Scoring Output Data Quality

How Global Footprint Network has determined NFBA quality scores

By David Lin, Ph.D. and Mathis Wackernagel, Ph.D., March 13, 2026

Background

Quality scores, or "output data quality scores" to be more precise, communicate quality characteristics of the National Footprint and Biocapacity Accounts (NFBA)'s results. These scores indicate which portions of the data output can be published. The scores are defined and explained here.[1]

[1] Since now there are extensions beyond the "last year with complete input data," Global Footprint Network suggests to add an "e" to the score for those countries, were the extension is publishable (this is also explained in here: https://www.footprintnetwork.org/data-quality-scores/)

Purpose of this document: ***This document outlines the process for identifying implausible anomalies in the National Footprint and Biocapacity Accounts output data which then can be turned into quality scores that guide what is publishable and what isn't.***

Implausible anomalies are statistical outliers or unusual results (e.g., spikes, dips, extreme values, trends) that cannot be credibly explained by known physical, economic, or historical reality. Such results are presumed to stem from a combination of input data and methodological limitations and are therefore omitted from publication.

The document describes the process and guidelines used by Global Footprint Network for scoring output data quality as input to the quality assurance process run by the current National Footprint and Biocapacity Accounts producers: Footprint Data Foundation (FoDaFo) and Ecological Footprint Initiative at York University. It also expands on the existing automated quantitative checks to assist in simplifying and systematizing expert scoring. This document draws on Global Footprint Network's experience of producing and quality assuring the National Footprint and Biocapacity Accounts for nearly two decades.

Interpretation of scores: The scoring framework indicates which subset of a country's results is free from implausible anomalies. Every country, for any given edition, gets one score (such as 2A), and its data is published accordingly. For this edition, FoDaFo may also consider adding an "e" to the score (as in 2Ae) for countries where the reviewers consider the extended estimates publishable.

FoDaFo, the steward of the National Footprint and Biocapacity Accounts, and York University, who create (or develop) the National Footprint and Biocapacity Accounts, apply these scores to indicate which results can be used for analyses or for publications, including data tables, figures, or infographics. Because each specific use case may draw upon a different subset of results, filtering output data by quality score ensures that only passing results are used or made public.

The future of the scores: The FoDaFo board, in collaboration with its Science Advisory Council and York University's Ecological Footprint Initiative, are currently deliberating how the process of quality assurance, including this process of determining quality scores, can be improved, potentially leading to refined or more effective quality scores.

Scientific Integrity and Data Stewardship

National Footprint and Biocapacity Accounts (NFBA) results derived from low-quality data are excluded from public display to protect the integrity of the accounts. While these datasets are available to researchers for the purpose of improvement, they are withheld from the public to prevent misinformation. This is not a matter of bias or policy preference, but a fundamental commitment to scientific honesty.

Quality control is the foundation of institutional credibility. For data stewards, the mandate extends beyond technical maintenance to an ethical responsibility: the refusal to publish spurious results. Releasing data marred by noise or anomalies erodes public trust and risks the misallocation of critical resources.

Sound science requires triangulation. Relying on a single accounting method without cross-checking against proxy techniques is indefensible, especially when results diverge. Findings must be stress-tested; results are not valid simply because a set of inputs run through an algorithm produced a number. If data outputs are determined to lack sufficient robustness, their publication becomes inherently misleading. Because most audiences cannot easily distinguish methodological artifacts from genuine real-world shifts, releasing unreliable data creates confusion that persists even when cautionary flags are applied. This ultimately undermines the credibility and utility of the accounts.

Scoring

Scoring Process Overview

Output data quality scoring is applied to the candidate[2] final version of that year's NFBA edition. The "candidate batch" is frozen before the quality review can begin. This provides a stable reference point for the review. It also means that any issues encountered during the production of the accounts from new input data or updated methodology needs to be resolved before the "final (frozen) candidate batch". No further change to the accounts will be made for that edition. All possible issues that would be encountered can be addressed with the next edition. This implies that any remaining issues discovered during the quality assurance process are logged to be implemented in the following year's edition[3], rather than immediately applying to this year's edition and thereby jeopardizing the timeline of the quality assurance process.[4]

The output data quality scores are assigned in a two-stage systematic process:

[2] It is conceivable that, during the review, significant enough issues are found in a candidate final batch which would warrant a new run of the accounts. In such a case, the process takes one step back to resolve errors and run another candidate final batch, and the review has to start from scratch again. Since this will cause time delays in the production, this may also lead to a delay in the release of the official edition.

[3] Unless they are show-stoppers and would require generating a new candidate edition as explained in footnote 2.

[4] Now, as the National Footprint and Biocapacity Accounts are governed by the Footprint Data Foundation – FoDaFo (www.fodafo.org), the suggested data output quality scores are approved by the FoDaFo board and the accepted, FoDaFo-accredited accounts are published accordingly.

Stage 1 - Statistical Flagging: Anomalies (dips, spikes, low and high values, trends) are identified through an automated quantitative process. The subset of anomalies that are classified as major and extreme are considered non-publishable, without further review.

Stage 2 - Systematic Expert Review: The review is focused primarily on flagged anomalies that are not considered major or extreme. Using third party information, flagged results are assessed for their plausibility. Computer based review engines and/or experts assign each country a score based on the subset of data that is considered publishable. Flagged anomalies may be given an OK for publication if contextual multi-criteria evidence supports the plausibility of the anomaly.

When data and quality scores are finalized and the accounts are accepted by FoDaFo as the official edition for the year, the new National Footprint and Biocapacity Accounts edition is ready for use by others, including for figures, data platforms, Earth Overshoot Day calculations, and research reports, etc.

Stage 1 – Statistical flagging

Each country has multiple output data for every year. Table 1 below identifies the key components for the four types of Ecological Footprints (EF) and for biocapacity (BC). EF has 6 sub-components, while BC only has 5 since forests provide for two competing Ecological Footprint functions: carbon sequestration and timber production. EF of consumption and biocapacity is conservatively evaluated for anomalies on a quantitative basis, for each subcomponent. Conservatively here means that data passing through this stage have no apparent statistical/quantitative anomaly, [5] with a bias towards over-flagging. All other EF components, production, imports, exports, are flagged for missing data.

[5] While datasets passing stage 1 should have no issues, new issues may be identified and flagged in stage 2 during expert review.

Table 1: *All output data refers to the following 32 data categories on a per-capita basis and on a total basis[6], for all years:*

	EF (consumption)	EF (production)	EF (imports)	EF (exports)	Biocapacity
Cropland	x	x	x	x	x
Grazing	x	x	x	x	x
Forest	x	x	x	x	x
Fish	x	x	x	x	x
Built-up Land	x	x			x
Carbon	x	x	x	x	
Total	x	x	x	x	x

Flagging Criteria: Data Anomalies in Ecological Footprint of consumption and biocapacity are flagged based on severity as either minor, major, or extreme anomalies based on the following quantitative criteria (see Tables A-G in Appendix for specific thresholds for these quantitative criteria):

- **0s:** Presence of zero values are flagged as extreme anomalies (Due to this category being binary, presence 0s are flagged as extreme anomalies, with no intermediate levels of severity)
- **Interannual variation:** The size of spike or dip is looked at both on a relative (to the time series of that country) and absolute scale. See *Suggested Thresholds for "Anomalies"*
- **Trends:** Changes over the last year, five years, ten years, that are surprisingly high. Criteria need to be defined similar to interannual variations proposed in *Suggested Thresholds for "Anomalies"*. This test should not only be run against present or last edition but also against older editions, such as 2018 edition (last Global Footprint Network edition).
- **Total value of EFC:** Results that fall outside of minimum and maximum per-capita thresholds (defined by income groups). This test does not apply to BC.

[6] Anomalies in Ecological Footprint are more easily spotted on a per capita basis, while anomalies for biocapacity are more easily spotted on a total basis.

Stage 2 – Systematic expert review

All data are reviewed with a primary focus on flagged anomalies**. Components without anomalies are generally considered passing, while major and extreme anomalies require explicit contextual justification to receive a passing score**:

- Each country is reviewed by at least 2 experts for general coherence.[7] See section *treatment of anomalies* below for reviewer guidelines. In this stage, new unusual data points beyond what has been flagged in stage 1 may be identified by the reviewer as anomalies. Flagged datapoints may be justified as representative of reality, and given a pass. Reviewers assign a score that indicates what components and years are free of unexplained anomalies.
- All scores are reconciled. Where discrepancies between the choices of the two researchers exist, the full team of experts is called upon to review justifications and reach consensus on the adequate score. In some cases, further investigation may be needed to justify a higher score.
- Scores are conservative. Scores are given the lower quality score if consensus is not reached. The goal is that the resulting public dataset contains no unexplained anomalies and can be explained with a high degree of confidence to non-scientific audiences.

Guidelines for expert scoring:

1. Treatment of anomalies

The following refer to the treatment of anomalies in EFC and BC. Zeros and other anomalies in EFP and EF trade components are treated as contextual information, with guidelines described below in section *zero values: treatment by component*.

Minor anomalies are considered and explained where possible, especially in the case of multiple minor anomalies, however no justification is needed unless a new score (different than prior year) is proposed by the reviewer. Issue may need to be addressed in next year's edition.

Major anomalies must be justified to receive a passing score, with a credible explanation and supplementary data points.

[7] For example, zeros in trade are likely reporting error unless indicated otherwise; or interannual variation in food footprint, for example, should most likely be less than variations in GDP per capita.

Extreme anomalies can also be justified to receive a passing score however these data points require extra scrutiny and justification, with a credible explanation and supplementary data points.

Justifications are rationale provided by the expert reviewer for scoring a component with reference to the identified anomalies. These are recorded for consensus steps and as reference for future scoring procedures.

Example justifications:

- Major anomalous dip in 2008 for EFc of carbon is OK – it corresponds to economic crisis and mirrored in GDP time series, and deviation occurs in carbon EFP, which mirrors external carbon emissions trends.
- Mongolia's EFc of grazing appears to be an extreme outlier, higher than all other countries – this OK as is confirmed by physical accounts; meat and dairy consumption from FAOstat also suggest the same conclusion.
- Country X has 0 EF of production for fishing grounds. This is OK. Country X is landlocked (as verified on map and flagged by FAOstat supplementary data).

Reference Values should be consulted for reviewing flagged high and low value anomalies. (see tables H and I for per capita average values, standard deviations, and ranges by region and income group)

2. Continuity and consistency and an evolving knowledgebase

Previous edition results and scores, along with their notes and justifications are used together as a reliable reference point for consistency in scoring.

In most cases, scores may not change from previous edition. For example, a country may have a low or 0 value in Fish EF of consumption occurs from 1992-1997, therefore receiving a "2" score to suppress detailed component values for the time series. If the same issue exists in the candidate edition, the score and justification remain the same.

In many cases historical events and related data points that correspond to major spikes, dips or other data anomalies are already recorded in the scoring notes and database.

If new methodology or data introduces or removes an anomaly in results, the score should be revised accordingly.

3. Supplementary data are considered in making justifications:

Several types of supplementary data can provide strong evidence for the existence of data anomalies.

- Country economic trends (such as GDP) are helpful in identifying economic, geopolitical or other events that can justify anomalous data points.
- Per capita income, region, geography, and EF of similar countries' neighbors can be used to justify anomalous data points.
- Data on carbon emissions, and consumption emissions can be used to evaluate flagged anomalous data points.
- Production based data points can be informative in matching EFp results in analogous sub-components, but provide only weak evidence for consumption (EFc) results. For example, identifying that a country has the world's largest commercial fisheries fleet, and leads the world in fish harvest, does not suggest that country's fishing grounds EFc should be the highest nor that the trends should mirror each other. In this case, data on fish consumption for that country would be much stronger evidence.

4. Expert Judgement

Expert reviewers understand the basic strengths and weaknesses in the account's methodology and input data as potential causes of data anomalies.

The accounts calculate consumption as EF Production + EF Imports – EF Exports (EFc = EFp + EFi – EFe). This consumption estimate,[8] also called "apparent consumption" is especially vulnerable to producing spurious results when trade flows are large compared to production, which occurs commonly in smaller economies. Trade statistics tend to be noisier than production statistics for most countries, and there can be allocation errors since trade categories and production categories do not fully match.

Examples:

- Carbon EF trade: Anomalous spike or rapid increasing trend in carbon EF due to a single or group of commodities. The expert knows that Carbon EF trade is limited by static values of embodied emissions (not country or year specific), and that commodity categories that may be too coarse. Given these weaknesses, this should raise suspicion especially if that

[8] This is a simplification as it assumes annual stock changes to be minor.

country's manufacturing of x product may have undergone significant evolution that isn't captured by current methodology.

- Forest Products EF of Trade: Per capita Footprint of consumption of forest products in several countries is identified as among the highest in the world and greatly exceeds that of other similar (by Income/Region) countries and is trending up. The expert knows that trade of derived forest products is not captured by the accounts (only raw and minimally processed forest products are currently captured). It is identified that harvest (EF production) is increasing, but EF of exports is decreasing. This should signal to the expert to investigate unaccounted exports of manufactured wood products as a cause of the data anomaly.

Note that the process of QA and reviewing the accounts often reveal weaknesses in the accounts that can be then recorded as areas for improvement. For example, as a simplification, apparent consumption is calculated as production plus imports minus exports. This assumes that the level of stocks stays constant. This assumption likely holds true on a decadal scale but may not, on a year-to-year basis.

5. Specific Guidelines

Consumption (EFc) components are the most derived output and therefore receive the highest priority in scoring. The other three Footprint types (production, imports and exports) as well as biocapacity can also be evaluated. EFc component results are evaluated for anomalies with the following tests, in order of the following priority:

- **Interannual or year-to-year variation.** Compare year-over-year change in values across the entire time series within the new edition, with highest priority for latest year (use **Table A** in the APPENDIX for thresholds for latest year, and **Table B** for time series).
- **Change against former editions.** Compare the candidate edition with the last official edition year-by-year across the entire time series (use **Table C** for anomaly thresholds). Also compare the candidate edition with two older editions, including the 2019 edition (use **Table D** for anomaly thresholds).
- **Timeseries Trends or change over longer time periods.** Compare last year with the values from 5 and 10 years earlier within the new edition (use **Table E** for anomaly thresholds).

Zero values, treatment by component (This refers to country scale results, not commodity level):

- 0s in EF Consumption components are generally considered unreasonable.

- 0s in EF production are also considered unreasonable. However, they can reflect physical reality in some cases. In those cases, 0s should be justified.
- 0s in EF trade are not uncommon, but in almost all cases, do not represent the reality and rather are reporting issues. In some cases trade is sporadic and very low, contextual information is important in assessing 0s in EF trade.
- 0s in biocapacity for any component are generally considered unreasonable – though can be justified. For Example, it would not be unreasonable for landlocked countries to have 0 Fishing grounds biocapacity, or desert countries like Qatar to have 0 forest biocapacity.
- Note: Cutoff years- it is not uncommon that 0s or extreme anomalies occur in the initial years of a country's results, in these cases the country be assigned a cutoff year to suppress results prior to the identified cutoff.

Missing components:

- If results are missing an entire component for some or all the country's timeline, the following guidelines can be used to determine whether the total results can still be shown.
- If a reasonable estimate can be made for the missing component, and the missing component is estimated to comprise 15% or less of the total result, the total result may be given a passing score.
- Examples of reasonable estimates:
    - Production and Trade components – it is common for trade data to be completely missing for part of the timeline. If reliable trade data exists for remaining years and, and the net trade balance can be estimated from other years and compared to the size of production.
    - EFc Subcomponents – if the built-up-land Footprint is completely missing, totals may generally still be shown as this component makes up roughly (2-4%) of the total Ecological Footprint.

Extreme values:

- Extreme low and high values are statistically flagged, see **tables F and G**.
- Anomalies may be justified by contextual information and supplementary data such as GDP per capita, physical consumption data, etc.

Anomaly treatment by component:

- EF Consumption - Anomalies in EFc should be justified from a coherence perspective, in other words, common sense suggests that per capita consumption for an entire country does not change drastically over short periods of time with no reason.
- EFP - Greater variation and trend is expected in EF production than in EF consumption. Data are generally considered much more reliable than trade from a methodological and provenance perspective. Thus, from a justification perspective, anomalies in EFp may not be as questionable as EFc changes, unless there are events that shift consumption (such as lock downs, war, economic crises).
- EF Trade data are frequently an issue due to a combination of methodology being unable to capture embodied EF reliably, less reliable trade flow reporting, and challenge of matching product categories between production and trade. If trade is a significant cause of anomalies in EFc, these data should be more closely reviewed. EF trade has stronger effects on smaller countries since trade flows are proportionally larger compared to the country's economy for smaller countries than for bigger countries where interregional trade within the country is not counted as trade.
- Biocapacity, in absolute, should, in most cases, not experience significant annual variations, and any cause of anomalies here should be easy to trace and justify due to the simplicity of methodology and data inputs, and to link them to real-world events.
- Food related consumption footprints as a whole and in individual components (cropland, fishing grounds, grazing land) should in theory be more stable over time than GDP per capita purely on the basis that these categories are relatively inelastic (income elasticity). Generally, cropland is expected to be the most stable followed by grazing and fishing grounds.

Anomaly treatment for edition-to-edition deviations:

Flagged differences between editions signifying major changes should be identified and justified. In most cases, this comparison serves as an output (or results) level check that has some redundancy to QA procedures performed at the input data level. QA analyses done at the component, or input level, are sufficient justification. The following are descriptions of typical cases and justifications:

- **New data:** differences may simply be due to updated primary data (from the same source or a new data source) which serves as sufficient justification, and these anomalies are likely to have already been identified in the production process (QA of new input data). Note that data from a new source (a source different than previous edition) may require additional

scrutiny based on expert judgment to verify that the source of anomaly is not due to issues related to new intake procedures or methodology associated with new data.

- **Updated methodology:** differences from updated methodology in an Edition have already been approved by SAC and therefore these deviations have been examined and should be well-documented. Justification should align with expected changes where applicable. This step provides a step of redundancy to ensure methodological changes do not introduce new errors.
- **Example:** In applying the marginal crops nutrition adjustment improvement, we would expect to see decreased EF and BC proportional to a country's production of marginal crops, when compared to the previous edition. Therefore, increases in crop EF or BC in such countries (where we would expect decreases) would warrant further investigation to receive a passing score.

APPENDIX: Suggested Thresholds for "Anomalies"

The following tables provide reference values to assist in automatically identifying potential anomalies in the output data sets. The tables, along with the guidelines above are designed support a systematic approach to expert review, minimize subjective decision making, and produce consistent scoring results. The values in the table are initial defaults and should be refined as the National Footprint and Biocapacity Accounts effort gains more experience with subsequent editions. Unless otherwise specified, thresholds refer to EFc per capita and BC per capita.

For each component time series, the year-to-year change (absolute and relative) in per capita EF are compared to the year prior. For example, a change in total EFc of 1.1 gha per person per year in the latest complete year would be flagged as a major anomaly (table A).

How to read the columns:

Values up to Minor value would be "**unsuspicious**"
Values between Minor and Major values would be "**minor**" anomalies
Values between Major and Extreme values would be "**major**" anomalies
Values above Extreme value would be "**extreme**" anomalies

Table A: Year to year change thresholds, latest complete year

These are the reference values for comparing year-over-year change in values for the last year in the time series within the new edition.

	Absolute value (in gha per person) from year to year			Relative change (in %) from year to year		
	Minor	Major	Extreme	Minor	Major	Extreme
Total EF or BC	0.50	1.00	2.00	20%	40%	80%
Crop_Land	0.20	0.50	1.00	30%	60%	140%
Grazing_Land	0.20	0.50	1.00	30%	60%	140%
Forest_Land	0.20	0.50	1.00	30%	60%	140%
Fishing_Ground	0.20	0.50	1.00	30%	60%	140%
Built_up_Land	0.02	0.10	0.20	30%	60%	140%
Carbon	0.40	0.80	1.50	30%	60%	140%

Table B: Year to year change thresholds, all years

These are the reference values for comparing year-over-year change in values over the entire time series within the new edition.

	Absolute value (in gha per person) from year to year			Relative change (in %) from year to year		
	Minor	Major	Extreme	Minor	Major	Extreme
Total EF or BC	1.00	2.00	4.00	50%	70%	150%
Crop_Land	0.30	1.00	1.50	60%	90%	300%
Grazing_Land	0.30	1.00	1.50	60%	90%	300%
Forest_Land	0.30	1.00	1.50	60%	90%	300%
Fishing_Ground	0.30	1.00	1.50	60%	90%	300%
Built_up_Land	0.00	0.10	0.20	60%	90%	300%
Carbon	0.70	1.50	3.00	60%	90%	300%

Table C: Change against last edition thresholds

These are the reference values for comparing the candidate edition with the last official edition year-by-year across the entire time series.

	Absolute value (in gha per person) year by year			Relative change (in %) year by year		
	Minor	Major	Extreme	Minor	Major	Extreme
Total EF or BC	0.25	0.50	1.00	10%	20%	40%
Crop_Land	0.10	0.25	0.50	15%	30%	70%
Grazing_Land	0.10	0.25	0.50	15%	30%	70%
Forest_Land	0.10	0.25	0.50	15%	30%	70%
Fishing_Ground	0.10	0.25	0.50	15%	30%	70%
Built_up_Land	0.01	0.05	0.10	15%	30%	70%
Carbon	0.20	0.40	0.75	15%	30%	70%

Table D: Change against older editions thresholds

These are the reference values for comparing the candidate edition with two older editions, including the 2019 edition, year-by-year across the entire time series.

	Absolute value (in gha per person) year by year			Relative change (in %) year by year		
	Minor	Major	Extreme	Minor	Major	Extreme
Total EF or BC	0.50	1.00	2.00	20%	40%	80%
Crop_Land	0.20	0.50	1.00	30%	60%	140%
Grazing_Land	0.20	0.50	1.00	30%	60%	140%
Forest_Land	0.20	0.50	1.00	30%	60%	140%
Fishing_Ground	0.20	0.50	1.00	30%	60%	140%
Built_up_Land	0.02	0.10	0.20	30%	60%	140%
Carbon	0.40	0.80	1.50	30%	60%	140%

Table E: Change in new edition over longer time periods thresholds

These are the reference values for comparing last year with the values from 5 and 10 years earlier within the new edition.

	Absolute value (in gha per person) Last year to 5 or 10 years ago			Relative change (in %) Last year to 5 or 10 years ago		
	Minor	Major	Extreme	Minor	Major	Extreme
Total EF or BC	1.00	2.00	4.00	60%	90%	300%
Crop_Land	0.30	1.00	1.50	60%	90%	300%
Grazing_Land	0.30	1.00	1.50	60%	90%	300%
Forest_Land	0.30	1.00	1.50	60%	90%	300%
Fishing_Ground	0.00	0.10	0.20	60%	90%	300%
Built_up_Land	0.30	1.00	1.50	60%	90%	300%
Carbon	0.30	1.00	1.50	50%	70%	150%

Table F: Upper threshold for low values (per capita Ecological Footprint)

These are the reference values for identifying potentially too low output data.

	Absolute value (in gha per person)		
	Minor	Major	Extreme
Total EF	0.85	0.70	0.50
Crop_Land	0.25	0.20	0.10
Grazing_Land	0.05	0.03	0.01
Forest_Land	0.15	0.11	0.01
Fishing_Ground	0.03	0.02	0.01
Built_up_Land	0.02	0.02	0.01
Carbon	0.05	0.03	0.01

Table G: Lower threshold for high values (per capita Ecological Footprint)

These are the reference values for identifying potentially too high output data.

	Absolute value (in gha per person)		
	Minor	Major	Extreme
Total EF	6.50	8.00	10.00
Crop_Land	1.00	1.20	2.00
Grazing_Land	0.80	1.10	2.00
Forest_Land	0.85	1.20	2.00
Fishing_Ground	0.35	0.60	2.00
Built_up_Land	0.15	0.20	0.70
Carbon	4.00	5.50	8.00

Table H. Reference Statistics - Ecological Footprint of Consumption Per capita, by Region

EFC per capita statistics by UN region

To reduce single year outliers, this dataset is derived from a table that consists of the average value for each country and component, from the period 2010-2022. IE. each "sample" here is an average value for a country and component over 22 years. Data was pre filtered by quality score.

* Note, world is shown as a single country, to show population weighted average (but would include all low quality countries, likely evened out by large high quality data)

Note also that values are not population weighted. Thus small countries and large countries receive equal weight. This applies to averages and st.dev only.

UN_region	Africa	Asia	Europe	Latin America and the Caribbean	North America	Oceania	World
max_crop_land	0.82	0.90	1.71	1.01	1.31	0.45	0.46
mean_crop_land	**0.35**	**0.47**	**0.94**	**0.50**	**1.27**	**0.45**	**0.46**
median_crop_land	**0.32**	**0.48**	**0.86**	**0.48**	**1.27**	**0.45**	**0.46**
min_crop_land	0.15	0.21	0.57	0.28	1.23	0.45	0.46
std_crop_land	0.15	0.18	0.24	0.16	0.04	0.00	0.00
sample_size_crop_land	34	25	31	17	2	1	1
max_grazing_land	1.00	4.20	0.66	1.59	0.31	0.19	0.14
mean_grazing_land	**0.23**	**0.31**	**0.26**	**0.46**	**0.30**	**0.19**	**0.14**
median_grazing_land	**0.11**	**0.12**	**0.22**	**0.39**	**0.30**	**0.19**	**0.14**
min_grazing_land	0.01	0.01	0.04	0.05	0.29	0.19	0.14
std_grazing_land	0.25	0.81	0.14	0.35	0.01	0.00	0.00
sample_size_grazing_land	34	25	31	17	2	1	1
max_forest_land	0.77	2.86	3.49	1.04	1.33	0.71	0.28
mean_forest_land	**0.30**	**0.30**	**0.83**	**0.34**	**1.10**	**0.71**	**0.28**
median_forest_land	**0.24**	**0.20**	**0.63**	**0.27**	**1.10**	**0.71**	**0.28**
min_forest_land	0.12	0.06	0.23	0.10	0.87	0.71	0.28
std_forest_land	0.17	0.53	0.72	0.24	0.23	0.00	0.00
sample_size_forest_land	34	25	31	17	2	1	1
max_fishing_ground	0.30	0.49	0.77	0.52	0.13	0.62	0.09
mean_fishing_ground	**0.06**	**0.14**	**0.17**	**0.15**	**0.13**	**0.62**	**0.09**
median_fishing_ground	**0.04**	**0.07**	**0.09**	**0.11**	**0.13**	**0.62**	**0.09**
min_fishing_ground	0.00	0.00	0.02	0.01	0.13	0.62	0.09
std_fishing_ground	0.07	0.15	0.19	0.14	0.00	0.00	0.00
sample_size_fishing_ground	34	25	31	17	2	1	1
max_built_up_land	0.08	0.19	0.31	0.09	0.08	0.04	0.06
mean_built_up_land	**0.04**	**0.06**	**0.15**	**0.05**	**0.07**	**0.04**	**0.06**
median_built_up_land	**0.04**	**0.05**	**0.16**	**0.05**	**0.07**	**0.04**	**0.06**
min_built_up_land	0.01	0.02	0.03	0.02	0.06	0.04	0.06
std_built_up_land	0.02	0.05	0.07	0.02	0.01	0.00	0.00
sample_size_built_up_land	34	25	31	17	2	1	1
max_carbon	2.63	13.11	11.35	3.81	5.53	0.98	1.67
mean_carbon	**0.37**	**2.23**	**2.89**	**1.30**	**5.33**	**0.98**	**1.67**
median_carbon	**0.20**	**1.05**	**2.65**	**1.00**	**5.33**	**0.98**	**1.67**
min_carbon	0.02	0.11	0.99	0.10	5.12	0.98	1.67
std_carbon	0.60	2.74	1.69	0.90	0.20	0.00	0.00
sample_size_carbon	34	25	31	17	2	1	1
max_total	4.01	14.62	14.69	5.57	8.20	7.33	2.70
mean_total	**1.56**	**3.27**	**5.18**	**2.89**	**8.19**	**3.89**	**2.70**
median_total	**1.33**	**2.20**	**4.89**	**2.76**	**8.19**	**3.38**	**2.70**
min_total	0.65	0.65	2.28	0.58	8.19	1.41	2.70
std_total	0.76	2.80	1.99	1.22	0.01	1.85	0.00
sample_size_total	51	40	37	25	2	7	1

Table I. Reference Statistics - Ecological Footprint of Consumption Per capita, by Income Group

EFC per capita statistics by income group

To reduce single year outliers, this dataset is derived from a table that consists of the average value for each country and component, from the period 2010-2022. IE. each "sample" here is an average value for a country and component over 12 years. Data was pre filtered by quality score.

***note values are not population weighted. Thus small countries and large countries receive equal weight. This applies to averages and st.dev only.**

WB_income_group	HI	UM	LM	LI
max_crop_land	1.71	1.40	0.66	0.61
mean_crop_land	**0.88**	**0.68**	**0.39**	**0.31**
median_crop_land	**0.83**	**0.62**	**0.36**	**0.28**
min_crop_land	0.42	0.33	0.22	0.15
std_crop_land	0.27	0.26	0.11	0.11
sample_size_crop_land	33	26	22	29
max_grazing_land	0.66	0.70	4.20	0.98
mean_grazing_land	**0.30**	**0.29**	**0.43**	**0.19**
median_grazing_land	**0.29**	**0.22**	**0.11**	**0.10**
min_grazing_land	0.04	0.02	0.01	0.01
std_grazing_land	0.14	0.20	0.91	0.21
sample_size_grazing_land	33	26	22	29
max_forest_land	3.49	1.32	2.86	0.77
mean_forest_land	**0.73**	**0.44**	**0.40**	**0.28**
median_forest_land	**0.48**	**0.28**	**0.21**	**0.24**
min_forest_land	0.15	0.11	0.08	0.06
std_forest_land	0.74	0.32	0.56	0.17
sample_size_forest_land	33	26	22	29
max_fishing_ground	0.77	0.62	0.26	0.30
mean_fishing_ground	**0.22**	**0.15**	**0.08**	**0.04**
median_fishing_ground	**0.14**	**0.09**	**0.05**	**0.03**
min_fishing_ground	0.02	0.02	0.00	0.00
std_fishing_ground	0.20	0.15	0.08	0.06
sample_size_fishing_ground	33	26	22	29
max_built_up_land	0.31	0.23	0.19	0.09
mean_built_up_land	**0.14**	**0.07**	**0.05**	**0.04**
median_built_up_land	**0.15**	**0.06**	**0.05**	**0.04**
min_built_up_land	0.03	0.02	0.02	0.01
std_built_up_land	0.07	0.04	0.03	0.02
sample_size_built_up_land	33	26	22	29
max_carbon	13.11	3.31	2.55	0.88
mean_carbon	**3.88**	**1.68**	**0.64**	**0.20**
median_carbon	**3.23**	**1.65**	**0.57**	**0.13**
min_carbon	2.13	0.69	0.20	0.02
std_carbon	2.32	0.64	0.50	0.19
sample_size_carbon	33	26	22	29
max_total	14.69	5.37	7.46	1.72
mean_total	**6.06**	**3.12**	**2.02**	**1.10**
median_total	**5.39**	**3.08**	**1.67**	**1.07**
min_total	3.82	1.89	0.65	0.58
std_total	2.23	0.86	1.24	0.30
sample_size_total	44	40	44	34