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AUTHENTIC SUSTAINABILITY FILTER (FAS). A NEW METHODOLOGY TO UNCOVER THE PARADOX BETWEEN REGULATORY COMPLIANCE AND THE AUTHENTIC SUSTAINABILITY OF COMPANIES

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Abstract: This study presents and validates a new author's methodology "Filter of Authentic Sustainability" (FAS). The FAS aims to make a quantitative distinction between procedural compliance with the implementation of EU regulatory frameworks (CSRD/ESRS) and the real economic capacity for sustainable transformation of firms. The study presents te FAS model and its validation through its application to two emblematic companies from different sectors - BASF SE (chemical industry) and Stora Enso Oyj (forestry industry). The results show that the companies surveyed that have full regulatory reporting status are in a "compliance paradox". While traditional metrics for the quality and completeness of their reports and ratings reward the completeness of reporting, the FAS index reveals structural imbalances between administrative sustainability costs and real equity investments in taxonomic assets. The FAS methodology is a necessary additional tool for the management of companies, investors and regulators to properly assess the sustainability of companies and choose an adequate policy.

Keywords: Sustainability authenticity, FAS index, Compliance paradox, EU Taxonomy alignment, Accounting based metrics of authentically sustainability.

1. INTRODUCTION

In the last ten years the European accountability rules is in rigour transformation with the introduction of regulatory frameworks for sustainability accounting standards. In the European Union, the Corporate Sustainability Reporting Directive (CSRD) and the European Sustainability Reporting Standards (ESRS) have set new transparency requirements for companies (European Commission, 2022, 2023). The EU Taxonomy Regulation has established a classification system to identify economic activities that contribute substantially to environmental objectives (European Commission, 2020). Despite these ambitious regulatory frameworks, modern corporate sustainability is in a state of conceptual crisis, disputes and

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changes. On the one hand, the European Union has introduced the most ambitious regulatory framework in history, on the other hand, the climate and biodiversity crises are deepening. This phenomenon, referred to in the current study as the "Compliance Paradox" suggests that current metrics primarily measure the ability to account, not the ability to transform. This paradox raises a fundamental question: "Can a company be "fully compliant" with regulations, create huge reports, but at the same time not be authentically sustainable?"

Existing assessment methods, including the ESG ratings of agencies such often rely on surveys, qualitative policy assessments and self-reported information. These approaches are susceptible to subjectivity and fail to distinguish between companies that manage and invest their own resources in long-term sustainability assets from those that finance their "sustainability" through external subsidies and funds that profit thanks to their beautiful reports, or inertialy maintain expensive administration without contributing to sustainability.

Guided by these facts, in this study we are introducing a new Authentic Sustainability Filter (FAS) as a new measure based on accounting data for the authenticity of companies' sustainability. Unlike traditional approaches, the FAS does not assess intentions or policies, but measures, based on data from companies" accounts, the weight of authentic sustainability capital versus the weight of declarative corporate sustainability. The index is based on rigorous financial data from audited annual accounts and Article 8 reports of the EU Taxonomy, applying an algorithm that penalizes the disproportion between operating costs of sustainability" and real capital investments. (European Parliament, 2020).

The purposes of this study are:

1. To present the philosophy, logic and mathematical apparatus of FAS.
2. Apply the methodology to two opposing cases from different sectors-BASF SE and Stora Enso Oyj for 2024.
3. To analyze the results obtained to demonstrate how FAS reveals hidden risks that remain invisible to conventional metrics.

The hypothesis of the study is that full compliance with regulatory reporting standards does not automatically correlate with a high authentic sustainability index and that there are "structural barriers" to the real transformation of companies towards sustainability, which can be quantified through an approach integrating financial and environmental flows.

2. LITERATURE REVIEW

The academic debate on the achievements and failures in creating sustainability at the company level can be systematized in three main directions: (1) the discrepancy and lack of consistency in existing ESG ratings; (2) the evolution from voluntary to mandatory non-financial reporting; (3) The need for new models and metrics to distinguish procedural compliance from the real economic transformation of firms towards sustainability. FAS belongs to this third strand.

2.1. Divergence and lack of consistency in ESG assessments

Berg et al. (2022) identify this phenomenon as "aggregate confusion", as they prove that the correlation between leading companies in ESG ratings is significantly lower compared to credit ratings. The authors attribute this discrepancy mainly to differences in scope divergence and measurement divergence methodologies. Similar conclusions are drawn by Vasiu, (2024), Li et al. (2025) and Chatterji et al. (2016) with the latter demonstrating that firms' ratings do not converge even after controlling the definitions of corporate social responsibility.

Dimson, Marsh and Staunton (2020) empirically prove that while credit ratings achieve a near-perfect correlation (0.99) between major agencies, the average correlation for ESG ratings is only 0,54. This drastic discrepancy proves that the available ESG assessments aren't objective financial facts, but subjective opinions highly dependent on the "appraiser effect".

2.2. Link between sustainability and financial performance

Some studies have shown a positive outcome for companies from including sustainability accountability and their financial performance. For example, a meta-study by Friede et al. (2015) covering a huge number of companies found a positive or neutral correlation in the majority of cases. Eccles et al. (2014) conclude that companies with high levels of sustainability have better operational processes and higher stock value in the long term. Trentin & Marques (2025) prove that the degree of maturity in accountability positively affects organizational performance, but they do not include in their methodology the circumstance of whether these companies are funded by grants, grants and grants.

Other studies have found a less optimistic effect. Berk et al. (2023) show that ESG factors act as risk factors in asset pricing. Khan et al. (2016) add the critical dimension of "materiality", arguing that only material ESG factors for a particular industry significantly affect financial performance. These studies support the hypothesis that general ESG assessments are insufficient to establish the truth about firms' sustainability.

2.3. Philosophical framework: "Sound good" v/s. "Do good"

The lack of consensus finds its philosophical dimension in Cornell and Damodaran (2020) and Damodaran (2021), distinguishing companies that "sound good" through marketing rhetoric from those actually "doing good" via actions leading to higher cash flows or reduced risk. Damodaran defines administrative costs of this "industry of good" as "organizational entropy" - "noise" inflating the balance without creating value. The Authentic Sustainability Filter operationalizes this skepticism using audited financial proxies to quantify entropy and uncover strategic authenticity behind the accountability facade.

2.4. Research gap

Let's summarize. The existing literature clearly documents the issues with the reliability of traditional ESG ratings and the parallel development of a strict regulatory framework in the EU. Despite the wealth of research on the relationship between sustainability and finance, there is a clear gap in the methodologies capable of distinguishing between "procedural compliance" and "substantive economic authenticity"- standing, tangible economic sustainability. The Authentic Sustainability Filter (FAS) proposed in this study, developed as an index, addresses exactly this gap, offering a reproducible, audited-based method for assessing companies" real own transformational capacity.

3. DATA AND METHODOLOGY

This study introduces the Authentic Sustainability Filter (FAS), which transforms sustainability from a regulatory and declarative category into a verifiable and falsifiable economic indicator, based entirely on auditable accounting data. The methodology defines sustainability as a function of the ratio between an internally generated "authentic sustainability capital" and an aggregated "inauthenticity burden", which integrates the administrative external

financial dependency and operational inefficiencies. The present study proposes an ontological distinction between two types of stability - "Procedural" v/s. "Authentic (Substantial)" stability. We define procedural sustainability as the creation of accountability in its regulatory completeness, the validation of which is achieved through external audit and formal compliance. Regulatory compliance is one side of the issue. If we are only looking for regulatory compliance and a formal audit, we will not know how authentic sustainability is. The FAS defines sustainability as a structural characteristic of the firm, and not as an aggregate of positive and negative actions and the scale of non-financial reporting. The basic logic is that sustainability cannot be "bought" through external assistance or short-term operating costs but must come from internally structured investments and the capacity to act independently.

4. RESULTS

4.1. 4.1. Authentic Sustainability Filter (FAS) General Formula

The basic equation of the Authentic Sustainability Filter defines sustainability as a function of the relationship between authentic self-contribution and the weight of internal and external dependencies:

$$FAS = \frac{I_{AC}}{W_{IA}} \quad (1)$$

Where:

$I_{_AC}$ is Index of Authentic Capital. It represents the numerator understood as the "energy of change" following the logic of Cornell and Damodaran (2020). It aggregates own investments in taxonomic assets and internally funded innovations.

$W_{_IA}$ is Weight of Inauthenticity. He is the denominator. It represents the "inertia of dependence". It aggregates the administrative burden, external funding and inefficiencies of operating costs.

The interpretive scale is defined in the following areas:

1. FAS > 1,5- High authenticity (own contribution dominates).
2. 1,0 < FAS ≤ 1,5 - Moderate authenticity.
3. 0,5 < FAS ≤ 1,0 - Moderate dependence.
4. FAS ≤ 0,5 - Critical dependency (the system is economically unsustainable without external injections or regulatory-compliant imitation).

While Article 8 of Regulation EU 2020/852 requires disclosure of turnover proportions, CAPEX and OPEX related to Taxonomy-aligned activities, the FAS methodology deliberately focuses on capital expenditure ($E_{_CAPEX}$) and internally funded sustainability innovation with own resources as key indicators of an authentic sustainability commitment. The turnover proportion is excluded from the FAS calculation because revenue generation reflects market performance and product positioning, not future-oriented investment decisions. A company can report high green turnover through labelling or pricing strategies without reallocating capital to sustainable transformation. By prioritizing CAPEX over turnover, FAS adheres to the thesis that authentic sustainability is demonstrated through sustainability capital rather than revenue classification. This scope limitation positions the FAS as a complementary tool to turnover-based metrics rather than a substitute.

4.2. Decomposition of components

4.2.1. Authentic Capital (IAC)

$$I_{AC} = E_{_CAPEX} + (R\&D_{total} - R\&D_{ext}) \quad (2)$$

Where:

$E_{_CAPEX}$ is the capital expenditures compliant with the EU Taxonomy-aligned, covering all 6 environmental objectives. The use of aligned (and not just eligible) values ensures that activities that meet the DNSH criteria and minimum social guarantees are measured.

$(R\&D_{total} - R\&D_{ext})$ The component isolates the internal innovation capacity. Externally financed is subtracted because it represents "borrowed" capacity and not its own strategic commitment. In the absence of detailed data on external financing, the conservative assumption is applied, which favors the magnitude of the index $(R\&D_{total} - R\&D_{ext})$.

4.2.2. Weight of inauthenticity (W_{IA})

In the FAS, the denominator integrates Damodaran's (2021) skepticism about the "marketing repackaging" of sustainability, identifying organizational entropy through the growth of administrative costs (SG&A). Damodaran warns against companies that "devote hundreds of pages of their annual reports to explain how much good they are doing" when in fact they are simply "repackaging existing concepts with a healthy dose of marketing and sales" (E_{Ent}). (Damodaran, 2021, pp. 2, 20). These approach makes it possible to distinguish between firms that are simply "doing good" from those that actually "doing good" through a real allocation of capital, assuming that "to be good will cost you and/or make it difficult for you" (Damodaran, 2021, p. 20). The proposed Authentic Sustainability Filter (FAS) introduces methodological modifications to the original organizational entropy indicator (E_{Ent}).

$$E_{Ent}^{Damodaran} = \frac{SG\&A}{Gross\ Profit} \quad (3)$$

This approach has 2 inconsistencies in the context of European sustainable accountability:

1. Aggregation. The variable brings together marketing, distribution, and administration costs without isolating the specific costs associated with ESG bureaucracy and the "good industry. " SG&A
2. Lack of regulatory link: the denominator (Gross Profit) is an accounting balance that does not directly reflect the regulatory requirements for taxonomic compliance.

The innovation of FAS consists in isolating $A_{_costs}$ and *S*. Unlike Damodaran's aggregated approach, the FAS methodology performs separation of the components forming the denominator of the index (Inauthenticity Burden - W_{IA}). The FAS uses the variable Acosts instead of the summarized. The FAS uses conservatively derived SG&A"General administrative expenses" (according to IAS 1 and ESRS G1), which serve as the most accurate proxy for compliance costs, audits, and non-financial reporting. This allows for direct measurement of the "bureaucratic fasade" that Damodaran warns about, but with much higher precision. In our philosophy, it is a *S* key author's element, missing from Damodaran's model. The FAS explicitly aggregates all forms of external support (IAS 20 government grants, tax breaks, EU funding, tax breaks) that artificially maintain the visibility of sustainability. While

Damodaran speaks of "entropy" as an internal expense, the FAS identifies "subsidized dependence" as a separate, aggravating factor.

1. Structural transformation of the model. To the extent that Damodaran uses entropy as a descriptive relation, FAS integrates it as a quadratic penalty mechanism into the formula for W_IA.

$$W_{IA} = \max(\underbrace{A_costs - Bio_opex}_{\text{Net Administrative Weith}}, 0) + \underbrace{S}_{\text{External Dependance}} + \underbrace{\left[(OPEX_{sust} + Prov_{env}) \times C_{gap}\right]}_{\text{Operative noneffectivness}} \quad (4)$$

By incorporating it as a standalone component and by applying the max (floor function) function to, the FAS model moves from descriptive cost analysis to a normative test of economic autonomy. While Damodaran's E_Ent signalize for "noice" the components A cost and *S* in FAS - in the FAS methodology, they quantitatively measure the cost of this noise and the degree of external dependence, turning skepticism into a financial indicator compliant with the requirements of the EU Taxonomy. The denominator is designed to capture the three main sources of "fasade" sustainability:

1. Net administrative burden: *max(A_cost - Bio_opex,0)*.
   - *A_cost* - Administrative costs related to ESG reporting, audits and bureaucratic compliance.
   - *Bio_opex* Operating costs for real monitoring and conservation of biodiversity (Objective 6).

The max (..., 0) function acts as a "floor", ensuring that the cost of real care for nature reduces the administrative burden but does not make it negative. If the company spends a lot on accountability, which is in the A cost but little on nature (*Bio_opex*), the burden increases.

2. External dependence (*S*). It is an aggregate of all forms of external grants (EU grants, state subsidies, tax breaks with cash equivalent, etc.). High means that sustainability is "delivered" by public funds rather than generated by the business model.

3. Environmental concealer with square effect

$$\left[(OPEX_{sust} + Prov_{env}) \times C_{gap}\right] \quad (5)$$

Where:

$OPEX_sust$ are operating costs related to the maintenance of taxonomic assets.

Prov_env are Provisions for past environmental damage and reclamation (historical debt).

Here we focus on the composition of the FAS index on C_gap (Divergence Ratio) $C_gap = \frac{OPEX_sust}{E_capex}$

This coefficient acts as a multiplier of inefficiency. If a company declares high operating costs for sustainability (*OPEX_sust*), but there is low real investment (*E_CAPEX*) the coefficient *C_gap* becomes big. Since it multiplies the sum of operating costs and provisions, this creates a non-linear (quadratic) penalty for companies that prioritize current costs ("green PR", audits, current repairs) over long-term investments. This is the mathematical mechanism for detecting "greenwashing through operating costs".

4.2.3. Bio-intensity (I_{bio})

In parallel with the main index, a specific indicator for the focus on biodiversity is included:

$$I_{bio} = \left(\frac{Bio_capex}{E_capex}\right) \times 100 \quad (6)$$

The I_bio indicator was introduced as a corrective for the structural deviation of the FAS towards capital-intensive and technology-oriented forms of sustainability. It measures the relative share of investments aimed at biodiversity and thus reveals the extent to which sustainability is realized not only in terms of capitalization efficiency, but also in terms of the content of this capitalization. In this sense, I_bio functions as a complementary indicator, which allows identifying potential "blind spots" in companies" investment strategies. Investments in biodiversity make natural capital manageable. Why? Biodiversity is a functional natural capital that supports production and economic processes through ecosystem services. Investments in biodiversity are targeted costs to preserve and restore this capital in order to reduce systemic risk, ensure future efficiency and achieve regulatory sustainability. If sustainability means an independent ability of a company to function in the future, then without biodiversity this ability is unrealistic, because the company does not control the basis of its own production.

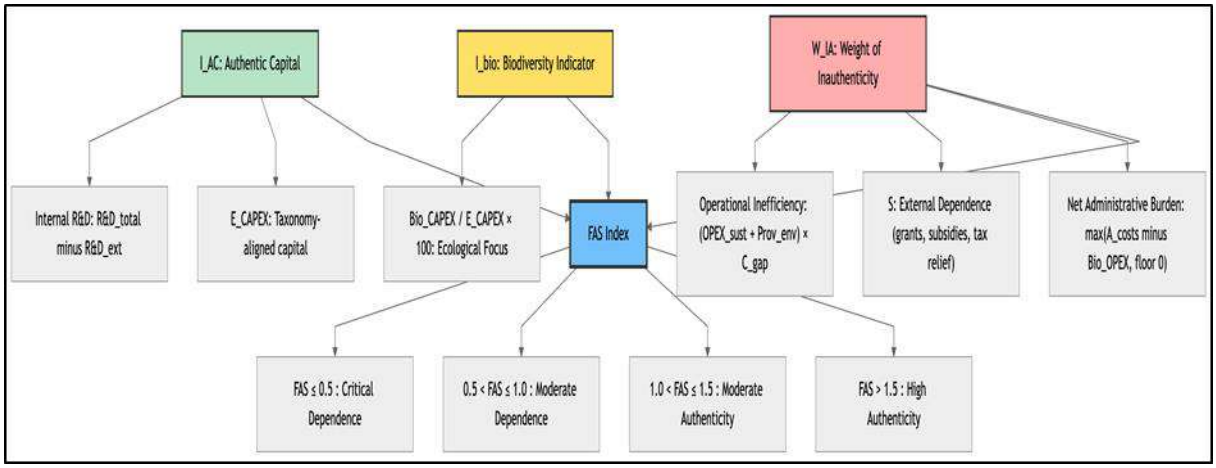


Figure 1. Graphical representation of FAS. Source: The Author via Mermaid.

5. APPLICATION OF FAS ON BASF SE AND STORA ENSO OYJ

5.1. Data extraction and Corporative Profile

To validate the FAS methodology, two European companies with comparable scale and full regulatory compliance under ESRS for 2024 were selected: BASF SE and Stora Enso Oyj. The selection follows a "most-likely / least-likely" case design (Flyvbjerg, 2006; Bukve, 2019), enabling a robust test of the index across structurally divergent sectors.

BASF SE operates in the core chemical industry and represents an upstream position in global value chains, relying predominantly on energy- and fossil-based inputs. The company is undergoing strategic transformation under the "Winning Ways" framework, aiming to integrate profitability, green transition and efficiency (BASF, 2024). For 2024, BASF reports total CAPEX of 6,826 mln. EUR, of which 253 mln. EUR (3,7%) is Taxonomy-aligned.

Sustainability-related OPEX amounts to 1,028 mln. EUR, while R&D reaches 2,061 mln. EUR. Administrative costs total 1,466 mln. EUR, environmental provisions 1,115 mln. EUR, and identified external support amounts to 375 mln. EUR. BASF SE does not disclose any taxonomy-aligned biodiversity investments (Bio_{CAPEX}) as shaw its disclosers. (BASF SE, 2025a; BASF SE, 2025b, BASF SE. 2025c).

Stora Enso Oyj operates in the forestry and bioeconomy sector, positioned closer to final products and based on renewable biological resources, with historical roots dating back to medieval industrial activity (Stora Enso, n.d.). For 2024, total CAPEX is 1,090 mln. EUR, with 64 mln. EUR (5.9%) reported as Taxonomy-aligned. Sustainability-related OPEX amounts to 68 mln. EUR, R&D to 78 mln. EUR, and administrative costs to 543 mln. EUR. Environmental provisions are 118 mln. EUR, while no consolidated value for external support is disclosed (S = 0). Similar to BASF, no Taxonomy-aligned biodiversity investments are reported, although core forestry activities are classified as eligible but not aligned due to verification constraints (Stora Enso Oyj, 2025a; 2025b; 2025c).

All data are extracted exclusively from audited annual financial statements, EU Taxonomy disclosures under Article 8 of Regulation of EU, 2020/852, and sustainability reports prepared in accordance with CSRD and ESRS.

5.2. Empirical analysis

5.2.1. Summary results

Applying the methodology to the extracted data gives the following results in Table 1. The Divergence coefficient (*C_gap*) for BASF Se shows operating costs 4 times higher than investments). Stora Enso Oyj Divergence coefficient (*C_gap*) is more balanced (1,06).

Table 1 Summary results of the implementation of the FAS

Indicator	BASF SE	Stora Enso OYJ	Interpretation
ESRS Status	FULL	FULL	Both companies have full regulatory compliance.
E_{CAPEX} (% from Total)	3,7%	5,9%	Stora Enso has a higher share of green investments compared to the total CAPEX.
C_gap	4,06	1,06	BASF has a serious disproportion (OPEX > CAPEX).
I_{AC} (mln. EUR)	2,314	142	BASF has a higher absolute capacity (mainly than R&D).
W_{IA} (mln. EUR)	10,166	740	BASF carries a huge burden of inefficiencies and provisions.
FAS Index	0,219	0,192	Both companies are in the Critical Dependence zone.
I_{bio} taxonomy alighted (%)	0,00%	0,00%	Lack of focus on biodiversity in both (?)

BASF's analysis reveals the existence of external financing in the amount of 375 mln. EUR, according to Note 9 (p.361) и Note 14 (p.378) Annual Report 2024 This amount includes 302 mln. EUR -grants and funding programs + 73 mln. EUR - tax breaks and other forms of external support.

For Stora Enso, despite the confirmed tax incentives (p. 50), we put $S = 0$ in the model, as there is no consolidated, audited cash value of grants in the public accounts.

5.2.2. The impact of external financing

The impact of external financing (excluding loans) *S* on the FAS index shows the following, presented in Table 2.

Table 2. The impact of external financing *S* (excluding loans) on the FAS index for BASF

Scenario	W_{IA} (mln. EUR)	FAS Index	Status
With external funding (S = 375)	10,548	0,219	Critical Dependency
Without external funding (S = 0)	10,173	0,227	Critical Dependency

The data show that for every 1EUR of authentic own contribution to sustainability, companies bring accordingly - BASF: 4,56 EUR burden (1/0,219); Stora Enso: 5.21 EUR burden (1/0.192). Both companies are structurally unsustainable on their own. Full compliance with the ESRS does not guarantee economic authenticity.

The most-likely / least-likely method we used succeeds in demonstrating the paradox. BASF has a higher FAS (0,219 v/s 0,192), although it has 4 times higher C_gap (inefficiencies) and huge provisions for environmental debt. This paradox is due to the size of the company. BASF has 16 times its authentic capital (I_{AC}), which partially offsets the high burden of administrative costs and environmental provisions. BASF has as a strong point a huge R&D budget (2,061 mln. EUR), which represents 89% от I_{AC}. Its weak point is taxonomic investments (E_{CAPEX}) only 3.7% from total CAPEX. Its weak point is taxonomic investments. The strength of Stora Enso is a higher share of E_{CAPEX} (45% от I_AC) which indicates that the company's investments are more focused on real assets. A weak point is the fact that their absolute value is very low (142 mln. EUR) - the company does not have the scale of BASF's innovation. BASF is an innovation giant with a low conversion into assets, while Stora Enso is a conservative investor of limited scale. The FAS Index confirms the hypothesis of the "Compliance Paradox" - companies can be "ESRS FULL" and at the same time be in critical dependence.

5.2.3. The Burden of Inauthenticity (W_IA)

$$W_IA = max(A_costs - Bio_opex, 0) + S + [(OPEX_sust + Prov_env) \times C_gap] \quad (7)$$

BASF: 10,548 mln. EUR, Stora Enso: 740,63 mln. EUR. The percent of *A_costs* from W_{IA} . Is given at Table 3.

Table 3. Administrative burden (*A_costs*)

Company	Value	% from $\boldsymbol{W_IA}$	Interpretation
BASF	1,466 mln. EUR	13,9%	High administrative costs, including accountability and compliance
Stora Enso	543 mln. EUR	73,3%	Critical

The main problem for Stora Enso is the administrative burden - 73% of the denominator. In BASF the administrative burden is less of a problem (14%) because it is "diluted" by the huge scale of the other components. The paradox here is that although Stora Enso is a smaller company, the administrative burden is disproportionately high relative to investments.

5.2.4. *C_gap* (Divergence coefficient)

The value of divergence coefficient is given at Table 4. ($C_gap = OPEX_sust / E_capex$)

Table 4. C_gap (divergence coefficient)

Value	Interpretation	Status
C_gap = 1	Perfect balance: 1 EUR OPEX for each 1 EUR CAPEX	Optimal
C_gap < 2	Good balance	Acceptable
C_gap > 3	Serious imbalance	Critical

5.2.5. Environmental corrector (quadratic punishment)

Here at Table 5 we will calculate separately the influence of the "environmental corrector". $(OPEX_sust + Prov_env) \times C_gap$

Table 5. Environmental corrector

Company	OPEX_sust	Prov_env	C_gap	Environmental corrector	% from W_IA
BASF	1,028	1,115	4,06	8,707 mln. EUR	82,5%
Stora Enso	68	118	1,06	197,63 mln. EUR	26,7%

Our methodology demonstrates the most important difference between companies. BASF has a C_gap = 4.06 means that BASF spent 4 times more for operational maintenance than investing in new assets. Since C_gap multiplies (OPEX_sust + Prov_env), This creates a quadratic penalty: (1,028 + 1,115) × 4.06 = 2,143 × 4.06 = 8,707 mln. EUR. This component accounts for 82.5% of the entire burden of inauthenticity. This suggests that BASF is trying to "optimize" existing (polluting) assets through high operating costs, rather than replacing them (or not being able to replace them) with new green investments. Stora Enso *C_gap* = 1.06 is almost optimal. With it, operating costs are commensurate with investments. Environmental corrector is only 26.7% of W_{IA} (against 82.5% for BASF). Stora Enso has a robust operating model; it doesn't spend too much on maintenance versus investment. Thus, for BASF, the problem is operational inefficiencies (high *C_gap*), while for Stora Enso the problem is bureaucracy (high *A_costs*).

5.2.6. Bio Intensity *I_bio*

$$I_bio = (Bio_capex / E_capex) \times 100 \quad (8)$$

Both companies have 0% (Table 6) biodiversity investments that are "taxonomically compliant." (Taxonomy Goal 6 i.e. taxonomy-aligned), although BASF operates in a chemical industry that is directly dependent on ecosystem services, and Stora Enso manages forests, a direct natural asset linked to biodiversity. Here we encounter an accounting problem for Stora Enso - forests are reported as "biological assets" and are valued at "fair value", not as an investment. But the report shows zero. ESG/Taxonomy measures what you declare as sustainable, not what resources you actually control over. In the 2024 Annual Report, Stora Enso discloses that its forest management activities are considered taxonomy-eligible but not taxonomy-aligned due to the inability to fulfil third-party verification requirements. As a result , core bio-based activities remain largely unrecognized within EU Taxonomy-aligned metrics, despite their central role in the company's business model. In its Report, the Company directly states, "forest management... reported as eligible but not-aligned" for the reason "unable to

fulfil the third party verification requirement". There are investments, but Taxonomy simply does not know what to do with them, and accountability does not capture them. There is no shortage of organic investments. Their recognition in taxonomy is missing. This is a very serious accounting problem. (Stora Enso, 2024a).

Table 6. Causes of the case I_bio

Company	Causes. Why *I_bio* = 0%?
BASF	There are no disclosed investments under Objective 6. Focus entirely on climate goals (Goal 1: Reduce emissions)
Stora Enso	Forestry is "eligible" but not "aligned" due to lack of third-party verification for taxonomy purposes

The zero investments in the restoration and creation of bio-resources, announced in accordance with the requirements of the sustainable reporting regulation, leads us to the thesis that the transition to the new economy is a "technocratic transition". It turns out that the "Green Transition" in accounting is anthropocentric and technological, not biocentric.

The paradox for Stora Enso is as follows. Stora Enso manages approximately 2 million hectares of owned and leased forest land globally, while historically its predecessor held up to 2.3 million hectares of forest assets and has bio-investments. However, 0% of investments are considered "biodiversity-compatible". This shows a gap in the regulatory framework: the "alignment" criteria may be too bureaucratic. Regulators need to simplify the criteria for Goal 6 to include sustainable forestry

The FAS index reveals that there are defects in the correct assessment of companies" efforts that need to be corrected. BASF is the more polluting industry, but it is more authentic (0.219 > 0.192), despite the higher C_gap because it has a huge R&D capacity (2,061 mln. EUR). The scale of the investments compensates partially for the inefficiencies. Stora Enso appears less authentic. Despite better *C_gap*, the administrative burden (73% of W_{IA}) "consumers" its advantage. The index shows that both companies are in critical dependency (FAS < 0.5). Both companies that are polar cases show that ESRS FULL ≠ authentic sustainability. This confirms the study's hypothesis that regulatory compliance does not guarantee authenticity of their sustainability. Even when turning on 375 mln. EUR external support, the BASF FAS index remains in the zone of critical dependence (0,219 < 0,5). The difference between the two scenarios is only 0,008 points (0,227 - 0.219). The problem is structural not financial - the low FAS index is not due to a lack of subsidies, but to a fundamental disproportion between operating costs and capital investments (*C_gap* - 4, 06). Grants, subsidies, external financial assistance do not buy authenticity: Even with 375 mln. EUR external support, BASF fails to get out of the zone of critical dependence. This calculations validate that sustainability cannot buy external financing but must come from an internal transformation of the business model. S's share is marginal: External funding accounts for only 3,5% of the total burden of inauthenticity (375 / 10,548). The main burden comes from the environmental corrector (8,707 mln. EUR, or 82,5% of W_{IA}); environmental corrector inflated by the high *C_gap*. For Stora Enso, the disclosure value of *S* (despite the existence of tax benefits) is in itself indicative of a lack of transparency on the dependence on public resources. This shows the need for detailed disclosure requirements for all forms of State support under Article 8 of the EU Taxonomy.

6. DISCUSSION: DECODING THE CORRESPONDENCE PARADOX

Our application of FAS reveal critical dimensions of corporate resilience that remain hidden in standard sustainability analysis. The key finding is the illusion of compliance: both companies, despite ESRS FULL status, fall within the "critical dependence" zone (FAS ≤ 0.5). This confirms the correspondence paradox: regulatory frameworks such as CSRD and ESRS standardize disclosure, but do not ensure structural reallocation of capital toward sustainable assets. Compliance with reporting, double materiality and assurance does not translate into economic sustainability.

6.1. Regulatory Blindness to Biodiversity – The Case of Stora Enso

From this study follows not only the filtering of the authenticity of the sustainability of the company, but also the structural defect in the EU Taxonomy itself. Stora Enso Oyj manages 2.3 mln. hectares of forests, a direct natural asset linked to biodiversity. However, the company reports I_bio = 0.00% according to Taxonomy-aligned metrics. The reason, as directly stated in the Annual Report (Stora Enso, 2024, p.86), is: "Forest management activities are considered taxonomy-eligible but aren't taxonomy-compliant due to the inability to meet third-party verification requirements. "Accounting invisibility of biological investments. Forests are accounted for as "biological assets" under IAS 41 (Fair Value) and not as equity investments (CAPEX). This makes them invisible to Taxonomy CAPEX metrics. The EU taxonomy requires third-party verification for Goal 6 (Biodiversity), but such a mechanism has not yet been operationalized for forestry. The Regulatory blindness (> 90% of Stora Enso's CAPEX is ineligible for reporting), even though the core business is bio-based. This means that the Taxonomy does not recognize sustainable forestry as a "sustainable activity".

Table 7. FAS's sensitivity to the recognition of bio-investments. Stora Enso Oyj (2024) - Hypothetical Scenario

Scenario	% от Non-eligible CAPEX recognized as Bio_{CAPEX}	FAS Index	I_bio (%)	Status	Changes in Status
S0 (Baseline) Current status: FAS = 0,192 (Critical) - regulatory blindness	0% (Aligned)	0,192	0,00%	Critical	-
S1	10%	0,285	61,5%	Critical	+0.093 (+48.4%)
S2	25%	0,456	80,6%	Critical	+0.171 (+89.1%)
S3(Transition) Transition threshold: FAS = 0,704 (Moderate) - realistic scenario	50%	0,704	88,8%	Moderate	+0.248 (+129.2%)
S4	75%	0,912	92,3%	Moderate	+0.208 (+108.3%)
S5 (Full Bio) Full Recognition: FAS = 1,089 (Moderate Authenticity) - Theoretical Maximum	100%	1,089	94,1%	Moderate authenticity	+0.177 (+92.2%)

Hypothetical Sensitivity Analysis (Table 7) confirms that partial recognition of biodiversity investments would have a non-linear impact on the FAS index. Even moderate inclusion of Bio_{CAPEX} significantly improves the numerator (I_{AC}) without proportionally increasing W_IA. This effect is particularly visible for Stora Enso Oyj, where forestry investments are structurally present but not recognized as Taxonomy-aligned. The results demonstrate that the current regulatory framework underestimates sustainability performance in bio-based sectors. At the same time, the sensitivity analysis does not alter the structural conclusions for BASF SE, where the dominant constraint remains the high divergence coefficient (C_gap) and the resulting environmental penalty.

6.2. The role of external financing (S)

For BASF, despite the existence of identified external grants and subsidies amounting to 375 mln. EUR (Note 9 and Note 14 of the 2024 Annual Financial Statements), they represent only 3.5% of the total burden of inauthenticity. Even with their inclusion, the FAS index remains in the zone of critical dependence (0.219), which underlines that the main problem is structural (high *C_gap* and administrative burden) and not so much dependence on subsidies." For Stora Enso, $S = 0$ in the model, since despite the confirmed tax benefits (p. 50 of the 2024 Annual Financial Statements), there is no consolidated, audited monetary value of grants in the public accounts.

7. LIMITATIONS OF THE STUDY

Despite analytical rigor, this study has three limitations outlining avenues for future FAS development. First, lacking public data on externally funded R&D forced a conservative assumption ($R\&D_ext = 0$), potentially overestimating I_{AC} and underscoring the need for transparent ESRS reporting. Second, using general administrative costs as an ESG bureaucracy proxy may overestimate *A_costs* , though justified for benchmarking. Third, the static one-year analysis (2024) offers only a snapshot, missing the dynamics of long-term asset transformation.

8. CONCLUSIONS

The current study has proven the viability and analytical value of the FAS methodology. By applying it to BASF and Stora Enso, we have demonstrated that full compliance with the world's most stringent regulations - European reporting standards - is not synonymous with authentic sustainability. We have a proof - both companies analyzed are in the zone of critical dependence, driven by different, but equally worrying factors. The complete lack of demonstrated investments under Biodiversity (Goal 6) for both companies reveals the "blind spot" of the current transition - the focus on climate is at the expense of nature. First of all, this analysis revealed the heterogeneity of "critical dependence". The literature (Berg et al., 2022; Zubizarreta & Aquino, 2026) documents the divergence of ESG ratings but does not analyze the structural sources of inauthenticity. This analysis shows that FAS < 0,5 can stem for different structural problems. The equal result does not mean equal causes. Improvement policies should be specific to the dependency profile. We operationalizes "organizational entropy" (Damodaran, 2021). The FAS Index quantifies administrative entropy through A_{costs}, distinguishes it from operational inefficiencies (Eco-Corrector), and allows comparisons between companies and sectors. The FAS Index doesn't just measure "how resilient" a company is, but "what type of resilience" it has. This allows for precise interventions instead of general recommendations. For Stora Enso, the problem is bureaucracy, for BASF,

operational inefficiencies. Both require different strategies to achieve authentic sustainability. The FAS index does not aim to replace existing ratings, but to supplement them with the necessary economic realism. It transforms sustainability from a marketing category into a strictly measurable economic variable. In a world where "green" is often used as a fasade, FAS offers the mathematical language needed to distinguish true transformation from the illusion of one. FAS not only measures authentic sustainability but also diagnoses regulatory gaps.

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