EXPOSING GREENWASHING: A DATA-DRIVEN APPROACH

Greenwashing Identifier

gwi.impactscope.com

Designed by

IMPACT SCOPE

In partnership with

INSIG AI

Contents

Executive summary

This White Paper aims to provide a comprehensive overview of the greenwashing phenomenon and introduce a practical solution for addressing it. By combining regulatory context and technological innovation, we seek to inform policymakers, sustainability officers, and financial institutions on how automated tools like the Greenwashing Identifier (GWI), implemented by ImpactScope, can enhance transparency, accountability, and impact measurement in corporate communications.

Several companies conduct deceptive market practices where they convey a false impression that their products and practices are more environmentally friendly than they are. This practice, known as greenwashing, misleads stakeholders, erodes consumer trust, and hampers genuine sustainability efforts in the market.

To counter this trend, several regulations have been enacted in the last few years to limit greenwashing. In the EU alone, companies accused of greenwashing may be liable to a fine corresponding to 4% of their yearly revenues. In parallel, increasing consumer pressures call for a decrease in greenwashing practices. Regulations and consumer pressures require regulators and companies themselves to be able to quickly identify greenwashing and take corrective action when it is identified.

1. What is greenwashing

1.1 Why is greenwashing bad?

Greenwashing is "*the deceptive practice of misleading the public about a company's or entity's environmental impact or actions*[1]". Following recent studies, 42%[2] or 55%[3] of companies making environmental claims engage in some form of greenwashing. Greenwashing practices have significant

negative implications as it is fundamentally a market distortion. Customers' buying decisions are misled as they are based on wrong perceptions of the companies' environmental performance. Companies doing greenwashing also feel less pressure to improve their environmental performance and, frequently, greenwashing leads to greenhushing: companies deciding not to communicate their environmental objectives to avoid scrutiny and allegations of greenwashing. As a matter of fact, a quarter of companies may be involved in greenhushing[4]. All these issues take away the credibility of all environmental initiatives and disempower climate change objectives.

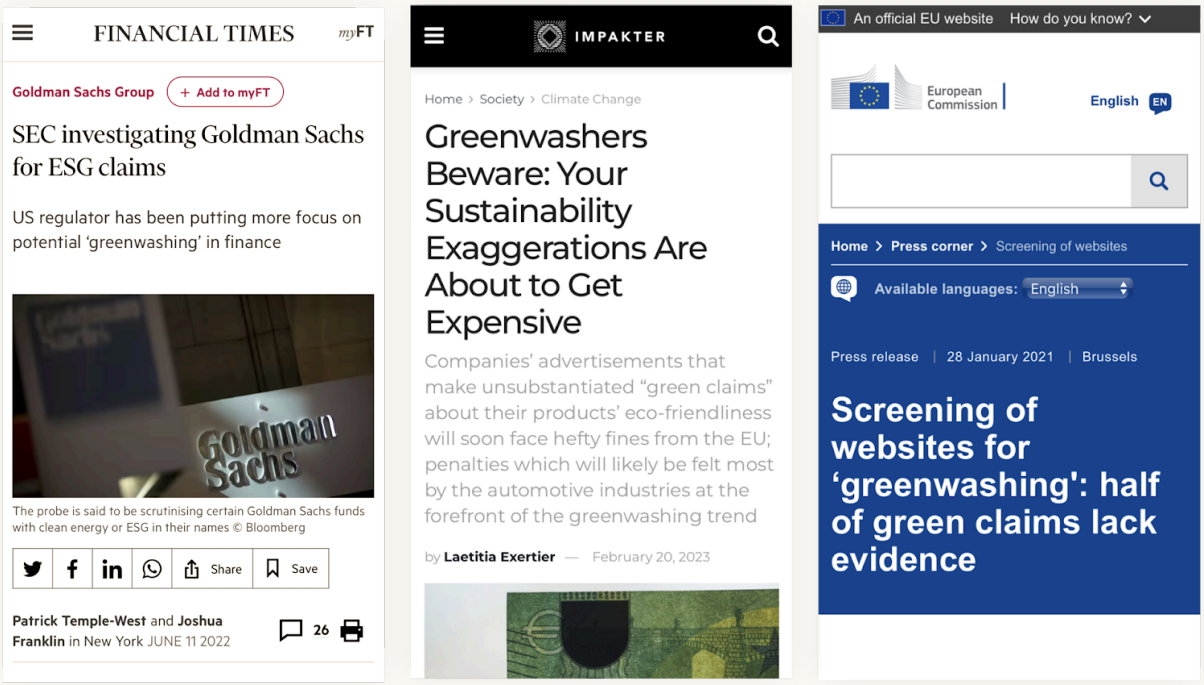

Fig. 1. Headlines highlighting regulatory actions against greenwashing, including SEC investigations and EU findings that half of green claims lack evidence

To counteract this issue, several greenwashing regulations are being introduced globally. In the EU, since 2024, companies caught doing

greenwashing may be subject to a fine corresponding to at least 4% of their revenues. In the regulation, it is stated that companies need to get their environmental claims approved before making them publicly[5]. Besides, the risk of getting fined for greenwashing is not limited to the EU. Several countries are implementing regulations[6] or requirements that may imply risks of getting fined for greenwashing. In certain jurisdictions such as Australia[7] or the USA[8], substantial fines for greenwashing were enforced. As of today, the 30 billion USD paid by Volkswagen after being caught rigging diesel engines to pass emissions tests is the biggest fine paid for greenwashing[9]. Incidentally, several initiatives and companies identify greenwashing instances and make them publicly available (e.g., Greenwash[10] and ClientEarth[11]).

1.2 Existing greenwashing regulations

Several countries recently published specific regulations that concern greenwashing, even though some of them do not specifically mention it. Nevertheless, their general scope of reporting for environmental impacts implies the requirement of avoiding greenwashing.

LAW	JURISDICTION	YEAR	AIM
Directive (EU) 2024/825 on Empowering Consumers for the Green Transition[12]	European Union	2024	Provide better information on product lifespan and repairability, protecting consumers from greenwashing by ensuring transparency in environmental claims
Corporate Sustainability Reporting Directive (CSRD)[13]	European Union	2024	Require companies to disclose information on how they operate and manage social and environmental challenges,

			aiming to prevent greenwashing through transparencyyztere
Financial Conduct Authority (FCA) Anti-Greenwashing Rule[14]	United Kingdom	2024	Protect consumers by ensuring that sustainable products and services are accurately described, preventing misleading environmental claims in financial markets
Financial Conduct Authority (FCA) Sustainability Disclosure and Labelling Regime[15]	United Kingdom	2024	Introduce investment labels, disclosure and naming and marketing rules that apply to UK asset managers regarding sustainability-labelled products
ASIC Information Sheet 271[16]	Australia	2022	Guide entities offering sustainability-related financial products to avoid greenwashing
Labeling and advertising act[17]	South Korea	2023	Strengthen the proof of liability on greenwashing-related operators and provide detailed guidelines for business entities
SEC Investment Company Act names rule	USA	2023	Require registered investment funds that include ESG factors in their name to place 80% of their assets in investments corresponding to those factors

Table 1. Recent global regulatory frameworks addressing greenwashing (2022-2024) and showing jurisdictional approaches to increase transparency and accountability in environmental claims

Identification of greenwashing still represents many challenges. Many greenwashing definitions exist globally[18], suggesting a cautious approach to

avoid public backlash or fines. Moreover, existing approaches to identify greenwashing are manual, implying a time-consuming process of reviewing corporate documents and communications, such as articles, social media posts, and website content.

The exploding reporting needs

Over the last few years, reporting requirements have significantly increased globally. A large number of reporting documents necessarily implies increased challenges in managing greenwashing risks. In the UK alone, for the FTSE 100, the average number of reports published per company has increased from 4 in 2015 to 17 in 2023, with an increase of over 440%. The average number of sentences published by a company has also increased by 141% over the same period. For the UK FCA, the local regulator, it would now take an analyst around 4.3 years just to read all the documents published by the FTSE 100.

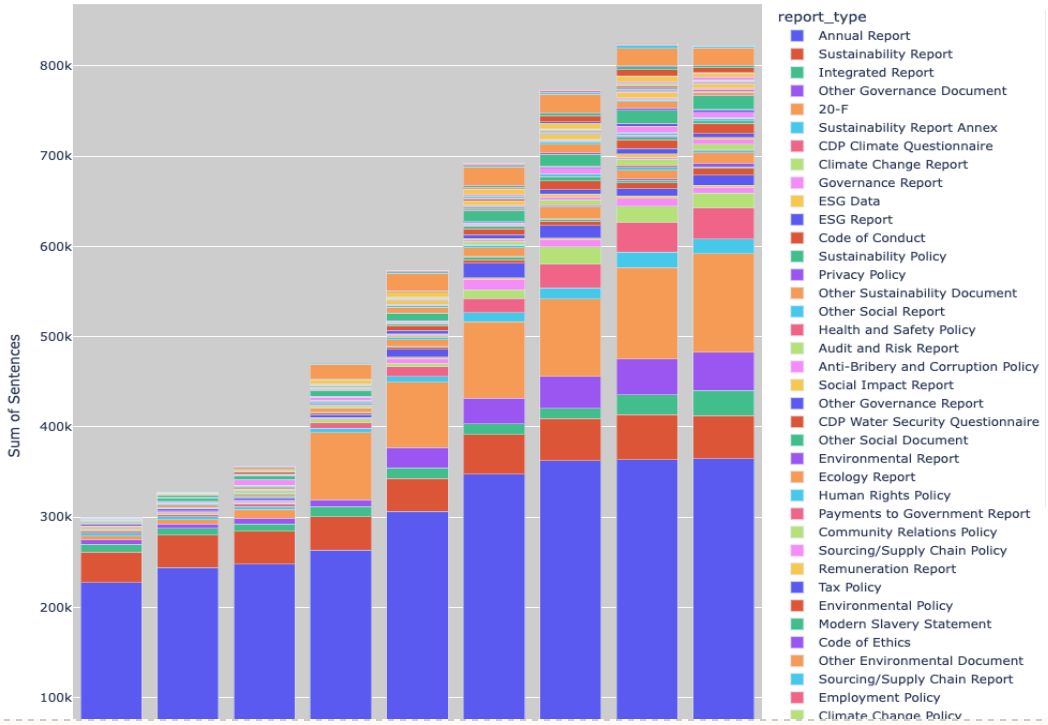

Fig. 2. UK Large Cap - volume of disclosure by report types per year

The increase in reporting documents calls for automated approaches to quickly identify greenwashing. This is needed for the control functions (e.g., financial regulators monitoring companies in their jurisdictions or investors calculating greenwashing risk in their portfolio) and for companies willing to ensure that no potential greenwashing instance is included in the reporting documents.

Greenwashing currently represents a financial risk and its identification implies a time-consuming process. The following section presents GWI, a tool specifically built to tackle these challenges. The tool helps regulators, investors, and companies monitor their greenwashing in corporate communications as well as take corrective actions.

2. GWI: AI and blockchain to identify greenwashing

2.1 The methodology of the tool

This section dives into the GreenWashing Identifier (GWI), a tool developed by ImpactScope in partnership with Insig AI[19] to identify greenwashing. We will present the tool's methodology and architecture, both grounded on AI and blockchain.

Greenwashing identification requires adopting a workable, high-level definition of the issue. Many regulations and definitions exist and generally refer to companies publishing misleading communications about their environmental performance. To develop a methodology for GWI, we adapted

our definition of greenwashing from a framework provided by the Chartered Financial Analysts (CFA) Institute. The four red flags suggested by the CFA Institute have been aggregated as they partially overlap.

GREENWASHING RED FLAGS	DESCRIPTION	EXAMPLE
Contradictions and inconsistencies	A combination of two or more statements that are opposed or not coherent	- **Contradiction:** A company states on its social media platform an objective of becoming Net Zero by 2050, while its sustainability report published in the same year mentions a goal of becoming carbon neutral by 2050. - **Inconsistency:** Financial institutions claim commitment to Net Zero targets while heavily funding oil and gas companies.
Omissions and Unsubstantiated Claims	Exclusion of relevant information or unsupported claims of achievements	- **Omission:** A company aims for Net Zero but fails to disclose scientific evidence suggesting the lack of credibility of the strategy. - **Unsubstantiated Claims:** A company claims carbon neutrality without providing factual data, percentages, or detailed figures to substantiate its ambition.

Table 2. Key greenwashing red flags with real-world examples from corporate sustainability communications

The four indicators are red flags for greenwashing that apply to every regulation. The framework represents the default detection analysis performed by GWI. Subsequently, the tool can be adapted to focus on specific types of greenwashing or regulations, such as the EU Green Claims Directive.

Additionally, quantitative indicators have been implemented to create a greenwashing benchmark, allowing comparison between companies or industries. This module was built to focus on the needs of regulators and

Asset Managers (AM). Regulators monitor and benchmark greenwashing instances for companies in their jurisdictions to take corrective actions. AM monitor the greenwashing risk of their portfolio to determine environmental scores. Globally, 25% of total Assets Under Management (AUM) refer to some type of ESG investing[21].

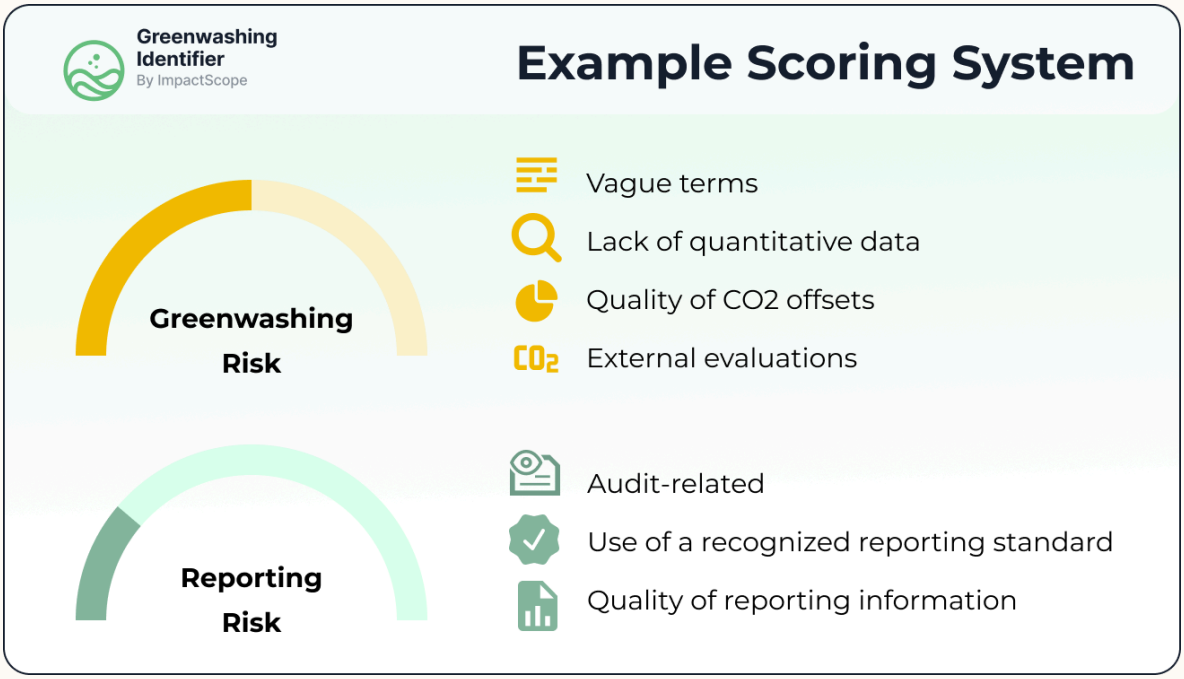

Fig. 3. GWI scoring system measures

The scoring system is composed of two measures. Greenwashing Risk refers to the risk that the documentation of a company contains greenwashing instances. It is composed of a combination of different elements, such as:

- Does the dataset have a statistically significant number of vague terms?
- Does the dataset have a lower number than the average of quantitative data?
- Does the company rely on reputable CO2 offsets (e.g., Verra and Gold Standard)?

- How is the environmental performance evaluated by third parties, such as Net Zero Tracker[22]?

Differently, Reporting Risk refers to the risk derived from the quality and depth of compliance reporting:

- Is a sustainability or financial report audited?
- Has a reputable reporting standard been used?
- What is the outcome of the audit?
- What is the level of assurance provided by the audit (e.g., full audit vs. limited review)?

The two scores help provide a high-level perspective on greenwashing risk and support benchmarking among companies or industries. Different weights and ranges for indicators are provided to adapt to regulations or other specific needs. An example concerning climate objectives is provided below.

INDICATOR	SCORING	WEIGHT
Does the company disclose the total quantity of GHG emissions for the year of reference?	0 to 1	30
Does the company disclose the total of GHG emissions for Scope 3 for the year of reference?	0 to 1	25
Does the company provide an intensity measure for carbon emissions (e.g., tons of CO2 emissions per employee or per monetary unit of reference)?	0 to 2	20
Does the company aim to halve their GHG by 2030?	0 to 1	10
Does the company have a target to reach Net Zero by 2050?	0 to 1	15
TOTAL		100

Table 3. Example of scoring matrix for cross-industry greenwashing risk benchmarking

Leveraging this approach, GWI brings significant advantages to regulators, AM, and companies in managing greenwashing risk:

USER	SPECIFIC INSTANCES	GENERAL INSTANCES	GWI SOLUTION
Regulators	- Take enforcement actions	- Benchmark companies and industries - Increase the quality of environmental reporting	- Investigate companies and funds at scale - Manage the data, evidence, and pipeline of cases - Timely, cost-effective, repeatable, transparent, and customisable process
AM	- Engage with Companies/Stewardship	- Calculate ESG ratings for companies in the portfolio - Determine an ESG investing portfolio	- Investigate portfolio of companies at scale - Manage the data and evidence in an auditable way - Timely, cost-effective, repeatable, transparent, and customisable
Companies	- Manage greenwashing risk - Modify sensitive information accordingly	- Identify areas of improvement	- Increase the quality of reporting - Take away pressure from the reporting team

Table 4.: GWI solutions for specific user groups, illustrating how regulators, Asset Managers (AM), and companies can address greenwashing challenges through scalable, transparent, and customizable processes

In the next section, we will walk through the process of generating the greenwashing report, as well as the description of the architecture of GWI.

2.2 The process of identification of greenwashing with GWI

The identification of greenwashing by GWI is performed by analyzing different types of public communications published by companies. Those generally refer to reporting and compliance documents (e.g., annual accounts, financial reports, sustainability reports, earning transcripts), social media text (e.g., Twitter, LinkedIn, Facebook), and Internet sites (e.g., company website). Furthermore, third-party public communications are collected (e.g., papers, reports, articles). The focus on public data arises from two important considerations. First and foremost, every company is independently analyzed without having to obtain approval or request documentation from the company itself. Secondly, the reliance on public data makes it a compliance-light solution, as questions about data ownership and data location (e.g., GDPR) are essentially not applicable. Public data is very relevant as it is a representation of the company in the consumers' and investors' eyes. Therefore, it leads their purchase or investment decisions.

The decision of the dataset to analyze depends on the context, especially regarding existing greenwashing regulations. Larger, more varied datasets may help uncover more instances of greenwashing. Moreover, the depth of the analysis must account for how many years need to be analyzed. How many years have to be analyzed? Can a specific greenwashing regulation be enforced retrospectively? Those are general considerations that are context-dependent.

Subsequently, the predetermined dataset (e.g., PDFs, website content) has to be transformed into a machine-readable format. Documents such as financial or sustainability reports contain text embedded in paragraphs, tables, and images. To perform the task, GWI relies on the support of Insig AI, the partner of ImpactScope in developing the tool.

INSIG

DATA ENGINEERING • ESG DATA

INSIG AI, the data provider

Insig AI provides AI-ready ESG data from corporate financial and sustainability reporting documents in a tagged and machine-readable format:

- Centralized library of over 6,400 international companies, 325,000 documents, and 149 million sentences.
- Dataset include all ESG-related documents as well as annual filings, human-validated for quality.
- Natural Language Processing (NLP) is used to classify each sentence across 14 sustainability-related topics for specific pre-trained model usage.
- Elastic search database enables keyword and phrase search and retrieval.

Finally, the data is filtered for environmental keywords to ensure the analysis is limited to relevant environmental information. The dataset is generated and includes all the sentences obtained from the different sources, together with metadata (e.g., name of report, year, company name). The data is uploaded into the tool that automatically generates the report. The report is divided into qualitative and quantitative indicators. The qualitative part includes a description of all different greenwashing red flags concerning contradictions,

inconsistencies, and unsubstantiated and vague claims. For each of them, an explanation is provided describing the greenwashing instance identified, together with the corresponding reference.

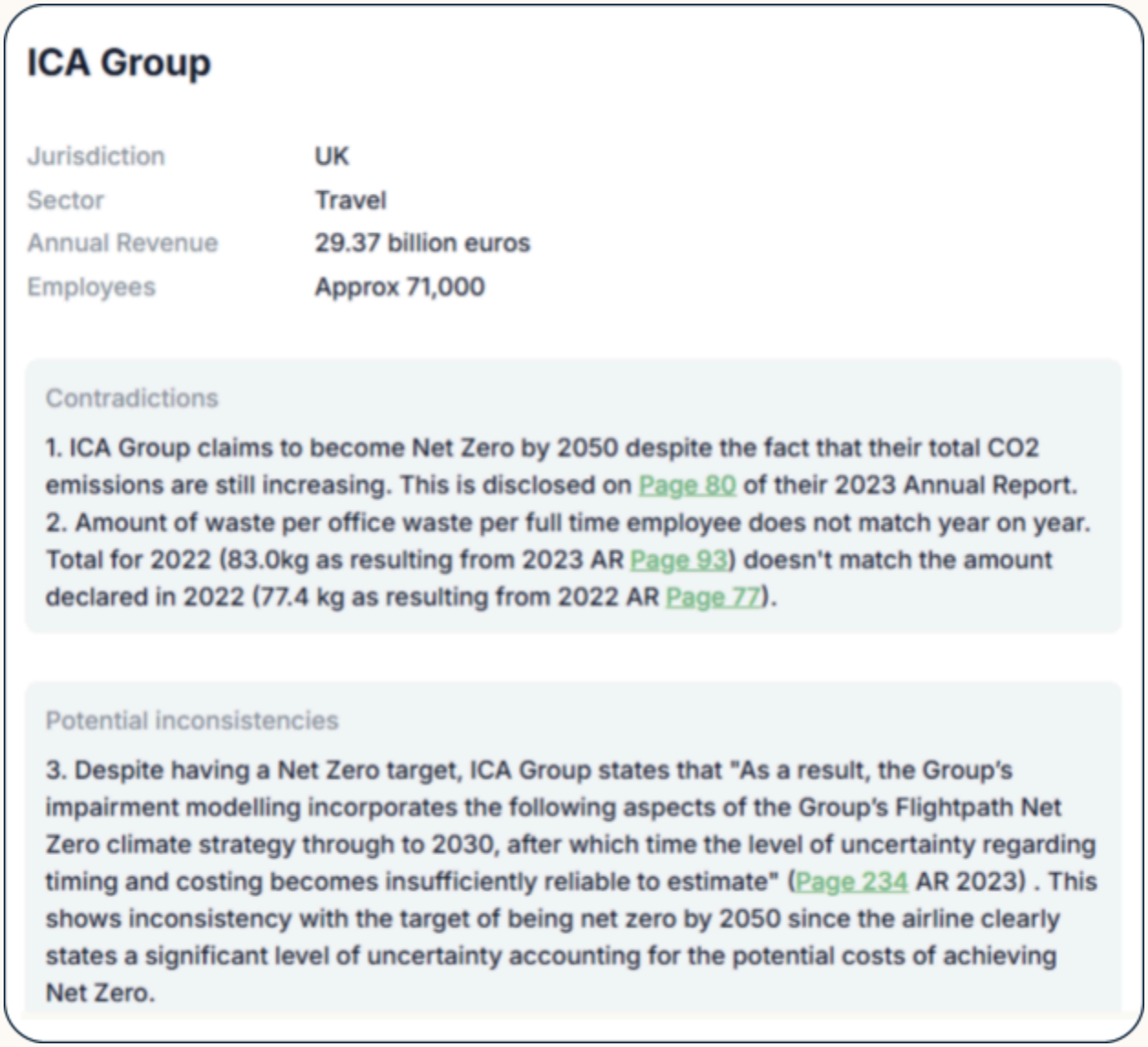

Fig. 4. Qualitative indicators of the Greenwashing Identifier

The quantitative part provides the score for the analyzed dataset regarding Greenwashing Risk and Reporting Risk. Financial regulators and AM can use it to compare different companies or industries.

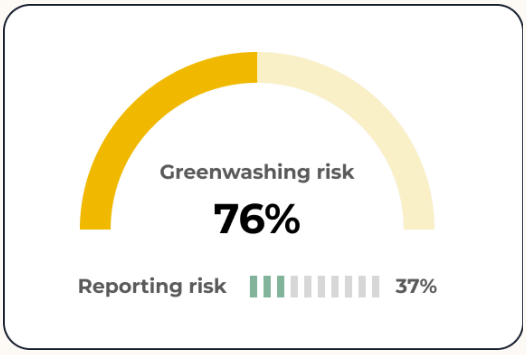

Fig. 5. Quantitative indicators of the Greenwashing Identifier

Recurring greenwashing patterns

The following table is an analysis of companies from different sectors and underlines the most recurring greenwashing patterns identified by GWI.

PATTERN	DESCRIPTION	EXAMPLE
Scope 1, 2 and 3 CO2 emissions retrospectively amended	Emissions data is revised retroactively without explanation, creating confusion around total figures and boundaries.	A company revises its Scope 3 emissions downward by claiming "updated methodology," while showing no justification for the changes.
Targeting Net Zero but raising doubts about financial feasibility	Announces ambitious Net Zero targets without addressing the economic or operational feasibility	An oil company pledging Net Zero by 2050 but continuing to invest in fossil fuel extraction with no clear divestment plan

Same disclosure over and over again	Repeatedly publishes identical sustainability reports without providing meaningful updates or new progress metrics.	A retail chain issues yearly reports highlighting "commitment to sustainability" but presents identical data every year.
Improvements without data	Claims of progress (e.g., reduced emissions) are unsupported by measurable data or credible sources.	A manufacturer declares a 20% improvement in energy efficiency without specifying baseline metrics or methodologies used.
Ambiguous naming for targets	Uses vague terms like "green energy", "climate-positive", or "low-impact" without defining these terms or their scope.	A tech company promises to be "carbon-neutral" but doesn't clarify if offsets or reductions drive neutrality.
Industry specifics: e.g., overreliance on SAF for airlines	Overstates the impact of specific technologies or measures common to the sector, ignoring broader systemic issues.	Airlines emphasizing the use of SAF (Sustainable Aviation Fuel) as a key solution without acknowledging the limits of scalability.

Table 5. Common greenwashing patterns across industries

Leveraging traceable AI

AI solutions hold immense potential; however, certain critical factors must be carefully considered for their implementation. One of the most pressing challenges is addressing the *black box* issue: while these systems often produce meaningful outputs, the process by which these results are derived remains unclear. Often, the decision-making process is either unknown or difficult to interpret. To ensure traceability and transparency, several architectural decisions have been made regarding GWI:

- The dataset to analyse is determined by the user's needs and is known. The use of public communications published by the company avoids hallucinations. The data source is available to the public and can be tested.
- A clickable link to the corresponding source is provided for every detected greenwashing instance. The link automatically redirects to the referred sentence in the Insig AI platform for reporting documents. For social media or articles, a link to the article is provided.
- The parameters and the variables used in the model are fully verifiable and adjustable depending on the customer's needs. They can be adapted to different greenwashing regulations depending on the applicable jurisdictions.
- The greenwashing report generated is saved on the blockchain to create a permanent record and *"preserve the scene of the crime"*. The tamper-proof nature of blockchain represents a significant deterrent to greenwashing.

Fig. 6. Blockchain transaction details of report

All these architectural choices lead towards a fully traceable AI solution.

2.3 Technology overview

GWI is an AI and blockchain-powered tool to speed up the process of greenwashing identification. As different types of AI technology exist, in the present section, we detail all components of GWI.

Natural Language Processing (NLP) represents a core component of GWI. For the data layer provided by GWI, NLP is used to classify each sentence across different sustainability topics for pre-trained models. Those are based on Bidirectional Encoder Representations from Transformers (BERT) in which a text is represented by a sequence of vectors using self-supervised learning. NLP is further used to identify contradictions relying on RoBERTa (Robustly Optimized BERT Pretraining Approach), developed specifically for environmental questions.

GenAI is used to generate the greenwashing report. The GenAI module identifies contradictions, inconsistencies, omissions, and unsubstantiated claims in the provided data source. Moreover, GenAI is similarly used to determine the greenwashing and reporting scores by querying the dataset on the predetermined elements. The modules are constantly updated to keep up with the speed of evolution of GenAI. The same is true for the prompts, which are adapted and tested depending on the applicable regulation or the user requirements.

Blockchain is used to store the greenwashing reports. A permanent record can be accessed through a blockchain scanner. The solution is blockchain agnostic as it has limited energy consumption and storage requirements. For the time being, Polkadot and Solana blockchains are used.

The process is concluded with a **manual review** of the greenwashing report. The review is based on the analysis performed by the NLP and the GenAI module. The results of the NLP module are consolidated into the

report generated by GenAI. Similarly to other AI applications, the human in-the-loop element is particularly relevant to deciding which kind of follow-up actions are required based on the outcome of GWI. As such, the tool supports decision making regarding greenwashing instances identified, offering the opportunity to review and discard, assign or close greenwashing cases.

Why GWI is significantly better than existing solutions

GWI leverages the latest technological developments to offer the best-in-class solutions for greenwashing identification. It addresses critical limitations of general-purpose AI like GPT models for the following reasons:

- **Specialized data layer**: Unlike GPT models, which rely on extensive general training data, GWI benefits from a focused dataset provided by Insig AI. This includes 150 million pre-tagged sentences, all in a machine-readable format, ensuring targeted and contextually relevant insights.
- **Purpose-built application layer**: 1) GWI has been tested extensively and demonstrates a minimal risk of hallucinations because its analysis is restricted to a known and public dataset. 2) GWI integrates blockchain technology to create a permanent and auditable record of identified greenwashing instances, adding transparency. 3) It includes a traceable AI component, enabling users to understand and verify how conclusions were reached—addressing the “black box” nature of general-purpose GPTs.
- **Market Fit Layer**: The tool has a 100% market fit. ImpactScope was invited to participate in a digital sandbox program organized by the UK Financial Conduct Authority. GWI has been built during weekly product design meetings with the World Bank, the National Bank of Bahrain

and the Malta Financial Services Authority. GWI won the Eureka prize in the Sandbox[23].

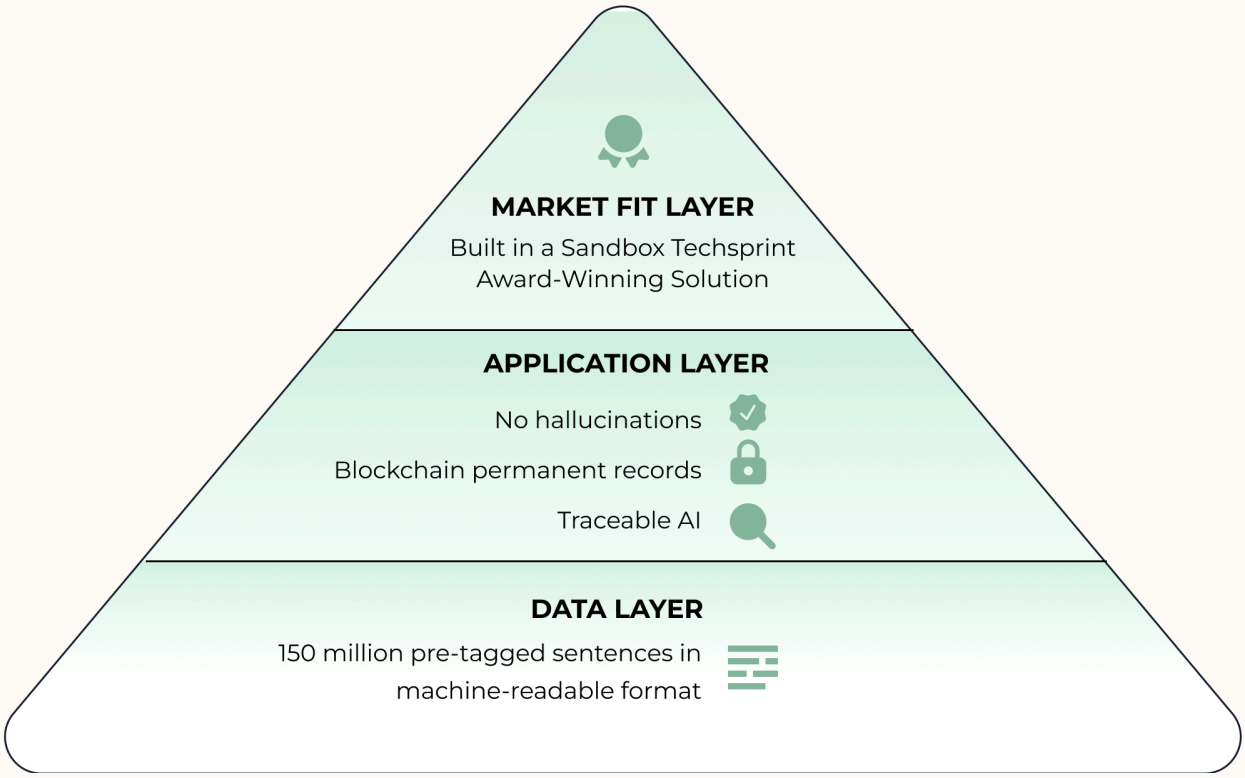

Fig. 7. GWI's three-tier architecture: robust data foundation, transparent AI application layer, and regulatory-endorsed market fit

In short, while GPT models are versatile, their general-purpose design makes them prone to errors and lacks the specificity required for tasks like greenwashing detection. GWI bridges this gap by delivering a focused, transparent, and reliable tool tailored to the sustainability and regulatory landscape.

The outcome: A 90% Reduction in Detection Time

By automating core elements of the greenwashing detection process, GWI transforms and eases the process of identifying greenwashing thanks to several factors:

- **Automated insights at scale:** GWI leverages NLP with 150 million pre-tagged sentences to instantly scan, interpret, and flag suspicious claims across large document sets. What would take a human months of effort is completed by GWI in hours or days.
- **Precision through tailored data and models:** Unlike generic AI models, GWI's targeted training ensures it identifies relevant greenwashing patterns without requiring time-intensive manual cross-checking. The possibility to instantly access the context in which an issue has been identified supports instant confirmation.
- **Traceability and transparency:** GWI creates a blockchain record of flagged instances, allowing analysts to verify findings without revisiting the entire document and further reducing time spent on validation.

This acceleration doesn't just save time; it empowers regulators, investors, and businesses to act on findings in near real-time, preventing harmful delays in sustainability reporting oversight. Identifying greenwashing is a complex and detailed task. Compared to standard benchmarks for similar activities, it requires significant time and effort. Below is a comparison of typical time estimates for related tasks:

TASKS	TIME PER PAGE	DESCRIPTION OF THE TASK
Proofreading	4–10 minutes	Basic grammar, spelling, and readability checks
Legal Document Review	~48 minutes	Comprehensive analysis by a lawyer, including legal coherence and cross-referencing
Greenwashing Identification	~6 minutes	Combines detailed verification of claims with benchmarking and qualitative analysis

Table 6. Standard time requirements per page for document analysis tasks

Using a conservative estimate of 6 minutes per page, reviewing all 17 documents of a FTSE company, each with an average length of 50 pages, would require 85 hours. By contrast, GWI automates much of the process, combining automatic analysis with manual review, and completes the task in just 8 hours, allowing a time saving of 90%.

3. The development of GWI

ImpactScope was invited to participate in a digital sandbox program organised by the UK FCA and other national and international regulators. We had weekly product design meetings with the World Bank, the National Bank of Bahrain, and the Malta Financial Services Authority. They told us what they needed and that's what we built. Insig AI was a data provider in the TechSprint and, eventually, we decided to partner up to develop GWI in the

long term. GWI won the Eureka prize during the competition[24] as the most practical and fastest solution to develop and implement.

Fig. 8. ImpactScope wins GFIN TechSprint Eureka prize

The GWI team is composed of experienced builders and globally recognized experts from ImpactScope and Insig AI, a unique blend of technologists, impact entrepreneurs, financial knowledge data scientists, researchers, software engineers, and sustainability practitioners.

The GWI Team

Sean Murphy
ImpactScope
Co-founder & CEO

20 years in emerging technology and impact investing in 10+ African countries. Former Co-Chair of Swiss Crypto Valley Association Sustainability Working Group.

Michele Soavi
ImpactScope
COO / Chief Sustainability Officer

15 years of international experience at the intersection of sustainability and financial reporting. Former PwC and EY. PhD in legal tech/smart contracts. MBA in Sustainable Business.

Balazs Bereczky
ImpactScope
CTO

Experienced full stack developer turned CTO. Managed international development teams for MassMutual, Aviva, Sport1, and OSN, the largest streaming service in the Middle East.

Steve Cracknell
Insig AI
Co-founder & CPO

FinTech entrepreneur with 20 years of financial technology experience at Goldman Sachs and in Silicon Valley start-ups.

Diana Rose
Insig AI
Head of ESG Research

Sustainability expert with Masters in Environmental Technology, 15+ years in sustainability and ESG experience as a consultant at De Beers group.

Warren Pearson
Insig AI
CTO

Seasoned technologist and cloud, DecOps & data engineering expert with 25 years of financial technology experience including Goldman Sachs.

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