

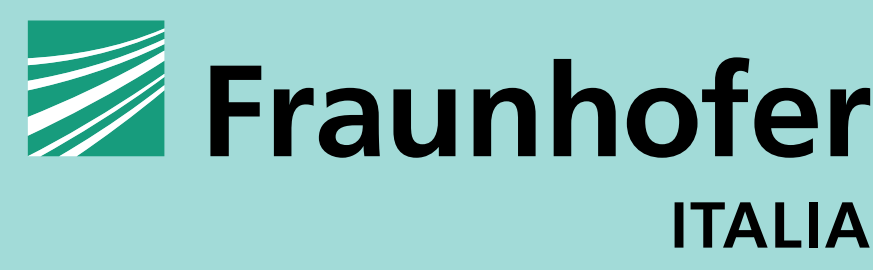
Aggregation and Comparability in Social Life Cycle Assessment Within a Safe and Sustainable by Design Framework: A Four Use-Case Study on Lubricant Additives



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KEY MESSAGE

SSbD scores average conditions per worker-hour. A PTFE redesign that needs 36 % more labour per kg in risky supply chains scores ‘comparable’ on every indicator. Report exposure, scores and risk distribution together.

WHAT IS NEW

- 1 Intensity vs. exposure gap in SSbD scoring
- 2 Risk distribution of worker hours from raw values (soca v4, openLCA)
- 3 Primary + secondary data combined and compared



1 · The Aggregation Gap

SSbD 2025 makes social LCA a mandatory part of the assessment and offers a 0–4 reference scale to score each social indicator. What it does not settle is how to get from indicators to a decision. Its scoring examples stay at indicator level, other sections group indicators into themes, and earlier guidance favoured unweighted aggregation. Weighting is mentioned as an option but not specified, and no threshold separates pass from fail. ORIENTING (D2.5) notes that no commonly applicable threshold exists for social risk. Meanwhile, S-LCA databases already pre-aggregate risk into medium risk hours, so practitioners aggregate anyway, each in their own way. Published SSbD benchmarks show the result:

Case	Scope	Aggregation	Scoring
Plasticiser for PVC ¹	LCA	Grouped, unweighted	Old JRC
Graphene, wind turbines ²	LCA	Grouped, unweighted	Own
Anti-stick coatings ³	S-LCA	Grouped, weighted	As in SHDB
Flame retardant ⁴	LCA	Grouped, unweighted	Own
SURPASS project ⁵	LCA, LCC	Grouped, optional weights	Unknown
Wastewater treatment ⁶	LCA	Grouped, unweighted	Old JRC (likely)

One of six studies covers S-LCA; they use at least three different scoring approaches.



2 · Indicator Selection

SSbD aspects
normative start

Hotspot screening
PSILCA + SHDB

Retained
where both converge

Both databases put 40–50 % of the risk in freedom of association and occupational safety. Competitiveness has no SHDB match and relies on PSILCA proxies.



3 · Aggregation & Weighting

Indicators → aspects → pillars, equal weights at each step (interim). soca v4; 1 kg produced, cradle-to-gate + end of life, direct calculation in openLCA.

PILLAR	SSbD ASPECT	PSILCA INDICATOR	SHDB
Social Fairness	Accidents at work	Fatal accidents rate	2B
	Presence of safety measures	Non-fatal accidents rate	–
	Fair salary	Sufficient safety measures	1A
	Risk of forced labour	Sector average wage	
		Frequency of forced labour	
		Goods produced by forced labour	1E
	Freedom of association	Informal employment	
		Freedom of association & coll. bargaining	1G
	Risk of child labour	Children in employment	1D
	Safe & healthy living	Waste management	–
Competitiveness reported, not scored	Equal opportunities	Gender wage gap	3B
		Gender inequalities	
	Working time	Weekly hours of work (f / m)	1F
Competitiveness reported, not scored	Technology potential	R&D expenditures*	–
	Knowledge-intensive jobs	Rate of researchers*	–
	Contribution to GDP	Contribution to econ. development	–

Red = child labour, followed through Sections 4–5. * Proxies: SSbD asks for patent growth and knowledge-intensive jobs.

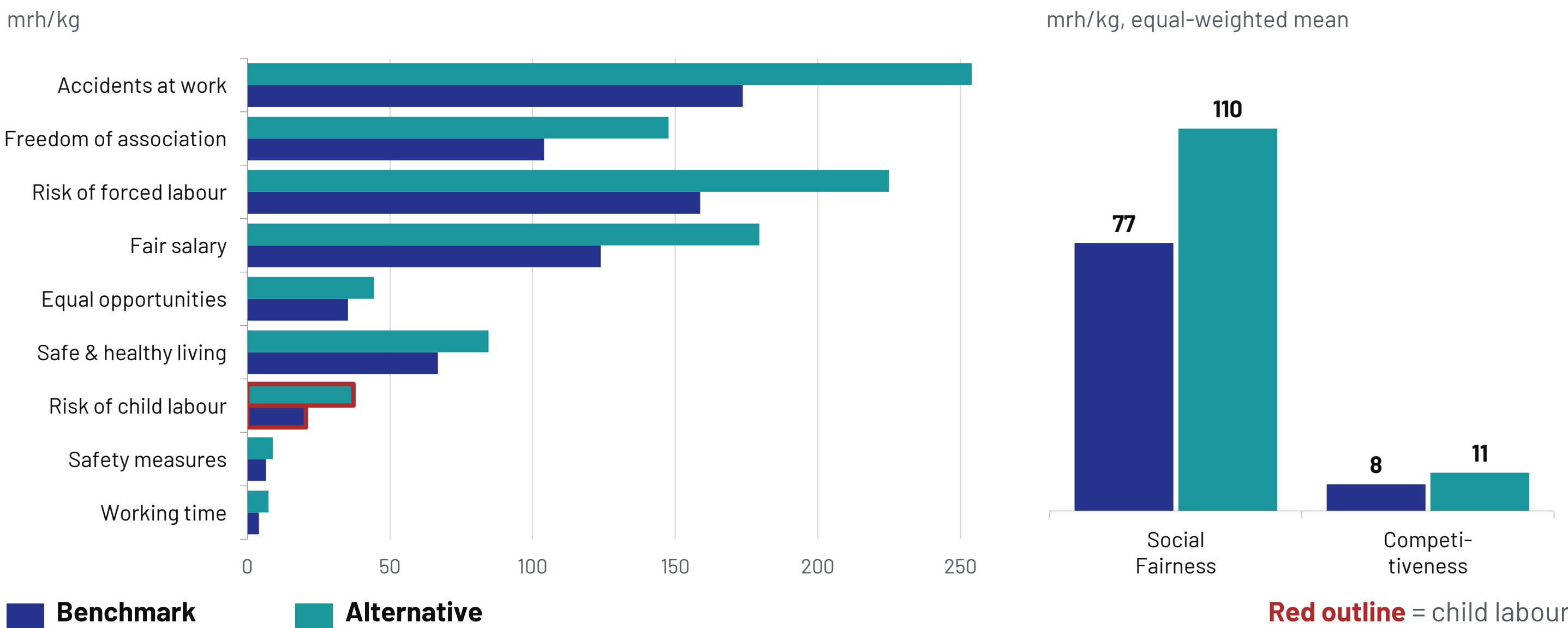
SHDB V6 subcategories: 1.A Wage assessment · 1.D Child labor · 1.E Forced labor · 1.F Excessive working time · 1.G Freedom of association, collective bargaining, right to strike · 2.B Occupational injuries & fatalities · 3.B Gender equality. “–” = no SHDB equivalent.



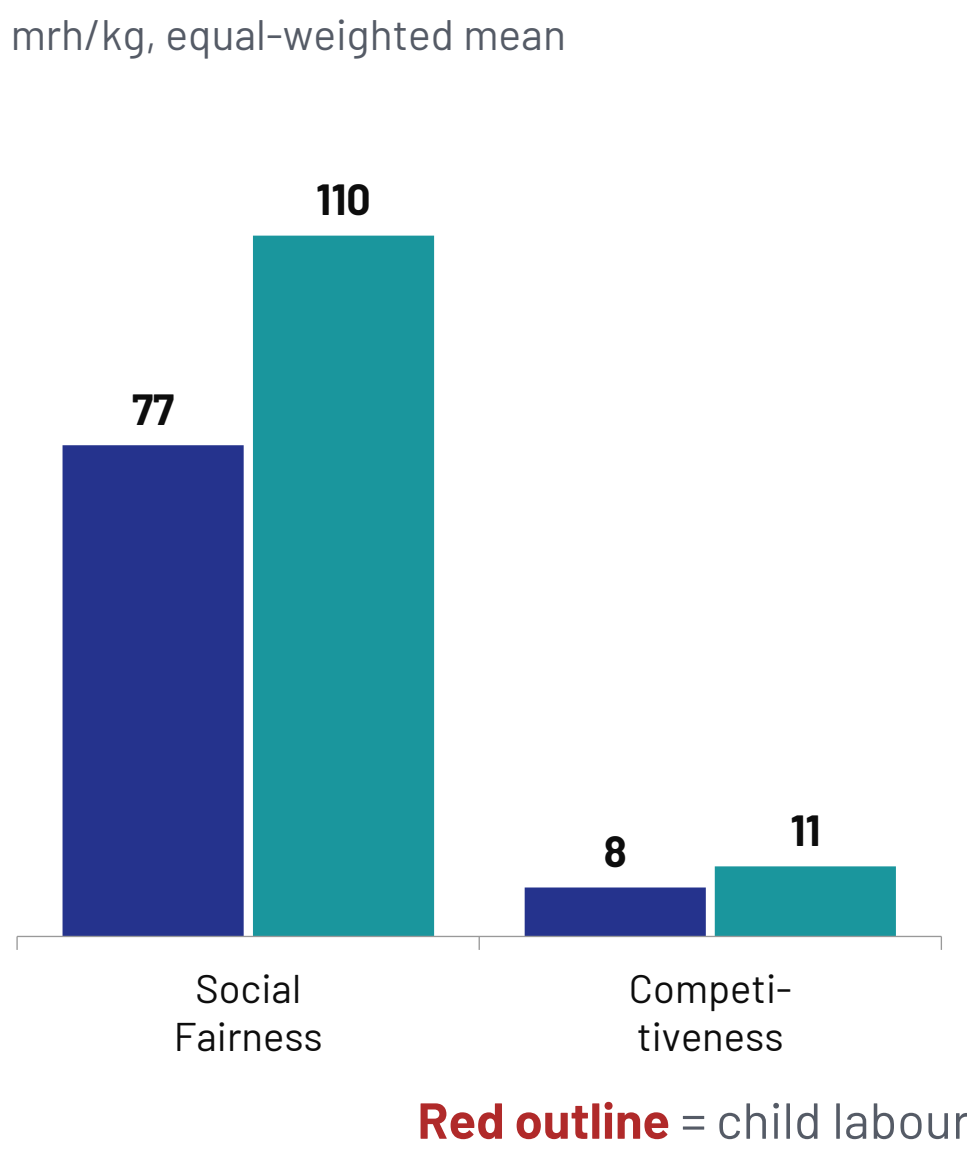
4 · Results: Three Layers

PTFE use case: benchmark vs. alternative formulation

Layer 1 · Social Fairness aspects

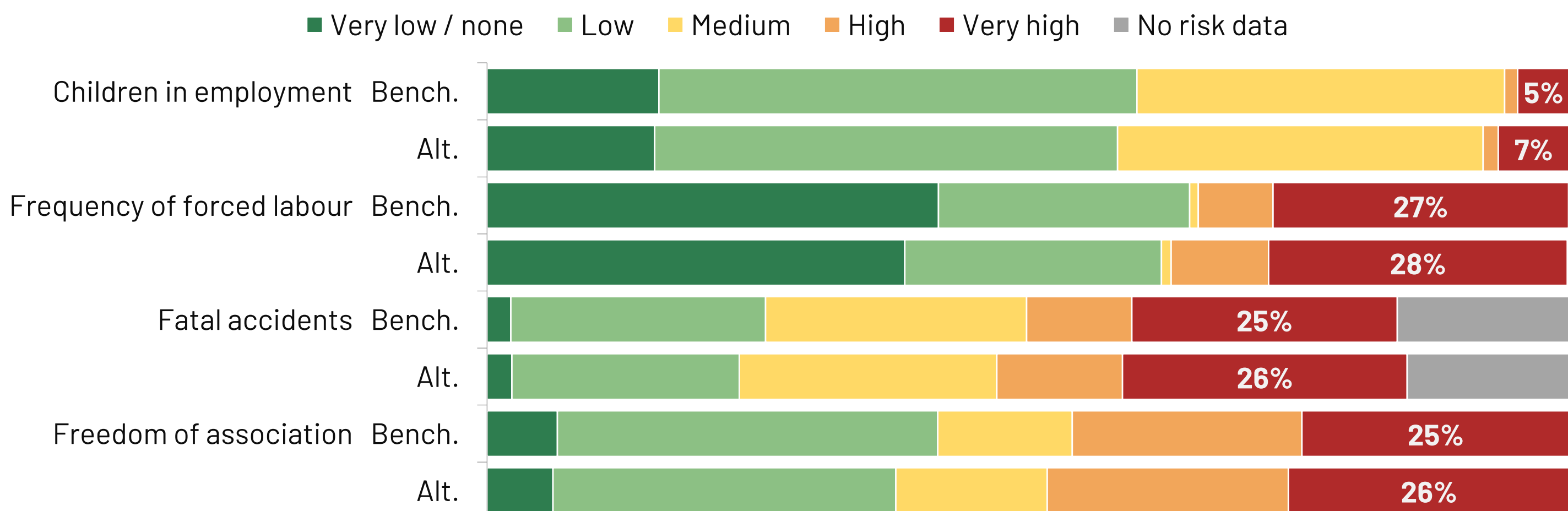


Layer 2 · Pillars



4 · Results (cont.) Layer 3 · Risk distribution of worker hours

Each bar splits the worker hours behind 1 kg of lubricant (100 %) by the risk level of the country and sector where those hours are worked. Red labels show the share at very high risk; grey shows hours with no data for that indicator. Bars compare shares, not amounts: the alternative also needs 35 % more hours in total



Where the risk sits: about 90 % of very-high-risk child-labour hours come from chemical factory construction (infrastructure), and they nearly double in the alternative (0.19 → 0.34 h/kg).



5 · Scoring & Pass/Fail

Each indicator gets an SSbD score of 0–4 (own interpretation, ranges from PSILCA v4.0.1). Scores 0–1 fail, 2–4 pass. Example, children in employment:

Children employed (%)	SSbD score	Class	Risk level	Pass/fail
≥ 3.16	0	CP5	Very high	X FAIL
2.18–3.16	1	CP4	High	X FAIL
1.23–2.18	2	CP3	Medium	✓ PASS
0.63–1.23	3	CP2	Low	✓ PASS
< 0.63	4	CP1	Very low	✓ PASS

PTFE indicator	Bench. value	SSbD	Alt. value	SSbD	Alt.
Fatal accidents	3.19	1	3.41	1	X
Non-fatal accidents	1.159	1	1.206	1	X
Safety measures	0.0038	1	0.0040	1	X
Freedom of association	3.16	1	3.20	1	X
Sector average wage	0.20	0	0.21	0	X
Children in employment	1.25 %	2	1.30 %	2	✓
Forced labour (frequency)	5.34	2	5.55	2	✓
Informal employment	9.5 %	3	11.7 %	3	✓

No indicator changes class (5 of 8 fail in both). Raw values move by ≤ 7 %, because they are averages per worker-hour.

Why the score misses it: child labour in the PTFE alternative



Total potential risk per kilogram (in medium risk hours) is worker hours per kilogram multiplied by potential risk per worker-hour. The PTFE alternative needs 35 % more worker hours (3.85 → 5.20 h/kg), and each hour carries 34 % more risk, mostly because the share of hours at very high risk grows from 4.8 % to 6.6 %. Together this gives +81 % total potential risk for child labour. The SSbD score uses only the hour-weighted average of children in employment (1.25 % → 1.30 %), so it ignores the extra hours and stays in the same band (score 2).



A second use case: Layers 1–2 improve, Layer 3 worsens. In the chlorinated-paraffin alternative, every summary improves: the Social Fairness pillar falls by 60 %, child labour by 8 %, and the SSbD score stays at 2. Yet the share of child-labour hours at high or very high risk nearly doubles, from 18 % to 33 %.



6 · Primary vs. Secondary Data

Secondary = potential risk across the chain; primary = measured at one company (PTFE, hypothetical company data).

Indicator	Secondary (soca)	Primary (company)	Weighted by hours
Sector average wage	0	4	0
Fatal accidents	1	3	0
Safety measures	1	4	2
Freedom of association	1	2	1
Children in employment	2	4	3

Weighting lets upstream risk swamp the company (fatal accidents 1 → 0). We recommend parallel reporting.



7 · Conclusions

- 01 SSbD scores average conditions per worker-hour, so they miss scale: +35 % hours per kg left every score unchanged.
- 02 Aggregated potential risk (mrh/kg) enables direct comparison: the pillar flagged +43 % where indicator scores saw no change.
- 03 But aggregates can mislead too: in CP every summary improves while the share of high-risk child-labour hours nearly doubles.
- 04 Report potential risk, scores and risk distribution together, and we ask JRC guidance on weighting, scale and primary-secondary data.

References
¹ doi:10.1093/inteam/vjag059 · ² doi:10.1016/j.envint.2025.109345 · ³ doi:10.20900/jsr20260023 · ⁴ Maga et al., LCM 2025 · ⁵ SURPASS project, D5.3 · ⁶ doi:10.1039/d5gc06437f

JRC (2025) SSbD guidance, JRC143022 · ORIENTING D2.5 · PSILCA v4.0.1 manual · ISO 14075:2024 · Data: SiToLub, soca v4. mrh = medium risk hours (PSILCA characterisation factors, worker hours from the openLCA activity variable).