

● ISSUE 02 · A PIPELIT PUBLICATION

Ghost CarbonTM

R E P O R T

*The carbon cost of non-compliant pre-consent tracking –
and the [legal and ESG question](#) it raises.*

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METHOD

46 sites · 3 browsers

UK residential IP

EXECUTIVE SUMMARY

One root cause. Three consequences.

Non-compliant pre-consent tracking is simultaneously illegal under UK law, destroying marketing attribution, and generating measurable carbon emissions that no visitor ever agreed to. This report quantifies all three.

ILLEGAL	WASTEFUL	REPORTABLE
<p>UK PECR Reg 6 · UK GDPR Art 5(1)(a) · Art 5(1)(c) · Planet49</p> <p>No lawful basis (Art 5(1)(a)). Not minimised (Art 5(1)(c)). Pre-ticked boxes invalid (Planet49/CJEU 2019). PECR Reg 6: no storage without consent. DUAA 2025 fine ceiling: £17.5M or 4% of turnover.</p>	<p>500+ tonnes CO₂e/yr from 46 sites</p> <p>Pre-consent payloads generate measurable carbon. SWDM v4 formula, BEIS 2023 conversion factors. Every number is deliberately understated.</p>	<p>IFRS S2 Scope 3 from January 2027</p> <p>FCA CP26/5 makes disclosure mandatory for UK listed companies. Pre-consent tracking waste is a Scope 3 digital supply chain emission. ePrivacy Directive Art 5(3) extends this to EU visitors.</p>

TWO RANKINGS. TWO STORIES.

This report ranks every site twice. The Pipelit Scanner Score (out of 100) measures compliance quality — is there a banner, are toggles off by default, can you reject as easily as accept? The carbon waste ranking measures environmental impact — how many KB of tracking fire pre-consent, multiplied by real traffic, converted to CO₂e.

They tell different stories. HubSpot scores 78/Silver — it has a banner with proper UX. But the banner gates nothing: 2,800 KB fires pre-consent = 64 tonnes/yr. Booking.com scores 80/Silver but generates 299 tonnes — 520 KB pre-consent × 500M visits.

The gap between the two rankings is where the real risk lives. A passing compliance score does not mean zero carbon waste.

WHO THIS IS FOR

CMOs — attribution contaminated by the same tracking generating this carbon.

DPOs — every finding is a potential PECR Reg 6 and UK GDPR Art 5(1)(a) breach.

ESG teams — IFRS S2 Scope 3 from January 2027 covers digital supply chain.

Leadership — one root cause, three liabilities, one fix.

SECTION 00 · CONTENTS

What's inside.

Pre-consent tracking waste across 46 websites – measured, scored, and converted to carbon, with the full methodology in the open.

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SECTION 04B · CARBON WASTE RANKING

Ranked by carbon waste.

Every site ranked by pre-consent payload – largest carbon footprint to zero. Same scanner, same formula, every site.

— from largest carbon footprint to zero. The same scanner, the same formula, every site.

HOW TO READ

WASTE/VISIT is the pre-consent payload in KB measured by the scanner across three browsers. FLOOR CO₂e is the annual carbon at 100,000 monthly visits (deliberately conservative). SCANNER SCORE is the 5-category compliance score out of 100. All leakers are ordered worst-first. Clean sites (zero pre-consent waste) are grouped at the bottom.

#	SITE	SECTOR	WASTE/VISIT	FLOOR CO ₂ e/YR	REAL CO ₂ e (EST.)	SCORE
1	HubSpot	Enterprise	2,800 KB	322 kg	64 t (20M/mo)	78 · Silver
2	Datadog	Enterprise	2,087 KB	240 kg	72 t (30M/mo)	36 · Below
3	Booking.com	Retail	520 KB	60 kg	299 t (500M/mo)	80 · Silver
4	Sunderland Uni	Education	668 KB	77 kg	115 kg (150k)	8 · Below
5	Semrush	Enterprise	385 KB	44 kg	7 t (15M/mo)	22 · Below
6	Trainline	Retail	354 KB	41 kg	3 t (8M/mo)	56 · Bronze
7	Independent	Media	246 KB	28 kg	4 t (15M/mo)	17 · Below
8	Newcastle Uni	Education	177 KB	20 kg	41 kg (200k)	32 · Below
9	Daily Mail	Media	~2 KB *	0.2 kg	184 kg (80M/mo)	15 · Below
10	M&S	Retail	~10 KB *	1.2 kg	230 kg (20M/mo)	72 · Silver
11	Lloyds	Finance	~5 KB *	0.6 kg	58 kg (10M/mo)	70 · Silver
12	Telegraph	Media	~2 KB *	0.2 kg	35 kg (15M/mo)	10 · Below

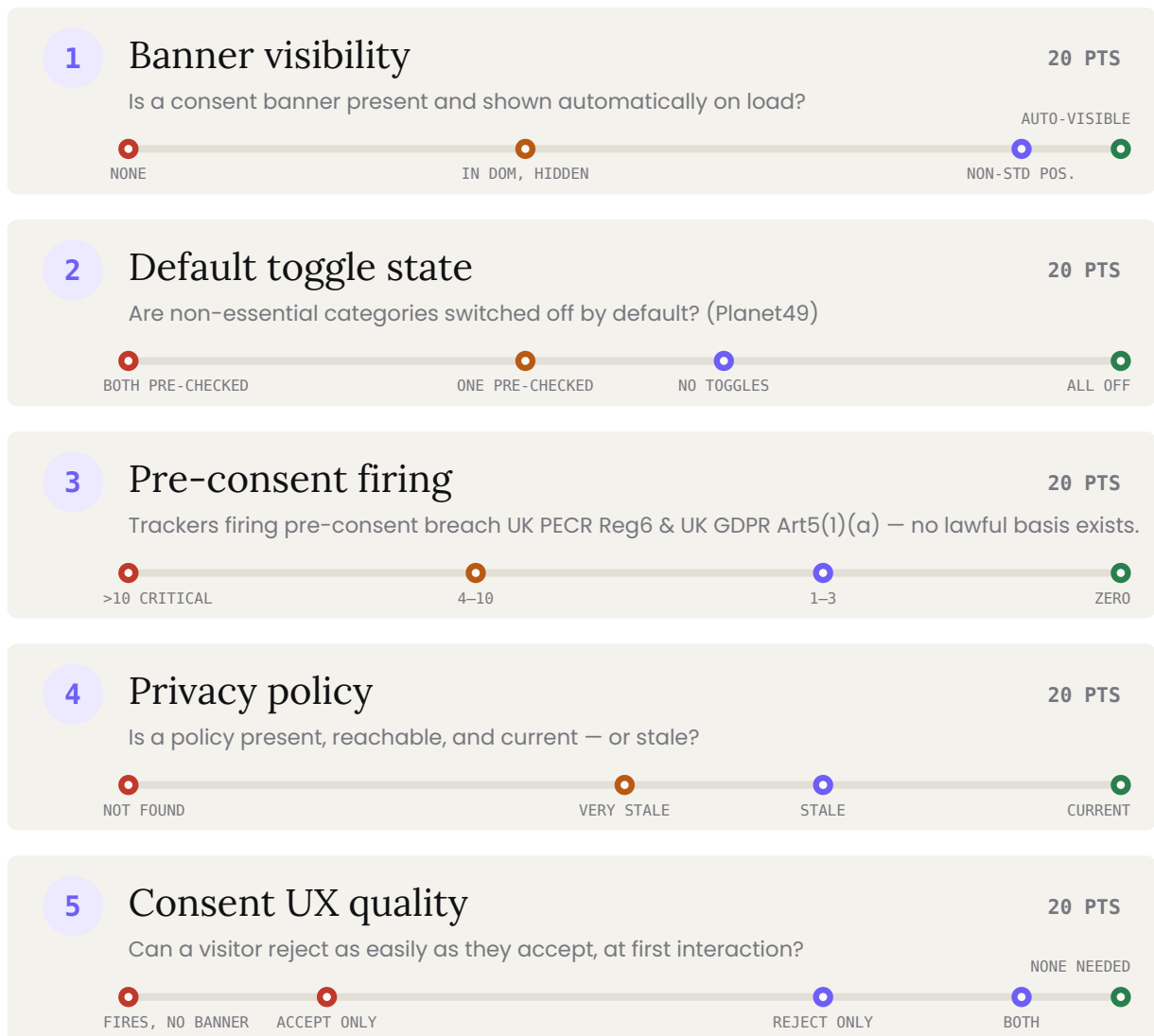
✓ ZERO PRE-CONSENT WASTE · CLEAN SITES

Guardian	Media	93 · Gold	0 KB · ZERO CO ₂ e
Skyscanner	Retail	88 · Gold	0 KB · ZERO CO ₂ e
Revolut	Finance	93 · Gold	0 KB · ZERO CO ₂ e
Monzo	Finance	73 · Silver	0 KB · ZERO CO ₂ e
Stripe UK	Finance	100 · Diamond	0 KB · ZERO CO ₂ e
Linear	Enterprise	100 · Diamond	0 KB · ZERO CO ₂ e

SECTION 01 · METHODOLOGY · PART ONE

What the scanner measures.

Five categories, twenty points each. The scanner loads each homepage in a fresh, cookieless session and records what fires before anyone touches the consent banner.



LEGAL BASIS

UK PECR Regulation 6 – no cookie or tracker may fire without prior informed consent (strictly necessary exemptions apply). UK GDPR Article 5(1)(a) – processing must be lawful; pre-consent tracking has no valid lawful basis. UK GDPR Article 5(1)(c) – data minimisation; firing 10– 20 trackers pre-consent is the opposite. Planet49 (CJEU, 2019) – pre-ticked boxes do not constitute valid consent. ePrivacy Directive Article 5(3) – EU equivalent of PECR Reg 6, applies to any site with EU visitors.

COOKIE CLASSIFICATION

Scanner v1 classifies pre-consent activity at the domain level – identifying tracking domains (Google Analytics, Meta Pixel, Clarity, etc.) and measuring their payload. First-party cookie-name classification (mapping individual cookie names to categories) is being expanded in v2. Carbon waste is calculated from domain-level tracking payloads, not cookie size.

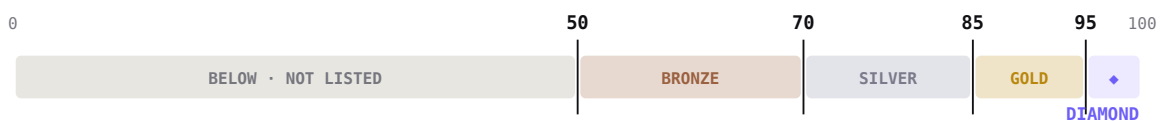
HEAVIEST PENALTY

Session recording tools (Hotjar, Microsoft Clarity, FullStory) firing pre-consent carry the heaviest penalty inside Category 3 – they capture keystrokes, mouse movement, and form input before any consent exists.

SECTION 02 · METHODOLOGY · PART TWO

Scores, tiers & special rules.

The five category scores sum to a total out of 100. Tier thresholds are fixed, published, and the same for every site.



ONLY BRONZE AND ABOVE (50+) APPEAR ON THE PUBLIC HALL OF FAME.

The clean-by-design rule.

Under UK PECR Regulation 6, a site that stores nothing and fires nothing before consent doesn't need a banner at all. When the scanner finds zero critical flags, zero grey flags, and zero pre-consent cookies, banner-related categories score full marks automatically. No banner is not a failure — when there is nothing to consent to, it is the highest form of compliance.

This is how Linear and Stripe (UK) score 100. They didn't pass the banner test — they made the banner unnecessary.

Confidence & manual review.

Every scan carries a confidence rating on banner detection. Any Diamond or Gold result without high confidence is flagged for manual review before publication, and only Bronze tier (50+) and above ever appear on the public Hall of Fame. Sites below 50 are never named on the leaderboard — this report names them only where the public interest in the finding is clear.

CROSS-BROWSER

Since scanner v1.8, every scan runs Chromium, Firefox and WebKit in parallel and compares the results. When the same homepage behaves differently per browser, a cross-browser inconsistency finding is raised — the discrepancies feed the findings count in Category 3.

SECTION 03 · METHODOLOGY · PART THREE

From bytes to carbon.

Only bytes transferred by domains classified as pre-consent tracking are counted as waste. The conversion uses the Sustainable Web Design Model v4 – the same published model used across the digital sustainability field.

$$\text{CO}_2\text{e per visit} = \text{Waste (GB TRANSFERRED)} \times 0.194 \text{ (kWh PER GB)} \times 494 \text{ (gCO}_2\text{e PER kWh)}$$

Energy intensity 0.194 kWh/GB · grid carbon 494 gCO₂e/kWh (global average) · Sustainable Web Design Model v4

$$\text{CO}_2\text{e per year} = \text{per visit (FROM ABOVE)} \times 100,000 \text{ (MONTHLY VISITS · FLOOR)} \times 12 \text{ (MONTHS)}$$

Worked example · Datadog: 2,087 KB × 100,000 × 12 = 2,504 GB/yr × 0.194 kWh/GB × 494 g ≈ 240 kg CO₂e/yr.

The 100,000-visit floor.

Every annualised figure in this report multiplies per-visit waste by a deliberately conservative floor of 100,000 monthly visits. The smallest site in the dataset (Linear) receives roughly 7.7 million. For most sites, real traffic is 10x to 1,000x the floor.

Every number in this report is therefore a deliberate understatement. Where a "real traffic" figure is shown, it uses published third-party traffic estimates and is labelled as such.

What is deliberately left out.

First-party content, fonts, images and the site's own functionality are never counted – only third-party tracking payloads that fire before consent. Post-consent tracking, however heavy, is also excluded: this report measures only the slice of transfer that no visitor ever agreed to.

SECTION 04 · WHAT WE FOUND

Three patterns.

Across 46 sites and eight sectors, the same three patterns appear again and again. The third is the one that matters most.

LEGAL FRAMEWORK

Every pre-consent finding in this report represents a potential breach of: UK PECR Regulation 6 (storage/access without consent) · UK GDPR Article 5(1)(a) (no lawful basis) · UK GDPR Article 5(1)(c) (data minimisation) · Planet49 CJEU 2019 (pre-ticked boxes invalid) · ePrivacy Directive Article 5(3) (EU visitors). DUAA 2025 raises the fine ceiling to £17.5M or 4% of global turnover.

PATTERN 01

The browser blind spot.

Single-browser audits produce false confidence. 14 of 46 sites showed different results by browser. A Chrome-only audit called M&S compliant; Firefox revealed Meta Pixel, TikTok, Google Ads, Bing UET and DoubleClick all firing pre-consent.

PATTERN 02

The decorative banner.

Some banners appear but gate nothing. Trackers fire before or alongside them, so by the time a visitor clicks reject, the data is already sent. It is worse than having no banner, because it fakes compliance.

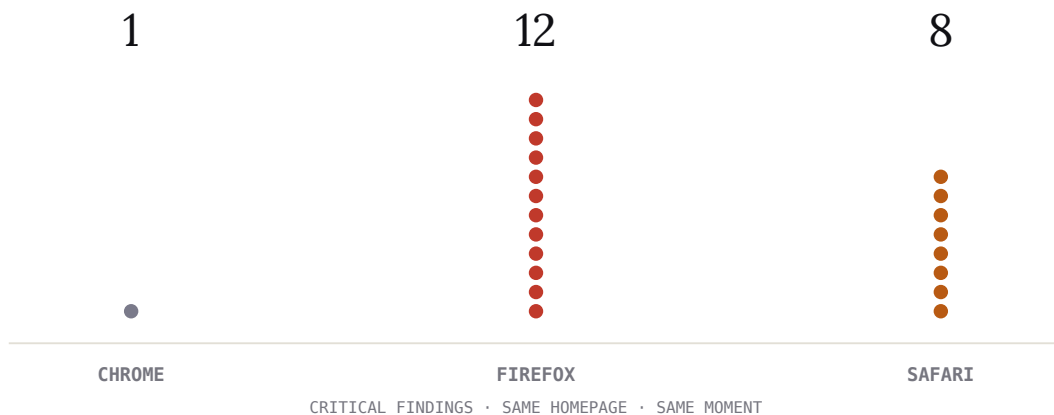
PATTERN 03 – THE ONE THAT MATTERS

The sector split.

In every sector, at least one company proves zero pre-consent waste is achievable. The Guardian (ad-funded) is clean. Monzo (a bank) is clean. The companies that waste carbon cannot claim it is impossible – their competitors already solved it.

The blind spot, visualised.

The same M&S homepage, scanned at the same moment, in three browsers.



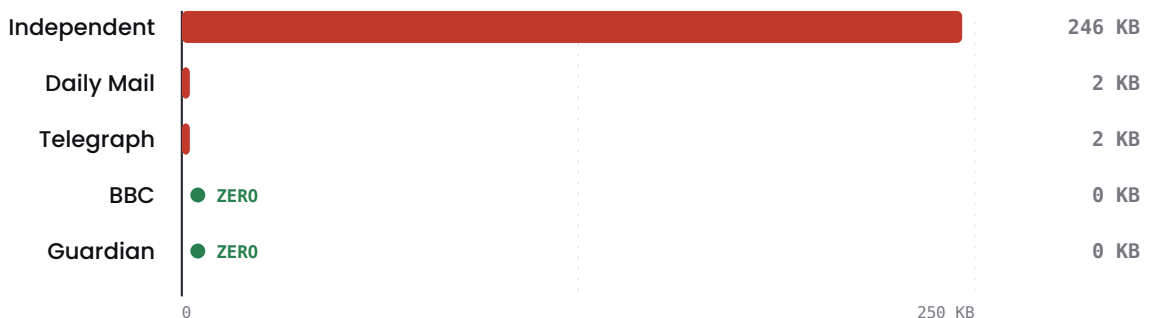
SECTION 05 · MEDIA & PUBLISHING

Media & Publishing.

The Guardian – ad-funded and free – fires zero pre-consent trackers across all three browsers. The Daily Mail and Telegraph, same ad model, leak heavily.

SITE	SCANNER SCORE	CRITICAL	WASTE / VISIT	NOTE
Guardian	93 · Gold	0	0 KB	Ad-funded. Zero tracking. Proof it's possible.
BBC	68 · Bronze	0	0 KB	Public broadcaster. Custom banner, clean.
Independent	17 · Below	2	246 KB	Pay-or-accept banner. No free reject. DoubleClick fires anyway.
Daily Mail	15 · Below	4	~0 *	Banner present but gates nothing. GA + DoubleClick fire pre-consent.
Telegraph	10 · Below	6	~0 *	No banner. Full Adobe stack. *Firefox figures.

PRE-CONSENT WASTE PER VISIT



CARBON EQUIVALENCE

246 KB × 100,000 visits × 12 months ≈ 28 kg CO₂e/yr at the floor. At the Independent's estimated 15M monthly visits: 4.2 tonnes CO₂e/yr – 2 return flights London to New York (1.78 t CO₂e each, BEIS 2023 economy + RFI).

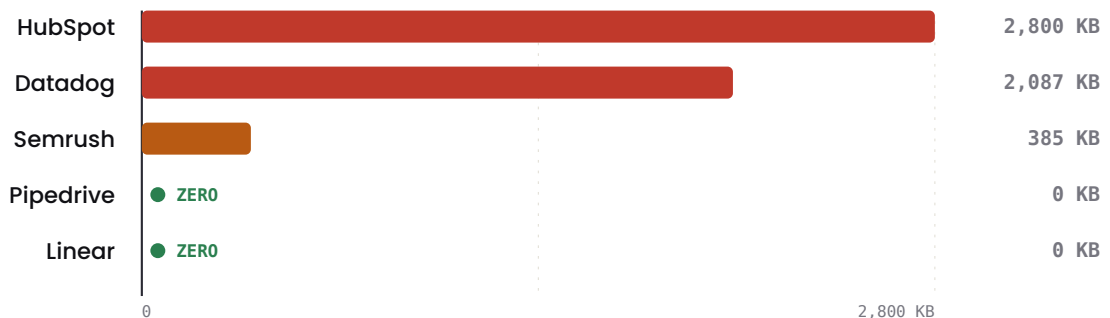
SECTION 06 · ENTERPRISE & MARTECH

Enterprise & MarTech.

Linear’s perfect 100 anchors this sector – clean by design, no banner needed. The companies that sell marketing and monitoring tools are among the worst on their own sites. (Stripe UK, also a perfect 100, is listed under Finance.)

SITE	SCANNER SCORE	CRITICAL	WASTE / VISIT	NOTE
Linear	100 · Diamond	0	0 KB	Clean by design. No banner needed.
Pipedrive	83 · Silver	0	0 KB	OneTrust configured correctly.
HubSpot	78 · Silver	18	2.8 MB	Largest absolute waste in dataset.
Datadog	36 · Below	19	2.1 MB	Observability company. Worst per visit.
Semrush	22 · Below	3	385 KB	SEO experts. No consent banner.

PRE-CONSENT WASTE PER VISIT



CARBON EQUIVALENCE

2,087 KB × 100,000 × 12 ≈ 240 kg CO₂e/yr at the floor. At Datadog’s estimated 30M monthly visits: 72 tonnes CO₂e/yr – over 10 times around the Earth by car (424,000 km at 170 gCO₂e/km, BEIS 2023).

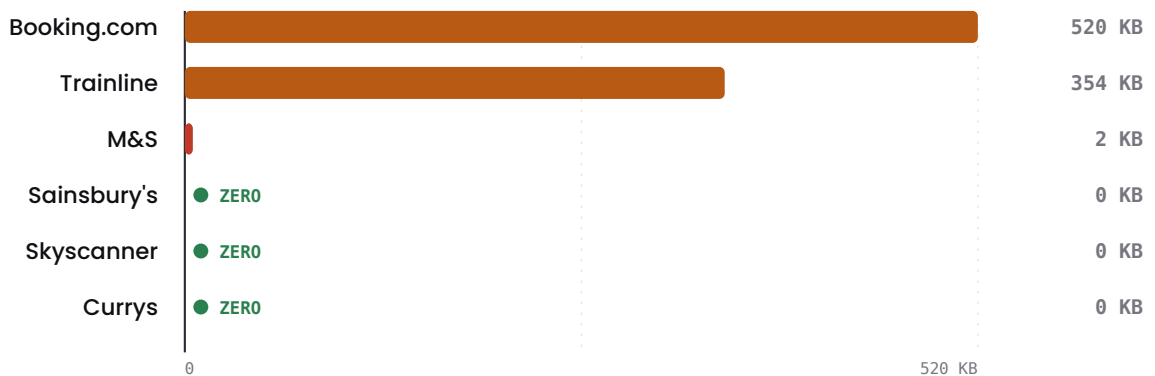
SECTION 07 · RETAIL & TRAVEL

Retail & Travel.

Retail shows the blind spot most clearly: M&S has one critical in Chrome but twelve in Firefox. Skyscanner and several retailers prove clean is the norm.

SITE	SCANNER SCORE	CRITICAL	WASTE / VISIT	NOTE
Currys	93 · Gold	0	0 KB	Clean in Chrome. Firefox-only DoubleClick.
Sainsbury's	88 · Gold	0	0 KB *	Chrome clean. FF/Safari: 3 each.
Booking.com	80 · Silver	3	520 KB	Good banner. Syndication fires anyway.
M&S	72 · Silver	1/12	~0 *	Chrome vs Firefox criticals. Worst blind spot.
Trainline	56 · Bronze	2	354 KB	DoubleClick + Syndication. Pre-ticked.

PRE-CONSENT WASTE PER VISIT



CARBON EQUIVALENCE

520 KB × 100,000 × 12 ≈ 60 kg CO₂e/yr at the floor. At Booking.com's 500M estimated monthly visits: 299 tonnes CO₂e/yr — 1,495 return flights London to Edinburgh. Conversion: 0.20 t CO₂e per return flight (BEIS 2023).

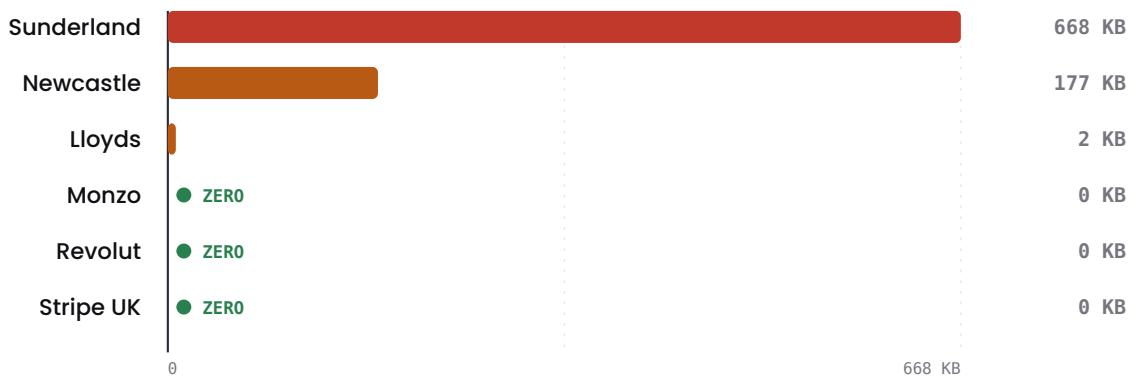
SECTION 08 · FINANCE & EDUCATION

Finance & Education.

The finance split is generational – every challenger fintech is clean while legacy banking runs ad-tech pre-consent. Universities, handling data about minors, fare worst of all.

SITE	SCANNER SCORE	CRITICAL	WASTE / VISIT	NOTE
Stripe UK	100 · Diamond	0	0 KB	Zero cookies, zero tracking.
Revolut	93 · Gold	0	0 KB	Only Cloudflare security. Spotless.
Monzo	73 · Silver	0	~0 KB	Only Sentry (grey, 2 bytes).
Lloyds	70 · Silver	6	~0 *	TapAd + Adobe. Payload geo-gated – US view carries the weight.
Newcastle Uni	32 · Below	15	177 KB	Pre-ticked toggles. Clarity/Hotjar.
Sunderland Uni	8 · Below	29	668 KB	Decorative banner. 13 domains.

PRE-CONSENT WASTE PER VISIT



CARBON EQUIVALENCE

668 KB × 100,000 × 12 ≈ 77 kg CO₂e/yr – generated by a public institution whose stated mission cites UN SDG 12 (Responsible Consumption) and SDG 13 (Climate Action).

SECTION 09 · THE TOTAL CARBON COST

The total carbon cost.

Across all 46 sites, the measurable pre-consent waste totals over 620 kg CO₂e/yr at the conservative 100,000-visit floor – and over 500 tonnes at real estimated traffic. This is just 46 of roughly 1.2 million UK business sites.

<p>CO₂E / YR · 100K FLOOR</p> <h2>620+ kg</h2> <p>Conservative baseline. Every number deliberately understates the real impact.</p>	<p>CO₂E / YR · REAL TRAFFIC</p> <h2>500+ t</h2> <p>At published traffic estimates. Clean sites prove every tonne was preventable.</p>	<p>DUAA 2025 FINE CEILING</p> <h2>£17.5M</h2> <p>Or 4% of global turnover. Royal Assent received. ICO enforcement hardening.</p>
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What 500 tonnes looks like.

 <h2>281</h2> <p>RETURN FLIGHTS LONDON – NEW YORK</p>	 <h2>62</h2> <p>UK HOUSEHOLDS' TOTAL ANNUAL FOOTPRINT</p>	 <h2>2.94M km</h2> <p>DRIVEN BY AN AVERAGE CAR</p>
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SECTION 10 · WHY THIS MATTERS NOW

Three reasons, one deadline.

DATA (USE AND ACCESS) ACT 2025

Fines rise to £17.5M.

Royal Assent received.
Maximum fines rise to £17.5M
or 4% of global turnover. New
children's-data provisions
strengthen the case against
education sites tracking
minors.

UK SUSTAINABILITY · IFRS S2

Scope 3 from Jan 2027.

Companies must report
Scope 3 emissions –
including the digital supply
chain. Pre-consent tracking
waste sits squarely inside
that scope.

GREENWASHING ENFORCEMENT

A credibility risk.

The CMA Green Claims Code
and FCA anti-greenwashing
rule mean a net-zero pledge
alongside 2 MB of
unconsented tracking per
visit is a regulatory risk.

WHY THIS IS CONSERVATIVE

Every figure in this report scans one page only – the homepage. Not the checkout, not the search results, not the account pages. A real visitor browses multiple pages per session, each firing the same pre-consent trackers again. The scanner also measures from a UK IP only – sites that geo-gate (serving heavier US payloads to US visitors) will generate significantly more carbon globally than our UK scan captures. The 100,000-visit floor understates most sites by 10x to 5,000x. Booking.com receives approximately 500M total visits/mo (Semrush/SimilarWeb, Jan 2026) – yet we measure only the UK homepage payload. The real global, multi-page carbon footprint of pre-consent tracking is orders of magnitude larger than anything in this report.

Traffic estimates: Semrush · SimilarWeb · AltIndex (Jan–Apr 2026). Conversion factors: BEIS 2023 GHG Conversion Factors (gov.uk). LHR–JFK return economy + RFI: 1.78 t CO₂e. LHR–EDI return: 0.20 t CO₂e. UK avg car: 170 g CO₂e/km. UK household total footprint inc. indirect: 8.1 t CO₂e/yr (DESNZ 2023). Carbon formula: SWDM v4 · 0.194 kWh/GB · 494 gCO₂e/kWh.

FROM THE FIELD

“Non-compliant pre-consent tracking is simultaneously illegal, revenue-destroying, and environmentally wasteful. Ghost Carbon is not a new emission – it is an existing emission that has never been measured. Now it has.”

LALARUKH OSAMA · FOUNDER, PIPELIT

Scan your site. Find your number.

The Ghost Carbon™ calculation is live in Pipelit Scanner – the same scanner, the same scoring, the same three browsers used in this report. Free to run. No sign-up.

→ scan.pipelit.co.uk

GLOSSARY

Terms used in this report.

Tracker	A third-party script or pixel that fires on page load and sends data to an external domain. Examples: Google Analytics, Meta Pixel, Microsoft Clarity. Distinguished from first-party cookies by operating across domains.
Cookie	A small file stored on the visitor's device. Can be first-party (set by the site itself) or third-party (set by an external domain). Not all cookies are trackers – some are strictly necessary for the site to function.
Pre-consent	Anything that fires, loads, or stores data before a visitor has interacted with a consent banner. Under UK PECR Regulation 6, this requires prior informed consent unless strictly necessary.
Critical finding	A tracker firing pre-consent with no defensible legal basis. Marketing pixels, ad-tech, session recording tools. The clearest PECR Regulation 6 violations.
Grey area finding	A tracker firing pre-consent with an arguable but unsettled legal basis. Could be defended as legitimate interest under UK GDPR Article 6(1)(f), but ICO position is evolving. Flagged for review.
Consent banner / CMP	A consent management platform or banner that asks visitors to accept or reject non-essential cookies and trackers. Under Planet49 (CJEU 2019), pre-ticked boxes do not constitute valid consent.
Decorative banner	A consent banner that appears but gates nothing. Trackers fire before or alongside it, so by the time a visitor clicks reject, the data is already sent. Worse than no banner because it fakes compliance.
Pre-consent payload	The total data in kilobytes (KB) transferred by tracking domains before any consent is given. This is what the carbon formula measures – not the full page weight, only the tracking waste.
Ghost Carbon™	The CO ₂ e emissions generated by pre-consent tracking payloads. Calculated using the Sustainable Web Design Model v4: Waste (GB) × 0.194 kWh/GB × 494 gCO ₂ e/kWh. Named by Pipelit because it is an existing emission that had never been measured.
Scanner Score	Pipelit's compliance quality score out of 100. Five categories, twenty points each: banner visibility, default toggle state, pre-consent firing, privacy policy, and consent UX quality.

Tier	The public ranking derived from the Scanner Score. Diamond (95–100), Gold (85–94), Silver (70–84), Bronze (50–69), Below (0–49). Only Bronze and above appear on the public Hall of Fame.
Clean-by-design	A site that fires zero trackers, sets zero tracking cookies, and transfers zero tracking payload pre-consent. No banner is needed because there is nothing to consent to. This is the highest form of compliance under PECR Regulation 6.
SWDM v4	Sustainable Web Design Model version 4. The published methodology for estimating digital carbon emissions from data transfer. Used by the Green Web Foundation and adopted across the digital sustainability field.
BEIS 2023	UK Government greenhouse gas conversion factors published by the Department for Energy Security and Net Zero. Provides the grid carbon intensity (494 gCO ₂ e/kWh global average) and transport equivalences used in this report.
100,000–visit floor	The deliberately conservative baseline used for all annualised figures. Every site's carbon is calculated at 100,000 monthly visits minimum, even though real traffic for most sites is 10x to 1,000x higher. Every number in this report is therefore a deliberate understatement.
