Methodology

AFoCO Carbon Tree(A·C·T) Calculator

1. Introduction

The AFoCO Carbon Tree (A·C·T) Calculator is a tool developed to promote environmental protection and carbon neutrality. Its purpose is to provide information to individuals and businesses so they can make more environmentally friendly choices. Through this calculator, users can visualize the impact of their activities on the environment and are expected to be able to take practical steps to contribute to environmental protection through activities like planting trees.

2. Calculation Methodologies

The A·C·T Calculator has been developed based on data from trusted organizations such as the Intergovernmental Panel on Climate Change (IPCC) and the World Bank, as well as environmental reports and research papers.

The A·C·T Calculator allows users to determine carbon emissions from individuals' daily life(Individual) and events(Group/Event). For 'Individual', excluding transportation, users can select their lifestyle using a slider to estimate annual carbon emissions. For 'Group/Event', users can input the values directly to calculate emissions over the event duration.

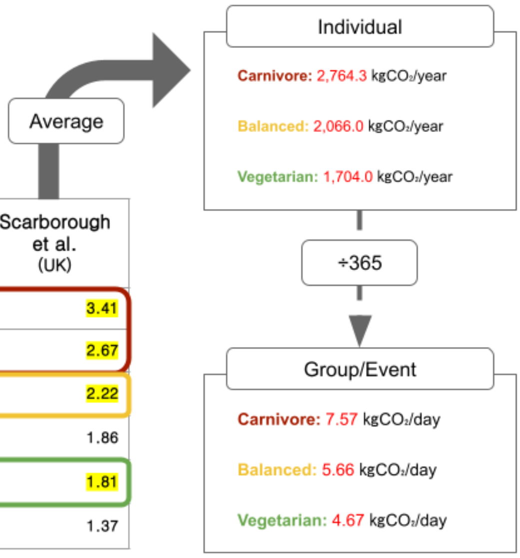
3. Individual & Group/Event Emission Values

3.1 Food

Annual carbon emission values presented in research
(Unit: tCO_2/year)

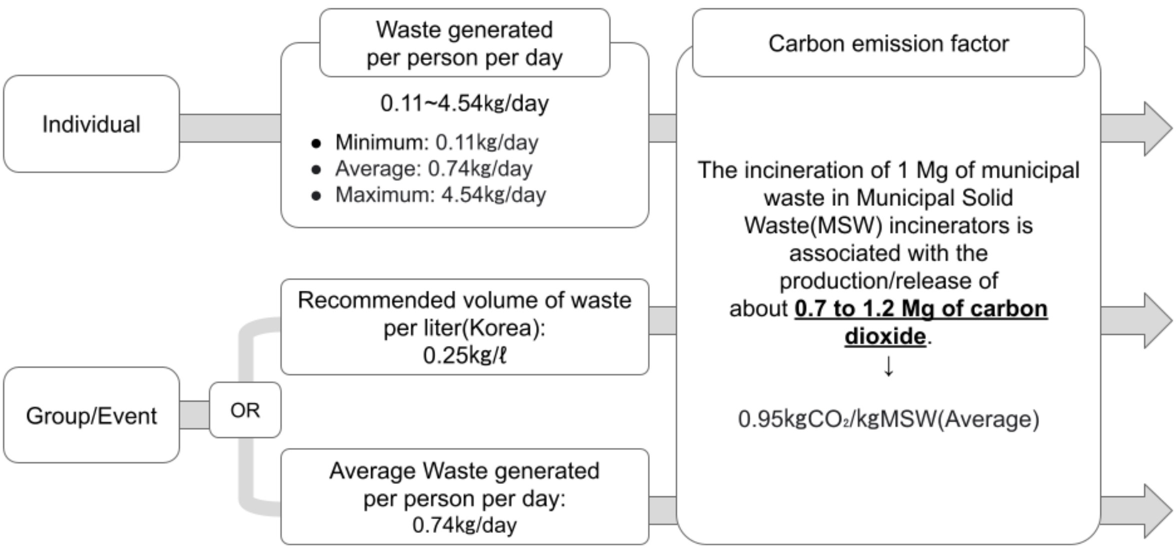
	The planet app (Spain)	Shrink that Footprint (USA)	ÜÇTUĞ et al. (Turkey)	Bruno et al. (Denmark)	Scarborough et al. (UK)
Carnivore	3.01	3.3	–	2.38	3.41
	2.08	2.5			2.67
Average	1.76	1.9	2.38	2.07	2.22
Fish eater	–	–	–	–	1.86
Vegetarian	1.35	1.7	1.88	1.78	1.81
Vegan	0.97	1.5	1.25	1.16	1.37

based on 2,600㎉/day



- The A·C·T Calculator categorizes 'Food' into three main types: carnivorous, omnivorous, and vegetarian. To derive values for each type, we referenced research studies related to dietary habits and carbon emissions (The Planet App, n.d.; Shrink That Footprint, n.d.; ÜÇTUĞ et al., 2021; Bruno et al., 2019; Scarborough et al., 2014). Based on these studies, average values for carnivorous, omnivorous, and vegetarian diets were utilized as the input values for our calculations.
- For 'Individual', the yearly average values from the referenced studies were used.
- For 'Group/Event', the individual values were divided by 365 to obtain daily emissions.

3.2 Trash



- The A·C·T Calculator determines carbon emissions from waste disposal by multiplying the user-input waste volume by the carbon emissions per unit volume.
- The carbon emissions per unit volume are based on IPCC value for Municipal Solid Waste (MSW), as 0.95 $MgCO_2/MgMSW$ (Penman et al., 2000).
- For 'Individual', waste disposal is categorized into 7 levels, with the lowest, average, and highest values derived from World Bank data (World Bank, n.d.).
- For 'Group/Event', there are two options: 1) To calculate carbon emissions based on the used trash bags. This involves using the carbon emission value per liter, considering Korea's waste density standard of 0.25㎏/ℓ (ENV-INFO, n.d.). 2) If not using trash bags or the trash bag volume is unknown, use the average value of 0.74 ㎏/day from 'Individual' (World Bank, n.d.).

3.3 Transportation

- Transportation was categorized as Walk or Bike, Motorcycle, Car, and public transportation (Bus, Subway, Train, Airplane). The A·C·T Calculator multiplies various factors by the user-input values as distance and time.

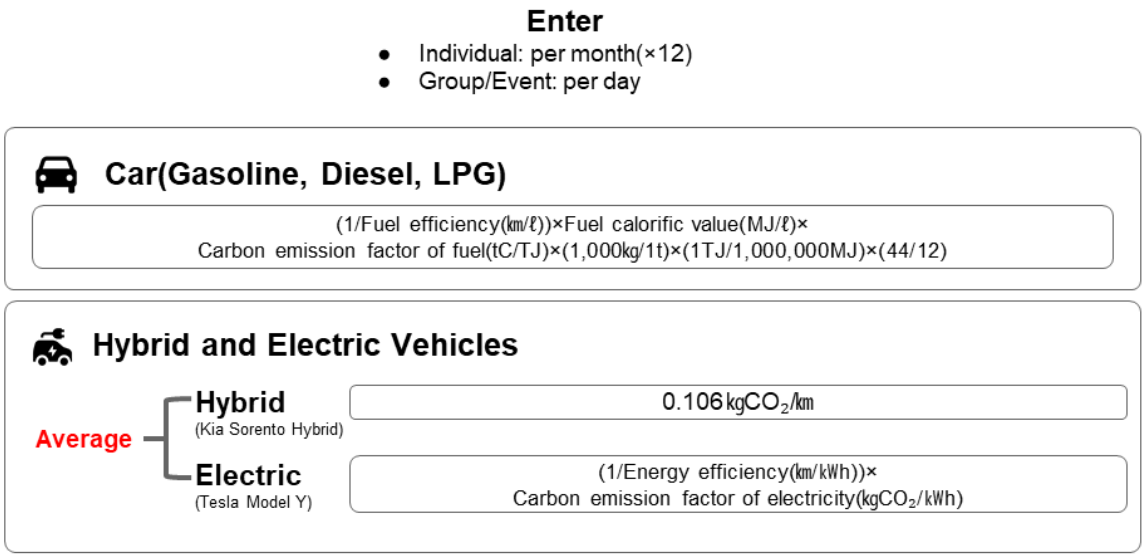
3.3.1 Walk or Bike

- Walking and cycling are considered carbon-neutral activities, emitting 0 $kgCO_2$ regardless of distance.

3.3.2 Motorcycle

- For motorcycle, carbon emission factor was set at approximately 0.113 $kgCO_2$ per kilometer based on data from a carbon emissions research company (Thrust Carbon, n.d.).

3.3.3 Car



- For personal vehicles, options include gasoline, diesel, LPG, hybrid and electric cars. For 'Individual', users can input monthly travel distances, while inputting daily travel distances for 'Group/Event'.

Car (Gasoline, Diesel, LPG)

- To determine carbon emissions from gasoline, diesel, and LPG cars, fuel efficiency is used to convert distance to volume. After converting, fuel calorific value and carbon emission factor are applied to calculate carbon emissions. The formula is expressed as follows:

$$\frac{1}{FE} \times FCV \times CEF \times 1000 \times \frac{1}{1000000} \times \frac{44}{12}$$

  - ➢ FE: Fuel efficiency (㎞/ℓ)
  - ➢ FCV: Fuel calorific value (MJ/ℓ)
  - ➢ CEF: Carbon emission factor of fuel (tC/TJ)

- Fuel efficiency, fuel calorific value, and carbon emission factor vary based on the type of fuel (Seo et al., 2006; EG-TIPS, n.d.; IPCC, n.d.). The corresponding values are as follows:

	Fuel efficiency	**Fuel calorific value**	**Carbon emission factor of fuel**
Gasoline	12.16	32.40	18.90
Diesel	12.16	36.60	20.20
LPG	9.18	50.20	17.20

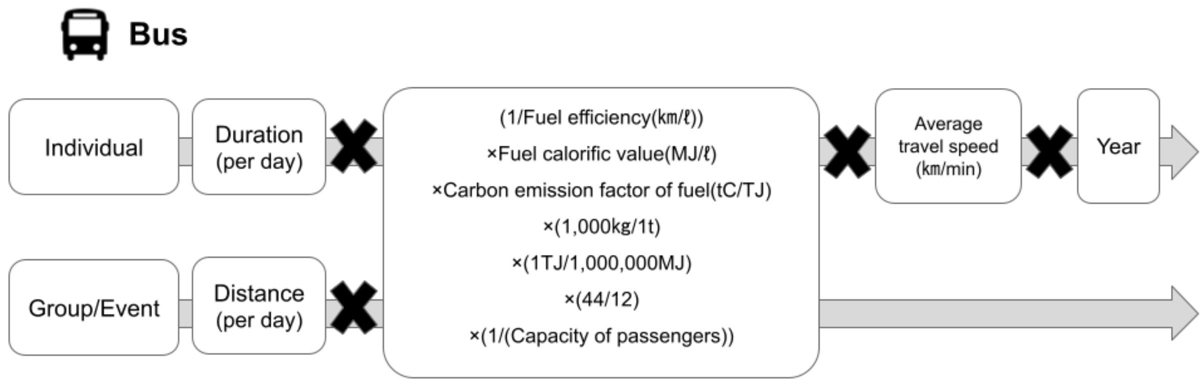
Hybrid and Electric Vehicles

- The hybrid and electric vehicle category calculates carbon emissions based on the average values of hybrid and electric cars. The Kia Sorento Hybrid (ZDNET Korea, 2023) and Tesla Model Y (EV LOUNGE, 2023), both representing the highly market-share car models in their respective categories, serve as the benchmarks for determining carbon emissions.
- For hybrid cars, emissions are calculated using the carbon emission rate per kilometer (0.106 kgCO_2/km) (CN Media, 2023). For electric cars, emissions per kilometer are determined by considering the vehicle's energy efficiency and carbon emission factor of electricity. The formula for electric cars is as follows (Joongang, 2021; GIR, 2022).

$$\frac{1}{EE} \times CEF$$

  - ➢ EE: Energy efficiency (㎞/㎾h)
  - ➢ CEF: Carbon emission factor of electricity (㎏CO_2/㎾h)

3.3.4 Bus



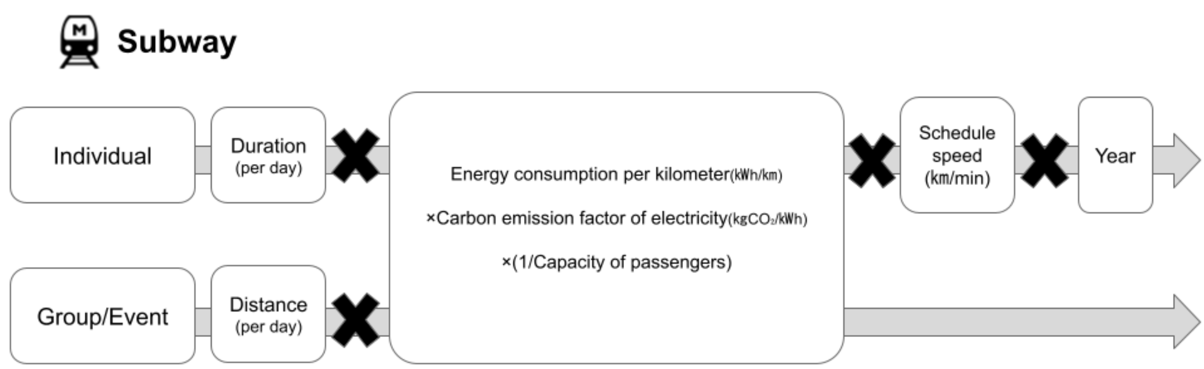
- Bus emissions are calculated following the criteria specified in the IPCC (2006), treating buses equivalently to truck. Emissions for diesel buses are calculated using fuel efficiency, fuel calorific value, and carbon emissions factor (Seo et al., 2006; EG-TIPS, n.d.; IPCC, n.d.). Additionally, emissions per passenger were determined by dividing the total emissions by the capacity of passengers on a bus (Auto Tribune, 2020).

$$\frac{1}{FE} \times FCV \times CEF \times 1000 \times \frac{1}{1000000} \times \frac{44}{12} \times \frac{1}{CP}$$

- ➢ FE: Fuel efficiency (㎞/ℓ)
- ➢ FCV: Fuel calorific value (MJ/ℓ)
- ➢ CEF: Carbon emission factor of fuel (tC/TJ)
- ➢ CP: Capacity of passengers

- For 'Individual', users input daily travel time, while inputting daily travel distance for 'Group/Event'. For 'Individual', time is converted to distance by multiplying with speed and then converted to one year (K-indicator, 2023).

3.3.5 Subway



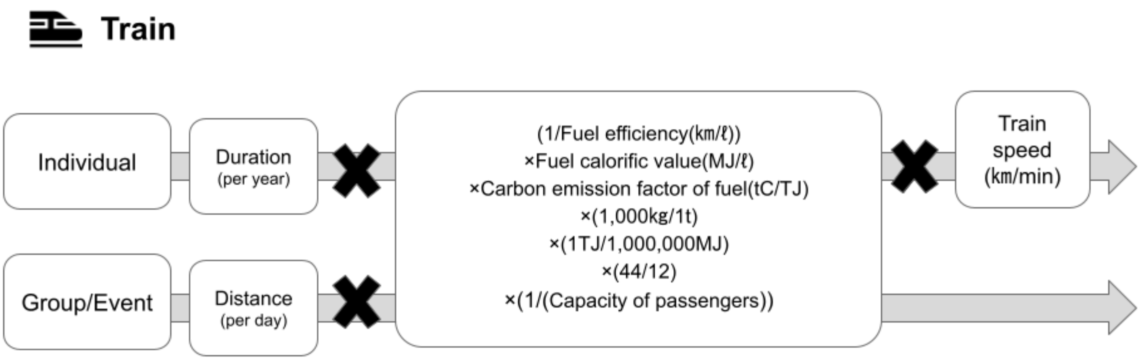
- For the subway, carbon emissions are calculated by multiplying the energy consumption per kilometer by the electricity carbon emission factor (Joongang, 2001; GIR, 2022). Additionally, emissions per person are determined by dividing the total emissions by capacity of passengers on the subway (Moneytoday, 2013).

$$EC \times CEF \times \frac{1}{CP}$$

➢ EC: Energy consumption per kilometer (㎞/㎾h)
➢ CEF: Carbon emission factor of electricity (㎏CO_2/㎾h)
➢ CP: Capacity of passengers

- For 'Individual', users input daily travel time, while inputting daily travel distance for 'Group/Event'. For 'Individual', time is converted to distance by multiplying with speed and then converted to one year (Bizwatch, 2022).

3.3.6 Train



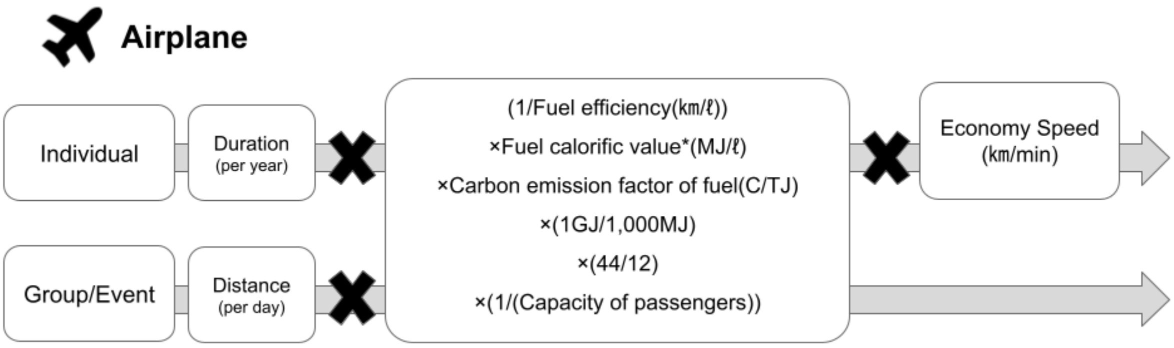
- Trains, using the KTX, calculated emissions based on fuel efficiency, fuel calorific value, and carbon emissions coefficients (Hyundai Rotem, 2019; EG-TIPS, n.d.; IPCC, n.d.). Emissions per passenger were determined by dividing the total emissions by the capacity of passengers on a train (MOLIT, 2013).

$$\frac{1}{FE} \times FCV \times CEF \times 1000 \times \frac{1}{1000000} \times \frac{44}{12} \times \frac{1}{CP}$$

➢ FE: Fuel efficiency (㎞/ℓ)
➢ FCV: Fuel calorific value (MJ/ℓ)
➢ CEF: Carbon emission factor of fuel (tC/TJ)
➢ CP: Capacity of passengers

- For 'Individual', users input yearly travel time, while inputting daily travel distance for 'Group/Event'. For 'Individual', time is converted to distance by multiplying with speed (MOLIT, 2013).

3.3.7 Airplane



* Fuel calorific value(MJ/ℓ)= The net energy content for aviation fuels(MJ/kg) × Density of aviation fuel(kg/ℓ)

- Airplane, based on the Boeing 747-400, is calculated emissions based on fuel efficiency, fuel calorific value, and carbon emissions factor (MOLIT, 2013; Wikipedia contributors, 2023; Penman et al., 2000). Emissions per passenger were determined by dividing the total emissions by the capacity of passengers on an airplane (Asiana Airlines, n.d.).

$$\frac{1}{FE} \times FCV \times CEF \times \frac{1}{1000} \times \frac{44}{12} \times \frac{1}{CP}$$

  - ➢ FE: Fuel efficiency (㎞/ℓ)
  - ➢ FCV: Fuel calorific value (MJ/ℓ)
  - ➢ CEF: Carbon emission factor of fuel (㎏C/TJ)
  - ➢ CP: Capacity of passengers

- Fuel calorific value was determined by using the net energy content and density of aviation fuel (Wikipedia contributors, 2023).

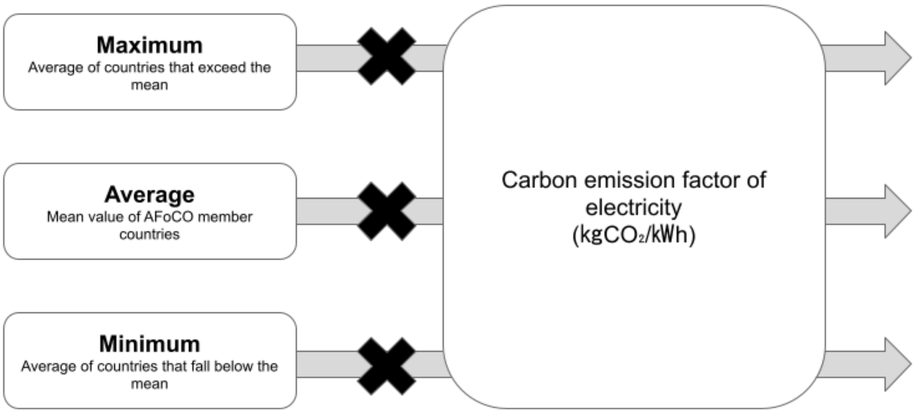
$$NEC \times D$$

  - ➢ NEC: The net energy content for aviation fuels (MJ/㎏)
  - ➢ D: Density of aviation fuel (㎏/ℓ)

- For ‘Individual’, users input daily travel time, while inputting daily travel distance for ‘Group/Event’. For ‘Individual’, time was converted to distance by multiplying by speed and then converted to one year (MOLIT, 2013).

4. Individual Emission Values

4.1 Electricity and Fuel



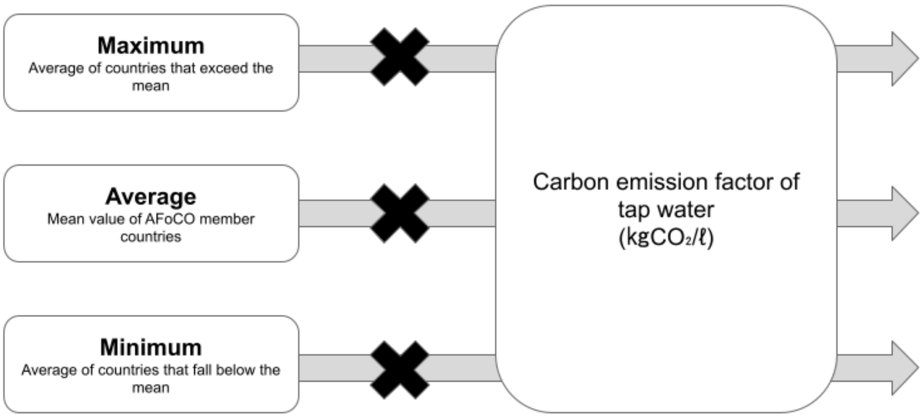
- The carbon emissions of electricity and fuel are calculated by multiplying the values of annual electricity and heating fuel consumption per capita by the electricity carbon emission factor (World Bank, n.d.; Our World in Data, n.d.; GIR, 2022).
- The values of annual electricity and heating consumption per capita are based on the most recent data. The average values of consumption are set as the average of all AFoCO member countries. The maximum values of consumption are derived from the average of AFoCO member countries with consumption higher than the average, and the minimum values of consumption are derived from the average of AFoCO member countries with consumption lower than the average.
- Both electricity and fuel are measured in kWh/year/person, and their values are as follows:

Electricity(2014)			
Category	**Country**	**Value**	**Average**
Maximum	KR	10,496.50	7,920.40
	BN	10,121.10	
	SG	8,844.69	
	KZ	5,600.21	
	MY	4,539.50	
Average			3,806.32
Minimum	TH	2,483.56	1,235.02
	MN	2,032.16	
	KG	1,941.22	
	VN	1,431.16	
	ID	808.42	

Fuel(2021)			
Category	**Country**	**Value**	**Average**
Maximum	SG	161,038.0	109,134.7
	KR	57,231.4	
Average			41,147.9
Minimum	KZ	39,590.4	18,485.7
	MY	31,630.0	
	TH	18,412.9	
	VN	9,512.3	
	ID	7,556.2	
	PH	4,212.3	
Bhutan - BT / Brunei Darussalam - BN / Cambodia - KH / Indonesia - ID / Kazakhstan - KZ / Kyrgyzstan - KG / Lao PDR - LA / Mongolia - MN /			

	PH	690.77		Myanmar - MM / Philippines - PH / Republic of Korea - KR / Thailand - TH / Timor-Leste - TL / Viet Nam - VN / Malaysia - MY / Singapore - SG
	KH	272.50		
	MM	220.39		

4.2 Water

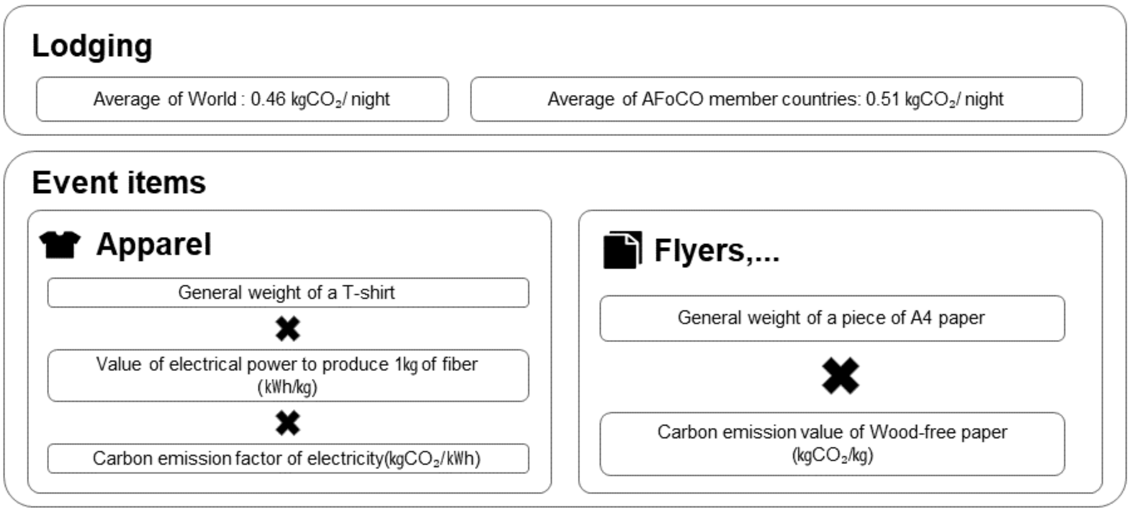


- The carbon emissions from water are calculated by multiplying the annual water consumption per capita by the water carbon emission factor (Worldometer, n.d.; Cpoint, 2022).
- The average value of consumption is set as the average of all AFoCO member countries. The maximum value of consumption is derived from the average of AFoCO member countries with consumption higher than the average, and the minimum value of consumption is derived from the average of AFoCO member countries with consumption lower than the average.
- The unit of consumption is ℓ/person/year, and the values are as follows:

Water (2021)			
Category	**Country**	**Value**	**Average**
Maximum	Kyrgyzstan	1,562,565	1,080,347.86
	Kazakhstan	1,277,135	
	Timor-Leste	1,205,960	
	Vietnam	978,565	
	Thailand	865,780	
	Indonesia	851,180	
	Philippines	821,250	

Average			766,656.43
Minimum	Myanmar	711,385	452,965.00
	Laos	607,360	
	South Korea	599,695	
	Bhutan	503,335	
	Malaysia	435,810	
	Cambodia	162,060	
	Mongolia	151,110	

5. Group/Event Emission Values



5.1 Lodging

- Lodging has adopted guidelines based on the Carbon Measurement Working Group, a joint initiative of the International Tourism Partnership (ITP) and the World Travel & Tourism Council (WTTC), as outlined in the GHG guidelines (UNEP, n.d.). According to these guidelines, the global average carbon emissions is 0.46kgCO_2/night, while the average for AFoCO member countries is 0.51kgCO_2/night. Considering this, carbon emission factor was derived as 0.5kgCO_2/night.

5.2 Event Items

- The event items include apparels and flyers. For apparel, carbon emissions were calculated by multiplying the energy consumption and carbon emission factor for fiber production by the standard weight of a typical T-shirt, 100g (Joongang, 2022; GIR, 2021).
- Flyers are based on A4 paper, and the carbon emissions were calculated by multiplying the carbon emission factor for A4 paper by the standard weight of a typical A4 paper, 4.7g (KISDI, 2010).

6. Carbon Sequestration by species

Carbon sequestration value in literature

Species | Synonym (Genus) | Synonym (Family) | Synonym (Order)

Derivation based on allometric models and coefficients

V(gr)×WD×BEF×RS×CF

- V(x) = Tree volume allometric model(m^3)
- gr = Growth rate of DBH(Annual growth value of DBH)(cm/yr)
- WD = Wood density(kg/m^3)
- BEF = Biomass expansion factor
- RS = Root-to-shoot ratio
- CF = Carbon fraction

- The A·C·T Calculator provides information on the number of trees required for carbon neutrality based on carbon emissions. To achieve this, the number of trees needed to offset 1kg of carbon dioxide was calculated by dividing the carbon sequestration factor for each tree species from 1kg. In cases where data was challenging to find, similar species were used as substitutes at the genus, family, or order level based on existing data.
- The carbon absorption coefficient per tree was derived through two main methods: 1) Reference to literature specifying carbon sequestration and 2) Derivation based on allometric models and coefficients.

6.1 Carbon sequestration value in literature

- For some tree species, the value of carbon sequestration by one tree was available in various research literature. The corresponding values are as follows:

Scientific Name (Common name)	Country	Value (Trees/1kgCO_2)	Synonym	Reference
Pinus densiflora (Red pine)	KR	0.00716	Species	Lee et al., 2019
Pinus koraiensis (Korean pine tree)	KR	0.00610	Species	
Quercus spp. (Oak tree)	KR	0.00435	Species	
Larix sibirica (Siberian larch)	MN	0.00582	Genus	
Pinus Caribaea Morelet	VN	0.00630	Genus	

(Caribbean pine)				
Ulmus pumila (Siberian elm)	MN	0.01337	Family	IPCC, 2019
Cinnamomum parthenoxylon (Martaban camphor tree)	VN	0.01340	Genus	
Michelia spp. (Michelia)	VN	0.00119	Genus	Pham et al., 2022
Santalum album (Sandal wood)	TL	0.00820	Species	Prabha et al., 2017
Bhutan - BT / Brunei Darussalam - BN / Cambodia - KH / Indonesia - ID / Kazakhstan - KZ / Kyrgyzstan - KG / Lao PDR - LA / Mongolia - MN / Myanmar - MM / Philippines - PH / Republic of Korea - KR / Thailand - TH / Timor-Leste - TL / Viet Nam - VN / Malaysia - MY / Singapore - SG				

6.2 Derivation based on allometric models and coefficients

- For some tree species, allometric models and coefficients are necessary to calculate carbon sequestration. The following methods were used to derive the values (1):

$$V(gr) \times WD \times BEF \times RS \times CF \times (\frac{44}{12})$$

  - ➢ V(x) = Tree volume allometric model (Above-ground volume) (m^3)
  - ➢ gr = Growth rate of DBH(Annual growth value of DBH) (cm/yr)
  - ➢ WD = Wood density (kg/m^3)
  - ➢ BEF = Biomass expansion factor
  - ➢ RS = Root-to-shoot ratio
  - ➢ CF = Carbon fraction
- However, for certain tree species, an allometric model provided a formula to calculate the volume of the entire tree, excluding the Root-to-shoot ratio (2).
- For Agarwood and its synonyms, Utomo et al. (2021) was referred to for calculations, following their suggested method (3):

$$CS(DBH) \times H \times CF \times \frac{1}{M} \times (\frac{44}{12})$$

  - ➢ CS(x) = Carbon sequestration allometric model (t)
  - ➢ DBH = Annual growth value of DBH (cm/yr)
  - ➢ H = Annual growth value of height (m/yr)
  - ➢ CF = Carbon fraction
  - ➢ M = Mature duration

In this case, DBH (Diameter at Breast Height) and H (Height) were substituted with the mature DBH and height divided by the mature period to calculate the annual growth rate.

- The carbon sequestration derived through these methods are as follows:

Scientific Name (Common name)	Country	Value (Trees/1kgCO_2)	Method	Synonym	Reference
Rhizophora spp. (Mangrove)	ID, TL	0.01931	(1)	Genus	Krisnawati et al, 2012; AFT, n.d.; IPCC, 2006
Casuarina spp. (Casuarina)	TL	0.00435	(2)	Genus	Krisnawati et al, 2012; TTL, n.d.; IPCC, 2003
Azadirachta indica (Neem tree)	TL	0.00372	(2)	Genus	Krisnawati et al, 2012; Moon et al., 2011; IPCC, 2003
Aquilaria malaccensis (Agarwood)	KH, TH	0.01220	(3)	Species	PSA, n.d.; Utomo et al., 2021; Housing, 2023
Dipterocarpus spp. (Dipterocarpus)	KH	0.01220	(3)	Order	
Shorea spp. (Sal tree)	LA	0.01220	(3)	Order	
Hopea spp. (Hopea)	TH	0.01220	(3)	Order	
Dryobalanops aromatica (Borneo Camphor)	TH	0.01220	(3)	Order	
Bhutan - BT / Brunei Darussalam - BN / Cambodia - KH / Indonesia - ID / Kazakhstan - KZ / Kyrgyzstan - KG / Lao PDR - LA / Mongolia - MN / Myanmar - MM / Philippines - PH / Republic of Korea - KR / Thailand - TH / Timor-Leste - TL / Viet Nam - VN / Malaysia - MY / Singapore - SG					

References

The data sources are as follows:

- *Asiana airlines*. (n.d.). https://flyasiana.com/C/PH/KO/contents/b747-400 (2023.11.28.)
- *Auto Tribune*. (2020). https://www.autotribune.co.kr/news/articleView.html?idxno=4716 (2023.11.28.)
- *Bizwatch*. (2022). https://news.bizwatch.co.kr/article/real_estate/2022/10/14/0021 (2023.11.28.)
- Bruno, M., Thomsen, M., Pulselli, F. M., Patrizi, N., Marini, M., & Caro, D. (2019). The carbon footprint of Danish diets. Climatic Change, 156, 489-507.
- *Carbon neutral point (Cpoint)*. (2022). https://cpoint.or.kr/user/board/printRead.do?board_seq=11674&searchKey=&searchType=&pageIndex=0
- *CN Media*. (2023). https://www.consumernews.co.kr/news/articleView.html?idxno=632755 (2023.11.28.)
- *EG-TIPS*. (n.d.). https://tips.energy.or.kr/popup/toe.do# (2023.11.28.)
- *ENV-INFO*. (n.d.). https://www.env-info.kr/member/board/FAQ/list.do (2023.11.27.)
- *EV LOUNGE*. (2023). https://evlounge.donga.com/FOREV/List/3/01/20230526/119498895/2 (2023.11.28.)
- Greenhouse Gas Inventory and Research Center (GIR). (2022). https://www.gir.go.kr/home/board/read.do;jsessionid=Nq16eRb3Pt8nlNjrjMC7Oz0Y3UdSv33sKJIU08g9FyqgMNXn7zGxFPLuxn0CwxVp.og_was2_servlet_engine1?pagerOffset=0&maxPageItems=10&maxIndexPages=10&searchKey=&searchValue=&menuId=36&boardMasterId=2&boardId=56 (2023.11.28.)
- *Housing*. (2023). How to grow and care for Agarwood tree?. https://housing.com/news/agarwood-tree-wood-of-the-gods/ (2023.12.01.)
- *Hyundai Rotem*. (2019). https://blog.hyundai-rotem.co.kr/252 (2023.11.28.)
- Intergovernmental Panel on Climate Change (IPCC). (2003). Good Practice Guidance for Land Use, Land-Use Change and Forestry
- Intergovernmental Panel on Climate Change (IPCC). (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories
- Intergovernmental Panel on Climate Change (IPCC). (2006). IPCC Guidelines for National Greenhouse Gas Inventories, Prepared by the National Greenhouse Gas Inventories Programme
- Intergovernmental Panel on Climate Change (IPCC). (2019). Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Switzerland: IPCC.
- *Intergovernmental Panel on Climate Change (IPCC)*. (n.d.). Emission Factor Database. https://www.ipcc-nggip.iges.or.jp/EFDB/find_ef.php?resetFuels= (2023.11.28.)
- *Joongang*. (2001). https://www.joongang.co.kr/article/4068719#home (2023.11.28.)
- *Joongang*. (2021). https://www.joongang.co.kr/article/24080735#home (2023.11.28.)
- *Joongang*. (2022). https://www.joongang.co.kr/article/25039376#home (2023.11.28.)
- *K-indicator*. (2023). https://www.index.go.kr/unity/potal/indicator/IndexInfo.do?popup=Y&clasCd=2&idxCd=5079 (2023.11.28.)

- Korea Information Society Development Institute (KISDI). (2010). *Measures to revitalize the e-book market for green growth*. (10-02-45). https://www.kisdi.re.kr/report/view.do?key=m2101113024153&arrMasterId=3934560&masterId=3934560&artId=530975
- Krisnawati, H., Adinugroho, W. C., & Imanuddin, R. (2012). Allometric models for estimating tree biomass at various forest ecosystem types in Indonesia: Monograph. wahyu catur adinugroho.
- Lee, S., Lim, J., Kang, J. (2019). Standard Carbon Sequestration of Major Forest Tree Species. NIFoS
- *Ministry of Land, Infrastructure and Transport (MOLIT)*. (2013). http://www.molit.go.kr/USR/BORD0201/m_67/DTL.jsp?mode=view&idx=217551 (2023.11.28.)
- MOLIT. (2013). http://www.molit.go.kr/USR/BORD0201/m_67/DTL.jsp?id=IN0405&cate=&mode=view&idx=153004&key=&search=&search_regdate_s=2013-05-18&search_regdate_e=2014-05-18&order=&desc=asc&srch_prc_stts=&item_num=0&search_dept_id=&search_dept_nm=&srch_usr_nm=N&srch_usr_titl=N&srch_usr_ctnt=N&srch_mng_nm=N&old_dept_nm=&search_gbn=&search_section=&source=&search1=&lcmspage=3 (2023.11.28.)
- *Moneytoday*. (2013). https://news.mt.co.kr/mtview.php?no=2013061011363586698 (2023.11.28.)
- Moon H.K., Ujang S.I., Park S.Y., Park C.H., Yi J.S. (2011). Tropical trees of Indonesia A Field Guide to Tropical Trees. NIFoS
- *Our World in Data*. (n.d.). Fossil Fuels. https://ourworldindata.org/fossil-fuels (2023.11.29.)
- Penman, J., Kruger, D., Galbally, I.E., Hiraishi, T., Nyenzi, B., Emmanuel, S., Buendia, L., Hoppaus, R., Martinsen, T., Meijer, J., Miwa, K.,& Tanabe, K. (2000). Good practice guidance and uncertainty management in national greenhouse gas inventories. IPCC
- Pham TT & Tang TKH Nguyen CC. (2022). Forest carbon market in Vietnam: Legal framework, opportunities and challenges. Occasional Paper 238. Bogor, Indonesia: CIFOR.
- *Plants of Southeast Asia* (PSA). (n.d.). https://www.asianplant.net/Thymelaeaceae/Aquilaria_malaccensis.htm (2023.12.01.)
- Prabha, S. J., Kumar, S., Shrinidhi, R., & Megha, M. (2017). QUANTITATIVE ANALYSIS OF CARBON STORAGE CAPACITY IN THE STANDING BIOMASS OF SEMI-ARID REGIONS OF RAMDURGA TALUK, BELAGAVI DISTRICT, KARNATAKA.
- Scarborough, P., Appleby, P. N., Mizdrak, A., Briggs, A. D., Travis, R. C., Bradbury, K. E., & Key, T. J. (2014). Dietary greenhouse gas emissions of meat-eaters, fish-eaters, vegetarians and vegans in the UK. Climatic change, 125(2), 179-192.
- Seo, J., Lee, K., Sohn, K., Lim, J., Bae, J., Yoo, D., & No, J. (2006). Global Warming, forest and Carbon tree calculator. NIFoS
- *Shrink That Footprint*. (n.d.). The Big Question: What Diets Drive Carbon Emissions And By How Much. https://shrinkthatfootprint.com/food-carbon-footprint-diet/ (2023.11.27.)
- *The Agroforestree Database (AFT)*. (n.d.). https://apps.worldagroforestry.org/treedb/AFTPDFS/Rhizophora_mucronata.PDF (2023.12.01.)
- *The Planet App*. (n.d.). Carbon emissions and type of diet: the facts. https://theplanetapp.com/carbon-emissions-and-type-of-diet/?lang=en (2023.11.27.)

- *Thrust Carbon*. (n.d.). How to calculate motorbike CO2 emissions. https://thrustcarbon.com/insights/how-to-calculate-motorbike-co2-emissions (2023.11.27.)
- *Tropical Trees for Life (TTF)*. (n.d.). http://www.treesforlife.info/gmptsf/acacia-mangium.htm (2023.12.01.)
- ÜÇTUĞ, F. G., GÜNAYDIN, D., HÜNKAR, B., & ÖNGELEN, C. (2021). Carbon footprints of omnivorous, vegetarian, and vegan diets based on traditional Turkish cuisine. Sustainable Production and Consumption, 26, 597-609.
- United Nations Development Programme(UNDP). (n.d.). https://procurement-notices.undp.org/ (2023.12.04.)
- Utomo, S. W., Pambudi, P. A., & Pramudianto, A. (2021, April). The carbon dioxide (CO2) sequestration potential of conservation plant Aquilaria malaccensis. In IOP Conference Series: Earth and Environmental Science (Vol. 724, No. 1, p. 012063). IOP Publishing.
- Wikipedia contributors. (2023, September 27). Aviation fuel. In Wikipedia, The Free Encyclopedia. Retrieved 05:11, November 28, 2023, from https://en.wikipedia.org/w/index.php?title=Aviation_fuel&oldid=1177501986
- *World Bank*. (n.d.). Electric power consumption (kWh per capita). https://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC (2023.11.29.)
- *World Bank*. (n.d.). Trends in Solid Waste Management. https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html (2023.11.27.)
- *Worldometer.* (n.d.). https://www.worldometers.info/water/ (2023.11.29.)
- *ZDNET Korea*. (2023). https://zdnet.co.kr/view/?no=20230217154704 (2023.11.28.)