I. METADATA HEADER

Code: EFU-RES-EN-2026-01
Title: EFU Manifesto and Protocol – Research Model v1.1
Status: Research material – Open for critical review (Research Phase)
Version: 1.1 (English, standardized 2026)
Connectivity: EFU-100.x (Ethical-Philosophical Pillar), EFU-200.x (Research Governance and Audit)

Abstract:
[HYPOTHESIS] This document presents a theoretical-research model of the EFU (Ecological Flux Unit) framework. Its purpose is not to establish finalized rules but to propose a biothermodynamic framework where "flux," "Metabolic Dignity," "Sovereignty Gap," and "Audit" represent research model-specific definitions. Model verification requires further empirical measurement, review, and critical feedback.

II. INTRODUCTION – THE SOVEREIGNTY SHIFT (RESEARCH FRAMEWORK)

Thesis: [HYPOTHESIS]
The research model posits that human neurological stress and biospheric depletion share a common systemic origin, described as the "Paradox of Digital Abstraction": technological and financial structures detach from underlying physical fluxes.

Research Objective: [PROTOCOL]
Within the model framework, it can be investigated whether the EFU framework can reconnect human scale and thermodynamic integrity to economic and artificial intelligence systems as a biothermodynamic reference.

Model-level Observation: [HYPOTHESIS]
At this research stage, the individual carbon footprint narrative can be interpreted as guilt-based, while the EFU model redirects accountability toward systemic and institutional metabolic audit. Its validity remains subject to empirical investigation.

III. THE HUMAN COMPASS – MANIFESTO AS RESEARCH AXIOMATIC FRAMEWORK

The following table is not a normative rule set but a theoretical ethical-ontological map providing the thematic framework for subsequent empirical investigations.

Ethical Pillar	EFU Conceptual Correlation	Statement Type
Primacy of Human Compass	Intention as directional vector governing EFU-H (cognitive energy flux) as model axiom	[AXIOM]

Ethical Pillar	EFU Conceptual Correlation	Statement Type
Liberation of Creativity	Model suggests automation aims to reduce entropy-intensive labor flux	[PROTOCOL]
Digital Ethics and Transparency	EFU-metrics auditability appears as ideal-typical target state in research framework	[HYPOTHESIS]
Foresight as Right	Hypothesis that understanding technological/ecological processes constitutes Metabolic Dignity component	[HYPOTHESIS]
Community Well-being & European Sovereignty	Model presumes flux balance more sensitive indicator of social cohesion than GDP	[HYPOTHESIS]

IV. PHYSICAL GAAP MODEL – METABOLIC ACCOUNTING (RESEARCH VERSION)

IV.1 Biological Anchor – RACF (Reference Annual Carbon Flux)

[AXIOM] The thermodynamic principle states that all socio-technical systems operate through constrained energy and material fluxes.

[HYPOTHESIS] RACF represents the model parameter for minimum carbon-based flux required for average human life support.

Table – RACF and EFU Model Values

Metric	Value	EFU Equivalent
Basal Metabolic Rate	≈ 1441 kcal/day	–
Life Support Flux	526 kg C/year	0.072 EFU/year
1 EFU Model Baseline	–	≈ 7.31 t C/year (1/0.072)

These values represent research calibration parameters requiring validation against physiological and energy databases. [HYPOTHESIS]

IV.2 Sovereignty Gap (SS) – Model Definition

[PROTOCOL] Within the research model, Sovereignty Gap (SS) is expressed as:

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SS = M_institution - M_allocated
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where

- `M_institution` = institution's aggregated metabolic flux in EFU units
- `M_allocated` = region's sustainably allocable capacity in EFU units

Model-level Interpretation:

- SS > 0 → [HYPOTHESIS] physical debt / potential dependency state
- SS ≤ 0 → [HYPOTHESIS] flux balance / presumed metabolic sovereignty

This interpretation is hypothetical and requires empirical case studies (cities, data centers, industrial clusters).

V. INSTITUTIONAL MODEL PROTOCOL – NON-NORMATIVE FRAMEWORK

The following points are **not mandatory requirements** but suggested investigative steps within the research model to facilitate empirical testing.

[PROTOCOL] For institutional systems exceeding 1000 EFU-E/year, the model suggests the following investigative sequence:

1. **Metabolic Audit (research audit):**
   Estimation and EFU-unit conversion of primary flux dimensions (energy, water, material, entropy, carbon).
2. **Transparency (research publication):**
   Experimental EFU-profile generation (e.g., "Institution X – SS model value, EFU level").
3. **Reduction Plan (scenario analysis):**
   Scenario-level investigation of pathways to achieve SS ≤ 0 model target.
4. **Governance Integration (governance research):**
   Testing integration of biothermodynamic indicators into decision processes.
5. **Certification (pilot-level, non-legal):**
   Research-comparative benchmarking against ISO/EU standards.

Levels as research categories:

Level	Designation (model)	Condition (hypothetical)	Possible Interpretation
1	EFU-Sovereign	Flux < Allocation	Reference case
2	EFU-Balanced	± 10%	Stable but vulnerable
3	EFU-Deficit	> 110%	Sovereignty gap suspected
4	EFU-Critical	> 150%	Potential structural crisis

All categories represent **research labels**, not legal or mandatory classifications. [HYPOTHESIS]

VI. LEGAL AND STANDARDS CONNECTIVITY – RESEARCH LEVEL

Sub-module	Connectivity	Type
EFU-Crypto v1.0	EU AI Act, ISO 14064 (comparative)	[PROTOCOL]
Data Governance	ISO 27000, blockchain architectures	[PROTOCOL]
Legal Framework	EFU Professional Research License (EPRL)	[AXIOM] – authorship/research rights only

Above connections represent "alignment," not de facto extension of standards. [HYPOTHESIS]

VII. ARGUMENT MAP – CRITICAL ATTACK POINTS IDENTIFIED

Premise A: [AXIOM]
All socio-technical systems fundamentally operate through physical fluxes (energy, material, entropy).

Premise B: [HYPOTHESIS]
When an institution's flux loading persistently exceeds regional metabolic regeneration capacity (SS > 0), sovereignty gap emerges.

Conclusion C: [HYPOTHESIS]
The research model suggests EFU-based flux and Sovereignty Gap audit as viable tool for measuring physical sustainability and human-scale sovereignty.

Logical Chain:
A (physical fluxes) + B (capacity exceedance → SS) → C (EFU-audit as measurement framework)

Critical attack points for reviewers:

- A: Flux metric calibration (EFU-H, EFU-C, EFU-S)
- B: Regional "allocated capacity" estimation
- C: EFU-audit outcome correlation with real institutional performance

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VIII. INTERDISCIPLINARY SYNTHESIS – RESEARCH MATRIX

Discipline	EFU Model Connection	Example/Test Area
Physics	Thermodynamics 1st-2nd laws → EFU-H, EFU-S parameters	Reactors, data centers

Discipline	EFU Model Connection	Example/Test Area
Ecology	C/N/O cycles → EFU-C/W/N	Urban material/energy metabolism
Economics	Physical GAAP → MROI, SS	Institutional balance sheets with physical supplement
Psychology/Sociology	Metabolic Dignity → cognitive energy, stress	Mental load, attention economy

All connections represent experimental hypotheses subject to inter/transdisciplinary research. [HYPOTHESIS]

IX. EPISTEMOLOGICAL APPENDIX (EA – RESEARCH PHASE)

IX.1 Falsifiability

[PROTOCOL] Model validity testable at multiple levels:

- **EFU-calibration falsification:**
  If RACF and EFU baseline values cannot be consistently reconciled with independent physiological/energy databases, current model parameterization is rejectable/modifiable.
- **Sovereignty Gap (SS) falsification:**
  If institutional cases exist where SS ≫ 0 yet no measurable ecological, social, or economic risk is observed, then SS-"sovereignty risk" relationship is weak or erroneous.
- **MROI falsification:**
  If high MROI values do not consistently correlate with any societal utility indicators, current MROI formulation requires redefinition.

IX.2 Uncertainty Factors

[HYPOTHESIS] Model uncertainty sources include:

- Data gaps and variability (regions, sectors)
- Operationalization of Metabolic Dignity psychological component
- Institutional transparency: auditability constraints
- Flux embedding in financial/political contexts (biases, interests)

X. CLOSING STATEMENT – RESEARCH STATUS

[HYPOTHESIS] The EFU Manifesto and Protocol in current form represents a **theoretical-research model**, not a standard. Its purpose is not regulation but hypothesis formulation and rendering physical sovereignty and socio-technical systems relationship investigable.

Next recommended step: empirical model testing (pilot audits, case studies, simulations) in collaboration with institutional and scientific partners.

ACADEMIC NOTE ON BIOPHYSICAL FOUNDATIONS

This Manifesto and Protocol is grounded in the literature of biophysical and ecological economics, which models economic and technological systems as embedded in, and constrained by, thermodynamic and biophysical fluxes rather than by financial variables alone. The general claim that socio-economic systems must be analysed through energy and material flows, in line with the first and second laws of thermodynamics, follows the biophysical economics tradition (e.g. Hall, Cleveland, Melgar-Melgar, and others) and provides the conceptual context for EFU-based metabolic accounting.[sciencedirect]

The critique of the individual carbon-footprint narrative as a guilt-based diversion from systemic responsibility resonates with recent analyses of climate guilt and corporate strategies that individualise climate responsibility, and the EFU framework aligns with this strand by reallocating accountability toward institutions and infrastructures. The formulation of the Reference Annual Carbon Flux (RACF) and the 1 EFU baseline is anchored in established physiological data on human basal metabolic rate, which place typical adult BMR values in the range of roughly 1 200–1 800 kcal per day, making the chosen 1 441 kcal/day reference a conservative, population-consistent estimate.[en.wikipedia]

The notion of a Sovereignty Gap (SS) as a biophysical analogue to ecological debt is conceptually aligned with work on biophysical accounting and ecological overshoot, where systemic deficits emerge once resource use and emissions exceed regional regenerative capacity. Similarly, the proposed institutional audit tiers (EFU-Sovereign / Balanced / Deficit / Critical) echo contemporary attempts to connect biophysical indicators with financial risk assessment and governance, including emerging work on integrating physical metrics into sustainability-oriented risk models.[rethinkeconomics]

The institutional implementation protocol and the connectivity to EFU-Crypto, data-governance and AI-audit modules are intentionally designed as research-level extensions of existing standards and regulatory trajectories, including ISO 14064 for greenhouse gas accounting, the ISO/IEC 27000 family for information security and data integrity, and the EU AI Act's emphasis on transparency, documentation, and independent conformity assessment for high-risk AI systems. Within this ecosystem, EFU operates as a biophysical complement: it does not replace legal or technical compliance regimes, but adds thermodynamic integrity and metabolic sovereignty as explicit audit dimensions.[esg.sustainability-directory]

Finally, the interdisciplinary synthesis linking physics, ecology, economics, and social sciences follows established treatments of socio-economic metabolism and climate-related psychological phenomena, while the specific EFU constructs (Metabolic Dignity, Sovereignty Gap, EFU-H, EFU-S, EFU-C/W/N) are introduced as novel, explicitly defined research concepts that remain open to empirical testing and falsification.[ecopsychepedia]