LIFE TECHNICAL GUIDE – 01

Measuring the Biodiversity Pressure Index (BPI) and definition of Biodiversity Minimum Performance (BMP)

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Lasting Initiative for *Earth.*

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OBJECTIVE

To present the concept and method of obtaining the Biodiversity Pressure Index (BPI), as well as the Biodiversity Minimum Performance (BMP) that each organization/producer must achieve in biodiversity conservation actions and ecosystem services, considering the size and impact of the activity.

APPLICATION

This document applies to organizations/producers in preparation for LIFE Certification, LIFE Certified organizations/producers, as well as others interested in incorporating biodiversity management into their business models.

For a complete assessment of the LIFE Methodology for Business and Biodiversity, the LIFE Standard for Business and Biodiversity, Technical Guide 02 and complementary documents should also be considered.

For LIFE Certified organizations in previous versions, this document becomes effective after the end of the certification cycle, that is, on recertification. For other organizations/producers, this document applies automatically as of the date of publication.

This document is applicable to the Latin American continent, excluding the countries that have their own specific adaptation of the LIFE Methodology.

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1. INTRODUCTION

The Biodiversity Pressure Index (BPI) is an index developed by the LIFE Institute to define, compare and monitor, on the same scale, the pressure of any organization/producer to biodiversity and ecosystem services, serving as an important management tool.

From the calculation of the BPI, organizations and producers who wish to contribute to biodiversity may know and carry out the minimum performance in conservation actions that would be more appropriate to their size and impact.

This document introduces the concept and the manner of obtaining the Biodiversity Pressure Index (BPI) and the Biodiversity Minimum Performance (BMP) relating to every size and impact.

The information presented in this document is only a description of the calculations used. Obtaining the BPI/BMP is facilitated by using an automated calculation tool (LIFE Key software).

Organizations and producers who achieve or exceed the minimum performance set may request a third-party assessment to obtain an external recognition on their performance in favor of biodiversity. In this case, LIFE Certification can be granted, through the Certifying Body, whenever an organization/producer:

- ✓ Achieves a Biodiversity Positive Performance (BPP) equal to or higher than Biodiversity Minimum Performance (BMP). This positive performance must be demonstrated through a Biodiversity and Ecosystem Services Action Plan (BAP), assessed and rated according to the document Technical Guide 02.
- ✓ Meets the minimum indicators for biodiversity management described in LIFE Standard for Business and Biodiversity.

2. BIODIVERSITY PRESSURE INDEX (BPI)

Aiming to establish a metric for scaling and comparing pressures to biodiversity, making it possible to define relative performance for conservation, the Biodiversity Pressure Index (BPI) was developed.

To calculate the BPI five environmental aspects are measured and evaluated. These aspects were selected from the performance of public meetings for the definition and selection of relevant variables for the index, both for their relation to the main causes of global biodiversity loss[1] and for their data collection in organizations of any size and sector.

As a result of this analysis, we selected those aspects that had higher viability and ease of data collection and direct relationship with official data available: waste generation; water consumption; energy consumption; land use; greenhouse gas emission.

The BPI is obtained through information related to the quantity and severity relating to these five selected environmental aspects.

Information on the quantity of environmental aspects assessed, or “Quantity Value”, refers to a direct relationship between the data of the organization/producer compared to an official data for this aspect. This comparison generates a quantity value of impact for each environmental aspect referring to its contribution to the regional total.

Information on severity, or “Severity Value”, considers specific information for each environmental aspect, which allows to define their criticality: water availability in the region, potential for global warming from the gases emitted, impact of the energy sources used, hazard and disposal of waste generated by, and fragility of the ecoregion[2] occupied by the enterprise. This information, although qualitative, is quantitatively represented by the severity values.

By multiplying the quantity values of impact by their severity factors, “Pressure Values” (PV) are generated for each environmental aspect. For comparison purposes, these pressure values are transformed into “Pressure Indexes” (PI), with the purpose of being mathematically distributed on the same scale, from zero to one thousand. This distribution has as reference the value of greatest impact known in the region for each environmental aspect.

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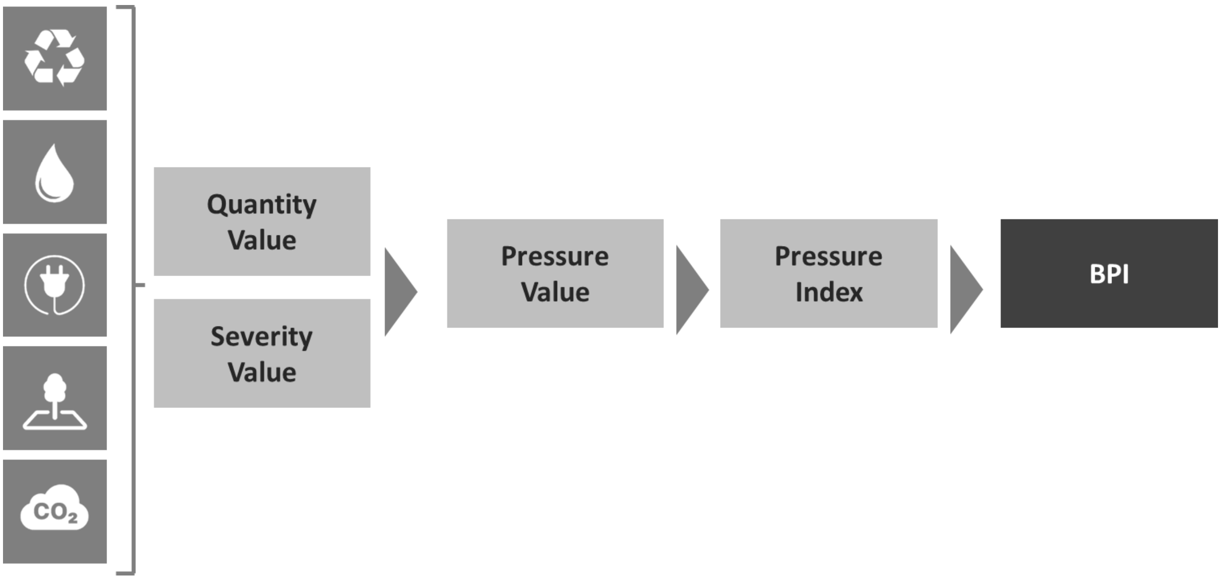
[1] Destruction of habitats; climate changes; introduction of invasive exotic species; over-exploitation of species; pollution (*Millennium Ecosystem Assessment*, 2005).

[2] Ecoregions are defined as relatively large areas of land or water containing a characteristic set of natural communities that share a large majority of their species, ecological dynamics, and environmental conditions (*Dinerstein et al*.,1995)

The simple average of the Pressure Indexes (PI) for each one of the environmental aspects, results in the Biodiversity Pressure Index (BPI). The BPI is presented in a dimensionless value, on a scale from zero to one thousand.

Figure 1 represents the steps for calculating the BPI. Detailed information applied equations and necessary data from organizations/producers for the calculation can be found in the next sections of the document.

Figure 1. Steps for calculating the Biodiversity Pressure Index (BPI)



Note: Quantity Value, Severity Value, Pressure Value and Pressure Index: calculated individually by environmental aspect.

2.1 BIODIVERSITY PRESSURE INDEX (BPI) CALCULUS

This section of the document introduces the steps and equations used to calculate the BPI.

2.1.1 Quantity Values (QV) and Severity Values (SV) of Environmental Aspects

Table 1 presents the equations used to calculate the quantity and severity values for each environmental aspect.

Table 1 - Equations of Quantity Values (QV) and Severity Values (SV) to calculate the BPI for each environmental aspect

ENVIRONMENTAL ASPECT	QUANTITY	SEVERITY
Waste Generation	$QV_{WASTE} = \frac{WG}{RV_{WASTE}}$	$SV_{WASTE} = \frac{\sum_{i=1}^{n}(\%WG_i \times ID_i)}{ID_{max}}$
Water Consumption	$QV_{WATER} = \frac{WU}{RV_{WATER}}$	$SV_{WATER} = \frac{DAB_{OHR}}{DAB_{CHR}}$
Energy Consumption	$QV_{ENERGY} = \frac{EC}{RV_{ENERGY}}$	$SV_{ENERGY} = \frac{\sum_{i=1}^{n}(\%EC_i \times IE_i)}{IE_{max}}$
Land Use	$QV_{LAND\ USE} = \frac{\sum_{i=1}^{n} LU_O \times (1 - MSA)}{LU_E}$	$SV_{LAND\ USE} = \frac{E_{if}}{100}$
Greenhouse Gas Emissions	$QSV_{GHG} = \left(\frac{\sum_{i=1}^{n}(GE_i \times GWP_i)}{RV_{GHG}}\right)$	

Table 2 describes the terms that make up the equations presented in Table 1.

Table 2 – Terms used in the equations for the quantity and severity values

EQUATION	TERMS USED
QV_{WASTE}	QV_{WASTE}= Quantity Value for Waste WG= Total quantity of hazardous and non-hazardous waste generated by the organization/producer (t/year) RV_{WASTE}= Reference Value for waste (t/year) according to *Item 3* in Appendix.
QV_{WATER}	QV_{WATER}= Quantity Value for Water WU= Consumption of water used by the organization/producer (m^3/year) RV_{WATER}= Reference Value for water (m^3/year), according to *Item 3* in Appendix.
QV_{ENERGY}	QV_{ENERGY}= Quantity Value for Energy EC= Total quantity of energy consumed by the organization/producer (toe/year) RV_{ENERGY}= Reference Value for Energy (toe/year), according to *Item 3* in Appendix.
$QV_{LAND\ USE}$	$QV_{LAND\ USE}$= Quantity Value for land use LU_O= Land use of the organization/producer (hectares) LU_E= Original land use of the ecoregion in which the organization/producer is located (hectares), according to *Item 4* in Appendix. MSA = Value of the land use class in accordance with Mean Species Abundance, according to *Item 4* in Appendix.
QSV_{GHG}	QSV_{GHG}= Quantity and Severity Value for Greenhouse Gases GE_i= Quantity of greenhouse gas emissions *i* emitted by the organization/producer GWP_i= Global warming potential of greenhouse gas *i* according to *Item 4* in Appendix. RV_{GHG}= Reference value for greenhouse gases (tCO_2e/year) according to *Item 3* in Appendix.
SV_{WASTE}	SV_{WASTE}= Severity Value for Waste. WG_i= Percentage of waste generation with type “*i*” destination. ID_i= Impact of destination “*i*” (ID) listed to *Item 4* in Appendix. ID_{max}= Maximum impact observed between “*i*” types of destination.
SV_{WATER}	SV_{WATER}= Severity Value for the water aspect. DAB_{CHR}= Demand-Availability Balance DAB_{OHR}=Demand-Availability Balance of the country where the organization/producer is located, listed to *Item 4* in Appendix.
SV_{ENERGY}	SV_{ENERGY}= Severity value for the energy aspect. EC_i= Percentage of the energy source type *i* consumed by the organization/producer. IE_i= Impact of the energy source *i* consumed by the organization/producer, according to *Item 4* in Appendix. IE_{max}= Maximum impact observed between energy sources according to *Item 4* in Appendix.
$SV_{LAND\ USE}$	$SV_{LAND\ USE}$= Severity value for the land use aspect. E_{IF}= Ecoregion importance factor, according to *Item 4* in Appendix.

2.1.2 Pressure Values of Environmental Aspects (PV)

In Table 3, the equations used to obtain the Pressure Value (PV_i) of each aspect *i* are listed.

Table 3 - Calculation of the pressure value for each environmental aspect

ENVIRONMENTAL ASPECT	PRESSURE VALUE OF THE ASPECT
Waste Generation	$PV_i = QV_i \times SV_i$
Water Consumption	
Energy Consumption	
Land Use	
Greenhouse Gas Emissions	$PV_{GHG} = QSV_{GHG}$

2.1.3 Pressure Indexes of Environmental Aspects (PI)

The Pressure Values (PV) are transformed into Pressure Indexes (PI), which allow the representation of the pressure of each environmental aspect on the same scale, dimensionless, ranging from zero to 1,000. The Pressure Index (PI) is calculated individually for each environmental aspect by the following equation:

$$PI_i = \left(1 - \frac{1}{1 + a_i PV_i}\right) x\ 1000$$

Where in:

PI_i = Pressure Index of aspect *i*

a_i= Correction factor[3] of aspect *i*, which allows *PI* to range between 0 and 1,000

PV_i = Pressure Value of aspect *i*

[3] See details in *Item 1* in the Appendix.

2.1.4 Biodiversity Pressure Index (BPI)

The BPI is presented in a dimensionless value, on a scale from zero to one thousand. It is obtained by the simple arithmetic average of the Pressure Indexes (PI) of the five environmental aspects assessed:

$$BPI = \frac{PI_{WASTE} + PI_{WATER} + PI_{ENERGY} + PI_{LAND\ USE} + PI_{GHG}}{5}$$

Information on the reference values can be found in the *Item 3*, in Appendix **(Reference Information to calculate the BPI)**.

2.2 DATA REQUIRED TO CALCULATE THE BIODIVERSITY PRESSURE INDEX (BPI)

This document section presents the data from the organization/producer that need to be informed to calculate the BPI.

The calculation of the BPI is carried out by business unit. Therefore, it is necessary to clearly and objectively define which business unit is being evaluated and which division it belongs to[4]. In addition, data from the five environmental aspects of the previous year (from January to December) must be considered.

[4] According to the LIFE Methodology, the following definitions apply:

Business Division: A segment of an organization that operates with significant operational differences from others, which may be more or less specific depending on the size of the organization. Examples: forestry division, agricultural division, industrial division, construction division, wind energy division, thermal division, operations division, manufacturing division, etc.

Business Unit: Refers to a physical unit with a continuous area, under the same management, and within the same business division of the organization, from which data is provided for the calculation of the Biodiversity Pressure Index (BPI) and Biodiversity Minimum Performance (BMP). It is typically linked to a specific location, for example: Wind Energy Unit A, Wind Energy Unit B, etc.

2.2.1 Waste Generation

a) Inform the total amount of waste generated by the organization/producer in tons/year, adding all the following situations:

i) Any waste, whether treated or not, forwarded to third parties, whether through donation or sale, for treatment, storage or final elimination
ii) Waste sent to landfills, own or third party
iii) Waste stored, internally or by third parties
iv) Household and production waste generated within the property
v) Other wastes not receiving internal treatment in the organization/property

The data reported must refer to the total waste generated in all processes - direct and indirect, productive, administrative and from maintenance - as long as performed on the physical site which is being assessed.

b) There is no need to inform about waste destined internally for:

i) Production of biogas
ii) Incineration
iii) Co-processing
iv) Reuse
v) Recycling

All consumption of water, energy and land use relating to these processes must be informed on the other environmental aspects to calculate the pressure of the organization/property.

c) Inform of the dangers of waste generated in:

i) Hazardous Waste
ii) Non-hazardous waste

d) Inform the destination of the waste informed in item (a) in:

i) Reuse
ii) Recycling

iii) Composting

iv) Landfarming

v) Co-processing

vi) Biogas

vii) Storage

viii) Incineration

ix) Landfill with biogas utilization

x) Landfill

When the destination is different from these categories, the organization/producer may select that with the characteristics closest to the informed destination.

Wastes from agricultural production, even if destined to industry, must be recorded as primary waste production and classified according to the type of destination (e.g.: recycling, co-processing, etc.). If the industry receiving this waste is undergoing assessments by LIFE Methodology, this material, in this unit assessed, must be considered as an input and not as waste.

Industrial waste used in agriculture must be informed as “landfarming”, to calculate the impact of the waste from the plant assessed.

2.2.2 Water Consumption

a) Inform the volume of consumptive water use[5] of all processes, direct and indirect, carried out in the physical unit assessed.

i) **Primary sector:** inform the sum of the values for “green footprint” (water from precipitation stored in plants, evaporated or transpired) and for “blue footprint” (surface or underground water incorporated into the process).

[5] Non-consumptive uses do not need to be reported, e.g.: aquaculture, hydroelectricity, water for dilution and/or purification of effluents.

- **Agricultural crops:** water consumption estimates for each crop can be obtained through an online tool from the Water Footprint Network initiative.
- **Animal production:** water consumption estimates can be obtained by extrapolation of the individual consumption per animal/head, including watering, washing, etc.
- **Forestry:** water consumption estimates for forestry must be calculated by the organization/producer and reported in the LIFE Key software, considering the "water type" field as "green".

ii) Secondary sector: the organization must inform only the consumptive use of blue water (water collected less the water discarded, either as effluent or process losses).

iii) Tertiary sector: the organization must inform only the consumption of blue water. The consumption of blue water can be informed through consumption records, being possible to discount the return volume to the basin only when this information is available.

b) Inform the country where the assessed enterprise is located.

2.2.3 Energy Consumption

a) Inform the total amount of energy consumed (own or acquired by the business unit). Inform the distribution of consumption by sources used:

i) Energy from the electricity produced by country (grid)
ii) Biofuels (ethanol)
iii) Biofuels (Oils and Biodiesel)
iv) Biogas
v) Biomass (wood)
vi) Biomass (residual)
vii) Mineral Coal
viii) Sea Energy
ix) Wind

x) Natural Gas

xi) Geothermal

xii) Hydroelectricity

xiii) Non-renewable residual

xiv) Nuclear

xv) Oil and derived

xvi) Solar

xvii) Coal and derivates

xviii) Other Renewables

2.2.4 Land use

a) Inform the area and the land use, according to occupation classes in accordance with MSA (Mean Species Abundance[6]) adaptation.

b) Inform the ecoregion in which the organization/producer is located:

The organization can define its ecoregion by entering the location data on the map provided by the LIFE Key software.

For the calculation of the PI_{AREA}, the business unit must present only one ecoregion. Therefore, all occurrences related to the land use of the business unit must have the same ecoregion option selected in LIFE Key. If the business unit is between two or more ecoregions, the one with the highest percentage should be considered.

[6] Mean Species Abundance (MSA) is an indicator that describes the changes in the environment in relation to the original ecosystem. The MSA is an indicator of naturalness or intactability of biodiversity, defined as mean abundance of original species in the land use in question in relation to their abundance in undisturbed ecosystems. An land use with an MSA of 100% (1.0) means having a biodiversity similar to the natural situation. An MSA of 0% (0.0) means a completely destroyed ecosystem without remaining original species. The relationship of the MSA classes for land use are in the *Item 4*, in Appendix.

c) In the case of agricultural properties bound by leasing contracts or others, inform only the land users relating to the contract[7] .

d) External land users to the assessed properties, bound only to conservation actions, must not be accounted for to calculate the BPI.

2.2.5 Greenhouse Gas Emissions

a) The total amount of emissions of all greenhouse gases;

The organization/producer must inform the Total Emissions of each one of the Greenhouse Gases (tCO_2e/year), considering the Scopes 1+2+3 of the GHG Protocol tool. More detailed information on the scopes of the GHG Protocol is listed in *Item 4* in Appendix, and in the Reference Document related to the subject.

The GHG Protocol also has a calculation tool specific for the primary sector. Other tools for the inventory of emissions will be accepted, as long as also using the IPCC (Intergovernmental Panel on Climate Change) guidelines[8].

The BPI assesses the negative pressures to biodiversity for all environmental aspects considered. Thus, for this step, only greenhouse gas emissions will be accounted for, and not carbon sequestration. Carbon fixation projects, validated by a third party[9], may score as indirect effect action for biodiversity conservation (strategic line “Group 4” – Technical Guide 02).

[7] In these cases, legal environmental compliance is mandatory for the entire land use of the property, even if the contract is bound to a partial area. This mandatory legal compliance must be provided for in contract.
[8] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories.
[9] Validation by recognized initiatives relative to the topic or by consulting works based in detailed, justified and recognized methodologies.

3. BIODIVERSITY MINIMUM PERFORMANCE (BMP)

The Biodiversity Minimum Performance (BMP) refers to the minimum score to be achieved in conservation actions by an organization/producer depending on its pressure on biodiversity and its size (turnover).

It is determined from the Biodiversity Pressure Index (BPI) and the turnover (TO) of the organization/producer, through the following equation:

$$\text{BMP} = 50 \times \text{BPI}^{x} \times \text{TO}^{y}$$

Where in:

BMP: Biodiversity Minimum Performance
BPI: Biodiversity Pressure Index
TO: Turnover (dollar)
x, y: calibration factors of BMP

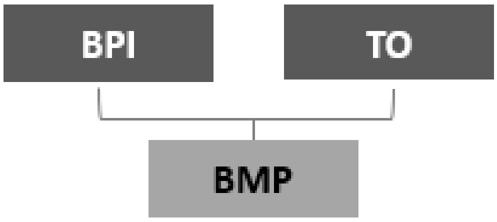
The Turnover of the organization/producer must be converted into dollars, considering the currency conversion rate on the date of December 31 of the base year referring to the calculation of the BPI.

Additional information used to calculate the BMP is available in the Appendix of this document.

Once the BMP is calculated, the organization must evaluate and compare it with its Biodiversity Positive Performance (BPP). Biodiversity Positive Performance (BPP) is related to the score of the organization's Biodiversity and Ecosystem Services Action Plan (BAP). The methodology for scoring BPP can be found on LIFE Technical Guide 02.

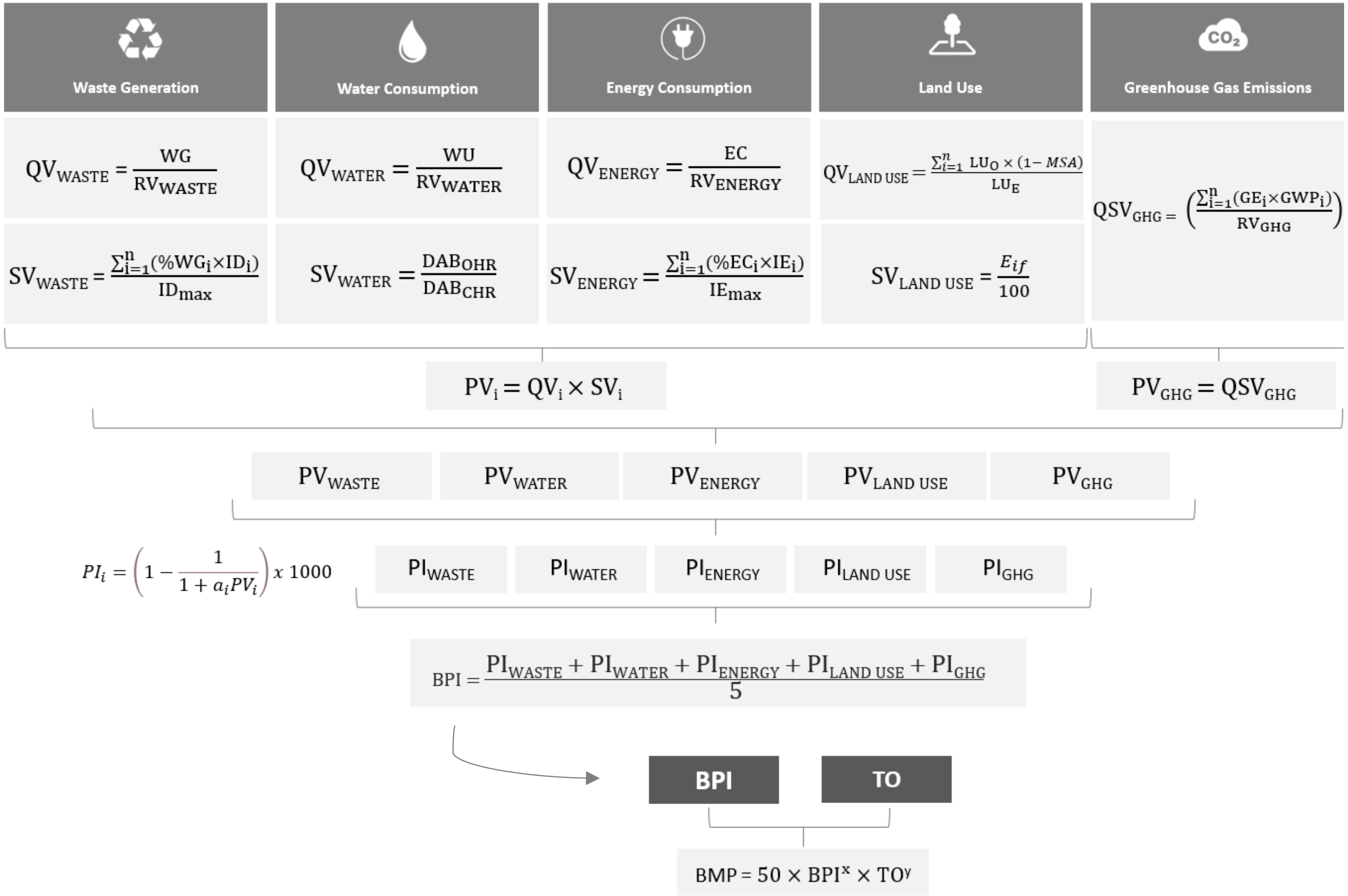
Figure 2 presents a simplified BMP calculation scheme.

Figure 2. BMP calculation scheme



4. FLOWCHARTS TO CALCULATE THE BPI AND THE BMP

Figure 3. Flow charts to calculate the BPI and the BMP



5. GLOSSARY

The terms used in this document are available in the LIFE Glossary.

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7. APPENDIX

1. Factor a_i

Factor a_i is the Correction Factor of distribution scale of the Pressure Indexes. These factors establish a distribution scale for the impacts, assigning higher values to each individual impact (productive unit). The factor is set so that the maximum value observed for the environmental aspect corresponds to a value of 950 on a scale from 0 to 1,000.

The Correction Factors are determined at an international level for the Aspects Waste, Energy and Greenhouse Gases (GHG). For the Aspects Water and Land Use, the correction factors are determined at a continental or national level.

The Correction Factors for the Aspects Waste, Energy and GHG were obtained through the simple average of the references adapted by country (Technical Guides 01 (TG01) for Brazil, Paraguay, Mexico and the European Union). These documents are available on the LIFE Institute website.

The Correction Factors presently used in international level are: **Waste: 59,398 - Energy: 1,341 - Greenhouse Gases: 2,997.**

The correction factor for the Water Aspect was calculated by continent, based on the water availability and demand of each country in the continent.

The Water Aspect Correction Factors applied to each continent are:

CONTINENT	CORRECTION FACTORS (*ai*)
Africa	3,043
America	10,947
Asia	39,673
Europe	2,870
Oceania	3,128

The Correction Factor for the Land Use Aspect was calculated for the Latin American continent, based on the total area of the ecoregions in this continent, and the maximum land occupation value obtained from the adaptation values of the countries Brazil, Mexico, Paraguay and Europe.

The Land Use Aspect Correction Factor applied to each continent is:

CONTINENT	CORRECTION FACTORS (*ai*)
Latin America	4,190

2. Calibration factors of BMP

The factors of equation BMP are the ones that adjust the region's conservation performance according to the current practices of organizations, so that all enterprises seek to achieve the best practices. Current practices of organizations in conservation are researched and assessed by local experts.

Calibration factors of BMP in International: x) 0.42; y) 0.29.

3. Reference Values (RV) for environmental aspects

The Reference Value (RV) represents the whole, in terms of quantity, regional impact in one year.

ASPECT	REFERENCE VALUE (RV)	DOCUMENT	YEAR	BASE YEAR	INFORMATION USED
WASTE	742,120,880.43 t/year	TG01 Brazil 4.0, TG01 Europe 1.0, TG01 Paraguay 3.2 and TG01 México 1.0	2024	Several (see TG documents)	Estimated medium
GASES	1,717,898,916.71 tCO_2e/year	TG01 Brazil 4.0, TG01 Europe 1.0, TG01 Paraguay 3.2 and TG01 México 1.0	2024	Several (see TG documents)	Estimated medium
ENERGY	287,957,672.67 toe/year	TG01 Brazil 4.0, TG01 Europe 1.0, TG01 Paraguay 3.2 and TG01 México 1.0	2024	Several (see TG documents)	Estimated medium
WATER	Europe 221,700,000,000.00 m3/year	SOURCE: AQUASTAT Disclosure System - FAO	2024	2020	Water Demand by country/continent
	Africa 23,110,000,000.00 m^3/year				
	America 845,730,000,000.00 m^3/year				
	Asia 3,065,070,000,000.00 m^3/year				
	Oceania 241,630,000,000.00 m^3/year				

4. References for the calculation of the Severity Value

a) Impact of Destination (ID) of non-hazardous waste generated by the organization

ASPECT	Reduction of the volume of waste to be disposed in a landfill	Reduction of the potential for contamination of the waste	Generation of new products	Energy reuse	Reduction of the consumption of natural resources	Generation of other waste	Area degradation	Generation of liquid effluents / Possibly contaminated water bodies	Generation of pollutant gases	**Sum of the impact**	**Process score**	**Severity Index**
Destination	**Positive Impact**					**Negative Impact**						
Reuse	0	0	0	0	0	0	0	0	0	0	1	**0**
Recycling	0	0	0	0	0	1	0	1	0	2	2	**4**
Composting	0	0	0	1	0	0	0	1	0	2	2	**4**
Landfarming	0	0	0	0	0	0	0	1	1	2	4	**8**
Co-processing	0	0	0	0	0	1	0	1	1	3	3	**9**
Biogas	0	0	0	1	0	0	1	1	1	4	3	**12**
Storage	0	0	1	1	-	0	0	1	0	3	4	**12**
Incineration	0	0	1	0	1	1	-	-	1	4	4	**16**
Landfill with biogas utilization	1	1	0	0	1	1	1	1	1	7	5	**35**
Landfill	1	1	1	1	1	1	1	1	1	9	5	**45**

***The impact score of the disposal of the waste considers positive (+) and negative (-) environmental aspects**					
Positive Impact Score (+)	**0**	Presence of positive impact	**Negative Impact Score (-)**	**0**	Absence of positive impact
	1	Absence of positive impact		**1**	Presence of positive impact
	-	Not Applicable		**-**	Not Applicable
**** The destination process is scored according to the waste management hierarchy adapted and adopted by the LIFE Institute**					
Step in Waste Management	Reuse	Recycling	Energy Recovery (using raw materials)	Energy Recovery (no use of raw materials)	Final waste disposal
Score	1	2	3	4	5

Source: LIFE Institute - 2021

b) Impact of Destination (ID) of hazardous waste generated by the organization

ASPECT	Reduction of the volume of waste to be disposed in a landfill	Reduction of the potential for contamination of the waste	Generation of new products	Energy reuse	Reduction of the consumption of natural resources	Generation of other waste	Area degradation	Generation of liquid effluents / Possibly contaminated water bodies	Generation of pollutant gases	Flammability	Corrosivity	Reactivity	Toxicity	Pathogenicity	**Sum of the impact**	**Process score**	**Severity Index**
Destination	**Positive Impact**					**Negative Impact**											
Reuse	0	0	0	0	0	0	0	0	0	10	10	10	10	10	50	1	**50**
Recycling	0	0	0	0	0	10	0	10	0	10	10	10	10	10	70	2	**140**
Landfarming	0	0	0	0	0	0	0	10	10	10	10	10	10	10	70	3	**210**
Co-processing	0	0	0	0	0	10	0	10	10	10	10	10	10	10	80	3	**240**
Biogas	0	0	0	0	0	0	0	10	10	10	10	10	10	10	70	4	**280**
Storage	0	0	10	10	-	0	0	10	0	10	10	10	10	10	80	4	**320**
Incineration	0	0	10	0	10	10	-	-	10	10	10	10	10	10	90	4	**360**
Landfill with biogas utilization	10	10	0	0	10	10	10	10	10	10	10	10	10	10	120	5	**600**
Landfill	10	10	10	10	10	10	10	10	10	10	10	10	10	10	140	5	**700**

***The impact score of the disposal of the waste considers positive (+) and negative (-) environmental aspects**					
Positive Impact Score (+)	**0**	Presence of positive impact	**Negative Impact Score (-)**	**0**	Absence of positive impact
	10	Absence of positive impact		**10**	Presence of positive impact
	-	Not Applicable		-	Not Applicable

**** The destination process is scored according to the waste management hierarchy adapted and adopted by the LIFE Institute**					
Step in Waste Management	Reuse	Recycling	Energy Recovery (using raw materials)	Energy Recovery (no use of raw materials)	Final waste disposal
Score	1	2	3	4	5

Source: LIFE Institute - 2021

c) Demand-Availability Balance (DAB) by continent

AFRICA

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Congo	832.00	0.09	0.00011
Democratic Republic of the Congo	1283.00	0.68	0.00053
Liberia	232.00	0.15	0.00063
Equatorial Guinea	26.00	0.02	0.00076
Gabon	166.00	0.14	0.00084
Sierra Leone	160.00	0.21	0.00133
Cameroon	283.15	1.09	0.00384
Guinea	226.00	0.89	0.00394
Angola	148.40	0.71	0.00476
Guinea-Bissau	31.40	0.19	0.00605
Mozambique	217.10	1.47	0.00678
Namibia	39.91	0.29	0.00722
Comoros	1.20	0.01	0.00833
Benin	26.39	0.23	0.00887
Uganda	60.10	0.64	0.01060
Gambia	8.00	0.10	0.01270
South Sudan	49.50	0.66	0.01329
Côte d'Ivoire	84.14	1.16	0.01381
Lesotho	3.02	0.04	0.01449
Zambia	104.80	1.57	0.01500
Togo	14.70	0.22	0.01517
Botswana	12.24	0.22	0.01801
Sao Tome and Principe	2.18	0.04	0.01876
Chad	45.70	0.88	0.01925
Burundi	12.54	0.28	0.02234
Ghana	56.20	1.46	0.02606
Madagascar	337.00	13.56	0.04023
Mali	120.00	5.19	0.04322
Nigeria	286.20	12.48	0.04359
Rwanda	13.30	0.60	0.04515
United Republic of Tanzania	96.27	5.18	0.05385
Burkina Faso	13.50	0.82	0.06059
Djibouti	0.30	0.02	0.06333
Niger	34.05	2.58	0.07587
Senegal	38.97	3.02	0.07752
Malawi	17.28	1.36	0.07852
Eritrea	7.32	0.58	0.07956
Ethiopia	122.00	10.55	0.08646

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Kenya	30.70	4.03	0.13134
Timor-Leste	8.22	1.17	0.14267
Mauritius	2.75	0.61	0.22101
Somalia	14.70	3.30	0.22435
Eswatini	4.51	1.07	0.23681
Zimbabwe	20.00	4.91	0.24548
Morocco	29.00	10.43	0.35969
South Africa	51.35	19.19	0.37369
Sudan	37.80	26.94	0.71257
Algeria	11.67	10.46	0.89672
Cabo Verde	0.30	0.29	0.97659
Egypt	57.50	77.50	1.34783
Libya	0.70	5.83	8.32857

Source: LIFE Institute - 2024

AMERICA

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Bolivia	574.00	2.21	0.00385
Belize	21.73	0.10	0.00465
Guyana	271.00	1.44	0.00533
Suriname	99.00	0.62	0.00622
Nicaragua	164.52	1.27	0.00775
Panama	139.30	1.21	0.00870
Colombia	2360.00	25.87	0.01096
Canada	2902.00	33.75	0.01163
Venezuela	1325.00	22.63	0.01708
Honduras	92.16	1.61	0.01744
Peru	1879.80	38.55	0.02051
Uruguay	172.20	3.66	0.02125
Ecuador	442.40	9.92	0.02242
Guatemala	127.91	3.32	0.02599
Costa Rica	113.00	3.14	0.02777
Chile	923.06	32.37	0.03507
El Salvador	26.27	0.96	0.03662
Argentina	876.24	37.78	0.04312
Jamaica	10.82	0.53	0.04871
Grenada	0.20	0.01	0.07050
Saint Vincent and the Grenadines	0.10	0.01	0.08502

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Trinidad and Tobago	3.84	0.38	0.09979
Dominica	0.20	0.02	0.10000
Haiti	14.02	1.45	0.10341
Saint Lucia	0.30	0.04	0.14300
United States of America	3069.00	444.29	0.14477
Cuba	38.12	6.96	0.18256
Antigua and Barbuda	0.05	0.01	0.22115
Dominican Republic	23.50	9.08	0.38629
Puerto Rico	7.10	3.27	0.46120
Saint Kitts and Nevis	0.02	0.02	0.65000
Barbados	0.08	0.08	1.01250

Source: LIFE Institute - 2024

The values of Demand-Availability Balance (DAB) for **Brazil, Mexico and Paraguay** can be found in their specific Technical Guides.

ASIA

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Bhutan	78.00	0.34	0.00433
Cambodia	476.10	2.18	0.00459
Malaysia	580.00	5.49	0.00946
Brunei Darussalam	8.50	0.09	0.01082
Mongolia	34.80	0.46	0.01329
Russian Federation	4525.45	64.82	0.01432
Lao People's Democratic Republic	333.50	7.35	0.02204
Belarus	57.90	1.33	0.02295
Myanmar	1167.80	33.39	0.02859
Bangladesh	1227.03	35.87	0.02923
Nepal	210.20	9.50	0.04518
Viet Nam	884.12	82.03	0.09278
Democratic People's Republic of Korea	77.15	8.66	0.11222
Mauritania	11.40	1.35	0.11844
Thailand	438.61	57.31	0.13065
Japan	430.00	78.30	0.18209
Philippines	479.00	87.48	0.18262
Maldives	0.03	0.01	0.19667
China	2840.22	581.29	0.20466
China	2840.22	602.12	0.21200

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Kazakhstan	108.41	24.56	0.22658
Sri Lanka	52.80	12.95	0.24519
Türkiye	211.60	62.08	0.29336
Afghanistan	65.33	20.37	0.31185
Kyrgyzstan	23.62	7.66	0.32433
Azerbaijan	34.68	12.20	0.35195
Armenia	7.77	2.83	0.36414
Republic of Korea	69.70	27.08	0.38855
India	1910.90	761.00	0.39824
Lebanon	4.50	1.84	0.40862
Tajikistan	21.91	9.90	0.45185
Iraq	89.86	45.04	0.50125
Palestine	0.84	0.45	0.53572
Iran (Islamic Republic of)	137.05	93.30	0.68080
Pakistan	246.80	183.45	0.74331
Tunisia	4.62	3.59	0.77733
Syrian Arab Republic	16.80	16.76	0.99752
Uzbekistan	48.87	51.22	1.04800
Turkmenistan	24.77	26.24	1.05975
Singapore	0.60	0.66	1.10000
Jordan	0.94	1.10	1.17915
Israel	1.78	2.40	1.34831
Oman	1.40	1.92	1.36786
Yemen	2.10	3.57	1.69762
Bahrain	0.12	0.43	3.74483
Saudi Arabia	2.40	25.99	10.83000
Qatar	0.06	0.88	15.23318
United Arab Emirates	0.15	4.98	33.20875
Kuwait	0.02	1.25	62.50000

Source: LIFE Institute - 2024

EUROPE

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Iceland	170.00	0.28	0.00164
Norway	393.00	2.68	0.00683
Albania	30.20	0.79	0.02603
Georgia	63.33	1.65	0.02611
Switzerland	53.50	1.74	0.03256
Serbia	162.20	5.32	0.03283

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Ukraine	175.28	9.87	0.05631
United Kingdom of Great Britain and Northern Ireland	147.00	8.42	0.05728
Republic of Moldova	12.27	0.80	0.06520
North Macedonia	6.40	0.70	0.10970

Source: LIFE Institute - 2024

The values of Demand-Availability Balance (DAB) for European Union countries can be found in their specific Technical Guide.

OCEANIA

Country	Water availability in the region (10^9 m³/year)	Water demand in the region (10^9 m³/year)	Demand-Availability Balance (DAB)
Papua New Guinea	801.00	0.39	0.00049
Fiji	28.55	0.08	0.00297
New Zealand	327.00	4.89	0.01495
Australia	492.00	13.63	0.02770
Indonesia	2018.70	222.64	0.11029

Source: LIFE Institute - 2024

d) Severity Value for Water by continent

AFRICA

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Congo	0.000013
Democratic Republic of the Congo	0.000064
Liberia	0.000076
Equatorial Guinea	0.000091
Gabon	0.000101
Sierra Leone	0.000159
Cameroon	0.000462
Guinea	0.000473
Angola	0.000571
Guinea-Bissau	0.000727
Mozambique	0.000815

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Namibia	0.000866
Comoros	0.001001
Benin	0.001065
Uganda	0.001273
Gambia	0.001525
South Sudan	0.001596
Côte d'Ivoire	0.001658
Lesotho	0.001740
Zambia	0.001801
Togo	0.001821
Botswana	0.002162
Sao Tome and Principe	0.002253
Chad	0.002311
Burundi	0.002683
Ghana	0.003129
Madagascar	0.004830
Mali	0.005189
Nigeria	0.005234
Rwanda	0.005421
United Republic of Tanzania	0.006466
Burkina Faso	0.007275
Djibouti	0.007604
Niger	0.009109
Senegal	0.009308
Malawi	0.009428
Eritrea	0.009553
Ethiopia	0.010381
Kenya	0.015769
Timor-Leste	0.017130
Mauritius	0.026536
Somalia	0.026938
Eswatini	0.028433
Zimbabwe	0.029475
Morocco	0.043187
South Africa	0.044868
Sudan	0.085557
Algeria	0.107668
Cabo Verde	0.117258
Egypt	0.161832
Libya	1.000000

Source: LIFE Institute - 2024

AMERICA

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Bolivia	0.003801
Belize	0.004590
Guyana	0.005265
Suriname	0.006144
Nicaragua	0.007652
Panama	0.008589
Colombia	0.010828
Canada	0.011487
Venezuela	0.016866
Honduras	0.017221
Peru	0.020254
Uruguay	0.020992
Ecuador	0.022142
Guatemala	0.025667
Costa Rica	0.027428
Chile	0.034635
El Salvador	0.036163
Argentina	0.042584
Jamaica	0.048111
Grenada	0.069630
Saint Vincent and the Grenadines	0.083970
Trinidad and Tobago	0.098560
Dominica	0.098765
Haiti	0.102132
Saint Lucia	0.141235
United States of America	0.142980
Cuba	0.180301
Antigua and Barbuda	0.218424
Dominican Republic	0.381525
Puerto Rico	0.455503
Saint Kitts and Nevis	0.641975
Barbados	1.000000

Source: LIFE Institute - 2024

The Severity Value of Water for **Brazil, Mexico and Paraguay** can be found in their specific Technical Guides.

ASIA

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Bhutan	0.000069
Cambodia	0.000073
Malaysia	0.000151
Brunei Darussalam	0.000173
Mongolia	0.000213
Russian Federation	0.000229
Lao People's Democratic Republic	0.000353
Belarus	0.000367
Myanmar	0.000457
Bangladesh	0.000468
Nepal	0.000723
Viet Nam	0.001485
Democratic People's Republic of Korea	0.001796
Mauritania	0.001895
Thailand	0.002090
Japan	0.002913
Philippines	0.002922
Maldives	0.003147
China	0.003275
China	0.003392
Kazakhstan	0.003625
Sri Lanka	0.003923
Türkiye	0.004694
Afghanistan	0.004990
Kyrgyzstan	0.005189
Azerbaijan	0.005631
Armenia	0.005826
Republic of Korea	0.006217
India	0.006372
Lebanon	0.006538
Tajikistan	0.007230
Iraq	0.008020
Palestine	0.008572
Iran (Islamic Republic of)	0.010893
Pakistan	0.011893
Tunisia	0.012437
Syrian Arab Republic	0.015960
Uzbekistan	0.016768
Turkmenistan	0.016956
Singapore	0.017600
Jordan	0.018866
Israel	0.021573

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Oman	0.021886
Yemen	0.027162
Bahrain	0.059917
Saudi Arabia	0.173280
Qatar	0.243731
United Arab Emirates	0.531340
Kuwait	1.000000

Source: LIFE Institute - 2024

EUROPE

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Iceland	0.001309213
Norway	0.005463340
Albania	0.020814296
Georgia	0.020883275
Switzerland	0.026036981
Serbia	0.026252707
Ukraine	0.045033003
United Kingdom of Great Britain and Northern Ireland	0.045807952
Republic of Moldova	0.052142463
North Macedonia	0.087731510

Source: LIFE Institute – 2024

The Severity Value of Water for **European Union countries** can be found in their specific Technical Guide.

OCEANIA

Country	$SV_{WATER} = DAB_{OHR} / DAB_{CHR}$
Papua New Guinea	0.004439
Fiji	0.026964
New Zealand	0.135584
Australia	0.251194
Indonesia	1.000000

Source: LIFE Institute - 2024

e) Impact of Electric Grid

For this item, the average composition of the energy GRIDS from the 27 European countries, Brazil, and Mexico was calculated, resulting in an average **International Electric Grid Impact of 70.86**.

f) Impact of energy sources used by the organization (IE)

IMPACT													
COMPONENT	WATER		AIR			SOIL					BIOTA		IMPACT OF ENERGY SOURCE (IE)
ENVIRONMENTAL FACTOR	Water use and / or consumption	Generation of effluents	Emissions of greenhouse gases	Atmospheric emissions	Noise emissions	Movement of soil			Land use	Generation of solid waste	Occupation of areas	Generation of effluents and solid residues; atmospheric emissions	
POTENTIAL IMPACT	Change in water availability	Change in water quality	Contribution to increased climate warming	Change in air quality	Change in noise levels	Intensification of silting processes	Intensification of erosive processes	Generation of induced earthquakes	Changes in landscape and land use	Change in soil quality	Habitat change and / or reduction	Structural and / or functional change of ecosystems	
ENERGY SOURCE													
Biofuels (Ethanol)	9	5	2	5	1	2	5	n.s	9	1	5	3	**47**
Biofuel (Oils and Biodiesel)	9	5	2	5	1	2	5	n.s	5	5	5	3	**47**
Biogas	2	1	3	3	1	n.s	n.s	n.s	2	1	n.s	n.s	**13**
Biomass (wood)	3	1	9	7	3	2	2	n.s	7	3	9	3	**49**
Biomass (residual)	1	1	3	5	1	1	1	n.s	5	3	1	3	**25**
Mineral Coal	9	8	10	10	7	9	9	9	10	10	10	9	**110**
Sea Energy	n.s	n.s	n.s	n.s	2	n.s	n.s	n.s	1	n.s	5	1	**9**
Wind	n.s	n.s	n.s	n.s	6	n.s	1	n.s	9	n.s	2	n.s	**18**
Natural Gas	9	7	9	7	7	4	4	9	9	5	8	6	**84**
Geothermal	1	6	1	2	4	1	1	9	9	5	5	1	**45**
Hydroelectricity	9	1	1	3	3	10	9	2	10	1	9	1	**59**
Non-renewable residual	1	5	10	7	5	1	1	n.s	5	n.s	2	1	**38**
Nuclear	10	6	1	3	7	9	9	9	10	10	9	5	**88**
Petroleum and byproducts	9	8	10	10	7	4	4	9	9	8	4	6	**88**
Solar	5	1	1	n.s	1	1	1	n.s	6	6	5	5	**32**

n.s = not significant

g) Land use (Mean Species Abundance - MSA adaptation)

MSA	Classes of Soil Use
1.0	• Areas permanently covered with snow or ice considered as undisturbed areas. • Areas permanently without vegetation (for example, deserts, high alpine areas). • Minimal disturbance, where flora and fauna species abundance are near pristine. • Grassland or scrubland-dominated vegetation (for example, steppe, tundra, or savannah).
0.7	• Forests with extractive use and associated disturbance like hunting and selective logging, where timber extraction is followed by a long period of re-growth with naturally occurring tree species. • Grasslands where wildlife is replaced by grazing livestock.
0.5	• Areas originally covered with forest or woodlands, where vegetation has been removed, forest is re-growing or has a different cover and is no longer in use. • Agricultural production intercropped with (native) trees. Trees are kept for shade or as wind shelter.
0.3	• Subsistence and traditional farming, extensive farming, and low external input agriculture.
0.2	• Planted forest often with exotic species.
0.1	• Forests and woodlands that have been converted to grasslands for livestock grazing. • High external input agriculture, conventional agriculture, mostly with a degree of regional specialization, irrigation-based agriculture, drainage-based agriculture.
0.05	• Areas more than 80% built up.

Source: Globio 3 – 2009 (Adapted)

Note: Native and conventional squares and gardens, as well as artificial dams, must be considered in the class "Areas more than 80% built up".

h) Ecoregions of Continent/Country

LATIN AMERICA (All countries in Central and South America, except those that are colonies of other countries, including islands).

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
ANTIGUA AND BARBUDA	Leeward Islands moist forests	2,888	2,521	87.30
	Caribbean shrublands	34,570	7,157	20.70
	Lesser Antillean dry forests	7,687	1,249	16.20
ARGENTINA	Rock and Ice	472,205	466,714	98.80
	Valdivian temperate forests	7,763,342	2,449,667	31.60
	Central Andean dry puna	59,964,754	1,830,984	3.10
	Central Andean puna	7,781,117	4,024,444	51.70
	Paraná flooded savanna	3,601,688	1,398,617	38.80
	Southern Andean steppe	10,587,732	3,818,471	36.10
	Magellanic subpolar forests	5,041,716	1,812,855	36.00
	Southern Andean Yungas	62,469,425	3,246,899	5.20
	Alto Paraná Atlantic forests	12,826,333	4,308,556	33.60
	Araucaria moist forests	5,756,884	1,567,390	27.20
	High Monte	108,534,456	8,881,759	8.20
	Humid Chaco	2,827,478	475,877	16.80
	Patagonian steppe	574,929	90,473	15.70
	Low Monte	15,215,781	2,188,625	14.40
	Dry Chaco	20,600,917	2,055,349	10.00
	Uruguayan savanna	29,951	924	3.10
	Humid Pampas	57,468,930	3,985,125	6.90
	Espinal	43,732,022	756,122	1.70
	Southern Cone Mesopotamian savanna	3,466,527	59,357	1.70
BARBADOS	Caribbean shrublands	44,207	815	1.80

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
BELIZE	Central American Atlantic moist forests	72	72	100.00
	Petén-Veracruz moist forests	1,812,601	739,767	40.80
	Belizian pine forests	308,122	97,921	31.80
	Mesoamerican Gulf-Caribbean mangroves	243,563	71,106	29.20
	Yucatán moist forests	1,195	149	12.40
BOLIVIA	Cerrado	629,802	471,008	74.79
	Bolivian Yungas	9,234,642	5,169,449	55.98
	Pantanal	3,526,745	1,944,209	55.13
	Madeira-Tapajós moist forests	6,272,820	2,550,658	40.66
	Dry Chaco	13,769,900	4,918,848	35.72
	Chiquitano dry forests	17,862,753	4,239,500	23.73
	Southern Andean Yungas	3,154,472	593,390	18.81
	Central Andean wet puna	1,940,336	341,539	17.60
	Beni savanna	13,286,031	2,111,720	15.89
	Southwest Amazon moist forests	17,900,059	2,792,270	15.60
	Bolivian montane dry forests	8,118,080	1,153,598	14.21
	Central Andean puna	6,335,460	660,307	10.42
	Central Andean dry puna	16,013,181	1,180,444	7.37
	Monte Alegre varzeá	13	0.1	0.01
	Purus-Madeira moist forests	393	0.1	0.01
	Lake	311,973	16.0	0.79
	Iquitos varzeá	1,851	0.1	0.03
CHILE	Rock and Ice	4,106,550	4,106,550	100.00
	Juan Fernández Islands temperate forests	20,991	20,991	100.00
	San Félix-San Ambrosio Islands temperate forests	97	97	100.00
	Magellanic subpolar forests	31,512,639	24,402,922	77.40

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Rapa Nui subtropical broadleaf forests	19,988	8,418	42.10
	Valdivian temperate forests	35,075,086	13,896,525	39.60
	Patagonian steppe	7,133,986	1,463,942	20.50
	Central Andean dry puna	9,724,647	1,115,802	11.50
	Southern Andean steppe	4,057,957	215,462	5.30
	Sechura desert	157,942	5,189	3.30
	Chilean matorral	20,394,795	653,300	3.20
	Atacama desert	12,245,261	192,463	1.60
	Central Andean puna	101,085	6.0	0.01
COLOMBIA	Malpelo Island xeric scrub	768	768	100.00
	Santa Marta páramo	128,204	125,123	97.60
	Guianan piedmont and lowland moist forests	1,851	1,504	81.24
	Santa Marta montane forests	493,175	366,110	74.24
	Amazon-Orinoco-Southern Caribbean mangroves	332,540	227,852	68.52
	Venezuelan Andes montane forests	3,970	2,670	67.25
	Iquitos varzeá	24,122	14,287	59.23
	Central American dry forests	357	209	58.55
	Northern Andean páramo	1,432,333	773,319	53.99
	Eastern Panamanian montane forests	85,031	43,508	51.17
	Sinú Valley dry forests	2,561,107	1,206,373	47.10
	South American Pacific mangroves	551,580	256,959	46.59
	Cordillera Oriental montane forests	5,940,573	2,691,924	45.31
	Magdalena-Urabá moist forests	7,794,226	3,465,908	44.47
	Caqueta moist forests	17,056,756	7,235,893	42.42

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Cayos Miskitos-San Andrés and Providencia moist forests	5,152	1,772	34.40
	Magdalena Valley montane forests	10,554,814	3,263,363	30.92
	Apure-Villavicencio dry forests	2,466,781	730,791	29.63
	Purus varzeá	3,000,834	886,746	29.55
	Catatumbo moist forests	684,438	196,875	28.76
	Guajira-Barranquilla xeric scrub	2,859,966	762,088	26.65
	Cauca Valley montane forests	3,212,988	843,174	26.24
	Northwestern Andean montane forests	4,921,440	1,267,500	25.75
	Eastern Cordillera real montane forests	1,082,376	275,062	25.41
	Japurá-Solimoes-Negro moist forests	3,475,679	789,707	22.72
	Rio Negro campinarana	322,759	70,301	21.78
	Solimões-Japurá moist forests	7,240,607	1,534,505	21.19
	Patía Valley dry forests	226,033	43,856	19.40
	Llanos	15,373,600	2,608,460	16.97
	Napo moist forests	3,950,584	530,386	13.43
	Magdalena Valley dry forests	1,961,791	242,855	12.38
	Cauca Valley dry forests	735,767	68,272	9.28
	Chocó-Darién moist forests	6,013,797	510,851	8.49
	Negro-Branco moist forests	9,726,830	666,630	6.85
	Western Ecuador moist forests	238,500	3,851	1.61
	Southwest Amazon moist forests	374	0.1	0.03
COSTA RICA	Talamancan montane forests	1,193,746	1,193,746	100.00

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Cocos Island moist forests	2,497	2,497	100.00
	Mesoamerican Gulf-Caribbean mangroves	31,171	28,079	90.08
	Isthmian-Atlantic moist forests	1,715,757	1,299,246	75.72
	Isthmian-Pacific moist forests	923,022	426,924	46.25
	Costa Rican seasonal moist forests	873,733	368,343	42.16
	Southern Mesoamerican Pacific mangroves	82,040	28,072	34.22
	Central American dry forests	627,980	106,611	16.98
CUBA	Bahamian-Antillean mangroves	813.125	548,053	67.40
	Cuban wetlands	656,017	424,112	64.65
	Cuban cactus scrub	351,229	105,045	29.91
	Cuban moist forests	2,437,730	577,956	23.71
	Cuban pine forests	738,679	67,338	9.12
	Cuban dry forests	7,552,592	528,479	7.00
DOMINICA	Windward Islands moist forests	61,191	17,112	28.00
	Caribbean shrublands	15,083	618	4.10
DOMINICAN REPUBLIC	Enriquillo wetlands	46,553	43,295	93.00
	Hispaniolan pine forests	926,321	463,610	50.05
	Bahamian-Antillean mangroves	125,766	55,361	44.02
	Hispaniolan dry forests	1,061,007	364,115	34.32
	Hispaniolan moist forests	3,191,018	450,204	14.11
ECUADOR	Galápagos Islands scrubland mosaic	796,962	796,962	100.00
	Chocó-Darién moist forests	1,452	1,452	100.00
	Cordillera Central páramo	45,137	35,580	78.83
	Northern Andean páramo	1,530,109	577,204	37.72

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Napo moist forests	7,078,126	2,133,127	30.14
	Eastern Cordillera real montane forests	6,586,980	1,666,248	25.30
	South American Pacific mangroves	504,740	108,105	21.42
	Northwestern Andean montane forests	3,182,983	386,042	12.13
	Western Ecuador moist forests	3,150,009	142,781	4.53
	Tumbes-Piura dry forests	297,814	12,738	4.28
	Ecuadorian dry forests	2,105,547	56,053	2.66
	Guayaquil flooded grasslands	292,426	5,868	2.01
	Iquitos varzeá	412	0.1	0.02
EL SALVADOR	Southern Mesoamerican Pacific mangroves	79,517	76,831	96.62
	Central American montane forests	101,666	51,468	50.62
	Central American dry forests	868,362	146,613	16.88
	Central American pine-oak forests	1,133,153	166,520	14.70
	Sierra Madre de Chiapas moist forests	6,291	479	7.61
GRENADA	Caribbean shrublands	2,314	1,119	48.30
	Lesser Antillean dry forests	6,420	1,699	26.50
	Windward Islands moist forests	23,195	5,148	22.20
GUATEMALA	Yucatán moist forests	12,910	12,910	100.00
	Mesoamerican Gulf-Caribbean mangroves	39,424	34,665	87.93
	Petén-Veracruz moist forests	5,202,091	2,881,074	55.38
	Central American montane forests	637,535	261,882	41.08

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Central American Atlantic moist forests	911,520	223,598	24.53
	Motagua Valley thornscrub	249,097	49,123	19.72
	Southern Mesoamerican Pacific mangroves	118,544	18,348	15.48
	Central American pine-oak forests	3,144,082	226,775	7.21
	Central American dry forests	703,492	8,872	1.26
	Sierra Madre de Chiapas moist forests	611,248	4,648	0.76
	Chiapas Depression dry forests	95,535	255	0.27
	Chiapas montane forests	21,223	2.0	0.01
GUYANA	Amazon-Orinoco-Southern Caribbean mangroves	62,553	45,087	72.08
	Guianan Highlands moist forests	2,671,110	419,510	15.71
	Guianan moist forests	16,599,547	1,294,606	7.80
	Orinoco Delta swamp forests	395,157	20,454	5.18
	Uatuma-Trombetas moist forests	36,483	813	2.23
	Guianan savanna	1,356,201	7,346	0.54
	Guianan piedmont and lowland moist forests	13,414	0.7	0.01
	Pantepui	122,521	7.0	0.01
HAITI	Enriquillo wetlands	22,988	22,045	95.90
	Bahamian-Antillean mangroves	64,729	11,297	17.45
	Hispaniolan pine forests	361,984	36,364	10.05
	Hispaniolan moist forests	1,894,973	147,118	7.76
	Hispaniolan dry forests	647,119	43,278	6.69
HONDURAS	Cuban dry forests	309	309	100.00

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Mesoamerican Gulf-Caribbean mangroves	237,840	154,020	64.76
	Southern Mesoamerican Pacific mangroves	82,084	51,456	62.69
	Central American Atlantic moist forests	3,605,644	1,885,115	52.28
	Central American montane forests	578,551	274,359	47.42
	Miskito pine forests	671,732	206,821	30.79
	Central American pine-oak forests	4,736,826	725,628	15.32
	Central American dry forests	2,025,519	87,721	4.33
JAMAICA	Bahamian-Antillean mangroves	44,432	24,352	54.80
	Jamaican dry forests	245,148	70,967	28.90
	Jamaican moist forests	913,532	148,045	16.20
NICARAGUA	Cayos Miskitos-San Andrés and Providencia moist forests	3,935	3,671	93.28
	Isthmian-Atlantic moist forests	1,932,831	1,391,235	71.98
	Southern Mesoamerican Pacific mangroves	95,575	68,736	71.92
	Mesoamerican Gulf-Caribbean mangroves	343,571	234,760	68.33
	Central American montane forests	96,215	58,275	60.57
	Central American Atlantic moist forests	4,981,716	2,321,125	46.59
	Lake	830,308	234,540	28.25
	Costa Rican seasonal moist forests	219,325	46,303	21.11
	Miskito pine forests	1,268,224	259,219	20.44
	Central American pine-oak forests	1,102,423	151,730	13.76
	Central American dry forests	2,544,389	290,383	11.41

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
PANAMA	Eastern Panamanian montane forests	223,732	194,112	86.76
	Talamancan montane forests	730,765	603,107	82.53
	Chocó-Darién moist forests	1,376,600	704,210	51.16
	Mesoamerican Gulf-Caribbean mangroves	48,369	19,893	41.13
	South American Pacific mangroves	189,955	66,324	34.92
	Isthmian-Atlantic moist forests	2,349,565	819,942	34.90
	Southern Mesoamerican Pacific mangroves	105,111	33,299	31.68
	Isthmian-Pacific moist forests	2,019,634	142,961	7.08
	Panamanian dry forests	515,902	11,993	2.32
PERU	Lake	550,394	545,287	99.07
	Southwest Amazon moist forests	26,803,368	8,347,449	31.14
	Solimões-Japurá moist forests	5,854,447	1,670,954	28.54
	Bolivian Yungas	491,219	138,945	28.29
	Iquitos varzeá	8,385,843	2,137,975	25.50
	Napo moist forests	14,052,260	3,255,124	23.16
	Ucayali moist forests	11,638,903	2,449,259	21.04
	Eastern Cordillera real montane forests	2,560,994	488,151	19.06
	Peruvian Yungas	19,281,889	3,127,607	16.22
	Central Andean puna	7,242,050	1,138,635	15.72
	Central Andean wet puna	10,417,294	1,609,558	15.45
	Cordillera Central páramo	1,186,636	160,173	13.50
	South American Pacific mangroves	33,168	4,250	12.81
	Tumbes-Piura dry forests	3,840,744	290,801	7.57
	Purus varzeá	291,493	20,685	7.10
	Marañón dry forests	1,145,042	77,227	6.74
	Sechura desert	19,224,801	857,571	4.46

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Central Andean dry puna	13,476	0.7	0.01
PUERTO RICO	Bahamian-Antillean mangroves	23,536	4,987	21.20
	Puerto Rican dry forests	134,993	18,979	14.10
	Puerto Rican moist forests	823,258	46,079	5.60
SAINT KITTS AND NEVIS	Leeward Islands moist forests	6,942	5,236	75.40
	Caribbean shrublands	1,465	380	25.90
	Bahamian-Antillean mangroves	19,782	4,009	20.30
SAINT LUCIA	Windward Islands moist forests	34,122	14,574	42.70
	Lesser Antillean dry forests	25,853	10,804	41.80
	Caribbean shrublands	1,915	490	25.60
SAINT VINCENT AND THE GRENADINES	Bahamian-Antillean mangroves	14,032	7,296	51.99
	Windward Islands moist forests	18,934	7,854	41.48
	Caribbean shrublands	3,940	233	5.91
	Lesser Antillean dry forests	5,175	24	0.47
SURINAME	Guianan savanna	54,088	54,088	100.00
	Pantepui	31,814	31,814	100.00
	Uatuma-Trombetas moist forests	13,689	10,629	77.65
	Amazon-Orinoco-Southern Caribbean mangroves	414,683	282,251	68.06
	Guianan Highlands moist forests	214,723	53,271	24.81
	Guianan moist forests	13,025,491	1,769,140	13.58
	Guianan freshwater swamp forests	774,494	92,215	11.91
TRINIDAD AND TOBAGO	Trinidad and Tobago moist forests	475,682	148,060	31.10

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Amazon-Orinoco-Southern Caribbean mangroves	17,926	2,794	15.60
	Lesser Antillean dry forests	25,684	1,498	5.80
URUGUAY	Atlantic Coast restingas	847	847	100.00
	Humid Pampas	10,916	7,434	68.10
	Uruguayan savanna	25,057,507	2,142,217	8.50
	Southern Cone Mesopotamian savanna	192	0.1	0.05
	Espinal	16,111	0.9	0.01
VENEZUELA	Catatumbo moist forests	1,645,817	1,645,817	100.00
	Cordillera de Merida páramo	286,006	268,227	93.78
	Guianan savanna	1,301,193	1,201,635	92.35
	Northern Andean páramo	28,565	26,327	92.16
	Pantepui	4,434,356	4,084,806	92.12
	Cordillera Oriental montane forests	897,936	822,659	91.62
	Guianan Highlands moist forests	9,019,310	7,981,402	88.49
	Amazon-Orinoco-Southern Caribbean mangroves	1,153,619	979,085	84.87
	Cordillera La Costa montane forests	1,471,320	1,240,913	84.34
	Maracaibo dry forests	3,094,077	2,533,805	81.89
	Guajira-Barranquilla xeric scrub	378,658	302,192	79.81
	Guianan piedmont and lowland moist forests	14,590,319	11,158,528	76.48
	Guianan moist forests	3,270,472	2,302,236	70.39
	Venezuelan Andes montane forests	2,989,051	1,886,908	63.13
	Negro-Branco moist forests	5,534,290	3,470,634	62.71

Country	Ecoregion	Original land use (ha)	Overlapping of land use conservation priority database (ha)	Ecoregion Importance Factor(E_{if})
	Orinoco Delta swamp forests	2,467,136	1,537,099	62.30
	Orinoco wetlands	612,755	362,013	59.08
	La Costa xeric shrublands	7,006,495	2,544,979	36.32
	Rio Negro campinarana	1,248,570	419,774	33.62
	Lara-Falcón dry forests	1,746,656	575,368	32.94
	Apure-Villavicencio dry forests	4,458,522	1,442,663	32.36
	Paraguana xeric scrub	1,640,338	528,006	32.19
	Llanos	22,712,956	5,172,205	22.77
	Araya and Paria xeric scrub	526,401	68,869	13.08
	Japurá-Solimoes-Negro moist forests	3,707	0.2	0.01

Source: LIFE Institute, 2025. Ecoregion Importance Factor calculed through the overlaping of the Terrestrial Ecoregions of the World by WWF (World Wildlife Fund for Nature) and of 3 conservation priority area by UNEP-WCMC (UN Environment Programme World Conservation Monitoring Centre).

The Ecoregion Importance Factor for **Brazil, Mexico and Paraguay** can be found in their specific Technical Guides.

i) Greenhouse Gases and their global warming potential (GWP) for a period of 100 years

Gas	Chemical formula	GWP
Carbon Dioxide	CO_2	1
Methane	CH_4	28
Nitrous Oxide	N_2O	265
Hydrofluorocarbon (HFC)		
HFC-125	C_2HF_5	3,170
HFC-134a	$C_2H_2F_4$ (CH_2FCF_3)	1,300
HFC-143a	$C_2H_3F_3$ (CF_3CH_3)	4,800
HFC-152a	$C_2H_4F_2$ (CH_3CHF_2)	138
Perfluorocarbons (PFC)		
Perfluoromethane (tetrafluoroethane)	CF_4	6,630
Perfluorethane (Hexafluoroethane)	C_2F_6	11,100
Sulfur hexafluoride	SF_6	23,500

Source: IPCC Fifth Assessment Report, 2014 (AR5). (Adapted)

5. Factors for Unit Conversation:

a) Relations between Units

Exponential	Equivalence	Practical relations
(k) kilogram = 10^3	1 m^3 = 6.28981 barrels	
(M) mega = 10^6	1 barrel = 0.158987 m^3	1 toe year = 7.2 boe year
(G) giga = 10^9	1 joule = 0.239 cal	1 boe year = 0.14 toe year
(T) tera = 10^{12}	1 Btu = 252 cal	1 toe year = 0.02 boe day
(P) peta = 10^{15}	1 m^3 of oil = 0.872 t (in 1994)	1 boe day = 50 toe year
(E) exa = 10^{18}	1 toe = 10,000 Mcal	

Source: 2016 Unit converter and glossary – Internacional Energy Agency (IEA)

b) Coefficients of Caloric Equivalence

Multiplied by from → to		(m^3)	(1,000 m^3)	(t)	(m^3)	(t)	(t)
		Fuel oil	Dry natural gas	Mineral Coal 5,200	LPG	Firewood	Charcoal
Mineral Coal 5,200	(t)	0.52	0.56	1.00	0.80	1.58	0.76
Charcoal	(t)	0.67	0.73	1.31	1.05	2.06	1.00
Dry natural gas	(1,000 m^3)	0.92	1.00	1.78	1.43	2.80	1.36
LPG	(m^3)	0.64	0.70	1.25	1.00	1.97	0.95

Multiplied by from → to		(m^3) Fuel oil	(1,000 m^3) Dry natural gas	(t) Mineral Coal 5,200	(m^3) LPG	(t) Firewood	(t) Charcoal
Firewood	(t)	0.33	0.36	0.63	0.51	1.00	0.49
Fuel oil	(m^3)	1.00	1.09	1.94	1.56	3.06	1.48

Source: Ministry of Mines and Energy- 2013 (Adapted)

c) Conversion Factors for Mass

Multiplied by from → to		kg	t	tl	tc	lb
Kilogram	(kg)	1	0.001	0.000984	0.001102	2.2046
Metric Ton	(t)	1,000	1	0.984	1.1023	2,204.6
Long ton	(tl)	1,016	1.016	1	1.12	2,240
Short ton	(tc)	907.2	0.9072	0.893	1	2,000
Pound	(lb)	0.454	0.000454	0.000446	0.0005	1

Source: 2016 Unit converter and glossary – International Energy Agency (IEA)

d) Conversion Factors for Volume

Multiplied by from → to		m^3	l	gal (US)	gal (UK)	bbl	ft^3
Cubic meters	(m^3)	1	1,000	264.2	220	6.289	35.3147
Liters	(l)	0.001	1	0.2642	0.22	0.0063	0.0353
Gallons	(US)	0.0038	3.785	1	0.8327	0.02381	0.1337
Gallons	(UK)	0.0045	4.546	1.201	1	0.02859	0.1605
Barrels	(bbl)	0.159	159	42	34.97	1	5.615
Cub feet	($feet^3$)	0.0283	28.3	7.48	6.229	0.1781	1

Source: 2016 Unit converter and glossary – International Energy Agency (IEA)

e) Conversion Factors for Energy

Multiplied by from → to		J	BTU	cal	kWh
Joule	(J)	1	947.8×10^{-6}	0.23884	277.7×10^{-9}
British Thermal Unit	(BTU)	1.055×10^{3}	1	252	293.07×10^{-6}
Calorie	(cal)	4.1868	3.968×10^{-3}	1	1.163×10^{-6}
Kilowatt-hour	(kWh)	3.6×10^{6}	3412	860×10^{3}	1
Ton of oil equivalent	(toe)	41.87×10^{9}	39.68×10^{6}	10×10^{9}	11.63×10^{3}
Barrel of oil equivalent	(boe)	5.95×10^{9}	5.63×10^{6}	1.42×10^{9}	1.65×10^{3}

Source: 2016 Unit converter and glossary – International Energy Agency (IEA)

f) Mean Coefficients of Equivalence for Gaseous Fuels

Multiplied by to / from 1,000 m³	giga-calorie	toe (10,000 kcal/kg)	boe	tec (7,000 kcal/kg)	giga-joule	millions BTU	megawatt-hour (860 kcal/kWh)
Coke oven gas	4.3	0.43	3.03	0.614	18.00	17.06	5.00
Dry natural gas	8.8	0.88	6.20	1.257	36.84	34.92	10.23
Humid natural gas	9.93	0.993	6.99	1.419	41.58	39.40	11.55

Source: Ministry of Mines and Energy – 2013 (Adapted)

g) Mean Coefficients of Equivalence for Liquid Fuels

Multiplied by to / from m³	giga-calorie	toe (10,000 kcal/kg)	Boe	tec (7,000 kcal/kg)	giga-joule	millions BTU	megawatt-hour (860 kcal/kWh)
Anhydrous ethyl alcohol	5.34	0.534	3.76	0.763	22.35	21.19	6.21
Hydrated ethyl alcohol	5.01	0.510	3.59	0.728	21.34	20.22	5.93
Asphalts	10.18	1.018	7.17	1.455	42.63	40.40	11.84
Petroleum coke	8.73	0.873	6.15	1.247	36.53	34.62	10.15
Refinery gas	6.55	0.655	4.61	0.936	27.43	26.00	7.62
Automotive gasoline	7.70	0.770	5.42	1.099	32.22	30.54	8.95
Aviation gasoline	7.63	0.763	5.37	1.090	31.95	30.28	8.88
LPG	6.11	0.611	4.30	0.872	25.56	24.22	7.10
Agents, Lubrication	8.91	0.891	6.27	1.272	37.29	35.34	10.36
Naphtha	7.65	0.765	5.39	1.093	32.05	30.37	8.90
Fuel oil	9.59	0.959	6.75	1.370	40.15	38.05	11.15
Diesel Oil	8.48	0.848	5.97	1.212	35.52	33.66	9.87
Other petroleum based energy sources	8.90	0.890	6.27	1.271	37.25	35.30	10.35
Other non-petroleum based energy sources	8.90	0.890	6.27	1.271	37.25	35.30	10.35
Petroleum	8.90	0.890	6.27	1.271	37.25	35.30	10.35
Aviation kerosene	8.22	0.822	5.79	1.174	34.40	32.60	9.56
Illuminating kerosene	8.22	0.822	5.79	1.174	34.40	32.60	9.56
Solvents	7.81	0.781	5.50	1.115	32.69	30.98	9.08

Source: Ministry of Mines and Energy – 2013 (Adapted)

h) Mean Coefficients of Equivalence for Solid Fuels

Multiplied by from ton → to	giga-calorie	toe (10,000 kcal/kg)	boe	tec (7,000 kcal/kg)	giga-joule	millions BTU	megawatt-hour (860 kcal/kWh)
Tar	8.55	0.855	6.02	1.221	35.80	33.93	9.94
Imported metallurgical coal	7.40	0.740	5.21	1.057	30.98	29.36	8.61
Steam coal 3,100 kcal/kg	2.95	0.295	2.08	0.421	12.35	11.70	3.43
Steam coal 3,300 kcal/kg	3.10	0.310	2.18	0.443	12.98	12.30	3.61
Steam coal 3,700 kcal/kg	3.50	0.350	2.46	0.500	14.65	13.89	4.07
Steam coal 4,200 kcal/kg	4.00	0.400	2.82	0.571	16.75	15.87	4.65
Steam coal 4,500 kcal/kg	4.25	0.425	2.99	0.607	17.79	16.86	4.94
Steam coal 4,700 kcal/kg	4.45	0.445	3.13	0.636	18.63	17.66	5.18
Steam coal 5,900 kcal/kg	5.60	0.560	3.94	0.800	23.45	22.22	6.51
Steam coal 6,000 kcal/kg	5.70	0.570	4.01	0.814	23.86	22.62	6.63
Unspecified steam coal	2.85	0.285	2.01	0.407	11.93	11.31	3.31
Steam coal 5,200 kcal/kg	4.90	0.490	3.45	0.700	20.52	19.44	5.70
Charcoal	6.46	0.646	4.55	0.923	27.05	25.63	7.51
Mineral coal coke	6.90	0.690	4.86	0.986	28.89	27.38	8.02
Firewood	3.10	0.310	2.18	0.443	12.98	12.30	3.61
Lye	2.86	0.286	2.01	0.409	11.97	11.35	3.33
Molasses	1.85	0.185	1.30	0.264	7.75	7.34	2.15

Source: Ministry of Mines and Energy – 2013 (Adapted)

i) Densities and Calorific Values – 2012

Energetic	Density kg/m³ (1)	Higher calorific value kcal/kg	Inferior calorific value kcal/kg
Tar	1,000	9,000	8,550
Anhydrous ethyl alcohol	791	7,090	6,750
Hydrated ethyl alcohol	809	6,650	6,300
Asphalts	1,025	10,500	9,790
Biodiesel (B100)	880	9,345	9,000
Imported metallurgical coal	-	7,700	7,400
Steam coal 3,100 kcal/kg	-	3,100	2,950
Steam coal 3,300 kcal/kg	-	3,300	3,100
Steam coal 3,700 kcal/kg	-	3,700	3,500
Steam coal 4,200 kcal/kg	-	4,200	4,000
Steam coal 4,500 kcal/kg	-	4,500	4,250
Steam coal 4,700 kcal/kg	-	4,700	4,450
Steam coal 5,200 kcal/kg	-	5,200	4,900

Energetic	Density kg/m³ (1)	Higher calorific value kcal/kg	Inferior calorific value kcal/kg
Steam coal 5,900 kcal/kg	-	5,900	5,600
Steam coal 6,000 kcal/kg	-	6,000	5,700
Unspecified steam coal	-	3,000	2,850
Charcoal	250	6,800	6,460
Mineral coal coke	600	7,300	6,900
Petroleum coke	1,040	8,500	8,390
Electricity [1]	-	860	860
Hydraulic Power [1]	1,000	860	860
Coke oven gas [2]	-	4,500	4,300
Refinery gas	0.780	8,800	8,400
Liquefied Petroleum Gas	552	11,750	11,100
Dry natural gas [2,3]	0.740	9,256	8,800
Humid natural gas [2,3]	0.740	10,454	9,930
Automotive gasoline	742	11,220	10,400
Aviation gasoline	726	11,290	10,600
Gathered firewood	300	3,300	3,100
Commercial firewood	390	3,300	3,100
Lye	1090	3,030	2,860
Agents, Lubrication	875	10,770	10,120
Molasses	1,420	1,930	1,850
Naphtha	702	11,320	10,630
Fuel oil	1,000	10,085	9,590
Diesel Oil	840	10,750	10,100
Other petroleum based energy sources	864	10,800	10,200
Other non-petroleum based energy sources	864	10,800	10,200
Petroleum	884	10,800	10,190
Aviation kerosene	799	11,090	10,400
Illuminating kerosene	799	11,090	10,400
Solvents	741	11,240	10,550

Source: Ministry of Mines and Energy – 2013 (Adapted)

[1] kcal/kWh
[2] $kcal/m^3$
[3] At a temperature of 20 °C, for derivatives of petroleum and natural gas

j) Conversion Factors for mean toe

Energy Source	Unit	toe
Tar	m^3	0.855
Anhydrous ethyl alcohol	m^3	0.534
Hydrated ethyl alcohol	m^3	0.510
Asphalts	m^3	1.018
Biodiesel (B100)	m^3	-
Imported metallurgical coal	T	0.740
Steam coal 3,100 kcal/kg	T	0.295
Steam coal 3,300 kcal/kg	T	0.310
Steam coal 3,700 kcal/kg	T	0.350
Steam coal 4,200 kcal/kg	T	0.400
Steam coal 4,500 kcal/kg	T	0.425
Steam coal 4,700 kcal/kg	T	0.445
Steam coal 5,200 kcal/kg	T	0.490
Steam coal 5,900 kcal/kg	T	0.560
Steam coal 6,000 kcal/kg	T	0.570
Unspecified steam coal	T	0.285
Charcoal	T	0.646
Mineral coal coke	T	0.690
Petroleum coke	m^3	0.873
Electricity	MWh	0.086
Coke oven gas	10^3m^3	0.430
Refinery gas	10^3m^3	0.655
Liquefied petroleum gas	m^3	0.611
Dry natural gas	10^3m^3	0.880
Humid natural gas	10^3m^3	0.993
Automotive gasoline	m^3	0.770
Aviation gasoline	m^3	0.763
Hydraulic	MWh	0.086
Commercial firewood	T	0.310
Lye	T	0.286
Agents, Lubrication	m^3	0.891
Molasses	T	0.185
Naphtha	m^3	0.765
Fuel oil (medium)	m^3	0.959
Diesel Oil	m^3	0.848
Other non-renewable	Toe	1.000
Other renewable	Toe	1.000
Other petroleum based energy sources	m^3	0.890
Other non-petroleum based energy sources	m^3	0.890

Energy Source	Unit	toe
Petroleum	m^3	0.891
Aviation kerosene	m^3	0.822
Illuminating kerosene	m^3	0.822
Solvents	m^3	0.781
Uranium contained in UO_2	Kg	73.908
Uranium U_3O_8	Kg	10.139

Source: Ministry of Mines and Energy -2015 (Adapted)

6. Scopes of GHG Protocol Program

Sector	Emission Source Scope 1	Emission Source Scope 2	Emission Source Scope 3
Energy			
Generation of Energy	• Stationary combustion (boilers and turbines used in the production of energy, heat, or steam; fuel pumps; fuel cells; burning of discarded gases or flaring) • Mobile combustion (trucks, vessels, and trains for transporting fuels) • Fugitive emissions (CH_4 leak from transmission and from storage installations; HFC emissions from storage installations; SF_6 emissions from transmission and distribution equipment)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (mining and extraction of fuels, energy for refining and processing of fuels) • Process emissions (productions of fuels, SF_6 emissions) • Mobile combustion (transport of fuels / waste, business trips, employee commuting to-from work) • Fugitive emissions (CH_4 and CO_2 from landfills, pipelines, SF_6 emissions)
Oil & Gas	• Stationary combustion (process heaters, motors, turbines, burning of discarded gases or flaring, incinerators, oxidants, production of electricity, heat, and steam) • Process emissions (process vents, equipment vents, routine and maintenance activities, non-routine activities) • Mobile combustion (transport of raw materials, products, waste; vehicles belonging to the company) • Fugitive emissions (leaks from pressurized equipment, sewage treatment, dams)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (use of products as fuel or combustion for the production of acquired materials) • Mobile combustion (transport of raw materials, products, and waste; employees' business trips; employee commuting to-from work; use of products as fuel) • Process emissions (use of product as raw material or emissions resulting from the production of acquired materials) • Fugitive emissions (CH_4 and CO_2 from landfills or from the production of acquired materials)

Sector	Emission Source Scope 1	Emission Source Scope 2	Emission Source Scope 3
Coal Mining	• Stationary combustion (flaring and use of methane, use of explosives, fires in mines) • Mobile combustion (mining equipment, transport of coal) • Fugitive emissions (CH_4 emissions from coal mines and coal deposits)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (use of product as fuel) • Mobile combustion (transport of coal or waste, employees' business trips, employee commuting to-from work) • Process emissions (gasification)
		Metals	
Aluminum	• Stationary combustion (processing of bauxite into aluminum; coke baking; use of lime; sodium carbonate and fuel; CHP) • Process emissions (anodic oxidation, electrolysis, PFC) • Mobile combustion (transport pre-and post-casting smelting, ore trucks) • Fugitive emissions (CH_4, HFC and PFC from fuel pipes, SF_6 as blanket gas)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (processing of raw materials and production of coke by third parties, manufacture of machinery for the production line) • Mobile combustion (transport services, business trips, employee's trips) • Process emissions (during the production of acquired materials) • Fugitive emissions (CH_4 and CO_2 from mining and landfills, emissions from outsourced processes)
Iron and steel	• Stationary combustion (flows of coke, coal, and carbonate; boilers; burners) • Process emissions (oxidation of pig-iron, consumption of reducing agent, carbon content of pig-iron and ferroalloys) • Mobile combustion (on-site transport) • Fugitive emissions (CH_4, N_2O)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (mining equipment, production of acquired materials) • Process emissions (production of ferroalloys) • Mobile combustion (transport of raw materials, products, waste and intermediary products) • Fugitive emissions (CH_4 and CO_2 from sanitary landfills)
		Chemicals	
Nitric acid, ammonia, adipic acid, urea, petrochemicals	• Stationary combustion (boilers, burners, reducing furnaces, flame reactors, steam reformers)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (production of acquired materials, waste combustion)

Sector	Emission Source Scope 1	Emission Source Scope 2	Emission Source Scope 3
	• Process emissions (oxidation or reduction of substrates, removal of impurities, N_2O by-products, catalytic cracking, and several other individual emissions from each process) • Mobile combustion (transport of raw materials, products and waste) • Fugitive emissions (use of HFC, leakage from storage tanks)		• Process emissions (production of acquired materials) • Mobile combustion (transport of raw materials, products and waste; business trips, employee commuting to-from work) • Fugitive emissions (CH_4 and CO_2 from sanitary landfills and ducts)
Minerals			
Cement and lime	• Process emissions (calcination of limestone) • Stationary combustion (clinker over, drying of raw materials, energy production) • Mobile combustion (quarry operations, on-site transport)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (production of acquired materials, waste combustion) • Process emissions (production of acquired clinker and lime) • Mobile combustion (transport of raw materials, products and waste; business trips, employee commuting to-from work)
Waste			
Landfills, waste combustion, water services	• Stationary combustion (incinerators, boilers, burners) • Process emissions (sewage treatment, nitrogen loading) • Fugitive emissions (emissions of CH_4 and CO_2 from the decomposition of waste and animal product) • Mobile combustion (transport of waste or products)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (recycled waste used as fuel) • Process emissions (recycled waste used as raw materials) • Mobile combustion (transport of waste or products, business trips, employee commuting to-from work)

Sector	Emission Source Scope 1	Emission Source Scope 2	Emission Source Scope 3
	Pulp & Paper		
Pulp & Paper	• Stationary combustion (production of steam and energy, emissions derived from fossil fuels from the calcination of calcium carbonate in lime ovens, drying of products using infrared dryers powered by fossil fuels) • Mobile combustion (transport of raw materials, products, and waste; operation of harvesting equipment) • Fugitive emissions (CH_4 and CO_2 from waste)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (production of acquired materials, waste combustion) • Process emissions (production of acquired materials) • Mobile combustion (transport of raw materials, products, and waste; business trips, employee commuting to-from work) • Fugitive emissions (landfill emissions of CH_4 and CO_2)
	Production of HFC, PFC, SF_6 and HCFC-22		
Production of HCFC-22	• Stationary combustion (energy consumption, heat or steam) • Process emissions (ventilation of HFC) • Mobile combustion (transport of raw materials, products and waste) • Fugitive emissions (use of HFC)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (production of acquired materials) • Process emissions (production of acquired materials) • Mobile combustion (transport of raw materials, products and waste; business trips, employee commuting to-from work) • Fugitive emissions (leakages in the use of the product, CH_4 and CO_2 from landfills)
	Production of Semiconductors		
Production of Semiconductors	• Process emissions ((C_2F_6, CH_4, CHF_3, SF_6, NF_3, C_3F_8, C_4F_8, N_2O used in the fabrication of wafers, CH_4 created from the processing of C_2F_6 and C_3F_8)	• Stationary combustion (consumption of energy, heat or steam acquired)	• Stationary combustion (production of imported materials, combustion of waste, losses in T&D of energy acquired higher in the value chain)

Sector	Emission Source Scope 1	Emission Source Scope 2	Emission Source Scope 3
	• Stationary combustion (oxidation of volatile organic waste; production of energy, heat, or steam) • Fugitive emissions (leakages in the storage of process gases, leakages of remnants from storage tanks) • Mobile combustion (transport of raw materials, products and waste)		• Process emissions (production of acquired materials, outsourced elimination of gases from processes and remnants from storage tanks) • Mobile combustion (transport of raw materials, products and waste; business trips, employee commuting to-from work) • Fugitive emissions (emissions of CH_4 and CO_2 from landfills, leakages of remnants in storage tanks of process gases lower in the value chain).
Other Sectors			
Sector of services / organizations with activities performed in offices	• Stationary combustion (production of energy, heat or steam) • Mobile combustion (transport of raw materials or waste) • Fugitive emissions (mainly emissions of HFC during the use of refrigeration and air-conditioning equipment)	• Stationary combustion (energy consumption, heat or steam acquired)	• Stationary combustion (production of acquired materials) • Process emissions (production of acquired materials) • Mobile combustion (transport of raw materials, products and waste; business trips, employee commuting to-from work)

Source: Specifications of the GHG Protocol Program – 2nd Edition.

NOTES ON DEVELOPMENT OF THIS DOCUMENT

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