IMP

Personal Care's Silicone Reckoning:

What REACH, California, and Consumer Pressure Mean for Formulators

$552B	**$10.8B**	**D4/D5/D6**	**Jun 2027**
Global personal care market 2025	Clean beauty market 2025, CAGR 15%	REACH ban extended to all leave-on cosmetics May 2024	EU compliance deadline for D5/D6 in leave-on products
Source: IMARC Group	Source: Fortune Business Insights	Source: Regulation (EU) 2024/1328	Source: ECHA / Biorius
18–36 mo	**20–60%**	**91%**	**Jan 2025**
Reformulation timeline per major product line	Cost premium for bio-based silicone alternatives	Share of consumers checking ingredient lists (women 35–54)	California AB 496 in force: 26 EU-banned ingredients banned
Industry estimate	Formulator surveys	Source: Grand View Research 2025	Source: Safe Cosmetics Alliance

REACH Restrictions · D4 / D5 / D6 · Dimethicone · Leave-on Cosmetics · Clean Beauty · Consumer Pressure · EWG Skin Deep · TikTok Influence · California AB 496 · MoCRA · Silicone Substitutes · Reformulation Cost · Supply Chain Risk · Wacker / Dow / Momentive · Biofermentation · Skinimalism

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Executive Summary

The personal care industry is navigating a silicone reckoning that is simultaneously regulatory, commercial, and reputational — and the three pressures are not fully aligned. REACH has imposed a staged but now comprehensive restriction on cyclic volatile methylsiloxanes (cVMS) across both rinse-off and leave-on cosmetics, with the most significant compliance deadline — D5 and D6 in all cosmetic products — falling in June 2027. California independently banned D4 (cyclotetrasiloxane) under AB 496, effective January 2025, mirroring EU prohibitions. Washington State's Safer Products program has listed cVMS as a category of concern. The US federal framework under MoCRA leaves ingredient regulation to states, making the regulatory map increasingly fragmented.

Consumer pressure, widely cited as the primary driver of clean beauty, is real but structurally misread. The channels through which consumer sentiment reaches brand formulators — social media listening, retail clean standards, NGO campaigns, ingredient-rating apps — are structurally biased toward vocal minorities and hardcoded negativity frames. The industry systematically underfunds the one mechanism that could actually resolve this: rigorous, blinded consumer research on ingredient preference, performance trade-offs, and willingness to pay. What companies call consumer insight is largely social listening. That is not the same thing.

The question of who triggers change is not clean. REACH is the enforcement-backed mandate. Retailers provide the market-access lever. NGOs supply the narrative pressure. Social media amplifies without evidence. Actual structured consumer research — the kind that could tell a formulator whether a silicone-free moisturiser at 20% higher price actually converts in a blinded in-store test — remains rare. The result is that reformulation decisions worth hundreds of millions in development cost are made against a preference signal that is directionally plausible but quantitatively thin.

For formulators, the silicone restriction creates three parallel cost burdens: regulatory compliance and safety re-assessment, reformulation of affected product lines against a technology set that does not yet match silicone performance on all dimensions, and supply chain exposure in alternative ingredient sourcing from a market that is still scaling. This paper maps all three dimensions, assesses the REACH framework on its merits, and surfaces the personal care trends — visible and less visible — that determine what formulation strategy actually makes commercial sense in 2026 and beyond.

Regulatory	Commercial	Consumer Signal
D4 banned EU + CA. D5/D6 in all cosmetics: 0.1% max from June 2027. California AB 496 in force Jan 2025.	Clean beauty CAGR: 8.6–15%. Silicone-free haircare holds 32% of clean beauty market. Premium tier growing at 11.7% CAGR.	#CleanBeauty: 1.9B TikTok views. 63% of US consumers prefer natural ingredients. But stated preference ≠ purchase behaviour.

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The Regulatory Architecture: REACH, California, US Federal

The global regulatory framework around silicones in personal care is the most complex and fast-moving it has ever been. Three distinct jurisdictions are advancing restrictions on overlapping but non-identical chemical sets, on different timelines, with different enforcement mechanisms and scientific frameworks. Formulators supplying global brands must navigate all three simultaneously.

2.1 REACH: The EU Framework

The European Union has taken a staged, evidence-based approach to cVMS restriction that spans eight years. The scientific basis is SVHC designation: D4, D5, and D6 were added to the REACH Candidate List in June 2018 as very persistent and very bioaccumulative (vPvB) substances. D4 additionally meets PBT criteria (persistent, bioaccumulative, toxic) and carries a harmonised classification as suspected of damaging fertility and very toxic to aquatic life with long-lasting effects.

The restriction timeline has three phases. First, Commission Regulation (EU) 2018/35 restricted D4 and D5 in rinse-off cosmetics at concentrations above 0.1% by weight, entering into force in February 2020. This covered shampoos, body washes, and any wash-off personal care product. D4 was additionally prohibited entirely in cosmetics under the EU Cosmetics Regulation (Annex II) from January 2022. Second, Commission Regulation (EU) 2024/1328 of 16 May 2024 extended restrictions to leave-on products. D5 and D6 in all cosmetic products — including make-up, face creams, hair styling products — are restricted to a maximum of 0.1% by weight. This restriction applies from June 6, 2027 for cosmetic products, with different timelines for medical devices and dry cleaning applications. Third, the Authorisation List process: in April 2021, ECHA submitted its recommendation to include D4, D5, and D6 in the Authorisation List. If adopted, this would require companies to apply for — and be granted — authorisation to continue use, effectively a market access gate.

The practical compliance consequence is this: any leave-on personal care product currently formulated with D5 or D6 above 0.1% must be reformulated before June 2027. New safety assessments are required. CPNP notifications must be updated. Non-compliant products must be withdrawn from EU markets before the transition deadline. ECHA's enforcement pilot found that 3% of inspected products still contained restricted D4 and/or D5 in 2024 — indicating that compliance monitoring has already begun.

REACH Restriction Timeline: D4, D5, D6 in Cosmetics

Period	Substance	Scope	Limit	Regulation
Feb 2020	D4, D5	Rinse-off cosmetics	0.1% max	2018/35
Jan 2022	D4	ALL cosmetic products	Prohibited	Cosmetics Reg. Annex II
Jun 6 2026	D4, D5, D6	Consumer + professional products (non-cosmetic)	0.1% max	2024/1328
Jun 6 2027	D5, D6	ALL cosmetic products (leave-on)	0.1% max	2024/1328
2034	D5	Dry cleaning (closed systems)	Restricted	2024/1328 derogation

Sources: ECHA cyclosiloxanes hot topics page; Commission Regulation (EU) 2024/1328 OJ L 22 May 2024; Biorius (Jan 2026).

2.2 California: AB 496 and the DTSC Work Plan

California has enacted the most direct state-level restriction on silicones in personal care in the English-speaking world. AB 496 (Friedman, 2023) bans the sale of cosmetic products containing 26 specific substances previously prohibited by the EU, including cyclotetrasiloxane (D4). The law entered into force on January 1, 2025. California's approach is notable for directly importing EU SVHC chemistry into state law without independent scientific assessment — a legislative reference model that signals the EU framework's de facto global reach.

The California Department of Toxic Substances Control (DTSC) is separately advancing the Safer Consumer Products (SCP) program under its 2024-2026 Work Plan. Cyclic volatile methylsiloxanes (cVMS) — including D5 and D6 not yet covered by AB 496 — appear in the Draft Identification of Priority Products Report published November 2024. If listed as a priority product, manufacturers would be required to conduct an Alternatives Analysis. DTSC regulatory responses available upon completion of that analysis range from additional labelingto sales prohibition. The Washington State Safer Products for Washington program is running a parallel process covering cVMS.

The US federal Modernization of Cosmetics Regulation Act (MoCRA), enacted December 2022, does not regulate cosmetic ingredients. It requires facility registration (mandatory from July 2024), product listing, GMP compliance, and adverse event reporting. Ingredient-specific restrictions remain with states — creating a patchwork in which California and Washington are advancing restrictions that the FDA is not authorized to impose. For multinational formulators, the practical constraint is the most restrictive jurisdiction: the EU framework for EU sales, and California for US market claims.

US Regulatory Landscape: Key Provisions for Silicones in Personal Care

Regulation / Program	Jurisdiction	Silicone Scope	Status / Timeline
California AB 496	California	D4 (cyclotetrasiloxane) and 25 other EU-banned substances prohibited	In force Jan 1 2025
CA DTSC SCP Work Plan 2024-2026	California	cVMS (D5/D6) under Priority Product evaluation; Alternatives Analysis may be required	Draft report Nov 2024; final rulemaking pending
Washington Safer Products for Washington	Washington State	cVMS listed as Phase 1 chemicals of concern; product evaluation underway	Multi-phase programme 2022-ongoing
MoCRA (Federal)	USA (federal)	No ingredient restrictions; facility registration, product listing, GMP, adverse event reporting only	Registration required Jul 2024; GMP rule pending 2026+
FDA MoCRA GMP Rule	USA (federal)	Good Manufacturing Practices for cosmetics; ingredient safety substantiation improved	Proposed rule timeline uncertain; moved to long-term agenda

Sources: DTSC 2024-2026 Priority Product Work Plan; Safe Cosmetics Alliance (2026); FDA MoCRA tracker; Alston & Bird (Mar 2026).

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Consumer Pressure: How It Materialises in Reality

Consumer pressure on silicones is frequently described as the primary commercial driver of clean beauty. The claim has surface validity: global clean beauty was valued at $10.8 billion in 2025, growing at 8.6–15% CAGR depending on definition scope. #CleanBeauty has accumulated 1.9 billion TikTok views and over 6.1 billion Instagram posts by 2025. Approximately 63% of US consumers stated a preference for products with natural ingredients in 2025. Around 65% of women aged 35–54 report reviewing ingredient lists before purchase. These are real and significant. They are also structurally partial.

Consumer preference as measured in surveys, social listening, and retail analytics is not the same as formulation-level ingredient rejection. The clean beauty category is driven primarily by a rejection of parabens, sulfates, synthetic fragrances, and microplastics — categories that carry stronger, longer-established negative narratives than silicones. Silicones occupy an ambiguous consumer position: they are known to hair-care users as conditioning agents; they are frequently invisible in skin care. The degree to which a consumer who selects a 'clean beauty' product is specifically rejecting dimethicone versus broadly selecting a 'natural' brand positioning is rarely disaggregated in the data companies actually use.

3.1 The Pressure Channels: A Reality Map

Channel	Mechanism	Signal Quality	Silicone-Specific Impact
Ingredient-rating apps (EWG Skin Deep, Think Dirty, INCI Decoder)	Rate individual ingredients on hazard scores; consumers check before purchase	High reach (EWG: 80,000+ products rated), but ratings based on hazard identification, not dose-response or exposure. Binary framing.	D4 and D5 flagged red/high concern. PDMS/dimethicone rated moderate concern or 'limited data'. Consumers rarely distinguish.
Retailer clean standards (Sephora Clean, Target Clean, Ulta Conscious Beauty, Whole Foods)	Retailers impose banned ingredient lists as condition of shelf access. Formulators must comply or lose distribution.	Very high commercial leverage. Retail gate is harder than consumer preference signal. Non-negotiable for listed retailers.	Cyclosiloxanes (D4/D5/D6) on most retailer banned lists since 2020-2022. PDMS/dimethicone status varies by retailer. Sephora Clean allows dimethicone.
NGO campaigns (Campaign for Safe Cosmetics, CHEM Trust, Women's Voices for the Earth)	Public campaigns, brand targeting, media pressure, regulatory submissions. CHEM Trust active in ECHA SVHC processes.	High reputational leverage with media; uncertain direct consumer conversion. Primary function is agenda-setting, not consumer education.	NGO campaigns primarily target D5/cVMS as endocrine disruptors. Broader silicone category caught in narrative. Evidence standards in public materials often lag ECHA scientific process.
Social media and influencer content (TikTok, Instagram, YouTube SkinTok)	Ingredient explainers, product reviews, 'what I avoid' content. Algorithm-amplified. Often no scientific vetting.	Massive reach, zero regulatory accountability. Viral misinformation cycles common. Positive reformulation stories also circulate.	Silicone-free haircare dominant clean-beauty narrative. 'Silicones coat the scalp' claim widespread and scientifically contested. Consumer fear of PDMS substantially exceeds evidence base.
Professional salon community	Hairdressers and estheticians influence retail and professional product decisions. Salon-grade clean beauty emerging.	High trust credibility with their client bases. Professional endorsement of silicone-free carries weight in premium haircare.	Silicone-free salon brands (Davines, Maria Nila, Rahua) market specifically to conscious salon professionals. Growing professional channel pressure.

Sources: Grand View Research (2025); Campaign for Safe Cosmetics; EWG Skin Deep database; Sephora Clean methodology.

The practical consequence of this channel structure is that consumer pressure reaches brand and formulation teams as a composite signal with no ingredient-specific resolution. A brand's social listening dashboard tells them that 'clean' and 'natural' and 'silicone-free' are trending in their category. It does not tell them whether removing dimethicone from a specific moisturiser will be noticed by any consumer who does not specifically read the INCI list. That question — the one that determines whether reformulation generates commercial return — is almost never answered with direct research.

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The Survey Gap: What Companies Think They Know

The personal care industry has a structural research problem that is rarely named in B2B communications and almost never in investor materials: it systematically substitutes social listening for consumer research. The distinction matters enormously for the reformulation decisions now being driven by both regulatory and commercial pressure.

What companies collect: social media mention volume and sentiment, in-store return rates, Net Promoter Score changes after reformulations, syndicated market research (Mintel, Euromonitor, Nielsen) on category-level trends. What they rarely commission: blinded performance trials comparing current and reformulated products on real consumers who do not know which version they are testing; conjoint analysis quantifying how much ingredient transparency actually moves purchase intent relative to price and performance; segmented surveys that separate the 10% of consumers actively avoiding silicones from the 90% who have no ingredient-level position on the category.

What companies use as 'consumer insight'	What they would need to actually know
• Social media listening dashboards • Syndicated market reports (Mintel, Euromonitor) • Website search term analysis • Retailer clean beauty standard compliance metrics • Post-launch NPS tracking • Ingredient-app rating scores	• Blinded comparative product tests: silicone vs. reformulated — does the consumer notice? • Willingness-to-pay at SKU level for verified silicone-free vs. equivalent performance • Segmentation: what % of target audience actively reads INCI lists? • Retailer clean standard pass rate vs. actual sales velocity correlation • Post-reformulation repeat purchase rate (not NPS — revealed preference) • Double-blind sensory panel on texture, slip, residue with and without dimethicone

The cost argument against primary consumer research is understood: a rigorous blinded sensory study across representative consumer segments costs EUR 80,000–250,000. A full conjoint analysis with purchase intent modelling: EUR 150,000–400,000. For a brand with 200+ SKUs requiring reformulation assessment, the budget implication is material. But the cost of not doing it is also material: reformulating a product line to silicone-free, absorbing a 20–60% ingredient cost premium, extending development timelines by 18–36 months, and then discovering that post-launch repeat purchase rates fell because texture differentiation was lost — without knowing whether the change drove a single incremental consumer — is a more expensive outcome. It is also the outcome that several clean beauty reformulations have produced.

The practical gap is that brand-side research budgets in personal care are heavily weighted toward claims substantiation (efficacy studies), trend monitoring (syndicated data), and in-store analytics. Primary research into whether specific ingredient removals generate commercial return is structurally under-resourced. The reformulation decision is made at the intersection of regulatory mandate (REACH compliance is not optional), retailer pressure (shelf access is not optional for mass market brands), and social media sentiment (directional, not quantified). The consumer's actual product preference — when the label is removed and the texture is felt — is inferred, not measured.

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Who Triggers Change? Mapping the Pressure Architecture

The popular narrative positions consumer demand as the primary driver of silicone reformulation in personal care. The evidence supports a more differentiated picture. The pressure architecture has four distinct actors, each operating through different mechanisms and with different degrees of force.

Actor	Mechanism	Force Level	Evidence Quality	PDMS / Dimethicone Pressure?
EU REACH / ECHA	Legislative mandate backed by enforcement. Non-compliance = market access loss.	Highest — not discretionary	Science-based: SVHC assessment, RAC opinion, Annex XVII restriction	No — PDMS not restricted. Cyclic cVMS (D4/D5/D6) only.
California DTSC + AB 496	State law plus regulatory programme. AB 496 in force. SCP process ongoing for D5/D6.	High — legal compliance in largest US market	Largely imports EU SVHC chemistry. Alternatives Analysis adds scientific layer.	D4 banned (AB 496). D5/D6 under evaluation. PDMS not currently targeted.

Actor	Mechanism	Force Level	Evidence Quality	PDMS / Dimethicone Pressure?
Retailers (Sephora, Target, Ulta, Whole Foods)	Banned ingredient lists as shelf access condition. Non-compliant products excluded.	High — distribution leverage for mass market brands	Retailer internal lists, often based on NGO inputs, ECHA SVHC, Campaign for Safe Cosmetics	Cyclosiloxanes on most lists. Dimethicone (PDMS) allowed by Sephora Clean. Mixed by retailer.
NGOs + Social Media	Public campaigns, media pressure, influencer content amplification. No enforcement authority.	Medium — reputational risk, not legal risk	Variable. CHEM Trust inputs to ECHA are science-based. Social content often is not.	High consumer concern about PDMS despite absence from regulatory lists. Narrative outpaces science.
Primary Consumer Research	Survey data, blinded product tests, conjoint analysis, repeat purchase analytics.	Low — structurally underfunded	Where commissioned, rigorous. Industry-wide: rarely done at ingredient level.	Unknown — rarely disaggregated at ingredient level. Assumed from social listening.

Sources: IMP analysis; ECHA REACH restriction tracker; Sephora Clean criteria; Campaign for Safe Cosmetics retailer standards review.

The structural conclusion is that REACH and retailer standards are the primary operational triggers of reformulation for any brand with EU distribution or mass retail channel dependency. Consumer demand, as currently measured, is the justification story told after the commercial decision is made — not the evidence base on which it was made. This is not dishonest; it is an accurate description of how the industry's pressure architecture functions. What it means for B2B chemical suppliers is significant: your customer's reformulation is regulatory- and retail-driven. Their communication about it will be consumer-driven. These are different conversations.

6

Is REACH Justified? An Honest Assessment

The restriction of D4, D5, and D6 under REACH has generated a sustained scientific and industry debate that deserves more serious B2B engagement than the binary 'regulatory burden vs. environmental protection' framing usually applied. There are legitimate arguments on both sides — and understanding them matters for assessing whether broader silicone restrictions are likely, and how robust the current framework is against challenge.

6.1 The Case For the Restrictions

The environmental persistence case for D4, D5, and D6 is substantively strong. The substances do not biodegrade under REACH criteria. They have been detected in sewage sludge, soil, water, fish tissue, human plasma, abdominal fat, and breast milk. Crucially, D4, D5, and D6 have been detected in the Arctic and Antarctic — evidence of long-range atmospheric transport from source regions (urban wastewater systems, personal care product manufacturing) to remote ecosystems. D4 has a harmonised EU classification as very toxic to aquatic life with long-lasting effects and is suspected of damaging fertility.

ECHA's identification of cosmetic products as the primary route of environmental release is quantitatively supported: rinse-off products entering wastewater are the dominant pathway to aquatic systems; leave-on and volatile-use products are the dominant pathway to atmospheric distribution. The projected 90% emission reduction from the 2024 restriction is based on product-use modelling that is consistent with the source attribution data. The precautionary logic — restrict prior to irreversible environmental impact from persistent accumulation — is also consistent with the EU's established approach to PBT/vPvB substances under REACH, Which does not require demonstrated harm at current exposure levels.

6.2 The Industry Counter-Arguments

The industry response, advanced primarily through the Silicones Europe industry group and Evonik's published FAQ, raises substantive scientific points that are not adequately dismissed. The REACH vPvB framework assesses persistence based on biodegradation data alone — it does not credit other environmental degradation mechanisms. D4, D5, and D6 do undergo abiotic degradation (photolysis, hydrolysis) at rates that are not zero. Including these mechanisms produces different environmental persistence calculations. Monitoring data from Canada, Japan, and Norway show that real-world environmental concentrations of D5 are below predicted no-effect concentrations (PNECs) at most measured locations. The disconnect between modelled risk and measured environmental reality is genuine.

The risk vs. hazard debate is also real. REACH's PBT/vPvB framework operates on hazard identification, not risk assessment at current use levels. An alternative risk-based framework — as applied by, for example, Environment Canada in their D5 assessment — can reach different conclusions about the necessity of restrictions at the concentrations reaching the environment from personal care product use. The question of whether the OSPAR Convention's stricter precautionary approach to the North Sea's closed semi-enclosed water system is proportionate when applied globally as REACH framework is a legitimate regulatory design question, not an industry deflection.

6.3 The Balanced Assessment

The restrictions are justified because:	The restrictions may be disproportionate in that:
vPvB designation is consistent with REACH criteria as written. Arctic/Antarctic detection confirms long-range transport. D4 toxicity to aquatic life is documented. Precautionary restriction of accumulating substances is legitimate policy. Alternatives exist or are developing.	Real-world concentrations below PNEC at most monitoring sites. Abiotic degradation excluded from REACH persistence calculation. Risk-based frameworks in other jurisdictions reached different conclusions. PDMS (non-cyclic) has similar persistence but is not restricted. Compliance cost falls disproportionately on SME formulators.

The net assessment: the REACH restriction on D4, D5, and D6 in cosmetics is scientifically grounded and procedurally legitimate within the EU's established framework. The industry counter-arguments on real-world risk are substantive and should be engaged with seriously — they are likely to influence how future restrictions on PDMS and other non-cyclic siloxanes are approached. The restriction is not arbitrary overregulation. It is also not a perfect risk assessment. It is a defensible precautionary position on accumulating substances in a closed regulatory system that prioritises hazard over risk.

The more important strategic question for B2B actors is not whether REACH is justified — the legal framework is in place and the June 2027 deadline is immovable — but whether PDMS (polydimethylsiloxane, dimethicone) will follow. The answer is: not imminently, but not excluded. PDMS is the workhorse silicone in leave-on skin care, sun care, and colour cosmetics. It does not have SVHC designation. It does not carry REACH restrictions. It does appear on some retailer 'avoid' lists due to its silicone family association. If PDMS comes under formal ECHA assessment — possible but not confirmed by 2026 — the scale of reformulation required would be an order of magnitude larger than cVMS alone.

7

Formulator Implications: Costs, Timelines, and the Texture Problem

For any formulator supplying into EU markets or US retailers with clean standards, the cVMS restriction creates a defined compliance obligation. For those with broader portfolios containing dimethicone (PDMS) in leave-on products, the commercial pressure from retailers and consumer-facing clean standards creates a second reformulation wave that is driven by market positioning rather than legal mandate. The cost structure and timeline differ significantly.

7.1 Reformulation Economics

Cost Category	Range	Driver	Notes
Alternative ingredient cost premium (bio-based / plant-derived substitutes)	+20–60%	Raw material pricing vs. conventional silicone	Highly variable by substitute category. Inulin derivatives and polyglyceryl esters at lower end. Biofermentation-derived at upper end.
Reformulation development cost (per product line, major brand)	EUR 80K–400K	Formulation chemist time, stability studies, safety re-assessment	Includes CPNP update, new safety assessment by Responsible Person, stability and compatibility testing.
Timeline to market (from reformulation decision to compliance)	18–36 months	Regulatory process, stability windows, supply qualification	18 months minimum for line extensions. Full product-line reformulation typically 24–36 months. Inadequate for brands not already in process.
Regulatory compliance cost (EU CPNP update, new ECHA notifications)	EUR 5K–25K/SKU	Responsible Person fees, safety assessment update	Scales with SKU count. A brand with 50 affected SKUs faces EUR 250K–1.25M in compliance admin alone.
Sensory performance gap (commercial risk if texture not matched)	Unquantified	Consumer repeat purchase change post-reformulation	Most significant risk for silicone-heavy leave-on skin care and hair treatment categories. Brands that have not done blind sensory testing face unknown commercial exposure.

Sources: IMP estimates from industry formulator interviews; Coslaw.eu (2025); Biorius compliance guidance.

7.2 The Texture Problem: What Silicones Do That Alternatives Don't (Yet)

Silicones — particularly PDMS (dimethicone), cyclomethicone, and aminodimethicone in hair care — provide a specific sensory profile that no single alternative ingredient replicates across all application types. The performance properties are: thermal protection (hair care), controlled spread and slip (skin care), non-comedogenic film formation (colour cosmetics), frizz reduction and smoothing (hair), and long-term moisture retention through occlusion. The texture profile consumers associate with 'luxury' and 'effective' in many premium categories is silicone-derived.

Alternative Category	INCI Names (examples)	Performance Equivalence	Cost Position	Scalability
Plant-derived emollients (esters, plant oils)	Caprylic/Capric Triglyceride, Squalane (sugarcane), Jojoba Esters	Good for skin feel and moisture; lower thermal protection and film-forming; slightly heavier texture	Comparable to PDMS for common esters; squalane 30–50% premium	Well established; broad supply base
Polyglyceryl esters (sugar-derived)	Polyglyceryl-3 Diisostearate, Polyglyceryl-10 Stearate	Good emulsification; lower slip; different finish than cyclomethicone in rinse-off	+15–40% vs. comparable silicone	Available; growing
Modified starch polymers (tapioca, rice)	Tapioca Starch, Hydroxypropyl Starch Phosphate	Texture bulking; poor thermal protection; absorbs oil differently	Low cost; +5–15%	Well established

Alternative Category	INCI Names (examples)	Performance Equivalence	Cost Position	Scalability
Inulin derivatives (chicory-derived)	Inulin Laurylcarbamate, Hydroxypropyl Inulin	Moderate hair conditioning; film-forming; not equivalent for thermal protection	+25–50% premium	Niche; capacity limited
Biofermentation polymers (microbial)	Pullulan, Levan, Bacterial Cellulose Derivatives	Film-forming; skin feel good; scaling to replace silicone volumes not achieved	+40–70%	Early commercial; key scalability gap
Silicone from renewable feedstock (bio-silicone)	PDMS from sugarcane-derived silicon (Elkem BioSilicone research pathway)	Equivalent — identical chemistry from sustainable source	+30–60% at current scale	Early stage; Elkem active; not broad market

Sources: Cosmetics & Toiletries (2025); Formulator intelligence; Elkem personal care; dsm-firmenich formulation papers.

The performance-equivalence gap is most acute in premium hair care (thermal protection, frizz reduction) and leave-on skin treatment categories where silicone delivers a distinct end-sensory signature. For rinse-off categories, the reformulation challenge is more manageable — ingredient alternatives are better established and consumer perception of the end product is less dependent on INCI-level texture precision. The strategic implication: brands reformulating rinse-off products for compliance have more headroom than brands reformulating premium leave-on hair treatments or skin serums where the silicone texture is commercially defining.

8

Personal Care Trends: Major and Hidden

The silicone reckoning takes place inside a category that is simultaneously restructuring across multiple dimensions. Understanding the full trend context matters: some trends accelerate the commercial logic for silicone-free formulation; others complicate it; several are barely discussed in the trade press but are already shaping formulation strategy at leading labs.

8.1 Major Trends

Trend	Status / Scale	Silicone Implication
Clean beauty mainstreaming	$10.8B market 2025, CAGR 8.6-15%. Moved from indie to mass market. Sephora, Target, Ulta, Walmart now clean-standard retailers.	Primary commercial driver of cVMS removal. Retail gate pressure extends beyond REACH compliance to PDMS in some retailer standards.
Waterless / concentrated formulations	Growing at double-digit rates in premium segments. Anhydrous serums, solid shampoo bars, powder actives gaining shelf space.	Silicones less relevant in truly anhydrous formats. Some silicone functions (emulsification, spreading) eliminated by category structure. Opportunity for non-silicone alternatives.
Active ingredient proliferation	Retinol, niacinamide, peptides, AHAs, ceramides now mainstream in mass-market skin care. Ingredient-literate consumer growing.	Consumer reading INCI for actives increasingly reads silicone entries. Category-level literacy drives silicone scrutiny beyond cVMS into PDMS territory.
Inclusivity and skintone diversity	Foundation shade expansion, curl pattern-specific hair care, microbiome-sensitive formulations for diverse skin types.	Silicone-free hair care particularly relevant for textured/curly hair care segment, where silicone residue build-up perception is a well-established consumer concern.
Sustainable packaging priority	EU PPWR 2025/40 in force. Recyclable, minimum recycled content requirements. PFAS in packaging restricted.	Packaging sustainability compliance adds cost burden on top of ingredient reformulation. Budget conflict for brands with concurrent packaging and formulation transition obligations.

8.2 Hidden and Sideline Trends

The following trends are either underreported in mainstream personal care trade coverage or are operating below the noise threshold of category marketing — but are already influencing formulation strategy at leading labs and early-stage brands:

Hidden Trend	What It Is	Why It Matters for Silicone Strategy
Biofermentation-derived actives replacing synthetic pathways	Ceramides, squalane, hyaluronic acid, niacinamide now produced via precision fermentation. BASF, dsm-firmenich, Evonik all active. Cost curves declining.	Bio-derived functional ingredients are being positioned as the premium ingredient story that replaces silicone's historical 'smooth, effective technology' narrative. The fermentation platform can also target silicone-function replacements directly.
Microbiome-compatible formulation	Products formulated to not disrupt skin or scalp microbiome. Prebiotic and postbiotic ingredients growing. Surfactant reformulation driven by microbiome science.	Some silicone alternatives (plant oils, fermented ingredients) have documented microbiome compatibility. Silicones themselves have limited microbiome data. Emerging as a secondary clean-beauty argument.
Skinimalism ('skin minimalism')	Fewer, higher-quality products. Multi-functional SKUs replacing 10-step routines. Premium positioning through simplicity.	Directly reduces SKU count across a product portfolio. Brands reducing total SKUs simplify reformulation burdens. Also means each remaining product must work better — raising the bar for silicone alternatives.
AI-driven skin diagnosis and personalisation	In-store and app-based AI skin analysis tools (Skin + Me, Proven, Function of Beauty) driving individualised product recommendation and formulation.	Personalised formulation at scale reduces reliance on mass-market sensory standards. Potentially increases tolerance for ingredient substitution if personalisation engine correctly models individual sensory preference.
Solid and anhydrous format expansion	Solid shampoo bars, anhydrous serum concentrates, powder cleansers. Premium positioning. Growing in European and Asian markets.	Formats where silicone is not a primary functional ingredient. Reduces overall silicone dependency in portfolio without requiring direct replacement in each SKU. Strategic mitigation route.
Psychodermatology (skin-mind axis)	Research on skin-stress connection driving aromatherapy, adaptogen, and nervous system-modulating ingredient claims. Early stage but investment growing.	A new ingredient narrative space that does not intersect with silicone controversy. Brands expanding into psychodermatology can position new launches without clean-beauty silicone complexity.
Upcycled / circular ingredients	Food and agricultural waste as cosmetic ingredients: grape seed, coffee grounds, rice bran, citrus peel. EU Farm to Fork alignment. Growing consumer resonance.	Positioning as sustainability story. Upcycled ingredients inherently 'clean' in consumer perception. Supply chain storytelling advantage over silicone alternatives without clear origin narrative.

Sources: Cosmetics Business (2025); Mintel Beauty Trends 2025; IMP formulation intelligence synthesis.

9

Supply Chain: How Exposed Is the Sector?

The silicone supply chain for personal care is an oligopoly with significant geographic concentration — and the alternative ingredient supply chains are less developed, less transparent, and subject to their own concentration risks. Both dimensions create formulator exposure.

9.1 The Silicone Supply Chain

Five companies account for the majority of global silicone production for personal care: Wacker Chemie (Germany), Dow (USA), Momentive Performance Materials (USA), Shin-Etsu Chemical (Japan), and Elkem (Norway). Each operates upstream (silicon metal and chlorosilane intermediates) to downstream (formulated silicone blends for cosmetic use). The critical upstream raw material — metallurgical-grade silicon metal — is produced predominantly in China, which accounts for approximately 70–80% of global output. The 2021–2022 silicon metal price crisis — triggered by Chinese power rationing policy and production curtailments — drove silicon metal prices up by 250–300% within months and sent cyclomethicone prices to multi-year highs. Personal care formulators who had not built multi-supplier contracts faced force majeure notifications and spot market premiums.

Supplier	HQ	Relevant Personal Care Products	Notes
Wacker Chemie	Germany	Cyclomethicone, PDMS, dimethiconol, phenyl trimethicone, silicone resins	Leading EU-based producer. Active sustainability and bio-silicone R&D programme.
Dow (Dow Silicones)	USA	Full cVMS and PDMS range; Xiameter commodity grade; DC series personal care	Largest global silicone producer. Early reformulation support to customers post-2018 restrictions.
Momentive	USA	Dimethicone copolymers, amodimethicone, silicone elastomers for skin feel	Premium specialty silicones for colour cosmetics and skin care. Strong in sensory-modifying grades.
Shin-Etsu Chemical	Japan	Full personal care silicone range; KF series	Dominant in Asia-Pacific supply. Innovation in volatile silicone alternatives.
Elkem	Norway	Personal care-grade silicones; active in bio-silicone R&D	Exploring renewable silicon feedstock. Sustainability positioning as differentiator.

Sources: Company profiles; Wacker Chemie annual report 2024; Elkem sustainability materials.

9.2 The Alternative Ingredient Supply Chain: Less Mature Than Assumed

The instinct of formulators responding to cVMS restrictions is to switch to established plant-derived alternatives. The supply chain reality is more constrained. Several alternative categories face their own geographic concentration, volume limitations, and price volatility that are not well characterised in brand-side analysis.

Alternative	Primary Supply Source	Volume Constraint	Price Risk
Sugarcane-derived squalane	Brazil (cane), Peru (olive); Amyris dominant via fermentation route	Fermentation squalane scalable; olive-derived limited by harvest. Total supply tight for mass-market volumes.	Olive-derived volatile with harvests. Fermentation squalane more stable but Amyris financial instability (2023 restructuring) creates key-supplier risk.
Caprylic/capric triglycerides (coconut/palm derived)	Southeast Asia (palm kernel), Philippines/Indonesia (coconut)	Adequate volume for current demand. Palm oil sustainability concerns limit claim positioning.	Palm price volatility. Sustainability certification (RSPO) required for premium claims; adds cost.
Jojoba esters	USA (Arizona), Argentina, Israel, Australia	Limited total acreage. Cannot scale to replace silicone at mass-market volumes in one crop cycle.	Weather-sensitive. Price premium over silicone ~40–60%. Supply tightens in strong demand periods.
Inulin / chicory derivatives	Europe (primarily Belgium, Netherlands: Cosucra, Beneo)	Limited to hair care concentrations. Not viable as primary silicone volume replacement.	Moderate. Chicory crop seasonal. European supply concentration.
Biofermentation polymers (pullulan, levan, bacterial)	Specialty fermentation producers: Hayashibara (Japan), BASF R&D, various start-ups	Commercially immature for large volume replacement. Pilot scale to commercial scale gap significant.	High cost variability. Technology not yet commoditised.

Sources: Formulators' supply chain reports; Cosmetics & Toiletries supply chain supplement 2025; IMP analysis.

The net supply chain exposure for a formulator transitioning from cVMS to alternatives is significant in three dimensions. First, concentration risk does not decrease — it shifts from silicon metal in China to crop-based supply concentrated in Southeast Asia or South America. Second, volume scalability is constrained: alternatives work at current reformulated volumes for products that are partially silicone replacement; they do not yet scale to full-volume displacement of PDMS in the global personal care market. Third, lead times for certified-sustainable alternatives — RSPO palm, Ecocert-approved esters — are materially longer than conventional silicone procurement. Formulators need to build new supplier qualification processes that their procurement infrastructure was not designed for.

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Forward View: Risks, Opportunities, and What to Watch

Risk / Opportunity	Horizon	Detail
PDMS / dimethicone under ECHA review	Medium term — 3–6 years	PDMS is not currently restricted. Growing retailer clean-standard pressure and consumer narrative around 'all silicones' creates pre-regulatory risk. Any ECHA SVHC assessment of PDMS would trigger a reformulation scale approximately 10x larger than cVMS alone. Monitor ECHA workplan.
California SCP expansion to D5/D6	Short term — 2026–2027	DTSC 2024-2026 Work Plan includes cVMS. If D5/D6 listed as Priority Products, Alternatives Analysis required. California effectively becomes 2nd REACH restriction implementation for US market.
Washington State Safer Products for Washington	Short term — ongoing	Washington cVMS restriction likely to follow California timelines. Multi-state US market access increasingly requires REACH-equivalent compliance for formulators not currently selling into EU.
EU Cosmetics Regulation Green Deal revision	Medium term — 2025–2027 discussion	EU Commission reviewing cosmetics regulation under Green Deal framework. Potential for faster SVHC-to-cosmetics ban pipeline and expanded ingredient review categories. REACH and Cosmetics Regulation alignment reducing.
PDMS retailer exclusion expansion	Short term — active	Retailer clean standards are not static. Whole Foods and some independent retailer lists already restrict PDMS. If Sephora Clean moves to exclude dimethicone, mass reformulation trigger precedes any regulatory mandate.
Bio-silicone commercialisation	Long term — 5–10 years	Elkem and Wacker R&D on renewable silicon feedstock (sugarcane, agricultural waste). If bio-silicone achieves cost parity, enables 'clean silicone' positioning that resolves the sustainability narrative without performance compromise. Transformative if achieved.
AI formulation tools accelerating alternatives	Short–medium term	AI-assisted formulation (Chemists Corner, Mindsync, major supplier AI tools) beginning to identify silicone-equivalent blends from alternative ingredient libraries at reduced development cost. Could compress 36-month reformulation timelines materially.
Primary consumer research deficiency creates risk	Immediate	Brands reformulating for compliance or retailer access without blinded performance data risk post-launch repeat purchase loss if texture performance gap materialises. First-mover brands that do the research and get texture equivalence right will capture positioning advantage.

Sources: IMP forward analysis; ECHA workplan 2024-2026; California DTSC SCP Work Plan; Elkem sustainability roadmap.

The defining characteristic of the silicone reckoning in personal care is that it is happening at three speeds simultaneously. REACH operates on published timelines: June 2027 is fixed. Retailer clean standards move faster and without notice — a Sephora Clean revision can change the commercial landscape in a product cycle. Consumer narrative, amplified by social media, operates faster still, and independently of both regulatory fact and retailer decision. Formulators who build their response only to the regulatory timeline are behind on the commercial requirement. Those who reformulate for social media pressure without the consumer research to validate commercial return are reformulating expensively against a signal whose magnitude they have not measured.

The structural advantage belongs to formulators who have mapped their cVMS exposure by June 2027 compliance date, qualified alternative suppliers with adequate volume capacity and sustainability certification, conducted blinded sensory equivalence studies on their highest-SKU-value reformulations, and built the regulatory compliance story — safety assessment, CPNP update, ingredient provenance documentation — that their customers' procurement compliance teams will increasingly require regardless of whether the consumer in the store has ever read an INCI list.

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