Multi-decadal analysis of major global risk assessments reveals consistent biases and low predictive capacity

Louis Delannoy[1,2,*], Mélis Busson[1,3], Peter Søgaard Jørgensen[1,2,4]

[1] Global Economic Dynamics and the Biosphere, Royal Swedish Academy of Science, Stockholm, Sweden

[2] Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden

[3] CentraleSupélec, 3 Rue Joliot Curie, Gif-sur-Yvette, France

[4] Anthropocene Laboratory, Royal Swedish Academy of Sciences, Stockholm, Sweden

*Corresponding author: Louis Delannoy (louis.delannoy@su.se)

This article is a non-peer-reviewed preprint submitted to EarthArXiv.

Abstract

The World Economic Forum (WEF) Global Risk Reports (GRRs) are published annually with the aim to uncover the most pressing challenges facing the world. However, the GRR have been criticized for presenting an overly simplistic and potentially biased portrayal of interconnected global risks and crises. Despite their influence, no in-depth, interannual analysis of the GRRs has been conducted to date. To address this gap, we analyze GRRs from 2006 to 2024 using textual analysis, systematic screening, and back- and forecasting methodologies. Our findings reveal a linguistic shift toward a technical, expert-driven narrative that frames global risks as regulatory challenges rather than opportunities for systemic transformation. Comparing text versus survey responses, the text of GRRs overemphasize economic considerations, marginalize environmental and social dimensions, and underrepresent ecological impacts. A comparison of GRR risk likelihoods with historical shocks shows consistent misalignment across most risk categories. By perpetuating an anthropocentric, business-centered, and fragmented representation of global risks, non-critical interpreations of the GRR can themselvself amplify risks to global sustainability and equity at a time of multiple interacting criss. We propose practical recommendations for use of the GRR and how they can be recalibrated to better represent multiple interacting global risks.

Significance

The World Economic Forum's Global Risks Reports (GRRs) influence global policy by assessing major challenges and guiding response strategies. Our analysis of GRRs (2006–2024) reveals a bias toward economic priorities, marginalization of environmental and social dimensions, and misalignment with historical risk patterns. This technical, business-centered framing neglects systemic challenges like ecological impacts and erodes social accountability. By perpetuating fragmented views of global risks, GRRs risk undermining sustainable and equitable solutions. At a time of escalating global crises, our findings call for recalibrating GRRs to provide a more balanced and inclusive perspective. Until such improvements are made, we urge scholars, policymakers, and NGO representatives to critically evaluate these reports and their influence on global governance before relying on them.

Keywords

World Economic Forum, global risk, climate change, policy, governance

Introduction

Founded in 1971 on the initiative of Klaus Schwab, the World Economic Forum (WEF) is a non-governmental organization with a special place in global governance. Initially conceived as a platform for fostering new ideas, the WEF has evolved into an influential actor actively shaping policy agendas, particularly concerning the role of technology and innovation in societal transformation (1). For instance, the WEF has successively put itself at the center of discussions on the fourth industrial revolution, global health, inclusive growth, and, more recently, artificial intelligence (2–5). Through its annual meetings in Davos, the WEF has convened world leaders, business executives, academics, and civil society representatives to reimagine global governance, promoting a multi-stakeholder model where private interests play a dominant role (6–8). However, the institution's discourse has increasingly aligned with technocratic and neoliberal paradigms (9–11), which are implicated in the root causes of the current polycrisis (12–16). Leveraging its "liquid mandate" (17), the WEF has not only contributed to the emergence of these discourses but has also facilitated their dissemination through transnational policy broker networks and their subsequent implementation (18–20). Overall, this model of unelected "discretionary governance" (21) has undermined the legitimacy of intergovernmental frameworks (22,23), helped the formation of a transnational class of elites (24,25), and normalized the role of business in global governance while simultaneously depoliticizing environmental and social disruptions (26,27). It further favored neoliberalism-compatible theories of gender and development (28–31) while allowing WEF partners to project a questionable sense of accountability (32,33). Paradoxically, the WEF's objective to "create a new [system] that is more resilient, equitable, and sustainable in the long run", according to Klaus Schwab (34), presents a significant risk to global justice and sustainability.

At the core of the World Economic Forum's (WEF) initiatives are its annual reports, particularly the Global Risks Reports (GRRs), which have occupied a unique position in the global policy landscape since 2006 and are widely referenced worldwide (Figure SI-9). The GRRs aim to identify humanity's most pressing risks and serve as essential resources for organizations to anticipate risks and develop response strategies. To achieve this, the GRRs draw on the WEF's annual Global Risks Perception Survey (GRPS), which tasks over a thousand leaders from academia, business, and government with

ranking the likelihood and impact of global risks over one-, two-, and ten-year horizons (35). The reports are subsequently refined through stakeholder consultations, including community meetings, private interviews, and thematic workshops, to produce foresight documents intended to inform global governance (36). The GRRs have been critiqued for their narrow framing of risks, emphasizing economic threats to private interests while neglecting broader social, political, and environmental dimensions (26). This compartmentalized approach obscures the interconnections between risks, promotes oversimplified solutions, largely undermines the likelihood of climate risks compared to scientists, and favors corporate-led governance over systemic resilience (37,31,38). Furthermore, the GRRs' ahistorical perspective and reliance on technocratic narratives perpetuate global inequalities by overlooking the structural barriers developing nations face (29).

While research on the World Economic Forum has been prolific, especially from a global governance perspective, less attention has been devoted to the Global Risks Reports. A result is that, to date and to the best of our knowledge, no comprehensive and empirically based interannual analysis of the GRRs has been conducted to evaluate the relevance and robustness of these reports. More precisely, only one quantitative study focuses on the WEF's COVID-19 reports (39), while two analyses address the GRRs, each limited to a single year: 2014, examined by Evans et al. (40), and 2019, analyzed by Qazi & Al-Mhdawi (38). We aim to fill this gap and hope that this study will contribute to a better understanding of the vision conveyed in the GRRs and assess whether these reports warrant the attention they have garnered over the years. To do so, three research questions have been formulated:

- RQ1: To what extent do the GRRs exhibit linguistic distinctions when compared to reports produced by other international organizations?
- RQ2: How are risks conceptualized within the GRRs, and do they truthfully depict the results from the Global Risks Perception Survey (GRPS)?
- RQ3: To what degree do the risks presented in the GRRs truthfully align with observed historical patterns?

Results

Linguistic analysis

Global Risks Reports (GRRs) exhibit significant variation in the six linguistic dimensions analyzed (Fig. 1a). Still, GRRs employ, on average, a substantial proportion of negative (mean = 0.71) and uncertain (*indefinite*, *fluctuate*, etc.) terms (mean = 0.64), respectively in increasing and decreasing manners, suggesting that risks are described as more serious and more certain over time. The usage of constraining (*required*, *comply*, etc.) and litigious language (*legislation*, *regulation*, etc.) is moderate (0.5 and 0.46, respectively) and on the rise. Combined with the important decline in readability over the years, this suggests that the reports increasingly portray risks as complex regulatory challenges rather than opportunities for systemic transformation and aim at an expert audience at hand with policy and compliance aspects.

In comparison to reports from other international organizations, GRRs distinctly stand out in their linguistic characteristics. There are indeed no other reports relying more on negative and uncertain language. The highest mean frequencies of negative words are observed in those from the Food and Agriculture Organization (FAO) at 0.35, the International Monetary Fund (IMF) at 0.34, and the Bank for International Settlements (BIS) at 0.31. Similarly, the highest mean frequencies of uncertain words are found in reports from the BIS at 0.30, the IMF at 0.23, and both the World Meteorological Organization (WMO) and FAO at 0.12. Positive words are used sparingly across all reports; however, they are more prevalent in the reports of the World Intellectual Property Organization (WIPO) and the United Nations Conference on Trade and Development (UNCTAD), both with a mean of 0.62. These higher frequencies of positive words, combined with significantly lower mean values for negative words (0.08 for both WIPO and UNCTAD), highlight a stark contrast with the GRRs, explained by their focus on innovation. Furthermore, the FAO reports demonstrate a higher mean value for constraining words (0.60) compared to the GRRs, indicating a stronger emphasis on requirements and compliance within the context of food insecurity. The reports from the United Nations High Commissioner for Refugees (UNHCR) exhibit the highest mean values for both constraining words (0.79) and litigious language (0.60), reflecting the legal and regulatory complexities associated with refugee issues. The same reports

also demonstrate the highest readability (mean = 0.74), highlighting that UNHCR deals with complex situations in an accessible language.

The distinct linguistic positioning of the GRRs among international organization reports is further supported by the Euclidean distances calculated across six linguistic dimensions (Fig. SI-1). With the highest average Euclidean distance (0.84) among all analyzed reports, the GRRs demonstrate the greatest divergence in linguistic features compared to their counterparts. Notably, the reports most linguistically similar to the GRRs are those produced by the BIS, with an Euclidean distance of 0.66. This finding underscores the notion that the WEF primarily targets an economic and financial demographic with the GRRs. We also find notable linguistic commonalities between reports from the IMF and FAO (distance = 0.26) due to a shared reliance on economic terminology (similar use of constraining and uncertain words related to economic policies) and comparable readability levels (targeting policymakers and experts). Another similarity can be found between reports from UNCTAD and WIPO (distance = 0.31), as both employ equivalent proportions of positive and constraining words to discuss trade, innovation, and development. Finally, we find significant similarity between BIS and UNWWDR (United Nations World Water Development Reports) with a 0.34 distance, as both address risk management, respectively, in finance and water resources. This closeness suggests that BIS and UNWWDR, despite focusing on different sectors, employ comparable linguistic strategies when addressing risks. It also underlines that, as the GRRs align more closely with the linguistic patterns of the former, the WEF may be disproportionately emphasizing financial and economic aspects of risks at the expense of environmental and social dimensions that are, for instance, crucial in UNWWDR's approach.

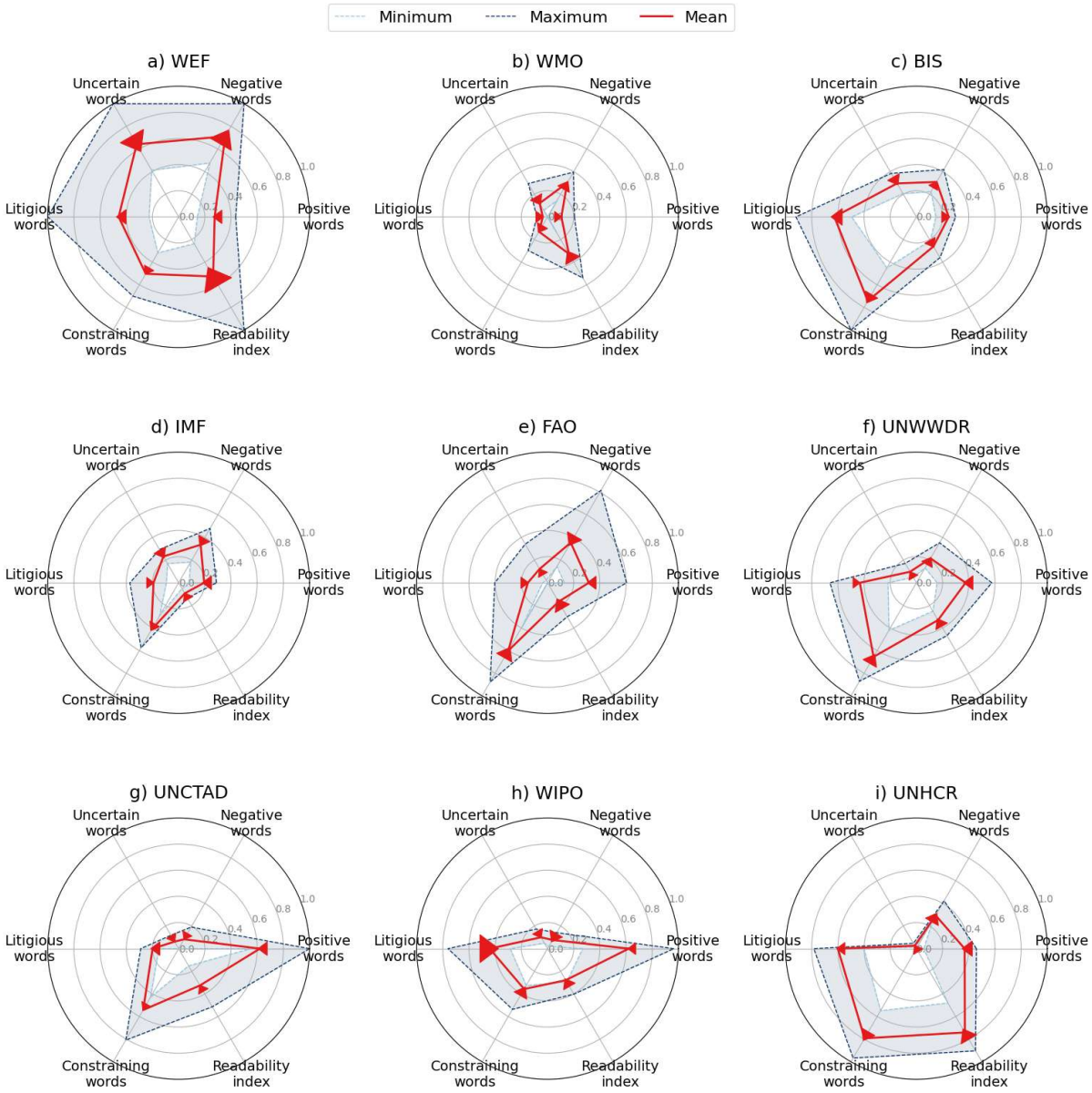


Figure 1: Linguistic analysis of major international organizations reports against 6 linguistic criteria: proportion of positive, negative, uncertain, litigious and constraining words, as well as the Gunning index of readability. (a) WEF = World Economic Forum Global Risks Reports; (b) WMO = World Meteorological Organization: State of the Climate Reports; (c) BIS = Bank for International Settlements: Annual Reports; (d) IMF = International Monetary Fund: World Economic Outlooks; (e) FAO = Food and Agriculture Organization: The State of Food Insecurity in the World Reports; (f) UNWWDR = The United Nations World Water Development Reports; (g) UN Technology = UN Conference on Trade and Development: Technology and Innovation Reports; (h) WIPO = World Intellectual Property Organization Reports; (i) UNHCR = The UN Refugee Agency Global Reports.

Values have been normalized across all reports and each indicator between 0 and 1, 0 being the lowest value of the indicator across all reports and 1 being the highest. What is referred to as the minimum (respectively maximum) on the spider charts refers to the smallest (respectively largest) value of the criteria among the years the report was published. The mean is the average of the normalized values across the time scale reports were published (see Table SI-1). Red arrows indicate the progression of each criterion, tracing the evolution from the initial five publications (or the initial three, in cases where institutions have not published sufficient reports) to the five (or three) most recent publications.

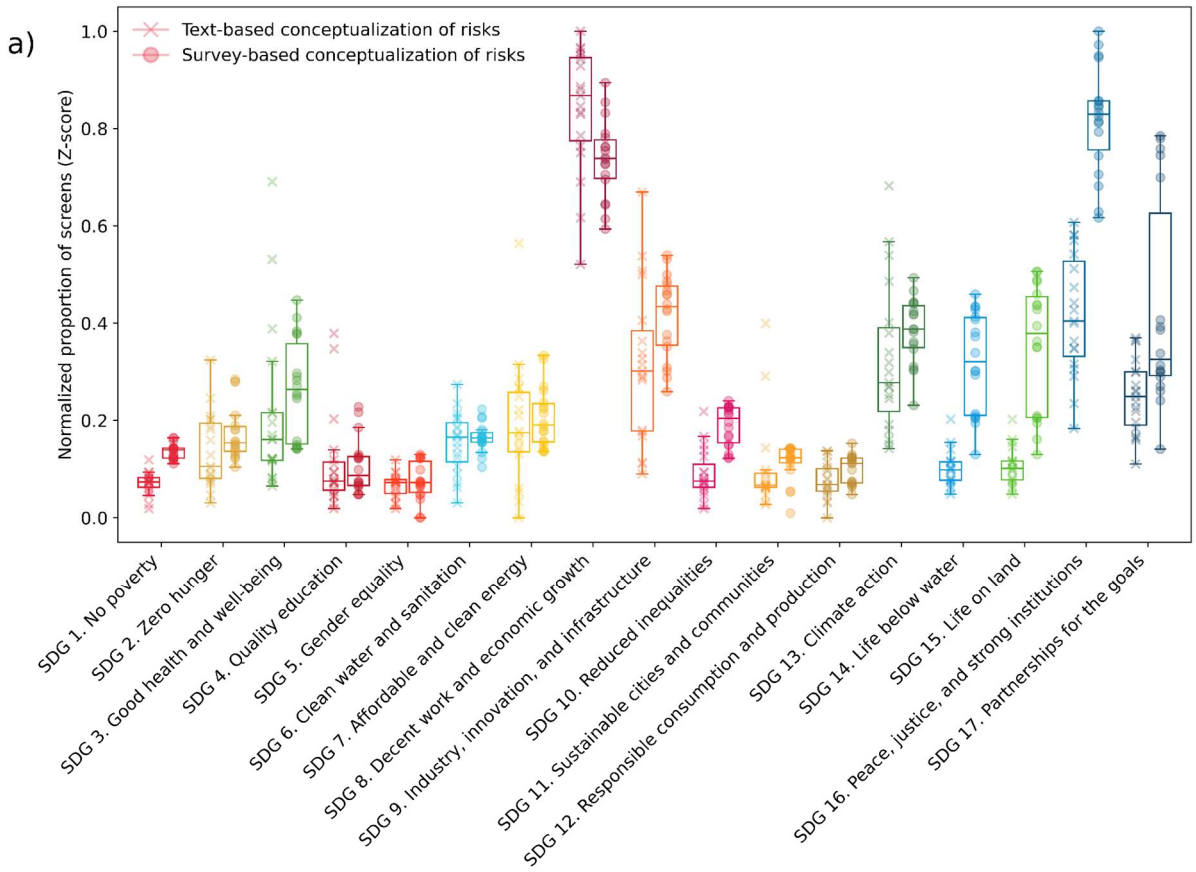
Tridimensional screening

Analyzing textual content and survey data from the GRRs through the lens of the Sustainable Development Goals (SDGs) reveals substantial biases in the conceptualization of the risk impacts (Fig. 2a). Among the SDGs, SDG 8 (Decent work and Economic Growth) emerges as the most frequently referenced, with a mean normalized proportion of 0.84 for text-based screens and 0.74 for survey-based screens. SDG 16 (Peace, Justice, and Strong Institutions) follows, with proportions of 0.42 and 0.82, respectively, reflecting an absolute difference of 0.4 - equivalent to 65% of the average across text and survey screens. This disparity parallels that of SDG 1 (No Poverty) but is surpassed by SDG 10 (Reduced Inequality), SDG 14 (Life Below Water), and SDG 15 (Life on Land), with respective absolute differences of 63%, 71%, 104%, and 107%. These findings suggest that impact dimensions related to poverty, inequality, biodiversity, and conflict are underrepresented in textual narratives relative to survey responses, contrasting with the elevated focus on impacts on economic growth (13% more present in text than survey). In contrast, SDGs 4 (Quality Education), 6 (Clean Water and Sanitation), and 7 (Affordable and Clean Energy) show minimal differences (4%, 7%, and 8%, respectively), suggesting consistent representation across formats. However, temporal trends highlight overall widening divergences, with some SDGs, particularly SDG 9 (Industry, Innovation, and Infrastructure), SDG 14, and SDG 15, while others like SDG 5 (Gender Equality) and SDG 17 (Partnerships for the Goals) exhibit narrowing gaps (Fig. SI-2).

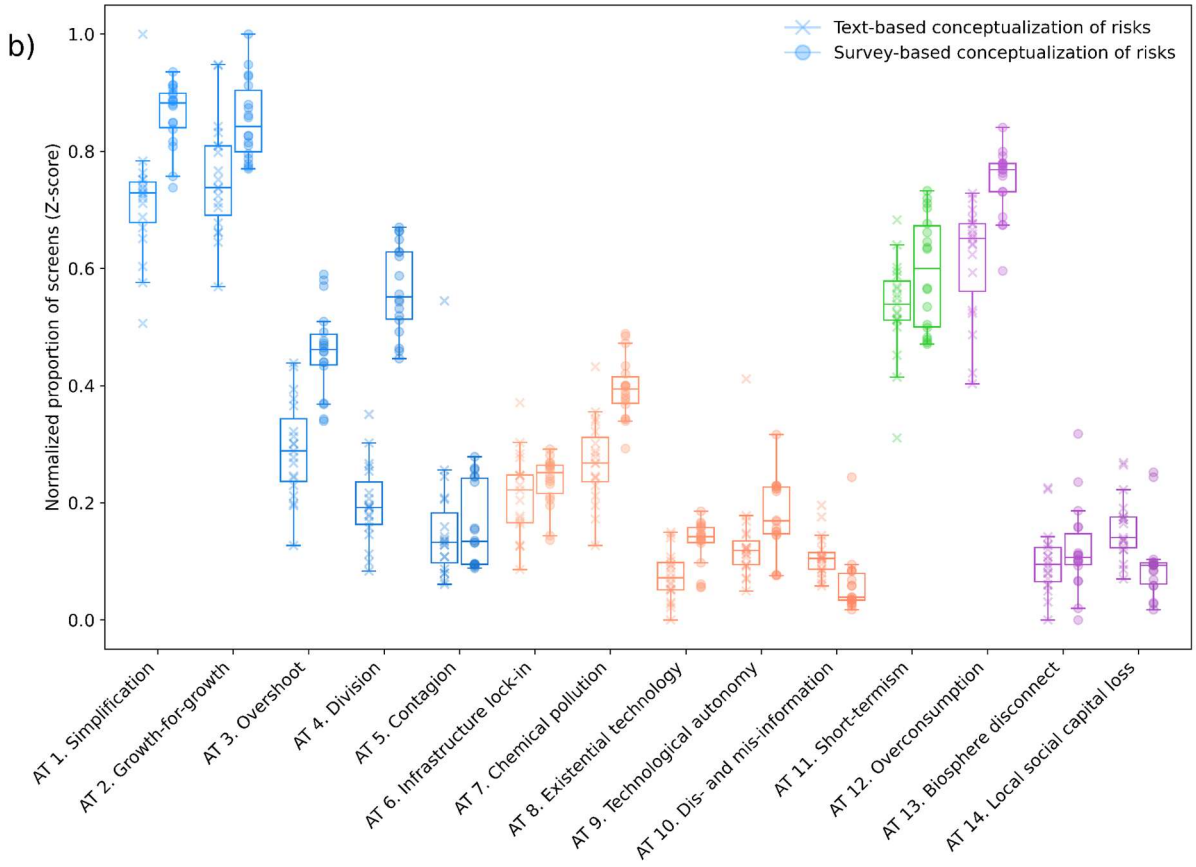
Screening GRRs against the Anthropocene Traps (ATs) from Søgaard Jørgensen et al. (41) offers additional insights into the framing of global risks (Fig. 2b). Four traps—AT 1 (Simplification), AT 2

(Growth-for-growth), AT 11 (Short-termism), and AT 12 (Overconsumption)—dominate, with average normalized screening values of 0.79, 0.80, 0.56, and 0.68, respectively, across text and survey formats averaged. A second tier, including AT 3 (Overshoot), AT 4 (Division), and AT 7 (Chemical Pollution), follows with averages of 0.38, 0.38, and 0.33. Notably, this second group displays substantial text-survey discrepancies, with absolute differences of 45%, 96%, and 37%, in stark contrast to the relatively low differences observed for the first group (12%–20%). Over time, these differences have diminished (Fig. SI-3), though trends vary by trap. For example, AT 11 and AT 13 (Biosphere Disconnect) exhibit converging patterns between text and survey screens, whereas AT 1, AT 3, and AT 9 (Technological Autonomy) show increasing divergences. Interestingly, all traps are more downplayed in the text than in surveys, except AT 10 (Dis- and Mis-information) and AT 14 (Local Social Capital Loss), which are underrepresented in both formats, with low normalized values of 0.08 and 0.13.

When framed against Corporate Sustainability Spectrums (CSSs) from Landrum & Ohsowski (42), GRRs predominantly reflect a risk responsibility perception that aligns with weak to intermediate definitions of sustainability (Fig. 2c). Textual analyses reveal a predominant reliance on CSS 2 (Business-centered responsibility; normalized value of 0.85), while survey responses emphasize CSS 3 (Systemic responsibility; normalized value of 0.86). Notably, text-based narratives include extremes, CSS 1 (Compliance) and CSS 5 (Co-evolutionary), with normalized values of 0.15 and 0.14, respectively, whereas these are nearly absent from surveys (0.03 and 0.02). This divergence underscores a broader range of responsibility views embedded in the text, from very weak to very strong, compared to the narrower intermediate focus of survey responses. Temporal trends reveal a shift toward weaker sustainability definitions, with declining text-based emphasis on CSS 5 to match near-zero survey values and growing dominance of CSS 2 at the expense of CSS 3 (Fig. SI-4). Overall, the depiction of social responsibility within the GRRs is evolving, raising questions about a potential erosion of accountability as global risks materialize and intensify.


a)
Text-based conceptualization of risks
Survey-based conceptualization of risks
Normalized proportion of screens (Z-score)
1.0
0.8
0.6
0.4
0.2
0.0
SDG 1. No poverty
SDG 2. Zero hunger
SDG 3. Good health and well-being
SDG 4. Quality education
SDG 5. Gender equality
SDG 6. Clean water and sanitation
SDG 7. Affordable and clean energy
SDG 8. Decent work and economic growth
SDG 9. Industry, innovation, and infrastructure
SDG 10. Reduced inequalities
SDG 11. Sustainable cities and communities
SDG 12. Responsible consumption and production
SDG 13. Climate action
SDG 14. Life below water
SDG 15. Life on land
SDG 16. Peace, justice, and strong institutions
SDG 17. Partnerships for the goals

225


b)
Text-based conceptualization of risks
Survey-based conceptualization of risks
Normalized proportion of screens (Z-score)
1.0
0.8
0.6
0.4
0.2
0.0
AT 1. Simplification
AT 2. Growth-for-growth
AT 3. Overshoot
AT 4. Division
AT 5. Contagion
AT 6. Infrastructure lock-in
AT 7. Chemical pollution
AT 8. Existential technology
AT 9. Technological autonomy
AT 10. Dis- and mis-information
AT 11. Short-termism
AT 12. Overconsumption
AT 13. Biosphere disconnect
AT 14. Local social capital loss

226

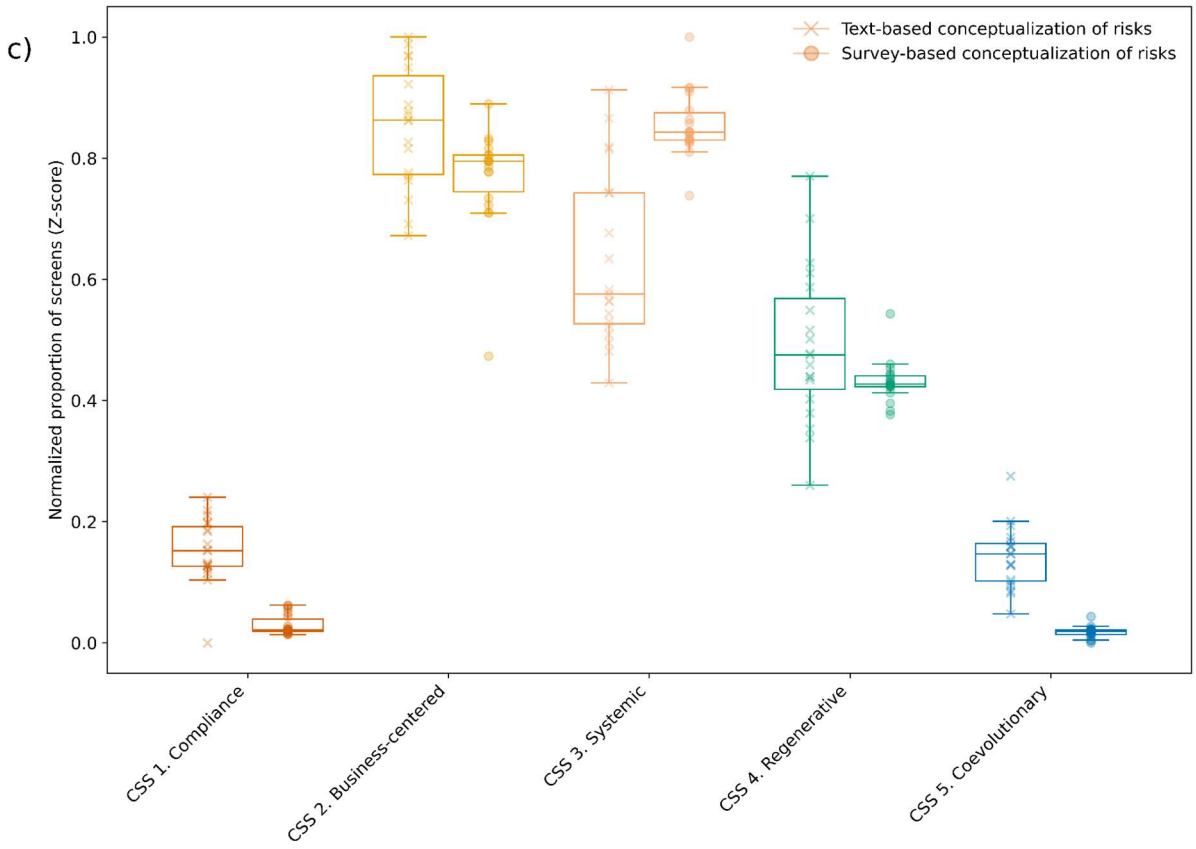


Figure 2: Text and survey-based conceptualizations of global risks in relation to (a) Sustainable Development Goals, (b) Anthropocene Traps, and (c) Corporate Sustainability Spectrums.

Backcasting analysis

The comparison of surveyed risk likelihoods in the GRRs (Fig. SI-6) with historical shocks, based on the database of Delannoy et al. (43), offers a framework to assess the extent to which GRRs align with observed historical patterns or anticipate future risks. More specifically, we evaluate whether the GRRs primarily reflect past events (backward-looking) or provide robust predictions of future shocks (forward-looking) across risk categories.

For climatic risks, GRRs display limited backward-looking alignment, as indicated by a moderately negative mean correlation (-0.41). Forward-looking analyses reveal a moderate positive correlation (0.26), suggesting an emergent acknowledgment of future climatic risks. However, the relatively low magnitude of this correlation raises doubts about the robustness of this conclusion. Geophysical, economic, and technological risks exhibit consistently negative correlations for both backward (-0.39,

-0.21, and -0.17, respectively) and forward looking (-0.18, -0.35, and -0.23, respectively). For ecological risks, including those associated with diseases and ecosystem services, GRRs show minimal alignment with both historical and future shocks as well. Backward looking correlations for ecological diseases (0.08) and ecosystem services (-0.18) suggest a lack of integration of past shocks into risk perceptions, while forward-looking correlations (-0.12 and 0.15, respectively) indicate limited consideration of emerging ecological risks. Geopolitical risks, particularly terrorist attacks, display a contrasting trend. Backward-looking analyses show a strong positive correlation (0.45), indicating substantial reliance on historical shocks to inform risk assessments. However, forward-looking correlations are notably weaker (0.19), suggesting a declining attention to the future likelihood of such risks. Conflicts, however, emerge as the most consistently emphasized risk category in the GRRs. Backward-looking correlations are robust (0.55), and forward-looking correlations are even stronger (0.71), underscoring the GRRs' prioritization of geopolitical conflicts. Overall, our analysis reveals that GRRs perform poorly in aligning with historical patterns and future trends for most risk categories, except for conflicts. While conflicts are undeniably significant, this narrow emphasis neglects systemic, long-term risks—such as climate change, biodiversity loss, and economic instability—critical for sustainable global risk management.

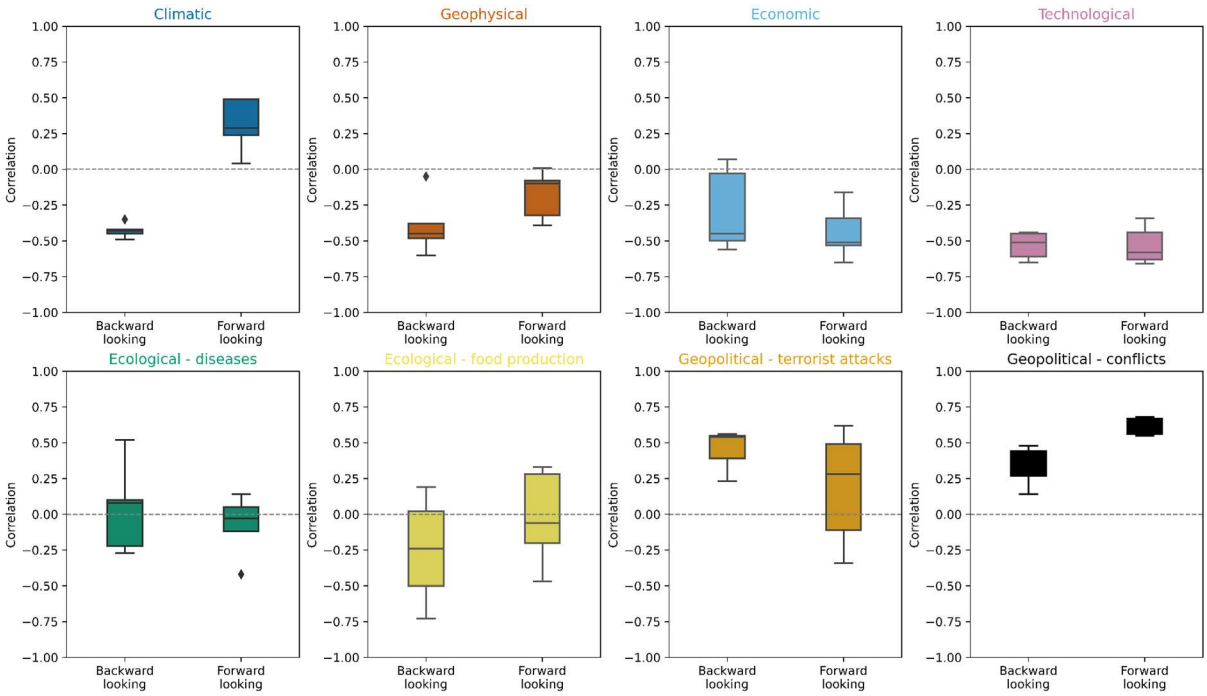
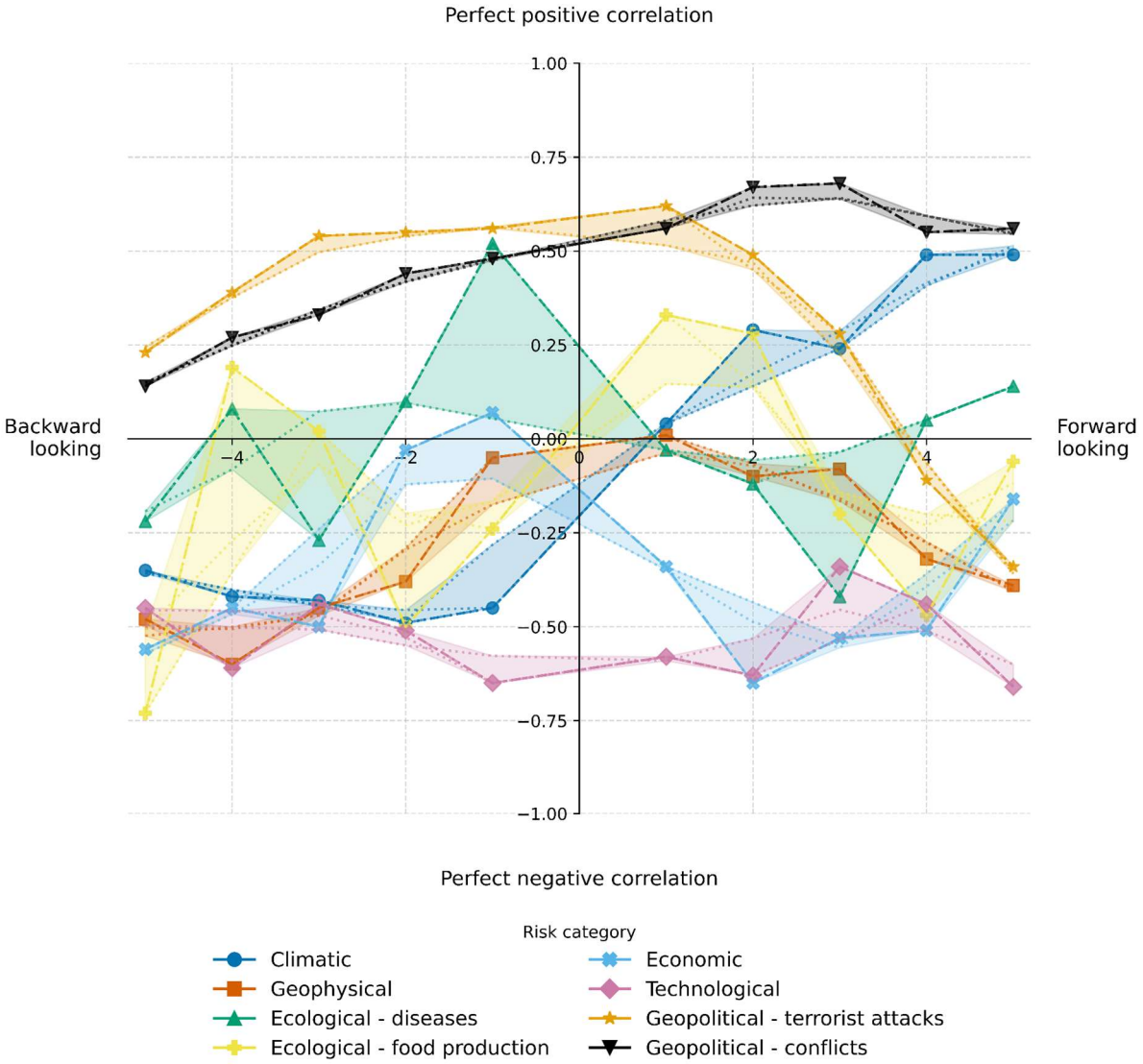


Figure 3: Distribution of the correlations between surveyed risks likelihoods of the GRRs and historical shocks from the database of Delannoy et al. (43), per risk category. Forward and backward looking indicate that surveyed risk likelihoods are compared to historical shocks with a respective positive or negative time lag: in forward-looking analyses, the likelihoods for year *y* are compared with shocks from year *y+i*, while in backward-looking, they are compared with shocks from year *y-i*, with *i* ranging from 1 to 5.

Yearly backward- and forward-looking correlations further uncover substantial insights (Fig. 4). For example, climatic risks show increasing correlations, from -0.31 at lag -5 to -0.47 at lag -2, further reinforcing the idea that they are gradually being integrated into the GRRs' framing of risks after having been disregarded. Geophysical, economic, and technological risks exhibit consistent negative correlations, with geophysical risks peaking at -0.60 (lag -5), economic risks peaking at -0.56 (lags 2 and 3), and technological risks at -0.44 (lag 5). Ecological risks present a mixed picture. While ecological disease correlations rise to 0.48 at lag -1 (suggesting potential high memory bias of 1 year), their overall volatility suggests inconsistent consideration of historical disease outbreaks. For ecosystem services, correlations remain weak but improve slightly at shorter lags (0.36 at lag -2), which might indicate some delayed recognition of historical ecosystem disruptions, in line with the delayed acknowledgment of climate shocks. Geopolitical risks, such as terrorist attacks and conflicts, display consistent positive correlations with historical shocks, peaking at 0.56 and 0.65, respectively, at lag -1. While this reflects the tangible and immediate nature of such risks, it raises concerns about a skewed risk prioritization of immediate, high-visibility risks over more complex, interconnected challenges such as climate, biodiversity, and economic instability.



283

284 **Figure 4: LOESS-smoothed trends with confidence envelopes for frac values 0.1, 0.2, 0.3, 0.4 and**
285 **0.5 across correlations coefficients between surveyed risks likelihoods of the GRRs and historical**
286 **shocks from the database of Delannoy et al. (43), per risk category.** Forward and backward looking
287 indicate that surveyed risk likelihoods are compared to historical shocks with a respective positive or
288 negative time lag: in forward-looking analyses, the likelihoods for year *y* are compared with shocks
289 from year *y*+*i*, while in backward-looking, they are compared with shocks from year *y*-*i*, with *i* ranging
290 from 1 to 5.

Discussion

The Global Risk Reports (GRR) have garnered increasing attention since their inception. Not only have they become a central piece in the World Economic Forum's agenda, but they have also served as a reference tool for many organizations. However, studying these reports using a comprehensive methodology combining linguistic analysis, systematic screening, and backcasting analysis has enabled us to identify gaps and biases that should be widely acknowledged so that the reports can be taken with a grain of salt.

Amid an evolving landscape of pressing global crises, the GRRs have increasingly framed risks as more severe and certain. The concurrent decline in readability and the growing prevalence of constraining and litigious language suggest a deliberate shift toward a technical, expert-oriented narrative. This shift appears to position global risks as complex regulatory challenges, potentially at the expense of framing them as opportunities for systemic transformation. However, this approach raises concerns. Compared to reports from organizations such as the FAO, IMF, or UNHCR, the GRRs exhibit a greater linguistic detachment from accessible, actionable language. For instance, the UNHCR, despite addressing complex legal and regulatory issues, maintains the highest readability, demonstrating a commitment to making complex challenges comprehensible to a broader audience. The GRRs, by contrast, appear increasingly focused on an economic and financial demographic, as evidenced by their linguistic proximity to reports from the BIS and IMF.

The GRRs' overemphasis on the economic dimension and marginalization of environmental and social considerations is further supported by our screening of their content against the Sustainable Development Goals (SDGs), Anthropocene Traps (ATs), and Corporate Sustainability Spectrum (CSSs). Among the SDGs, the overwhelming focus on SDG 8 (Decent Work and Economic Growth) reflects a prioritization of risk impacts on economic growth over other critical dimensions such as biodiversity (SDG 14 and 15), inequality (SDG 10), and poverty (SDG 1). These disparities are particularly stark for SDGs 14 and 15, where differences between textual and survey-based representations exceed 100%, highlighting a systemic underrepresentation of global risk impacts on ecological systems in textual content. Similarly, screening against ATs reveals a disproportionate

emphasis on traps such as growth-for-growth (AT 2) and short-termism (AT 11), which align with economic narratives, while systemic traps such as contagion (AT 5) and chemical pollution (AT 7) receive far less attention. Although the GRRs acknowledge these systemic risks to some extent, the consistent textual downplaying of such traps compared to survey results suggests a narrative skew that prioritizes immediate, measurable risks over long-term, systemic challenges. Additionally, the CSS screens reveal a gradual change toward weaker sustainability definitions, with declining text-based emphasis on CSS 5 to match near-zero survey values and growing dominance of CSS 2 at the expense of CSS 3. This suggests that the depiction of social responsibility and accountability within the GRRs appears to be eroding as global risks are perceived as more likely and more severe (see Fig. SI-7 and Fig. SI-8).

Finally, the comparison of GRR risk likelihoods with historical shocks reveals consistent misalignment across most categories, particularly in climatic, geophysical, ecological, economic, and technological risks. Climatic risks, for instance, exhibit moderately negative backward-looking correlations, suggesting a historical neglect of climate-related shocks. While forward-looking correlations indicate some emergent acknowledgment of future risks, the low magnitude of this alignment raises questions about the robustness of the GRRs at times of potential catastrophic climate change. Similarly, ecological risks, including diseases and ecosystem services, show minimal correlations with both historical and forward-looking shocks, reflecting an insufficient consideration of these critical systemic challenges. Economic and technological risks exhibit persistently negative correlations in both temporal directions, underscoring a failure to integrate past disruptions and anticipate future challenges, particularly striking given the WEF's self-positioning as a central authority on those issues. In contrast, geopolitical risks, particularly conflicts, are strongly aligned with historical and future trends, reflecting the GRRs' prioritization of immediate, high-visibility risks. While conflicts are undeniably significant, we believe this emphasis comes at the expense of more attention to interconnected and long-term challenges.

Overall, the GRRs' linguistic, conceptual, and temporal biases suggest a narrowly framed approach to global risks that prioritizes economic and geopolitical dimensions while neglecting systemic and long-term challenges. This approach limits their relevance for fostering integrated, forward-thinking policies capable of addressing the interconnected nature of global risks. Moving forward, we invite the WEF to

346 adopt a more balanced perspective that (i) incorporates accessible and actionable language to engage
347 broader audiences; (ii) aligns risk conceptualization with strong sustainability frameworks; (iii)
348 encourages the explicit representation of social accountability of current global risks and crises; (iv)
349 adopts changes to improve the robustness of surveys, for instance by turning to heterodox economists,
350 and transdisciplinary scholars rooted in sustainability science. Without such recalibration, the GRRs
351 risk perpetuating a fragmented understanding of global risks, undermining their utility as a resource for
352 guiding sustainable and resilient policy responses at times of polycrisis.
353

Materials and Methods

The methodology employed in this study is organized into three streams, each tailored to address one of the research questions defined in the Introduction (Fig. 5). First, the text from each Global Risks Report (GRR) is extracted for linguistic analysis. A similar process is conducted for reports produced by other international organizations to determine whether the GRRs exhibit any distinctive linguistic features. Second, the primary results from the Global Risks Perception Survey (GRPS), which is the backbone of the GRRs, are extracted from the risk maps within the GRRs. These surveys, along with the textual content of the GRRs, are then analyzed using a three-dimensional framework that includes (i) the Sustainable Development Goals (SDGs), (ii) Anthropocene Traps (ATs), and (iii) Corporate Sustainability Spectrums (CSSs), see Table SI-2, SI-3, and SI-4 for a description of each framework. This allows for a comparison of the risk conceptualizations as presented in both the reports and the surveys to evaluate the accuracy of the GRRs' transcription. Third, the results from the GRPS are compared against the database of national shocks of Delannoy et al. (43) to assess whether GRRs perform better at representing past trends or anticipating future ones.

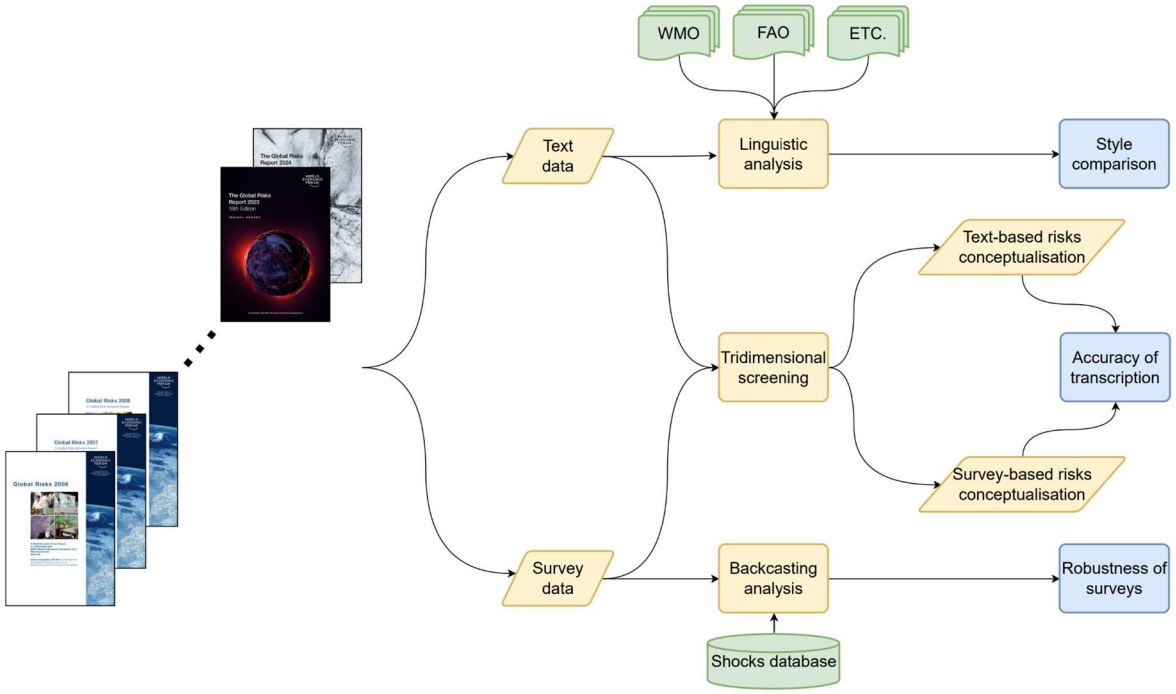


Figure 5: Main stages of the research process.

Linguistic analysis

We collect PDF files of the Global Risks Report from 2006 to 2024 from the WEF website and convert them to .txt format. The same applies to annual reports from various international organizations that were selected for their comprehensive coverage in terms of global issues present in the GRRs, yearly availability, and institutional reputation (see Table SI-1). We then assess six different linguistic criteria throughout each report: the percentage of words classified as positive, negative, constraining, litigious, and uncertain, as well as the overall readability of the text. The identification of words classified as positive, negative, constraining (*required*, *comply*, etc.), litigious (*legislation*, *regulation*, etc.), and uncertain (*indefinite*, *fluctuate*, etc.) is conducted using the February 2024 version of the dictionary of words of Loughran & McDonal (44,45). We estimate the readability through the Gunning Fog Index (GFI), which is commonly used to evaluate how easily text can be read by its intended audience:

$$GFI = 0.4\left(\frac{number\ of\ words}{number\ of\ sentences} + 100\left(\frac{number\ of\ complex\ words}{number\ of\ words}\right)\right)$$

Complex words are words with 3 syllables or more that are not compound words, and compound words are a combination of 2 or more smaller words (for example, "multinational", which is made up of the words "multi" and "national"). The compilation of the Gunning Fox Index for all reports is done through a slightly modified version of the open-source code of Anusha (46). The values reported for the six different linguistic criteria are then normalized between 0 and 1 to ensure comparability (0 being the lowest value of the indicator across all reports from all organizations and 1 the highest).

Tridimensional screening

We import the .txt files of each GRR in the Orange Data Mining software. We obtain the list of the most frequently used words in each report along with their associated frequencies (or weights), enabling us to compare the most used words across years. We then perform a cleaning process to remove words without relevance or meaning on their own (see Table SI-5). For words appearing closely in the ranking due to their frequent co-occurrence, for example, in the 2018 report, the terms "fake" and "news" were assigned weights of 34 and 66, respectively, we opted to retain only one word (for instance we excluded the word "news" from classification, retaining only "fake" to ensure more accurate weighting and

mitigate potential bias and prevent overemphasis on the "fake news" concept). We finally carried out a consistency check across all reports through a comparative analysis and elaboration of a justification list. It is worth noting that the years 2006, 2009, 2012, and 2015 were initially poorly processed by the software. We opted to copy the text from these PDFs, paste it into a Word document, and then reprocess it using the Orange Data Mining software. The results were significantly more conclusive and relevant after this second treatment.

To retrieve the primary results from the Global Risks Perception Survey (GRPS), we extract from the risks map of each GRR and with the ”WebPlotDigitizer” software, the likelihood and short-term (1-5 years) severity for each risk from 2006 to 2021. In 2022, the WEF adopted a distinct methodology for measuring risk likelihood and severity: likelihood was assessed as the percentage of respondents anticipating the risk to occur within a 5-10-year horizon, while severity was quantified using a "number of points" system. Due to the significant methodological deviation from the approach employed in other years (2006–2024), survey data from 2022 were excluded from subsequent analyses to ensure methodological consistency and comparability across the study period. In 2023 and 2024, the WEF introduced a measure termed "long-term severity," which, as confirmed through email correspondence with the WEF in April 2024, represents a composite of both long-term likelihood and severity. Values of likelihood and severity of risks across each year are then normalized on a 1 to 5 scale (1 being the lowest, 5 the highest), with the following caveats:

- 2006: No graphical representation of risks was provided, but the appendix included a list of risks with likelihood and severity values under four scenarios: "Short-term Base," "Short-term Worst," "Long-term Base," and "Long-term Worst." The average of the "Long-term Base" and "Long-term Worst" values was used to maintain consistency with other years referencing long-term projections.
- 2007–2010: Likelihood was expressed as a percentage, and severity was quantified in US dollars. However, the appendices included a correspondence between these metrics and scales ranging from 1 to 5, allowing both axes to be standardized on this scale.
- 2011: A unique approach was needed due to differences in the likelihood (percentage) and severity (US dollars) scales compared to previous years. First, the average likelihood and

severity values from 2010 and 2012 were calculated and used as reference averages for 2011. The WebPlotDigitizer software was then employed to extract the coordinates of all points on the 2011 risk map using an arbitrary axis calibration. The extracted values were adjusted with a correction factor to align their averages with the reference values.

- 2013: Values for this year were directly available in the report appendix, eliminating the need for software-based extraction.
- 2012–2021: Risk values were represented on scales ranging from 1 to 5 or 1 to 7. These values were extracted using the WebPlotDigitizer software and standardized to a 1–5 scale to facilitate comparisons across years.
- 2022: This year was excluded from the study due to methodological differences, as explained previously.
- 2023–2024: For these years, only a combined impact measure of likelihood and severity was provided, expressed on a scale of 1 to 5. To enable comparisons with earlier years, the likelihood and severity values for each risk from 2006 to 2021 were multiplied and normalized to the same 1–5 scale. For 2024, while data were directly available from the WEF website, the WebPlotDigitizer software was also used to extract values from the risk map included in the report. The extracted values were compared with the provided data to evaluate the software's accuracy.

Once textual and survey data are collected, we perform a systematic tridimensional screening of both data against (i) the Sustainable Development Goals (SDGs), (ii) Anthropocene Traps (ATs), and (iii) Corporate Sustainability Spectrums (CSSs) (see Figure 6). We selected these three typologies as they represent different and complementary aspects of the conceptualization of risks, with the ATs, SDGs, and CSSs respectively answering (i) *what* type of risks are assessed, (ii) *how* are the risks impacting human societies (i.e., transgressing what target?), (iii) *who* is responsible for the risk's emergence?

Each word or survey response is categorized according to the most related of the 17 SDGs, 14 ATs, and 5 CSSs, considering all potential categories. The screening process consistency was ensured through an initial individual screening, a second collective screening, and an internal consistency check across all screens. As a rule, we determined the most pertinent category for each indicator and each typology, but

for the typologies made of non-exclusive categories (SDGs and ATs), the same indicator could be classified by referring to more than one category. For instance, the 2013 risk “Diffusion of weapons of mass destruction” was screened against SDG 16 (Peace, Justice and Strong Institutions) but against AT 4 (Division) and AT 8 (Existential Technology).

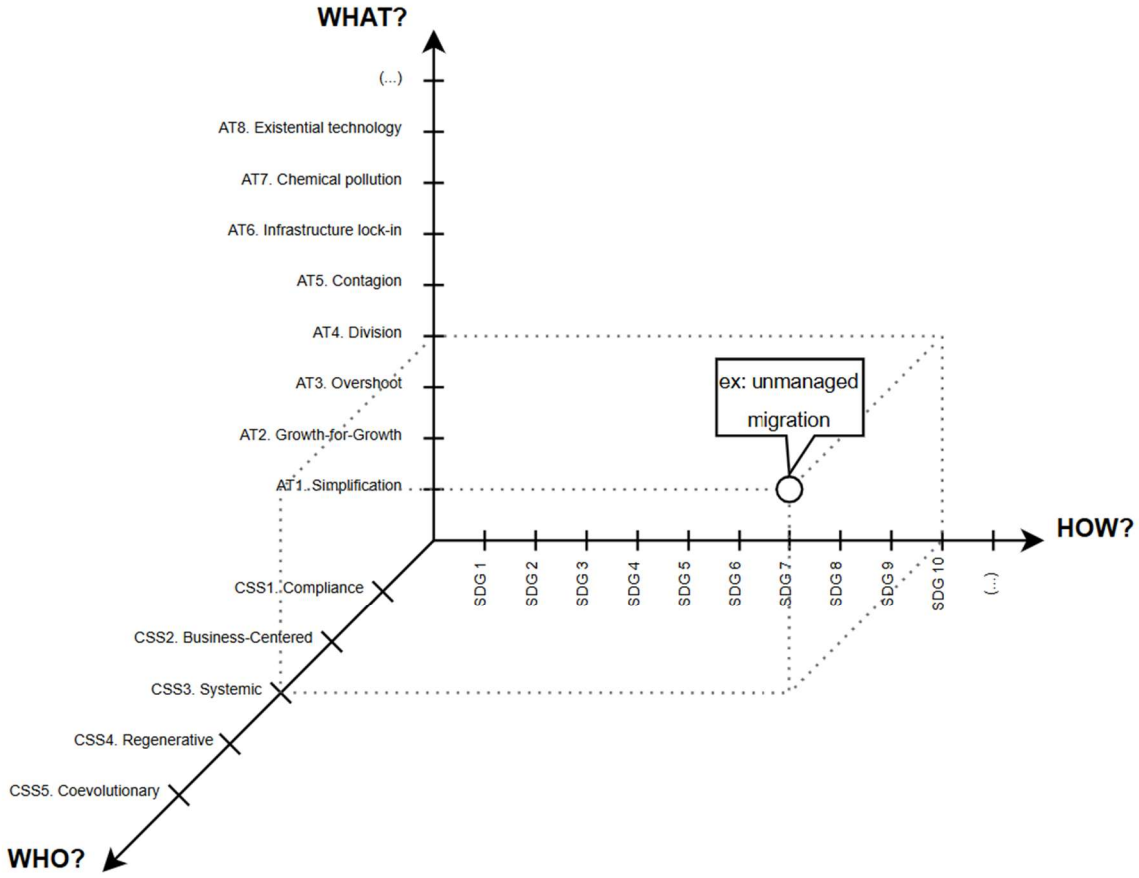


Figure 6: Heuristic cube of the tridimensional screening. Source: own elaboration, inspired by Merino-Saum et al. (47).

To visualize interactions between gross screens, we constructed a Sankey diagram (Fig. SI-5). The first column of the Sankey diagram represents the 15 most frequently used words across all reports, determined by summing the weight of each word from 2006 to 2024, with the term "others" aggregating the weight of all remaining words not included in the top 15. To illustrate connections with the DGs, the total weight of each word was divided by the number of SDGs it corresponds to, generating flows proportional to these connections. Each word was further linked to a single category within the CSSs,

ensuring that the sum of SDG flows originating from a word converges toward its corresponding Spectrum category, with a total weight equal to the word's cumulative weight. This process ensures that the total weight of words aligns with the total weight attributed to the CSS. Finally, for the right side of the diagram, each word's total weight was again divided, this time by the number of Anthropocene Traps to which it is associated. We then normalized screens to ensure comparability and consistency across the three dimensions and the 19 years of reports. To do so, we employed "z-score" normalization:

$$z = \frac{x - \mu}{\sigma}$$

z is the standardized value, x is the original value, μ is the mean of the considered year, and σ is the standard deviation of the considered year. The normalization process involves subtracting the mean of each year from its respective data points and then dividing by the standard deviation of the same year. This transformation produces a distribution with a mean of zero and a standard deviation of one, standardizing the data for meaningful comparisons. Following normalization using the z-score method, the resulting values were rescaled to a range of 0 to 1 to enhance the readability and interpretability. The resulting boxplots were then plotted through Python.

Backcasting analysis

From the GRRs, we select the risks that can be tracked against the database of national historical shocks of Delannoy et al. (43), the only comprehensive database of national shocks to our knowledge. We draw 8 categories of risks: climatic, geophysical, ecological - diseases, ecological - ecosystem services, economic, technological, geopolitical - terrorist attacks, and geopolitical - conflicts. For those risks, we retrieve the short-term likelihood (1-5 years) as well as the number of shocks at global scale. We then compute the correlation coefficients for each category of risks, including for backward and forward looking perspectives. Forward and backward looking indicate that surveyed risk likelihoods are compared to historical shocks with a respective positive or negative time lag: in forward-looking analyses, the likelihoods for year y are compared with shocks from year $y+i$, while in backward-looking, they are compared with shocks from year $y-i$, with i ranging from 1 to 5. Finally, we plot LOESS-smoothed trends with confidence envelopes for frac values 0.2, 0.3, and 0.4 across correlation

coefficients between surveyed risk likelihoods of the GRRs and historical shocks from the database of Delannoy et al. (43) per risk category.

Limitations and future development

This study is subject to limitations stemming from both its methodology and the data utilized. Methodologically, the selection of international organization reports, the three analytical dimensions, and the decision to screen words and survey responses against these dimensions inherently involve a degree of subjectivity. To mitigate this, several strategies were employed. First, reports were selected from international organizations addressing one or more categories of risks assessed in the GRRs, ensuring comprehensive coverage of all risk categories present in the GRRs. Second, a multi-step process was implemented, incorporating both individual and collective screenings alongside consistency checks to enhance reliability. Third, an additional screening was conducted using the Environmental, Social, and Governance (ESG) dimensions from the Baier et al (48) dictionary, serving as a final benchmark verification tool. From a data perspective, the study faced constraints due to the uncooperative stance of the World Economic Forum (WEF), which declined to provide primary survey results despite multiple requests. Consequently, surveyed likelihood and severity values were manually extracted from risk maps using the "WebPlotDigitizer" software. To assess the robustness of this data extraction method, values obtained via the software were compared against available data for 2024. The results were consistent, as detailed in Table SI-6, validating the reliability of the extraction process. Future research could build on this study by analyzing additional linguistic features, such as those identified by El-Haj et al. (49), or by exploring risk severity in greater depth—an effort currently constrained by data limitations (43). Moreover, engaging directly with the WEF could enable a critical evaluation of potential biases in survey populations and methodologies, providing a more comprehensive understanding of the reports' construction and impact.

Acknowledgments

The authors are grateful to Magnus Nyström for fruitful discussions or comments on our work, Vaida Ražaitytė for sharing data from InfoMedia, and Raf Jansen for carefully reviewing the manuscript.

Author Contributions

Louis Delannoy: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Supervision, Visualization, Writing – original draft, Writing – review & editing. **Mélis Busson**: Data Curation, Investigation, Methodology, Visualization, Formal analysis, Writing – original draft. **Peter Søgaard Jørgensen**: Writing – review & editing.

Financial Support

L.D. and P.S.J. thank the Erling-Persson Family Foundation for funding the research. P.S.J. also acknowledges funding from the IKEA Foundation, the Marianne and Marcus Wallenberg Foundation, the Marcus and Amalia Wallenberg Foundation, the European Union (ERC, INFLUX, 101039376), and the Swedish Research Council Formas (2020–00371). However, the views and opinions expressed are those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Council. Neither the European Union nor the granting authority can be held responsible for them. M.D. acknowledges funding from the European Commission through the Erasmus+ traineeships grant.

Conflicts of Interest declarations

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

Data and code for the analysis, as well as figures, can be accessed from the following repository: https://github.com/LouisD-KVA/WEF-GRR-analysis

Declaration of AI use

We have used AI-assisted technologies for spellchecking, code checking, and as inspiration for rewording individual sentences. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References

1. Stefán CI. The World Economic Forum. In: Marton P, Thomasen G, Békés C, Rácz A, editors. The Palgrave Handbook of Non-State Actors in East-West Relations [Internet]. Cham: Springer International Publishing; 2024 [cited 2024 Nov 20]. p. 1–13. Available from: https://link.springer.com/10.1007/978-3-031-05750-2_21-1
2. Moll I. The Fourth Industrial Revolution: A New Ideology. TripleC Commun Capital Crit Open Access J Glob Sustain Inf Soc. 2022 Feb 17;20(1):45–61.
3. McNeill D. The World Economic Forum: An unaccountable force in global health governance? Glob Policy. 2023;14(5):782–9.
4. Saqer A. Repackaging growth at Davos: the World Economic Forum's inclusive growth and development approach. Rev Int Polit Econ. 2023 May 4;30(3):914–38.
5. Francisco M, Linnér BO. AI and the governance of sustainable development. An idea analysis of the European Union, the United Nations, and the World Economic Forum. Environ Sci Policy. 2023 Dec 1;150:103590.
6. Graz JC. How Powerful are Transnational Elite Clubs? The Social Myth of the World Economic Forum. New Polit Econ. 2003 Nov;8(3):321–40.
7. Pigman GA. The World Economic Forum: a multi-stakeholder approach to global governance. London ; New York: Routledge; 2007. 175 p. (Routledge global institutions).
8. Fougner T. Corporate Power In World Politics: The Case Of The World Economic Forum. J Int Trade Dipl. 2008;2(2):97–134.
9. Pigman GA. A Multifunctional Case Study for Teaching International Political Economy: The World Economic Forum as Shar-pei or Wolf in Sheep's Clothing? Int Stud Perspect. 2002 Aug;3(3):291–309.
10. Giesler M, Veresiu E. Creating the Responsible Consumer: Moralistic Governance Regimes and Consumer Subjectivity. J Consum Res. 2014 Oct 1;41(3):840–57.
11. Garsten C, Sörbom A. His Master's Voice? Conceptualizing the Relationship Between Business and the World Economic Forum. J Bus Anthropol. 2019 Apr 29;8(1):41–62.
12. Jayasuriya K. Polycrisis or crises of capitalist social reproduction. Glob Soc Chall J. 2023 Dec;2(2):203–11.
13. Albert MJ. Navigating the polycrisis: mapping the futures of capitalism and the Earth. Cambridge, Massachusetts: The MIT Press; 2024. 1 p.
14. Jacobs M. After Neoliberalism: Economic Theory and Policy in the Polycrisis. Polit Q. 2024 Feb 2;1467-923X.13363.
15. Lawrence M, Homer-Dixon T, Janzwood S, Rockström J, Renn O, Donges JF. Global polycrisis: the causal mechanisms of crisis entanglement. Glob Sustain. 2024;7:e6.
16. Szepanski A. Capitalism in the Age of Catastrophe: The Newest Developments of Financial Capital in Times of Polycrisis [Internet]. Cham: Springer Nature Switzerland; 2024 [cited 2024 Nov 20]. (Palgrave Insights into Apocalypse Economics). Available from: https://link.springer.com/10.1007/978-3-031-57754-3
17. Garsten C, Sörbom A. Discreet power: how the World Economic Forum shapes market agendas. Stanford, California: Stanford University press; 2018. (Emerging frontiers in the global economy).
18. Garsten C, Sörbom A. Think tanks as policy brokers in partially organized fields: The case of World Economic Forum. Stockholms centrum för forskning om offentlig sektor; 2014.
19. Garsten C, Sörbom A. Global policy bricolage: the role of business in the World Economic Forum. In: Garsten C, Sörbom A, editors. Power, Policy and Profit [Internet]. Edward Elgar Publishing; 2017 [cited 2024 Nov 20]. Available from: https://china.elgaronline.com/view/edcoll/9781784711207/9781784711207.00008.xml
20. Navidi S, Roubini N. Superhubs: how the financial elite and their networks rule our world. London Boston: Nicholas Brealey Publishing; 2017. 289 p.
21. Garsten C, Sörbom A. Discretionary Governance: Selection, Secrecy, and Status within the World Economic Forum. Glob Gov Rev Multilateralism Int Organ. 2021 Dec

13;27(4):540–60.
22. Pal LA. Speaking good to power: repositioning global policy advice through normative framing. Policy Soc. 2023 Oct 12;42(3):347–58.
23. Van Der Veer R, Meibauer G. Technocracy, populism, and the (de)legitimation of international organizations. Eur J Int Relat. 2024 Dec;30(4):946–71.
24. Giridharadas A. Winners take all: the elite charade of changing the world. New York: Alfred A. Knopf; 2018. 288 p. (A Borzoi book).
25. Kaplan R. “Rather Than Follow Change, Business Must Lead this Transformation”: Global business’s institutional project to privatize global environmental governance, 1990–2010. Organ Stud. 2024 Jan;45(1):161–88.
26. Sharma S, Soederberg S. Redesigning the business of development: the case of the World Economic Forum and global risk management. Rev Int Polit Econ. 2020 Jul 2;27(4):828–54.
27. Woodworth E. How the World Economic Forum damages the credibility of climate science. Am J Econ Sociol. 2023 Nov;82(5):493–511.
28. Elias J. Davos Woman to the Rescue of Global Capitalism: Postfeminist Politics and Competitiveness Promotion at the World Economic Forum. Int Polit Sociol. 2013 Jun;7(2):152–69.
29. Domingo A. Migration as a Global Risk : The World Economic Forum and Neoliberal Discourse on Demography. Quetelet J. 2015 Oct 1;3(1):97–117.
30. Nauta C. Female Representation at the World Economic Forum. 2015 [cited 2024 Nov 21]; Available from: http://lup.lub.lu.se/student-papers/record/5465895
31. Taylor RS. Risky business: how the WEF Global Risks Report misrepresents the plights of the developing world [Internet]. Texas State University; 2021. Available from: https://digital.library.txst.edu/server/api/core/bitstreams/79ebb976-6d51-4100-8d85-4942bbb06d56/content
32. Garsten C, Sörbom A. Values aligned: the organization of conflicting values within the World Economic Forum. In: Alexius S, Tamm Hallström K, editors. Configuring Value Conflicts in Markets [Internet]. Edward Elgar Publishing; 2014 [cited 2024 Nov 20]. Available from: https://china.elgaronline.com/view/edcoll/9781782544463/9781782544463.00014.xml
33. Pagan V, Haynes K, Reissner S. Accountable Selves and Responsibility Within a Global Forum. J Bus Ethics. 2023 Oct 1;187(2):255–70.
34. Schwab K. Now is the time for a ‘great reset’ [Internet]. 2020. Available from: https://www.weforum.org/stories/2020/06/now-is-the-time-for-a-great-reset/
35. WEF. Global Risks Report [Internet]. World Economic Forum; 2024 [cited 2024 Dec 2]. Available from: https://www.weforum.org/publications/global-risks-report-2024/
36. Garsten C, Sörbom A. Risk, resilience, and alternative futures : Scenario-building at the World Economic Forum. In 2016 [cited 2024 Nov 21]. Available from: https://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-542339
37. Garschagen M, Wood SLR, Garard J, Ivanova M, Luers A. Too Big to Ignore: Global Risk Perception Gaps Between Scientists and Business Leaders. Earths Future. 2020 Mar;8(3):e2020EF001498.
38. Qazi A, Al-Mhdawi MKS. Exploring dependencies among global environmental, socioeconomic, and technological risks. Environ Impact Assess Rev. 2023 Jan;98:106912.
39. Nam H, Nam T. Exploring Strategic Directions of Pandemic Crisis Management: A Text Analysis of World Economic Forum COVID-19 Reports. Sustainability. 2021 Apr 7;13(8):4123.
40. Evans J, Allan N, Cantle N. A New Insight into the World Economic Forum Global Risks. Econ Pap J Appl Econ Policy. 2017 Jun;36(2):185–97.
41. Søgaard Jørgensen P, Jansen REV, Avila Ortega DI, Wang-Erlandsson L, Donges JF, Österblom H, et al. Evolution of the polycrisis: Anthropocene traps that challenge global sustainability. Philos Trans R Soc B Biol Sci. 2024 Jan;379(1893):20220261.
42. Landrum NE, Ohsowski B. Identifying Worldviews on Corporate Sustainability: A

661 Content Analysis of Corporate Sustainability Reports. Bus Strategy Environ. 2018
662 Jan;27(1):128–51.
663 43. Delannoy L, Verzier A, Bastien-Olvera B, Benra F, Nyström M, Søgaard Jørgensen
664 P. Dynamics of the polycrisis: temporal trends, spatial distribution and interconnections of
665 national shocks (1970-2019) [Internet]. 2024 [cited 2024 Nov 20]. Available from:
666 https://eartharxiv.org/repository/view/7732/
667 44. Loughran T, McDonald B. When Is a Liability Not a Liability? Textual Analysis,
668 Dictionaries, and 10-Ks. J Finance. 2011 Feb;66(1):35–65.
669 45. Loughran T, McDonald B. Measuring Firm Complexity. J Financ Quant Anal. 2024
670 Sep;59(6):2487–514.
671 46. Anusha A. Fog-Index. https://github.com/anushaa51/Fog-Index/; 2018.
672 47. Merino-Saum A, Baldi MG, Gunderson I, Oberle B. Articulating natural resources and
673 sustainable development goals through green economy indicators: A systematic analysis.
674 Resour Conserv Recycl. 2018 Dec;139:90–103.
675 48. Baier P, Berninger M, Kiesel F. Environmental, social and governance reporting in
676 annual reports: A textual analysis. Financ Mark Inst Instrum. 2020 Aug;29(3):93–118.
677 49. El-Haj M, Alves P, Rayson P, Walker M, Young S. Retrieving, classifying and
678 analysing narrative commentary in unstructured (glossy) annual reports published as PDF
679 files. Account Bus Res. 2020 Jan 2;50(1):6–34.
680 50. Søgaard Jørgensen P, Delannoy L, Maniatakou S, Folke C, Moore ML, Olsson P.
681 Navigating the polycrisis: assessing the adequacy of adaptive and transformative
682 capacities for addressing Anthropocene traps [Internet]. 2024 [cited 2024 Nov 20].
683 Available from: https://osf.io/xtrmb
684

Supplementary information

Material included:

A. Reports collected
    - Table SI-1: Reports from international organizations that were selected for the linguistic analysis comparison with the GRRs. WMO = World Meteorological Organization: State of the Climate Reports; BIS = Bank for International Settlements: Annual Reports; IMF = International Monetary Fund: World Economic Outlooks; FAO = Food and Agriculture Organization: The State of Food Insecurity in the World Reports; UNWWDR = The United Nations World Water Development Reports; UN Technology = UN Conference on Trade and Development: Technology and Innovation Reports; WIPO = World Intellectual Property Organization Reports; UNHCR = The UN Refugee Agency Global Reports.

B. Description of SDGs, ATs and CSSs
    - Table SI-2: Sustainable Development Goals description.
    - Table SI-3: Anthropocene Traps description. Relying on Søgaard Jørgensen et al. (41) and reproduced with the author's approval from Søgaard Jørgensen et al. (50).
    - Table SI-4: Corporate Sustainability Spectrum description. Relying on Landrum & Ohsowski (42).

C. Linguistic analysis
    - Table SI-5: List of "stop" words.
    - Figure SI-1: Euclidean distances among reports from international organizations, assessed over six linguistic criteria.

D. Tridimensional screening
    - Figure SI-2: Normalized proportion of screens screened against Sustainable Development Goals (SDGs) for words (top) and surveys (bottom).
    - Figure SI-3: Normalized proportion of words systematically screened against Anthropocene Traps for words (top) and surveys (bottom).

include a risk survey, and the 2023 and 2024 reports only show severity multiplied by likelihood.

- Figure SI-11: Surveyed severity times likelihood of global risks (normalized from 1 to 5), by category of risks, in GRRs from 2006 to 2021. Note that the 2022 Global Risk Report did not include a risk survey, and the 2023 and 2024 reports only show severity times likelihood.
- Table SI-9: The surveyed severity of risks in the 2024 Global Risks Report, as provided by the World Economic Forum (WEF) or extracted from the risk map using the WebPlotDigitizer software.
- Figure SI-12: P-values of t-test and Wilcoxon signed-rank test between
- Table SI-8: P-values of t-test and Wilcoxon signed-rank test between and . Differences are considered statistically significant if p-values are below 0.05.

F. Influence of the Global Risks Reports

- Figure SI-13: Distribution of news articles referencing ‘Global Risks Report’ in 2023, as documented in InfoMedia.

A - Reports collected

Year	WMO	BIS	IMF	FAO	UNWWDR	UN Technology	WIPO	UNHCR
2006	✓	✓	✓	✓	✓			
2007	✓	✓	✓	✓				
2008	✓	✓	✓	✓				
2009	✓	✓	✓	✓	✓			
2010	✓	✓	✓	✓		✓		
2011	✓	✓	✓	✓		✓	✓	
2012	✓	✓	✓	✓	✓	✓		
2013	✓	✓	✓	✓			✓	
2014	✓	✓	✓	✓	✓			
2015	✓	✓	✓	✓	✓	✓	✓	✓
2016	✓	✓	✓	✓	✓			✓
2017	✓	✓	✓	✓	✓		✓	✓
2018	✓	✓	✓	✓	✓	✓		✓
2019	✓	✓	✓	✓	✓		✓	✓
2020	✓	✓	✓	✓	✓			✓
2021	✓	✓	✓	✓	✓	✓		✓
2022	✓	✓	✓	✓	✓		✓	✓
2023	✓	✓	✓	✓	✓	✓		

757 Table SI-1: Reports from international organizations that were selected for the linguistic analysis comparison with the GRRs. WMO = World Meteorological
758 Organization: State of the Climate Reports; BIS = Bank for International Settlements: Annual Reports; IMF = International Monetary Fund: World Economic
759 Outlooks; FAO = Food and Agriculture Organization: The State of Food Insecurity in the World Reports; UNWWDR = The United Nations World Water
760 Development Reports; UN Technology = UN Conference on Trade and Development: Technology and Innovation Reports; WIPO = World Intellectual Property
761 Organization Reports; UNHCR = The UN Refugee Agency Global Reports.

762 **B - Description of SDGs, ATs and CSSs**

Sustainable Development Goals (SDGs)	Description
1. No Poverty	End poverty in all its forms everywhere.
2. Zero Hunger	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
3. Good Health and Well-being	Ensure healthy lives and promote well-being for all at all ages.
4. Quality Education	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
5. Gender Equality	Achieve gender equality and empower all women and girls.
6. Clean Water and Sanitation	Ensure availability and sustainable management of water and sanitation for all.
7. Affordable and Clean Energy	Ensure access to affordable, reliable, sustainable, and modern energy for all.
8. Decent Work and Economic Growth	Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
9. Industry, Innovation and Infrastructure	Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
10. Reduced Inequalities	Reduce inequality within and among countries.
11. Sustainable Cities and Communities	Make cities and human settlements inclusive, safe, resilient, and sustainable.
12. Responsible Consumption and Production	Ensure sustainable consumption and production patterns.
13. Climate Action	Take urgent action to combat climate change and its impacts.
14. Life Below Water	Conserve and sustainably use the oceans, seas, and marine resources for

	sustainable development.
15. Life on Land	Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss.
16. Peace, Justice and Strong Institutions	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
17. Partnerships for the Goals	Strengthen the means of implementation and revitalize the global partnership for sustainable development.

763 Table SI-2: Sustainable Development Goals description.

764

Type	Anthropocene Traps (ATs)	Description
Gl - global traps	1. Simplification	Increasing specialization produces simplified sub-systems that are vulnerable to shocks
	2. Growth-for-growth	Institutional lock-ins drive pursuit of growth at the cost of well-being
	3. Overshoot	Continued material growth leads to overshoot of Earth system tipping points
	4. Division	Unstable selection for global human cooperation increases risk of international conflict
	5. Contagion	Global connectivity increases the risk of large-scale contagion, e.g. of infectious diseases
Te - technology traps	6. Infrastructure lock-in	Complex material infrastructure becomes

		maladaptive, e.g. owing to sunk costs
	7. Chemical pollution	Capacity to produce complex or persistent compounds that can cause long-term harm to humans and ecosystem
	8. Existential technology	Technological arms-races drive the evolution of existential technology, such as weapons of mass destruction
	9. Technological autonomy	Reliance on automation can backfire if systems become misaligned to human needs
	10. Dis- and mis-information	Digitalization can amplify spread of mis- and disinformation e.g. destabilizing democracies
Te - temporal trap	11. Short-termism	Favour of short-term over long-term benefits reinforces other traps and promotes conflic
Co - connectivity traps	12. Overconsumption	Separation of production and consumption facilitates overconsumption
	13. Biosphere disconnect	Separation of human settlements and ecosystems reduces awareness about their benefits
	14. Local social capital loss	Digitalization can lead to loss of local social capital through reduced interaction and echo chambers

765

766 Table SI-3: Anthropocene Traps description. Relying on Søgaard Jørgensen et al. (41) and reproduced with the author's approval from Søgaard Jørgensen et al.

767 (50).

768

Corporate Sustainability Spectrum (CSSs)	Description
1. Compliance	Focuses on meeting externally enforced regulations and compliance requirements with an internally firm-centric perspective.
2. Business-Centered	Prioritizes incremental improvements and business benefits, using eco-efficiency as a tool to "do less bad" while maintaining an anthropocentric view.
3. Systemic	Integrates economic, environmental, and social sustainability by fostering systemic change through collaboration and partnerships.
4. Regenerative	Seeks to repair damage caused by industrial practices by operating within planetary boundaries and prioritizing ecological science.
5. Coevolutionary	Promotes a symbiotic relationship between humans and nature, aiming for mutual flourishing without growth in production or consumption

769

770 Table SI-4: Corporate Sustainability Spectrum description. Relying on Landrum & Ohsowski (42).

C - Linguistic analysis

Stop words			
https	could	th	ai
www	figure	com	many
nd	next	st	rd
org	two	e	c
october	al	g	b
pdf	may	term	http
n	w	ts	h
l	r	p	section
sectio	f	n	source
ranking	bn		

Table SI-5: List of "stop" words.

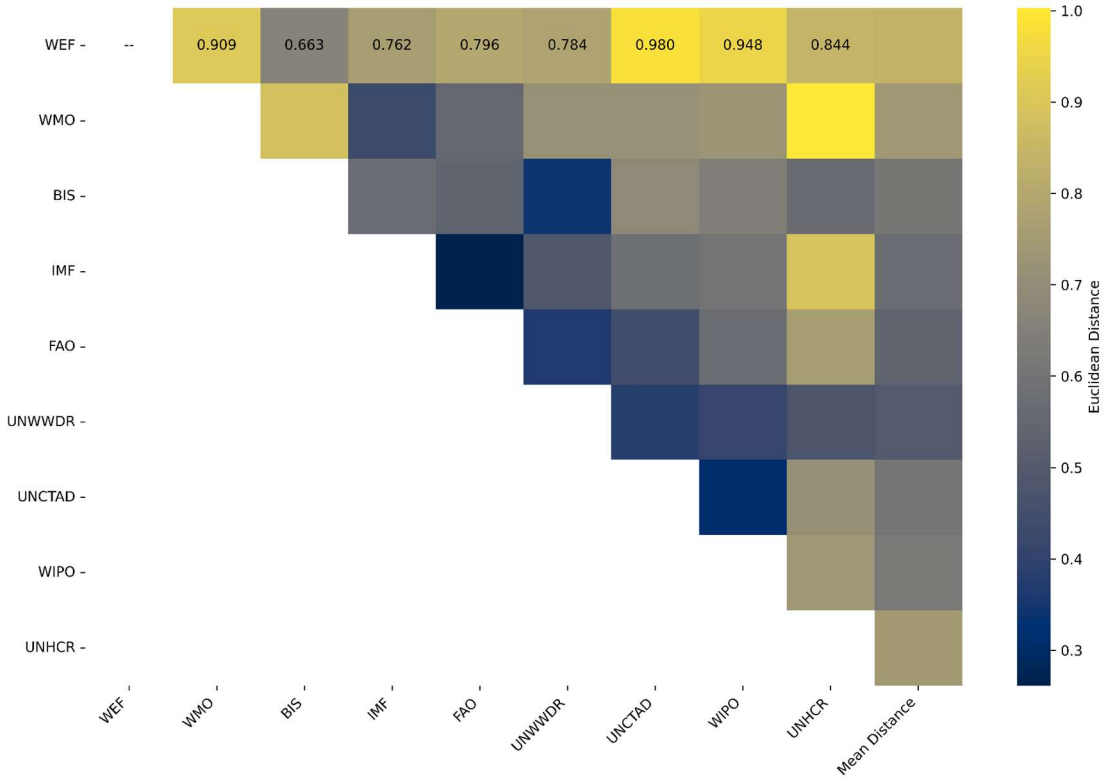


Figure SI-1: Euclidean distances among reports from international organizations, assessed over six linguistic criteria.

D - Tridimensional screening

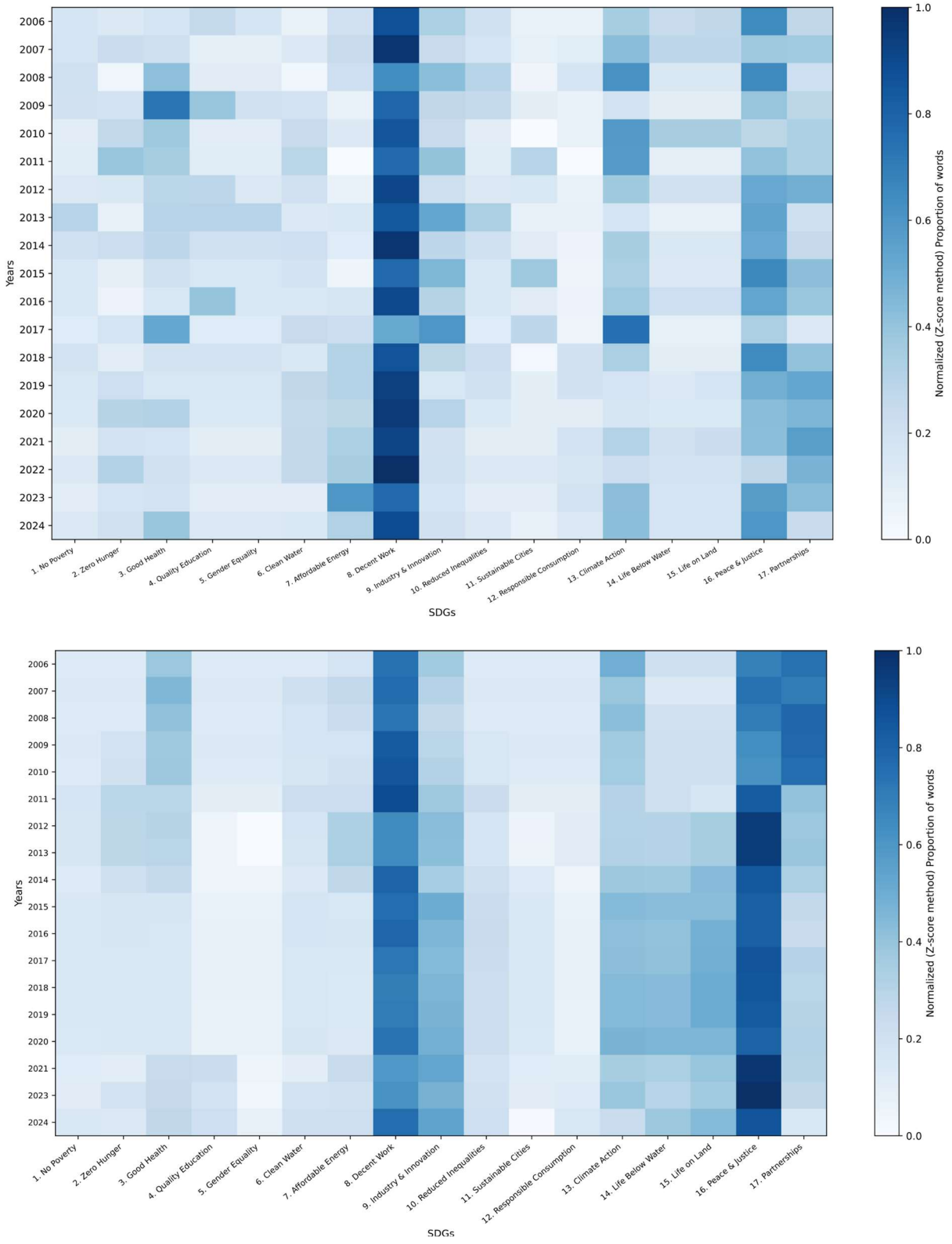
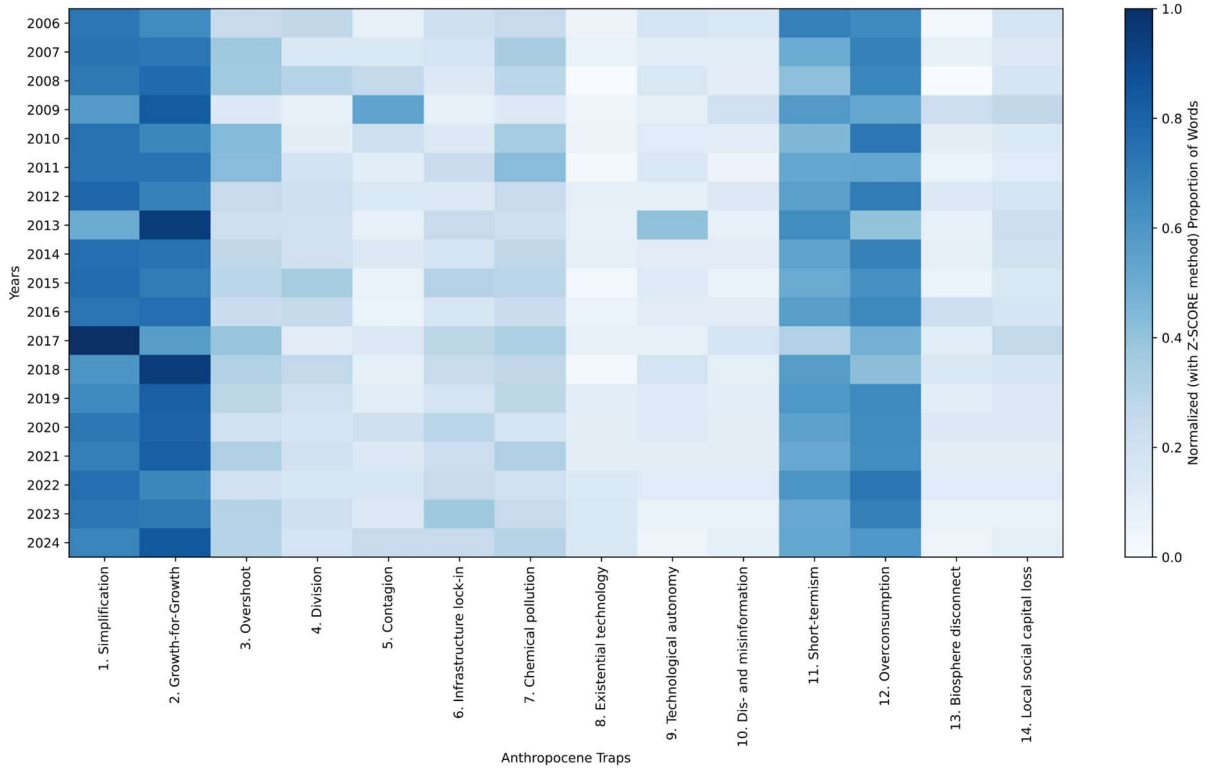
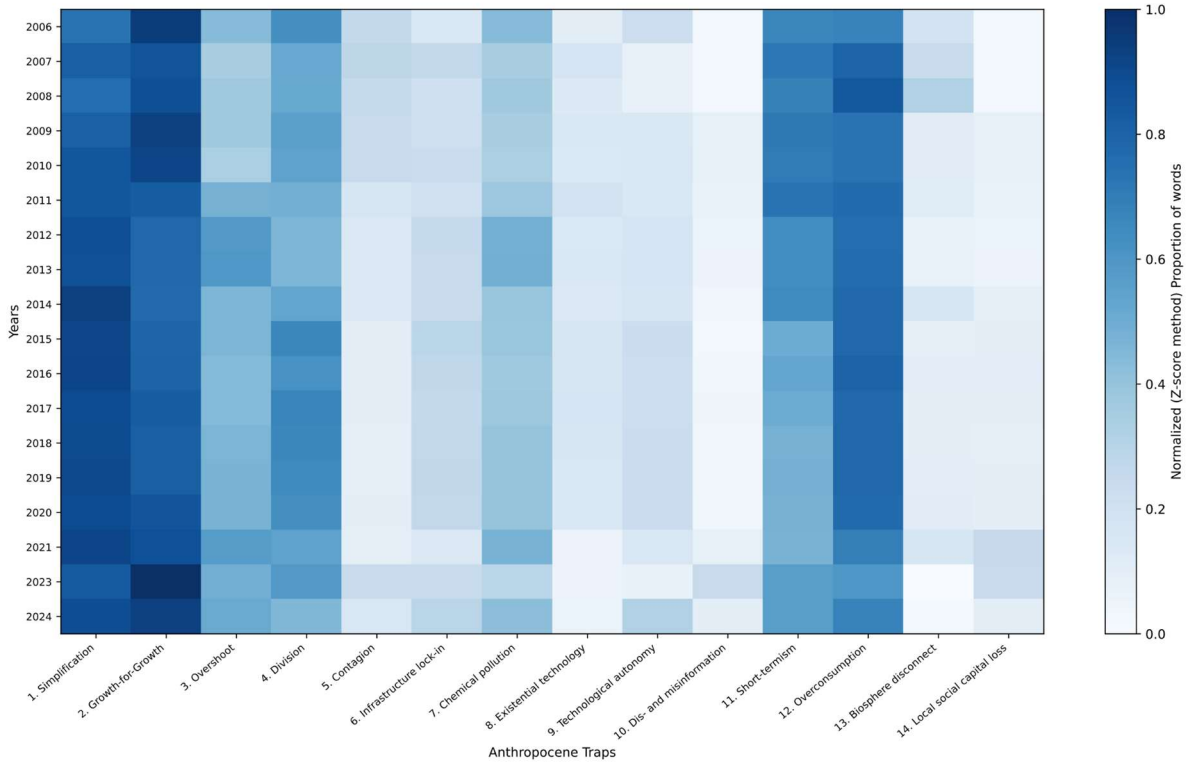


Figure SI-2: Normalized proportion of screens screened against Sustainable Development Goals (SDGs) for words (top) and surveys (bottom).



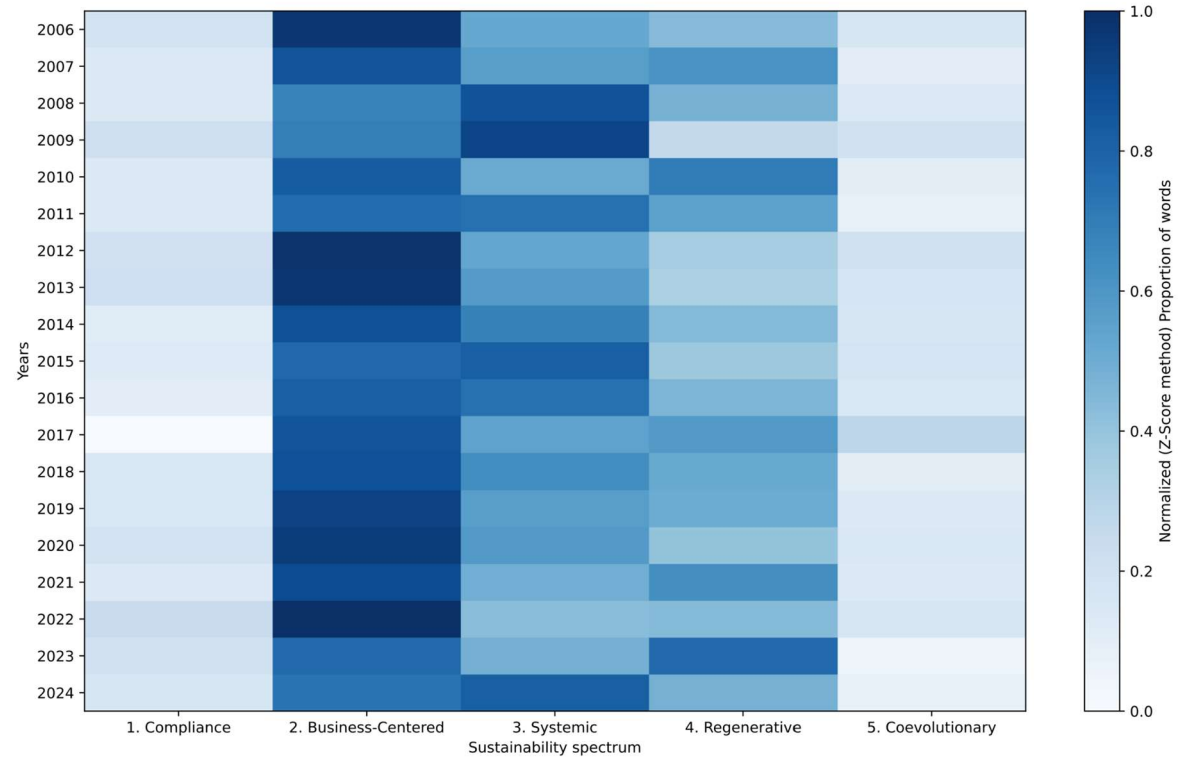
783



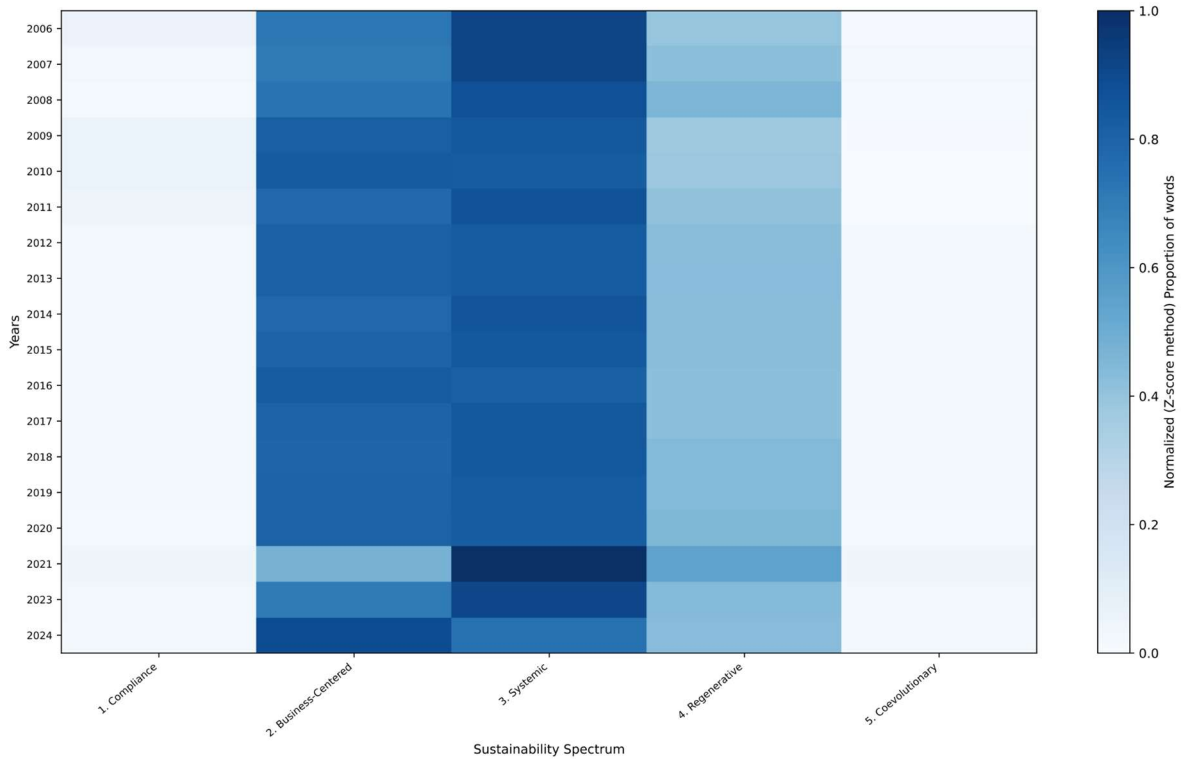
784

785 Figure SI-3: Normalized proportion of words systematically screened against Anthropocene Traps for

786 words (top) and surveys (bottom).



787



788

789 Figure SI-4: Normalized proportion of words systematically screened against Corporate Sustainability

790 Spectrums for words (top) and surveys (bottom).

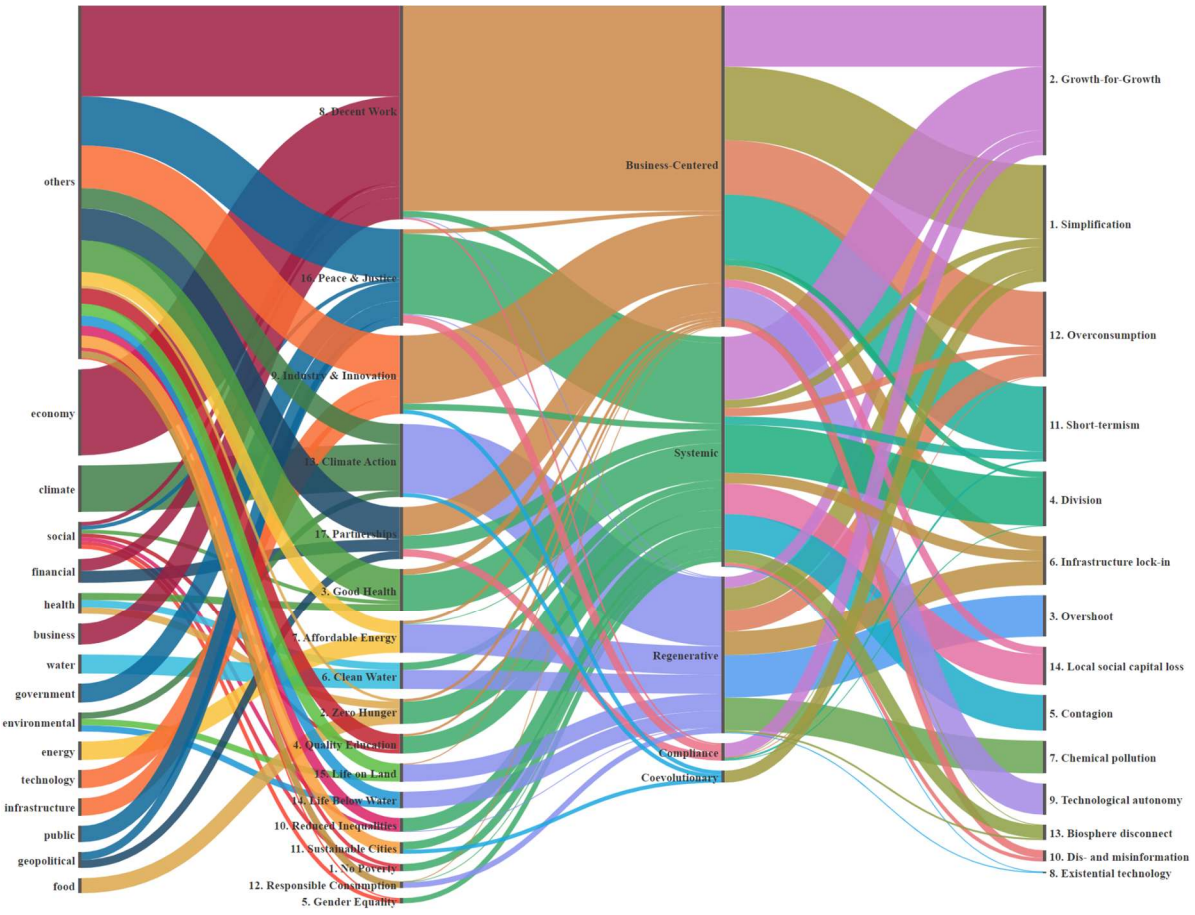


Figure SI-5: Sankey diagram representing the interconnections between (left) words of the GRRs, and screens against (middle left) Sustainable Development Goals, (middle right) Corporate Sustainability Spectrums, (right) Anthropocene Traps.

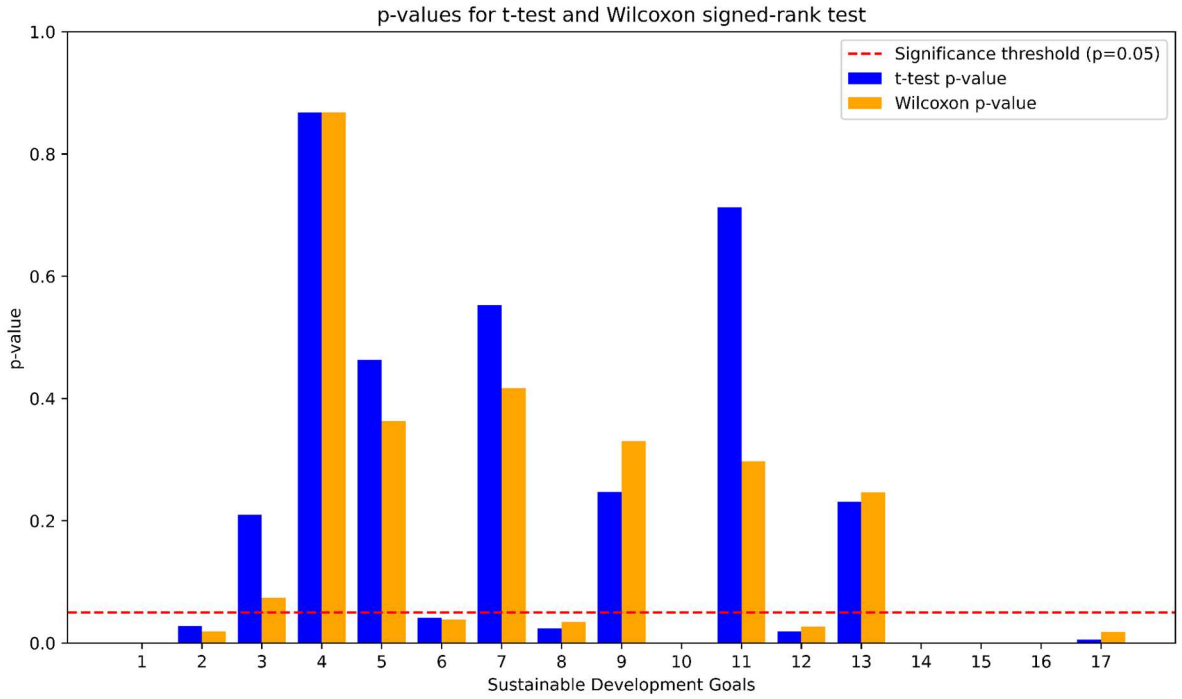


Figure SI-6: P-values of t-test and Wilcoxon signed-rank test between survey and text-Based screens against Sustainable Development Goals.

Sustainable Development Goals	t-pvalue	Wilcoxon-pvalue	Interpretation
1	2.558297e-08	0.000008	Significant in both tests
2	2.796694e-02	0.018556	Significant in both tests
3	2.097044e-01	0.073685	No significant difference
4	8.681325e-01	0.868333	No significant difference
5	4.626984e-01	0.363101	No significant difference
6	4.148293e-02	0.038490	Significant in both tests
7	5.525635e-01	0.417114	No significant difference
8	2.389084e-02	0.034233	Significant in both tests

9	2.468350e-01	0.330536	No significant difference
10	1.789556e-05	0.000252	Significant in both tests
11	7.128115e-01	0.296995	No significant difference
12	1.855754e-02	0.026848	Significant in both tests
13	2.312315e-01	0.246208	No significant difference
14	9.733674e-07	0.000023	Significant in both tests
15	2.141602e-06	0.000023	Significant in both tests
16	5.263195e-07	0.000351	Significant in both tests
17	5.407244e-03	0.017857	Significant in both tests

Table SI-6: P-values of t-test and Wilcoxon signed-rank test between survey and text-based screens against Sustainable Development Goals. Differences between survey and text-based screens are considered statistically significant if p-values are below 0.05.

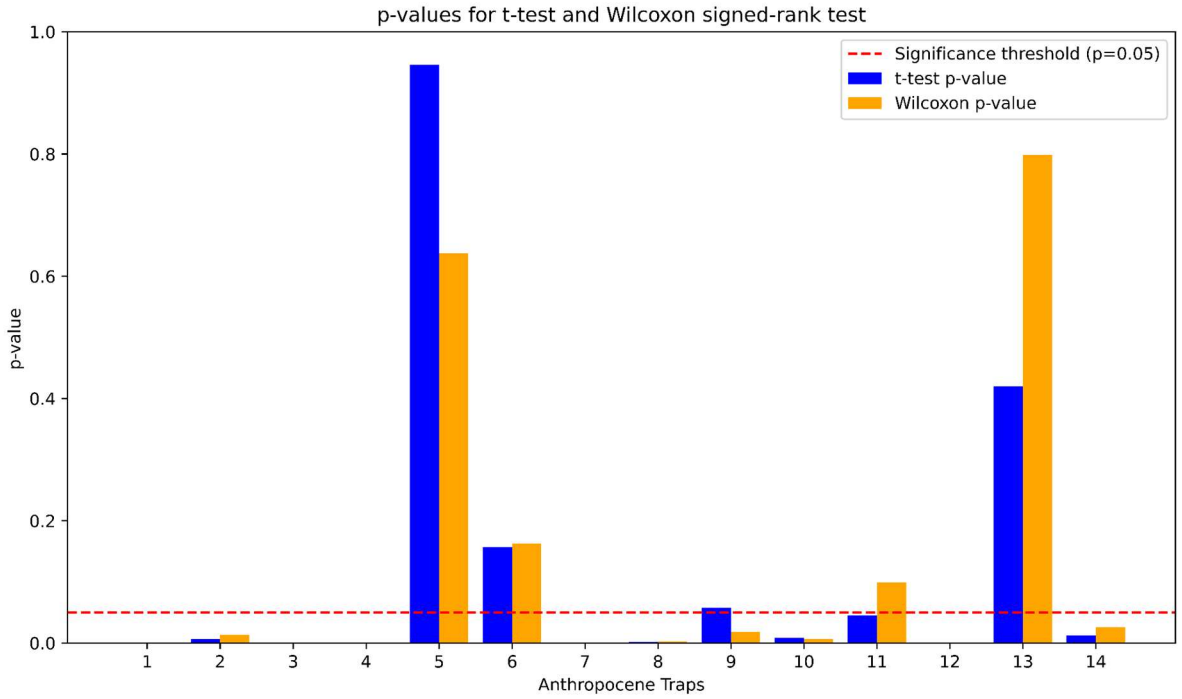


Figure SI-7: P-values of t-test and Wilcoxon signed-rank test between survey and text-Based screens against Anthropocene Traps.

Anthropocene Traps	t-pvalue	Wilcoxon-pvalue	Interpretation
1	2.047749e-05	0.000145	Significant in both tests
2	6.435382e-03	0.012921	Significant in both tests
3	4.063399e-05	0.000706	Significant in both tests
4	3.807430e-12	0.000008	Significant in both tests
5	9.462313e-01	0.637518	No significant difference
6	1.564924e-01	0.162336	No significant difference
7	3.437256e-05	0.000650	Significant in both tests
8	1.751242e-03	0.002335	Significant in both tests

9	5.755169e-02	0.018234	Significant in Wilcoxon only
10	8.455982e-03	0.006393	Significant in both tests
11	4.517324e-02	0.098740	Significant in t-test only
12	1.131957e-04	0.000145	Significant in both tests
13	4.198936e-01	0.798706	No significant difference
14	1.211354e-02	0.025775	Significant in both tests

Table SI-7: P-values of t-test and Wilcoxon signed-rank test between survey and text-based screens against Anthropocene Traps. Differences between survey and text-based screens are considered statistically significant if p-values are below 0.05.

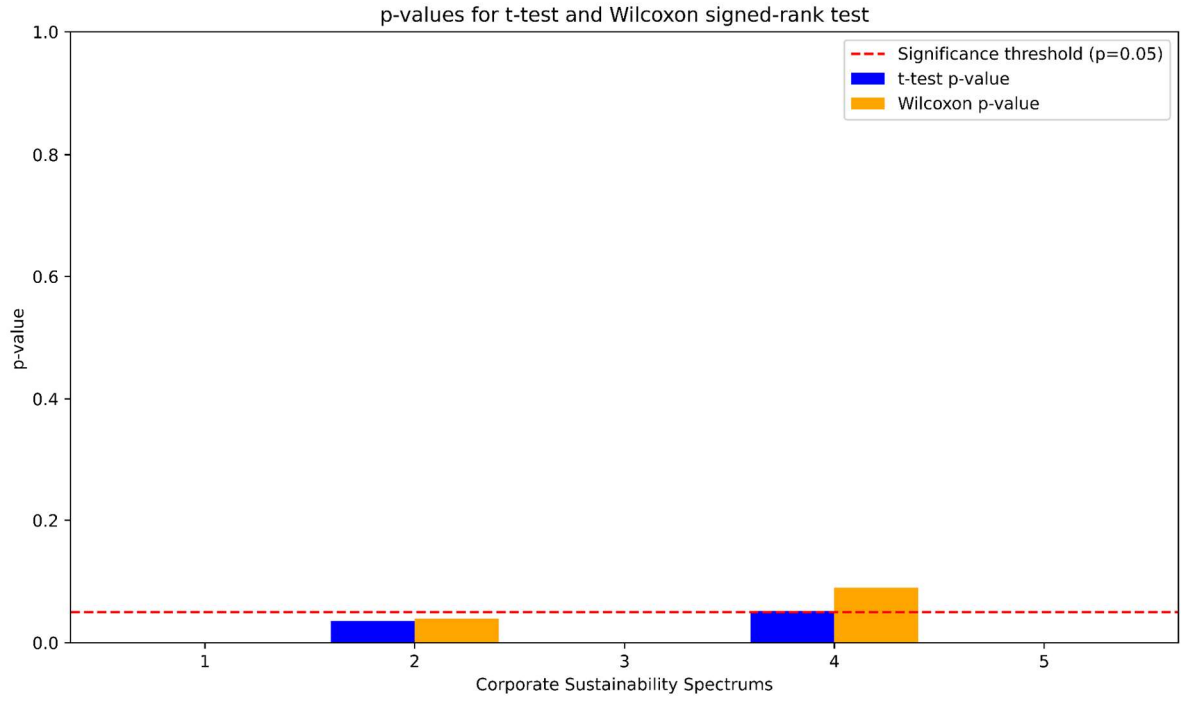


Figure SI-8: P-values of t-test and Wilcoxon signed-rank test between survey and text-Based screens against Corporate Sustainability Spectrums.

Corporate Sustainability Spectrums	t-pvalue	Wilcoxon-pvalue	Interpretation
1	2.830489e-08	0.000015	Significant in both tests
2	3.557458e-02	0.039447	Significant in both tests
3	5.747100e-05	0.000252	Significant in both tests
4	5.203275e-02	0.089767	No significant difference
5	2.315405e-08	0.000008	Significant in both tests

Table SI-8: P-values of t-test and Wilcoxon signed-rank test between survey and text-based screens against Corporate Sustainability Spectrums. Differences between survey and text-based screens are considered statistically significant if p-values are below 0.05.

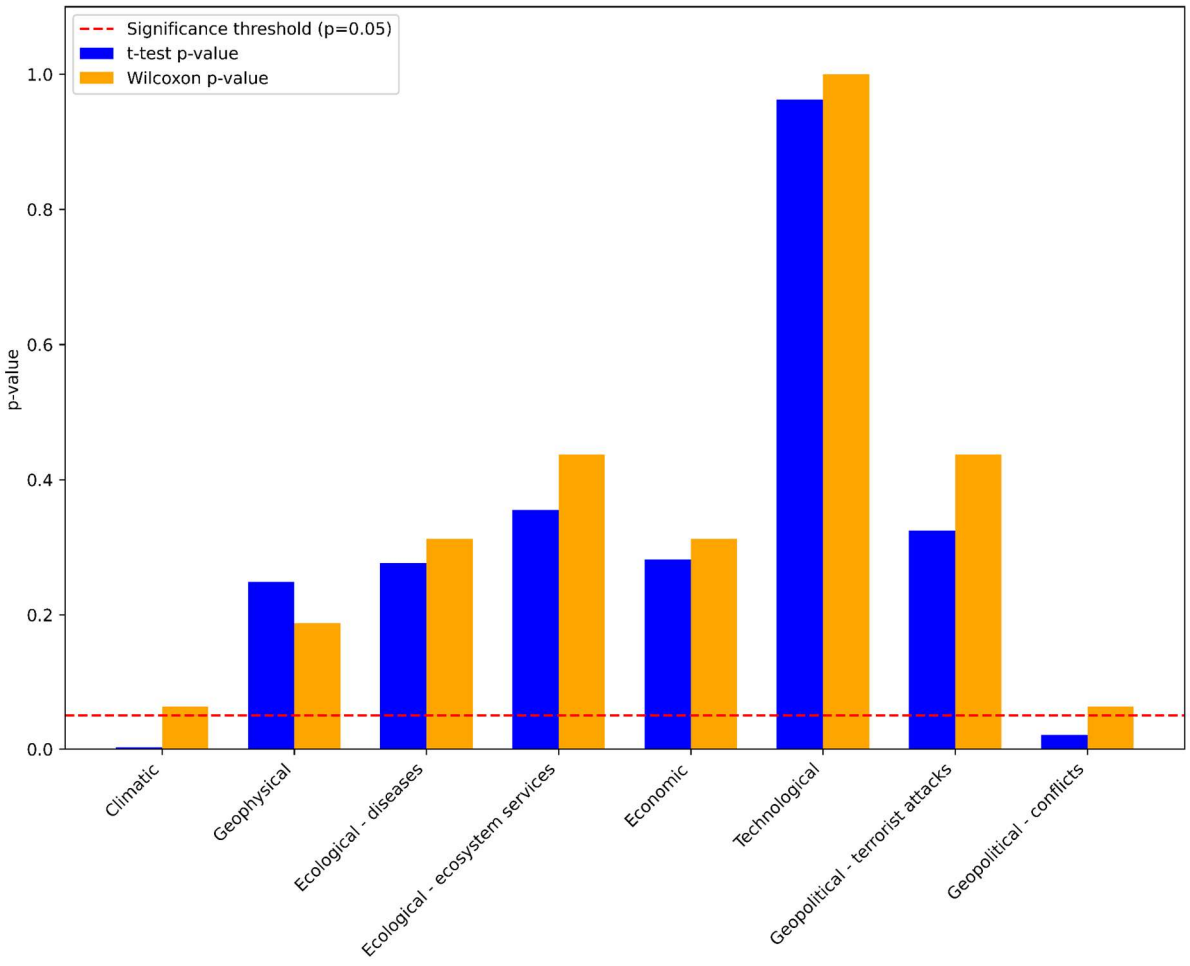


Figure SI-9: P-values of t-test and Wilcoxon signed-rank test for correlations between surveyed risks likelihoods of the GRRs and historical shocks from the database of Delannoy et al. (43).

Risk category	t-pvalue	Wilcoxon-pvalue	Interpretation
Climatic			
Geophysical			
Ecological - diseases			
Ecological - food production			
Economic			
Technological			
Geopolitical - terrorist attacks			

Geopolitical - conflicts			

Table SI-8: P-values of t-test and Wilcoxon signed-rank test between survey and text-based screens against Corporate Sustainability Spectrums. Differences between survey and text-based screens are considered statistically significant if p-values are below 0.05.

E - Backcasting analysis

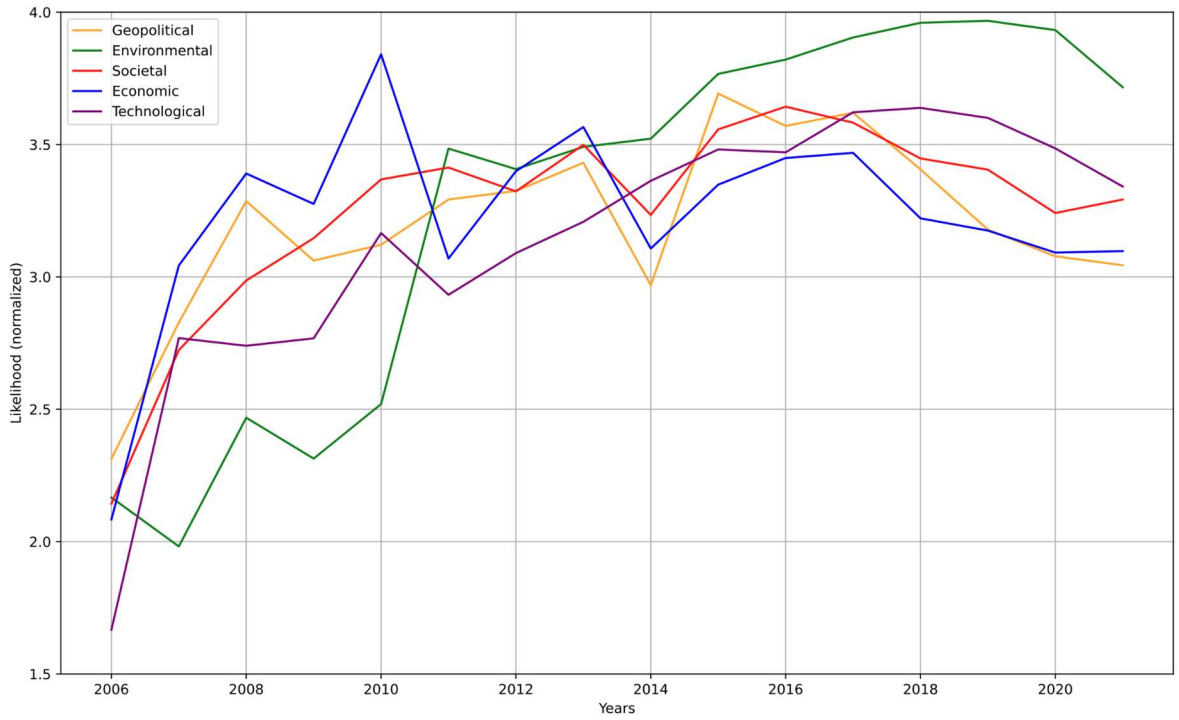


Figure SI-10: Surveyed likelihood of global risks (normalized from 1 to 5), by category of risks, in GRRs from 2006 to 2021. Note that the 2022 Global Risk Report did not include a risk survey, and the 2023 and 2024 reports only show severity multiplied by likelihood.

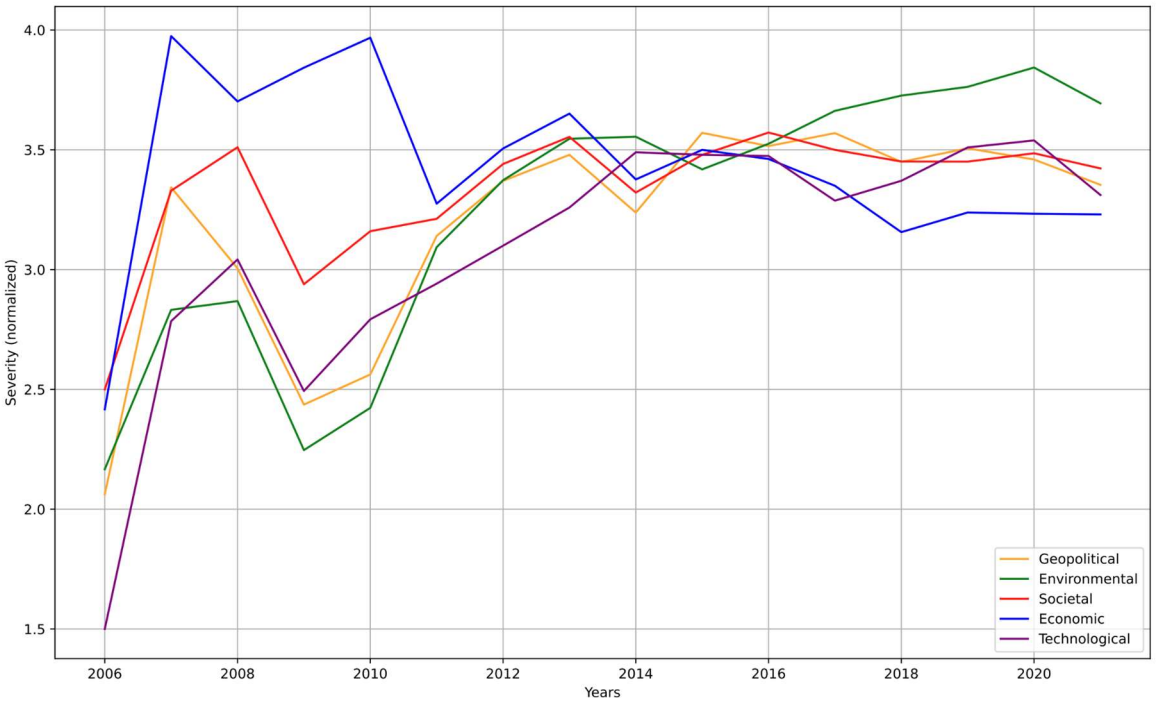


Figure SI-11: Surveyed severity of global risks (normalized from 1 to 5), by category of risks, in GRRs from 2006 to 2021. Note that the 2022 Global Risk Report did not include a risk survey, and the 2023 and 2024 reports only show severity multiplied by likelihood.

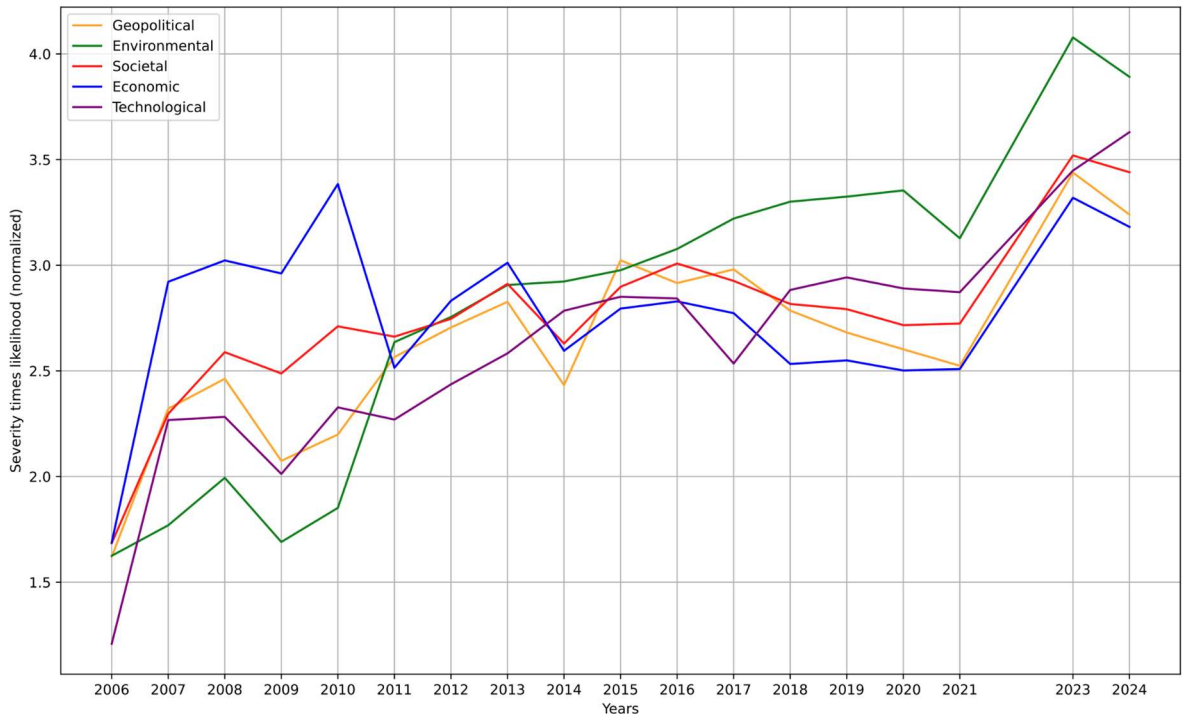


Figure SI-12: Surveyed severity times likelihood of global risks (normalized from 1 to 5), by category of risks, in GRRs from 2006 to 2021. Note that the 2022 Global Risk Report did not include a risk survey, and the 2023 and 2024 reports only show severity times likelihood.

Risk	Category	WEF (2024)	WebPlotDigitizer
Adverse outcomes of AI technologies	Technological	5.3	5.277799665
Adverse outcomes of frontier technologies	Technological	4.4	4.374618339
Asset bubble bursts	Economic	4.1	4.122426869
Biodiversity loss and ecosystem collapse	Environmental	5.7	5.734216488
Biological, chemical or nuclear hazards	Geopolitical	4.4	4.355953905
Censorship and surveillance	Technological	4.7	4.69206146

Chronic health conditions	Societal	4.5	4.467792771
Concentration of strategic resources	Economic	4.8	4.798187728
Critical change to Earth systems	Environmental	5.9	5.936718211
Cyber insecurity	Technological	5.2	5.138924456
Debt	Economic	4.6	4.57815424
Disruptions to a systemically important supply chain	Economic	4.4	4.339456318
Disruptions to critical infrastructure	Economic	4.4	4.382941003
Economic downturn	Economic	4.2	4.175514626
Erosion of human rights	Societal	4.6	4.550034473
Extreme weather events	Environmental	6	6.002708559
Geoeconomic confrontation	Geopolitical	4.6	4.627302275
Illicit economic activity	Economic	4	4.003151778
Inequality or lack of economic opportunity	Societal	4.6	4.900325027
Infectious diseases	Societal	4.5	4.467054073
Inflation	Economic	3.9	3.914508027
Insufficient public infrastructure and services	Societal	4.4	4.423766374
Interstate armed conflict	Geopolitical	4.7	4.660888407
Intrastate violence	Geopolitical	4.4	4.388555107
Involuntary migration	Societal	5.2	5.140057126
Labour shortages	Economic	4.2	4.136018911
Misinformation and disinformation	Technological	5.3	5.291046981

Natural resource shortages	Environmental	5.4	5.42992219
Non-weather related natural disasters	Environmental	3.9	3.92056535
Pollution	Environmental	5	4.999507535
Societal polarization	Societal	5.2	5.138185758
Technological power concentration	Technological	4.9	4.89446469
Terrorist attacks	Geopolitical	3.8	3.76553728
Unemployment	Societal	4.2	4.193538856

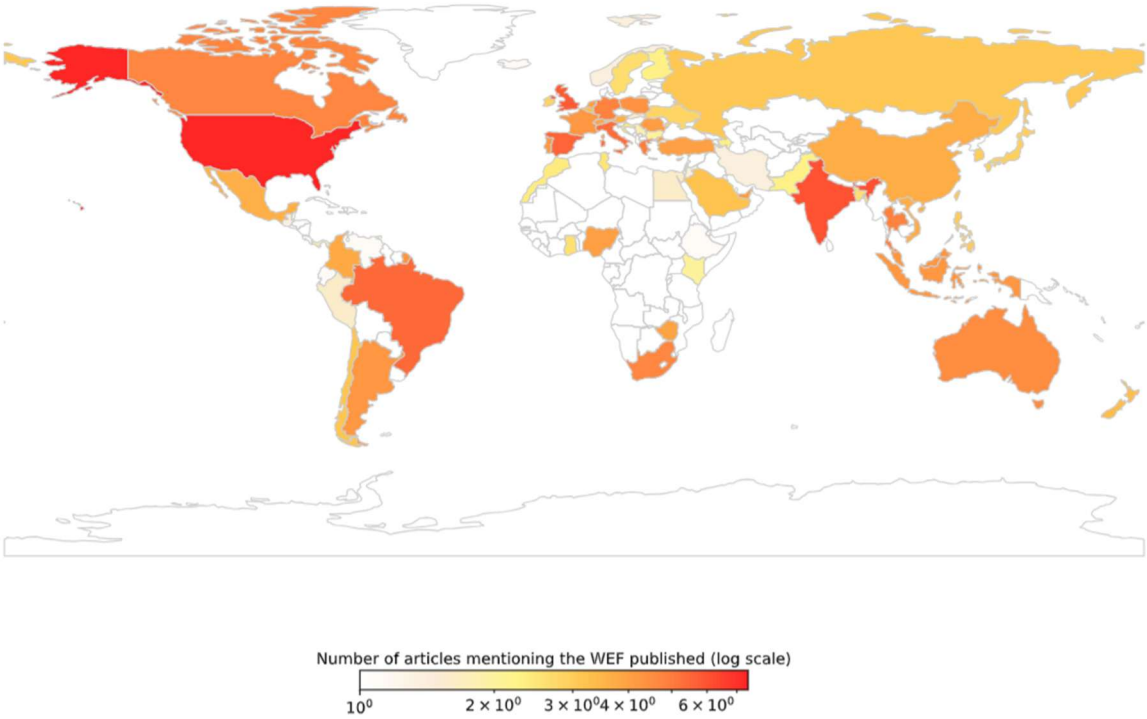
850

851 Table SI-9: The surveyed severity of risks in the 2024 Global Risks Report, as provided by the World

852 Economic Forum (WEF) or extracted from the risk map using the WebPlotDigitizer software.

853 **F- Influence of the Global Risks Reports**

854



855

856 Figure SI-13: Distribution of news articles referencing 'Global Risks Report' in 2023, as documented

857 in InfoMedia.