

EFU-CARBON LICENSE v2.0 – SCIENTIFIC AUDIT VERSION

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Status: Research material – Open for critical review (Research Phase)

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ABSTRACT

[HYPOTHESIS] This document constitutes the research audit version of the EFU-Carbon License v1.0. By augmenting the open Creative Commons (CC BY 4.0) framework, it performs a hypothetical verification of a flux-based carbon accounting model. Its objective is to investigate the extent to which the EFU model (as a human-scale flux unit) can methodologically complement open science licensing to avoid static standardization while maintaining research transparency and anti-greenwashing integrity.

1. SCOPE AND RESEARCH OBJECTIVE

[HYPOTHESIS] The EFU-Carbon system is situated in the boundary zone between a legal license and a scientific methodological protocol. The model assumes that quantifying material and energy flows in human throughput equivalents (EFU) increases transparency.

[ARGUMENT MAP]

- **A:** CC BY 4.0 ensures transparency but lacks a methodological framework for flux-based data replication.
 - **B:** The EFU model adds the material flow measurement dimension.
 - **C:** Consequently, a transition to an open, falsifiable carbon accounting protocol becomes possible.
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2. LICENSE MODEL ANALYSIS: STRUCTURAL LAYERS

[PROTOCOL] The analysis distinguishes between three layers:

1. **Legal Layer (Base License):** CC BY 4.0 remains valid without modification.

2. **Methodological Layer (EFU-Carbon Spec):** A research-level declaration of flux measurement principles.
 3. **Audit Layer (Label Mechanism):** An optional, voluntary verification channel that does not constitute a standard.
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3. METHODOLOGICAL ASSUMPTIONS AND DATA QUALITY

[AXIOM] Flux-based measurement is grounded in the principle of Conservation of Mass/Energy.

[PROTOCOL] **EFU Data Quality Tier System:**

- **Tier 1 (Estimated Flux):** Calculations based on industry averages or secondary statistical data. Uncertainty: >20%.
- **Tier 2 (Indirect Measurement):** Flux calculated via proxy data (e.g., utility bills, fuel invoices). Uncertainty: 10–20%.
- **Tier 3 (Direct Measurement):** Real-time flux captured via sensors or physical mass-flow meters. Uncertainty: <10%.

Audit Layer (Label Mechanism): An optional, voluntary verification channel that does not constitute a standard.

Participation in the Audit Layer does not confer compliance, certification, or endorsement.

4. INTEGRITY AND ANTI-GREENWASHING MECHANISM

[HYPOTHESIS] Flux-based auditing reduces the distortion between nominal carbon offsetting and real physical flux. The EFU scale quantifies carbon movement in human-equivalents, allowing anti-greenwashing principles to be integrated into published data [Liu et al., 2024].

5. SOVEREIGNTY AND "METABOLIC DIGNITY"

[HYPOTHESIS] The EFU-Carbon audit rejects carbon accounting that reduces the fundamental human flux to a purely financial unit.

- **Metabolic Dignity:** The minimum flux below which human life support and social participation would de facto be compromised.
 - **Sovereignty Gap:** The domain where techno-flux cannot replace the natural metabolism of living systems.
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6. FALSIFIABILITY AND UNCERTAINTY (EA SECTION)

[HYPOTHESIS] The model is falsified if:

1. EFU-equivalence fails to correlate with actual carbon balances (ISO 14064/14067).

2. Measurement noise exceeds the empirical validation threshold ($\pm 20\%$).

7. CRITICAL COMMENTARY MATRIX (Argument Map Audit)

| Model Element | Critical Vulnerability | Recommended Research Direction |
|----------------------|--|---|
| Reference (1 EFU) | Neglect of demographic and climatic variance. | Development of stratified EFU baselines. |
| Material Homogeneity | Mass-based measurement ignores thermodynamic quality. | Investigation of entropy-weighted EFU components. |
| Sovereignty Gap | Estimation of local regenerative capacity is methodologically contested. | Empirical bio-regional flux-ceiling studies. |

8. ANNOTATED REFERENCES AND ACADEMIC FOOTNOTES

- Thermodynamic Foundations:** The persistence of living systems depends on continuous throughput rather than static mass [*Schrödinger, "What is Life?"*].
- Reference Values:** The 20 kg/day EFU base is biologically supported by daily water, food, and air intake [*PubMed data*].
- MFA and ISO:** EFU does not replace ISO 14064/14067 standards; it complements them with a human-scale normalization layer [*Liu et al., 2024; ISO 14064-1:2018*].
- Offset Criticisms:** Measuring the gap between financial compensation and physical flux is the core of the anti-greenwashing strategy [*Climate Policy Brief, 2023*].

RESEARCH STATUS STATEMENT: This document represents a theoretical model in the research phase. It does not constitute a legal, regulatory, or market standard.

“Any attempt to formalize EFU Carbon as a binding standard contradicts the intent of this research version.”