

Supplementary Materials: Sustainability Assessment in Automotive and Electronics Supply Chains—A Set of Indicators Defined in a Multi-Stakeholder Approach

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This document provides the full list of 69 supply chain indicators in Table S1. Table S2 lists the standards and templates used for the estimation of the maturity of sustainability data exchange in the European automotive and electronics industries.

Table S1. Full list of 69 supply chain sustainability indicators. Rank refers to the rank the sustainability aspect received in Fritz et al. [18]; * For each environmental or social commitment indicator in addition to the answer to the yes/no questions a text description is required. This is not indicated in the table in order to improve readability. Italic = additional indicators.

Compliance						
Rank	Sustainability Aspect	Governance Level	Compliance Performance Level			
			Indicator	Equation	Unit	Sources
8	Compliance with environmental regulations	Are you compliant with the environmental regulations of your country? (i.e., REACH, RoHS, ELV)	Fines due to non-compliance with environmental regulation	Total value of fines	EUR	[5,51,57]
			<i>Incidents due to non-compliance with environmental regulations</i>	<i>Total number of incidents</i>	<i>Number</i>	<i>[5,51,57]</i>
15	Compliance with social regulations	Are you compliant with the social regulations of your country?	Fines due to non-compliance with social regulation (e.g., anti-competitive behavior, anti-trust, monopoly, bribery, ...)	Total value of fines	EUR	[5,51,57]
			<i>Incidents due to non-compliance with social regulations</i>	<i>Total number of incidents</i>	<i>Number</i>	<i>[5,51,57]</i>
20	Compliance with human rights regulations	Are you compliant with the human rights regulations of your country?	Fines due to non-compliance with human rights regulation	Total value of fines	EUR	
			<i>Incidents due to non-compliance with human rights regulations</i>	<i>Total number of incidents</i>	<i>Number</i>	<i>[5,51,57]</i>
2, 26	Compliance with product related regulations	Are you compliant with product related regulations of your country?	Fines due to non-compliance with product related regulation	Total value of fines	EUR	[5,51,57]
			<i>Incidents due to non-compliance with product related regulations</i>	<i>Total number of incidents</i>	<i>Number</i>	<i>[5,51,57]</i>

Table S1. Cont.

Management Systems and Standards						
Rank	Sustainability Aspect	Governance Level	Management Systems and Standards Performance Level			
			Indicator	Equation	Unit	Sources
10	Environmental management Systems	Do you have any environmental management system? If yes, which one? (Tickbox: ISO 14001, EMAS, EN 16001, ISO 50001)	Monitoring of the environmental management system	Number of days since last self-assessment	Days	
				<i>Number of days since last audit?</i>	<i>Days</i>	
8	Social management systems	Do you have any social management system? If yes, which one? (Tickbox: SA 8000; ONR192500)	Monitoring of the social management system	Number of days since last self-assessment	Days	
				<i>Number of days since last audit?</i>	<i>Days</i>	
18	Quality management systems	Do you have any quality management system? If yes, which one? (Tickbox: ISO 9001)	Monitoring of the quality management system	Number of days since last self-assessment	Days	
				<i>Number of days since last audit?</i>	<i>Days</i>	
28	Health and Safety Management system	Do you have any health and safety management system? (if yes, which one? SCC?)	Monitoring of the health and safety management system	Number of days since last self-assessment	Days	
				<i>Number of days since last audit?</i>	<i>Days</i>	
19	Stakeholder inclusiveness	Are you committed to the inclusion of stakeholders? *	Conducted stakeholder mapping and active stakeholder engagement	Number of stakeholder dialogues per year	Number	
33	Special initiatives for sustainable R&D expenses	Are you committed to special initiatives for sustainable R&D? *	R&D expenses related to sustainability	R&D expenses related to sustainability/Total R&D expenses	%	[49,57]

Table S1. Cont.

Environment						
Rank	Sustainability Aspect	Environmental commitment Level *	Environmental Performance Level			
			Indicator	Equation	Unit	Sources
1	Hazardous substances		Substances of Very High Concern (SVHC)	Total amount of each SVHC	kg	[24,57]
3	Wastes management	Are you committed to waste management (e.g., prevention, reduction, reuse, safe disposal)?	Total amount of solid wastes generated by type	Σ Solid wastes produced and generated by type	kg	[24,51]
			<i>Total amount of solid wastes reused, recycled, landfilled per type</i>	Σ <i>Solid wastes reused, recycled, landfilled per type</i>	kg	[24,51,56,57]
4	GHG and other air emissions	Are you committed towards the reduction and prevention of GHG and other air emissions?	Total direct and indirect GHG-emissions from energy demand (Scope 1 and 2 according to GHG-protocol)	Σ CO ₂ equivalent	kg	[24,51]
			<i>Other relevant indirect emissions by weight (Scope 3 according to the GHG-protocol)</i>	Σ CO ₂ equivalent	kg	[24,51]
			<i>Emissions of ozone-depleting substances by weight</i>	Σ CFC-11 equivalent	kg	[24,51]
			<i>NO_x, SO_x and other significant air emissions by type and weight</i>	Σ <i>Other significant air emissions by type</i>	kg	[24,51]
6	Energy consumption	Are you committed towards the reduction of energy consumption?	Energy consumption	Total energy consumption (incl. self-generated and purchased)	Joules	[24,51]
29			<i>Renewable energy sources</i>	<i>Total amount of renewable energy per source (solar, wind, ocean, hydro-power, hydrogen from renewable sources, biofuels, geothermal, biomass, ...)</i>	Joules	[24,51]
22	Materials	Are you committed towards a sustainable use of materials? (e.g.: resource efficiency, use of recycled materials, eco-design)	Use of renewable materials	Weight of materials that are renewable/Total weight of materials	%	[24]
			<i>Use of recycled materials</i>	<i>Weight of materials that are recycled material/Total weight of materials</i>	%	[24]
			<i>Recyclability of the product</i>	<i>Total weight of recyclable materials/Total weight of materials</i>	%	[24]
23	Water	Are you committed towards the reduction of water consumption?	Total use of water per year	Total use of water/year	%	[24]
			<i>Reuse of water</i>	<i>Water reused/Total use of water</i>	%	[24]
34	Biodiversity	Are you committed towards the reduction of the impact of your activities, products and services on biodiversity?	Number of identified impacts on biodiversity	Total number of impacts identified	Number	[51]
			<i>Number of measures to reduce identified impacts on biodiversity</i>	<i>Total number of measures to reduce identified impacts</i>	Number	[51]

Table S1. Cont.

Rank	Sustainability Aspect	Social Commitment Level *	Social			
			Indicator	Equation	Unit	Sources
7	No corruption and bribery	Are you committed to avoid corruption and bribery?	Incidents of corruption	\sum Incidents of corruption	Number	[5,51,56]
9	Prohibition of child labor	Are you committed to the abolition of child labor?	Incidents of child labor	\sum Incidents of child labor	Number	[5,51,56]
11	Occupational Health and Safety	Are you committed to ensure workers health & safety?	Injuries, occupational diseases, lost days, absenteeism and fatalities	(Total number of injuries \times working hours per week \times working weeks)/Total amount of hours worked by all employees per year	%	[56,60]
				(Total number of occupational diseases cases \times working hours per week \times working weeks)/Total amount of hours worked by all employees per year	%	[24,51,60]
				(Total number of lost days \times working hours per week \times working weeks)/Total amount of hours worked by all employees per year	%	[24,51,60]
				(Total number of missed (absentee) days over the period \times working hours per week \times working weeks)/Total amount of hours worked by all employees per year	%	[24,51,60]
				(Total number of fatalities \times working hours per week \times working weeks)/Total amount of hours worked by all employees per year	%	[24,51,60]
13			Employees receiving OHS training	Total number of trained employees on OHS/Total number of all employees	%	[56]
14	Employee training	Are you committed to continuous skills improvement of your employees?	Training per employee per year	Total training hours/ Total number of employees	%	[51]
16	Non-discrimination	Are you committed to ensure that no employee is discriminated against?	Incidents of discrimination	Total number of incidents of discrimination/ Total number of employees	%	[51]

Table S1. Cont.

Rank	Sustainability Aspect	Social Commitment Level *	Social			
			Indicator	Social Performance Level		
				Equation	Unit	Sources
17	Use of conflict minerals		Conflict minerals used	Amount of Tantalum, Tin, Tungsten, Gold used	kg	[52]
21	Securing minimum wages	Are you committed to securing minimum wages for your employees?	Employees covered by minimum wages	Total number of employees covered by at least the legal local minimum wages/Total number of employees	%	[56]
25	Confidentiality of data	Are you committed to protect your customers and employee's confidential data?	Confidentiality of data	Σ Conflicts regarding disclosure of confidential data	Number	-
30	Freedom of association and collective bargaining, protection of worker's representatives	Are you committed to respect the freedom of association, collective bargaining and protection of worker's representatives?	Freedom of association and collective bargaining	Number of incidents of violations of freedom of association	Number	[51]
			<i>Employees covered by collective bargaining agreements</i>	<i>Total number of employees covered by collective bargaining agreements/ Total number of all employees</i>	%	[51]
32	Community engagement	Are you committed to the consultation of local communities and the respect for cultures and traditions of local communities?	Expenses for local community projects and donations	Σ Expenses	EUR	[24]
	Gender awareness	Are you committed to an equal treatment of men and women?	Female employees in the company	Total number of female employees/ Total number of employees	%	[51]

Table S2. Overview of identified standards and templates for supply chain sustainability data exchange ($n = 24$).

Maturity of Standardization	Name of Standard/Template
Fully structured (5)	IMDS, IEC 62575, IPC 1752, IPC 1755, IEC/PAS 62545
Semi-structured (19)	ISO14064, ISO 50001, ISO 14051, ISO 14052, ISO 14046, EN 16231:2012, EN 16231:2013, EN 16231:2014, LCA, SMETA, GHG Protocol, Voluntary Carbon Standard 2007, EICC Carbon Reporting System, BSCI, WRAP, OHSAS 18001, ROHS-Template, ETI Code