Use of the IPCC Inventory Software for the Energy sector

Training for the African Region

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Content

- Sector overview
- Subcategories/Worksheets
- Methodological Approaches
- Reporting
- Activity data
- Conversion factors
- Sector specific
- Exercises

Energy sector







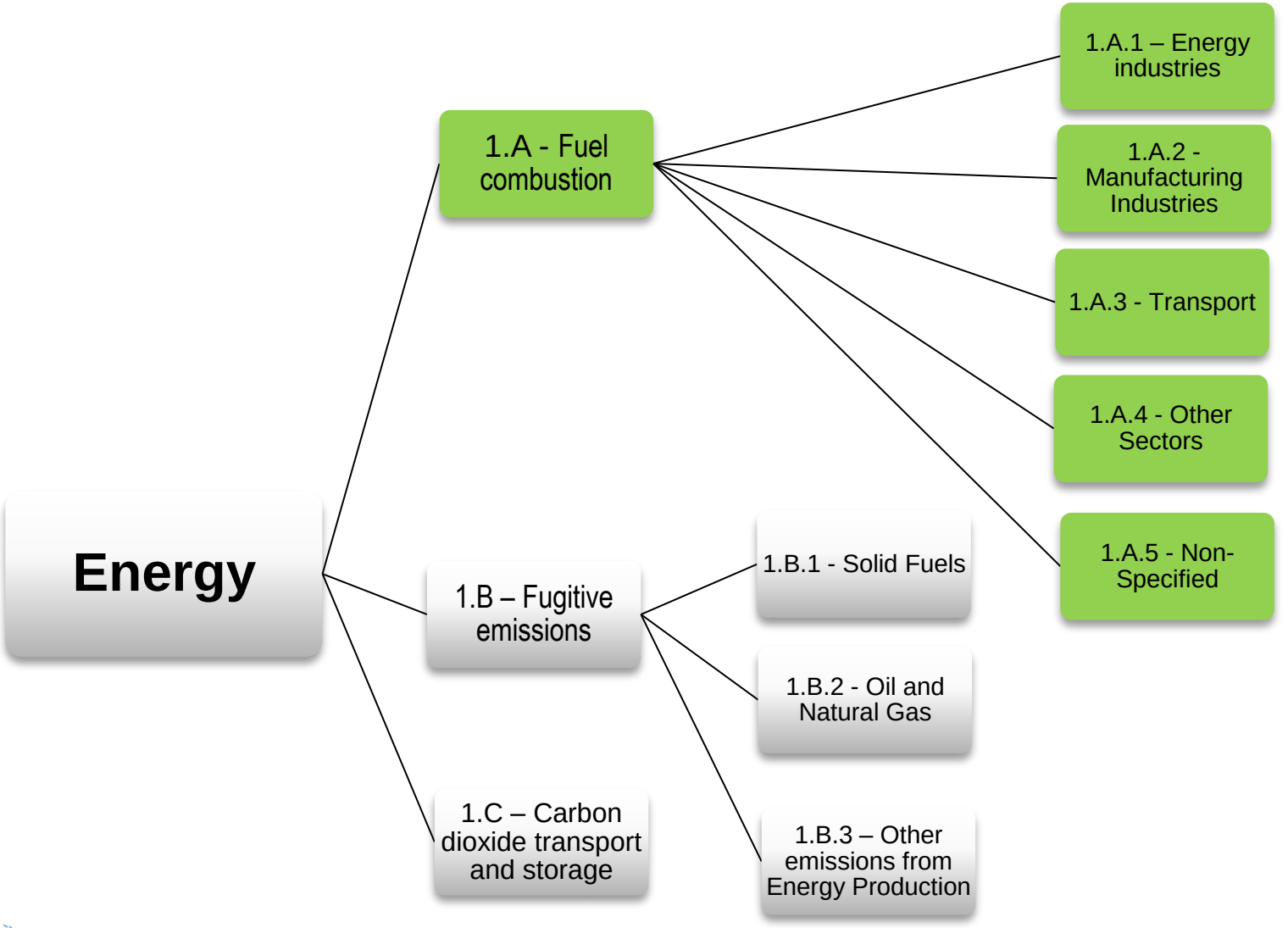

Exploration and exploitation of primary energy sources

Conversion of primary energy sources into more useable energy forms in refineries and power plants

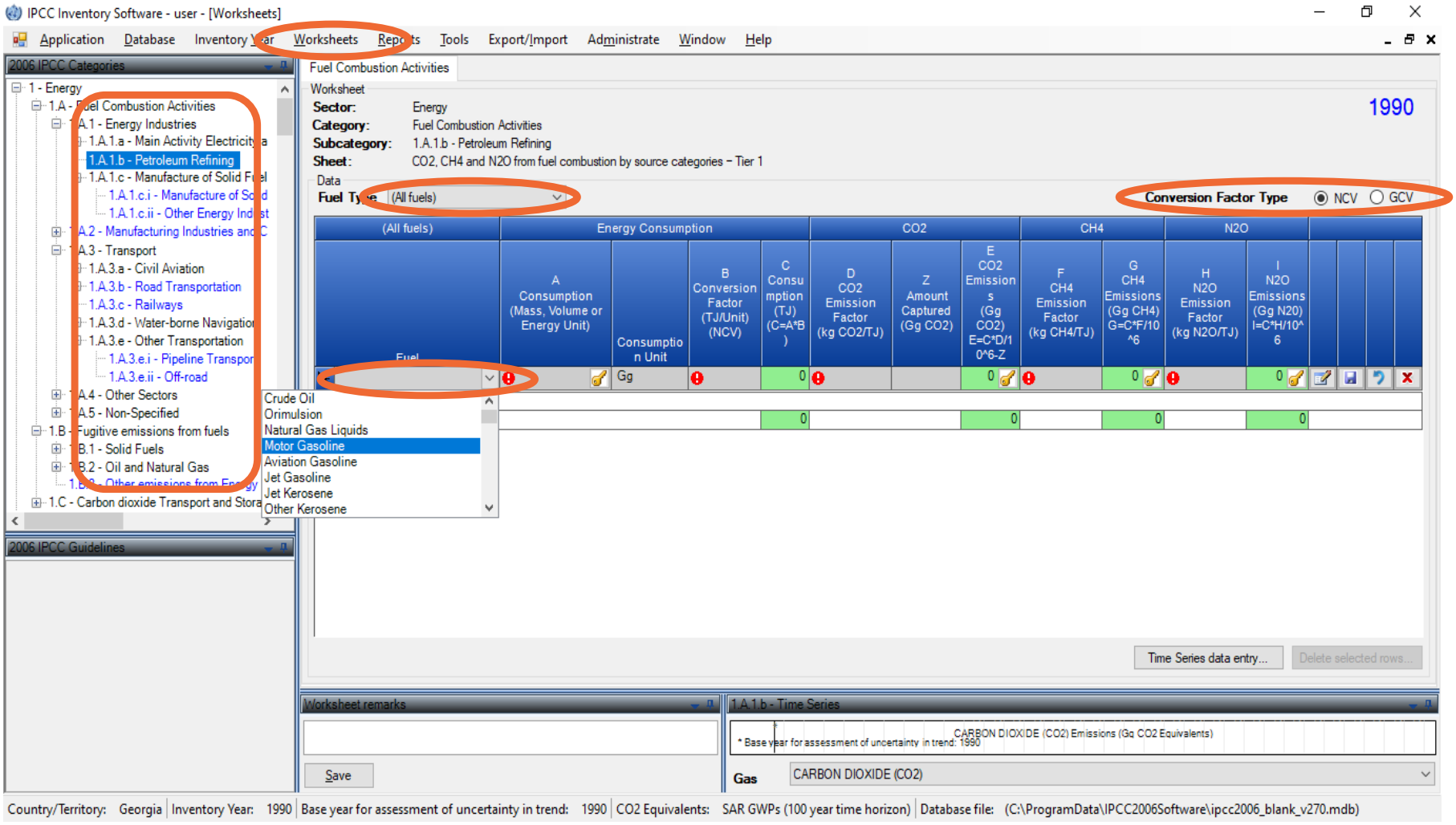
Transmission and distribution of fuels

Use of fuels in stationary and mobile applications

Sector structure



Worksheets



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Methodological approaches

Sectoral approach - bottom-up methodology

Tier 1 (default)

Default calorific values, default emission factors

Tier 2 (country-specific)

Country-specific factors

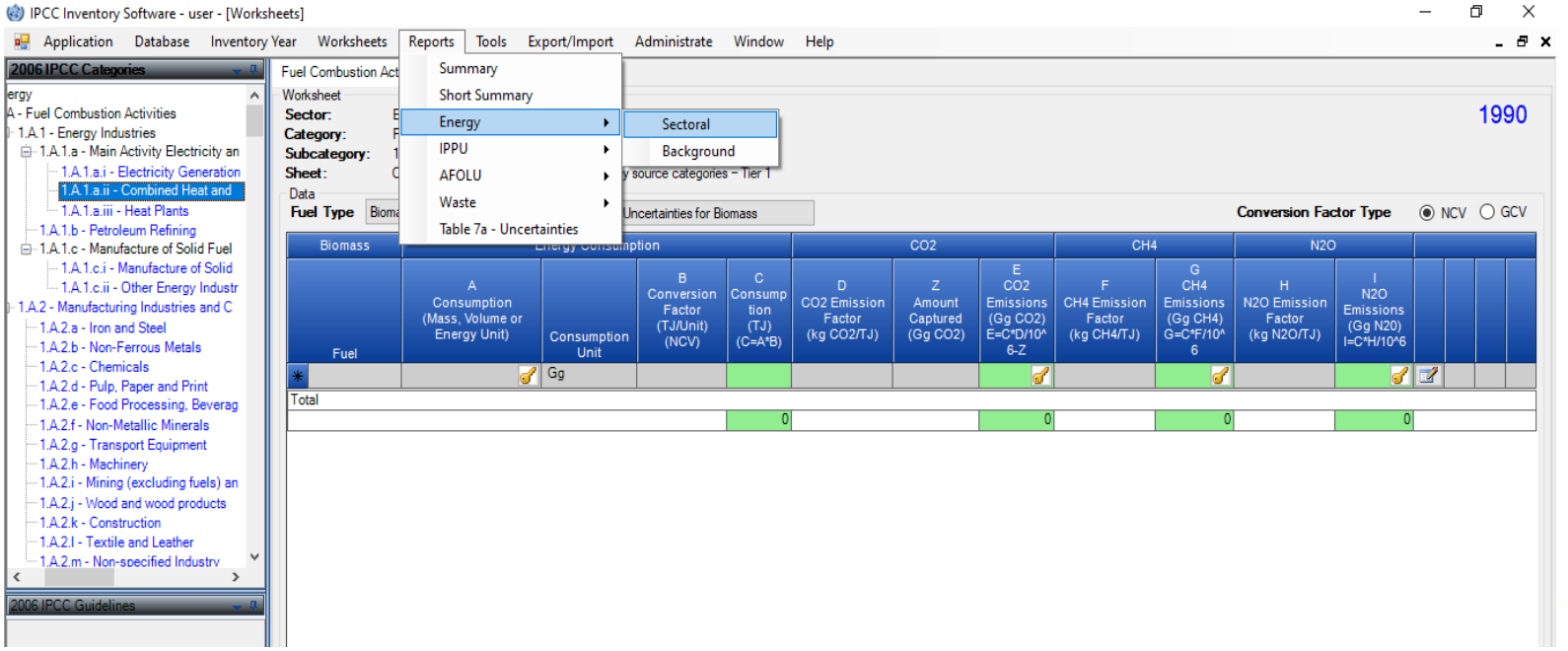
Tier 3 (technology-specific, measurements)

Combustion technology, operating conditions, control technology, quality of maintenance, age of the equipment, equipment-specific EFs (measurements)

Reference approach - top-down approach, first-order estimate of CO2 emissions, verification cross-check for Sectoral approach outcomes

Reporting

- **Short Summary** – all sectors, levelized on the first categories (1.A, 1.B,…)
- **Summary** – all sectors, breakdown on subsector level (1.A.1, 1.A.3,…)
- **Energy Sectoral Tables** – only sectoral emissions, lowest level of detail (1.A.3.b.ii.1)
- **Energy Background Tables** – sectoral activity data, lowest level of detail, sectoral emissions divided by fuel type, Reference approach results



Activity data sources

National sources

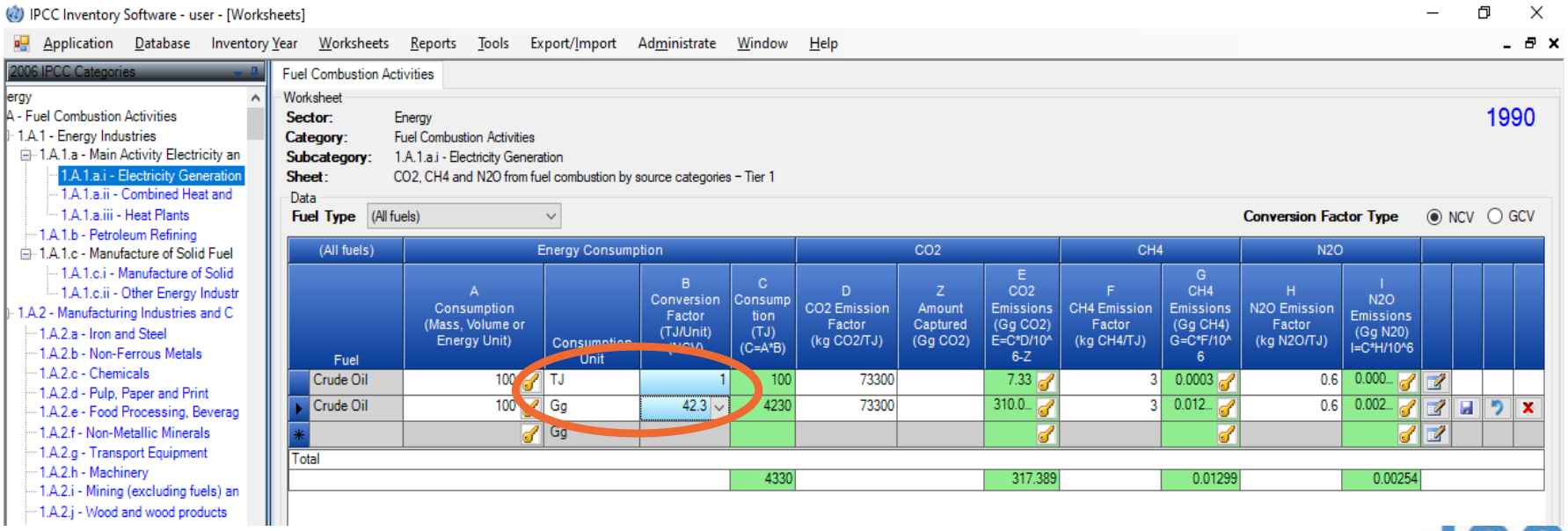
- Energy balance
- Statistical reports
- Utility providers' reports
- Customs services report
- Surveys

International sources

- International Energy Agency
- UN Stat

Data units

- Consumption data can be presented in physical (Gg, m3) and/or energy units (TJ)
- Default calorific values are provided in Table 1.2 of Volume 2: Energy, 2006 IPCC Guidelines for National Greenhouse Gas Inventories



1.A - Fuel combustion

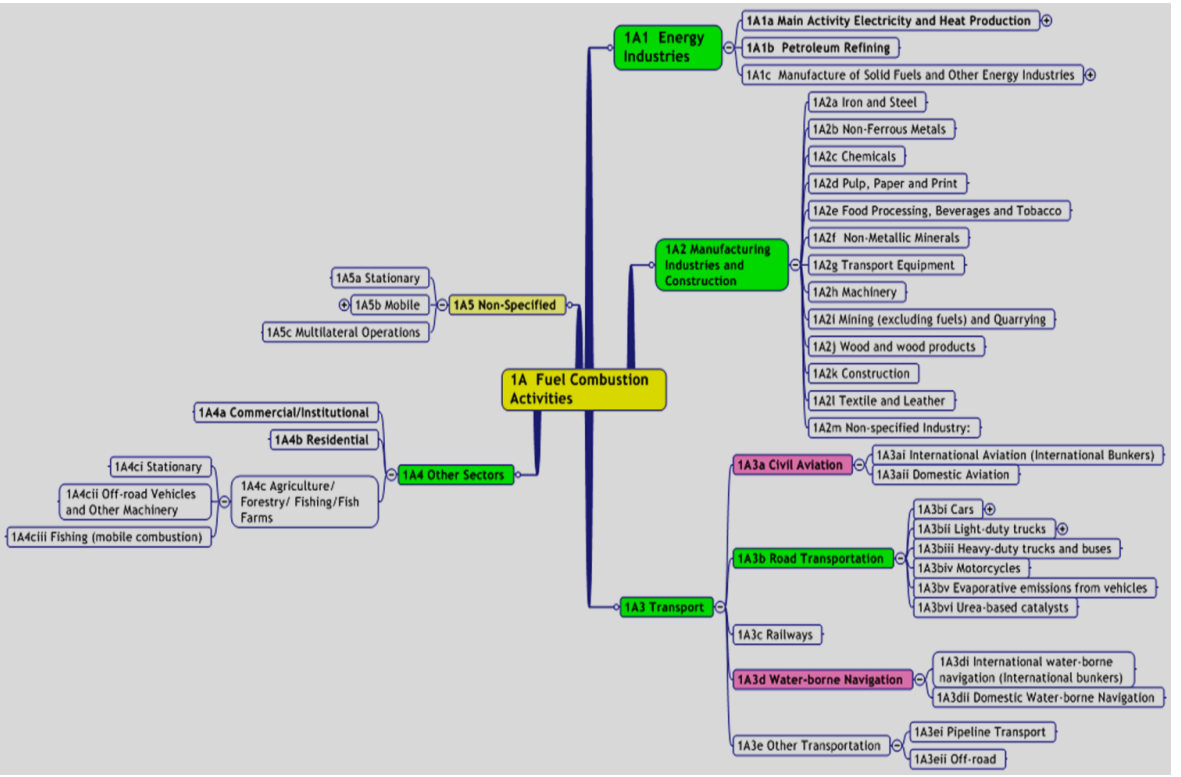
Sectoral approach - Tier 1

Default CO2 emission factors assume that 100% of the fuel carbon is oxidized to CO2

EQUATION 2.1

GREENHOUSE GAS EMISSIONS FROM STATIONARY COMBUSTION

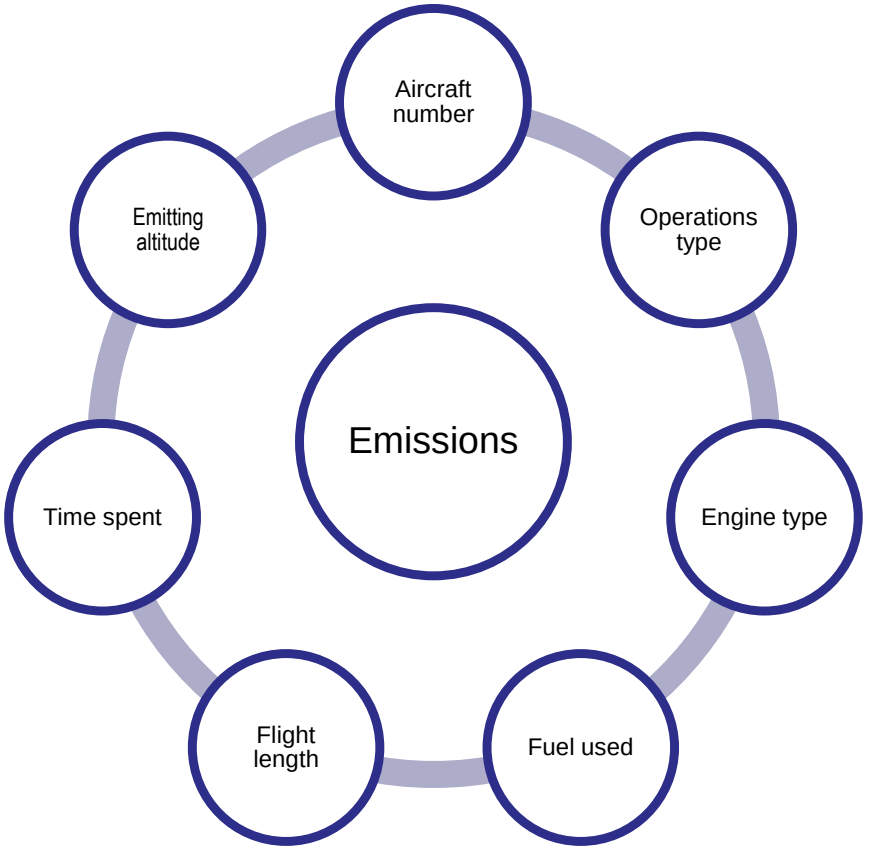
$$Emissions_{GHG,\,fuel} = Fuel\ \ Consumption_{fuel} \bullet Emission\ \ Factor_{GHG,\,fuel}$$



Sectoral approach - Tier 2

Country-specific emission factors

Aviation



Aircraft operations

- Landing/Take-Off (LTO) cycle
- Cruise (around 90% of emissions)

Aviation

Tier 1

Total fuel consumed during all the operations

EQUATION 3.6.1
(AVIATION EQUATION 1)

Emissions = Fuel Consumption • Emission Factor

Tier 2

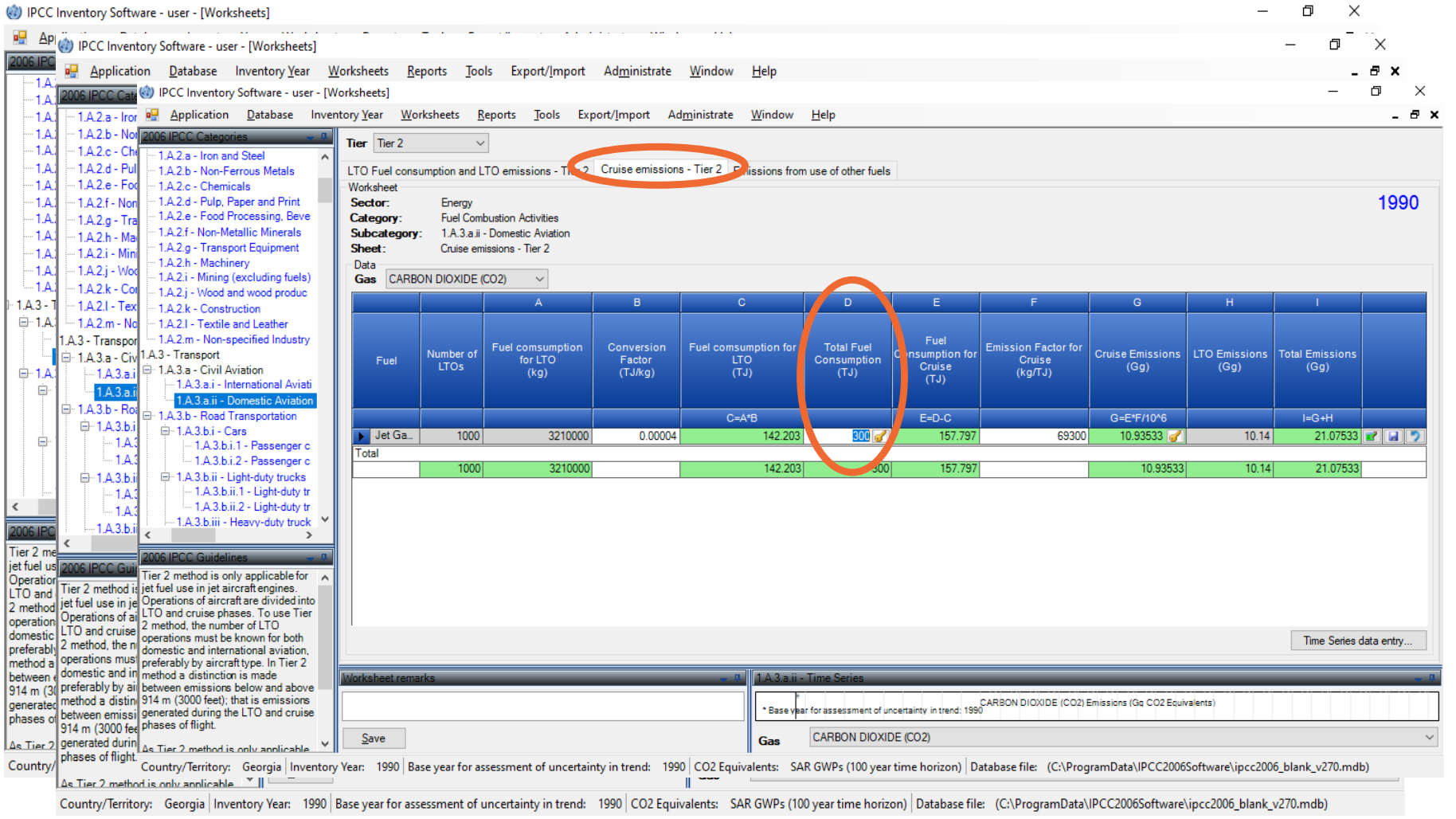
Breakdown by operations

Total Emissions = Emissions(LTO) + Emissions(Cruise)

$E_{LTO} = N_{LTO} * EF_{LTO}$

$E_{cruise} = (F_{total} - F_{LTO}) * EF_{cruise}$

Aviation



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International bunker

Aviation and water-borne navigation

Domestic

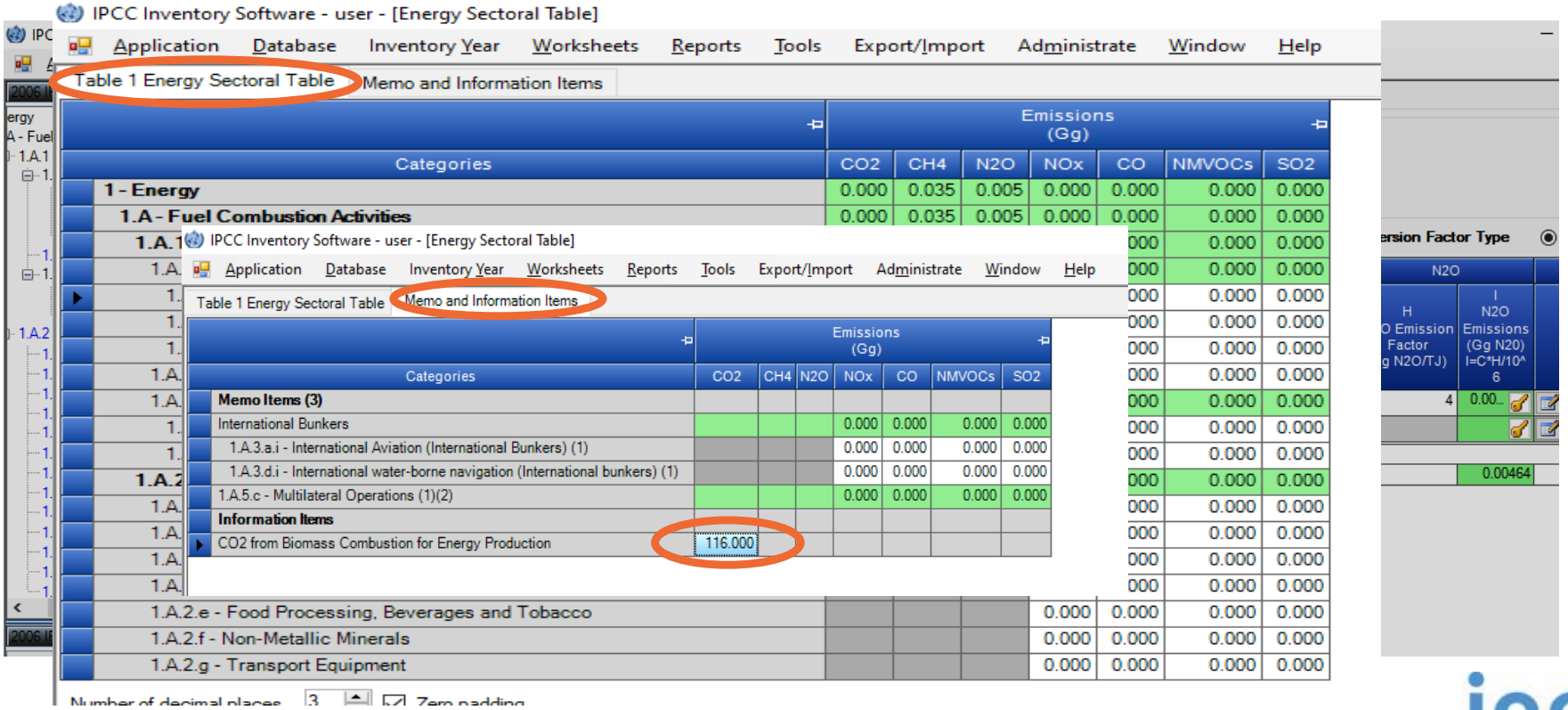
- depart and arrive in the same country
- emissions from these activities are reported in the national total

International

- depart in one country and arrive in a different country
- international aviation and water-borne navigation emissions are reported separately from domestic, and **not** included in the national total

Biomass

- CO_2 emissions from biomass burning for energy purposes are not included in the sectoral or national total, instead they are reported separately as an *information item*.
- Non-CO_2 emissions from biomass burning for energy purposes should be reported in the sectoral and national total



Reference approach

- Reference Approach is a top-down approach using a country's energy supply data to calculate the emissions of CO2 from fuel combustion
- Easily available energy supply statistics
- Comparison with the sectoral approach results

EQUATION 6.1
CO_2 EMISSIONS FROM FUEL COMBUSTION USING THE REFERENCE APPROACH

$$CO_2\ Emissions = \sum_{all\ fuels}\left[\begin{array}{l}((Apparent\ Consumption_{fuel} \bullet Conv\ Factor_{fuel} \bullet CC_{fuel}) \bullet 10^{-3} \\ -Excluded\ Carbon_{fuel}) \bullet COF_{fuel} \bullet 44/12\end{array}\right]$$

Primary fuels

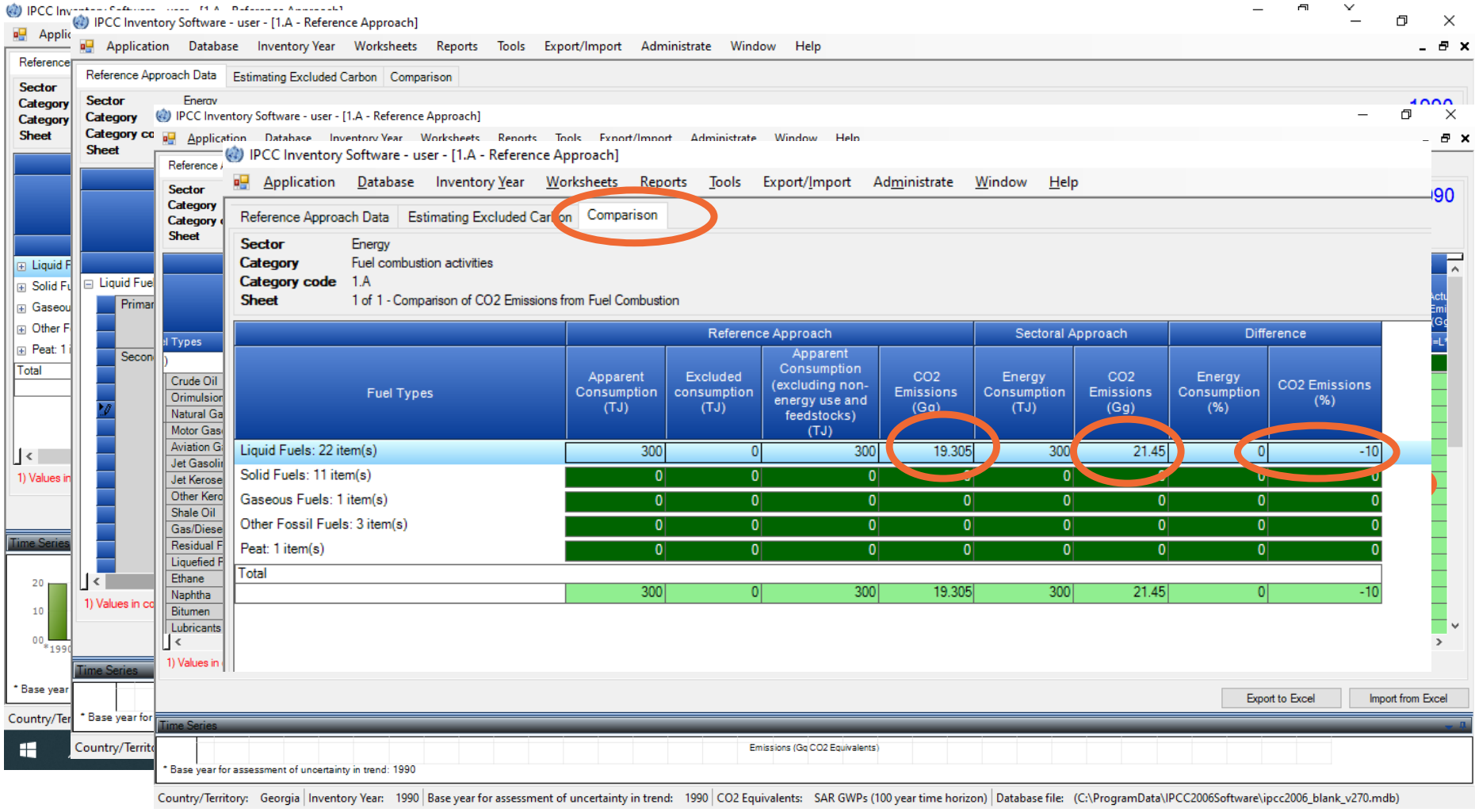
Apparent consumption = Production + Import - Export - International bunker - Stock change

Apparent consumption of crude oil already contains the carbon from which gasoline would be refined

Stocks increase → positive stock change

Excluded Carbon - carbon in feedstocks and non-energy use

Reference approach



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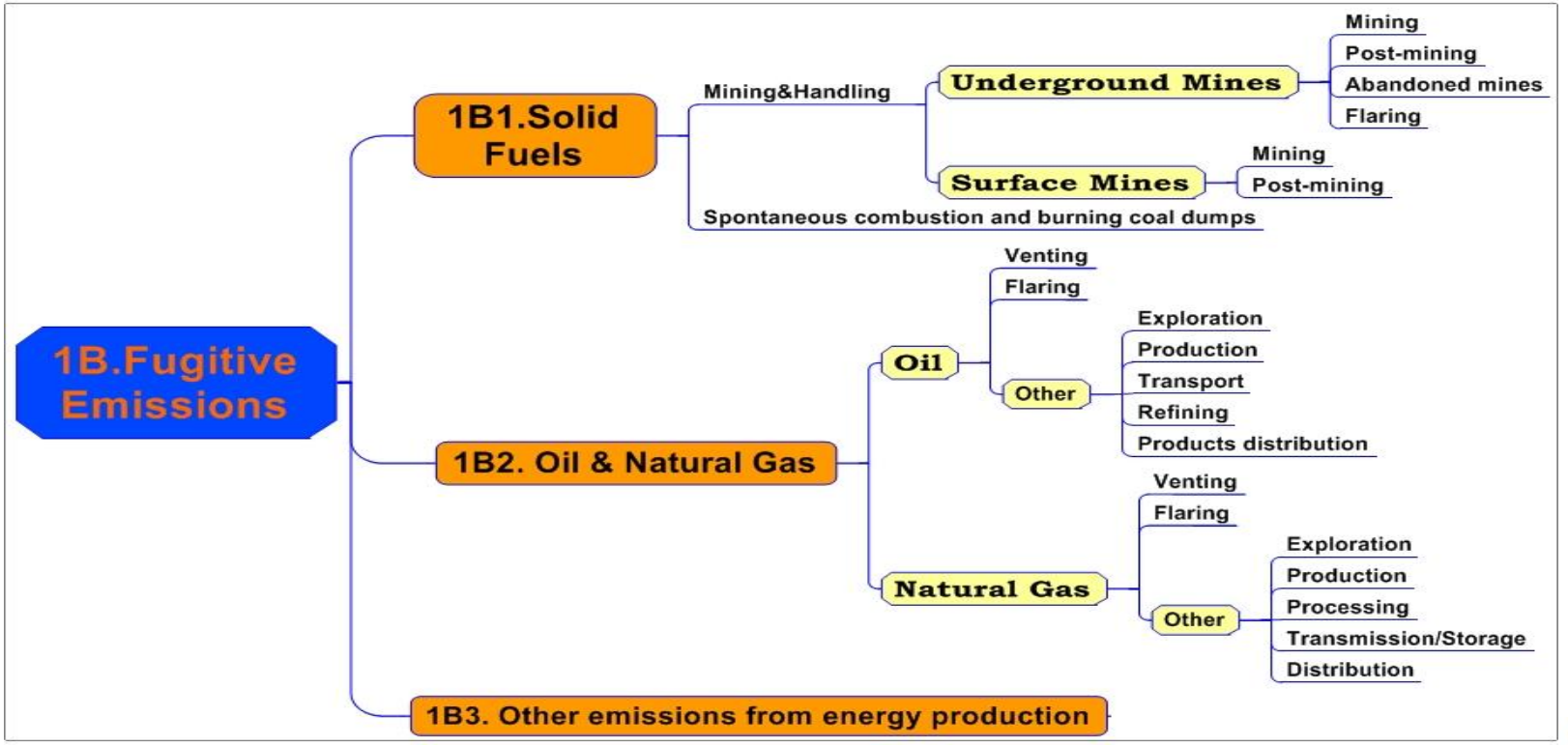
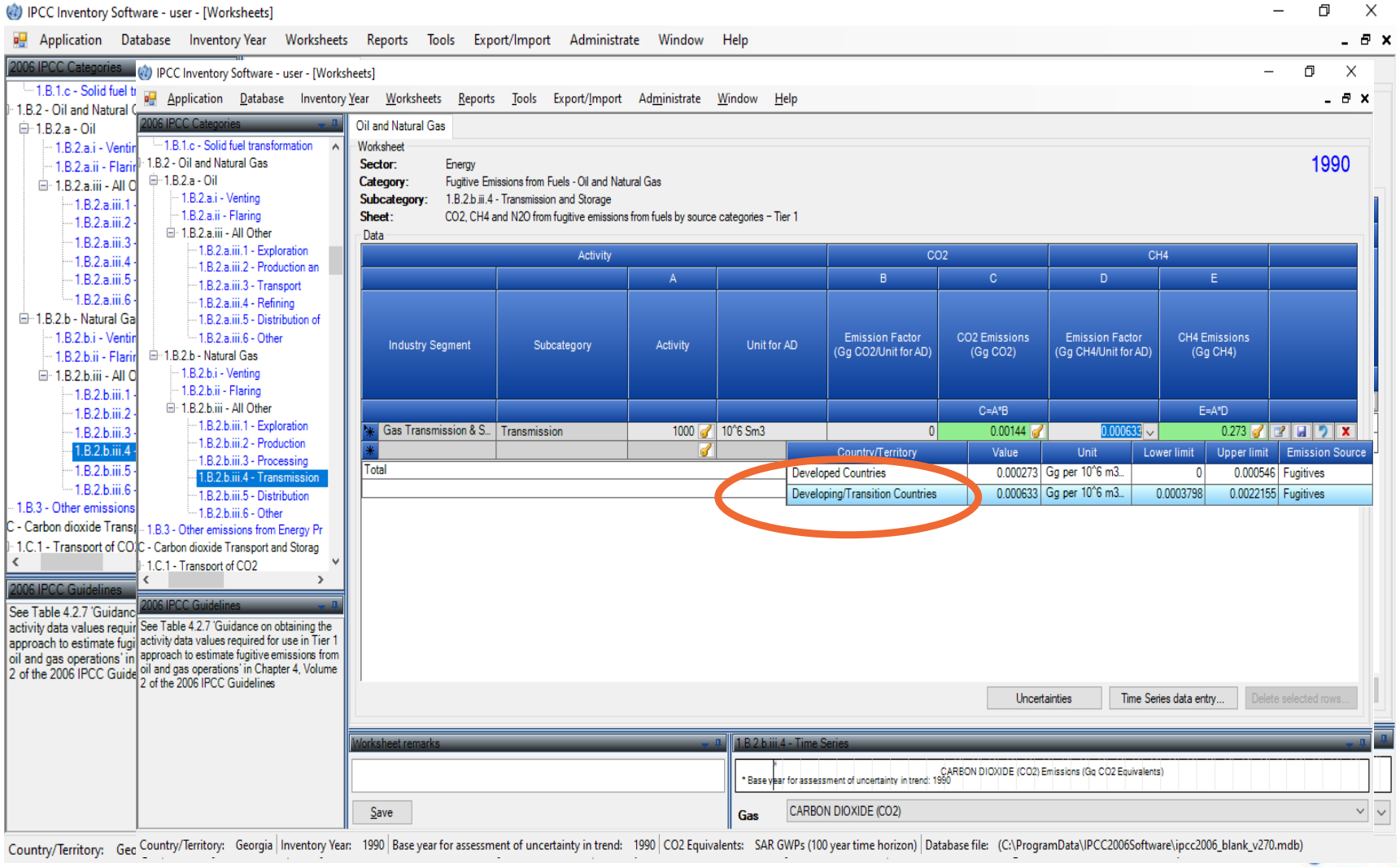
1.B - Fugitive emissions

Intentional or unintentional release of greenhouse gases during the extraction, processing and delivery of fossil fuels to the point of final use



1.B - Fugitive emissions



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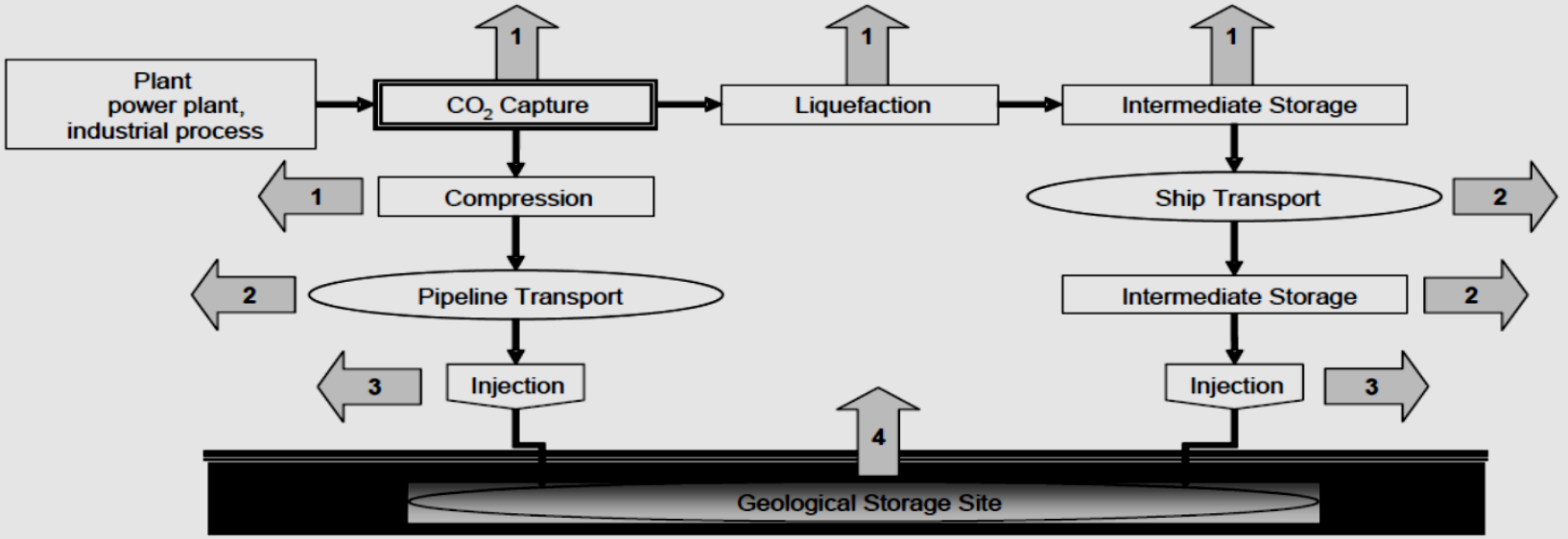
1.C - CO2 Transport, Injection and Geological Storage

1.Capture and compression → 2.Transport → 3. Injection → 4. Storage

Figure 5.1 **Schematic representation of the carbon capture and storage process with numbering linked to systems discussion above.**



Capture + Imports = Injection + Leakage + Exports

Practical Exercises

1. Tier 1. Sectoral approach - Stationary combustion
2. Tier 1. Sectoral approach – Mobile combustion
3. Reference Approach
4. Tier 2. Sectoral approach - Stationary combustion
5. Tier 2. Sectoral approach – Mobile combustion (Aviation)

Thank you!

https://www.ipcc-nggip.iges.or.jp/index.html