

## **Framing protocol for ecosystem health evaluation**

The protocol is designed to assess the current state of resources and the environment by focusing the political and societal demand on strong sustainability, namely targeting the intrinsic value of the ecosystem capital (that can not be replaced by economic values) rather than the use value to achieve no net ecosystem degradation. Preference should be given to tools that evaluate ecosystem degradation through norms that work as social signals, are not prescriptive, and mobilize financial levers (rather than norms external to society).

A comprehensive protocol for aid to decision-making (administrative, economic, political) would consider achieving a thorough description of physical and digital resources for a given territory, capable of monitoring the quality of management and internalizing constraints by all actors in a variety of economic, political, and institutional contexts.

Upgrading the existing methodologies must consider systemic accounting approaches that ensure the maintenance of ecosystem capacities (no net ecosystem degradation) as the bottom line. By estimating the ecosystem potential (or capability) one can engage with strong sustainability policies. Establishment of an ecological balance sheet in physical units and aggregation of accounts in intrinsic ecological value units are essential for both integration in national accounts and comparison over time.

A systemic and exhaustive accounting for the ecosystem capital based on a robust statistical base would include accessible resources description, production, and supply, the intensity of their use (consumption, accumulation, and trade), with corresponding remunerations, profits, taxes and subsidies, financial flows and assets, and debts originating from the entire process. This could subsequently be translated into financial costs of depreciation and conservation / compensation procedures, allowing calculating the full costs of products and restoration costs.

This implies a double constraint:

- Use of homogenized statistical norms (statistical socio-ecological standards and units), allowing the integration of physical unit data in macro-economic models (such as those on Carbon quotas) and
- Setting up accounting norms (accounting standards with units of measurement to quantify in relative terms the degradations / improvements) of the physical state of ecosystems at various scales (based on data that are exhaustive, regular, coherent, transparent, and verifiable) enabling local-to-global comparisons to implement systematic ecosystem capital amortization.

The optimized tool for the evaluation of the intrinsic ecological value as an aid to decision-making (administrative, economic, political) is expected to be inclusive, integrated, and actionable simultaneously in distinct socio-economic contexts in order to :

- Organize information at the scale of functional ecological units (water basins, mountain ranges, ecosystem types, etc.) according to core accounting grids;
- Provide methodology for integrating ecosystem degradation into ecosystem capital accounting standards that describe and measure stressor effects with comprehensive and contextualized indicators that out weight juxtaposed aggregated indicators (in the form of lists or dashboards) ;
- Value with multi-scalar environmental diagnostic tools the ecological capital in physical units (gains / losses) as a measure of improvement / degradation;
- Estimate depreciation costs (polluter-payer and other unpaid costs) and the programming of ecosystem capital amortizing costs (natural resource degradation), as well as investment and financial depreciation costs (ecological restoration or avoidance costs);
- Quantify in synthetic manner the externalities of the economy and internalize them in decision processes through annual reporting.

That expertise will become invaluable in

- Detecting early warning signals of ecosystem capital degradation;
- Assessing the impact and effectiveness of public policies, planning decisions and management, and economic activities on the ecological potential;
- Addressing issues such as estimation of full costs (of use, production) and anticipation of financial risks for public institutions (tax base / liability, keeping ecological balance sheets as a market condition) and private companies (financial rating, investment risks, etc.);
- Serving as basis for upgrading legal and institutional frames aiming at the full amortization of the ecosystem capital.