015	2018	-	-	-	-
Bahamas	2022	-	-	-	-	-
Bharain	-	-	-	-	-	-
Bangladesh	-	-	-	-	-	-
Barbados	-	-	-	-	-	-
Belize	2021	-	-	-	-	2021
Benin	2019	-	-	-	-	2019
Bhutan	2022	-	-	-	-	-
Bolivia	-	-	-	-	-	-
Bosnia and Herzego-vina	2015	2017	2023	-	-	-
Botswana	2019	-	-	-	-	-
Brazil	2014	2017	2019	2020	-	-
Brunei Darussalam	-	-	-	-	-	-
Burkina Faso	2021	-	-	-	-	-
Burundi	2022	-	-	-	-	-

Cabo Verde (Republic of)	-	-	-	-	-	-
Cambodia	2020	-	-	-	-	2020
Cameroon	-	-	-	-	-	-
Central African Repu-blic	-	-	-	-	-	-
Chad	-	-	-	-	-	-
Chile	2015	2017	2018	2021	2022	2023
China	2017	2019	-	-	-	-
Colombia	2015	2018	2022	-	-	2022
Comoros	-	-	-	-	-	-
Congo	-	-	-	-	-	-
Cook Islands	-	-	-	-	-	-
Costa Rica	2015	2019	-	-	-	2020
Cote d'Ivoire	2018	-	-	-	-	-
Cuba	2020	-	-	-	-	-
Cyprus	-	-	-	-	-	-
Democratic People´s Republic of Korea	-	-	-	-	-	-
Democratic Republic of the Congo	2022	-	-	-	-	2023
Djibouti	-	-	-	-	-	-
Dominica	-	-	-	-	-	-
Dominican Republic	2020	-	-	-	-	-
Ecuador	2016	2023	-	-	-	2023
Egypt	2019	-	-	-	-	-
El Salvador	2018	-	-	-	-	-
Equatorial Guinea	-	-	-	-	-	-
Eritrea	2021	-	-	-	-	-

Eswatini	-	-	-	-	-	-
Ethiopia	-	-	-	-	-	-
Fiji	-	-	-	-	-	-
Gabon	2021	-	-	-	-	2021
Gambia	-	-	-	-	-	-
Georgia	2016	2019	-	-	-	2019
Ghana	2015	2019	2021	-	-	2021
Grenada	-	-	-	-	-	-
Guatemala	2023	-	-	-	-	-
Guinea	2023	-	-	-	-	-
Guinea-Bissau	2020	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haití	-	-	-	-	-	-
Honduras	2020	-	-	-	-	2020
India	2016	2018	2021	-	-	-
Indonesia	2016	2018	2021	-	-	-
Iran (Islamic Republic of)	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Israel	2016	2023	-	-	-	-
Jamaica	2016	-	-	-	-	-
Jordan	2017	2021	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-
Kuwait	2019	-	-	-	-	-
Kyrgyzstan	2022	-	-	-	-	2022

Lao People's Democratic Republic	2020	-	-	-	-	-
Lebanon	2015	2017	2019	2021	-	-
Lesotho	2021	-	-	-	-	-
Liberia	2021	-	-	-	-	-
Libya	-	-	-	-	-	-
Madagascar	-	-	-	-	-	-
Malawi	2022	-	-	-	-	-
Malaysia	2016	2018	2020	2022	-	-
Maldives	2020	-	-	-	-	-
Mali	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Mauritania	2016	2021	-	-	-	2021
Mauritius	2021	-	-	-	-	2021
Mexico	2015	2019	2022	-	-	2022
Micronesia (Federated States of)	2023	-	-	-	-	-
Mongolia	2017	-	-	-	-	2017
Montenegro	2016	2019	2022	-	-	2022
Morocco	2016	2019	2022	-	-	-
Mozambique	2022	-	-	-	-	-
Myanmar	-	-	-	-	-	-
Namibia	2014	2016	2019	2021	-	2021
Nauru	-	-	-	-	-	-
Nepal	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	-
Niger	2022	-	-	-	-	2023
Nigeria	2018	2021	-	-	-	-

Niue	-	-	-	-	-	-
North Macedonia	2015	2018	2021	-	-	2021
Oman (Sultanate of)	2019	-	-	-	-	-
Pakistan	2022	-	-	-	-	-
Palau	-	-	-	-	-	-
Panama	2019	2021	-	-	-	2021
Papua New Guinea	2019	2022	-	-	-	2022
Paraguay	2015	2018	2021	-	-	2022
Peru	2014	2019	2023	-	-	2019
Philippines	-	-	-	-	-	-
Qatar	-	-	-	-	-	-
Republic of Korea	2014	2017	2019	2023	-	-
Republic of Moldova	2016	2019	2021	-	-	2021
Rwanda	2021	-	-	-	-	2022
Saint Kitts and Nevis	-	-	-	-	-	-
Saint Lucia	2021	-	-	-	-	2021
Saint Vincent and the Grenadines	-	-	-	-	-	-
Samoa	-	-	-	-	-	-
San Marino	-	-	-	-	-	-
Sao Tome and Principe	2022	-	-	-	-	-
Saudi Arabia	2018	-	-	-	-	-
Senegal		-	-	-	-	-
Serbia	2016	-	-	-	-	-
Seychelles	-	-	-	-	-	-
Sierra Leone	-	-	-	-	-	-
Singapore	2014	2016	2018	2020	2022	-

South Sudan	-	-	-	-	-	-
Sri Lanka	-	-	-	-	-	-
State of Palestine	-	-	-	-	-	-
Sudan	-	-	-	-	-	-
Suriname	2022	-	-	-	-	-
Syrian Arab Republic	-	-	-	-	-	-
Tajikistan	2019	-	-	-	-	-
Thailand	2015	2017	2020	2022	-	-
Timor-Leste	-	-	-	-	-	-
Togo	2017	2021	-	-	-	2021
Tonga	-	-	-	-	-	-
Trinidad and Tobago	2021	-	-	-	-	-
Tunisia	2014	2016	2022	-	-	-
Turkmenistan	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-
Uganda	2019	-	-	-	-	-
United Arab Emirates	-	-	-	-	-	-
United Republic of Tanzania	-	-	-	-	-	-
Uruguay	2015	2017	2019	2021	-	2022
Uzbekistan	2021	-	-	-	-	-
Vanuatu	2021	-	-	-	-	-
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-
Viet Nam	2014	2017	2021	-	-	2021
Yemen	2018	-	-	-	-	-
Zambia	2020	-	-	-	-	-
Zimbabwe	2021	-	-	-	-	-

APPENDIX III: METHODOLOGICAL CRITERIA AND VALUES FOR THE AFOLU SECTOR IN THE LATEST BIENNIAL UPDATE REPORT BY NON-ANNEX I COUNTRIES.

Country	Inventory period	Last Inventory Year	IPCC Guideline	GWP	Metodology	Opening of gas emissions	Total Country	Agriculture	LULUCF	AFOLU	Unit
Afghanistan	1990-2017	2017	2006	AR4	D-T1-T2-CS	Yes. Opening by category	43.471,4	20.073,9	NE	-	Gg CO2eq
Albania	2009-2016	2016	2006	AR2	T1	Total sector by gas	10.461,0	-	-	3.688,0	Gg CO2eq
Andorra	1990, 1995, 2000, 2005, 2010-2019	2019	2006	AR5	T1+	Total sector by gas	371,71	-	-	-129,1	Gg CO2eq
Antigua and Barbuda	1990-2020	2015	2006	-	T1-T2-T3	Yes. Opening by category	-	-	-	-	Gg CO2eq
Argentina	1990-2018	2018	2006-2019	AR2	D-T1-T2-CS	Yes. Opening by category	365.889,8	-	-	143.194,5	Gg CO2eq
Armenia	1990-2017	2017	2006	AR2	T1-T2-T3	Yes. Opening by category	10.153,5	-	-	1.494,8	Gg CO2eq
Azerbaijan	1990-2013	2013	2006	AR2	D-T1	Total sector by gas	53.889,0	-	-	605,0	Gg CO2eq
Bahamas	2001-2018	2018	2006	AR5	T1	Total sector by gas	6.264,4	-	-	2993,3	Gg CO2eq
Belize	2012, 2015, 2017	2017	2006	AR2	T1-T2-T3	Yes. Opening by category	-4.878,2	-	-	-6.683,2	Gg CO2eq
Benin	1990-2015	2015	2006	AR4	D-T1-T2-CS	Information in graphics	7.792,4	4.863,7	-3.959,8	-	Gg CO2eq
Bhutan	2016-2020	2020	2006	AR4	D-T1-T2-CS	Total sector by gas	-6.789,6	512,0	8.969,0	-	Gg CO2eq

Bosnia and Herzegovina	1990, 2014-2018	2018	2006	AR2	T1+	Main categories only	25.339,0	1.890,9	-5.831,9	-	Gg CO2eq
Botswana	2015	2015	2006	AR2	D-T1	Yes. Opening by category	7.131,1	-	-	-2.803,0	Gg CO2eq
Brazil	1990-2016	2016	1996-2006	AR2	T1-T2-T3	Yes. Opening by category	1.305.570,0	439.213,0	290.867,0	-	Gg CO2eq
Burkina Faso	1995-2015	2015	2006	AR2	D-T1-T2-T3-CS	Yes. Opening by category	66.035,5	-	-	59.832,8	Gg CO2eq
Burundi	2005-2019	2019	2006	AR5	T1	Total sector by gas	-11.219,0	2.057,0	-	-13.277,0	Gg CO2eq
Cambodia	1994-2016	2016	2006	AR4	T1	Total sector by gas	163.592,4	18.397,7	131.011,2	-	Gg CO2eq
Chile	1990-2020	2020	2006	AR4	T1+	Total sector by gas	55.824,5	11.237,7	-49.727,4	-	Gg CO2eq
China	1994-2005-2010-2012-2014	2014	1996-2006	AR2	D-T1-T2-T3-CS	Total sector by gas	11.186.000,0	830.000,0	-1.115.000,0	-	Gg CO2eq
Colombia	1990-2018	2018	2006-2019	AR5	T1+	Yes. Opening by category	279.199,0	-	-	155.290,0	Gg CO2eq
Costa Rica	2005-2010-2012-2015	2015	2006	AR2	T1+	Total sector by gas	10.881,7	-	-	179.41	Gg CO2eq
Cote d'Ivoire	1990-2014	2014	2006	AR3	T1-T2	Information in graphics	50.356,4	-	-	36.885,2	Gg CO2eq
Cuba*	1990-2016	2016	2006	AR2	T1+	Total sector by gas	23.066,5	10.108,4	-27.146,2	-	Kt CO2eq
Democratic Republic of the Congo	2000-2018	2018	2006 con inclusión parcial refinamientos 2019	AR5	T1	Yes. Opening by category	718.318,6	5.492,8	-8.630,2	-	Gg CO2eq
Dominican Republic	2010-2015	2015	2006	AR2	T1	Yes. Opening by category	24.634,2	4.753,6	-10.851,8	-	Gg CO2eq
Ecuador	1994-2018	2018	2006	AR4	T1-T2	Yes.	75.326,9	15.699,5	16.282,9	-	Gg CO2eq

						Opening by category					
Egypt	2005-2015	2015	2006	AR2	T1	Total sector by gas	325.614,0	-	-	48.390,0	Gg CO2eq
El Salvador	2014	2014	2006	AR4	T1-T2-T3	Yes. Opening by category	20.394,9	-	-	11.793,6	Gg CO2eq
Eritrea	2000-2006-2010-2015-2018	2018	2006	AR2	T1	Information in graphics	3.992,2	-	-	2.985,2	Gg CO2eq
Gabon	1994-2017	2017	2006	AR2	T1+	Yes. Opening by category	-103.085,0	797,0	-108.000,0	-	Gg CO2eq
Georgia	1990-2015	2015	2006	AR2	T1	Yes. Opening by category	13.707,0	3.271,0	-3.882,0	-	Gg CO2eq
Ghana*	1990-2019	2019	2006	AR4	T1+	Yes. Opening by category	59,8	12,1	14,5	-	Mt CO2eq
Guatemala*	1990-2018	2018	2006 con inclusión parcial refinamientos 2019	AR4	T1-T2	Yes. Opening by category	62.058,6	6.552,9	30.804,0	-	Kt CO2eq
Guinea	1990-2019	2019	2006	AR2	T1	-	2.057,6	-	-	-1.645,1	Gg CO2eq
Guinea-Bissau	2006-2013	2013	2006	AR5	T1	Yes. Opening by category	1.556,6	-	-	-453,8	Gg CO2eq
Honduras	2005-2015	2015	2006	AR2	T1-T2	Information in graphics	8.753,1	-	-	-3.727,8	Gg CO2eq
India	2000-2016	2016	1996-2006	AR2	T1+	Information in graphics	2.531.069,0	407.821,0	-307.820,0	-	Gg CO2eq
Indonesia	2000-2019	2019	2006	AR2	-	Information in graphics	1.845.067,0	105.301,0	924.853,0	-	Gg CO2eq
Israel*	1996-2020	2020	1996-2006	-	T2	Information in graphics	77.154,8	2.296,8	-260,2	-	Mt CO2eq
Jamaica	2006-2012	2012	2006	AR2	T1	Total sector by gas	20.205,0	-	-1.626,0	-	Gg CO2eq

Jordan	2016	2016	2006-2019	AR2	T1	Total sector by gas	31.063,3	-	-	428,7	Gg CO2eq
Kuwait	1994,2000,2016	2016	2006	AR2	T1	Yes. Opening by category	86.336,5	154.371,0	-13.190,0	-	Gg CO2eq
Kyrgyzstan	1990-2018	2018	2006	AR2	T1+	Yes. Opening by category	6.917,0	5.196,3	-10.941,4	-	Gg CO2eq
Lao People's Democratic Republic	2014	2014	2006	-	T1	Yes. Opening by category	24.100,0	-	-	18.793,4	Gg CO2eq
Lebanon	1994-2018	2018	2006	AR5	T1+	Yes. Opening by category	29.266,0	907,0	-3.194,4	-	Gg CO2eq
Lesotho	1994-2017	2017	2006	AR2	T1	-	5.660,4	-	-	2.417,0	Gg CO2eq
Liberia	2000,2015-2017	2017	2006	AR2	T1-T2	Yes. Opening by category	5.990,7	208,4	3.805,7	-	Gg CO2eq
Malawi	2001-2017	2017	2006	AR2	T1	Yes. Opening by category	3.613,5	-	-	1.205,0	Gg CO2eq
Malaysia	1990-2019	2019	2006	AR4	T1+	Yes. Opening by category	115.643,7	9.921,7	-214.714,5	-	Gg CO2eq
Maldives	2001-2015	2015	2006	AR2	T1	Yes. Opening by category	1.536,0	NE	-	-	Gg CO2eq
Mauritania	1990-2018	2018	2006	AR4	T1	Yes. Opening by category	9.944,6	-	-	6.547,0	Gg CO2eq
Mauritius	2000-2016	2016	2006	AR2	T1+	Main categories only	4881.36	-	-	-171,6	Gg CO2eq
Mexico	1990-2019	2019	2006-2019	AR5	T1+	Yes. Opening by category	534.688,6	140.807,2	-201.941,0	-	Gg CO2eq
Micronesia (Federated States of)	2001-2018	2018	2006-2019	AR5	T1	Total sector by gas	174,2	28,4	-	-	Gg CO2eq

Mongolia	1990-2014	2014	2006	AR2	T1-T2-D-CS	Yes. Opening by category	10.030,8	16.727,0	-24.451,9	-	Gg CO2eq
Montenegro	1990-2019	2019	2006	AR4	T1-D-CS	Yes. Opening by category	1.119,3	-	-	-2.232,4	Gg CO2eq
Morocco	2010, 2012, 2014, 2016, 2018	2018	2006	AR4	T1	Total sector by gas	90.944,5	20.729,3	-1.745,6	-	Gg CO2eq
Mozambique	1990, 1994, 2000, 2005, 2010, 2012, 2014, 2016	2016	2006	AR2	T1-T2	-	55.498,0	1.882,0	337.221,0	-	Gg CO2eq
Namibia	1990-2016	2016	2006-2019	AR2	T1-T2	Yes. Opening by category	-105.428,0	-	-	-126.688,0	Gg CO2eq
Niger	1990-2019	2019	2006-2019	AR4	T1-T2	Yes. Opening by category	40.669,0	-	-	33.836,6	Gg CO2eq
Nigeria	2000-2017	2017	2006	AR5	T1-T2	Yes. Opening by category	673.641,0	-	-	389.790,0	Gg CO2eq
North Macedonia	1990-2016	2016	2006	AR4	T1-T2-CS	Total emissions by gas	8.020,6	-	-	-2.087,8	Gg CO2eq
Oman (Sultanate of)	1994,2000,2015	2015	2006	AR5	T1	Total sector by gas	96.072,0	-	-	1.466,0	Gg CO2eq
Pakistan*	1994, 2008, 2012, 2015, 2018	2018	2006	-	T1	Yes. Opening by category	489,9	-	-	223,5	Mt CO2eq
Panama*	1994-2017	2017	2006	AR5	D-T1-T2	Yes. Opening by category	-9.758,3	3.463,2	-27.629,2	-	Kt CO2eq
Papua New Guinea*	2000-2017	2017	2006	AR2	T1-T2-CS	Yes. Opening by category	-1.958,0	935,0	-12.725,0	-	Kt CO2eq
Paraguay*	1990-2017	2017	2006	AR2	D-T1-T2-T3	Yes. Opening by category	49.855,5	25.027,2	14.511,0	-	Kt CO2eq

Peru	2000, 2005, 2010, 2012, 2014, 2016, 2018, 2019	2019	2006-2019	AR5	T1-CS	Yes. Opening by category	210.404,4	28.478,0	100.794,0	-	Gg CO2eq
Republic of Korea*	1990-2018	2018	1996-2006	AR2	D-T1-T2-CS	Yes. Opening by category	686.348,2	21.190,5	-41.285,1	-	Kt CO2eq
Republic of Moldova*	1990-2019	2019	2006	AR4	D-T1-T2-CS	Information in graphics	14.105,8	1.943,5	295,8	-	Kt CO2eq
Rwanda	2006-2018	2018	2006	AR2	T1-T2	Yes. Opening by category	2.630,1	-	-	-793,3	Gg CO2eq
Saint Lucia	2000, 2005, 2010, 2014-2018	2018	2006-2019	AR2	D-T1-T2	Yes. Opening by category	509,0	27,0	-227,0	-	Gg CO2eq
Sao Tome and Principe	2012, 2016, 2018	2018	2006	AR2	D-T1	Yes. Opening by category	-303,5	24,4	-516,0	-	Gg CO2eq
Saudi Arabia	2012	2012	1996	-	T1-CS	Yes. Opening by category	-	-	-	-	Gg CO2eq
Serbia	1990, 2010-2013	2013	2006	AR4	T1	Total emissions by gas	46.783,8	-	-	6.621,0	Gg CO2eq
Singapore	1994, 2000, 2010, 2012, 2014, 2016, 2018	2018	2006	AR5	D-T1-T2-T3-CS	Yes. Opening by category	53.312,7	8,0	112,2	-	Gg CO2eq
Suriname	2000-2017	2017	2006-2019	AR2	T1-T2-CS	Information in graphics	-	-	-	-	Gg CO2eq
Tajikistan	2004-2014	2014	2006	AR2	T1-T2	Total sector by gas	7.554,4	4.556,2	-1.576,6	-	Gg CO2eq
Thailand	2000-2019	2019	2006	AR4	D-T1-T2-CS	Yes. Opening by category	280.728,3	56.766,3	-91.988,5	-	Gg CO2eq
Togo	1995-2018	2018	2006	AR2	T1-T2	Yes. Opening by category	40.990,6	19.035,1	18.138,3	-	Gg CO2eq
Trinidad and Tobago	2006-2018	2018	2006	AR5	-	Main categories only	41.598,9	-	-	-2.192,4	Gg CO2eq

Tunisia*	2010-2021	2021	2006	AR4	T1-T2	Yes. Opening by category	35.366,0	-	-	-5.159,0	Kt CO2eq
Uganda	2005-2015	2015	2006	AR5	T1	Main categories only	77.381,0	-	-	66.829,0	Gg CO2eq
Uruguay	1990, 1994, 1998, 2000, 2002, 2004, 2006, 2008, 2010, 2012, 2014, 2016-2019	2019	2006	AR2	T1-T2-T3	Yes. Opening by category	19.463,0	-	-	11.101,0	Gg CO2eq
Uzbekistan	1990-2017	2017	2006	AR4	D-T1-T2-CS	Main categories only	180.575,3	33.652,3	-8.632,2	-	Gg CO2eq
Vanuatu	2010-2017	2017	2006	AR5	D-T1	Yes. Opening by category	600,2	399,4	-	-	Gg CO2eq
Viet Nam*	2010, 2014, 2016	2016	2006-2019	AR5	T1-T2-T3	Yes. Opening by category	316.735,0	-	-	44.069,7	Kt CO2eq
Yemen	2012	2012	1996	AR2	T1	Yes. Opening by category	36.261,0	10.770,0	-1.540,0	-	Gg CO2eq
Zambia	1994, 2000, 2005, 2010-2016	2016	2006	-	D-T1-T2	Yes. Opening by category	-9.508,5	-	-	-18.379,3	Gg CO2eq
Zimbabwe	2000-2017	2017	2006	AR2	D-T1-T2-CS	Yes. Opening by category	37.786,6	-	-	23.130,8	Gg CO2eq

T1: Tier 1; T2: Tier 2; T3: Tier 3; CS: country-specific information. NE: not estimated for Activity Data and/or emissions by sources and removals by sinks of GHGs which have not been estimated but for which a corresponding activity may occur within a Party. Empty cells (-) generally responds to difference on data opening reporting

Country	A. Livestock		B. Land						C. Aggregate Sources and Non-CO2 Emissions Sources on Land									D. Others
	A. Enteric Fermentation	B. Manure Management	B.1. Forest Land	B.2. Crop Land	B.3. Grassland	B.4. Wetlands	B.5. Settlements	B.6. Others lands	C.1. Emissions from Biomass Burning (Land)	C.2. Emissions from Biomass Burning (Agriculture)	C.3. Liming	C.4. Urea Application	C.5. Direct N_2O emissions from managed soils	C.6. Indirect N_2O emissions from managed soils	C.7. Indirect N_2O emissions from manure management	C.8. Rice cultivation	C.9. Others	D.1. Harvested Wood Products
Afghanistan	10.273,2	2.188,6	-	5.487,0	-	-	-	-	-	21,6	-	-	-	-	-	2.040,6	67,9	-
Albania	1.239,8	291,2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Andorra	4,8	0,9	-139,5	3,5	0,0	0,0	0,0	0,2	-	-	-	-	84,0	0,3	0,0	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Argentina	55.534,8	2.315,9	-10.644,6	14.828,2	41.316,6	-	-	-6.216,5	-	4.524,7	-	1.339,2	34.958,5	6.944,4	367,9	367,9	-	-2.441,5
Armenia	1.065,7		-530,4	-6,7	18,4	18,8	-0,2	29,6	-	-	-	-	671,0	181,7	-	-	47,0	-
Azerbaijan	3.713,0	753,0	-6.248,0	1.742,0	-1.706,0	-	-	-	1,9		-	21,5	1.915,0	19,1	279,0	15,6	-	-
Bahamas	1,7	1,5	-1.042,6	138,3	2.986,3	550,0	304,2	42,8	-	-	-	0,1	8,0	2,7	0,4	-	-	-
Belize	162,4	14,6	-10.935,2	2.717,1	1.239,4	0,0	-7,8	0,0	44,4	15,8	0,3	12,3	70,4	NE	NE	11,8	5,5	-34,5
Benin	2.746,7	186,8	-22.241,7	13.729,1	47,7	0,0	38,7	120,2	4.346,3	40,3	-	12,5	1.420,8	355,1	6,4	95,1	-	0,0
Bhutan	341,4	49,4	-	-	-	-	-	-	-	-	-	-	88,6			33,2	-	-
Bosnia and Herzegovina	859,8	257,4	-	-	-	-	-	-	-	-	-	-	-	-	-	0,0	-	-
Botswana	1.403,8		-2.786,6						446,0									-11,1

Brazil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burkina Faso	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cambodia	5.384,5		131.011,0						13.013,1									-
Chile	4.426,1	1.627,5	-49.430,2	1.164,1	4.201,3	4,7	304,6	401,2	-	45,7	67,6	403,3	4.475,2			192,4	-	-6.373,1
China	207.000,0	138.000,0	-840.000,0	-49.000,0	-109.000	-45.000,0	2.530,0	-	-	9.000,0	-	-	288.000,0			187.000,0	-	-111.000,0
Colombia	42.303,0	2.580,5	40.054,8	-1.061,2	57.914,3	1.199,9	125,0	827.8	922,3		37,3	191,2	6.398,4	3.185,2	372,1	828,8	-	-589,2
Costa Rica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cote d'Ivoire	1.706,8		31.177,7						4.000,8									-
Cuba*	3.664,9	1.148,9	-27.007,7	-	-	-	-	-	-	-	4,3	20,4	2.814,8	698,3	1.206,0	412,2	-	-
Democratic Republic of the Congo	2.139,2	-	-8.630,2	-	-	-	-	-	3.353,6	-	-	-	-	-	-	-	-	-
Dominican Republic	3.540,8	388,4	-11.699,7	0,1	847,9	-	-	-	-	-	-	22,1	268,5			533,3	-	-
Ecuador	9.572,0	445,9	-24.649,6	35.924,4	1.201,4	1.015,0	1.398,9	1.362,6	30,2	22,0	47,1	186,8	3.824,4	1.066,0	106,8	430,2	-	-
Egypt	10.694,2	5.758,4	-	-	-	-	-	-	-	638,7	-	1.277,5	20.759,3	5.429,4	319,4	3.513,1	-	-
El Salvador	1.562,0	220,3	3.775,4	1.754,1	3.446,5	-	319,3	223,2	97,3		-	6,6	279,0	65,3	30,9	13,7	-	-
Eritrea	2.947,6	242,5	-207,6	2,3	-0,1	-	0,4	-	-	-	-	-	-	-	-	-	-	-
Gabon	77,0	19,0	-120.321,0	8.741,0	289,0	20,0	2.410,0	60,0	608,0		3,0	1,0	68,0	17,0	3,0	-	-	-
Georgia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ghana*	4,4		14,5						19,4									-

Guatemala*	4.191,1	406,8	16.327,8	3.475,3	10.396,0	90,9	167,6	346,4	195,6	171,1	-	37,3		1.532,6		18,3	-	-
Guinea	7.206,0	257,4	-12.545,8	30,7	-	-	-	-	79,7	-	-	2,1	3.354,0	-	-	-	-	-8,8
Guinea-Bissau	94,0	8,6	-19.822,0	19.252,0	-	-	-	-	9,6	-	-	0,3	7,4	0,1	-	-	-	-3,6
Honduras	2.017,4	188,5	-14.534,9	-	-	-	-	7.098,2	-	-	5,8	40,4	1.131,3	282,5	22,5	26,0	-	-
India	222.655,0	27.227,0	-75.343,0	-251.975,0	21.289,0	-	-1.790,0	-	-	8.836,0	-	-	64.762,0	13.050,3		71.322,0	-	-
Indonesia	17.898,0	9.079,0	-355.211,0	83.146,0	77.806,0	-	60.330,0	1.044.209,0	-	16.649,0	2.160,0	5.182,0	31.800,0	7.526,0	4.343,0	25.235,0	-	-
Israel*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jamaica	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Jordan	630,5					-922,6							720,8					-
Kuwait	142,0					-13.910,0							12.371,0					-
Kyrgyzstan	2.684,6	241,5	-7.471,7	-3.469,7	-	-	-	-	0,1	14,1	-	-	1.539,6	590,7	74,6	51,0	-	-0,5
Lao People's Democratic Republic	3.211,2	755,7	-12.662,0	19.314,6	8,2	-	91,7	2.340,8	967,2		1,7	24,2	1.306,6	420,1	41,4	1.147,9	-	1.824,3
Lebanon	419,0	211,0	-2.026,1	-1.220,3	-	-	51,9	-	0,9		-	1,1	182,6	67,6	25,5	-	-	-12,3
Lesotho	669,7	88,0	1.089,6	-	-	-	-	-	23,7		-	0,1	408,9	135,1	2,1	-	-	-
Liberia	173,3					3.805,7							35,1					-
Malawi	1.246,6	314,3	-2.626,9	1.589,4	261,9	-	24,8	188,3	31,3		-	88,7	-	0,2	9,7	122,4	-	-45,6
Malaysia	1.224,5	660,1	-237.008,4	-18.561,1	-	-	40.854,9	-	14,7	10,0	21,7	389,9	3.736,7	1.053,3	541,9	2.269,0	-	-
Maldives	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mauritania	4.936,0	292,1	-900,4	42,3	400,7	-	-	-	26,1		-	9,9	1.740,1	-	-	-	-	-

Mauritius	23,6	13,9	-394,4	-	-	-	-	62,6	2,7	2,3	-	-	78,4	25,5	11,7	-	-	1,9
Mexico	82.287,3	27.984,9	-191.483,3	-12.362,6	10.234,2	107,7	110,5	639,5	700,1	1.366,6	47,4	1.484,7	18.752,7	6.748,3	1.316,3	119,1	-	-9.187,0
Micronesia (Fede-rated States of)	0,9	21,5	-	-	-	-	-	-	-	-	-	-	4,2	0,9	1,0	-	-	-
Mongolia	9.588,9	251,2	-24.634,3	-	-	-	-	-	2,58	-	-	-	5.037,2	1.847,2	-	-	-	182,4
Montenegro	205,9	54,2	-2.423,8	0,7	-1,0	-	59,8	-	-	0,0	0,0	0,3	11,1	-	-	-	-	-139,6
Morocco	8.211,2	1.590,3	-2.483,4	-374,2	302,0	-146,4	639,1	317,4	-	-	-	34,0	10.879,6	-	-	14,2	-	-
Mozambique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Namibia	3.999,6	252,0	-126.598,1	-	9.755,9	-	12,8	-	-	-	-	1,3		2.879,8		-	-	-90,3
Niger	18.830,8	5.745,5	-511,3	-	- 10.521,4	-0,2	2,0	1.987,4	132,9	-	-	2,5	13.497,1	3.816,9	769,7	63,3	-	-
Nigeria	-	-	319.970,6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-4.542,6
North Macedonia	833,5		-3.603,6	31,2	25,8	-	2,9	262,6	-	-	-	3,2	224,5	80,7	28,0	23,4	-	-
Oman	1.216,0	-	-	0,0	-	-	-	-	-	-	-	37,0	212,0	-	-	-	-	-
Pakistan*	92,2	17,0	25,1	5,9	0,0	0,5	-	-	-	-	-	4,3	45,7	21,1	3,9	7,8	-	-
Panama*	2.526,3	110,2	-31.989,3	658,8	3.200,6	-	500,7	-	-	11,0	0,3	6,1	527,4	130,1	45,9	105,8	-	-
Papua New Gui-nea*	172,9	158,7	-23.617,4	9.397,8	323,2	-	1.058,5	-	112,9	-	-	-	528,8	70,1	4,3	-	-	-
Paraguay*	15.219,1	355,2	-13.323,0	11.124,3	15.208,8	6,6	527,5	966,7	-	-	104,2	36,2	7.156,5	1.604,4	33,3	518,4	-	-
Peru	15.432,4	654,2	6.281,7	62.542,2	24.463,1	-	7.078,8	428,3	814,8		-	292,6	6.853,7	2.454,3	185,4	1.790,8	-	-
Republic of Korea*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Republic of Moldova*	441,6	345,1	-1.950,1	1.789,9	-293,3	-82,8	277,8	611,8	-	-	-	39,6	1.117,1			-	-	-57,6
Rwanda	3.196,9	135,3	-7.090,8	1.609,5	171,0	14,3	201,5	2,1	76,0		8,7	7,0	405,9	119,7	68,8	280,7	-	-
Saint Lucia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sao Tome and Principe	5,4	6,1	-564,0	6,1	-	-	41,9	-	1,0		-	0,0	9,2	2,7	0,1	-	-	-0,1
Saudi Arabia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Serbia	2.059,0	1.083,5	-15.735,6	223,2	5,3	21,6	110,6	1,1	1,5		-	88,4	2.062,8	631,9	332,1	-	-	-1,4
Singapore	0,3	4,6	-48,0	0,8	-	1,9	155,8	1,7	-	-	0,1	-	2,1	0,9	-	-	-	-
Suriname	-	-	-22.798,4	-116,8	-2.090,6	105,5	7.030,5	72,9	-	-	-	-	-	-	-	-	-	-
Tajikistan	3.177,0	643,0	-	-	-	-	-	-	-	-	-	57,9	385,0	125,0	-	169,0	-	-
Thailand	10.765,8	2.657,5	-25.793,1	-66.352,4	-	-	-	119,5	37,4	1.418,3	25,5	1.483,9	8.060,5	3.049,7	590,3	28.714,8	-	-
Togo	910,4	253,7	15.594,7	-	1.664,6	-	-	879,5	701,6	569,5	-	-	17.008,6			76,5	-	-
Trinidad and To-bago	105,5	24,8	-	-2.708,3	-	-	-	-	53,3	0,1	-	33,9	-	356,9	-	0,2	-	-
Tunisia*	2.883,0		-3.693,3	-10.977,1	1.272,5	-33,0	-	-	2.663,0								-	2.726,6
Uganda	15.432,9	-	39.811,4	10.611,3	2.727,2	-	-	-	610,0		-	-	5.595,7	1.822,6	-	652,5	-	-
Uruguay	14.274,5	226,6	-14.791,0	2.564,0	367,0	-	-17,2	320,0	-	-	90,6	68,0	6.344,2	1.586,1	-	226,6	-	-
Uzbekistan	19.446,3	3.093,8	-12.207,7	-1.448,7	5.024,2	-	-	-	-	-	-	-	10.943,4			168,8	-	-
Vanuatu	270,0	114,4	-	-	-	-	-	-	-	-	-	-	-	15,0	-	-	-	-
Viet Nam*	12.421,7	6.091,6	-54.657,8	3.637,6	1.383,6	1.046,9	1.919,1	7.178,3	1.624,1		565,8	1.436,1	7.754,1	3.752,6	221,9	49.693,0	-	-

Yemen	4.154,0	206,0	-	-	-	-	-	-	-	24,0	-	-		6.386,0		-	-	-
Zambia	3.958,0	242,5	-65.366,7	21.855,7	-	-	9.851,8	-	10.257,3		1,7	103,8	655,0	41,1	-	20,7	-	-
Zimbabwe	3.900,1	-	14.910,9	7763,26	19.987,4	164,3	224,7	174,8	4.998,1	-	-	-	799,5	-	-	-	-	

Empty cells (-) generally responds to difference on data opening reporting

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