# JICA Climate-FIT
# Version 5.0

## Appendicies

Table 1 Net Caloric Value of Fuels

| TABLE 1.2<br>DEFAULT NET CALORIFIC VALUES (NCVS) AND LOWER AND UPPER LIMITS OF THE 95% CONFIDENCE INTERVALS [1] | | | | |
|---|---|---|---|---|
| **Fuel type English description** | | **Net calorific value (TJ/Gg)** | **Lower** | **Upper** |
| Crude Oil | | 42.3 | 40.1 | 44.8 |
| Orimulsion | | 27.5 | 27.5 | 28.3 |
| Natural Gas Liquids | | 44.2 | 40.9 | 46.9 |
| Gasoline | Motor Gasoline | 44.3 | 42.5 | 44.8 |
| | Aviation Gasoline | 44.3 | 42.5 | 44.8 |
| | Jet Gasoline | 44.3 | 42.5 | 44.8 |
| Jet Kerosene | | 44.1 | 42.0 | 45.0 |
| Other Kerosene | | 43.8 | 42.4 | 45.2 |
| Shale Oil | | 38.1 | 32.1 | 45.2 |
| Gas/Diesel Oil | | 43.0 | 41.4 | 43.3 |
| Residual Fuel Oil | | 40.4 | 39.8 | 41.7 |
| Liquefied Petroleum Gases | | 47.3 | 44.8 | 52.2 |
| Ethane | | 46.4 | 44.9 | 48.8 |
| Naphtha | | 44.5 | 41.8 | 46.5 |
| Bitumen | | 40.2 | 33.5 | 41.2 |
| Lubricants | | 40.2 | 33.5 | 42.3 |
| Petroleum Coke | | 32.5 | 29.7 | 41.9 |
| Refinery Feedstocks | | 43.0 | 36.3 | 46.4 |
| Other Oil | Refinery Gas [2] | 49.5 | 47.5 | 50.6 |
| | Paraffin Waxes | 40.2 | 33.7 | 48.2 |
| | White Spirit and SBP | 40.2 | 33.7 | 48.2 |
| | Other Petroleum Products | 40.2 | 33.7 | 48.2 |
| Anthracite | | 26.7 | 21.6 | 32.2 |
| Coking Coal | | 28.2 | 24.0 | 31.0 |
| Other Bituminous Coal | | 25.8 | 19.9 | 30.5 |
| Sub-Bituminous Coal | | 18.9 | 11.5 | 26.0 |
| Lignite | | 11.9 | 5.50 | 21.6 |
| Oil Shale and Tar Sands | | 8.9 | 7.1 | 11.1 |
| Brown Coal Briquettes | | 20.7 | 15.1 | 32.0 |
| Patent Fuel | | 20.7 | 15.1 | 32.0 |
| Coke | Coke Oven Coke and Lignite Coke | 28.2 | 25.1 | 30.2 |
| | Gas Coke | 28.2 | 25.1 | 30.2 |
| Coal Tar [3] | | 28.0 | 14.1 | 55.0 |
| Derived Gases | Gas Works Gas [4] | 38.7 | 19.6 | 77.0 |
| | Coke Oven Gas [5] | 38.7 | 19.6 | 77.0 |
| | Blast Furnace Gas [6] | 2.47 | 1.20 | 5.00 |
| | Oxygen Steel Furnace Gas [7] | 7.06 | 3.80 | 15.0 |
| Natural Gas | | 48.0 | 46.5 | 50.4 |
| Municipal Wastes (non-biomass fraction) | | 10 | 7 | 18 |
| Industrial Wastes | | NA | NA | NA |
| Waste Oil [8] | | 40.2 | 20.3 | 80.0 |
| Peat | | 9.76 | 7.80 | 12.5 |

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 2: Energy, Chapter 1: Introduction, Table 1.2

Appendix

**TABLE 1.2 (CONTINUED)**
**DEFAULT NET CALORIFIC VALUES (NCVS) AND LOWER AND UPPER LIMITS OF THE 95% CONFIDENCE INTERVALS [1]**

| Fuel type English description | | Net calorific value (TJ/Gg) | Lower | Upper |
|---|---|---|---|---|
| Solid Biofuels | Wood/Wood Waste [9] | 15.6 | 7.90 | 31.0 |
| | Sulphite lyes (black liquor) [10] | 11.8 | 5.90 | 23.0 |
| | Other Primary Solid Biomass [11] | 11.6 | 5.90 | 23.0 |
| | Charcoal [12] | 29.5 | 14.9 | 58.0 |
| Liquid Biofuels | Biogasoline [13] | 27.0 | 13.6 | 54.0 |
| | Biodiesels [14] | 27.0 | 13.6 | 54.0 |
| | Other Liquid Biofuels [15] | 27.4 | 13.8 | 54.0 |
| Gas Biomass | Landfill Gas [16] | 50.4 | 25.4 | 100 |
| | Sludge Gas [17] | 50.4 | 25.4 | 100 |
| | Other Biogas [18] | 50.4 | 25.4 | 100 |
| Other non-fossil fuels | Municipal Wastes (biomass fraction) | 11.6 | 6.80 | 18.0 |

Notes:

[1] The lower and upper limits of the 95 percent confidence intervals, assuming lognormal distributions, fitted to a dataset, based on national inventory reports, IEA data and available national data. A more detailed description is given in section 1.5.

[2] Japanese data; uncertainty range: expert judgement

[3] EFDB; uncertainty range: expert judgement

[4] Coke Oven Gas; uncertainty range: expert judgement

[5-7] Japan and UK small number data; uncertainty range: expert judgement

[8] For waste oils the values of "Lubricants" are taken

[9] EFDB; uncertainty range: expert judgement

[10] Japanese data ; uncertainty range: expert judgement

[11] Solid Biomass; uncertainty range: expert judgement

[12] EFDB; uncertainty range: expert judgement

[13-14] Ethanol theoretical number; uncertainty range: expert judgement;

[15] Liquid Biomass; uncertainty range: expert judgement

[16-18] Methane theoretical number uncertainty range: expert judgement;

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 2: Energy, Chapter 1: Introduction, Table 1.2

Table 2 $CO_2$ Emission Factors of Fuels

| TABLE 1.4<br>DEFAULT $CO_2$ EMISSION FACTORS FOR COMBUSTION [1] | | | | | | |
|---|---|---|---|---|---|---|
| **Fuel type English description** | | **Default carbon content (kg/GJ)** | **Default carbon oxidation factor** | **Effective $CO_2$ emission factor (kg/TJ) [2]** | | |
| | | | | **Default value [3]** | **95% confidence interval** | |
| | | **A** | **B** | **C=A*B*44/12*1000** | **Lower** | **Upper** |
| Crude Oil | | 20.0 | 1 | 73 300 | 71 100 | 75 500 |
| Orimulsion | | 21.0 | 1 | 77 000 | 69 300 | 85 400 |
| Natural Gas Liquids | | 17.5 | 1 | 64 200 | 58 300 | 70 400 |
| Gasoline | Motor Gasoline | 18.9 | 1 | 69 300 | 67 500 | 73 000 |
| | Aviation Gasoline | 19.1 | 1 | 70 000 | 67 500 | 73 000 |
| | Jet Gasoline | 19.1 | 1 | 70 000 | 67 500 | 73 000 |
| Jet Kerosene | | 19.5 | 1 | 71 500 | 69 700 | 74 400 |
| Other Kerosene | | 19.6 | 1 | 71 900 | 70 800 | 73 700 |
| Shale Oil | | 20.0 | 1 | 73 300 | 67 800 | 79 200 |
| Gas/Diesel Oil | | 20.2 | 1 | 74 100 | 72 600 | 74 800 |
| Residual Fuel Oil | | 21.1 | 1 | 77 400 | 75 500 | 78 800 |
| Liquefied Petroleum Gases | | 17.2 | 1 | 63 100 | 61 600 | 65 600 |
| Ethane | | 16.8 | 1 | 61 600 | 56 500 | 68 600 |
| Naphtha | | 20.0 | 1 | 73 300 | 69 300 | 76 300 |
| Bitumen | | 22.0 | 1 | 80 700 | 73 000 | 89 900 |
| Lubricants | | 20.0 | 1 | 73 300 | 71 900 | 75 200 |
| Petroleum Coke | | 26.6 | 1 | 97 500 | 82 900 | 115 000 |
| Refinery Feedstocks | | 20.0 | 1 | 73 300 | 68 900 | 76 600 |
| Other Oil | Refinery Gas | 15.7 | 1 | 57 600 | 48 200 | 69 000 |
| | Paraffin Waxes | 20.0 | 1 | 73 300 | 72 200 | 74 400 |
| | White Spirit & SBP | 20.0 | 1 | 73 300 | 72 200 | 74 400 |
| Other Petroleum Products | | 20.0 | 1 | 73 300 | 72 200 | 74 400 |
| Anthracite | | 26.8 | 1 | 98 300 | 94 600 | 101 000 |
| Coking Coal | | 25.8 | 1 | 94 600 | 87 300 | 101 000 |
| Other Bituminous Coal | | 25.8 | 1 | 94 600 | 89 500 | 99 700 |
| Sub-Bituminous Coal | | 26.2 | 1 | 96 100 | 92 800 | 100 000 |
| Lignite | | 27.6 | 1 | 101 000 | 90 900 | 115 000 |
| Oil Shale and Tar Sands | | 29.1 | 1 | 107 000 | 90 200 | 125 000 |
| Brown Coal Briquettes | | 26.6 | 1 | 97 500 | 87 300 | 109 000 |
| Patent Fuel | | 26.6 | 1 | 97 500 | 87 300 | 109 000 |
| Coke | Coke oven coke and lignite Coke | 29.2 | 1 | 107 000 | 95 700 | 119 000 |
| | Gas Coke | 29.2 | 1 | 107 000 | 95 700 | 119 000 |
| Coal Tar | | 22.0 | 1 | 80 700 | 68 200 | 95 300 |
| Derived Gases | Gas Works Gas | 12.1 | 1 | 44 400 | 37 300 | 54 100 |
| | Coke Oven Gas | 12.1 | 1 | 44 400 | 37 300 | 54 100 |
| | Blast Furnace Gas [4] | 70.8 | 1 | 260 000 | 219 000 | 308 000 |
| | Oxygen Steel Furnace Gas [5] | 49.6 | 1 | 182 000 | 145 000 | 202 000 |

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 2: Energy, Chapter 1: Introduction, Table 1.4

Appendix

TABLE 1.4 (CONTINUED)
DEFAULT $CO_2$ EMISSION FACTORS FOR COMBUSTION [1]

| Fuel type English description | | Default carbon content (kg/GJ) | Default carbon oxidation Factor | Effective $CO_2$ emission factor (kg/TJ) [2] | | |
|---|---|---|---|---|---|---|
| | | | | Default value | 95% confidence interval | |
| | | A | B | C=A*B*44/12*1000 | Lower | Upper |
| Natural Gas | | 15.3 | 1 | 56 100 | 54 300 | 58 300 |
| Municipal Wastes (non-biomass fraction) | | 25.0 | 1 | 91 700 | 73 300 | 121 000 |
| Industrial Wastes | | 39.0 | 1 | 143 000 | 110 000 | 183 000 |
| Waste Oil | | 20.0 | 1 | 73 300 | 72 200 | 74 400 |
| Peat | | 28.9 | 1 | 106 000 | 100 000 | 108 000 |
| Solid Biofuels | Wood/Wood Waste | 30.5 | 1 | 112 000 | 95 000 | 132 000 |
| | Sulphite lyes (black liquor)[5] | 26.0 | 1 | 95 300 | 80 700 | 110 000 |
| | Other Primary Solid Biomass | 27.3 | 1 | 100 000 | 84 700 | 117 000 |
| | Charcoal | 30.5 | 1 | 112 000 | 95 000 | 132 000 |
| Liquid Biofuels | Biogasoline | 19.3 | 1 | 70 800 | 59 800 | 84 300 |
| | Biodiesels | 19.3 | 1 | 70 800 | 59 800 | 84 300 |
| | Other Liquid Biofuels | 21.7 | 1 | 79 600 | 67 100 | 95 300 |
| Gas biomass | Landfill Gas | 14.9 | 1 | 54 600 | 46 200 | 66 000 |
| | Sludge Gas | 14.9 | 1 | 54 600 | 46 200 | 66 000 |
| | Other Biogas | 14.9 | 1 | 54 600 | 46 200 | 66 000 |
| Other non-fossil fuels | Municipal Wastes (biomass fraction) | 27.3 | 1 | 100 000 | 84 700 | 117 000 |

Notes:

[1] The lower and upper limits of the 95 percent confidence intervals, assuming lognormal distributions, fitted to a dataset, based on national inventory reports, IEA data and available national data. A more detailed description is given in section 1.5

[2] TJ = 1000GJ

[3] The emission factor values for BFG includes carbon dioxide originally contained in this gas as well as that formed due to combustion of this gas.

[4] The emission factor values for OSF includes carbon dioxide originally contained in this gas as well as that formed due to combustion of this gas

[5] Includes the biomass-derived $CO_2$ emitted from the black liquor combustion unit and the biomass-derived $CO_2$ emitted from the kraft mill lime kiln.

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 2: Energy, Chapter 1: Introduction, Table 1.4

Appendix

## Table 3 Grid Emission Factors

Choose appropriate value of the target country taking into account types of the project such as firm energy (hydro, geothermal etc.), intermittent energy (solar, wind, tidal, etc.), energy efficiency and electricity consumption. In case the updated version of emission factors is provided by IFI TWG (The Technical Working Group of the International Financial Institutions), apply these values.

(t-$CO_2$/MWh)

| | Combined Margin Grid Emission Factor | | | | Operating Margin Grid Emission Factor (including for use in PCAF GHG accounting) |
|---|---|---|---|---|---|
| | Firm Energy (e.g., Hydro, Geothermal) | Intermittent Energy (e.g., Solar, Wind, Tidal) | Energy Efficiency | Electricity Consumption | |
| Country / Territory / Island | | | | | |
| Afghanistan | 0.193 | 0.331 | 0.193 | 0.193 | 0.414 |
| Albania | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Algeria | 0.397 | 0.479 | 0.397 | 0.397 | 0.528 |
| American Samoa (U.S.) | 0.516 | 0.664 | 0.516 | 0.516 | 0.753 |
| Andorra | 0.070 | 0.144 | 0.070 | 0.070 | 0.188 |
| Angola | 0.748 | 1.203 | 0.748 | 0.748 | 1.476 |
| Anguilla (U.K.) | 0.472 | 0.647 | 0.472 | 0.472 | 0.753 |
| Antigua and Barbuda | 0.489 | 0.654 | 0.489 | 0.489 | 0.753 |
| Argentina | 0.288 | 0.407 | 0.288 | 0.288 | 0.478 |
| Armenia | 0.205 | 0.321 | 0.205 | 0.205 | 0.390 |
| Aruba | 0.421 | 0.628 | 0.421 | 0.421 | 0.753 |
| Australia | 0.421 | 0.663 | 0.421 | 0.421 | 0.808 |
| Austria | 0.113 | 0.194 | 0.113 | 0.113 | 0.242 |
| Azerbaijan | 0.384 | 0.478 | 0.384 | 0.384 | 0.534 |
| Azores (Portugal) | 0.384 | 0.614 | 0.384 | 0.384 | 0.753 |
| Bahamas | 0.441 | 0.636 | 0.441 | 0.441 | 0.753 |
| Bahrain | 0.454 | 0.624 | 0.454 | 0.454 | 0.726 |
| Bangladesh | 0.412 | 0.484 | 0.412 | 0.412 | 0.528 |
| Barbados | 0.484 | 0.650 | 0.484 | 0.484 | 0.749 |
| Belarus | 0.292 | 0.359 | 0.292 | 0.292 | 0.400 |
| Belgium | 0.124 | 0.204 | 0.124 | 0.124 | 0.252 |
| Belize | 0.183 | 0.320 | 0.183 | 0.183 | 0.403 |
| Benin | 0.576 | 0.682 | 0.576 | 0.576 | 0.745 |
| Bermuda (U.K.) | 0.342 | 0.598 | 0.342 | 0.342 | 0.753 |
| Bhutan | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Bolivia, Plurinational State of | 0.393 | 0.525 | 0.393 | 0.393 | 0.604 |
| Bonaire (Netherland) | 0.400 | 0.620 | 0.400 | 0.400 | 0.753 |
| Bosnia and Herzegovina | 0.739 | 1.025 | 0.739 | 0.739 | 1.197 |
| Botswana | 1.070 | 1.330 | 1.070 | 1.070 | 1.486 |
| Brazil | 0.150 | 0.234 | 0.150 | 0.150 | 0.284 |
| British Virgin Islands (U.K.) | 0.420 | 0.628 | 0.420 | 0.420 | 0.753 |
| Brunei Darussalam | 0.407 | 0.578 | 0.407 | 0.407 | 0.681 |
| Bulgaria | 0.495 | 0.755 | 0.495 | 0.495 | 0.911 |
| Burkina Faso | 0.539 | 0.672 | 0.539 | 0.539 | 0.753 |
| Burundi | 0.197 | 0.333 | 0.197 | 0.197 | 0.414 |
| Cambodia | 0.588 | 0.874 | 0.588 | 0.588 | 1.046 |
| Cameroon | 0.354 | 0.545 | 0.354 | 0.354 | 0.659 |
| Canada | 0.213 | 0.312 | 0.213 | 0.213 | 0.372 |
| Canary Islands (Spain) | 0.435 | 0.633 | 0.435 | 0.435 | 0.753 |
| Cape Verde | 0.505 | 0.660 | 0.505 | 0.505 | 0.753 |
| Cayman Islands | 0.373 | 0.610 | 0.373 | 0.373 | 0.753 |
| Central African Republic | 0.077 | 0.146 | 0.077 | 0.077 | 0.188 |
| Chad | 0.581 | 0.688 | 0.581 | 0.581 | 0.753 |
| Channel Islands (U.K) | 0.389 | 0.616 | 0.389 | 0.389 | 0.753 |
| Chile | 0.235 | 0.499 | 0.235 | 0.235 | 0.657 |
| China (PRC and Hong Kong) | 0.485 | 0.744 | 0.485 | 0.485 | 0.899 |
| Colombia | 0.208 | 0.334 | 0.208 | 0.208 | 0.410 |
| Comoros | 0.589 | 0.691 | 0.589 | 0.589 | 0.753 |

Appendix

| | Combined Margin Grid Emission Factor | | | | Operating Margin Grid Emission Factor (including for use in PCAF GHG accounting) |
|---|---|---|---|---|---|
| | Firm Energy (e.g., Hydro, Geothermal) | Intermittent Energy (e.g., Solar, Wind, Tidal) | Energy Efficiency | Electricity Consumption | |
| Congo, Democratic Republic of | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Congo, Republic of | 0.405 | 0.564 | 0.405 | 0.405 | 0.659 |
| Cook Islands | 0.422 | 0.628 | 0.422 | 0.422 | 0.753 |
| Costa Rica | 0.039 | 0.082 | 0.039 | 0.039 | 0.108 |
| Côte d'Ivoire | 0.314 | 0.409 | 0.314 | 0.314 | 0.466 |
| Croatia | 0.168 | 0.247 | 0.168 | 0.168 | 0.294 |
| Cuba | 0.391 | 0.496 | 0.391 | 0.391 | 0.559 |
| Curacao/Netherlands Antilles | 0.506 | 0.737 | 0.506 | 0.506 | 0.876 |
| Cyprus | 0.438 | 0.633 | 0.438 | 0.438 | 0.751 |
| Czech Republic | 0.461 | 0.736 | 0.461 | 0.461 | 0.902 |
| Denmark | 0.155 | 0.284 | 0.155 | 0.155 | 0.362 |
| Djibouti | 0.575 | 0.686 | 0.575 | 0.575 | 0.753 |
| Dominica | 0.433 | 0.633 | 0.433 | 0.433 | 0.753 |
| Dominican Republic | 0.426 | 0.536 | 0.426 | 0.426 | 0.601 |
| Ecuador | 0.280 | 0.455 | 0.280 | 0.280 | 0.560 |
| Egypt | 0.406 | 0.498 | 0.406 | 0.406 | 0.554 |
| El Salvador | 0.275 | 0.445 | 0.275 | 0.275 | 0.547 |
| Equatorial Guinea | 0.361 | 0.531 | 0.361 | 0.361 | 0.632 |
| Eritrea | 0.704 | 0.836 | 0.704 | 0.704 | 0.915 |
| Estonia | 0.625 | 0.895 | 0.625 | 0.625 | 1.057 |
| Eswatini | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Ethiopia | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Falkland Islands (U.K.) | 0.316 | 0.589 | 0.316 | 0.316 | 0.753 |
| Faroe Islands (Denmark) | 0.320 | 0.590 | 0.320 | 0.320 | 0.753 |
| Fiji | 0.334 | 0.525 | 0.334 | 0.334 | 0.640 |
| Finland | 0.114 | 0.209 | 0.114 | 0.114 | 0.267 |
| France | 0.068 | 0.124 | 0.068 | 0.068 | 0.158 |
| French Guiana | 0.200 | 0.340 | 0.200 | 0.200 | 0.423 |
| French Polynesia | 0.412 | 0.625 | 0.412 | 0.412 | 0.753 |
| Gabon | 0.533 | 0.791 | 0.533 | 0.533 | 0.946 |
| Gambia | 0.591 | 0.692 | 0.591 | 0.591 | 0.753 |
| Georgia | 0.135 | 0.231 | 0.135 | 0.135 | 0.289 |
| Germany | 0.313 | 0.523 | 0.313 | 0.313 | 0.650 |
| Ghana | 0.276 | 0.413 | 0.276 | 0.276 | 0.495 |
| Gibraltar (U.K.) | 0.369 | 0.625 | 0.369 | 0.369 | 0.779 |
| Greece | 0.346 | 0.447 | 0.346 | 0.346 | 0.507 |
| Greenland | 0.105 | 0.204 | 0.105 | 0.105 | 0.264 |
| Grenada | 0.523 | 0.666 | 0.523 | 0.523 | 0.753 |
| Guadeloupe (France) | 0.433 | 0.633 | 0.433 | 0.433 | 0.753 |
| Guam | 0.428 | 0.631 | 0.428 | 0.428 | 0.753 |
| Guatemala | 0.427 | 0.659 | 0.427 | 0.427 | 0.798 |
| Guinea | 0.460 | 0.643 | 0.460 | 0.460 | 0.753 |
| Guinea-Bissau | 0.577 | 0.687 | 0.577 | 0.577 | 0.753 |
| Guyana | 0.616 | 0.760 | 0.616 | 0.616 | 0.847 |
| Haiti | 0.765 | 0.942 | 0.765 | 0.765 | 1.048 |
| Honduras | 0.359 | 0.548 | 0.359 | 0.359 | 0.662 |
| Hungary | 0.191 | 0.257 | 0.191 | 0.191 | 0.296 |
| Iceland | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| India | 0.608 | 0.822 | 0.608 | 0.608 | 0.951 |
| Indonesia | 0.675 | 0.743 | 0.675 | 0.675 | 0.783 |
| Iran, Islamic Republic of | 0.421 | 0.528 | 0.421 | 0.421 | 0.592 |
| Iraq | 0.788 | 0.971 | 0.788 | 0.788 | 1.080 |
| Ireland | 0.189 | 0.309 | 0.189 | 0.189 | 0.380 |
| Isle of Man (U.K.) | 0.204 | 0.349 | 0.204 | 0.204 | 0.436 |
| Israel | 0.258 | 0.343 | 0.258 | 0.258 | 0.394 |
| Italy | 0.224 | 0.343 | 0.224 | 0.224 | 0.414 |

Appendix

| | Combined Margin Grid Emission Factor | | | | Operating Margin Grid Emission Factor (including for use in PCAF GHG accounting) |
|---|---|---|---|---|---|
| | Firm Energy (e.g., Hydro, Geothermal) | Intermittent Energy (e.g., Solar, Wind, Tidal) | Energy Efficiency | Electricity Consumption | |
| Jamaica | 0.498 | 0.631 | 0.498 | 0.498 | 0.711 |
| Japan | 0.408 | 0.448 | 0.408 | 0.408 | 0.471 |
| Jordan | 0.382 | 0.474 | 0.382 | 0.382 | 0.529 |
| Kazakhstan | 0.532 | 0.698 | 0.532 | 0.532 | 0.797 |
| Kenya | 0.274 | 0.462 | 0.274 | 0.274 | 0.574 |
| Kiribati | 0.530 | 0.669 | 0.530 | 0.530 | 0.753 |
| Korea (North), Democratic People's Republic of | 0.359 | 0.606 | 0.359 | 0.359 | 0.754 |
| Korea (South), Republic of | 0.335 | 0.473 | 0.335 | 0.335 | 0.555 |
| Kosovo | 0.843 | 1.032 | 0.843 | 0.843 | 1.145 |
| Kuwait | 0.400 | 0.572 | 0.400 | 0.400 | 0.675 |
| Kyrgyzstan | 0.098 | 0.172 | 0.098 | 0.098 | 0.217 |
| Lao People's Democratic Republic | 0.555 | 0.876 | 0.555 | 0.555 | 1.069 |
| Latvia | 0.117 | 0.194 | 0.117 | 0.117 | 0.240 |
| Lebanon | 0.567 | 0.709 | 0.567 | 0.567 | 0.794 |
| Lesotho | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Liberia | 0.374 | 0.564 | 0.374 | 0.374 | 0.677 |
| Libya | 0.493 | 0.602 | 0.493 | 0.493 | 0.668 |
| Liechtenstein | 0.052 | 0.114 | 0.052 | 0.052 | 0.151 |
| Lithuania | 0.102 | 0.170 | 0.102 | 0.102 | 0.211 |
| Luxembourg | 0.095 | 0.173 | 0.095 | 0.095 | 0.220 |
| Madagascar | 0.567 | 0.760 | 0.567 | 0.567 | 0.876 |
| Madeira (Portugal) | 0.369 | 0.552 | 0.369 | 0.369 | 0.663 |
| Malawi | 0.243 | 0.397 | 0.243 | 0.243 | 0.489 |
| Malaysia | 0.436 | 0.508 | 0.436 | 0.436 | 0.551 |
| Maldives | 0.524 | 0.667 | 0.524 | 0.524 | 0.753 |
| Mali | 0.623 | 0.906 | 0.623 | 0.623 | 1.076 |
| Malta | 0.295 | 0.435 | 0.295 | 0.295 | 0.520 |
| Marshall Islands | 0.561 | 0.681 | 0.561 | 0.561 | 0.753 |
| Martinique (France) | 0.406 | 0.623 | 0.406 | 0.406 | 0.753 |
| Mauritania | 0.513 | 0.663 | 0.513 | 0.513 | 0.753 |
| Mauritius | 0.543 | 0.641 | 0.543 | 0.543 | 0.700 |
| Mayotte (France) | 0.512 | 0.662 | 0.512 | 0.512 | 0.753 |
| Mexico | 0.359 | 0.467 | 0.359 | 0.359 | 0.531 |
| Micronesia | 0.557 | 0.679 | 0.557 | 0.557 | 0.753 |
| Moldova, Republic of | 0.399 | 0.488 | 0.399 | 0.399 | 0.541 |
| Monaco | 0.068 | 0.124 | 0.068 | 0.068 | 0.158 |
| Mongolia | 1.002 | 1.230 | 1.002 | 1.002 | 1.366 |
| Montenegro | 0.471 | 0.739 | 0.471 | 0.471 | 0.899 |
| Montserrat | 0.517 | 0.664 | 0.517 | 0.517 | 0.753 |
| Morocco | 0.547 | 0.660 | 0.547 | 0.547 | 0.729 |
| Mozambique | 0.111 | 0.188 | 0.111 | 0.111 | 0.234 |
| Myanmar | 0.407 | 0.602 | 0.407 | 0.407 | 0.719 |
| Namibia | 0.139 | 0.274 | 0.139 | 0.139 | 0.355 |
| Nauru | 0.521 | 0.666 | 0.521 | 0.521 | 0.753 |
| Nepal | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Netherlands | 0.203 | 0.280 | 0.203 | 0.203 | 0.326 |
| New Caledonia (France) | 0.445 | 0.654 | 0.445 | 0.445 | 0.779 |
| New Zealand | 0.108 | 0.194 | 0.108 | 0.108 | 0.246 |
| Nicaragua | 0.372 | 0.562 | 0.372 | 0.372 | 0.675 |
| Niger | 0.718 | 0.752 | 0.718 | 0.718 | 0.772 |
| Nigeria | 0.358 | 0.463 | 0.358 | 0.358 | 0.526 |
| Niue | 0.459 | 0.642 | 0.459 | 0.459 | 0.753 |
| North Macedonia, Republic of | 0.563 | 0.743 | 0.563 | 0.563 | 0.851 |
| Northern Mariana Islands (U.S.) | 0.416 | 0.626 | 0.416 | 0.416 | 0.753 |
| Norway | 0.017 | 0.036 | 0.017 | 0.017 | 0.047 |

Appendix

| | Combined Margin Grid Emission Factor | | | | Operating Margin Grid Emission Factor (including for use in PCAF GHG accounting) |
|---|---|---|---|---|---|
| | Firm Energy (e.g., Hydro, Geothermal) | Intermittent Energy (e.g., Solar, Wind, Tidal) | Energy Efficiency | Electricity Consumption | |
| Oman | 0.320 | 0.419 | 0.320 | 0.320 | 0.479 |
| Pakistan | 0.386 | 0.515 | 0.386 | 0.386 | 0.592 |
| Palau | 0.497 | 0.657 | 0.497 | 0.497 | 0.753 |
| Palestinian Authority | 0.517 | 0.643 | 0.517 | 0.517 | 0.719 |
| Panama | 0.230 | 0.385 | 0.230 | 0.230 | 0.477 |
| Papua New Guinea | 0.315 | 0.491 | 0.315 | 0.315 | 0.597 |
| Paraguay | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Peru | 0.252 | 0.390 | 0.252 | 0.252 | 0.473 |
| Philippines | 0.525 | 0.617 | 0.525 | 0.525 | 0.672 |
| Poland | 0.532 | 0.717 | 0.532 | 0.532 | 0.828 |
| Portugal | 0.228 | 0.329 | 0.228 | 0.228 | 0.389 |
| Puerto Rico (U.S.) | 0.362 | 0.508 | 0.362 | 0.362 | 0.596 |
| Qatar | 0.258 | 0.411 | 0.258 | 0.258 | 0.503 |
| Reunion (France) | 0.421 | 0.641 | 0.421 | 0.421 | 0.772 |
| Romania | 0.289 | 0.414 | 0.289 | 0.289 | 0.489 |
| Russian Federation | 0.360 | 0.432 | 0.360 | 0.360 | 0.476 |
| Rwanda | 0.416 | 0.601 | 0.416 | 0.416 | 0.712 |
| Saint Helena (U.K.) | 0.456 | 0.641 | 0.456 | 0.456 | 0.753 |
| Saint Kitts and Nevis | 0.477 | 0.649 | 0.477 | 0.477 | 0.753 |
| Saint Lucia | 0.521 | 0.666 | 0.521 | 0.521 | 0.753 |
| Saint Martin (France) | 0.484 | 0.652 | 0.484 | 0.484 | 0.753 |
| Saint Pierre and Miquelon (France) | 0.415 | 0.626 | 0.415 | 0.415 | 0.753 |
| Saint Vincent and Grenadines | 0.499 | 0.658 | 0.499 | 0.499 | 0.753 |
| Samoa | 0.434 | 0.633 | 0.434 | 0.434 | 0.753 |
| San Marino | 0.224 | 0.343 | 0.224 | 0.224 | 0.414 |
| Sao Tomé & Principe | 0.565 | 0.682 | 0.565 | 0.565 | 0.753 |
| Saudi Arabia | 0.374 | 0.510 | 0.374 | 0.374 | 0.592 |
| Senegal | 0.656 | 0.790 | 0.656 | 0.656 | 0.870 |
| Serbia | 0.678 | 0.933 | 0.678 | 0.678 | 1.086 |
| Seychelles | 0.479 | 0.650 | 0.479 | 0.479 | 0.753 |
| Sierra Leone | 0.246 | 0.398 | 0.246 | 0.246 | 0.489 |
| Singapore | 0.200 | 0.311 | 0.200 | 0.200 | 0.379 |
| Sint Martin (Netherlands) | 0.463 | 0.644 | 0.463 | 0.463 | 0.753 |
| Slovak Republic | 0.164 | 0.269 | 0.164 | 0.164 | 0.332 |
| Slovenia | 0.285 | 0.494 | 0.285 | 0.285 | 0.620 |
| Solomon Islands | 0.563 | 0.681 | 0.563 | 0.563 | 0.753 |
| Somalia | 0.582 | 0.689 | 0.582 | 0.582 | 0.753 |
| South Africa | 0.786 | 0.964 | 0.786 | 0.786 | 1.070 |
| South Sudan | 0.704 | 0.820 | 0.704 | 0.704 | 0.890 |
| Spain | 0.209 | 0.329 | 0.209 | 0.209 | 0.402 |
| Sri Lanka | 0.506 | 0.646 | 0.506 | 0.506 | 0.731 |
| Sudan | 0.398 | 0.609 | 0.398 | 0.398 | 0.736 |
| Suriname | 0.565 | 0.855 | 0.565 | 0.565 | 1.029 |
| Sweden | 0.025 | 0.052 | 0.025 | 0.025 | 0.068 |
| Switzerland | 0.020 | 0.038 | 0.020 | 0.020 | 0.048 |
| Syrian Arab Republic | 0.546 | 0.650 | 0.546 | 0.546 | 0.713 |
| Taiwan (Chinese Taipei) | 0.331 | 0.427 | 0.331 | 0.331 | 0.484 |
| Tajikistan | 0.106 | 0.199 | 0.106 | 0.106 | 0.255 |
| Tanzania, United Republic of | 0.336 | 0.458 | 0.336 | 0.336 | 0.531 |
| Thailand | 0.351 | 0.413 | 0.351 | 0.351 | 0.450 |
| Timor-Leste | 0.589 | 0.691 | 0.589 | 0.589 | 0.753 |
| Togo | 0.597 | 0.761 | 0.597 | 0.597 | 0.859 |
| Tonga | 0.533 | 0.670 | 0.533 | 0.533 | 0.753 |
| Trinidad and Tobago | 0.370 | 0.488 | 0.370 | 0.370 | 0.559 |
| Tunisia | 0.348 | 0.423 | 0.348 | 0.348 | 0.468 |
| Turkey | 0.309 | 0.351 | 0.309 | 0.309 | 0.376 |

Appendix

| | Combined Margin Grid Emission Factor | | | | Operating Margin Grid Emission Factor (including for use in PCAF GHG accounting) |
|---|---|---|---|---|---|
| | Firm Energy (e.g., Hydro, Geothermal) | Intermittent Energy (e.g., Solar, Wind, Tidal) | Energy Efficiency | Electricity Consumption | |
| Turkmenistan | 0.676 | 0.833 | 0.676 | 0.676 | 0.927 |
| Turks and Caicos Islands (U.K.) | 0.451 | 0.639 | 0.451 | 0.451 | 0.753 |
| Tuvalu | 0.497 | 0.657 | 0.497 | 0.497 | 0.753 |
| Uganda | 0.116 | 0.218 | 0.116 | 0.116 | 0.279 |
| Ukraine | 0.435 | 0.643 | 0.435 | 0.435 | 0.768 |
| United Arab Emirates | 0.310 | 0.464 | 0.310 | 0.310 | 0.556 |
| United Kingdom | 0.219 | 0.320 | 0.219 | 0.219 | 0.380 |
| United States | 0.246 | 0.352 | 0.246 | 0.246 | 0.416 |
| Uruguay | 0.065 | 0.133 | 0.065 | 0.065 | 0.174 |
| Uzbekistan | 0.467 | 0.558 | 0.467 | 0.467 | 0.612 |
| Vanatu | 0.504 | 0.659 | 0.504 | 0.504 | 0.753 |
| Venezuela, Bolivarian Republic of | 0.368 | 0.582 | 0.368 | 0.368 | 0.711 |
| Viet Nam | 0.381 | 0.493 | 0.381 | 0.381 | 0.560 |
| Virgin Islands (U.S.) | 0.373 | 0.546 | 0.373 | 0.373 | 0.650 |
| Yemen | 0.615 | 0.735 | 0.615 | 0.615 | 0.807 |
| Zambia | 0.197 | 0.334 | 0.197 | 0.197 | 0.416 |
| Zimbabwe | 0.880 | 1.315 | 0.880 | 0.880 | 1.575 |

Note 1: For methodology and sources used to derive the default emission factors, please refer to the document "AHG-001: Methodological Approach for the Common Default Grid Emission Factor Dataset".
Note 2: Partnership for Carbon Accounting Financials (PCAF) is a global partnership of financial institutions that work together to develop and implement a harmonized approach to assess and disclose the GHG emissions associated with their loans and investments.
https://carbonaccountingfinancials.com/

出典：Harmonized IFI Default Grid Factors 2022 v3.2. IFI TWG (The Technical Working Group of the International Financial Institutions).
https://unfccc.int/climate-action/sectoral-engagement/ifis-harmonization-of-standards-for-ghg-accounting/ifi-twg-list-of-methodologies

Table 4 $CO_2$ Emission Factors for Standalone Power Generation

**Table 2. Emission factors for diesel generator systems (in kg CO2e/kWh[(a)]) for three different levels of load factors[(b)]**

| Cases | Mini-grid with 24 hour service | (a) Mini-grid with temporary service (4-6 hr/day); (b) Productive applications; (c) Water pumps | Mini-grid with storage |
|---|---|---|---|
| **Load factors [%]** | **25%** | **50%** | **100%** |
| <15 kW | 2.4 | 1.4 | 1.2 |
| >=15 <35 kW | 1.9 | 1.3 | 1.1 |
| >=35 <135 kW | 1.3 | 1.0 | 1.0 |
| >=135<200 kW | 0.9 | 0.8 | 0.8 |
| > 200 kW[(c)] | 0.8 | 0.8 | 0.8 |

(a) A conversion factor of 3.2 kg $CO_2$ per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories);

(b) Values derived from figures reported in RETScreen International's PV 2000 model retrieved from: <http://retscreen.net/>;

(c) Default values.

Source: Small Scale CDM Methodology: AMS I.F. ver.3

Table 5 Default Values of Boiler Efficiencies

**Table 1: Default baseline efficiency for different technologies**

| Technology of the energy generation system | Default efficiency |
|---|---|
| New natural gas fired boiler (w/o condenser) | 92% |
| New oil fired boiler | 90% |
| Old natural gas fired boiler (w/o condenser) | 87% |
| New coal fired boiler | 85% |
| Old oil fired boiler | 85% |
| Old coal fired boiler | 80% |

Source: CDM Tool to determine the baseline efficiency of thermal or electric energy generation systems, ver.1

## Table 6 $CO_2$ Emission Factors for Different Transport Modes

$CO_2$ emission factors per km (g-$CO_2$/km)

| Vehicle Type | Emission Factors |
|---|---|
| Car | 304.1 |
| 2-Wheeler | 45.9 |
| 3-Wheeler | 125.2 |
| Taxi | 290.6 |
| Bus | 1337.9 |
| Jeepney/RTV | 420.5 |

Source: Manual for Calculating Greenhouse Gas Benefits of Global Environment Facility Transportation Projects (GEF, 2012)

$CO_2$ emission factors per passenger km (g-$CO_2$/passenger-km)

| Vehicle Type | Emission Factors |
|---|---|
| Passenger car | 130 |
| Aviation | 98 |
| Bus | 57 |
| Railway | 17 |
| Motorbike | 50 |

Source: MLIT Ministry of Land, Infrastructure, Transport and Tourism, Japan (FY2019). Sustainable Transport : A Sourcebook for Policy-makers in Developing Cities (GTZ, 2007)

## Table 7 $CO_2$ Emission Factors in g-$CO_2$/t-km for Different Transport Modes

| Vehicle Type | | Emission Factors |
|---|---|---|
| Road | Commercial standard sized vehicles | 173 |
| | Commercial small size vehicles | 808 |
| | Commercial small mini vehicles | 1,951 |
| | Private standard sized vehicles | 394 |
| | Private small size vehicles | 3,443 |
| Railway | | 22 |
| Domestic vessels | | 39 |
| Domestic airway | | 1,490 |

Source: $CO_2$ Emission Estimation Guideline for Logistics, Version 3.1, METI and MLIT, Japan

| **Type of cargo transported** | **Emission factor (g $CO_2$/tonne.km)** |
|---|---|
| Agricultural products and live animals | 83 |
| Beverage | 61 |
| Groceries | 76 |
| Perishable and semi-perishable foodstuff and canned food | 94 |
| Other food products and fodder | 74 |
| Solid mineral fuels and petroleum products | 76 |
| Ores and metal waste | 90 |
| Metal products | 80 |
| Mineral products | 57 |
| Other crude and manufactured minerals and building materials | 70 |
| Fertilizers | 76 |
| Chemicals | 70 |
| Transport equipment | 100 |
| Machinery and metal products | 119 |
| Glass and ceramic and porcelain products | 84 |
| Grouped goods | 94 |
| Other manufactured articles | 113 |

Source: Approved baseline and monitoring methodology AM0090: Modal shift in transportation of cargo from road transportation to water or rail transportation.

Table 8 (1) Fraction of degradable organic carbon by waste type ($DOC_j$)

| Waste type *j* | $DOC_j$ (% wet waste) |
|---|---|
| Wood and wood products | 43 |
| Pulp, paper and cardboard (other than sludge) | 40 |
| Food, food waste, beverages and tobacco (other than sludge) | 15 |
| Textiles | 24 |
| Garden, yard and park waste | 20 |
| Glass, plastic, metal, other inert waste | 0 |

Source: CDM Methodological Tool: Emissions from solid waste disposal sites [version 8.1] (original source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 5, Table 2.4 and 2.5)

Table 8 (2) Fraction of degradable organic carbon which decomposes by waste type ($DOC_{f,j}$)

**TABLE 3.0 (NEW)**
**FRACTION OF DEGRADABLE ORGANIC CARBON WHICH DECOMPOSES ($DOC_F$) FOR DIFFERENT WASTE TYPES**

| Type of Waste | Recommended Default $DOC_f$ Values | Remark |
|---|---|---|
| Less decomposable wastes e.g. wood, engineered wood products, tree branches (wood) | 0.1 | An average value of 0.088 was derived from $DOC_f$ values for engineered wood products, sawn woods, tree branches reported in 3 references[1-3] |
| Moderately decomposable wastes e.g. paper, textile, nappies | 0.5 | An average value of 0.523 was derived from $DOC_f$ values for paper products, textile and nappies reported in 4 references[4-7]. |
| Highly decomposable wastes, e.g. food wastes, grasses (garden and park waste excluding tree branches) | 0.7 | An average value of 0.706 was derived from $DOC_f$ values for food wastes and grasses reported in 3 references[4-6] |
| Bulk waste* | 0.5 | |

[1] Wang *et al.* (2011); [2]Wang and Barlaz (2016); [3] Ximenes *et al.* (2018); [4]Eleazer *et al.* (1997); [5]Bayard *et al.* (2017); [6]Jeong (2016); [7]Wang *et al.* (2015)

* It is used when the fractions of less, moderately and highly decomposable wastes in MSW are not known.

Source: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Table 3.0 (New)

## Table 9(1) Methane Correction Factor (for SWDS)

**TABLE 3.1 (UPDATED)**
**SWDS CLASSIFICATION AND METHANE CORRECTION FACTORS (MCF)**

| Type of Site | Methane Correction Factor (MCF) Default Values | Remarks |
|---|---|---|
| Managed – anaerobic | 1.0[a] | These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) levelling of the waste. |
| Managed well – semi-aerobic | 0.5[b] | When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as well magement ; (i) permeable cover material; (ii) leachate drainage system without sunk; (iii) regulating pondage; and (iv) gas ventilation system without cap, (v) connection of leachate drainage system and gas ventilation system. |
| Managed poorly – semi-aerobic | 0.7[c] | When semi-aerobic managed SWDS type is managed under one of the following condition, it is regarded as poor management; (i) condition of sunk of leachate drainage system; (ii) closing of valve of drainage or atmosphere-unopening of drainage exit; (iii) capping of gas ventilation exit. |
| Managed well – active-aeration | 0.4[d,e,f] | Active aeration of managed landfills includes the technology of in-situ low pressure aeration, air sparging, bioventing, passive ventilation with extraction (suction). These must have controlled placement of waste and will include leachate drainage system to avoid the blockage of air penetration, and (i) cover material; (ii) air injection or gas extraction system without drying of waste. |
| Managed poorly – active-aeration | 0.7[f,g,h] | When SWDS, that is equipped as well as active aeration of managed SWDS, is managed under one of the following condition, it is judged as poor management; (i) blockage of aeration system due to failure of drainage; (ii) lack of available moisture for microorganisms due to high- pressure aeration. |
| Unmanaged – deep ( >5 m waste) and /or high water table | 0.8 [a] | All SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 metres and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste. |
| Unmanaged – shallow (<5 m waste) | 0.4 [a] | All SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres. |
| Uncategorised SWDS | 0.6 [a] | Only if countries cannot categorise their SWDS into above four categories of managed and unmanaged SWDS, the MCF for this category can be used. |

Sources: [a]IPCC (2000); [b]Matsufuji *et al*. (1996); [c]Yamada *et al*. (2013); [d]Hrad *et al*. (2013); [e]Ishigaki *et al*. (2003); [f]Ritzkowski & Stegmann (2013); [g]Raga & Cossu (2014); [h]Ritzkowski *et al*. (2016)

Source: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Table 3.1 (Updated)

Table 9(2) Methane Correction Factor (for wastewater)

| **Type of wastewater treatment and discharge pathway or system** | ***MCF* value** |
|---|---|
| Discharge of wastewater to sea, river or lake | 0.1 |
| Land application | 0.1 |
| Aerobic treatment, well managed | 0.0 |
| Aerobic treatment, poorly managed or overloaded | 0.3 |
| Anaerobic digester for sludge without methane recovery | 0.8 |
| Anaerobic reactor without methane recovery | 0.8 |
| Anaerobic shallow lagoon (depth less than 2 metres) | 0.2 |
| Anaerobic deep lagoon (depth more than 2 metres) | 0.8 |
| Septic system | 0.5 |
| Land application[(a)] | 0.1 |

(a) Please refer SSC_664, “Clarification on methane correction factors for treated water used for irrigation under AMS-III.H ver. 16”.

Source: CDM Methodology: AMS-III.H. Methane recovery in wastewater treatment [Version 19.0]

Table 10 Decay Rates of Wastes

| Waste type *j* | | Boreal and Temperate (MAT≤20°C) | | Tropical (MAT>20°C) | |
|---|---|---|---|---|---|
| | | Dry (MAP/PET <1) | Wet (MAP/PET >1) | Dry (MAP< 1000mm) | Wet (MAP> 1000mm) |
| Slowly degrading | Pulp, paper, cardboard (other than sludge), textiles | 0.04 | 0.06 | 0.045 | 0.07 |
| | Wood, wood products and straw | 0.02 | 0.03 | 0.025 | 0.035 |
| Moderately degrading | Other (non-food) organic putrescible garden and park waste | 0.05 | 0.10 | 0.065 | 0.17 |
| Rapidly degrading | Food, food waste, sewage sludge, beverages and tobacco | 0.06 | 0.185 | 0.085 | 0.40 |

Source: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, IPCC, Volume 5, Table 3.3

Table 11 Degradable Organic Content of the Untretaed Sludge

| Sludge type | | Default DOC(-) | |
|---|---|---|---|
| | | Wet matter | Dry matter |
| Domestic sludge | | 0.05 | 0.50 |
| Industrial sludge | Rough default | 0.09 | 0.35 |
| | Pulp and paper industry | - | 0.27 |
| | Food industry | - | 0.30 |
| | Chemical industry | - | 0.52 |

Source: 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste, p.2.13

Appendix

Table 12 Default Quantity of Waste Disposed in the SWDS ($W_y$)

**TABLE 2.1**
**MSW GENERATION AND TREATMENT DATA - REGIONAL DEFAULTS**

| Region | MSW Generation Rate[1, 2, 3] (tonnes/cap/yr) | Fraction of MSW disposed to SWDS | Fraction of MSW incinerated | Fraction of MSW composted | Fraction of other MSW management, unspecified[4] |
|---|---|---|---|---|---|
| **Asia** | | | | | |
| Eastern Asia | 0.37 | 0.55 | 0.26 | 0.01 | 0.18 |
| South-Central Asia | 0.21 | 0.74 | - | 0.05 | 0.21 |
| South-East Asia | 0.27 | 0.59 | 0.09 | 0.05 | 0.27 |
| **Africa[5]** | 0.29 | 0.69 | - | - | 0.31 |
| **Europe** | | | | | |
| Eastern Europe | 0.38 | 0.90 | 0.04 | 0.01 | 0.02 |
| Northern Europe | 0.64 | 0.47 | 0.24 | 0.08 | 0.20 |
| Southern Europe | 0.52 | 0.85 | 0.05 | 0.05 | 0.05 |
| Western Europe | 0.56 | 0.47 | 0.22 | 0.15 | 0.15 |
| **America** | | | | | |
| Caribbean | 0.49 | 0.83 | 0.02 | - | 0.15 |
| Central America | 0.21 | 0.50 | - | - | 0.50 |
| South America | 0.26 | 0.54 | 0.01 | 0.003 | 0.46 |
| North America | 0.65 | 0.58 | 0.06 | 0.06 | 0.29 |
| **Oceania[6]** | 0.69 | 0.85 | - | - | 0.15 |

[1] Data are based on weight of wet waste.

[2] To obtain the total waste generation in the country, the per-capita values should be multiplied with the population whose waste is collected. In many countries, especially developing countries, this encompasses only urban population.

[3] The data are default data for the year 2000, although for some countries the year for which the data are applicable was not given in the reference, or data for the year 2000 were not available. The year for which the data are collected, where available, is given in the Annex 2A.1.

[4] Other, unspecified, includes data on recycling for some countries.

[5] A regional average is given for the whole of Africa as data are not available for more detailed regions within Africa.

[6] Data for Oceania are based only on data from Australia and New Zealand.

Source:2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste Table2.1

Appendix

Table A-1 Default values of biomass expansion factors（BEF）

**TABLE 3A.1.10**
**DEFAULT VALUES OF BIOMASS EXPANSION FACTORS (BEFS)**
(BEF $_2$ to be used in connection with growing stock biomass data in Equation 3.2.3;
and BEF $_1$ to be used in connection with increment data in Equation 3.2.5)

| Climatic zone | Forest type | Minimum dbh (cm) | $BEF_2$ (overbark) to be used in connection to growing stock biomass data (Equation 3.2.3) | $BEF_1$ (overbark) to be used in connection to increment data (Equation 3.2.5) |
|---|---|---|---|---|
| Boreal | Conifers | 0-8.0 | 1.35 (1.15-3.8) | 1.15 (1-1.3) |
| | Broadleaf | 0-8.0 | 1.3 (1.15-4.2) | 1.1 (1-1.3) |
| Temperate | Conifers: Spruce-fir | 0-12.5 | 1.3 (1.15-4.2) | 1.15 (1-1.3) |
| | Pines | 0-12.5 | 1.3 (1.15-3.4) | 1.05 (1-1.2) |
| | Broadleaf | 0-12.5 | 1.4 (1.15-3.2) | 1.2 (1.1-1.3) |
| Tropical | Pines | 10.0 | 1.3 (1.2-4.0) | 1.2 (1.1-1.3) |
| | Broadleaf | 10.0 | 3.4 (2.0-9.0) | 1.5 (1.3-1.7) |

Note: $BEF_2$s given here represent averages for average growing stock or age, the upper limit of the range represents young forests or forests with low growing stock; lower limits of the range approximate mature forests or those with high growing stock. The values apply to growing stock biomass (dry weight) including bark and for given minimum diameter at breast height; Minimum top diameters and treatment of branches is unspecified. Result is above-ground tree biomass.

Sources: Isaev *et al.*, 1993; Brown, 1997; Brown and Schroeder, 1999; Schoene, 1999; ECE/FAO TBFRA, 2000; Lowe *et al.*, 2000; please also refer to FRA Working Paper 68 and 69 for average values for developing countries ( http://www.fao.org/forestry/index.jsp)

Source：IPCC Good Practice Guidance for Land Use, Land Use Change, and Forestry (LULUCF) Table3A.1.10, 2003[1]

[1] IPCCC: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Table A-2 Basic wood densities of stemwood WD (1)（t-dry matter/$m^3$）

**TABLE 3A.1.9-1**
**BASIC WOOD DENSITIES OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume)**
**FOR BOREAL AND TEMPERATE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| Species or genus | Basic wood density $m_0/V_{wet}$ | Source |
|---|---|---|
| Abies | 0.40 | 1 |
| Acer | 0.52 | 1 |
| Alnus | 0.45 | 1 |
| Betula | 0.51 | 1 |
| Carpinus betulus | 0.63 | 3 |
| Castanea sativa | 0.48 | 3 |
| Fagus sylvatica | 0.58 | 1 |
| Fraxinus | 0.57 | 1 |
| Juglans | 0.53 | 3 |
| Larix decidua | 0.46 | 1 |
| Larix kaempferi | 0.49 | 3 |
| Picea abies | 0.40 | 1 |
| Picea sitchensis | 0.40 | 2 |
| Pinus pinaster | 0.44 | 5 |
| Pinus strobus | 0.32 | 1 |
| Pinus sylvestris | 0.42 | 1 |
| Populus | 0.35 | 1 |
| Prunus | 0.49 | 1 |
| Pseudotsuga menziesii | 0.45 | 1 |
| Quercus | 0.58 | 1 |
| Salix | 0.45 | 1 |
| Thuja plicata | 0.31 | 4 |
| Tilia | 0.43 | 1 |
| Tsuga | 0.42 | 4 |

Source:

1. Dietz, P. 1975: Dichte und Rindengehalt von Industrieholz. Holz Roh- Werkstoff 33: 135-141
2. Knigge, W.; Schulz, H. 1966: Grundriss der Forstbenutzung. Verlag Paul Parey, Hamburg, Berlin
3. EN 350-2 (1994): Durability of wood and wood products - Natural durability of solid wood - Part 2: Guide to the natural durability and treatability of selected wood species of importance in Europe
4. Forest Products Laboratory: Handbook of wood and wood-based materials. Hemisphere Publishing Corporation, New York, London
5. Rijsdijk, J.F.; Laming, P.B. 1994: Physical and related properties of 145 timbers. Kluwer Academic Publishers, Dordrecht, Boston, London
6. Kollmann, F.F.P.; Coté, W.A. 1968: Principles of wood science and technology. Springer Verlag, Berlin, New York

Source：IPCC Good Practice Guidance for LULUCF , Table3A.1.9, 2003[2]

[2] IPCCC: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Appendix

Table A-2 Basic wood densities of stemwood WD (2)（t-dry matter/$m^3$）

**TABLE 3A.1.9-2**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Acacia leucophloea | 0.76 | Albizia spp. | 0.52 | Afzelia spp. | 0.67 |
| Adina cordifolia | 0.58, 0.59+ | Alcornea spp. | 0.34 | Aidia ochroleuca | 0.78* |
| Aegle marmelo | 0.75 | Alexa grandiflora | 0.6 | Albizia spp. | 0.52 |
| Agathis spp. | 0.44 | Alnus ferruginea | 0.38 | Allanblackia floribunda | 0.63* |
| Aglaia llanosiana | 0.89 | Anacardium excelsum | 0.41 | Allophyllus africanus f. acuminatus | 0.45 |
| Alangium longiflorum | 0.65 | Anadenanthera macrocarpa | 0.86 | Alstonia congensis | 0.33 |
| Albizzia amara | 0.70* | Andira retusa | 0.67 | Amphimas pterocarpoides | 0.63* |
| Albizzia falcataria | 0.25 | Aniba riparia lduckei | 0.62 | Anisophyllea obtusifolia | 0.63* |
| Aleurites trisperma | 0.43 | Antiaris africana | 0.38 | Annonidium mannii | 0.29* |
| Alnus japonica | 0.43 | Apeiba echinata | 0.36 | Anopyxis klaineana | 0.74* |
| Alphitonia zizyphoides | 0.5 | Artocarpus comunis | 0.7 | Anthocleista keniensis | 0.50* |
| Alphonsea arborea | 0.69 | Aspidosperma spp. (araracanga group) | 0.75 | Anthonotha macrophylla | 0.78* |
| Alseodaphne longipes | 0.49 | Astronium lecointei | 0.73 | Anthostemma aubryanum | 0.32* |
| Alstonia spp. | 0.37 | Bagassa guianensis | 0.68,0.69+ | Antiaris spp. | 0.38 |
| Amoora spp. | 0.6 | Banara guianensis | 0.61 | Antrocaryon klaineanum | 0.50* |
| Anisophyllea zeylanica | 0.46* | Basiloxylon exelsum | 0.58 | Aucoumea klaineana | 0.37 |
| Anisoptera spp, | 0.54 | Beilschmiedia sp. | 0.61 | Autranella congolensis | 0.78 |
| Anogeissus latifolia | 0.78, 0.79+ | Berthollettia excelsa | 0.59, 0.63+ | Baillonella toxisperma | 0.71 |
| Anthocephalus chinensis | 0.36,0.33+ | Bixa arborea | 0.32 | Balanites aegyptiaca | 0.63* |
| Antidesma pleuricum | 0.59 | Bombacopsis sepium | 0.39 | Baphia kirkii | 0.93* |
| Aphanamiris perrottetiana | 0.52 | Borojoa patinoi | 0.52 | Beilschmiedia louisii | 0.70* |
| Araucaria bidwillii | 0.43 | Bowdichia spp. | 0.74 | Beilschmiedia nitida | 0.50* |
| Artocarpus spp. | 0.58 | Brosimum spp. (alicastrum group) | 0.64, 0.66+ | Berlinia spp. | 0.58 |
| Azadirachta spp. | 0.52 | Brosimum utile | 0.41, 0.46+ | Blighia welwitschii | 0.74* |
| Balanocarpus spp. | 0.76 | Brysenia adenophylla | 0.54 | Bombax spp. | 0.4 |
| Barringtonia edulis * | 0.48 | Buchenauia capitata | 0.61, 0.63+ | Brachystegia spp. | 0.52 |
| Bauhinia spp. | 0.67 | Bucida buceras | 0.93 | Bridelia micrantha | 0.47* |
| Beilschmiedia tawa | 0.58 | Bulnesia arborea | 1 | Calpocalyx klainei | 0.63* |
| Berrya cordifolia | 0.78* | Bursera simaruba | 0.29, 0.34+ | Canarium schweinfurthii | 0.40* |
| Bischofia javanica | 0.54,0.58,0.62+ | Byrsonima coriacea | 0.64 | Canthium rubrocostratum | 0.63* |
| Bleasdalea vitiensis | 0.43 | Cabralea cangerana | 0.55 | Carapa procera | 0.59 |
| Bombax ceiba | 0.33 | Caesalpinia spp. | 1.05 | Casearia battiscombei | 0.5 |
| Bombycidendron vidalianum | 0.53 | Calophyllum sp. | 0.65 | Cassipourea euryoides | 0.70* |
| Boswellia serrata | 0.5 | Campnosperma panamensis | 0.33,0.50+ | Cassipourea malosana | 0.59* |
| Bridelia squamosa | 0.5 | Carapa sp. | 0.47 | Ceiba pentandra | 0.26 |
| Buchanania latifolia | 0.45 | Caryocar spp. | 0.69, 0.72+ | Celtis spp. | 0.59 |
| Bursera serrata | 0.59 | Casearia sp. | 0.62 | Chlorophora ercelsa | 0.55 |
| Butea monosperma | 0.48 | Cassia moschata | 0.71 | Chrysophyllum albidum | 0.56* |
| Calophyllum spp. | 0.53 | Casuarina equisetifolia | 0.81 | Cleistanthus mildbraedii | 0.87* |
| Calycarpa arborea | 0.53 | Catostemma spp. | 0.55 | Cleistopholis patens | 0.36* |
| Cananga odorata | 0.29 | Cecropia spp. | 0.36 | Coelocaryon preussii | 0.56” |
| Canarium spp. | 0.44 | Cedrela spp. | 0.40, 0.46+ | Cola sp. | 0.70” |
| Canthium monstrosum | 0.42 | Cedrelinga catenaeformis | 0.41, 0.53+ | Combretodendron macrocarpum | 0.7 |
| Carallia calycina | 0.66* | Ceiba pentandra | 0.23,0.24,0.25, 0.29+ | Conopharyngia holstii | 0.50* |

+ The wood densities specified pertain to more than one bibliographic source.
* Wood density value is derived from the regression equation in Reyes *et al.* (1992).
Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Appendix

Table A-2 Basic wood densities of stemwood WD (3) (t-dry matter/$m^3$)

**TABLE 3A.1.9-2 (CONTINUED)**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Cassia javanica | 0.69 | Centrolobium spp. | 0.65 | Copaifera religiosa . | 0.50” |
| Castanopsis philippensis | 0.51 | Cespedesia macrophylla | 0.63 | Cordia millenii | 0.34 |
| Casuarina equisetifolia | 0.83 | Chaetocarpus schomburgkianus | 0.8 | Cordia platythyrsa | 0.36” |
| Casuarina nodiflora | 0.85 | Chlorophora tinctoria | 0.71,0.75+ | Corynanthe pachyceras | 0.63” |
| Cedrela odorata | 0.38 | Clarisia racemosa | 0.53,0.57+ | Coda edulis | 0.78* |
| Cedrela spp. | 0.42 | Clusia rosea | 0.67 | Croton megalocarpus | 0.57 |
| Cedrela toona | 0.43 | Cochlospermum orinocensis | 0.26 | Cryptosepalum staudtii | 0.70* |
| Ceiba pentandra | 0.23 | Copaifera spp. | 0.46, 0.55+ | Ctenolophon englerianus | 0.78* |
| Celtis luzonica | 0.49 | Cordia spp. (gerascanthus group) | 0.74 | Cylicodiscus gabonensis | 0.8 |
| Chisocheton pentandrus | 0.52 | Cordia spp. (alliodora group) | 0.48 | Cynometra alexandri | 0.74 |
| Chloroxylon swietenia | 0.76, 0.79, 0.80+ | Couepia sp. | 0.7 | Dacryodes spp. | 0.61 |
| Chukrassia tabularis | 0.57 | Couma macrocarpa | 0.50,0.53+ | Daniellia ogea | 0.40* |
| Citrus grandis | 0.59 | Couratari spp. | 0.5 | Desbordesia pierreana | 0.87” |
| Cleidion speciflorum | 0.5 | Croton xanthochloros | 0.48 | Detarium senegalensis | 0.63* |
| Cleistanthus eollinus | 0.88 | Cupressus lusitanica | 0.43, 0.44+ | Dialium excelsum | 0.78* |
| Cleistocalyx spp. | 0.76 | Cyrilla racemiflora | 0.53 | Didelotia africana | 0.78” |
| Cochlospermum gossypium+religiosum | 0.27 | Dactyodes colombiana | 0.51 | Didelotia letouzeyi | 0.5 |
| Cocos nucifera | 0.5 | Dacryodes excelsa | 0.52, 0.53+ | Diospyros spp. | 0.82 |
| Colona serratifolia | 0.33 | Dalbergia retusa. | 0.89 | Discoglypremna caloneura | 0.32* |
| Combretodendron quadrialatum | 0.57 | Dalbergia stevensonii | 0.82 | Distemonanthus benthamianus | 0.58 |
| Cordia spp. | 0.53 | Declinanona calycina | 0.47 | Drypetes sp. | 0.63* |
| Cotylelobium spp. | 0.69 | Dialium guianensis | 0.87 | Ehretia acuminata | 0.51* |
| Crataeva religiosa | 0.53* | Dialyanthera spp. | 0.36, 0.48+ | Enantia chlorantha | 0.42” |
| Cratoxylon arborescens | 0.4 | Dicorynia paraensis | 0.6 | Endodesmia calophylloides | 0.66” |
| Cryptocarya spp. | 0.59 | Didymopanax sp. | 0.74 | Entandrophragma utile | 0.53 |
| Cubilia cubili | 0.49 | Dimorphandra mora | 0.99* | Eribroma oblongum | 0.60* |
| Cullenia excelsa | 0.53 | Diplotropis purpurea | 0.76, 0.77, 0.78+ | Eriocoelum microspermum | 0.50” |
| Cynometra spp. | 0.8 | Dipterix odorata | 0.81,0.86,0.89+ | Erismadelphus ensul | 0.56* |
| Dacrycarpus imbricatus | 0.45, 0.47+ | Drypetes variabilis | 0.69 | Erythrina vogelii | 0.25” |
| Dacrydium spp. | 0.46 | Dussia lehmannii | 0.59 | Erythrophleum ivorense | 0.72 |
| Dacryodes spp. | 0.61 | Ecclinusa guianensis | 0.63 | Erythroxylum mannii | 0.5 |
| Dalbergia paniculata | 0.64 | Endlicheria cocvirey | 0.39 | Fagara macrophylla | 0.69 |
| Decussocarpus vitiensis | 0.37 | Enterolobium schomburgkii | 0.82 | Ficus iteophylla | 0.40” |
| Degeneria vitiensis | 0.35 | Eperua spp. | 0.78 | Fumtumia latifolia | 0.45* |
| Dehaasia triandra | 0.64 | Eriotheca sp. | 0.4 | Gambeya spp. | 0.56* |
| Dialium spp. | 0.8 | Erisma uncinatum | 0.42, 0.48+ | Garcinia punctata | 0.78” |
| Dillenia spp. | 0.59 | Erythrina sp. | 0.23 | Gilletiodendron mildbraedii | 0.87” |
| Diospyros spp. | 0.7 | Eschweilera spp. | 0.71,0.79,0.95+ | Gossweilerodendron balsamiferum | 0.4 |
| Diplodiscus paniculatus | 0.63 | Eucalyptus robusta | 0.51 | Guarea thompsonii | 0.55” |
| Dipterocarpus caudatus | 0.61 | Eugenia stahlii | 0.73 | Guibourtia spp. | 0.72 |
| Dipterocarpus eurynchus | 0.56 | Euxylophora paraensis | 0.68,0.70+ | Hannoa klaineana | 0.28” |
| Dipterocarpus gracilis | 0.61 | Fagara spp. | 0.69 | Harungana madagascariensis | 0.45” |
| Dipterocarpus grandiflorus | 0.62 | Ficus sp. | 0.32 | Hexalobus crispiflorus | 0.48” |
| Dipterocarpus kerrii | 0.56 | Genipa spp. | 0.75 | Holoptelea grandis | 0.59” |

+ The wood densities specified pertain to more than one bibliographic source.
* Wood density value is derived from the regression equation in Reyes *et al.* (1992).
Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Appendix

Table A-2 Basic wood densities of stemwood WD (4) (t-dry matter/$m^3$)

**TABLE 3A.1.9-2 (CONTINUED)**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Dipterocarpus kunstlerii | 0.57 | Goupia glabra | 0.67, 0.72+ | Homalium spp. | 0.7 |
| Dipterocarpus spp. | 0.61 | Guarea chalde | 0.52 | Hylodendron gabonense. | 0.78” |
| Dipterocarpus warburgii | 0.52 | Guarea spp. | 0.52 | Hymenostegia pellegrini | 0.78” |
| Dracontomelon spp. | 0.5 | Guatteria spp. | 0.36 | Irvingia grandifolia | 0.78” |
| Dryobalanops spp. | 0.61 | Guazuma ulmifolia | 0.52, 0.50+ | Julbernardia globiflora | 0.78 |
| Dtypetes bordenii | 0.75 | Guettarda scabra | 0.65 | Khaya ivorensis | 0.44 |
| Durio spp. | 0.53 | Guillielma gasipae | 0.95, 1.25+ | Klainedoxa gabonensis | 0.87 |
| Dyera costulata | 0.36 | Gwtavia sp. | 0.56 | Lannea welwitschii | 0.45”’ |
| Dysoxylum quercifolium | 0.49 | Helicostylis tomentosa | 0.68, 0.72+ | Lecomtedoxa klainenna | 0.78” |
| Elaeocarpus serratus | 0.40* | Hernandia Sonora | 0.29 | Letestua durissima | 0.87” |
| Emblica officinalis | 0.8 | Hevea brasiliense | 0.49 | Lophira alata | 0.87” |
| Endiandra laxiflora | 0.54 | Himatanthus articulata | 0.40,0.54+ | Lovoa trichilioides | 0.45” |
| Endospermum spp. | 0.38 | Hirtella davisii | 0.74 | Macaranga kilimandscharica | 0.40* |
| Enterolobium cyclocarpum | 0.35 | Humiria balsamifera | 0.66,0.67+ | Maesopsis eminii | 0.41 |
| Epicharis cumingiana | 0.73 | Humiriastrum procera | 0.7 | Malacantha sp. aff. alnifolia | 0.45” |
| Erythrina subumbrans | 0.24 | Hura crepitans | 0.36, 0.37, 0.38+ | Mammea africana | 0.62 |
| Erythrophloeum densiflorum | 0.65 | Hyeronima alchorneoides | 0.60,0.64+ | Manilkara lacera | 0.78” |
| Eucalyptus citriodora | 0.64 | Hyeronima laxiflora | 0.59 | Markhamia platycalyx | 0.45* |
| Eucalyptus deglupta | 0.34 | Hymenaea davisii | 0.67 | Memecylon capitellatum | 0.77” |
| Eugenia spp. | 0.65 | Hymenolobium sp. | 0.64 | Microberlinia brazzavillensis | 0.7 |
| Fagraea spp. | 0.73 | Inga sp. | 0.49,0.52,0.58, 0.64+ | Microcos coriaceus | 0.42” |
| Ficus benjamina | 0.65 | Iryanthera spp. | 0.46 | Milletia spp. | 0.72 |
| Ficus spp. | 0.39 | Jacaranda sp. | 0.55 | Mitragyna stipulosa | 0.47 |
| Ganua obovatifolia | 0.59 | Joannesia heveoides | 0.39 | Monopetalanthus pellegrinii | 0.47” |
| Garcinia myrtifolia | 0.65 | Lachmellea speciosa | 0.73 | Musanga cecropioides | 0.23 |
| Garcinia spp. | 0.75 | Laetia procera | 0.68 | Nauclea diderrichii | 0.63 |
| Gardenia turgida | 0.64 | Lecythis spp. | 0.77 | Neopoutonia macrocalyx | 0.32” |
| Garuga pinnata | 0.51 | Licania spp. | 0.78 | Nesogordonia papaverifera | 0.65 |
| Gluta spp. | 0.63 | Licaria spp. | 0.82 | Ochtocosmus africanus | 0.78’ |
| Gmelina arborea | 0.41,0.45+ | Lindackeria sp. | 0.41 | Odyendea spp. | 0.32 |
| Gmelina vitiensis | 0.54 | Linociera domingensis | 0.81 | Oldfieldia africana | 0.78* |
| Gonocaryum calleryanum | 0.64 | Lonchocarpus spp. | 0.69 | Ongokea gore | 0.72 |
| Gonystylus punctatus | 0.57 | Loxopterygium sagotii | 0.56 | Oxystigma oxyphyllum | 0.53 |
| Grewia tiliaefolia | 0.68 | Lucuma spp. | 0.79 | Pachyelasma tessmannii | 0.70” |
| Hardwickia binata | 0.73 | Luehea spp. | 0.5 | Pachypodanthium staudtii | 0.58” |
| Harpullia arborea | 0.62 | Lueheopsis duckeana | 0.64 | Paraberlinia bifoliolata | 0.56” |
| Heritiera spp. | 0.56 | Mabea piriri | 0.59 | Parinari glabra | 0.87” |
| Hevea brasiliensis | 0.53 | Machaerium spp. | 0.7 | Parkia bicolor | 0.36” |
| Hibiscus tiliaceus | 0.57 | Macoubea guianensis | 0.40* | Pausinystalia brachythyrsa | 0.56” |
| Homalanthus populneus | 0.38 | Magnolia spp. | 0.52 | Pausinystalia cf. talbotii | 0.56” |
| Homalium spp. | 0.76 | Maguira sclerophylla | 0.57 | Pentaclethra macrophylla | 0.78” |
| Hopea acuminata | 0.62 | Mammea americana | 0.62 | Pentadesma butyracea | 0.78” |
| Hopea spp. | 0.64 | Mangifera indica | 0.55 | Phyllanthus discoideus | 0.76” |
| Intsia palembanica | 0.68 | Manilkara sp. | 0.89 | Pierreodendron africanum | 0.70;” |
| Kayea garciae | 0.53 | Marila sp. | 0.63 | Piptadeniastrum africanum | 0.56 |

\+ The wood densities specified pertain to more than one bibliographic source.

* Wood density value is derived from the regression equation in Reyes *et al.* (1992).

Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Table A-2 Basic wood densities of stemwood WD (5)（t-dry matter/$m^3$）

**TABLE 3A.1.9-2 (CONTINUED)**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Kingiodendron alternifolium | 0.48 | Marmaroxylon racemosum | 0.78* | Plagiostyles africana | 0.70” |
| Kleinhovia hospita | 0.36 | Matayba domingensis | 0.7 | Poga oleosa | 0.36 |
| Knema spp. | 0.53 | Matisia hirta | 0.61 | Polyalthia suaveolens | 0.66” |
| Koompassia excelsa | 0.63 | Maytenus spp. | 0.71 | Premna angolensis | 0.63” |
| Koordersiodendron pinnatum | 0.65, 0.69+ | Mezilaurus lindaviana | 0.68 | Pteleopsis hylodendron | 0.63* |
| Kydia calycina | 0.72 | Michropholis spp. | 0.61 | Pterocarpus soyauxii | 0.61 |
| Lagerstroemia spp. | 0.55 | Minquartia guianensis | 0.76,0.79+ | Pterygota spp. | 0.52 |
| Lannea grandis | 0.5 | Mora sp. | 0.71 | Pycnanthus angolensis | 0.4 |
| Leucaena leucocephala | 0.64 | Mouriria sideroxylon | 0.88 | Randia cladantha | 0.78* |
| Litchi chinensis ssp. philippinensis | 0.88 | Myrciaria floribunda | 0.73 | Rauwolfia macrophylla | 0.47* |
| Lithocarpus soleriana | 0.63 | Myristica spp. | 0.46 | Ricinodendron heudelotii | 0.2 |
| Litsea spp. | 0.4 | Myroxylon balsamum | 0.74, 0.76, 0.78+ | Saccoglottis gabonensis | 0.74” |
| Lophopetalum spp. | 0.46 | Nectandra spp. | 0.52 | Santiria trimera | 0.53* |
| Macaranga denticulata | 0.53 | O c o t e a spp. | 0.51 | Sapium ellipticum | 0.50* |
| Madhuca oblongifolia | 0.53 | Onychopetalum amazonicum | 0.64 | Schrebera arborea | 0.63* |
| Mallotus philippensis | 0.64 | Ormosia spp. | 0.59 | Sclorodophloeus zenkeri | 0.68* |
| Mangifera spp. | 0.52 | Ouratea sp. | 0.66 | Scottellia coriacea | 0.56 |
| Maniltoa minor | 0.76 | Pachira acuatica | 0.43 | Scyphocephalium ochocoa | 0.48 |
| Mastixia philippinensis | 0.47 | Paratecoma peroba | 0.6 | Scytopetalum tieghemii | 0.56” |
| Melanorrhea spp. | 0.63 | Parinari spp. | 0.68 | Sindoropsis letestui | 0.56* |
| Melia dubia | 0.4 | Parkia spp. | 0.39 | Staudtia stipitata | 0.75 |
| Melicope triphylla | 0.37 | Peltogyne spp. | 0.79 | Stemonocoleus micranthus | 0.56” |
| Meliosma macrophylla | 0.27 | Pentaclethra macroloba | 0.65,0.68+ | Sterculia rhinopetala | 0.64 |
| Melochia umbellata | 0.25 | Peru glabrata | 0.65 | Strephonema pseudocola | 0.56* |
| Me&a ferrea | 0.83,0.85+ | Peru schomburgkiana | 0.59 | Strombosiopsis tetrandra | 0.63” |
| Metrosideros collina | 0.70,0.76+ | Persea spp. | 0.40, 0.47,0.52+ | Swartzia fistuloides | 0.82 |
| Michelia spp. | 0.43 | Petitia domingensis | 0.66 | Symphonia globulifera | 0.58” |
| Microcos stylocarpa | 0.4 | Pinus caribaea | 0.51 | Syzygium cordatum | 0.59* |
| Micromelum compressum | 0.64 | Pinus oocarpa | 0.55 | Terminalia superba | 0.45 |
| Milliusa velutina | 0.63 | Pinus patula | 0.45 | Tessmania africana | 0.85” |
| Mimusops elengi | 0.72* | Piptadenia sp. | 0.58 | Testulea gabonensis | 0.6 |
| Mitragyna parviflora | 0.56 | Piranhea longepedunculata | 0.9 | Tetraberlinia tubmaniana | 0.60” |
| Myristica spp. | 0.53 | Piratinera guianensis | 0.96 | Tetrapleura tetraptera | 0.50” |
| Neesia spp. | 0.53 | Pithecellobium guachapele (syn. Pseudosamea) | 0.56 | Tieghemella heckelii | 0.55” |
| Neonauclea bernardoi | 0.62 | Platonia insignis | 0.70’ | Trema sp. | 0.40* |
| Neotrewia cumingii | 0.55 | Platymiscium spp. | 0.71, 0.84+ | Trichilia prieureana | 0.63” |
| Ochna foxworthyi | 0.86 | Podocarpus spp. | 0.46 | Trichoscypha arborea | 0.59” |
| Ochroma pyramidale | 0.3 | Pourouma aff. melinonii | 0.32 | Triplochiton scleroxylon. | 0.32 |
| Octomeles sumatrana | 0.27, 0.32+ | Pouteria spp. | 0.64, 0.67+ | Uapaca spp. | 0.6 |
| Oroxylon indicum | 0.32 | Prioria copaifera | 0.40,0.41+ | Vepris undulata | 0.70” |
| Ougenia dalbergiodes | 0.7 | Protium spp. | 0.53,0.64+ | Vitex doniana | 0.4 |
| Palaquium spp. | 0.55 | Pseudolmedia laevigata | 0.64 | Xylopia staudtii | 0.36* |
| Pangium edule | 0.5 | Pterocarpus spp. | 0.44 | | |
| Parashorea malaanonan | 0.51 | Pterogyne nitens | 0.66 | | |
| Parashorea stellata | 0.59 | Qualea albiflora | 0.5 | | |
| Paratrophis glabra | 0.77 | Qualea cf. lancifolia | 0.58 | | |
| Parinari spp. | 0.68 | Qualea dinizii | 0.58 | | |

\+ The wood densities specified pertain to more than one bibliographic source.
* Wood density value is derived from the regression equation in Reyes *et al.* (1992).
Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Appendix

Table A-2 Basic wood densities of stemwood WD (6)（t-dry matter/$m^3$）

**TABLE 3A.1.9-2 (CONTINUED)**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Parkia roxburghii | 0.34 | Qualea spp. | 0.55 | | |
| Payena spp. | 0.55 | Quararibaea guianensis | 0.54 | | |
| Peltophorum pterocarpum | 0.62 | Quercus alata | 0.71 | | |
| Pentace spp. | 0.56 | Quercus costaricensis | 0.61 | | |
| Phaeanthus ebracteolatus | 0.56 | Quercus eugeniaefolia | 0.67 | | |
| Phyllocladus hypophyllus | 0.53 | Quercus spp. | 0.7 | | |
| Pinus caribaea | 0.48 | Raputia sp. | 0.55 | | |
| Pinus insularis | 0.47,0.48+ | Rheedia spp. | 0.72 | | |
| Pinus merkusii | 0.54 | Rollinia spp. | 0.36 | | |
| Pisonia umbellifera | 0.21 | Saccoglottis cydonioides | 0.72 | | |
| Pittosporum pentandrum | 0.51 | Sapium ssp. | 0.47,0.72+ | | |
| Planchonia spp. | 0.59 | Schinopsis spp. | 1 | | |
| Podocarpus spp. | 0.43 | Sclerobium spp. | 0.47 | | |
| Polyalthia flava | 0.51 | Sickingia spp. | 0.52 | | |
| Polyscias nodosa | 0.38 | Simaba multiflora | 0.51 | | |
| Pometia spp. | 0.54 | Simarouba amara | 0.32, 0.34,0.38+ | | |
| Pouteria villamilii | 0.47 | Sloanea guianensis | 0.79 | | |
| Premna tomentosa | 0.96 | Spondias mombin | 0.30, 0.40,0.41+ | | |
| Pterocarpus marsupium | 0.67 | Sterculia spp. | 0.55 | | |
| Pterocymbium tinctorium | 0.28 | Stylogyne spp. | 0.69 | | |
| Pyge'um vulgare | 0.57 | Swartzia spp. | 0.95 | | |
| Quercus spp. | 0.7 | Swietenia macrophylla | 0.42,0.45,0.46, 0.54+ | | |
| Radermachera pinnata | 0.51 | Symphonia globulifera | 0.68 | | |
| Salmalia malabarica | 0.32,0.33+ | Tabebuia spp. (lapacho group) | 0.91 | | |
| Samanea saman | 0.45, 0.46+ | Tabebuia spp. (roble) | 0.52 | | |
| Sandoricum vidalii | 0.43 | Tabebuia spp. (white cedar) | 0.57 | | |
| Sapindus saponaria | 0.58 | Tabebuia stenocalyx | 0.55,0.57+ | | |
| Sapium luzontcum | 0.4 | Tachigalia myrmecophylla | 0.56 | | |
| Schleichera oleosa | 0.96 | Talisia sp. | 0.84 | | |
| Schrebera swietenoides | 0.82 | Tapirira guianensis | 0.47* | | |
| Semicarpus anacardium | 0.64 | Terminalia sp. | 0.50, 0.51, 0.58+ | | |
| Serialbizia acle | 0.57 | Tetragastris altisima | 0.61 | | |
| Serianthes melanesica | 0.48 | Toluifera balsamum | 0.74 | | |
| Sesbania grandiflora | 0.4 | Torrubia sp. | 0.52 | | |
| Shorea assamica forma philippinensis | 0.41 | Toulicia pulvinata | 0.63 | | |
| Shorea astylosa | 0.73 | Tovomita guianensis | 0.6 | | |
| Shorea ciliata | 0.75 | Trattinickia sp. | 0.38 | | |
| Shorea contorta | 0.44 | Trichilia propingua | 0.58 | | |
| Shorea gisok | 0.76 | Trichosperma mexicanum | 0.41 | | |
| Shorea guiso | 0.68 | Triplaris spp. | 0.56 | | |
| Shorea hopeifolia | 0.44 | Trophis sp. | 0.54 | | |
| Shorea malibato | 0.78 | Vatairea spp. | 0.6 | | |
| Shorea negrosensis | 0.44 | Virola spp. | 0.40, 0.44, 0.48+ | | |
| Shorea palosapis | 0.39 | Vismia spp. | 0.41 | | |
| Shorea plagata | 0.7 | Vitex spp. | 0.52,0.56, 0.57+ | | |

+ The wood densities specified pertain to more than one bibliographic source.
* Wood density value is derived from the regression equation in Reyes *et al.* (1992).
Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Appendix

Table A-2 Basic wood densities of stemwood WD (7)（t-dry matter/$m^3$）

**TABLE 3A.1.9-2 (CONTINUED)**
**BASIC WOOD DENSITIES (D) OF STEMWOOD (tonnes dry matter/$m^3$ fresh volume) FOR TROPICAL TREE SPECIES**
(To be used for D in Equations 3.2.3., 3.2.5, 3.2.7, 3.2.8)

| TROPICAL ASIA | D | TROPICAL AMERICA | D | TROPICAL AFRICA | D |
|---|---|---|---|---|---|
| Shorea polita | 0.47 | Vitex stahelii | 0.6 | | |
| Shorea polysperma | 0.47 | Vochysia spp. | 0.40,0.47, 0.79+ | | |
| Shorea robusta | 0.72 | Vouacapoua americana | 0.79 | | |
| Shorea spp. balau group | 0.7 | Warszewicsia coccinea | 0.56 | | |
| Shorea spp. dark red meranti | 0.55 | Xanthoxylum martinicensis | 0.46 | | |
| Shorea spp. light red meranti | 0.4 | Xanthoxylum spp. | 0.44 | | |
| Shorea spp. white meranti | 0.48 | Xylopia frutescens | 0 64” | | |
| Shorea spp. yellow meranti | 0.46 | | | | |
| Shorea virescens | 0.42 | | | | |
| Sloanea javanica | 0.53 | | | | |
| Soymida febrifuga | 0.97 | | | | |
| Spathodea campanulata | 0.25 | | | | |
| Stemonurus luzoniensis | 0.37 | | | | |
| Sterculia vitiensis | 0.31 | | | | |
| Stereospermum suaveolens | 0.62 | | | | |
| Strombosia philippinensis | 0.71 | | | | |
| Strychnos potatorum | 0.88 | | | | |
| Swietenia macrophylla | 0.49,0.53+ | | | | |
| Swintonia foxworthyi | 0.62 | | | | |
| Swintonia spp. | 0.61 | | | | |
| Sycopsis dunni | 0.63 | | | | |
| Syzygium spp. | 0.69, 0.76+ | | | | |
| Tamarindus indica | 0.75 | | | | |
| Tectona grandis | 0.50,0.55+ | | | | |
| Teijsmanniodendron ahernianum | 0.9 | | | | |
| Terminalia citrina | 0.71 | | | | |
| Terminalia copelandii | 0.46 | | | | |
| Terminalia foetidissima | 0.55 | | | | |
| Terminalia microcarpa | 0.53 | | | | |
| Terminalia nitens | 0.58 | | | | |
| Terminalia pterocarpa | 0.48 | | | | |
| Terminalia tomentosa | 0.73,0.76, 0.77+ | | | | |
| Ternstroemia megacarpa | 0.53 | | | | |
| Tetrameles nudiflora | 0.3 | | | | |
| Tetramerista glabra | 0.61 | | | | |
| Thespesia populnea | 0.52 | | | | |
| Toona calantas | 0.29 | | | | |
| Trema orientalis | 0.31 | | | | |

+ The wood densities specified pertain to more than one bibliographic source.
* Wood density value is derived from the regression equation in Reyes *et al.* (1992).
Source: Reyes, Gisel; Brown, Sandra; Chapman, Jonathan; Lugo, Ariel E. 1992. Wood densities of tropical tree species. Gen. Tech. Rep. SO-88 New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 15pp.

Table A-3 Carbon fraction of aboveground forest biomass（CF）

| TABLE 4.3<br>CARBON FRACTION OF ABOVEGROUND FOREST BIOMASS | | | |
|---|---|---|---|
| **Domain** | **Part of tree** | **Carbon fraction, (CF) [tonne C (tonne d.m.)$^{-1}$]** | **References** |
| **Default value** | All | 0.47 | McGroddy *et al.*, 2004 |
| **Tropical and Subtropical** | All | 0.47 (0.44 - 0.49) | Andreae and Merlet, 2001; Chambers *et al.*, 2001; McGroddy *et al.*, 2004; Lasco and Pulhin, 2003 |
| | wood | 0.49 | Feldpausch *et al.*, 2004 |
| | wood, tree d < 10 cm | 0.46 | Hughes *et al.*, 2000 |
| | wood, tree d ≥ 10 cm | 0.49 | Hughes *et al.*, 2000 |
| | foliage | 0.47 | Feldpausch *et al.*, 2004 |
| | foliage, tree d < 10 cm | 0.43 | Hughes *et al.*, 2000 |
| | foliage, tree d ≥ 10 cm | 0.46 | Hughes *et al.*, 2000 |
| **Temperate and Boreal** | All | 0.47 (0.47 - 0.49) | Andreae and Merlet, 2001; Gayoso *et al.*, 2002; Matthews, 1993; McGroddy *et al.*, 2004 |
| | broad-leaved | 0.48 (0.46 - 0.50) | Lamlom and Savidge, 2003 |
| | conifers | 0.51 (0.47 - 0.55) | Lamlom and Savidge, 2003 |

Source：IPCC Guidelines for National Greenhouse Gas Inventories (GNGGI), Volume4. Agriculture, Forestry, and Other Land Use, Table 4.3, 2006[3]

[3] IPCCC:http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_04_Ch4_Forest_Land.pdf

Table A-4 Abouveground Biomas Stock in Naturally Regenerated Forests (t/ha) (TT)

**TABLE 3A.1.2**
**ABOVEGROUND BIOMASS STOCK IN NATURALLY REGENERATED FORESTS BY BROAD CATEGORY (tonnes dry matter/ha)**

(To be used for Bw in Equation 3.2.9, for $L_{conversion}$ in Equation 3.3.8 in Cropland section and for $L_{conversion}$ in Equation 3.4.13. in Grassland section, etc. Not to be applied for $C_{t_2}$ or $C_{t_1}$ in Forest section Equation 3.2.3)

| Tropical Forests [1] | | | | | | |
|---|---|---|---|---|---|---|
| | **Wet** | **Moist with Short Dry Season** | **Moist with Long Dry Season** | **Dry** | **Montane Moist** | **Montane Dry** |
| **Africa** | 310 (131 - 513) | 260 (159 – 433) | 123 (120 - 130) | 72 (16 - 195) | 191 | 40 |
| **Asia & Oceania:** | | | | | | |
| Continental | 275 (123 - 683) | 182 (10 – 562) | 127 (100 - 155) | 60 | 222 (81 - 310) | 50 |
| Insular | 348 (280 - 520) | 290 | 160 | 70 | 362 (330 - 505) | 50 |
| **America** | 347 (118 - 860) | 217 (212 - 278) | 212 (202- 406) | 78 (45 - 90) | 234 (48 - 348) | 60 |

| Temperate Forests | | | |
|---|---|---|---|
| **Age Class** | **Coniferous** | **Broadleaf** | **Mixed Broadleaf-Coniferous** |
| **Eurasia & Oceania** | | | |
| ≤20 years | 100 (17 - 183) | 17 | 40 |
| >20 years | 134 (20 - 600) | 122 (18 -320) | 128 (20-330) |
| **America** | | | |
| ≤20 years | 52 (17-106) | 58 (7-126) | 49 (19-89) |
| >20 years | 126 (41-275) | 132 (53-205) | 140 (68-218) |

| Boreal Forests | | | |
|---|---|---|---|
| **Age Class** | **Mixed Broadleaf-Coniferous** | **Coniferous** | **Forest-Tundra** |
| **Eurasia** | | | |
| ≤20 years | 12 | 10 | 4 |
| >20 years | 50 | 60 (12.3-131) | 20 (21- 81) |
| **America** | | | |
| ≤20 years | 15 | 7 | 3 |
| >20 years | 40 | 46 | 15 |

Note: Data are given in mean value and as range of possible values (in parentheses).
[1] The definition of forest types and examples by region are illustrated in Box 2 and Tables 5-1, p 5.7-5.8 of the *IPCC Guidelines* (1996).

Source: IPCC Good Practice Guidance for LULUCF Annex 3A.1, Table 3A.1.2[4]

[4] IPCC: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Table A-5 Aboveground Biomass Stock in Plantation Forests (t/ha) (T)

**TABLE 3A.1.3**
**ABOVEGROUND BIOMASS STOCK IN PLANTATION FORESTS BY BROAD CATEGORY (tonnes dry matter/ha)**

(To be used for $B_w$ in Equation 3.2.9, for $L_{conversion}$ in equation in Equation 3.3.8 in Cropland section and for $L_{conversion}$ in Equation 3.4.13. in Grassland section, etc. Not to be applied for $C_{t_2}$ or $C_{t_1}$ in Forest section Equation 3.2.3)

**Tropical and sub-tropical Forests**

| | Age Class | Wet | Moist with Short Dry Season | Moist with Long Dry Season | Dry | Montane Moist | Montane Dry |
|---|---|---|---|---|---|---|---|
| | | R > 2000 | 2000>R>1000 | | R<1000 | R>1000 | R<1000 |
| **Africa** | | | | | | | |
| Broadleaf spp | ≤20 years | 100 | 80 | 30 | 20 | 100 | 40 |
| | >20 years | 300 | 150 | 70 | 20 | 150 | 60 |
| Pinus sp | ≤20 years | 60 | 40 | 20 | 15 | 40 | 10 |
| | >20 years | 200 | 120 | 60 | 20 | 100 | 30 |
| **Asia:** | | | | | | | |
| Broadleaf | All | 220 | 180 | 90 | 40 | 150 | 40 |
| other species | All | 130 | 100 | 60 | 30 | 80 | 25 |
| **America** | | | | | | | |
| Pinus | All | 300 | 270 | 110 | 60 | 170 | 60 |
| Eucalyptus | All | 200 | 140 | 110 | 60 | 120 | 30 |
| Tectona | All | 170 | 120 | 90 | 50 | 130 | 30 |
| other broadleaved | All | 150 | 100 | 60 | 30 | 80 | 30 |

**Temperate Forests**

| | Age class | Pine | Other coniferous | Broadleaf |
|---|---|---|---|---|
| **Eurasia** | | | | |
| Maritime | ≤20 years | 40 | 40 | 30 |
| | >20 years | 150 | 250 | 200 |
| Continental | ≤20 years | 25 | 30 | 15 |
| | >20 years | 150 | 200 | 200 |
| Mediterranean & steppe | ≤20 years | 17 | 20 | 10 |
| | >20 years | 100 | 120 | 80 |
| **S. America** | All | 100 | 120 | 90 |
| **N America** | All | 175 (50–275) | 300 | – |

**Boreal Forests**

| | Age class | Pine | Other coniferous | Broadleaf |
|---|---|---|---|---|
| **Eurasia** | ≤20 years | 5 | 5 | 5 |
| | >20 years | 40 | 40 | 25 |
| **N. America** | All | 50 | 40 | 25 |

Source: IPCC Good Practice Guidance for LULUCF Annex 3A.1, Table 3A.1.3

Appendix

Table A-6 Average Annual Increment in Aboveground Biomass in Natural Regeneration (t/ha/year) (TT)

**TABLE 3A.1.5**
**AVERAGE ANNUAL INCREMENT IN ABOVEGROUND BIOMASS IN NATURAL REGENERATION BY BROAD CATEGORY**
**(tonnes dry matter/ha/year)**

(To be used for $G_W$ in Equation 3.2.5)

**Tropical and Sub-Tropical Forests**

| Age Class | Wet | Moist with Short Dry Season | Moist with Long Dry Season | Dry | Montane Moist | Montane Dry |
|---|---|---|---|---|---|---|
| | R > 2000 | 2000>R>1000 | | R<1000 | R>1000 | R<1000 |
| **Africa** | | | | | | |
| ≤20 years | 10.0 | 5.3 | 2.4 (2.3 – 2.5) | 1.2 (0.8 – 1.5) | 5.0 | 2.0 (1.0 – 3.0) |
| >20 years | 3.1 (2.3 -3.8) | 1.3 | 1.8 (0.6 – 3.0) | 0.9 (0.2 – 1.6) | 1.0 | 1. 5 (0.5 – 4.5) |
| **Asia & Oceania** | | | | | | |
| Continental | | | | | | |
| ≤20 years | 7.0 (3.0 – 11.0) | 9.0 | 6.0 | 5.0 | 5.0 | 1.0 |
| >20 years | 2.2 (1.3 – 3.0) | 2.0 | 1.5 | 1.3 (1.0 – 2.2) | 1.0 | 0.5 |
| Insular | | | | | | |
| ≤20 years | 13.0 | 11.0 | 7.0 | 2.0 | 12.0 | 3.0 |
| >20 years | 3.4 | 3.0 | 2.0 | 1.0 | 3.0 | 1.0 |
| **America** | | | | | | |
| ≤20 years | 10.0 | 7.0 | 4.0 | 4.0 | 5.0 | 1.8 |
| >20 years | 1.9 (1.2 – 2.6) | 2.0 | 1.0 | 1.0 | 1.4 (1.0 – 2.0) | 0.4 |

**Temperate Forests**

| Age Class | Coniferous | Broadleaf |
|---|---|---|
| ≤20 years | 3.0 (0.5 – 6.0) | 4.0 (0.5 – 8.0) |
| >20 years | 3.0 (0.5 – 6.0) | 4.0 (0.5 – 7.5) |

**Boreal forests**

| Age Class | Mixed Broadleaf-Coniferous | Coniferous | Forest-Tundra | Broadleaf |
|---|---|---|---|---|
| **Eurasia** | | | | |
| ≤20 years | 1.0 | 1.5 | 0.4 (0.2 – 0.5) | 1.5 (1.0 – 2.0) |
| >20 years | 1.5 | 2.5 | 0.4 (0.2 – 0.5) | 1.5 |
| **America** | | | | |
| ≤20 years | 1.1 (0.7 – 1.5) | 0.8 (0.5 – 1.0) | 0.4 (0.2 – 0.5) | 1.5 (1.0 – 2.0) |
| >20 years | 1.1 (0.7 — 1.5) | 1.5 (0.5 – 2.5) | 0.4 (0.2 – 0.5) | 1.3 (1.0 – 1.5) |

Note: R= annual rainfall in mm/yr
Note: Data are given as mean value and as the range of possible values.

Source: IPCC Good Practice Guidance for LULUCF Annex 3A.1, Table 3A.1.5

Table A-7 Annual Average Aboveground Biomass Increment In Plantations (t/ha/year) (T)

**Table 3A.1.6**
**ANNUAL AVERAGE ABOVEGROUND BIOMASS INCREMENT IN PLANTATIONS BY BROAD CATEGORY**
**(tonnes dry matter/ha/year )**

(To be used for $G_W$ in Equation 3.2.5.
In case of missing values it is preferred to use stemwood volume increment data $I_V$ from Table 3A.1.7)

| Tropical and sub-tropical Forests | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Age Class | Wet | Moist with Short Dry Season | Moist with Long Dry Season | Dry | Montane Moist | Montane Dry |
| | | R >2000 | 2000>R>1000 | | R<1000 | R>1000 | R<1000 |
| **Africa** | | | | | | | |
| Eucalyptus spp | ≤20 years | - | 20.0 | 12.6 | 5.1 (3.0-7.0) | - | - |
| | >20 years | - | 25.0 | - | 8.0 (4.9-13.6) | - | - |
| Pinus sp | ≤20 years | 18.0 | 12.0 | 8.0 | 3.3 (0.5-6.0) | - | - |
| | >20 years | | 15.0 | 11.0 | 2.5 | - | - |
| others | ≤20 years | 6.5 (5.0-8.0) | 9.0 (3.0-15.0) | 10.0 (4.0-16.0) | 15.0 | 11.0 | - |
| | >20 years | - | - | - | 11.0 | - | - |
| **Asia** | | | | | | | |
| Eucalyptus spp | All | 5.0 (3.6-8.0) | 8.0 | 15.0 (5.0-25.0) | - | 3.1 | - |
| other species | - | 5.2 (2.4-8.0) | 7.8 (2.0-13.5) | 7.1 (1.6-12.6) | 6.45 (1.2-11.7) | 5.0 (1.3-10.0) | - |
| **America** | - | - | - | - | - | - | - |
| Pinus | - | 18.0 | 14.5 (5.0 – 19.0) | 7.0 (4.0 - 10.3) | 5.0 | 14.0 | - |
| Eucalyptus | - | 21.0 (6.4 - 38.4) | 16.0 (6.4 - 32.0) | 16.0 (6.4 - 32.0) | 16.0 | 13.0 (8.5 - 17.5) | - |
| Tectona | - | 15.0 | 8.0 (3.8 - 11.5) | 8.0 (3.8 - 11.5) | - | 2.2 | - |
| other broadleaved | - | 17.0 (5.0 - 35.0) | 18.0 (8.0 – 40.0) | 10.5 (3.2 - 11.8) | - | 4.0 | - |

Note 1 : R= annual rainfall in mm/yr

Note 2 : Data are given as mean value and as the range of possible values.

Note 3 : Some Boreal data were calculated from original values in Zakharov *et al.* (1962), Zagreev *et al.* (1993), Isaev *et al.* (1993) using 0.23 as belowground/aboveground biomass ratio and assuming a linear increase in annual increment from 0 to 20 years.

Note 4 : For plantations in temperate and boreal zones, it is good practice to use stemwood volume increment data ($I_v$ in Equation 3.2.5) instead of above ground biomass increment as given in above table.

Source：IPCC Good Practice Guidance for LULUCF Annex 3A.1, Table 3A.1.6[5]

[5] IPCCC: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Table A-8 Average Annual Aboveground Net Increment in Volume in Plantation ($m^3$/ha/year)

**TABLE 3A.1.7**
**AVERAGE ANNUAL ABOVE GROUND NET INCREMENT IN VOLUME IN PLANTATIONS BY SPECIES ($m^3$/ha/yr)**
(To be used for $I_v$ in Equation 3.2.5)

| Species | $I_V$ ($m^3$ $ha^{-1}$ $yr^{-1}$) | |
|---|---|---|
| | Range | Mean* |
| E. deglupta | 14 - 50 | 32 |
| E. globulus | 10 - 40 | 25 |
| E. grandis | 15 - 50 | 32.5 |
| E. saligna | 10 - 55 | 32.5 |
| E. camaldulensis | 15 - 30 | 22.5 |
| E. urophylla | 20 - 60 | 40 |
| E. robusta | 10 - 40 | 25 |
| Pinus caribaea var. caribaea | 10 - 28 | 19 |
| Pinus caribaea var. hondurensis | 20 - 50 | 35 |
| Pinus patula | 8 - 40 | 24 |
| Pinus radiata | 12 - 35 | 23.5 |
| Pinus oocarpa | 10 - 40 | 25 |
| Araucaria angustifolia | 8 - 24 | 16 |
| A. cunninghamii | 10 - 18 | 14 |
| Gmelina arborea | 12 - 50 | 31 |
| Swietenia macrophylla | 7 - 30 | 18.5 |
| Tectona grandis | 6 - 18 | 12 |
| Casuarina equisetifolia | 6 - 20 | 13 |
| C. junghuhniana | 7 - 11 | 9 |
| Cupressus lusitanica | 8 - 40 | 24 |
| Cordia alliadora | 10 - 20 | 15 |
| Leucaena leucocephala | 30 - 55 | 42.5 |
| Acacia auriculiformis | 6 - 20 | 13 |
| Acacia mearnsii | 14 - 25 | 19.5 |
| Terminalia superba | 10 - 14 | 12 |
| Terminalia ivorensis | 8 - 17 | 12.5 |
| Dalbergia sissoo | 5 - 8 | 6.5 |

* For those parties that have reason to believe that their plantations are located on more than average fertile sites it is suggested to use the mean value + 50%, for those Parties that have reason to believe their plantations are located on poor sites, it is suggested to use the mean value -50%

Source: Ugalde,L. and Prez,O. Mean annual volume increment of selected industrial forest planatation species. Forest Plantation Thematic Papers, Working paper 1. FAO (2001)
Available at http://www.fao.org/DOCREP/004/AC121E/AC121E00.HTM

Table A-9 Average belowground to aboveground biomass ratio (Root-Shoot ratio)（R）

| | Vegetation type | Aboveground biomass (t/ha) | Mean | SD | lower range | upper range | References |
|---|---|---|---|---|---|---|---|
| Tropical/sub-tropical forest | Secondary tropical/sub-tropical forest | <125 | 0.42 | 0.22 | 0.14 | 0.83 | 5, 7, 13, 25, 28, 31, 48, 71 |
| | Primary tropical/sub-tropical moist forest | NS | 0.24 | 0.03 | 0.22 | 0.33 | 33, 57, 63, 67, 69 |
| | Tropical/sub-tropical dry forest | NS | 0.27 | 0.01 | 0.27 | 0.28 | 65 |
| Conifer forest/ plantation | Conifer forest/plantation | <50 | 0.46 | 0.21 | 0.21 | 1.06 | 2, 8, 43, 44, 54, 61, 75 |
| | Conifer forest/plantation | 50-150 | 0.32 | 0.08 | 0.24 | 0.50 | 6, 36, 54, 55, 58, 61 |
| | Conifer forest/plantation | >150 | 0.23 | 0.09 | 0.12 | 0.49 | 1, 6, 20, 40, 53, 61, 67, 77, 79 |
| Temperate broadleaf forest/ plantation | Oak forest | >70 | 0.35 | 0.25 | 0.20 | 1.16 | 15, 60, 64, 67 |
| | Eucalypt plantation | <50 | 0.45 | 0.15 | 0.29 | 0.81 | 9, 51, 59 |
| | Eucalypt plantation | 50-150 | 0.35 | 0.23 | 0.15 | 0.81 | 4, 9, 59, 66, 76 |
| | Eucalypt forest/plantation | >150 | 0.20 | 0.08 | 0.10 | 0.33 | 4, 9, 16, 66 |
| | Other broadleaf forest | <75 | 0.43 | 0.24 | 0.12 | 0.93 | 30, 45, 46, 62 |
| | Other broadleaf forest | 75-150 | 0.26 | 0.10 | 0.13 | 0.52 | 30, 36, 45, 46, 62, 77, 78, 81 |
| | Other broadleaf forest | >150 | 0.24 | 0.05 | 0.17 | 0.30 | 3, 26, 30, 37, 67, 78, 81 |
| Grassland | Steppe/tundra/prairie grassland | NS | 3.95 | 2.97 | 1.92 | 10.51 | 50, 56, 70, 72 |
| | Temperate/sub-tropical/ tropical grassland | NS | 1.58 | 1.02 | 0.59 | 3.11 | 22, 23, 32, 52 |
| | Semi-arid grassland | NS | 2.80 | 1.33 | 1.43 | 4.92 | 17-19, 34 |
| Other | Woodland/savanna | NS | 0.48 | 0.19 | 0.26 | 1.01 | 10-12, 21, 27, 49, 65, 73, 74 |
| | Shrubland | NS | 2.83 | 2.04 | 0.34 | 6.49 | 14, 29, 35, 38, 41, 42, 47, 67 |
| | Tidal marsh | NS | 1.04 | 0.21 | 0.74 | 1.23 | 24, 39, 68, 80 |
| NS = Not specified | | | | | | | |

Source：IPCC Good Practice Guidance for LULUCF Annex 3A.1, Table 3A.1.8[6]

[6] IPCCC: http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf

Appendix

Table A-10 $CO_2$ Emissions from Fertilizer, ILakages and Effects of GHG emissions Reduction[7]

| Project | Host Parties | fertilizer (tonnes of CO2 e) | Estimation of baseline net GHG removals by sinks (tonnes of CO2 e) | Estimation of actual net GHG removals by sinks (tonnes of CO2 e) | Estimation of leakage (tonnes of CO2 e) [A] | Estimation of net anthropogenic GHG removals by sinks (tonnes of CO2 e) [B] | Ratio of leakage [A]/[B] |
|---|---|---|---|---|---|---|---|
| CARBON SEQUESTRATION THROUGH REFORESTATION IN THE BOLIVIAN TROPICS BY SMALLHOLDERS OF "The Federación de Comunidades Agroforestales de Rurrenabaque (FECAR)" | Bolivia | zero | 0 | 11,529 | 24,124 | 91,165 | 26% |
| Reforestation of croplands and grasslands in low income communities of Paraguarí Department, Paraguay | Paraguy | 3 | 8,737 | 58,188 | 18,983 | 30,468 | 62% |
| Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin | China | zero | 531 | 794,225 | 19,852 | 773,842 | 3% |
| The International Small Group and Tree Planting Program (TIST), Tamil Nadu, India | India | zero | 0 | 107,810 | 0 | 107,810 | 0% |
| Moldova Soil Conservation Project | Moldova | zero | 109,962 | 3,702,513 | 7,705 | 3,584,846 | 0% |
| Southern Nicaragua CDM Reforestation Project | Nicaragua | zero | 0 | 237,448 | 0 | 237,448 | 0% |
| Uganda Nile Basin Reforestation Project No 3 | Uganda | zero | 0 | 111,798 | 0 | 111,798 | 0% |
| Reforestation, sustainable production and carbon sequestration project in José Ignacio Távara´s dry forest, Piura, Peru | Peru | zero | 171,545 | 1,145,332 | 0 | 973,788 | 0% |
| Reforestation on Degraded Lands in Northwest Guangxi | China | | 15,394 | 1,761,552 | 0 | 1,746,158 | 0% |
| Reforestation of grazing Lands in Santo Domingo, Argentina | Argentina | zero | 21,366 | 1,342,140 | 0 | 1,320,775 | 0% |
| Assisted Natural Regeneration of Degraded Lands in Albania | Albania | zero | 6,250 | 465,537 | 0 | 459,287 | 0% |
| „Posco Uruguay" afforestation on degraded extensive grazing land | Uruguay | zero | 0 | 659 | 0 | 659 | 0% |
| Forestry Project for the Basin of the Chinchiná River, an Environmental and Productive Alternative for the City and the Region . | Columbia | zero | 0 | 755,678 | 0 | 755,678 | 0% |
| Ibi Batéké degraded savannah afforestation project for fuelwood production (Democratic Republic of Congo) | Congo | zero | 0 | 1,635,338 | 0 | 1,635,338 | 0% |
| AES Tietê Afforestation/Reforestation Project in the State of São Paulo, Brazil | Brasil | — | 59,257 | 4,788,332 | 0 | 4,729,074 | 0% |
| Humbo Ethiopia Assisted Natural Regeneration Project | Ethiopia | zero | 0 | 880,296 | 0 | 880,296 | 0% |
| Cao Phong Reforestation Project | Vietnam | 22 | 0 | 53,735 | 11,090 | 42,645 | 26% |
| India: Himachal Pradesh Reforestation Project – Improving Livelihoods and Watersheds | India | zero | 0 | 828,016 | 0 | 828,016 | 0% |
| Improving Rural Livelihoods Through Carbon Sequestration By Adopting Environment Friendly Technology based Agroforestry Practices | India | — | 0 | 146,888 | 0 | 146,888 | 0% |
| Reforestation as Renewable Source of Wood Supplies for Industrial Use in Brazil | Brasil | — | 751,894 | 30,409,091 | 15,522 | 2,273,493 | 1% |
| Argos CO2 Offset Project, through reforestation activities for commercial use. | Columbia | — | 133,021 | 1,079,384 | 23,100 | 923,263 | 3% |
| Small Scale Cooperative Afforestation CDM Pilot Project Activity on Private Lands Affected by Shifting Sand Dunes in Sirsa, Haryana. | India | zero | 43 | 29,785 | 0 | 231,920 | 0% |
| Nerquihue Small–Scale CDM Afforestation Project using Mycorrhizal Inoculation in Chile | Chile | zero | 0 | 185,836 | 0 | 185,836 | 0% |
| Forestry Project in Strategic Ecological Areas of the Colombian Caribbean Savannas | Columbia | zero | 279 | 1,999,849 | 0 | 1,999,571 | 0% |

[7] UNFCCC CDM http://cdm.unfccc.int/Projects/projsearch.html

## Table A-11 Examples of Stratification in Afforestation Projects（CDM Project）[8]

Country： Paraguay
Project participants：Japan International Research Center for Agricultural Sciences
Instituto Forestal Nacional (Public entity)
https://cdm.unfccc.int/Projects/DB/TUEV-SUED1245074838.6/view
Title： Reforestation of croplands and grasslands in low income communities of Paraguari Department, Paraguay
CDM registered 2009

| Stratum | Tree species | Tree spacing(m) | Plant age | Forested area (ha) |
|---|---|---|---|---|
| S1 | Eucalyptus grandis | 3.0×2.5 | 2007 | 30.05 |
| S2 | Eucalyptus grandis | 3.0×2.5 | 2008 | 31.17 |
| S3 | Eucalyptus camaldulensis | 3.0×2.5 | 2007 | 16.36 |
| S4 | Eucalyptus camaldulensis | 3.0×2.5 | 2008 | 64.48 |
| S5 | Grevillea robusta | 3.0×2.5 | 2007 | 5.59 |
| S6 | Grevillea robusta | 3.0×2.5 | 2008 | 15.16 |
| S7 | Grevillea robusta | 5.0×4.0 | 2007 | 14.05 |
| S8 | Grevillea robusta | 5.0×4.0 | 2008 | 38.30 |
| Total | | | | 215.16 |

Country： India
Project participants：Haryana CDM Variksh Kisan Samiti, Ellenabad, Sirsa
Title： Small Scale Cooperative Afforestation CDM Pilot Project Activity on Private Lands Affected by Shifting Sand Dunes in Sirsa, Haryana.
https://cdm.unfccc.int/Projects/DB/TUEV-SUED1229620290.53/view
CDM registered 2008

| Stratum | Tree species | Tree spacing(m) | Plant age | Forested area (ha) |
|---|---|---|---|---|
| S1 | *Eucalyptus hybrid* | | 2007 | 26.30 |
| S2 | *Ailanthus excelsa* | | 2007 | 57.86 |
| S3 | *Acacia tortilis* | | 2007 | 61.65 |
| S4 | *Dalbergia sissoo* | | 2007 | 53.65 |
| S5 | *Acacia nilotica* | | 2007 | 60.75 |
| S6 | *Prosopis cineraria* | | 2007 | 74.20 |
| S7 | *Zizyphus mauritiana* | | 2007 | 35.46 |
| Total | | | | 369.87 |

[8] UNFCCC: http://cdm.unfccc.int/Projects/projsearch.html

Country： Bolivia

Project participants：FECAR (community organization), (Private entity)
Foundation Centro Tecnico Forestal (CETEFOR) (Private entity)
Asociación Accidental Cetefor-Sicirec (Private entity)
Vlaams Gewest (Public entry)

Title： CARBON SEQUESTRATION THROUGH REFORESTATION IN THE BOLIVIAN TROPICS BY SMALLHOLDERS OF “The Federación de Comunidades Agropecuarias de Rurrenabaque (FECAR)” Version 2.03
https://cdm.unfccc.int/Projects/DB/JACO1239802765.75/view

CDM registered 2009

| Stratum | Tree species | Tree spacing(m) | Plant age | Forested area (ha) |
|---|---|---|---|---|
| S1 | *Fast growing/ plantation* | — | — | — |
| S2 | *Fast growing/Agroforestry System* | — | — | — |
| S3 | *Fast growing/ Silvipastoral System* | — | — | — |
| S4 | *Midium growing/ plantation* | — | — | — |
| S5 | *MidiumgrowingAgroforestrySystem* | — | — | — |
| S6 | *Midium growing/ Silvipastoral System* | — | — | — |
| S7 | *Slow growing/ plantation* | — | — | — |
| S8 | *Slow growing/Agroforestry System* | — | — | — |
| S9 | *Slow growing/ Silvipastoral System* | — | — | — |
| Total | | | | 317ha |

Table A-12 Example of Stratification for Deforestation and Forest Degradation Prpjects

Comparison of land use category classification between IPCC and Ministry of Forestry, Indonesia

| 林業省土地区分 | IPCC 土地区分対応 |
|---|---|
| 23 土地区分 | 6 土地区分 |
| 1. Forest (7 categories):<br>1) Primary Dry land Forest<br>2) Secondary Dry land Forest<br>3) Primary Mangrove Forest<br>4) Secondary Mangrove Forest<br>5) Primary Swamp Forest<br>6) Secondary Swamp Forest<br>7) Plantation Forest<br>2. Non-forest (14 categories) :<br>8) Agriculture dry land<br>9) Dry land Agriculture and shrubs<br>10) Plantation<br>11) Rice<br>12) shrub / scrub<br>13) Savanna<br>14) Kingfisher swamp<br>15) Swamp<br>16) Transmigration<br>17) Settlement<br>18) Pond<br>19) Land open<br>20) Mining<br>21) Port of air / sea<br>3. No data (category 2),<br>22) Cloud<br>23) No data | 1. Forest land (4 sub categories)<br>1) Dry land Forest<br>2) Mangrove Forest<br>3) Swamp Forest<br>4) Forest Plantation<br>2. Crop land (3 subcategories),<br>5) Dry land Agriculture<br>6) Plantation<br>7) Rice<br>3. Grass Land (1 sub categories),:<br>8) Grass Land<br>4. Wetlands (1 sub categories),<br>9) Swamp<br>5. Settlements (1 sub categories),<br>10) Settlement<br>6. Other Lands (1 sub categories),<br>11) Pond, Cloud |

Source: Survey on REDD in Indonesia (Global Warming Mitigation Technology Promotion Projects in 2010 (METI))

Stratification and LULUC

| Class Identifier | | Average carbon density (tCO2.ha-1) | | |
|---|---|---|---|---|
| ID | Name | $CD_{AB}$ | $CD_{BB}$ | Total average carbon density |
| Native1 | Floresta Arbórea Densa | 90,99 | 379,13 | 470,13 |
| Native2 | Floresta Arbórea Aberta | 91,16 | 42,91 | 134,08 |
| Native3 | Vegetação gramínio-lenhosa | 51,87 | 16,03 | 67,90 |
| Native4 | Solo-exposto natural | 51,87 | 16,03 | 67,90 |
| Antrop1 | Área cultivada | N.A. | N.A. | 17,23 |
| Antrop2 | Pastagem | N.A. | N.A. | 27,75 |

Note:
$CD_{AB}$ – Average Carbon Density in the above-ground biomass carbon pool; tCO2.ha-1
$CD_{BB}$ – Average Carbon Density in the below-ground biomass carbon pool; tCO2.ha-1
N.A. – denotes Not Available
Sources:
Native1 to Native4 - Castro and Kauffman, 1998
Antrop1 and Antrop2 - IPCC, 2006

The reference, leakage and project emission are determined based on the aboveground and belowground biomasses stock changes as for 6 stratum defined

Source: REDD survey in Mato Grosso, Brasil (2009, CDM/JICA)。

Stratification by Forest Types and Regions

## Arrangement of the national forest inventory data Results (Mean AGB+BGB par Regions and F.Types

($CO_2$t/ha)

| ※1 \ ※2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 181 | 157 | | | | | | | | 75 |
| 2 | 604 | 282 | 144 | 157 | 178 | | 279 | | | | | |
| 3 | | | | | | | | | | 115 | | 104 |
| 4 | 798 | 299 | | | | | | | | | | |
| 5 | 508 | 275 | 158 | 131 | | 78 | 219 | 92 | | | | 67 |
| 6 | 516 | 272 | 135 | 94 | | 66 | 118 | | | | 165 | 103 |
| 7 | 417 | 272 | 171 | 116 | | 82 | 181 | 146 | | | | 70 |
| 8 | | | | | | | | | | | | |
| 9 | | 271 | 110 | 115 | | 86 | 122 | | 105 | 4 | | 85 |
| 10 | 465 | 282 | 158 | 148 | 196 | 138 | 249 | | | | | 94 |
| 11 | 502 | 291 | 162 | 135 | 153 | 91 | 199 | 253 | 292 | | | 163 |
| 12 | 511 | 280 | 120 | 128 | 189 | 104 | 240 | | 271 | | | 106 |
| 14 | | | | | | | | | | | | 102 |

**※1 (Bio-ecoregions)**:1=Cardamom Mountains rain forests, 2=Central Indochina dry forests, 3=Indochina mangroves, 4=Luang Prabang montane rain forests, 5=Northern Annamites rain forests, 6=Northern Indochina subtropical forests, 7=Northern Vietnam lowland rain forests, 8=Red River freshwater swamp forests, 9=South China-Vietnam subtropical evergreen forests, 10=Southeastern Indochina dry evergreen forests
11=Southern Annamites montane rain forests, 12=Southern Vietnam lowland dry forests, 14=Tonle Sap-Mekong peat swamp forests

**※2（Forest types）**： 1=Evergreen broadleaf forest(rich forest), 2=Evergreen broadleaf forest(medium forest), 3=Evergreen broadleaf forest(poor forest), 4=Evergreen broadleaf forest(rehabilitationr forest), 5=Deciduous forest, 6=Bamboo forest, 7=Mixed timber and bamboo forest, 8=Coniferous forest, 9=Mixed broadleaf and coniferous forest, 10=Mangrove forest, 11=Limestone forest, 12=Plantation

Source : Baseline Scenario Survey in Vietnam (Japan Forest Technology Association)