

Environmental, social and economic reporting in the wind energy industry

A Comparative Study of Companies
from Germany, China, and the USA



Prepared by
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Data
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Statement of the Problem

Why Comparability Remains a Challenge

Abundance of ESG documents, yet like-for-like comparison is difficult

Three frictions:

- 1 Uneven disclosure depth (baselines, KPIs, time horizons)
- 2 Varying alignment with GRI, SDGs, TBL
- 3 Divergent credibility features (assurance, oversight structures)

Magnified by jurisdiction-specific rules
(EU CSRD vs. US vs. China)



Objective of the Study

Aim

To analyze, compare, and explain how Siemens Gamesa (EU), GE Vernova (US), and Goldwind (CN) embed Planet, People, and Profit in their 2023–2024 reports

Map coverage & depth
across TBL using a
transparent coding
protocol

Assess alignment with
GRI standards and the
SDGs

Evaluate credibility
(assurance, target
specificity, time-bound
KPIs)

Explain differences via
regulation, stakeholder
pressure, and corporate
strategy



Research Questions

Guiding the Inquiry

Primary Question

How do Siemens Gamesa, GE Vernova, and Goldwind articulate sustainability in their reports?

Secondary Questions

- To what extent do disclosures align with global frameworks (GRI, TBL, SDGs)?
- Which contextual factors explain cross-company differences in depth, emphasis, and credibility?



Research Hypothesis

Four Testable Propositions

H1

Depth

Companies differ significantly in disclosure depth per TBL pillar (KPI density, target specificity)

H2

Framework alignment

Siemens Gamesa shows stronger alignment with GRI & double materiality

H3

Economic framing

GE Vernova places greater weight on the Profit dimension

H4

Policy alignment & SDGs

Goldwind aligns more explicitly with national policy & SDGs, with fewer assured indicators

Structure of the Study

1

Introduction

Context, research problem, and objectives

2

Theoretical Framework

ESG, sustainability reporting standards (GRI, CSRD, SDGs), and Triple Bottom Line

3

Methodology

Data collection, coding scheme, and analytical approach

4

Analysis

Content analysis of Siemens Gamesa, GE Vernova, and Goldwind reports

5

Comparison and Discussion

Cross-country and cross-company differences

6

Conclusion

Key findings, implications, and recommendations for future reporting

Methodology. Codebook & Scoring

Domain	Sub-Domain	Score 0	Score 1	Score 2
Planet	GHG Emissions	No mention	Mentioned	Scopes 1–3, baseline, target year, method
	Biodiversity	No mention	Mentioned	Baseline, mitigation hierarchy, monitoring
People	Health & Safety	No mention	Mentioned	LTIFR/TRIR, near-miss tracking
	Community	No mention	Mentioned	Grievance channels, benefit mechanisms, data
Profit	Financial Resilience	No mention	Mentioned	Capex, backlog quality, scenario analysis
Governance	Board Oversight	No mention	Mentioned	Named committees, skills matrices

Inter-Coder Reliability Plan

Goal

Ensure consistency and objectivity

Pilot Test

On representative page sets

Targets

$\geq 85\%$ agreement, Cohen's $\kappa \geq 0.70$

Process

Clarify, re-train, re-pilot if needed

Result

Documented adjudication for earned reliability

Category block	Action if < target
Planet	Clarify inclusions; add examples
People	Merge overlapping codes; re-train
Profit	Refine definitions; second pilot
Governance	Tighten process-evidence rules

Aggregation & Normalization

Coverage Ratio

% of items scored ≥ 1

Depth Index

Mean item score (0-2)

TBL Balance Index

Coefficient of variation across
People/Planet/Profit

Alignment Score

Composite of GRI, SDG
Target, ESRS/IFRS cues

Assurance Quality Score

Level & scope of external
assurance

Normalization

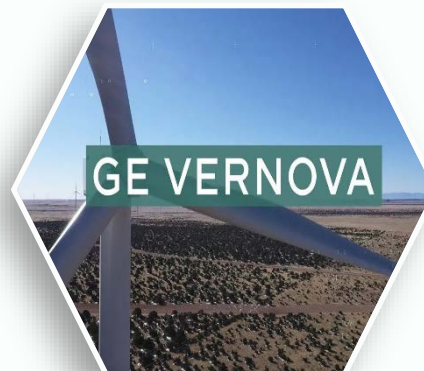
Applied per 100 pages to
control for report length

Dataset Overview



Siemens Gamesa

- FY2023 report
- ~180 pages
- GRI index
- assurance



GE Vernova

- 2023–2024 reports
- ~150–170 pages
- limited assurance



Goldwind

- 2023 report
- ~140 pages
- overview GRI mapping
- limited assurance

Applied codebook skeleton

- 0** No substantive coverage
- 1** Mentioned without KPIs/process evidence
- 2** Evidence-based, quantified, traceable

Planet



GHG; Energy; Circularity;
Water; Biodiversity

KPIs, baselines, targets, method notes;
mitigation hierarchy; monitoring

People



Health & Safety; DEI; Skills
& Training; Community

LTIFR/TRIR, training hours, DEI metrics,
grievance mechanisms, benefits

Profit



R&D & Innovation;
Financial Resilience

R&D spend/pipeline, backlog, scenario/risk;
critical materials due diligence

Governance



Board Oversight; Risk &
Controls; Due Diligence

Committee mandates, ERM, internal controls;
whistleblowing, anti-corruption

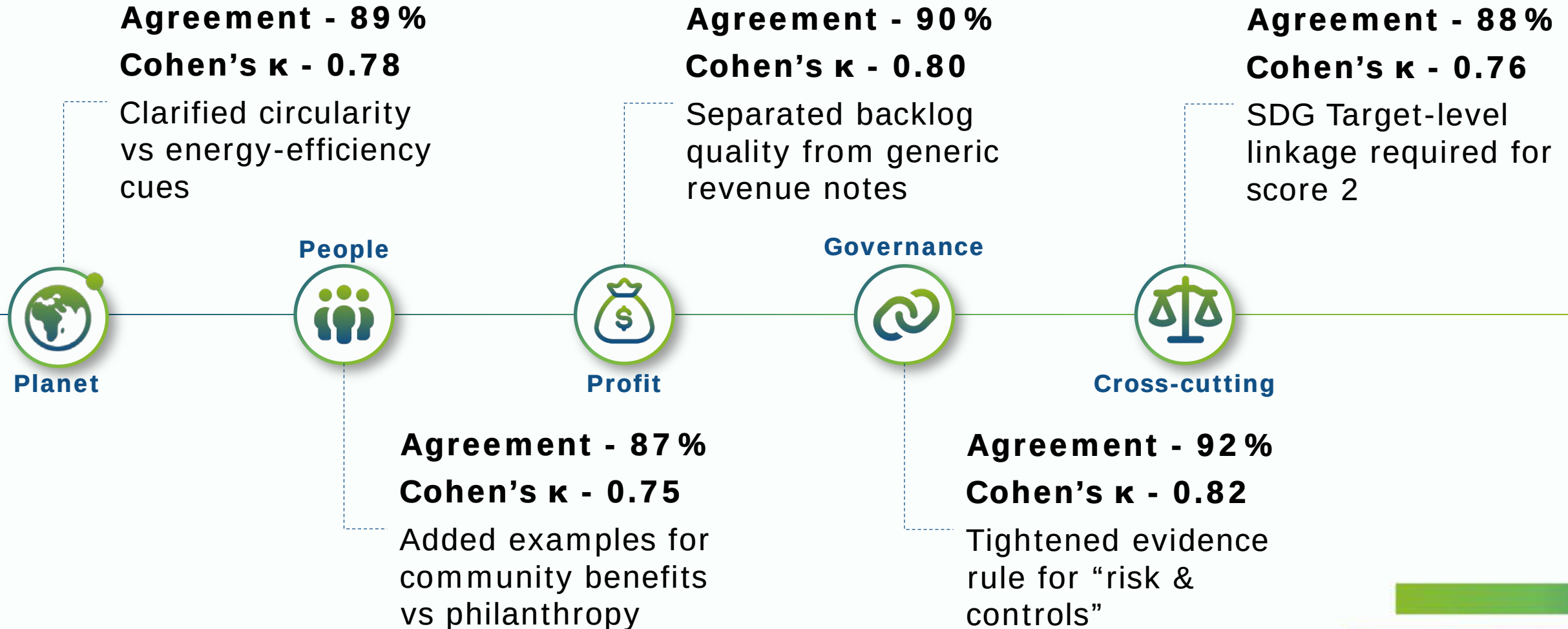
Cross-cutting



Materiality; Assurance;
SDG Alignment

Double/financial/impact; level/scope;
Target-level linkage to KPIs

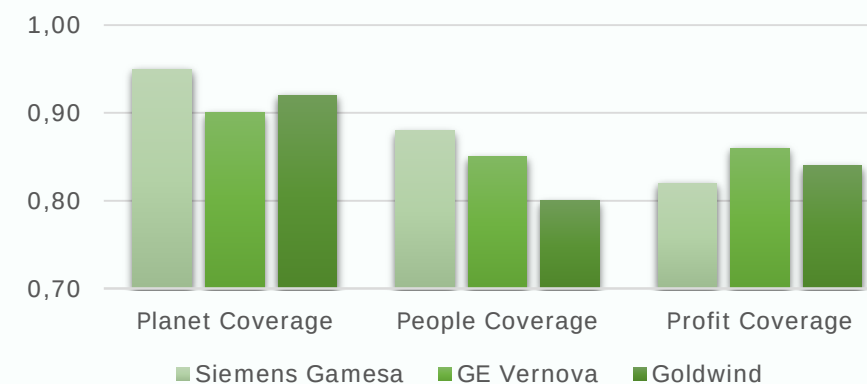
Inter-coder reliability outcomes



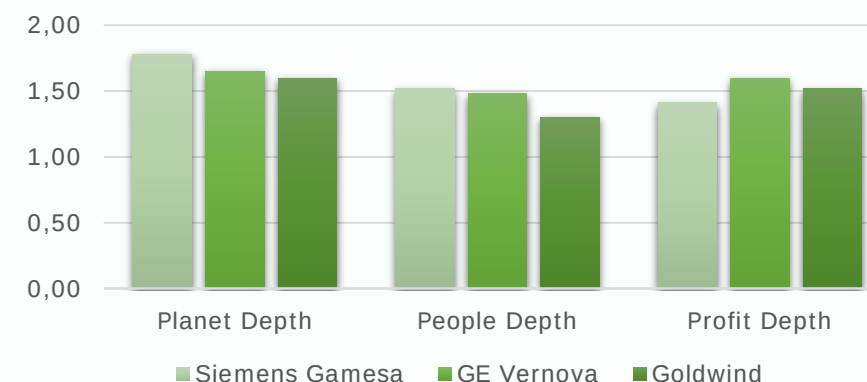
Results. Firm Scorecards (Coverage & Depth)

Metric	Siemens Gamesa	GE Vernova	Goldwind
Planet Coverage	0.95	0.90	0.92
People Coverage	0.88	0.85	0.80
Planet Depth	1.78	1.65	1.60
People Depth	1.52	1.48	1.30
Profit Depth	1.41	1.60	1.52
TBL Balance Index	0.12	0.07	0.11

Coverage Ratio by Domain



Depth Index by Domain

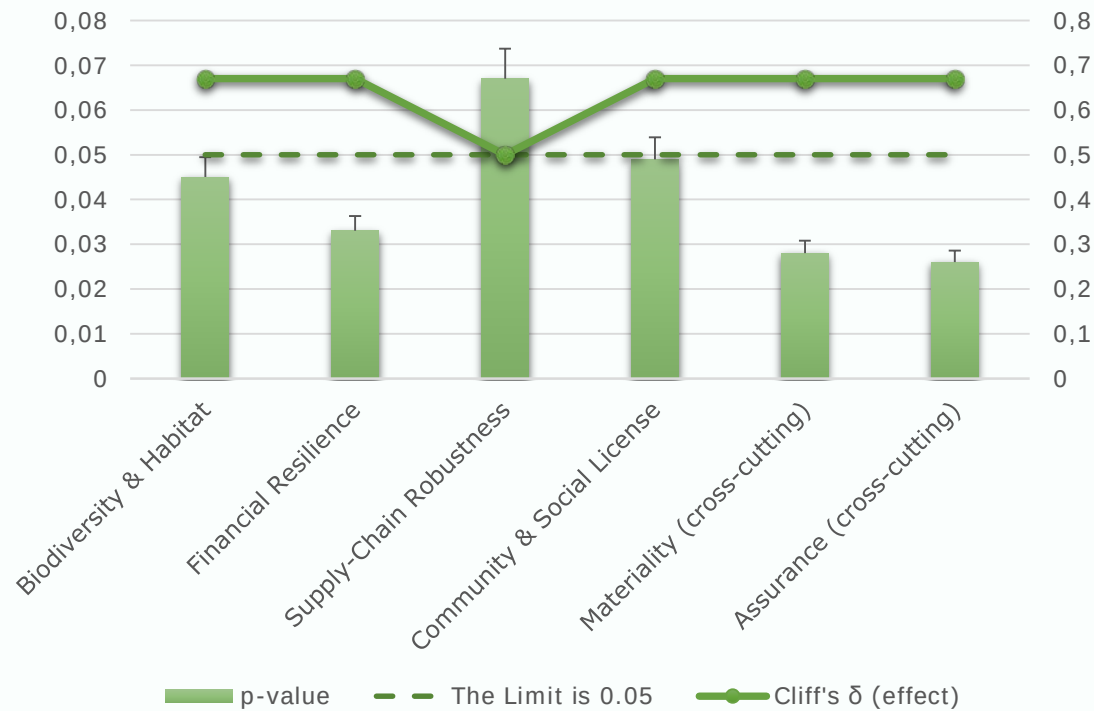


Sub-Domain Scores (0–2 by Company)



Non-Parametric Tests & Effect Sizes

Kruskal-Wallis test results and effects (Cliff's δ)



Sub-Domain	H-value	p-value	Cliff's δ	Conclusion
Biodiversity	6.20	0.045	0.67 (large)	SG > GE, GW
Financial Resilience	6.80	0.033	0.67 (large)	GE > SG, GW
Materiality	7.10	0.028	0.67 (large)	SG > GE, GW
Community	6.00	0.049	0.50 (moderate)	GW > SG, GE
Assurance	7.30	0.026	0.67 (large)	SG > GE, GW

Alignment & Assurance Composites

Alignment Score

0.86

Siemens
Gamesa

0.64

GE
Vernova

0.66

Goldwind

Assurance Quality Score

0.82

Siemens
Gamesa

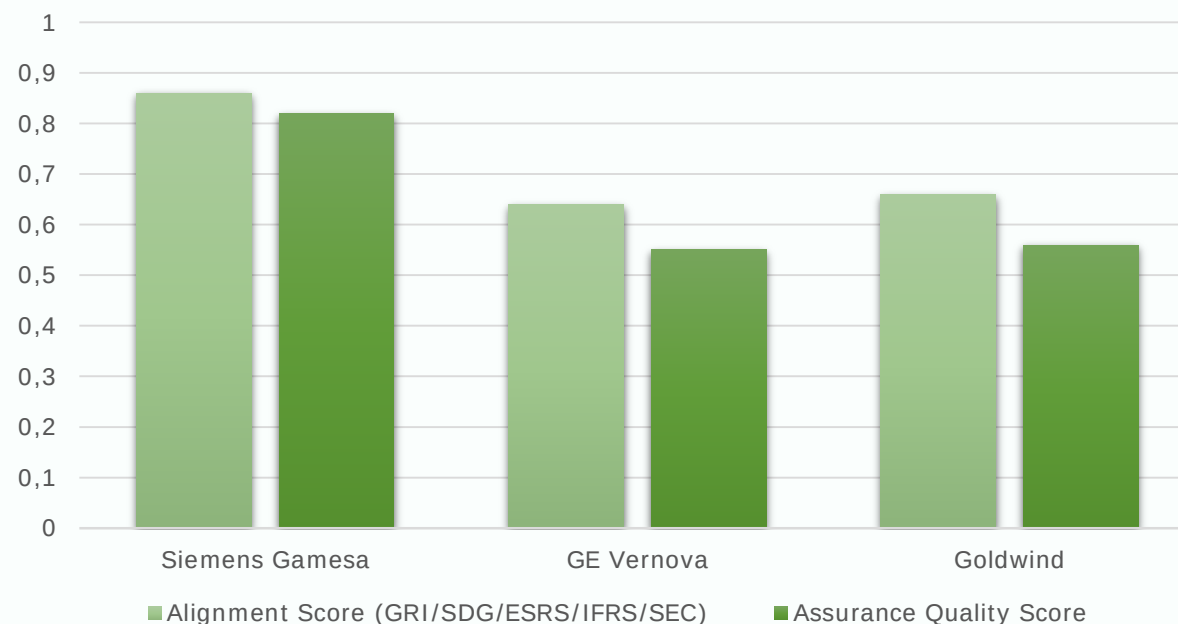
0.55

GE
Vernova

0.56

Goldwind

Alignment and Assurance Composite Scores (0-1 scales)



Interpretation: Higher alignment specificity correlates with internal data discipline

Cross-Country Synthesis

Category	EU (Siemens Gamesa)	USA (GE Vernova)	China (Goldwind)	Trend / Interpretation
Planet: Climate	✓✓ High	✓✓ High	✓✓ High	Convergence: investor pressure, sector physics
Biodiversity	✓✓ Strong emphasis	□? Moderate	□? Moderate	Divergence: ESRS E4 influence (EU)
Circularity	✓✓ Leader	□? Moderate	✓✓ Leader (pilots)	EU ≈ CN > US: regulatory/pilot initiatives
People: Community	✓ Moderate	✓ Moderate	✓✓ Localization focus	Divergence: CN policy, social license focus
Profit: Financial Resilience	✓ Moderate	✓✓ Risk–return focus	✓ Moderate	Divergence: SEC-style framing (US)
Supply-Chain Robustness	Board Oversight	✓✓ Leader	✓✓ Leader	US ≈ CN > EU: reshoring, critical materials
SDG Alignment	✓✓ Target-level	✓ General	✓✓ Target-level (policy)	CN ≈ EU > US: explicit goal linkage

Hypothesis Testing Summary

Decisions & Mechanisms

Explanatory
Mechanism



Regulatory
Design



Stakeholder
Salience



Corporate
Strategy

H1

Depth



Supported

Large effects in Biodiversity, Community, Financial Resilience

H2

**Frame
work**



Supported

Siemens Gamesa leads in alignment, double materiality, assurance breadth

H3

Economic



Supported

GE Vernova leads in Profit depth via risk-return & resilience metrics

H4

**Policy &
SDGs**



**Supported
(Alignment) /
Partial (Assurance)**

Goldwind strong on policy/SDG links; assurance lower than EU, narrower than US

Conclusion. Key Findings

1

Climate Core

Convergent reporting on GHG & energy KPIs

2

Adjacent Domains

Divergence in biodiversity, circularity, community, finance

3

Credibility

EU assurance breadth > US investor narratives > CN policy alignment

4

Framework Alignment

Indicator-level mapping signals data discipline

5

Drivers

Regulation + Stakeholders + Strategy

6

Siemens Gamesa

Leads in double materiality, GRI alignment, broad assurance

7

GE Vernova

Strong profit & risk-return focus; selective assurance

8

Goldwind

Policy & SDG-aligned; community focus; narrower assurance

9

Hypotheses

H1–H3 supported. H4: policy alignment ✓; assurance scope partial

10

Robust

Findings hold after normalization & sensitivity checks

Thank You for Your Attention!

Comparability is achievable
with traceability, specificity,
and assurance



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