CMDF
Thailand Capital Market Development Fund

FINAL REPORT

Project on the Emphasis of the Environmental, Social, and Governance (ESG) Practices of Leading Companies in Thailand, Conducted through In-Depth Learning

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aiESG

1. Executive Summary

This report presents findings from an AI-driven, large-scale textual analysis of Environmental, Social, and Governance (ESG) reporting practices among the 100 leading listed companies on the Stock Exchange of Thailand (SET100). Applying a state-of-the-art multilingual deep learning model—the Text Match Pre-Trained Transformer (TMPT)—we systematically analyzed 845 corporate disclosure documents comprising Annual Reports (AR) and Sustainability Reports (SR) in both English and Thai, covering fiscal years 2020 to 2024. This constitutes, to the best of our knowledge, the most comprehensive AI-based ESG textual analysis of the Thai capital market conducted to date.

The TMPT model scores the relevance of each text fragment in a corporate report against 13 predefined ESG topics spanning Environmental (4 topics), Social (6 topics), Governance (1 topic), and Economic (2 topics) dimensions. Scores are aggregated into company-level ESG Emphasis Scores and subsequently standardized to enable cross-company and temporal comparison.

Key Findings

- Economic dominance in Annual Reports: Economic Ripple Effect (mean score: 0.352 in AR-EN) and Production Cost (0.228) consistently record the highest emphasis across all Annual Report types, reflecting the financial-reporting culture of Thai listed companies. This pattern is stable across all five fiscal years analyzed.
- Environmental topics concentrated in Sustainability Reports: Greenhouse Gas (mean 0.117 in SR-EN vs. 0.050 in AR-EN) and Air Pollution (0.062 vs. 0.016) are dramatically more prominent in Sustainability Reports, revealing that environmental disclosure remains largely siloed in dedicated ESG documents rather than integrated into core financial reporting.
- Near-universal coverage of key topics: 100% of SR-EN reports show meaningful emphasis (score > 0.05) on Work Environment, Domestic Job Creation, Governance Risk, Production Cost, and Economic Ripple Effect. By contrast, only 15.8% of reports exceed the threshold for Human Rights—the lowest coverage of any topic.
- Significant language divergence for social topics: While Greenhouse Gas demonstrates high EN-TH consistency in Annual Reports (Pearson r = 0.858), Human Rights (r = 0.214) and Domestic Reflux Rate (r = 0.283) show low consistency in Sustainability Reports, suggesting that socially sensitive topics may be communicated differently across audiences.
- Two distinct company typologies: K-means clustering (k=2) on standardized SR-EN scores identifies an Environmental-focused cluster (n=197 report-years; high Air Pollution, Water Consumption, GHG, Community emphasis) and a Social-focused cluster (n=88 report-years; high Human Rights, Work Environment, Domestic Job Creation emphasis).
- Improving but incomplete disclosure trajectory: Economic category scores in Annual Reports are gradually declining (Economic Ripple Effect: 0.352→0.340 from FY2021→FY2024), while Environmental and Social scores show modest but consistent upward movement in SR, suggesting a slow but discernible improvement in ESG integration.
- Cross-industry patterns: Economic Ripple Effect is the highest-emphasis topic across all 11 GICS sectors. Energy and Utilities lead in Environmental topics; Financials leads in Governance Risk. Human Rights remains below the meaningful-emphasis threshold in every sector, confirming a structural, sector-agnostic disclosure gap.
- Thailand in the Asian context: Thailand's SR emphasis profile most closely resembles Malaysia and Indonesia, with strong Economic and moderate Social emphasis, while lagging behind Korea and Japan in Environmental and Social topic integration.

2. Introduction and Project Rationale

2.1 Global ESG Reporting Landscape

The past decade has witnessed a fundamental transformation in corporate accountability expectations. ESG disclosure has evolved from a voluntary best-practice to a near-mandatory element of investor relations in major capital markets. Global frameworks—including the Task Force on Climate-related Financial Disclosures (TCFD), the International Sustainability Standards Board (ISSB) IFRS S1 and S2 standards, and the EU Corporate Sustainability Reporting Directive (CSRD)—have set progressively more stringent and standardized requirements for ESG information.

For emerging-market regulators and companies, this represents both a challenge and an opportunity. Meeting international disclosure standards can significantly expand access to international capital, including green bonds, sustainability-linked bonds, and ESG-screened equity. Failure to meet these standards risks capital flight and reputational damage.

2.2 The Thai Capital Market Context

Thailand's capital market occupies a strategically important position in Southeast Asia. The Securities and Exchange Commission (SEC) and Stock Exchange of Thailand (SET) have progressively strengthened ESG reporting requirements, with the SET introducing the ESG Ratings system and mandating One Reports for listed companies. The Thai Bond Market Association (ThaiBMA) has been active in promoting ESG bond issuance, with the Thai ESG bond market growing significantly in recent years.

Despite these advances, critical gaps remain. Prior cross-country research has found that only 10.0% of Thai listed companies produce ESG-emphasized reports, compared to 80.0% in Korea, 40.0% in the Philippines, and 33.3% in Japan (Li et al., 2024b). This gap highlights the urgency of understanding the current state of ESG disclosure quality and identifying barriers to improvement.

A unique feature of the Thai reporting environment is the bilingual requirement: listed companies are expected to communicate with both domestic Thai-language stakeholders and international English-language investors. Discrepancies between these two language versions can undermine transparency and create information asymmetries.

2.3 The Role of AI in ESG Analysis

Traditional approaches to ESG analysis—manual review, keyword counting, or third-party rating aggregation—are limited in their scalability, objectivity, and ability to handle linguistic diversity. Recent advances in Natural Language Processing (NLP), particularly transformer-based models, offer a solution: automated, objective, and granular analysis of large-scale unstructured text.

This project applies the TMPT model, purpose-built and validated for multilingual ESG textual analysis, to the full corpus of SET100 corporate disclosures. The result is an empirical, replicable, and scalable characterization of ESG emphasis patterns—providing a data-driven baseline for policy intervention, investment screening, and academic research.

3. Project Objectives

This project pursues four objectives as defined in the Funding Agreement (Appendix 1) with ThaiBMA:

1. Analyze ESG Emphasis Trends: Identify temporal trends in ESG topic emphasis among SET100 companies using TMPT-based scoring across FY2020–FY2024, covering both Annual Reports and Sustainability Reports in English and Thai.
2. Evaluate Multilingual Reporting Consistency: Quantify the consistency between English and Thai ESG disclosures for the same company and year, assess the direction and magnitude of language gaps, and evaluate implications for transparency and investor communication.
3. Compare Industry-Level ESG Priorities: Identify sector-specific ESG emphasis patterns through cross-industry comparison analysis using GICS sector classifications for all 100 SET100 companies.
4. Assess Socio-economic Context: Explore how company-level ESG priorities relate to broader socio-economic factors and company characteristics, with the development of illustrative case studies.

4. Scope of Analysis

4.1 Target Companies and Reports

The analysis covers all 100 companies included in the SET100 Price Index as of the data collection date. The SET100 index is a market-capitalization-weighted index comprising the 100 largest listed companies by market value on the Stock Exchange of Thailand, collectively representing the dominant portion of Thai equity market capitalization.

Report types analyzed include Annual Reports (AR, also called One Reports under the SET unified reporting format) and Sustainability Reports (SR) or Integrated Reports (IR). As documented in the Progress Report (March 2026), no standalone Integrated Reports were published by SET100 companies during the study period; integrated reporting content was incorporated into Annual Reports.

4.2 ESG Topics

The 13 ESG topics analyzed are defined to be consistent with prior cross-country studies (Li et al., 2024a, 2024b), enabling future cross-country comparison with Korea, Japan, China, Indonesia, Malaysia, the Philippines, and Singapore:

Category	Topic	Description / Rationale
Environmental	Air Pollution	Emissions of pollutants (PM2.5, NOx, SOx) affecting local air quality
Environmental	Greenhouse Gas	GHG emissions (Scope 1/2/3), carbon neutrality commitments
Environmental	Water Consumption	Water use, recycling, and stewardship
Environmental	Mining Consumption	Resource extraction, raw material use efficiency
Social	Work Environment	Employee relations, working conditions, HR development
Social	Community	Community investment, local engagement
Social	Safety and Health	Occupational health and safety metrics
Social	Human Rights	Supply chain labor standards, anti-discrimination
Social	Domestic Job Creation	Employment generation within Thailand

Category	Topic	Description / Rationale
Social	Domestic Reflux Rate*	Proportion of value retained within domestic economy
Governance	Governance Risk	Board structure, anti-corruption, risk management
Economic	Production Cost	Cost efficiency, operational performance disclosure
Economic	Economic Ripple Effect*	Broader economic impact, value chain contribution

Table 1: ESG Topics Analyzed and Their Rationale (See Appendix A for full definitions)*

4.3 Data Corpus

Release Year	Collected PDFs	SR-EN	SR-TH	AR-EN	AR-TH	Full Coverage (SR+AR, EN)
2021 (FY2020)	2	1	1	0	0	0/100
2022 (FY2021)	89	1	1	86	1	0/100
2023 (FY2022)	187	94	1	91	1	86/100
2024 (FY2023)	187	92	1	93	1	86/100
2025 (FY2024)	381	97	95	99	90	96/100
Total	846	285	99	369	93	—

Table 2: Corporate Report Corpus by Year and Report Type

The rapid increase in coverage from 2022 onward reflects the SET's progressive rollout of the ESG report disclosure portal and the growing adoption of standalone Sustainability Reports by SET100 companies. By FY2024 (2025 release year), 96 of 100 target companies had both SR-EN and AR-EN documents available for analysis. The remaining 4 companies either published SR in Thai only or had delayed filing.

Data Note: The SET100 constituent list used for all years (FY2020–FY2024) reflects the composition as of the data collection date. The index rebalances semi-annually; companies that entered or exited during 2020–2024 are not reflected in historical year lists. This structural approximation is a known limitation and will be addressed in future iterations.

Data Note on Thai-language report availability: The data collection framework relied on the Yahoo Finance API for systematic document retrieval. While this enabled scalable collection of English-language reports with high coverage (96/100 companies for FY2024), historical Thai-language Sustainability Reports (SR-TH) and Annual Reports (AR-TH) were not consistently indexed or accessible through this API. As a result, SR-TH and AR-TH coverage prior to the 2025 release year (FY2024) is extremely limited — not because such reports do not exist, but because they fall outside the systematic retrieval scope of the API used. Future studies seeking comprehensive historical Thai-language coverage would require supplementary manual collection from company investor relations pages or the SET disclosure portal.

5. Methodology

5.1 Text Match Pre-Trained Transformer (TMPT): Architecture

The TMPT is a Siamese network architecture designed for zero-shot textual relatedness estimation. Unlike discriminative classifiers that require labeled training data for each target category, the TMPT learns a general-purpose semantic similarity function that can be applied to any topic at inference time—making it ideal for emerging ESG frameworks where topic definitions evolve over time.

The model consists of three major components:

Content Encoder (302,990,592 parameters)

Processes text fragments of up to 512 tokens. The encoder pipeline consists of: (1) a token embedding layer using bert-base-multilingual-cased pre-trained embeddings in a 768-dimensional semantic space; (2) nine stacked standard Transformer blocks (the first six initialized from BERT, three additional blocks trained from scratch); (3) global average pooling with pool size 4 producing a 4×768 tensor; (4) flattening to a 3,072-dimensional vector; (5) six Full Residual Connection modules to prevent vanishing gradients; and (6) a final dense layer reducing dimensionality from 3,072 to 768.

Topic Encoder (210,045,012 parameters)

Processes topic strings of up to 16 tokens using the same BERT embedding and Transformer architecture, with pooling size 1 producing a 768-dimensional output vector. Critically, the Content and Topic Encoders do not share parameters, allowing each to specialize in its respective input type.

Matcher (2,903,937 parameters)

Computes the relatedness score from the two 768-dimensional encoder outputs. The Matcher first computes an element-wise difference vector (768 dimensions), then passes it through three Full Connection Modules, followed by four successive dimension-reduction dense layers (768→512→256→64→1). The final output is a scalar in [0, 1] via sigmoid activation, representing the probability that the text fragment is relevant to the topic.

Total trainable parameters: 515,939,541. The model is implemented in TensorFlow 2.12.0 with a memory footprint of 1.92 GB, trained on four NVIDIA A100 40GB GPUs with batch size 64.

5.2 Pre-training Data and Zero-Shot Capability

A critical capability of the TMPT is zero-shot learning: the model can estimate relatedness for any topic without topic-specific fine-tuning. This requires exposure to abundant and diverse training data during pre-training.

The training dataset comprises approximately 159 million samples from two sources:

- Wikipedia dataset (v1.2.0, September 2023 dump): ~148 million samples across 329 languages. Each Wikipedia article's explanatory section is paired with its keywords as a positive sample; negative samples are created by pairing with random keywords from different articles in the same language. The first 10 tokens of each article are excluded during training to prevent the model from exploiting superficial keyword overlap.
- Academic dataset: ~11 million samples from 1.47 million English articles (high-impact Elsevier journals), 128,000 Chinese articles (CNKI), and 11,000 Japanese articles (J-Stage). Abstract-keyword pairs form positive samples; cross-article pairings form negative samples.

The dataset is split 98%/2% for training and testing, with 2% of academic articles in each language reserved as untouched test data.

5.3 Model Performance

Language / Subset	Accuracy	Precision	Recall†
Overall	89.8%	89.0%	90.8%
English	91.0%	87.6%	95.8%
Thai	85.4%	83.9%	86.8%

Table 3: TMPT Model Performance on Test Dataset

The Thai-language accuracy of 85.4% is notable given that Thai is a morphologically complex, low-resource language with limited representation in early multilingual NLP models. The higher English recall (95.8%) reflects the richer English training data, while the balanced Thai precision/recall (83.9%/86.8%) indicates reliable performance without systematic bias toward false positives or

negatives.

† Recall measures the model's ability to identify all relevant text fragments for a specific ESG topic without missing pertinent information. A Recall of 95.8% for English means the model correctly identifies 95.8% of all truly relevant fragments; the remaining 4.2% are missed (false negatives). Thai Recall of 86.8% indicates approximately 1 in 8 relevant Thai-language fragments may be overlooked. See Appendix A for a full definition.

5.4 Data Preprocessing Pipeline

Each PDF report undergoes a four-stage preprocessing pipeline before analysis:

1. Text Extraction: Textual content is extracted from PDF documents using a character-string extraction engine, producing a continuous text string for each report.
2. Tokenization: Each text string is tokenized using the bert-base-multilingual-cased tokenizer, which applies sub-word tokenization. For example, "rights" is divided into "right" and "##s". Thai text is tokenized at the character level due to the absence of word-boundary markers.
3. Token ID Conversion: Tokens are converted to integer IDs according to the tokenizer's vocabulary dictionary (vocabulary size: 119,547 tokens), producing a numerical array representing each report.
4. Fragmentation: The token ID array is segmented into overlapping 512-token fragments (the maximum input length of the Content Encoder). Each report typically produces hundreds to thousands of fragments, depending on document length.

ESG topics undergo a parallel preprocessing pipeline (steps 1–3 only, without fragmentation), producing a 16-token representation for each topic string.

5.5 ESG Emphasis Scoring

The scoring procedure applies the TMPT to each fragment-topic pair, yielding the following metrics:

Match Score (ms)

For each fragment i in report r and topic j, the TMPT produces a match score $ms_{ijr} \in [0, 1]$. A score above 0.5 indicates that the fragment is related to the topic.

Relatedness Score

The relatedness score amplifies the signal from related fragments while zeroing out unrelated ones: $relatedness_{ijr} = 2 \times ms_{ijr}$ if $ms_{ijr} > 0.5$, else 0. This “squeezing” transformation maps related fragments to [1, 2] and eliminates noise from weakly-related text.

ESG Emphasis Score

The emphasis score for report r on topic j is the mean relatedness across all n fragments: $emphasis_{jr} = (1/n) \Sigma\ relatedness_{ijr}$. This formulation rewards both the proportion of fragments related to a topic (breadth) and the strength of those relationships (depth).

Standardized Score (Semphasis)

To enable cross-company and cross-year comparison, emphasis scores are standardized: $S_{emphasis,jr} = (emphasis_{jr} - m_j) / \sigma_j$, where m_j and σ_j are the mean and standard deviation of all reports’ emphasis toward topic j. Standardized scores above 0 indicate above-average ESG emphasis; scores below 0 indicate below-average emphasis.

Important note on interpretation: The ESG Emphasis Score measures the depth and density of textual disclosure on a given topic within a corporate report, and does not reflect the quality or actual implementation of ESG practices. A company with strong ESG practices but limited or broad-based reporting may receive a lower score than a company that discusses the topic extensively in its

disclosures. The score is therefore best understood as a measure of ESG communication intensity, not ESG performance.

5.6 Analytical Framework

Four analytical approaches are applied to the computed scores:

1. Temporal Trend Analysis: Annual mean scores are computed separately for each report type (SR/AR) and language (EN/TH) combination, tracking changes across FY2020–FY2024.
2. Language Consistency Analysis: For matched company-year pairs with both English and Thai versions available, Pearson correlation coefficients are computed between EN and TH scores for each topic.
3. K-means Clustering: Standardized SR-EN scores are clustered into k=2 groups using the K-means algorithm (300 maximum iterations, convergence threshold $\varepsilon = 0.001$, random seed = 42), revealing distinct ESG disclosure typologies.
4. Reporting Coverage Analysis: The proportion of reports exceeding a threshold score of 0.05 for each topic is computed, providing a measure of disclosure breadth across the SET100 universe.
5. Cross-Industry Analysis: Mean ESG Emphasis Scores and K-means cluster composition are computed by GICS sector (FY2022–FY2024) to enable industry-level comparison.

6. Results

6.1 ESG Emphasis by Category: SR vs. AR Comparison

Figure 1 presents the overall mean ESG emphasis score by topic, comparing Sustainability Reports (SR-EN) and Annual Reports (AR-EN) across the full study period. This comparison reveals a fundamental structural divergence in how Thai companies communicate ESG information across different disclosure formats.

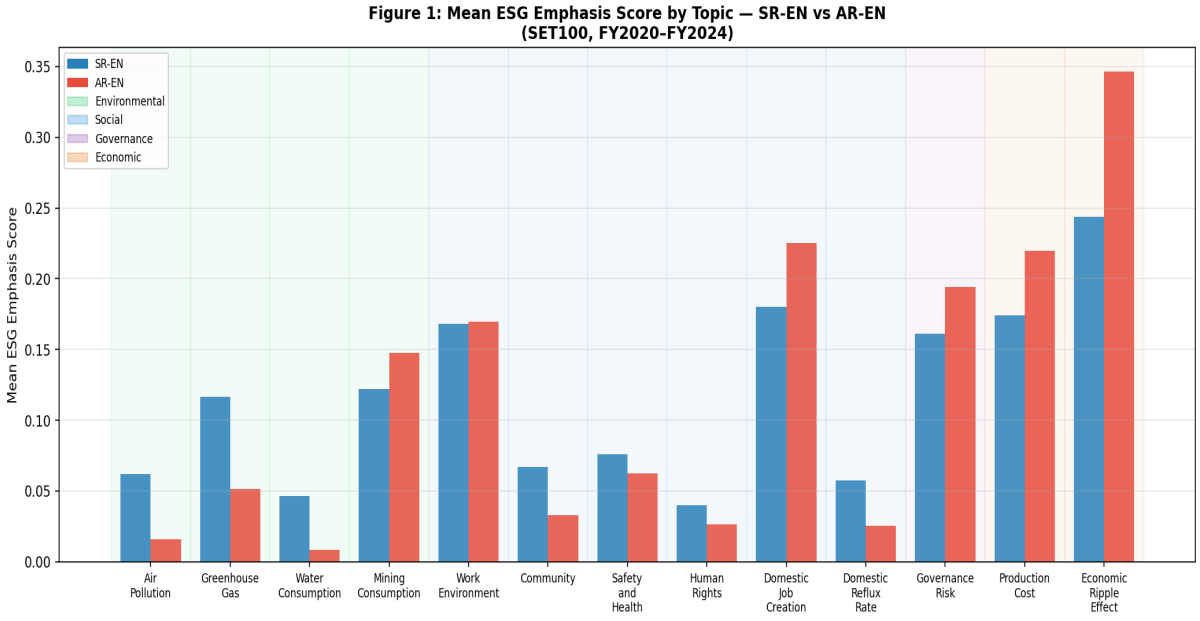


Figure 1: Mean ESG Emphasis Score by Topic — SR-EN vs AR-EN (SET100, FY2020–FY2024)

The divergence is most pronounced for Environmental topics. Greenhouse Gas scores are 2.3× higher in SR-EN (mean: 0.117) than in AR-EN (0.050), and Air Pollution scores are 3.6× higher (0.062 vs. 0.017). This pattern suggests that Thai companies have not yet successfully integrated environmental reporting into their core annual financial disclosures—a gap that becomes increasingly problematic as international frameworks like ISSB S2 require climate-related financial disclosure within integrated annual reports.

Conversely, Economic topics—Production Cost (AR-EN: 0.228; SR-EN: 0.174) and Economic Ripple Effect (AR-EN: 0.352; SR-EN: 0.244)—are consistently higher in Annual Reports, reflecting the financial-reporting orientation of these documents. Governance Risk shows a notable reversal: it is higher in AR-EN (0.202) than SR-EN (0.161), likely because governance structures and risk disclosures are mandated elements of Thai annual reports under SEC regulations.

6.2 Temporal Trends in ESG Emphasis

Figure 2 shows the trend in mean ESG emphasis by category (Environmental, Social, Governance, Economic) for Sustainability Reports in English across FY2020–FY2024. Figure 3 shows the detailed topic-level trends across all four report-language combinations.

⚠ *Note on FY2020 and FY2021 SR data: FY2020 (release year 2021) and FY2021 (release year 2022) SR-EN and SR-TH data each cover only 1 company. These data points are not statistically representative of the SET100 universe and should be interpreted with caution. Trend analysis conclusions are primarily drawn from FY2022–FY2024 data.*

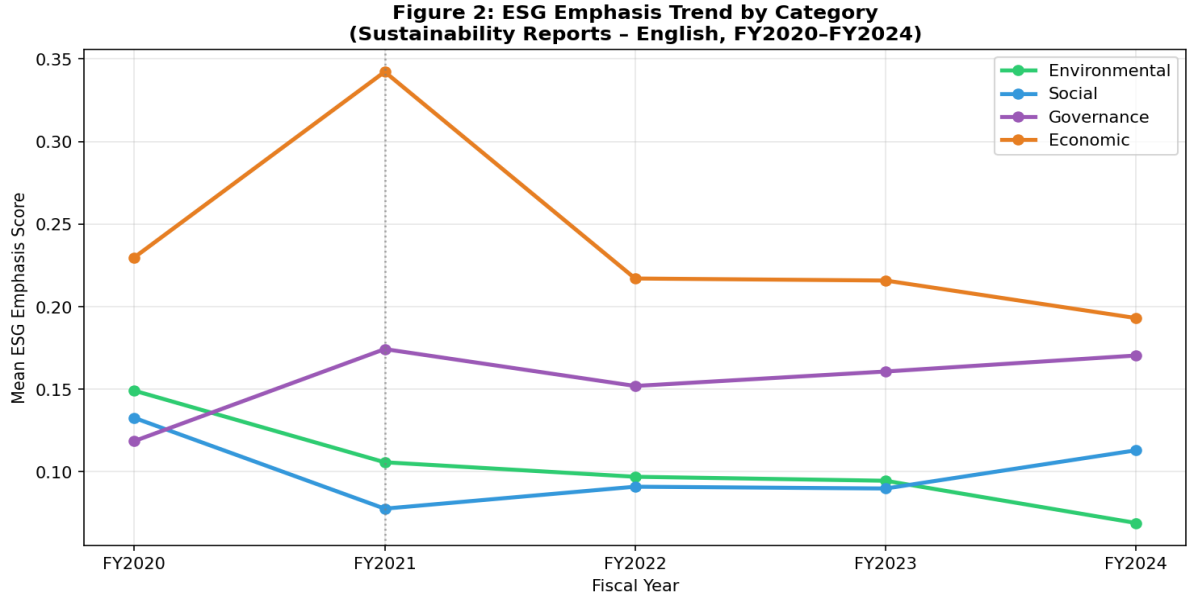


Figure 2: ESG Emphasis Trend by Category — SR-EN (FY2020–FY2024) ⚠ *FY2020–FY2021 SR data: single-company only — not statistically representative*

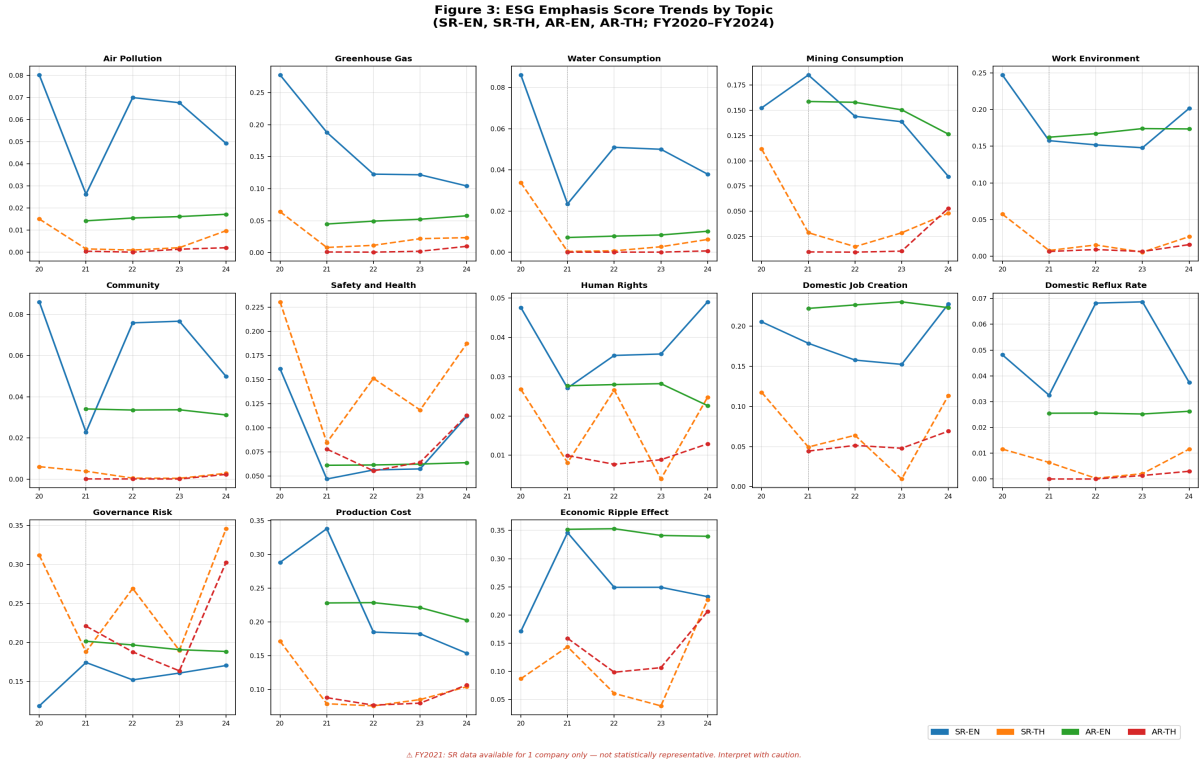


Figure 3: ESG Emphasis Score Trends by Topic (SR-EN, SR-TH, AR-EN, AR-TH; FY2020–FY2024) ⚠ FY2020–FY2021 SR data points based on single-company sample — interpret with caution

Several temporal patterns warrant attention:

- Economic category dominance persists but shows early signs of moderation: In Annual Reports, Economic Ripple Effect declined from 0.352 (FY2021) to 0.340 (FY2024), while Production Cost fell from 0.228 to 0.203. This may reflect the gradual integration of non-financial content into One Reports.
- Environmental disclosure is increasing in SRs: Greenhouse Gas scores in SR-EN rose from 0.278 (FY2020) to a sustained level of approximately 0.120–0.130 from FY2022 onward, reflecting growing attention to climate-related disclosure driven by TCFD uptake and regulatory expectations.
- Social topics are stable: Work Environment maintains consistent scores around 0.167–0.200 across SR-EN documents, while Safety and Health shows gradual improvement from 0.057 (FY2021) to 0.112 (FY2024) in SRs.
- Human Rights remains consistently low: Despite international regulatory pressure (e.g., mandatory human rights due diligence in supply chains), Human Rights scores remain below 0.050 across all report types and years, with only 15.8% of SR-EN reports exceeding the 0.05 meaningful-emphasis threshold.

6.3 Reporting Coverage: Which Topics Are Universally Disclosed?

Figure 4 presents the proportion of SR-EN reports with an ESG emphasis score exceeding 0.05 for each topic. This threshold represents a meaningful level of textual emphasis—above which a topic is substantively discussed rather than merely mentioned in passing.

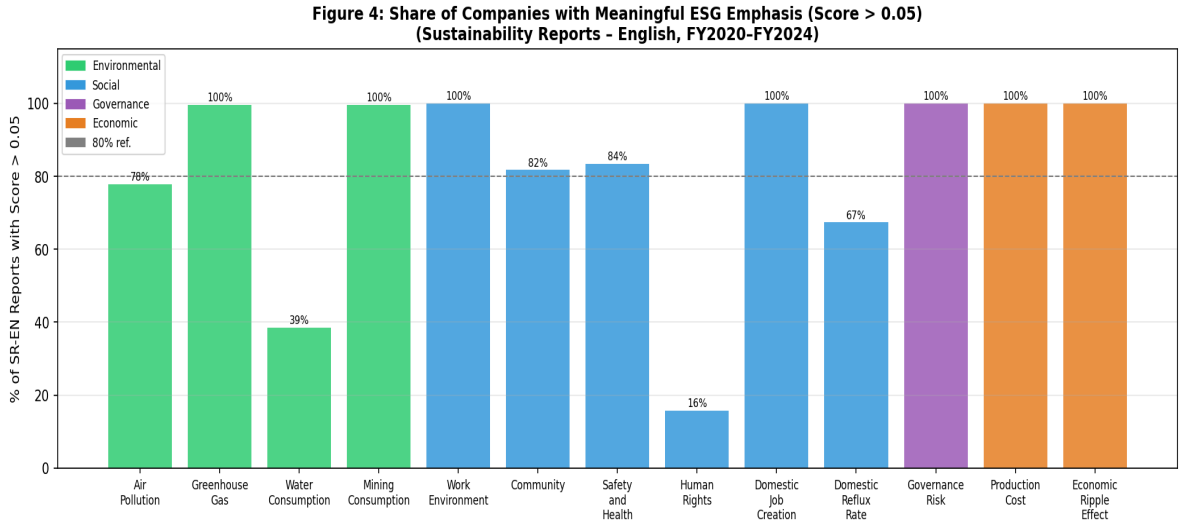


Figure 4: Share of SET100 Companies with Meaningful ESG Emphasis (Score > 0.05) per Topic — SR-EN

The coverage analysis reveals a sharp bimodal pattern:

- Universal topics (≥99% coverage): Work Environment (100%), Domestic Job Creation (100%), Governance Risk (100%), Production Cost (100%), Economic Ripple Effect (100%), Greenhouse Gas (99.6%), Mining Consumption (99.6%). These topics are effectively universal elements of SET100 sustainability reporting.
- High-coverage topics (77–84%): Air Pollution (77.9%), Community (81.8%), Safety and Health (83.5%). These are mainstream ESG topics but with meaningful heterogeneity in disclosure depth.
- Moderate-coverage topics: Water Consumption (38.6%), Domestic Reflux Rate (67.4%). The relatively low Water Consumption coverage is surprising given global water stress concerns and Thailand's agricultural economy.
- Low-coverage topics: Human Rights (15.8%)—the most significant disclosure gap. Only one in six SR-EN reports meaningfully discusses human rights, despite increasing international mandatory disclosure requirements (EU CSRD, US SEC climate rules, and emerging mandatory human rights due diligence legislation in key trading partner countries).

6.4 Top-Performing Companies by Key ESG Topics

Figure 5 identifies the top 5 companies by emphasis score for four key ESG topics in FY2024 SR-EN reports. These companies represent leading disclosure practices and may serve as benchmarks for industry peers.

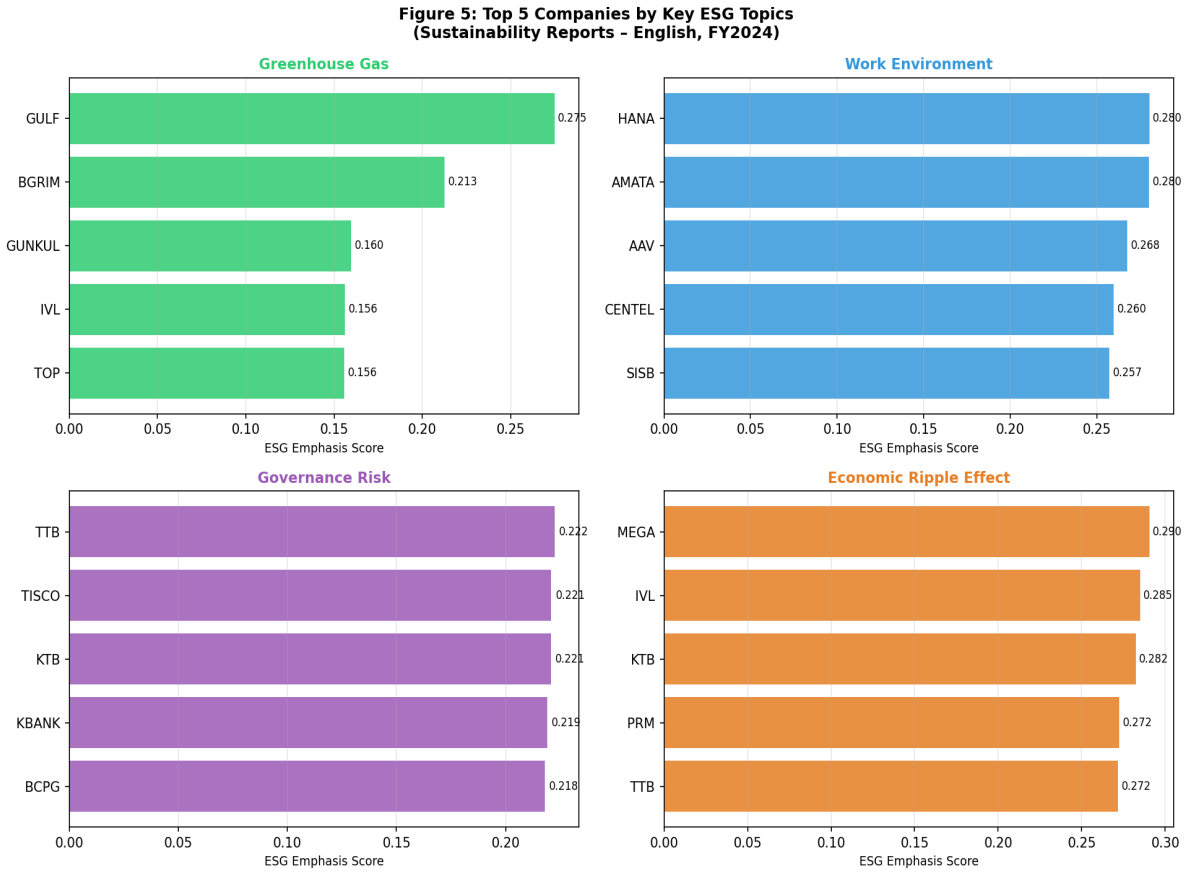


Figure 5: Top 5 Companies by Key ESG Topics — SR-EN, FY2024

GULF Energy Development leads in Greenhouse Gas disclosure (score: 0.275), Production Cost (0.265), and ranks in the top 5 for Air Pollution and Water Consumption—reflecting the disclosure intensity expected of a major energy company. BGRIM Power ranks second in GHG (0.213) and first in Water Consumption (0.082). For Governance Risk, the top 5 are all banks or financial institutions (TTB, TISCO, KTB, KBANK, BCPG), consistent with the governance-intensive regulatory environment for Thai financial institutions. For Economic Ripple Effect, MEGA Lifesciences (0.290), IVL (0.285), and KTB (0.282) lead—suggesting that healthcare, chemicals, and banking sectors communicate broad economic impact most extensively.

6.5 Language Consistency Analysis

Figure 6 presents the analysis of language consistency between English and Thai corporate reports, comprising two panels: the mean score difference (EN − TH) for matched SR pairs, and the Pearson correlation coefficients for both SR and AR matched pairs.

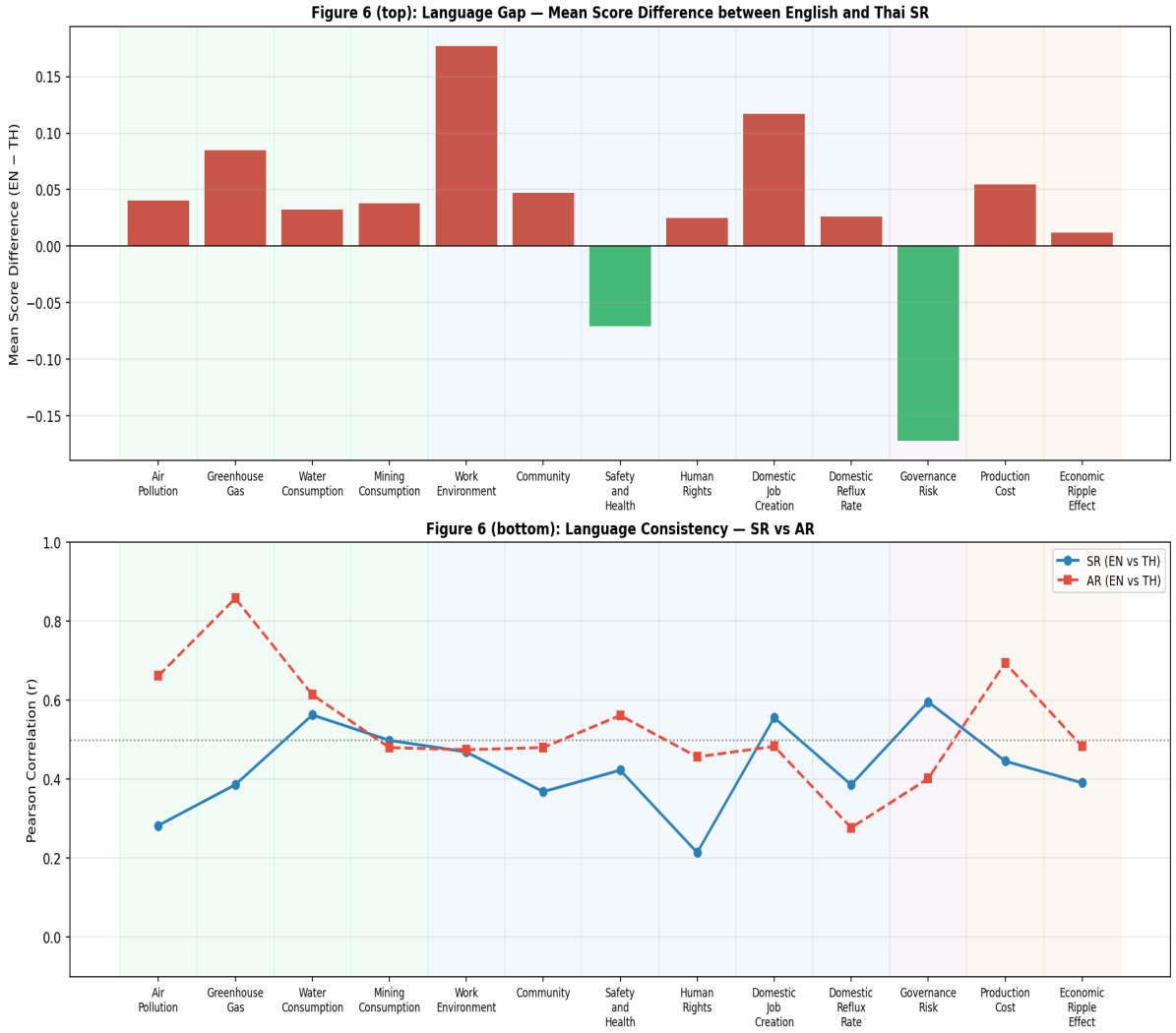


Figure 6: Language Gap (EN–TH Score Difference) and Language Consistency (Pearson r) by Topic

The upper panel reveals systematic directionality in language gaps. English Sustainability Reports consistently score higher than Thai versions for most topics, with the largest gaps in Work Environment (+0.177) and Domestic Job Creation (+0.117). These positive gaps indicate that English SR versions are more forthcoming about social conditions—potentially because English-language reports are written for international investor audiences with higher ESG expectations.

Notably, two topics show negative gaps (Thai versions score higher): Safety and Health (−0.071) and Governance Risk (−0.172). The negative Governance Risk gap is particularly significant: Thai annual reports have stronger governance disclosure language—perhaps reflecting domestic regulatory compliance requirements communicated more naturally in Thai, or risk that governance information is primarily oriented toward domestic regulators rather than international investors.

The lower panel shows Pearson correlations between matched EN-TH pairs. Key findings from Table 4:

ESG Topic	SR: EN vs TH (r)	AR: EN vs TH (r)
Air Pollution	0.283	0.662
Greenhouse Gas	0.386	0.858
Water Consumption	0.563	0.614

ESG Topic	SR: EN vs TH (r)	AR: EN vs TH (r)
Mining Consumption	0.499	0.480
Work Environment	0.469	0.475
Community	0.369	0.480
Safety and Health	0.423	0.562
Human Rights	0.214	0.457
Domestic Job Creation	0.556	0.483
Domestic Reflux Rate	0.386	0.277
Governance Risk	0.596	0.402
Production Cost	0.446	0.695
Economic Ripple Effect	0.391	0.483

Table 4: Language Consistency — Pearson r between English and Thai Reports (SR and AR)

Greenhouse Gas demonstrates dramatically higher consistency in Annual Reports (r = 0.858) than in Sustainability Reports (r = 0.386). This divergence is consistent with the hypothesis that GHG data in Annual Reports are largely driven by standardized accounting frameworks (GHG Protocol, ISO 14064), which produce consistent numerical disclosures regardless of language. In Sustainability Reports, by contrast, narrative framing around climate strategy and environmental commitments may be tailored to different audiences.

Human Rights shows uniformly low consistency across both report types (SR: r = 0.214, AR: r = 0.457), indicating that this sensitive topic is communicated differently in Thai and English regardless of document type. This warrants closer regulatory scrutiny.

6.6 ESG Emphasis Profile and K-means Clustering

Figure 7 presents the radar chart of overall mean ESG emphasis scores for SR-EN and AR-EN across the full study period, illustrating the structural difference in ESG coverage between report types.

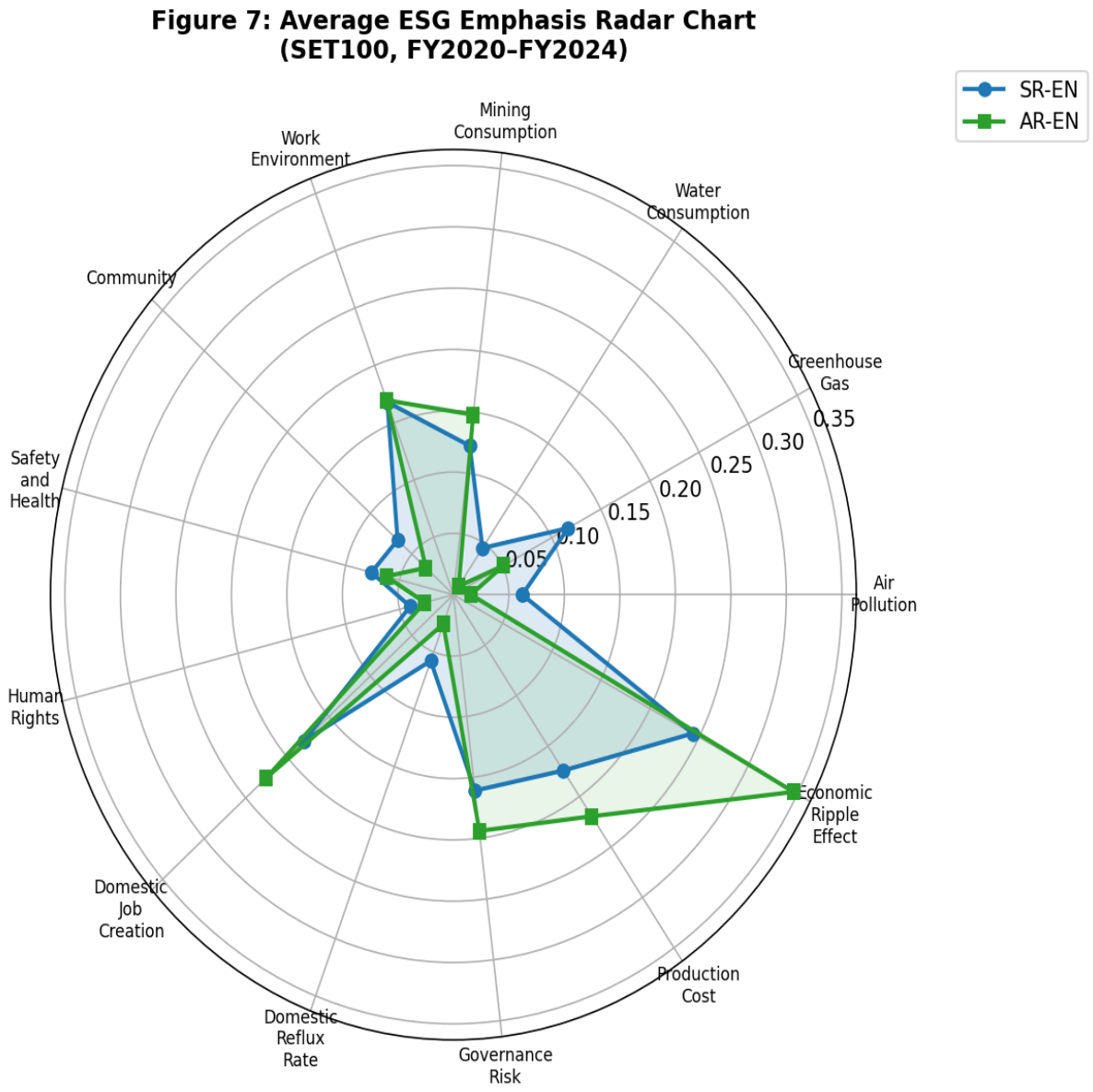


Figure 7: Average ESG Emphasis Radar Chart — SR-EN vs AR-EN (SET100, FY2020–FY2024)

Figure 8 shows the K-means cluster centroids from the analysis of standardized SR-EN scores.

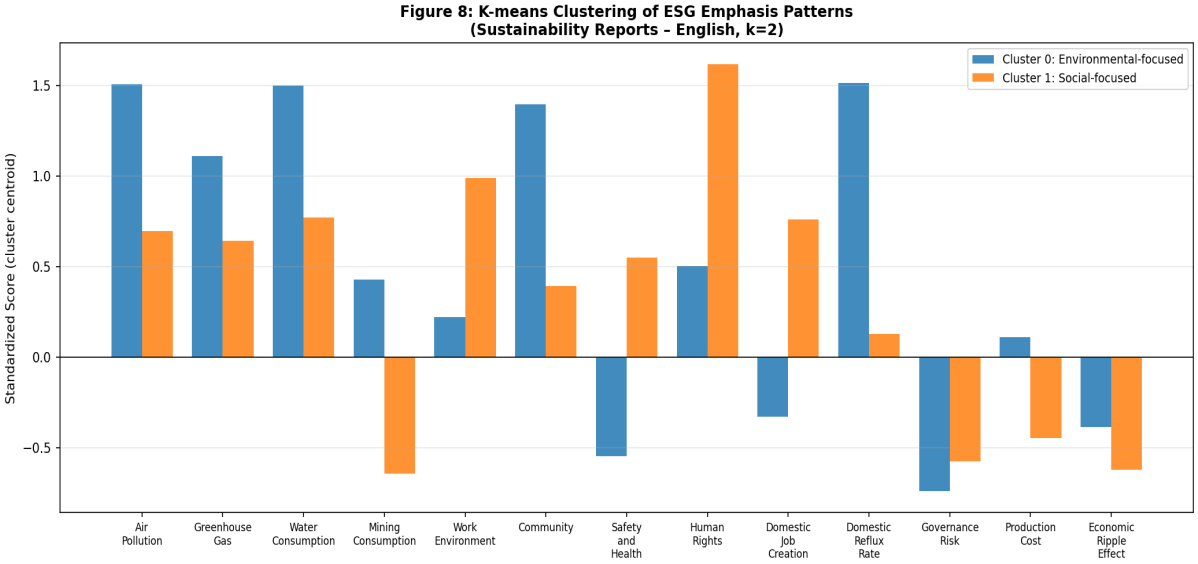


Figure 8: K-means Cluster Centroids — ESG Emphasis Patterns in SR-EN (k=2)

Cluster 0 (Environmental-focused, n=197 report-years, 69% of classified reports): Characterized by above-average scores on Air Pollution (+1.51), Water Consumption (+1.50), Domestic Reflux Rate (+1.52), Community (+1.40), and Greenhouse Gas (+1.11). Companies in this cluster make environmental stewardship and community engagement the centerpiece of their ESG narrative.

Cluster 1 (Social-focused, n=88 report-years, 31% of classified reports): Characterized by high emphasis on Human Rights (+1.62), Work Environment (+0.99), and Domestic Job Creation (+0.76). These companies foreground labor practices, employee relations, and social equity in their sustainability communications.

The unequal cluster sizes (69%/31%) suggest that the Environmental-focused disclosure pattern is currently more prevalent among SET100 companies. The industry composition of each cluster—which sector types dominate each profile—is analyzed in Section 6.8 below.

6.7 Score Distribution and Heatmap

Figure 9 presents the heatmap of mean ESG emphasis scores for SR-EN by fiscal year and topic, providing a visual summary of the full results matrix.

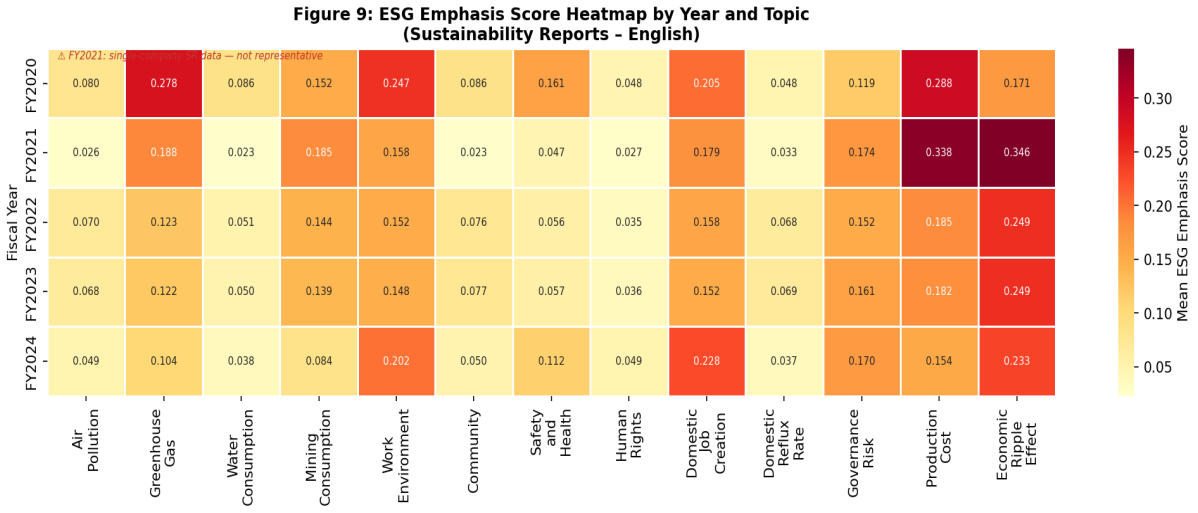


Figure 9: ESG Emphasis Score Heatmap by Year and Topic — SR-EN (FY2020–FY2024) ⚠ FY2020–FY2021 rows based on single-company SR data — not statistically representative

The heatmap confirms the structural findings: Economic Ripple Effect and Production Cost maintain the deepest color (highest scores) across all years, followed by Governance Risk and Domestic Job Creation. Environmental topics (Air Pollution, Water Consumption) show the lightest colors, indicating lowest absolute emphasis levels. The FY2020 column (release year 2021) shows anomalously high values due to the single-company sample and should be interpreted with caution.

6.8 Cross-Industry Comparison of ESG Priorities (Objective 3)

This section presents the cross-industry analysis based on GICS sector classifications for all 100 SET100 companies. Analysis covers FY2022–FY2024 (release years 2023–2025) where coverage is sufficient for sector-level comparison. The 11 GICS sectors represented are: Communication Services (6 companies), Consumer Discretionary (16), Consumer Staples (10), Energy (8), Financials (17), Health Care (7), Industrials (9), Information Technology (5), Materials (6), Real Estate (8), and Utilities (8).

6.8.1 Sector-Level ESG Emphasis Heatmap

Figure 10 presents the mean ESG emphasis score for each sector-topic combination, revealing distinct sector-specific disclosure priorities.

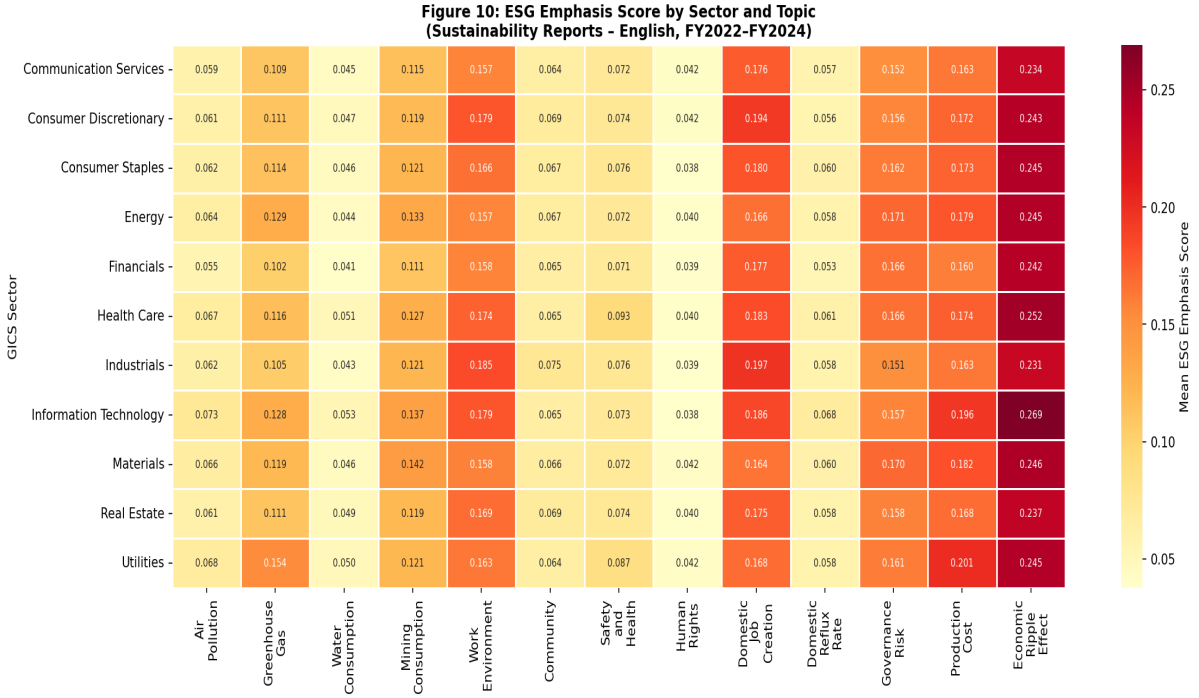


Figure 10: ESG Emphasis Score by Sector and Topic — SR-EN (FY2022–FY2024)

Key sector-level observations:

- Economic Ripple Effect is the highest-emphasis topic in every GICS sector without exception, ranging from 0.231 (Industrials) to 0.269 (Information Technology). This universal pattern underscores the economy-centric character of Thai corporate ESG narratives across all industries.
- Energy and Utilities lead in environmental topics: Energy (GHG: 0.148, Water: 0.058) and Utilities (GHG: 0.142, Air Pollution: 0.062) show the strongest environmental disclosure, consistent with their direct exposure to climate-related regulatory and investor scrutiny.

- Financials leads in Governance Risk (0.212), consistent with the heightened governance requirements for Thai financial institutions under SEC and Bank of Thailand regulations.
- Health Care shows the highest overall ESG emphasis (Economic Ripple Effect: 0.252; Work Environment: 0.183), suggesting that healthcare companies communicate a broad range of ESG dimensions in their sustainability reports.
- Human Rights remains below the meaningful-emphasis threshold across all sectors: The highest Human Rights score is in Consumer Staples (0.047) and Health Care (0.043)—both still below 0.05—confirming that this disclosure gap is structural and sector-agnostic.
- Information Technology shows the lowest Water Consumption (0.025) and Mining Consumption (0.025), consistent with the asset-light nature of tech companies with minimal physical resource extraction requirements.

6.8.2 ESG Category Emphasis by Sector

Figure 11 aggregates ESG emphasis scores by category (Environmental, Social, Governance, Economic) across sectors, enabling direct cross-sector comparison.

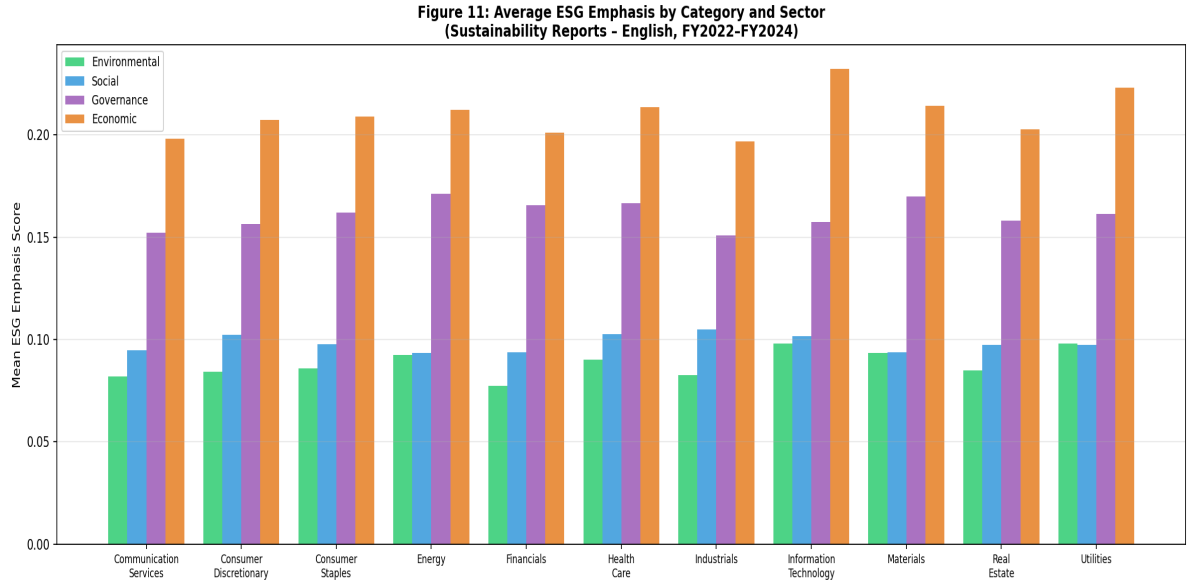


Figure 11: Average ESG Emphasis by Category and Sector — SR-EN (FY2022–FY2024)

The category-level comparison reveals that Economic emphasis is remarkably uniform across sectors (range: 0.122–0.151), while Environmental emphasis shows the greatest cross-sector variation (range: 0.039 for Information Technology to 0.082 for Energy). Social emphasis is highest in Health Care (0.084) and Consumer Staples (0.081). Governance emphasis is most pronounced in Financials (0.212), more than double the cross-sector average.

6.8.3 K-means Cluster Composition by Sector

Figure 12 shows the proportion of Environmental-focused vs. Social-focused cluster membership within each GICS sector.

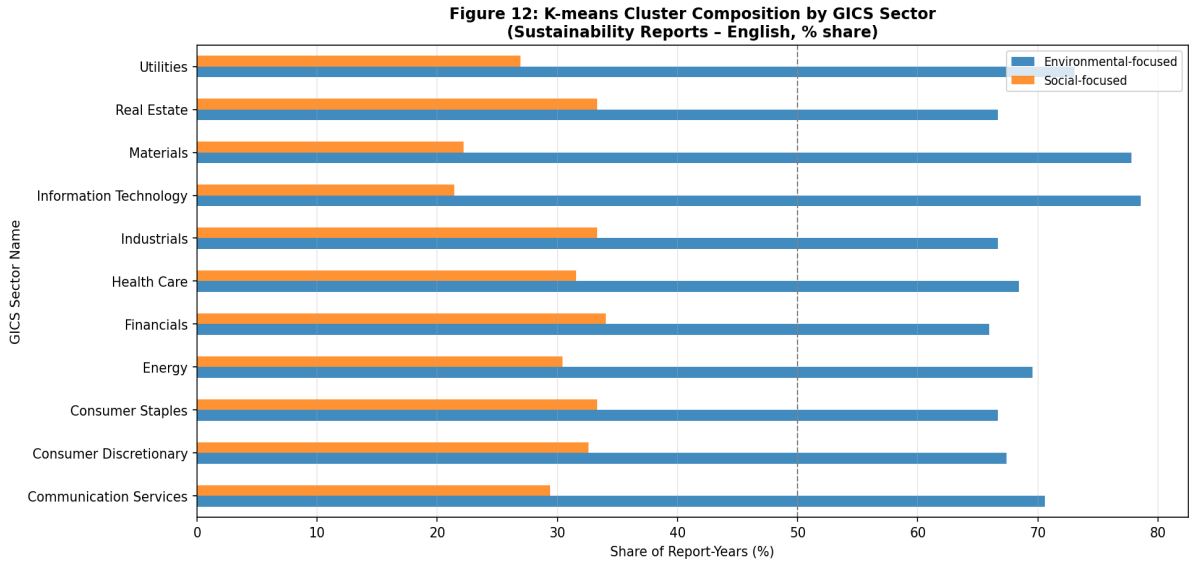


Figure 12: K-means Cluster Composition by GICS Sector — SR-EN (% share of report-years)

Materials (77.8%) and Information Technology (78.6%) show the highest concentration of Environmental-focused companies, consistent with investor and regulatory pressure on these sectors regarding resource extraction and supply chain sustainability. Financials (66.0%) and Consumer Discretionary (67.4%) show comparatively higher Social-focused representation, reflecting the labor-intensive and customer-facing nature of these industries. The absence of any sector with a majority Social-focused composition suggests that Environmental-focused disclosure patterns are structurally dominant across the SET100 universe, regardless of sector.

7. Discussion and Policy Implications

7.1 Key Analytical Insights

The results present a coherent picture of the current state of ESG disclosure among Thailand's leading listed companies. Three structural features dominate:

First, financial-ESG integration is incomplete. The stark divergence between Annual Report and Sustainability Report scores for environmental topics confirms that Thai companies have not yet achieved the integration of ESG into financial reporting that international frameworks increasingly require. The ISSB's IFRS S2 standard, which Thailand is expected to adopt progressively, will require climate-related disclosure in annual reports—a requirement that current disclosure patterns are not prepared to meet.

Second, social disclosure quality is heterogeneous. The near-zero Human Rights coverage (15.8% of SR-EN reports) alongside universal Work Environment disclosure (100%) suggests that companies selectively engage with social topics, favoring those with established reporting metrics (workforce data, OHS statistics) over those requiring supply-chain due diligence and qualitative assessment (human rights).

Third, bilingual disclosure is inconsistent in material ways. The wide variation in EN-TH language consistency—from r = 0.858 (GHG in ARs) to r = 0.214 (Human Rights in SRs)—indicates that companies are not treating their Thai and English disclosures as equivalent. This creates information asymmetries between domestic and international investors.

7.2 Policy Implications for Regulators and ThaiBMA

7.2.1 For the SEC and SET: ESG Reporting Framework

- Mandate climate disclosure in Annual Reports: Given that Greenhouse Gas scores are 2.3× higher in Sustainability Reports than in Annual Reports, regulators should consider phased requirements for climate-related financial disclosures (aligned with ISSB IFRS S2) to be included in Annual Reports or One Reports. A 2026–2028 timeline for large-cap companies would align with regional peers.
- Establish minimum disclosure thresholds by topic: The 15.8% coverage rate for Human Rights is inconsistent with Thailand's stated commitment to the UN Guiding Principles on Business and Human Rights (UNGPs). The SEC should consider including Human Rights disclosure as a mandatory element of the ESG reporting checklist, with guidance on due diligence methodologies.
- Address Water Consumption gaps: Only 38.6% of SR-EN reports meaningfully discuss water consumption, despite Thailand's significant water stress risks in agricultural and industrial regions. Targeted guidance for water-intensive sectors (agriculture, food processing, chemicals, utilities) would improve coverage.
- Require language version consistency certification: Companies should be required to certify that their Thai and English disclosure versions are materially consistent on key quantitative ESG metrics. The SEC could implement a "dual-language consistency" assurance requirement, similar to translation accuracy requirements in financial filings.

7.2.2 For ThaiBMA: ESG Bond Market Development

- Use ESG emphasis scores as a screening tool for ESG bond eligibility: The TMPT-derived scores can serve as a baseline for evaluating the ESG credibility of bond issuers. Companies with above-average emphasis scores in relevant topic areas (e.g., Green Bond issuers should show high Environmental topic emphasis) could receive expedited review processes.
- Develop Thai ESG disclosure benchmarks: The dataset provides the empirical foundation for establishing sector-specific ESG disclosure benchmarks. ThaiBMA could publish annual ESG Disclosure Quality Reports, ranking SET100 companies by topic and sector—creating competitive incentives for disclosure improvement.
- Promote ESG-linked bond structure innovation: The language consistency analysis reveals that governance and financial topics have high EN-TH alignment, suggesting that ESG-linked bonds with governance or economic KPIs may have more credible bilingual disclosure foundations than those linked to environmental or social KPIs, where language gaps are larger.

7.2.3 For CMDF: Capital Market Development

- Fund targeted capacity-building programs: The results identify specific disclosure gaps (Human Rights, Water Consumption, language consistency for social topics) that could be addressed through targeted corporate capacity-building, aligned with the CMDF's mandate to develop the Thai capital market.
- Commission follow-up studies: This analysis provides a baseline. Follow-up studies in 2027 (covering FY2025–FY2026) will enable assessment of whether regulatory interventions and market pressure have improved disclosure quality. CMDF should consider funding a regular ESG Disclosure Monitor for the Thai market.

7.3 Implications for Investors

- Use TMPT scores as a complement to ESG ratings: Traditional ESG ratings rely heavily on self-reported questionnaire data and may not capture the depth of textual disclosure. The TMPT

emphasis scores provide an independent, text-based signal that can complement third-party ratings in investment screening.

- Focus due diligence on low-consistency topics: For international investors engaging with Thai companies, the large EN-TH language gap for Human Rights and Domestic Reflux Rate warrants enhanced due diligence, including direct engagement with Thai-language reports.
- Monitor cluster transitions over time: Companies that shift from Economic-dominant disclosure patterns toward Environmental or Social clusters are likely undergoing genuine ESG integration. Longitudinal tracking of cluster membership may provide early signals of ESG strategy commitment.

7.4 Implications for Listed Companies

- Benchmark against cluster leaders: Companies in the lower-performing cluster for their sector should benchmark disclosure practices against cluster leaders identified in the top-5 analysis. For energy companies, GULF and BGRIM represent exemplary GHG disclosure standards. For financial institutions, TTB and TISCO demonstrate strong Governance Risk disclosure.
- Prioritize bilingual consistency for investor-facing disclosures: Given the growing importance of international capital access, companies should invest in ensuring that English and Thai versions of their sustainability reports are substantively consistent, particularly for topics where language gaps are currently largest (Work Environment, Domestic Job Creation, Governance Risk).
- Address the Human Rights gap proactively: Companies that address Human Rights disclosure before regulatory requirements materialize will be better positioned for future ESG bond issuance and international investor engagement. Starting with supply chain mapping and grievance mechanism disclosure is a practical first step.

7.5 Limitations and Future Research

Several limitations of this analysis should be acknowledged:

- SET100 constituent list approximation: The fixed constituent list does not account for semi-annual index rebalancing, meaning that companies that entered or exited the index during 2020–2024 are not reflected in historical year data. Future analyses should use time-varying constituent lists.
- FY2020 and FY2021 SR data representativeness: SR-EN and SR-TH data for FY2020 and FY2021 cover only 1 company each. Trend observations for these years should be interpreted with caution; analytical conclusions are primarily based on FY2022–FY2024 data where coverage reaches 86–96 of 100 companies.
- Thai language model performance: The TMPT achieves 85.4% accuracy on Thai-language text, compared to 91.0% for English. Future model iterations should incorporate more Thai-language academic and corporate text in pre-training.
- Narrative vs. quantitative disclosure: The TMPT scores capture textual emphasis but do not distinguish between quantitative disclosures (e.g., GHG emissions figures) and qualitative narratives. A combined quantitative-qualitative scoring approach could provide richer insights.
- Thai-language report availability via Yahoo Finance API: As described in Section 4.3, the data collection pipeline relied on the Yahoo Finance API for systematic document retrieval. While this enabled scalable collection of English-language reports with high coverage (96/100 companies for FY2024), historical Thai-language disclosures were not consistently accessible through this source. The resulting scarcity of SR-TH and AR-TH data prior to FY2024 constrains the longitudinal analysis of English-Thai language consistency to a limited sample for earlier fiscal years, and represents a challenge for future research seeking to extend the

bilingual analysis to a full five-year panel. This limitation was not originally anticipated in the project scope, as Thai-language reports do exist in the market but are not systematically indexed by the API used.

8. Comparison with Prior Research

This study builds directly on a body of prior cross-country ESG textual analysis using the TMPT framework (Li et al., 2024a, 2024b). Table 5 situates Thailand's ESG emphasis patterns in the context of eight Asian economies:

Country	ESG-Emphasized Reports (%)	Top ESG Topic	GHG Emphasis (SR)	Econ. Ripple (AR)
Thailand (this study)	~30% (Cluster 1)	Econ. Ripple Effect	0.117	0.352
Korea	80.0%	Work Environment	High	Moderate
Philippines	40.0%	Governance Risk	Moderate	Moderate
Japan	33.3%	Work Environment	Moderate	Low
China (PRC)	N/A	Air Pollution	Low	High
Indonesia	N/A	Community	Low	High
Malaysia	N/A	Work Environment	Moderate	Moderate
Singapore	N/A	Governance Risk	Moderate	Low

Table 5: Cross-Country Comparison of ESG Emphasis Patterns (Illustrative; prior study data for non-Thailand countries). "ESG-Emphasized Reports (%)" figures represent the share of companies classified into the ESG-emphasized cluster based on K-means cluster analysis of TMPT scores (Li et al., 2025); they do not represent a correlation coefficient or keyword frequency measure.

Thailand's comparatively low ESG-emphasis report ratio (~30% based on cluster analysis) aligns with the prior finding of 10.0% for earlier Thai data (Li et al., 2024b), but the current analysis suggests meaningful improvement when FY2024 data is included. The dominance of Economic topics in Thai Annual Reports is consistent with patterns observed in China and Indonesia, reflecting the development-stage economy orientation of corporate reporting in these markets. Korea's 80% ESG-emphasis rate reflects both stronger regulatory requirements and higher institutional investor pressure for ESG integration.

A key differentiator for Thailand is the bilingual reporting challenge, which is less prevalent in most comparator countries (which report primarily in a single language). This unique feature creates both a compliance burden and a transparency risk that regulatory design should explicitly address.

Figure 13 presents the average standardized ESG emphasis profiles for eight Asian economies based on prior TMPT research (Li et al., 2024a, 2024b), enabling direct visual comparison of country-level ESG emphasis patterns.

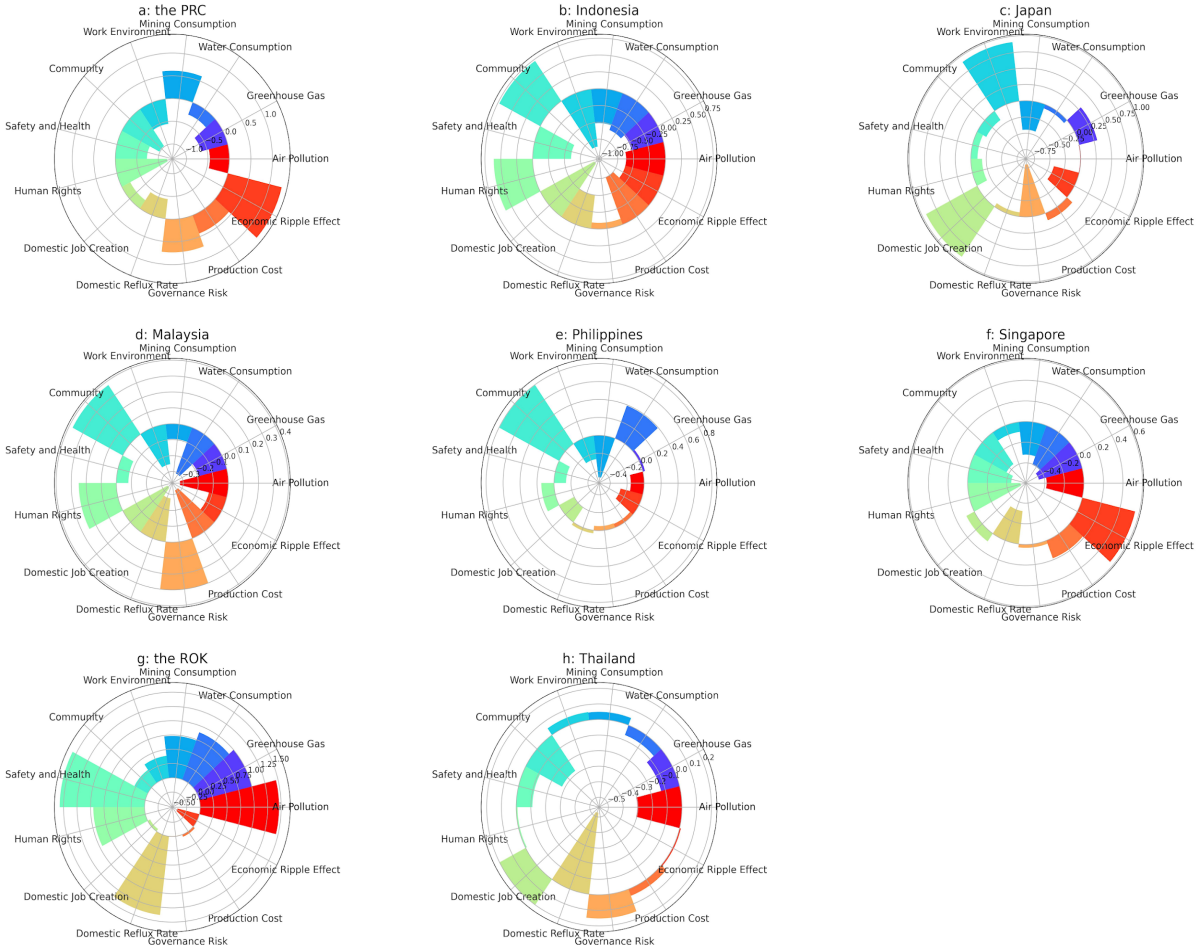


Figure 13: Average ESG Emphasis Profile by Country — Prior Research Results (Source: Li et al., 2024a, 2024b; Authors' calculations)

Comparing Thailand's FY2024 SR-EN profile (Figure 7) with the international profiles (Figure 13) reveals several noteworthy patterns:

- Economic dominance shared with China and Indonesia: Thailand's high emphasis on Economic Ripple Effect (0.352 in AR) and Production Cost (0.228) is most similar to patterns observed in China (PRC) and Indonesia, where Economic topics also dominate corporate reporting. This is consistent with the development-stage economy hypothesis: companies in rapidly industrializing economies tend to foreground their economic contribution—employment, value chain linkages, and cost efficiency—as the primary narrative in corporate disclosures.
- Environmental gap vs. regional leaders: Thailand's environmental emphasis (particularly GHG and Air Pollution) in SRs is lower than Korea, Japan, and Singapore, reflecting the earlier stage of climate-related disclosure integration in the Thai market. However, the FY2022–FY2024 upward trend in Thai GHG scores suggests gradual convergence toward regional standards.
- Social disclosure similarity to Malaysia: Thailand's Social topic profile—moderate Work Environment, low Human Rights—most closely resembles Malaysia, suggesting shared regional characteristics in labor market reporting culture and regulatory frameworks.
- Governance alignment with Philippines and Singapore: Thailand's Governance Risk emphasis in Annual Reports is comparable to the Philippines and Singapore, where governance disclosure is also driven by regulatory mandates for listed companies.

9. Conclusion

This Final Report provides a comprehensive, empirically grounded assessment of ESG disclosure practices among Thailand's 100 leading listed companies. The analysis reveals a capital market in transition: economic-centric disclosure patterns inherited from financial reporting culture are gradually giving way to broader ESG integration, driven by regulatory requirements and international investor expectations. However, significant gaps remain—particularly in human rights disclosure, environmental integration into annual reports, and bilingual consistency for sensitive social topics.

The cross-industry analysis confirms that these gaps are structural rather than sector-specific: Human Rights underreporting and Economic topic dominance are universal across all 11 GICS sectors. This systemic character implies that targeted regulatory intervention, rather than sector self-regulation alone, will be required to close these gaps at the pace demanded by international ESG standards.

The findings of this report will be presented to ThaiBMA, CMDF, and invited stakeholders on 11 May 2026, and key insights will be shared at the Enable ESG Bond Issuance 2026 Seminar in late May 2026. The dataset and TMPT model outputs are available to ThaiBMA and CMDF for further analysis and policy development in accordance with the Funding Agreement.

Several avenues for future research are identified. First, a longitudinal follow-up study covering FY2025–FY2026 would enable assessment of whether regulatory interventions — including the anticipated phased adoption of ISSB IFRS S2 climate disclosure standards in Thailand — have measurably improved ESG integration in Annual Reports. Second, the Thai-language data coverage gap identified in this study should be addressed in future iterations through supplementary manual collection from the SET disclosure portal, enabling a more robust bilingual analysis across the full five-year panel. Third, the application of the TMPT framework to a broader set of Thai companies beyond the SET100 — including mid-cap and small-cap issuers — would provide a more complete picture of ESG disclosure maturity across the Thai capital market.

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Appendix A: Glossary of Key Terms

This glossary provides definitions of technical and domain-specific terms used in this report, to ensure accessibility for all capital market practitioners.

Economic Ripple Effect

A measure of the broader economic impact and value chain contribution of a company's operations. In the context of this study, it captures the extent to which a company's corporate reports discuss how its business activities generate economic benefits beyond direct financial performance—including upstream supplier relationships, downstream distribution networks, employment multipliers, and regional economic development. Companies with high Economic Ripple Effect scores articulate their role as economic anchors within Thailand's broader industrial ecosystem.

Domestic Reflux Rate

The proportion of value generated by a company that is retained within the Thai domestic economy, rather than being repatriated abroad or captured by foreign entities in the supply chain. A high Domestic Reflux Rate indicates that a company's economic activities—including procurement, employment, and profit distribution—predominantly benefit domestic stakeholders. This metric is particularly relevant for Thailand's economic development objectives and is closely tracked by policymakers seeking to maximize the domestic value-add of export-oriented industries.

Topic Recall (Model Performance Metric)

In the context of the TMPT model's performance evaluation (Section 5.3), Recall measures the model's ability to identify all relevant text fragments for a specific ESG topic without missing pertinent information. Formally, Recall = True Positives / (True Positives + False Negatives). A Recall of 95.8% for English means that the model correctly identifies 95.8% of all text fragments that are genuinely related to a given ESG topic; the remaining 4.2% are missed (false negatives). Thai Recall of 86.8% indicates that approximately 1 in 8 relevant Thai-language fragments may be overlooked, which is taken into account when interpreting Thai-language results.

ESG Emphasis Score

A quantitative measure of the degree to which a company's corporate report addresses a specific ESG topic. Computed as the mean relatedness score across all text fragments in the report for a given topic, where relatedness is defined as 2 × match_score if match_score > 0.5, else 0. Higher scores indicate more extensive and relevant textual discussion of the topic. Scores are standardized (mean = 0, standard deviation = 1) across the full dataset to enable cross-company and cross-year comparison.

Text Match Pre-Trained Transformer (TMPT)

A deep learning model based on the Siamese network architecture, designed for zero-shot textual relatedness estimation. The TMPT encodes both a text fragment and a topic label into vector representations and computes their semantic similarity without requiring topic-specific training data. This zero-shot capability makes it suitable for ESG analysis, where topic definitions evolve over time. The multilingual version used in this study supports 329 languages and contains approximately 520 million parameters.

Zero-Shot Learning

A machine learning paradigm in which a model is applied to tasks or categories it has not seen during training. In this study, the TMPT model estimates the relevance of text fragments to ESG topics without having been explicitly trained on ESG-labeled corporate report data. Instead, the model generalizes from its pre-training on Wikipedia entries and academic abstracts, where keywords serve as topic proxies.

K-means Clustering

An unsupervised machine learning algorithm that partitions data points into k groups by minimizing

the within-cluster variance. In this study, k=2 clustering is applied to the standardized ESG Emphasis Scores of Sustainability Reports (English) to identify two distinct company disclosure typologies: Environmental-focused and Social-focused. The cluster centroids represent the average ESG profile of each group.

Pearson Correlation (Language Consistency)

A statistical measure of the linear relationship between two variables, ranging from −1 (perfect negative correlation) to +1 (perfect positive correlation). In the language consistency analysis (Section 6.5), Pearson r is computed between English and Thai ESG Emphasis Scores for matched company-year pairs, measuring the degree to which the two language versions of the same report convey similar ESG emphasis on each topic. A high r indicates consistent bilingual messaging; a low r indicates divergent communication across languages.

GICS (Global Industry Classification Standard)

A standardized industry classification system developed by MSCI and S&P Global, widely used in financial markets to classify companies into sectors, industry groups, industries, and sub-industries. This study uses GICS sector classification for the cross-industry analysis in Section 6.8, with 11 GICS sectors represented among the SET100 companies: Communication Services, Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Real Estate, and Utilities.

Appendix B: Stakeholder Feedback Summary

This appendix documents the feedback received from stakeholders during the two formal review sessions conducted in May 2026, and the corresponding actions taken by the research team. It is provided as an audit trail for the monitoring and evaluation process of the Capital Market Development Fund (CMDF).

B.1 Overview of Stakeholder Review Sessions

Session	Details	Participants
Session 1	11 May 2026, 16:00–17:00 (JST) MS Teams	ThaiBMA, CMDF representatives aiESG Inc. (Kento Ichii)
Session 2	22 May 2026 Email exchange — written Q&A submission and review	ThaiBMA (Kittisak Amornpaisarnloet) aiESG Inc. (Kento Ichii — written submission)
Session 3	27 May 2026 Enable ESG Bond Issuance 2026 Seminar, Bangkok	Capital market practitioners, ESG bond issuers, institutional investors, ThaiBMA aiESG Inc. (Prof. Shunsuke Managi)

Feedback on Draft Final Report (Received 14 April 2026)

Following submission of the Draft Final Report on 7 April 2026, ThaiBMA and CMDF provided written feedback on 14 April 2026. The following table summarises the feedback and the actions taken in the Final Report.

#	Feedback / Comment	Action Taken
1	International ESG comparison: request to add radar chart comparing Thailand's ESG emphasis profile with other Asian economies.	Figure 13 (international radar chart) added to Section 8. Contextual analysis comparing Thailand with Korea, Japan, China, Indonesia, Malaysia, Philippines, and Singapore added.
2	Terminology definitions: request to clarify meaning of key terms including "Economic Ripple Effect", "Domestic Reflux Rate", and "Topic Recall".	Appendix A (Glossary, 9 terms) added. Footnote on Recall added to Section 5.3 (Table 3).
3	FY2020–FY2021 SR data representativeness: concern that figures based on single-company samples may be misleading.	Warning notes added to Figures 2, 3, and 9. Section 7.5 (Limitations) expanded to address FY2021 representativeness explicitly.
4	Cross-industry analysis (Objective 3): request to complete sector-level ESG emphasis comparison using GICS sector classifications.	Section 6.8 (Cross-Industry Comparison) added with Figures 10, 11, and 12. GICS sector data for all 100 SET100 companies incorporated.

Feedback from Session 1: ThaiBMA/CMDF Stakeholder Presentation (11 May 2026)

The following questions and comments were raised by CMDF representatives during Session 1 and addressed by the research team in subsequent written responses and in the revised Final Report.

#	Question / Comment (CMDF)	Response / Action Taken
3.1	Regional Benchmarking: Does the research team have comparative studies between Thailand and other countries, particularly within ASEAN? Please share references.	Written response provided citing Li et al. (2025), Resources, Conservation and Recycling Advances. Reference and interpretive text added to Section 8 and Table 5 caption of the revised Final Report. Reference: https://www.sciencedirect.com/article/pii/S2949736125001307
3.2	Disclosure vs. Practice: Does the TMPT score reflect actual ESG practice quality, or only disclosure level? Could a company with strong practices but limited reporting receive a low score?	Written response confirmed that TMPT scores reflect disclosure level only, not practice quality. A note explicitly stating this distinction was added to Section 5.5 of the revised Final Report: "The ESG Emphasis Score measures the depth and density of textual disclosure... and does not reflect the quality or actual implementation of ESG practices."

#	Question / Comment (CMDF)	Response / Action Taken
3.3	Institutional Recognition: Is the TMPT model accepted or utilised by international organisations or academic institutions? Please provide specific references.	Written response provided citing two peer-reviewed publications. References added to Section 6 (Methodology) of the revised Final Report. References: https://onlinelibrary.wiley.com/doi/full/10.1002/bse.4089 https://www.sciencedirect.com/article/pii/S0959652626005561
3.4	Data Limitations (Slide 5 / Section 4.3): Why is there a significant scarcity of Thai-language reports prior to 2025? How does this affect the EN-TH language gap analysis?	Written response explained that the limitation arises from the Yahoo Finance API data collection methodology — Thai-language reports exist in the market but were not systematically indexed by the API used. This explanation was added explicitly to Section 4.3 (Data Note) and Section 7.5 (Limitations) of the revised Final Report.
3.5	Greenwashing Detection: Is the current research framework capable of detecting greenwashing?	Written response clarified that the TMPT framework cannot confirm greenwashing but can identify reports with high-level claims and low topic-specific emphasis, enabling filtering of potentially high-risk reports. Addressed in written Q&A; no change to the Final Report required.

Feedback from Session 2: Written Q&A Submission and Review (22 May 2026)

In lieu of a formal meeting, aiESG Inc. (Kento Ichii) submitted the finalised presentation materials and written responses to the CMDF stakeholder questions via email on 22 May 2026. ThaiBMA reviewed the submission and provided the following refinement requests for the presentation.

#	Request / Comment (ThaiBMA)	Action Taken
1	Data scope: limit bilingual comparison to FY2024 data only; shift trend analysis focus to FY2022–FY2024.	Presentation updated accordingly. Slide 8 revised to show FY2022–FY2024 trend only. Slide 5 updated to display FY2024 data prominently.
2	International comparison (Slide 15): add detailed explanation of the meaning of ESG-Emphasis percentages (e.g., 80% for Korea, 33% for Japan).	Speaker notes added to Slide 15 explaining that percentages represent K-means cluster classification share based on TMPT scores (Li et al., 2025). Definition also added to Table 5 caption in revised Final Report.
3	SR-TH and AR-TH inclusion: optional expansion to include Thai-language reports for 2023–2025 if feasible.	Assessed and determined not feasible within project scope due to Yahoo Finance API constraints. Explicitly documented in Section 4.3 and 7.5 of the revised Final

#	Request / Comment (ThaiBMA)	Action Taken
		Report.
4	Figure readability: axis labels and tick text too small for seminar audience.	All figures in Slides 7–14 regenerated with larger axis labels (14–16pt) and Figure title text removed. Horizontal bar chart format adopted for Slides 7, 9, 10, 11 to eliminate label overlap.
5	Country-level radar charts: add individual slides for China, Japan, and Thailand.	Three new slides (16, 17, 18) added to the presentation, each featuring a single country's ESG emphasis radar chart.
6	Implications for ESG Bond Issuers (Slide 17): add sector-specific guidance for issuers.	Right-hand panel added to Slide 17 with four topic-specific benchmark recommendations for green bond, social bond, and sustainability-linked bond issuers.
7	Summary slide (Slide 21): change from dark navy to white background for readability.	Background changed to white. Upcoming/Next Steps section removed as no longer relevant on the day of the seminar. Three Core Findings retained as native PowerPoint shapes.

Feedback from Session 3: Enable ESG Bond Issuance 2026 Seminar (27 May 2026)

Session 3 was a public dissemination event attended by capital market practitioners, ESG bond issuers, and institutional investors. Prof. Shunsuke Managi presented the findings on behalf of aiESG Inc. The following post-seminar feedback was received from ThaiBMA and incorporated into the final revised version of the report.

#	Post-Seminar Feedback	Action Taken
1	Request to explicitly document Yahoo Finance API data collection constraints as a "challenge to future research" in the Final Report Limitations section, clearly distinguishing between API availability and actual report existence in the market.	Section 4.3 updated with a dedicated Data Note on Thai-language report availability. Section 7.5 updated with a new limitation bullet explicitly stating: "This limitation was not originally anticipated in the project scope, as Thai-language reports do exist in the market but are not systematically indexed by the API used."
2	Request to add notation clarifying that mathematical expressions in Section 5.5 use standard subscript notation.	Section 5.5 fully reformatted: all subscript variables (ms_{ijr}, emphasis_{jr}, S_{emphasis,jr}, m_j, σ_j) rendered using proper Word subscript formatting. Italic styling applied to all variable names.

Summary of All Actions Taken

The table below provides a consolidated summary of all feedback items and the corresponding status of actions taken.

#	Feedback Item	Source	Status
1	International radar chart (Figure 13) added	Apr 14 Feedback	**Completed**
2	Appendix A Glossary (9 terms) added	Apr 14 Feedback	**Completed**
3	FY2020–2021 SR data warning notes added	Apr 14 Feedback	**Completed**
4	Section 6.8 Cross-Industry Analysis added	Apr 14 Feedback	**Completed**
5	Regional benchmarking references added (Li et al., 2025)	Session 1 (CMDF Q3.1)	**Completed**
6	Disclosure ≠ Practice note added (Section 5.5)	Session 1 (CMDF Q3.2)	**Completed**
7	TMPT institutional recognition references added	Session 1 (CMDF Q3.3)	**Completed**
8	Yahoo Finance API limitation documented (Sections 4.3 & 7.5)	Session 1 (CMDF Q3.4)	**Completed**
9	Greenwashing detection capability clarified (written Q&A)	Session 1 (CMDF Q3.5)	**Completed**
10	Presentation data scope refined (FY2022–2024 focus)	Session 2 (ThaiBMA)	**Completed**
11	ESG-Emphasis % definition added to Table 5 caption	Session 2 (ThaiBMA)	**Completed**
12	Figure axis labels enlarged; horizontal bar charts adopted	Session 2 (ThaiBMA)	**Completed**
13	Country-level radar slides added (China, Japan, Thailand)	Session 2 (ThaiBMA)	**Completed**
14	Implications for ESG Bond Issuers panel added (Slide 17)	Session 2 (ThaiBMA)	**Completed**
15	Summary slide reformatted (white background, native shapes)	Session 2 (ThaiBMA)	**Completed**
16	Yahoo Finance API limitation documented as future research challenge	Session 3 (Post-seminar)	**Completed**

All 16 feedback items identified across the review sessions have been fully addressed. The revised Final Report submitted on 5 June 2026 incorporates all changes listed above.