Towards a European-wide harmonised transport-specific LCA Approach

TranSensus LCA

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EXECUTIVE SUMMARY

In this Deliverable D2.4, the methodological choices made by TranSensus-LCA are tested regarding applicability and feasibility. The content is based on the results of the corresponding task T2.6 Applicability and feasibility. The methodological choices that are put up for voting as well as the respective voting results serve as a basis for this task.

This report provides an overview of the task T2.6 structure and testing approach as well as the applicability and feasibility testing method. Further, the testing results are displayed and the support on sensitive issues is described. Out of the total number of specific requirements, 47 were identified as relevant for testing, with the following distribution in the different life cycle assessment phases: 3 in Goal and Scope, 19 in Inventory analysis, 12 in Impact assessment and 13 in Interpretation.

While T2.6 focusses on supporting the voting and methodological choices in parallel to the methodology development and the voting sessions, WP3 (T3.3) builds on the insights from T2.6 by applying the full methodology (based on Deliverable 2.3) on a zero emission vehicle LCA, once all methodological choices are made.

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Glossary

AIB	Association of Issuing Bodies
ADP	Abiotic Depletion Potential
ADR	Average Dissipation Rate
BEV	Battery Electric Vehicle
BOM	Bill of materials
CED	Cumulative Energy Demand
DQR	Data Quality Rating
EACs	Energy Attribute Certificates
EDP	Environmental Dissipation Potential
EoL	End-of-life
GWP	Global Warming Potential
HDV	Heavy-Duty Vehicle
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LCA	Environmental LCA
LCI	Life Cycle Inventory
LDV	Light-Duty Vehicle
LCIA	Life Cycle Impact Assessment
OEM	Original Equipment Manufacturer
PCF	Product Carbon Footprint
RW correction factor	Real World correction factor
S-LCA	Social LCA
TSLCA	TranSensus-LCA
ZEV	Zero Emission Vehicle

I. Introduction

The Deliverable 2.4 deals with testing the methodological choices made by TranSensus-LCA regarding applicability and feasibility. The content of this deliverable builds on the results of Task 2.6. In the original proposal, it was planned to also include Interpretation and Decision making in the Deliverable 2.4. However, due to consistency reasons, it was decided to move this content to D2.3, which is why aspects of Interpretation and Decision making is not included in this document. For this, please refer to D2.3 chapter IV (Life Cycle Interpretation) and the subchapter IV.2 (Integration into the product development process with Prospective LCA).

In the Task 2.6, the development of methodological choices is supported by testing the applicability and feasibility in parallel to the voting sessions to be able to directly give feedback. Although all methodological choices are evaluated by the project's industry partners, the focus of the task is on sensitive issues with potential disagreements to support the voting preparations. The methodological choices that are put up for voting as well as the respective voting results serve as a basis for this task.

The objectives of this deliverable are:

- Providing an overview of the Task 2.6 structure and testing approach.
- Describing the applicability and feasibility testing method.
- Showing the applicability and feasibility testing results.
- Summarising Task 2.6 support on sensitive issues.

II. Structure and timeline of Task 2.6

The official kick-off for T2.6 was during the TranSensus-LCA General Assembly Meeting in Darmstadt on 30th and 31st January 2024. During a dedicated workshop, the general structure of T2.6 was defined, and possible test cases were brainstormed.

Further, the distinction between T2.6 and WP3 (T3.3: Road testing) was evaluated. T2.6 is focusing on supporting the voting and methodological choices in parallel to the methodology development and the voting sessions, while T3.3 is building on the insights from T2.6 and applying the full methodology (based on Deliverable 2.3) on a zero emission vehicle LCA, once all methodological choices are made. The testing of the full methodology in T3.3 also covers testing the methodological choices regarding S-LCA in an extensive case study, which is why S-LCA testing is excluded from this report.

In Figure 1, the structure and timeline of T2.6 can be found. Engagement with other WPs, especially WP3, took place but are not shown here.

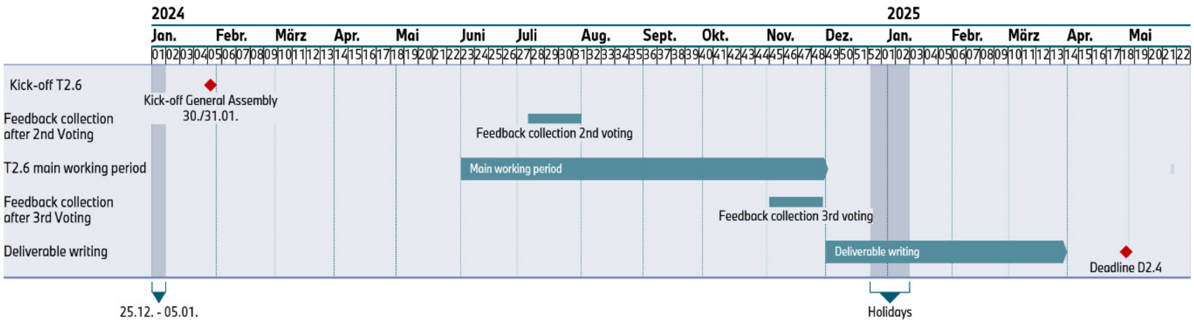

Figure 1. Timeline of T2.6 including main working period and deliverable writing

The main working period of T2.6 was between June 2024 and December 2024 with 1h biweekly meetings and additional meetings on dedicated topics when needed.

One challenge for T2.6 was on the one hand following all ongoing methodological discussions to support the voting preparations and on the other hand having first methodological choices to be able to start testing. After the second voting round end of March 2024, this situation changed and the results of the second voting round could be used to start a structured applicability and feasibility testing approach with two feedback loops: one feedback loop based on the results of the second voting and another feedback loop based on the results of the third voting end of September 2024.

III. Applicability and feasibility testing approach

The applicability and feasibility testing started with the methodological choices based on the second voting results. For a structured applicability and feasibility testing approach, a list of all questions for the first and second voting including the voting results was used as a basis, as it gives a good overview of all topics covered so far. Starting from this extensive list with all topics, the applicability and feasibility testing approach is as follows:

1) Selection and ranking of all relevant topics for testing.
2) Feedback collection and scoring of industry partners for all relevant topics on feasibility and applicability in two loops:
   a. Based on the methodological choices of the second voting
   b. Based on the methodological choices of the third voting
3) Focus on “sensitive issues” that need further deep dive, partly resulting from 2) and partly already known from other subtasks in order to support the third voting.

The input collection of industry partners on applicability and feasibility of all relevant topics (2) was running in parallel to the focus on “sensitive issues” (3) with dedicated meetings.

In Figure 2, the applicability and feasibility testing approach is illustrated for better understanding.

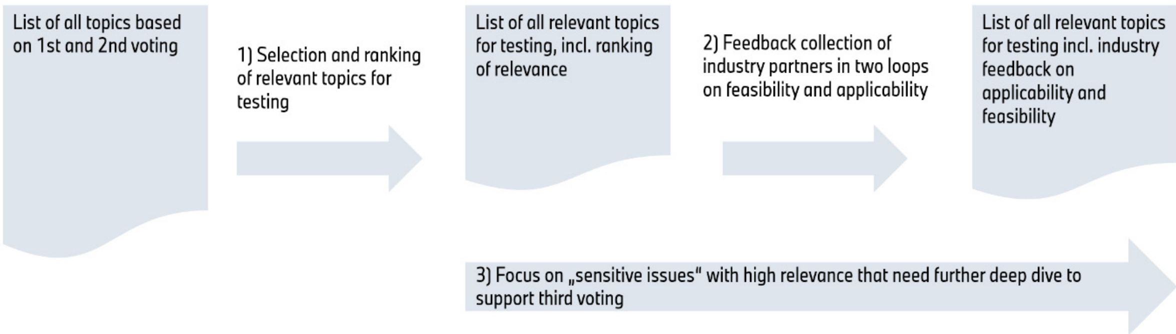

Figure 2. Applicability and feasibility testing approach

IV. Applicability and feasibility testing criteria

In the first step for the selection of relevant topics for testing, the extensive list with all topics covered was filtered based on testing relevance. A first pre-selection of relevant topics for testing was done by T2.6 task leaders with a drop-down option to either select “yes” relevant for testing or “no”, not relevant for testing for each topic in the extensive list. Together with the pre-selection of relevant topics for testing, the topics that were selected as relevant were ranked according to their importance for testing. This ranking of importance for testing was done based on the following criteria:

Table 1: Criteria used for ranking the importance for testing

Criteria	Score	Definition
Ranking of importance for testing	1	High importance
	2	Medium importance
	3	Low importance

The extensive list with the pre-selection of relevant topics for testing and ranking of importance was circulated among all industry partners in order to be able to give feedback on testing relevance and ranking as well as adjust the pre-selection. The selection and ranking of topics for testing was also discussed in the T2.6 meetings with participating industry partners with a joint decision. Out of the total number of specific requirements (143 methodological specific requirements, out of which 58 being mandatory), 47 were identified as relevant for testing, with the following distribution in the different life cycle assessment phases: 3 in Goal and Scope, 19 in Inventory analysis, 12 in Impact assessment and 13 in Interpretation.

In the second step, all industry partners were asked to provide feedback on applicability and feasibility for all the topics that were selected as being relevant for testing. Applicability and feasibility were evaluated based on two aspects: data availability and time effort for implementation. Both aspects were evaluated independent from each other. The following criteria was used for the evaluation [Haslinger *et al.*, 2024]:

Table 2: Criteria used in WP 3.3 taken from WP 2.6.

Criteria	Score	Definition
Data availability	3	access to supplier specific data
	2	access to data from databases
	1	no access to data from supplier/databases, however data can be collected from other sources with reasonable time effort
	0	no information available and/or too time intensive collection phase
Time effort for implementation	3	No additional time effort for implementation
	2	Minimal additional time effort for implementation
	1	Substantial additional time effort for implementation
	0	Too time intensive for implementation

After the third voting round, the extensive list of all topics covered was updated based on the results of the third voting round. Industry partners were then asked to give feedback again also using the same criteria as explained above. This way, all methodological choices were evaluated by industry partners, in two feedback loops.

V. Results

In this chapter, the results of the applicability and feasibility testing are displayed, sorted along the life cycle stages. For every topic, the feedback of industry partners is averaged, and the essential comments are extracted.

V.1 Goal and Scope

For the methodological choices regarding Goal and Scope, the following feedback was collected from industry partners, as shown in Table 3. For this life cycle stage, three subtopics were identified as relevant topics for testing. The first subtopic deals with the service life of vehicles in years. The industry feedback shows an average score for data availability of 2.0 (access to data from databases) and an average score for time effort for implementation of 3.0 (no additional time effort for implementation).

The second subtopic deals with the cut-off hierarchical process. The average data availability score is 1.2, whereas the average score for time effort for implementation is 0.8, which means that some industry partners stated 'substantial additional time effort' or 'too time intensive for implementation'. The comments reveal that in case of cut-off, the threshold of 3% based on mass and energy of the flows is questioned. The comments question the practical implementation of this methodological choice. This is why this aspect was submitted to the steering committee, see chapter V.1.1.

The last subtopic is the default process in-/exclusions. The average data availability score is 1.4 and the average score for time effort for implementation is 1.0 (substantial additional time effort). The comments reveal that there is general applicability, except for the non-exhaust emissions from tires and brakes. For this aspect, methodology and data is lacking.

Table 3: Relevant subtopics for testing of the life cycle stage Goal and Scope including feedback from industry partners

Topic	Subtopic	Complete question (Numbering based on 2nd voting)	Complete choice	Ranking of importance for testing	Data availability	Time effort for implementation	Essential Comments
Functional unit	Service life of vehicle in years	Q3: TranSensus LCA proposes default values for lifetime in years	Passenger cars= 15, LCV= 15, HDV/ urban busses= 13, HDV/ Trucks= 16, HDV/ coaches= 15 motorcycles= 25, mopeds= 21	3	2	3	-
System boundary	Cut-off hierarchical process	Q10a: For the cut-off of flows, WP2 pre-recommends following hierarchical process	No intentional cut-off of flows should be done. In case, cut-off is needed, thresholds based on 3% of mass and energy of the flows.	2	1.2	0.8	No intentional cut-off. How to remove 3% of mass, energy, etc. on which criteria, of which process? Not done yet…
System boundary	Default process in-/exclusions	Q10d: For including/ excluding processes from the system boundary, WP2 recommends the following for frequently raised discussion points in LCAs.	**Exclude:** Development, administration, marketing expenses; Employee commuting; Capital goods - infrastructure and equipment; Charging station // **Include:** Infrastructure for electricity and hydrogen generation; Auxiliary materials for production; Maintenance: consumables + wear parts; Non-exhaust emissions from tires and brakes; Charging cable	1	1.4	1.0	In general applicable, except for the non-exhaust emissions from tires and brakes. No data and methodology available.

V.1.1 Cut-off approach

The industry feedback on the cut-off hierarchical process reveals low scores, especially for the time effort for implementation (0.8). The comments show that industry partners question the threshold of 3% based on mass and energy of the flows in case of cut-off. This is why in the T2.6 meetings it was decided to submit this topic to the steering committee with the aim of improving the practical implementation of this methodological choice. The T2.6 alternative suggestion is using the threshold of 3% of the environmental impacts in all mandatory impact categories (all life cycle stages) in case a cut-off is needed.

In the steering committee, this alternative was put up for voting and reached the necessary majority to be adopted. The change was accordingly incorporated in the methodology (Deliverable D2.3).

V.2 Inventory analysis

For the methodological choices regarding Inventory analysis, the following feedback was collected from industry partners, as shown in Table 4. In total, 19 subtopics were identified as relevant for testing within this life cycle stage. The first subtopic deals with minimum data requirements for Level 3 LCA. OEMs shall choose vehicle parts that cause in total a minimum of 20% of the production stage GWP in addition to the battery system and model it with company specific data for at least their tier 1 suppliers. The industry feedback on this requirement is that this is an ambitious requirement as the battery is not included and primary data collection is currently very limited. This is also reflected in the low scores for data availability with 0.6 and time effort for implementation with 0.8. This is why T2.6 suggests a transition period for this aspect, as the share of company specific data is expected to increase in the future with initiatives like Catena-X. This requirement has further been modified according to the finding of WP 3.3 (see D3.3).

The second subtopic deals with the energy consumption to be used as standard scenario. Here, TranSensus-LCA mandates using the regulatory protocol for vehicle consumption reporting by authorities (WLTP for LDV's) with a 'real-world' (RW) correction factor. A sensitivity analysis is also mandated on the energy consumption. The industry feedback is a score of 2.0 for data availability and time effort for implementation. The comments show that in case a RW correction factor is given, it can easily be applied.

The third subtopic covers the adjustment factor for 'real-world' operational energy consumption of light duty vehicles. TranSensus-LCA proposes a priorisation to determine the appropriate RW adjustment factor. For this priorisation, the industry feedback is a score of 1.0 for both, data availability and time effort for implementation. In the comments it is stated that default values provided for European applications are not yet available, which explains the low scores. However, the values provided by JRC can be applied.

The next two subtopics deal with the non-exhaust emissions during the use phase. While the feedback regarding non-exhaust emissions from tires and brakes is already covered in the Goal and Scope, the inclusion of hydrogen leakage was added as a requirement in the third voting. For this aspect, the industry feedback is a score of 0.0 for data availability and a score of 3.0 for time effort for implementation. According to the comments, no official data is available for hydrogen leakage, which explains the score for data availability.

The next aspect deals with the fuel cell degradation factor. For this subtopic, not enough industry partners gave feedback, as there is not enough experience with fuel cell electric vehicles among the industry partners. The question raised in the comments, whether the numbers provided in the hierarchy (3.) are reasonable / representative, could not be tested.

The next subtopic deals with maintenance, wear and consumables. Here, the industry feedback is a score of 2.0 for data availability and a score of 1.5 for time effort for implementation with no comments signaling difficulties with adhering to the defined requirements for maintenance.

Further, the subtopic regarding data quality rating (DQR) is addressed. For this aspect, the industry feedback is a score of 1.0 for data availability and a score of 0.5 for time effort for implementation. The comments reveal general availability for secondary data, however, the extraction of the DQR is time-consuming. The evaluation for primary data requires even further effort.

The next 8 subtopics all deal with electricity modelling, starting with the highly debated subtopic of production phase electricity consumption modelling method (marked-based vs. location-based electricity modelling). Within the T2.6 meetings, it was decided to give this aspect a special focus to support the voting preparations and the consensus building. The outcome is a dedicated document on “electricity modelling industry approach” that contributed to the third voting on this aspect, see chapter V.2.1.

The next subtopic regarding electricity modelling deals with the on-site electricity production modelling. The industry feedback is a score of 1.5 for data availability and a score of 0.5 for time effort for implementation. One remark is that not every machine in the production line is modelled separately, which explains the low score for time effort for implementation.

The next four subtopics all cover additional specifications for market-based electricity approaches. The first three of them all received very similar industry feedback. The first refers to the additionality criteria (option 1: recent installations < 15 years or important retrofit; option 2: repowering < 5 years). The second concerns the production/consumption physical link and the third deals with a production/consumption time synchronization with the following hierarchy: 1. hourly; 2. monthly; 3. yearly. For all three additional specifications for market-based electricity consumption, the industry feedback distinguishes between electricity consumption for own production and electricity consumption within the supply chain. For the own production, the score is 2.0 for data availability and time effort for implementation. For the supply chain, however, the score is 0.0 for both. The comments reveal that there is uncertainty on whether the information is available for all used/ needed certificates, especially in the supply chain. For the supply chain the requirement has to be agreed with suppliers and cannot be proven for each.

The fourth additional specification for market-based electricity modelling covers the following hierarchy for the residual mixes that are used: 1. residual mixes characteristics prescribed by coordinating entities; 2. national mixes from which all the renewable production (wind power, photovoltaic and biomass energy) as well as nuclear electricity production has been taken out. For this subtopic the industry feedback shows a score of 2.0 for data availability and a score of 1.0 for time effort for implementation. The comments state that as long as there are nearly no datasets for materials with residual mixes, it is too time-consuming to model everything.

The next two subtopics deal with use phase electricity modelling. The first subtopic defines a hierarchy: 1. modelling dynamic future energy scenarios; 2. use a static modelling approach. Here, the industry feedback is a score of 2.0 for both, data availability and time effort for implementation with no specific comments.

The second subtopic covers the methodological approach for the dynamic future electricity grid mix. For this aspect, the industry feedback is a score of 2.0 for data availability and a score of 1.5 for time effort for implementation. The comments reveal a one-time effort to model future energy scenarios. Further, necessary data from IEA is available, however, the extended dataset needs to be bought for full breakdown of renewables.

The last three subtopics in the life cycle stage Inventory cover multifunctionality aspects. The first deals with the general hierarchy for multifunctionality: 1. Subdivision; 2. System expansion; 3. Substitution; 4. Allocation. The industry feedback on the multifunctionality hierarchy is a score of 0.8 for data availability and a score of 2.0 for time effort for implementation. A reoccurring remark from the industry partners is that possible multifunctionality issues are dealt within the secondary datasets which are blackbox datasets and often cannot be adjusted.

The second subtopic for multifunctionality aspects covers the allocation of credits and burdens between successive systems, where cut-off was voted for in the second voting round. For the cut-off approach in the EoL phase, the industry feedback is 2.3 for data availability and 2.8 for time effort for implementation. The comments reveal that cut-off is already widely used in industry with no concerns regarding applicability.

The last subtopic for multifunctionality aspects is the approach on how to handle multifunctionality in the EoL stage: model EoL until sufficient sorting leads to distinct waste streams. For this aspect, the industry feedback is a score of 2.0 for data availability and a score of 2.5 for time effort for implementation with no specific comments or concerns regarding applicability.

Table 4: Relevant subtopics for testing of the life cycle stage Inventory analysis including feedback from industry partners

Topic	Subtopic	Complete question (Numbering based on 2nd voting)	Complete choice	Ranking of importance for testing	Data availability	Time effort for implementation	Essential Comments
Data	Minimum data requirements for Level 3 LCA	Q23: TranSensus LCA recommends making the above minimum cradle-to-gate data requirements mandatory to reach Level 3 for a BEV Light-Duty Vehicle and Heavy-Duty Vehicle product LCA.	OEMs shall choose vehicle parts that cause in total a minimum of 20% of the production stage GWP in addition to the battery system and model with **company specific data** for at least their tier 1 suppliers.	1	0.6	0.8	Primary data collection is currently very limited. However, this will change in the future (Battery regulation, CatenaX, etc.). Tough requirement since battery cells are not included.
Data	Which energy consumption to use as standard scenario for LDV?	Q24: TranSensus LCA recommends using the regulatory protocol for fleet reporting by authorities (WLTP for LDV's) [e.g. kWh/100km] as standard scenario and the regulatory cycle x RW correction factor for sensitivity analysis.		2	2.0	2.0	If the real world correction factor is just one number it can be easily added for a scenario.
Data	(Energy consumption) subquestion 1: Realword emission factor	Q28: Where an adjustment factor is applied to account for 'real-world' (RW) operational energy consumption of light duty vehicles (either in the default assessment, or in sensitivity analyses), the above prioritisation	Proposed prioritisation: 1. OEM specific average data; 2. Default values provided for European application as part of i) the LCA methodology for the LDV CO 2 regulations, or ii) the UNECE A-LCA	3	1.0	1.0	Applicable for given RW factors (e.g. from JRC). Data for 2. not available yet.

		methodology should be applied to determine the appropriate RW Adjustment Factor(s) to apply, depending on the available data.	methodology; 3. default values based on EC JRC's 2018 analysis				
Data	Non-exhaust emissions during the use phase	Q25: How should TranSensus LCA address non-exhaust emission during the use phase?	Option 1: Non-exhaust PM emissions from tyre and brake wear are included. No other non-exhaust emissions covered; Option 2: Include tire and brake wear, as well as others (e.g. potentially hydrogen, refrigerant leakage, etc.) on a list to be provided by TranSensus LCA for BEV/FCEV and LDV/HDV each.	1	0.0	0.5	Only if methodology is available
Data	Non-exhaust emissions (hydrogen leakage)	Q30: When utilising hydrogen supply mix in modelling the use-phase of ZEVs, the above methodological approach is proposed to estimate hydrogen leakage across the lifecycle	1. use official governmental estimates; 2. estimated H2 supply chain emission rates based on provided table	2	0.0	3.0	No official data available
Data	(Energy consumption) subquestion 2: Fuel cell degradation	Q29: To account for degradation in the efficiency of fuel cells over the operational life of the vehicle (for all vehicle categories), the above methodology shall be applied for FCEVs/FC-REEVs to determine the Degradation Factor, depending on the available data.	Proposed prioritisation: 1. OEM / supplier specific operational fuel cell efficiency loss; 2. OEM / supplier specific data on fuel cell life and average operational power level; 3. operational life of 6000/24000h (for LDVs/HDVs), an efficiency of 55%/52% (at the start of the fuel cell life for LDVs/HDVs)	2	n/a	n/a	Are the numbers provided in the hierarchy (3.) reasonable / representative?

			with efficiency loss of 10% over the life of the fuel cell and running at an average of 25%/25% (LDVs/HDVs) of the peak power rating.				
Data	Maintenance, wear and consumables	Q32: Do you agree with this proposed way of accounting for maintenance, wear and consumables during the use phase?	Mandatory: Adblue, Refridgerants, Tires, Starter Battery, Brake Pads, Traction Battery, Fuel Cell Stack, Auxiliary Battery	2	2.0	1.5	
Data	Data Quality Rating (DQR)	Q33: Do you agree with this proposed approach for data quality rating (DQR)?	not mandate a specific way; apply the same method used in the background database	3	1.0	0.5	Available for secondary data, but time-consuming to extract; evaluation for primary data requires further effort
Electricity modelling	Production phase electricity consumption modelling method	Q10: When performing a Product LCA, TranSensus LCA proposes using the above decision tree for the Product LCA production phase electricity consumption modelling	1. No EACs, then location-based approach; 2. EACs and data (residual sec. data..), then 100% market-based; 3. EACs but no data (residual sec. data..), then mixed with location-based sec. data	1	2.0	3.0	Evaluation provided in separate chapter V.2.1.
Electricity modelling	On-site electricity production modelling for Product LCA	Q18: When performing a Product LCA, in the case of on-site produced electricity, with no contractual instruments sold to a third party, that is partly or entirely consumed during the production phase, TranSensus LCA proposes above approach.	energy producing system be within the boundaries (inventory included and prorated to the time and quantity of the electricity really consumed); Proof on a i) hourly or ii) yearly basis	2	1.5	0.5	We do not model every machine in the production line separately. Difficult to apply.

Electricity modelling	Production phase electricity consumption modelling - Additional specifications for market-based electricity modelling approaches	Q11: When performing a Product LCA, TranSensus LCA proposes that, in case a market-based electricity modelling option is chosen for the production phase, the following criteria related to **additionality** be used for all considered Energy Attribute Certificates (EAC)	Option 1: recent installations < 15 years or important retrofit; Option 2: repowering < 5 years	1	For own production: 2.0 For supply chain: 0.0	For own production: 2.0 For supply chain: 0.0	Information available on certificates? Possible to check for all used/needed certificates? AIB has to provide data.
Electricity modelling	Production phase electricity consumption modelling - Additional specifications for the market-based electricity modelling approach	Q12: When performing a Product LCA, TranSensus LCA proposes that, in case a market-based electricity modelling option is chosen for the production phase, the following criteria related to a production/consumption **physical link** be used for all considered Energy Attribute Certificates (EAC):	The attribute tracking instrument shall refer to an electricity production asset located in the same regional market (within which a physical synchronous interconnection can be proven) in which the product production phase electricity-consuming operations are located.	1	For own production: 2.0 For supply chain: 0.0	For own production: 2.0 For supply chain: 0.0	Information available on certificates / via certification system? Possible to check for all used/needed certificates? AIB has to provide data.
Electricity modelling	Production phase electricity consumption modelling - Additional specifications for the market-based electricity modelling approach	Q13: When performing a Product LCA, TranSensus LCA proposes that, in case a market-based electricity modelling option is chosen for the production phase, the above hierarchy related to a production/consumption **time synchronization** be used for all considered Energy Attribute Certificates (EAC)	Hierarchy: 1. hourly; 2. monthly; 3. yearly	3	For own production: 2.0 For supply chain: 0.0	For own production: 2.0 For supply chain: 0.0	For internal electricity consumption: general "statement" from electricity purchase dep. enough? For supply chain: requirement has to be agreed with suppliers, but cannot be proven for each.

Electricity modelling	Production phase electricity consumption modelling - Additional specifications for the market-based electricity modelling approach	Q16: When performing a Product LCA, TranSensus LCA proposes that, in case a market-based electricity modelling option is chosen for the production phase,..., the **residual mixes** that are used within the chosen market-based approach be modelled according to the above hierarchy	Hierarchy: 1. residual mixes characteristics prescribed by co-ordinating entities; 2. national mixes from which all the renewable production (wind power, photovoltaic and biomass energy) as well as nuclear electricity production has been taken out	2	2.0	1.0	As long as there are nearly no datasets for materials with residual mix, it is too time-consuming to model everything.
Electricity modelling	Use phase	Q8: TransensusLCA recommends previous approach to model the electricity input to the use phase of ZEVs	SHALL: modelling dynamic future energy scenarios; MAY: use static modelling	1	2.0	2.0	
Electricity modelling	Use phase electricity consumption modelling	Q17: When performing a Product LCA, and modelling the use-phase of ZEVs using a **dynamic future electricity grid mix** (as the default case or in scenario analysis), the above methodological approach is proposed. This includes the approach that shall be followed in prioritising data sources/the basis for the default conservative future electricity mix projection to be used.		1	2.0	1.5	One-time effort to model future energy scenarios. IEA data is available but need to buy extended dataset for full breakdown of renewables.
Multi-functionality	The General Hierarchy for multifunctionality	Q19: TranSensus LCA recommends the above hierarchy to deal with Multifunctionality in environmental LCA	1. Subdivision; 2. System expansion; 3. Substitution; 4. Allocation	1	0.8	2.0	Possible multifunctionality issues are dealt within the secondary datasets which are

							blackbox datasets. Factor of 4 can be tested.
Multi-function-ality	Multifucntion-ality in the EoL	Q21: Which approach do we use to deal with Multifunctionality in the EoL stage (allocation of credits and burdens between successive systems)?	Option 1: CFF (PEF) Option 2: Cut-off approach	3	2.3	2.8	Cut-off already used.
Multi-function-ality	EoL	Q25: Do you agree with the following approach to handle multi-functionality in the EoL stage?	Model EoL until sufficient sorting leads to distinct waste streams (incl. transport). Namely, collection, pretreatment, dismantling and shredding.	3	2.0	2.5	

V.2.1 Production phase electricity modelling method

As already stated, it was decided within the T2.6 meetings to give this highly debated aspect a special focus to support the voting preparations and the consensus building. To do so, dedicated meetings with all industry partners were set up to discuss both electricity modelling approaches, marked-based and location-based approach. The outcome is a dedicated document on "electricity modelling industry approach" that contributed to the third voting on this aspect. That way, based on the work of T2.6 an applicable approach from industry point of view was proposed for the third voting (mixed-approach). In the following, key insights are summarized from this document and the proposed approach is described.

It was concluded that both approaches have limitations and merits. However, it is crucial to be consistent in the modelling approach to avoid double counting the renewable energy generation and accurately represent environmental impact of the product. The market-based approach without any safeguard criterion does not accurately represent the environmental impact of the products. However, it allows companies/actors to take action and show willingness to improve the environmental impact of the products.

On the other hand, location-based approach on a system level is easy to implement but imposes some limitations on actors to take action to improve the product environmental impacts.

Market-based approach

Associated concerns with market-based approach are the following:

- There is a large number of EAC tracking systems (e.g. RECs (US, Canada), GoOs (Europe), GECCs (China), iRECs (Global)) with different methodological requirements, e.g. regarding different criterion for allocation of EAC to location or time expiry.
- Most life cycle inventory (LCI) datasets in common LCA databases include location-based electricity mixes. Using these LCI datasets in combination with market-based electricity accounting, for production sites within the same electricity market, leads to double counting of electricity from specific sources, such as renewable energy, in LCAs. [Holzapfel *et.al.*, 2024]
- Potential disconnection between sourcing of EACs in location and time: geographical disconnection can be solved by defining safeguards for the use of EACs; Time disconnection can be solved by a more precise tracking of renewable electricity production.

Location-based approach

Associated concerns with location-based approach are the following:

- Definition of location boundary: There are strong regional differences irrespective of the criteria for defining location. For example, if a country or continent is defined as a geographic boundary there are cases where energy mix varies vastly within some geographic boundaries. An ideal solution would be to define dynamic location boundary based on the congestion zones. However, this is not possible in the current energy market.

- It is not possible to reduce electricity-related emissions via the active acquisition of electricity from specific energy sources, such as fossil-free energy.
- Potential time disconnection: electricity datasets refer to past electricity production that is used for present electricity consumption.
- Secondary datasets used in the modelling of LCAs are compiled using location-based consumption mixes, but depending on the source of data these mixes can be referenced to different years or regions. E.g. datasets from associations such as Worldsteel or PlasticsEurope are mostly not updated yearly and not available for every region. If emission factors with different temporal and spatial resolutions are permitted, an accounting system among the different electricity mix resolutions is necessary, in order to avoid double counting. [Holzapfel *et.al.*, 2023]

Current practice

With regard to the applicable electricity mix, the GHG Protocol allows the market-based and the location-based electricity method. If contractual instruments are available, market-based emission factors shall be calculated according to these contractual instruments. If no such contractual instruments are acquired, market-based emissions shall be calculated using a residual electricity mix. Residual means that all electricity attributes that have been claimed via certificates, and other contractual agreements shall be removed from the consumption electricity grid mix. If a residual electricity mix is not available, location-based emission factors may be used.

Recommended approach

As a result based on feasible and current practices today, a hybrid approach is recommended in addition to pure location-based or pure marked-based approach. This hybrid approach tries to address some of the concerns associated with both approaches and names safeguards for using the market-based approach. The following wording was suggested for the third voting on the mixed-method approach: "Using the available location-based production processes in the databases as generic default while being able to use (market-based) specific electricity sources from suppliers or within the OEM’s factories until the secondary databases allow for residual-mix based production phase modelling on a global scale.”

Justification

It is understood that leaving the final choice to the practitioner would mean that there will be a risk of double counting. Since the largest share of environmental impacts originates from the supply chain rather than from electricity consumption during final product manufacturing, the amount of double counting might be rather low. Nonetheless, there is a strong push towards increasing the primary data share in LCAs through initiatives like Catena-X. Thus, sourcing and environmental accounting of electricity from fossil-free energy along the supply chain might gain in relevance. Consequently, consistent residual mix application, in order to avoid double counting, is likely to gain importance. [Holzapfel *et.al.*, 2023]

It is expected that LCA database providers will continue to implement residual grid mixes within LCI datasets. So far, residual grid mixes are commonly available for European countries. In the future, we expect an expansion to other geographical regions as well as an inclusion of more aggregated secondary datasets for materials modelled with residual grid mixes, as there are already some datasets available e.g. for steel within MLC (Sphera). However, there are still some challenges regarding data availability and definition of covered scopes for the datasets. [Holzapfel *et.al.*, 2024]

Outlook

It is expected that the sustainability requirements on EACs will increase in the next 5-10 years. Additional criteria may include requirements on renewable energy, additionality, shorter expiration of EACs (e.g. 24/7 matching) and stricter definitions of electricity markets. Therefore, it is suggested to continuously assess the feasible solutions and develop the safeguards needed accordingly.

V.3 Impact assessment

For the Impact assessment life cycle stage, in total 12 methodological choices were identified as relevant for testing. The methodological choices as well as the industry feedback can be found in Table 5. The first subtopic deals with the comparison of different databases regarding TranSensus-LCA compliant secondary data. The industry feedback on this aspect is a score of 0.0 for both, data availability and time effort for implementation. The comments reveal that this is not realistic due to a lot of integration to other systems and too time and resource consuming.

The second subtopic deals with the LCIA method. TranSensus-LCA proposes the use of the last version of EF method (EF3.1) and associated indicators for all TranSensus-LCA mandatory impact categories. The industry feedback on this aspect is a score of 2.5 for data availability and 3.0 for time effort for implementation. No specific comments are provided that would reveal difficulties in the application.

The next 8 subtopics cover mandatory impact categories. The first mandatory impact category is climate change, with a score of 2.8 for data availability and 3.0 for time effort for implementation. No specific comments are provided. The following four mandatory impact categories, namely Photochemical ozone formation, Acidification, Freshwater & Marine eutrophication and Particulate matter, show very similar results. All four receive a score of 2.5 for data availability and a score of 3.0 for time effort for implementation. In the comments it is stated that they are all available in LCA software, however, primary datasets cannot be used, as those are usually PCF not LCA.

For the following two mandatory impact categories, CED as well as Depletion and Dissipation, the applicability and feasibility scoring show for both impact categories a score of 2.0 for data availability, while the score for time effort for implementation is 3.0. In the comments it was stated that ADP is easy to implement, as it is integrated in LCA software. ADR and EDP, however, are currently not implemented in LCA software, which makes the application challenging.

The last mandatory impact category is cumulative H2 emissions. TranSensus-LCA proposes to include a mandatory hydrogen (H2) emission flow indicator, and to include a sensitivity including hydrogen emission greenhouse gas impacts for LCAs of hydrogen fuelled ZEVs, until a formalised GWP is available according to IPCC/within the EF method. For this requirement, the industry feedback is a score of 1.0 for both, data availability and time effort for implementation. According to the comments, literature data is only available for H2 leakage, which makes this requirement difficult to implement.

Further, the next subtopic deals with the criticality inclusion. Here, TranSensus-LCA recommends using the GeoPolRisk method. The industry feedback on this aspect is a score of 0.0 for data availability and a score of 0.3 for time effort for implementation. The comments show that within industry, there is little experience with the GeoPolRisk method, and more guidance would be needed.

For the inclusion of a normalisation factor, the results are similar. TranSensus-LCA recommends using the Global Planetary Boundary based normalization factors. The industry feedback is a score of 0.5 for data availability and a score of 1.0 for time effort for implementation. In the comments it is questioned whether the normalisation can be done within existing software, and it is also stated that there is little experience yet.

Table 5: Relevant subtopics for testing of the life cycle stage Impact assessment including feedback from industry partners

Topic	Subtopic	Complete question (Numbering based on 2nd voting)	Ranking of importance for testing	Data availability	Time effort for implementation	Essential Comments
Comparison of Software's	Differences in LCIA Calculation	Q31: In Deliverable 2.3, LCA for Experts (LCA FE; formerly known as GaBi) and SimaPro will be compared since they are the most commonly used ones, but recommendation to use a particular software will not be made in TranSensus.	3	0.0	0.0	Not realistic to apply different Software for OEMs due to a lot of integration to other systems and too time and resource consuming.
Mandatory Impact categories	LCIA Method	Q35: TranSensus LCA proposes the use of the last version of EF method (EF3.1) and associated indicators for all TranSensus LCA mandatory impact categories.	2	2.5	3.0	
Mandatory Impact Categories	Climate Change	Q32: TransensusLCA recommends including the impact "Climate Change" in the mandatory list of TranSensus-LCA impact categories.	3	2.8	3.0	
Mandatory Impact Categories	Photochemical ozone formation	Q35: TransensusLCA recommends including photochemical ozone formation in the mandatory list of TranSensus-LCA impact categories.	3	2.5	3.0	Available in LCA software. Only challenge is we cannot use primary datasets as those are usually PCF and not LCA.
Mandatory Impact Categories	Acidification	Q38: TransensusLCA recommends including acidification in the mandatory list of TranSensus-LCA impact categories.	3	2.5	3.0	Available in LCA software. Only challenge is we cannot use primary datasets as those are usually PCF and not LCA.
Mandatory Impact Categories	Freshwater & Marine eutrophication	Q39: TransensusLCA recommends including freshwater eutrophication and exclude marine eutrophication in the mandatory list of TranSensus-LCA impact categories.	3	2.5	3.0	Available in LCA software. Only challenge is we cannot use primary datasets as those are usually PCF and not LCA.

Mandatory Impact Categories	Particulate matter	Q40: TransensusLCA recommends including particulate matter in the mandatory list of TranSensus-LCA impact categories.	3	2.5	3.0	Available in LCA software. Only challenge is we cannot use primary datasets as those are usually PCF and not LCA.
Mandatory Impact categories	CED	Q34: TranSensus LCA proposes CED to be part of the mandatory list of TranSensus LCA impact categories including the split of renewable and non-renewable CED. TranSensus LCA proposes using CED with the method based on the energy-harvested approach.	3	2.0	3.0	
Mandatory Impact categories	Depletion and Dissipation	Q36: TranSensus LCA proposes including depletion of abiotic resources in the mandatory list and dissipation in the optional list of TranSensus LCA impact categories.	3	2.0	3.0	ADP: Okay, as integrated in LCA software. Optional ADR & EDP: Not okay, as no data available, no method implemented.
Mandatory Impact categories	Cumulative H2 emissions	Q37: TranSensus LCA proposes to include a mandatory hydrogen (H2) emission flow indicator, and to include a sensitivity including hydrogen emission greenhouse gas impacts for LCAs of hydrogen fuelled ZEVs, until a formalised GWP is available according to IPCC/within the EF method.	2	1.0	1.0	Literature data only for H2 leakage - incomplete data.
Non-restrictive set	Criticality inclusion	Q38: WP2 pre-recommends to include in the non restrictive set of relevant Impact categories, category indicators, LCIA methods: Criticality: ...We recommend using the GeoPolRisk method ...; when the characterization factors will be provided by the ORIENTING project.	3	0.0	0.3	Guideline available? Unknown as no experience with it yet.

Normalisa-tion	Normalisation Factor	Q29: TransensusLCA recommends to use Global Planetary Boundary based normalization factors.	3	0.5	1.0	Is it possible to do normaliza-tion acc. to TranS. within exist-ing software? No experience yet.

V.4 Interpretation

For the methodological choices regarding Interpretation, the following feedback is collected from industry partners, as shown in Table 6. In total, 13 subtopics were identified as relevant for testing within this life cycle stage. The first four methodological choices deal with mandatory analysis of parameters. The next eight subtopics cover recommended analysis of parameters, while the last subtopic deals with reporting.

The first subtopic of the mandatory analysis of parameters concerns the consumption in the use phase. If the default is WLTP, then RW correction factor shall be applied as mandatory sensitivity analysis or vice-versa. For this aspect, the industry feedback is a score of 1.4 for data availability and a score of 2.0 for time effort for implementation, with no comments revealing difficulties in the application.

The second subtopic of the mandatory analysis of parameters deals with the quantity value for hotspots. For this aspect, the industry feedback is a score of 1.0 for data availability and a score of 0.3 for time effort for implementation. The comments reveal insights on the low score for time effort. It is stated that manually modifying the BOM and map all datasets again is very time consuming for very little extra knowledge.

The third subtopic of the mandatory analysis of parameters covers the vehicle lifetime for the use phase (low-high lifetime km). The industry feedback is 2.3 for both, data availability and time effort for implementation. According to the comments, defining the low-high lifetime km would be beneficial.

The fourth mandatory analysis of parameters concerns the variation of the consumption energy mix in the use phase. For this aspect, the industry feedback reveals a score of 1.0 for data availability and a score of 2.0 for time effort for implementation. No specific comments are raised that would suggest difficulties in the application.

The first recommended analysis of parameters deals with the choice of secondary data. It is recommended to change one dataset at a time and evaluate the influence on the final result. The industry feedback for this analysis is a score of 2.0 for data availability and a score of 1.2 for time effort for implementation. In the comments it was stated that varying chosen datasets is hard to justify, as the most representative dataset is chosen and there is no reason to investigate a case where it is done differently.

The second recommended analysis of parameters covers varying the location of the electricity mix for the value chain. For this aspect, the industry feedback is a 2.0 for data availability and a 1.3 for time effort for implementation. In the comments it is highlighted that this can be a useful analysis for a prospective LCA or explorative LCA. There is no need to model something for the product that is not true.

The third recommended analysis of parameters concerns supply chain improvements, namely recycled vs. primary materials. The industry feedback is a score of 2.3 for data availability and a 1.8 for time effort for implementation, with comments stating that this is straight forward using different available datasets.

The next recommended analysis deals with maintenance and wearing during the use phase. It is recommended to analyze a low and a high wearing and maintenance requirements scenario. The industry feedback for this aspect is a score of 1.0 for data availability and a score of 2.0 for time effort for implementation. The comments highlight that a definition of 'high' and 'low' would be beneficial.

Further, TranSensus-LCA recommends analyzing the effect of varying the payload/number of passengers. Here, the industry feedback is a score of 3.0 for data availability and a score of 2.0 for time effort for implementation. The comments reveal that there is no access to changes in the consumption values with more passengers for LDVs. The vehicle is always approved for a maximum of load-weight (passengers or trailer / payload).

Next, the recommended analysis of parameters covers varying the temperature during the use phase to analyze the effects on energy consumption. For this aspect, the industry feedback is a score of 1.0 for both, data availability and time effort for implementation. The comments state that there is no proven data available that could be used to change parameters.

The second to last recommended analysis of parameters concerns the future electricity / fuel mix for EoL. It is recommended to vary the EoL electricity / fuel mix with a future mix (static or dynamic). The industry feedback is a score of 0.5 for both, data availability and time effort for implementation. The comments highlight that no information regarding location of EoL of vehicle neither electricity / fuel mix is available.

Lastly, TranSensus-LCA recommends analyzing second use for the battery. The industry feedback is a score of 0.5 for both, data availability and time effort for implementation. The comments reveal that this can be a one-time study, however, it is not necessary for every product LCA.

The last subtopic identified as relevant for testing in the life cycle stage Interpretation is the reporting content for product LCA. Here, two different adherence levels are proposed: Adherence level A and B (see Deliverable D2.3 for more details). For Adherence level A, all mandatory requirements from TranSensus-LCA are followed, including those on reporting. For Adherence level B, all mandatory requirements are followed, excluding those on reporting. As part of the testing within T2.6, a minimum info for public reporting was suggested and coordinated among industry partners. The results are incorporated in the Adherence level B as minimum reporting requirements, see also chapter V4.1.

Table 6: Relevant subtopics for testing of the life cycle stage Interpretation including feedback from industry partners

Topic	Subtopic	Complete question (Numbering based on 2nd voting)	Complete choice	Ranking of importance for testing	Data availability	Time effort for implementation	Essential Comments
Mandatory analysis of parameters	Usage: consumption	Q56: TranSensus LCA recommends the above guidelines for the mandatory sensitivity analysis on the usage: consumption.	If default is WLTP, RW as sensitivity, or vice-versa	2	1.4	2.0	If the realworld correction factor is just one number, it can be easily added for a scenario.
Mandatory analysis of parameters	Quantity value (for hotspots)	Q62: TranSensus LCA recommends the above guidelines for the mandatory sensitivity analysis on the quantity value for hotspots.	Certain flows can be excluded from the sensitivity analysis if it is possible to justify that they are fixed (e.g., the BOM for a representative vehicle). sensitivity analysis can be conducted using worst/best cases for the remaining flows based on measurements or data from literature.	2	1.0	0.3	Could be done, however, you would have to manually modify the BOM and map all datasets again... very time consuming for very little extra knowledge.
Mandatory analysis of parameters	Usage: vehicle lifetime	Q58: TranSensus LCA recommends the above guidelines for the mandatory sensitivity analysis on the usage: vehicle lifetime activity.	Considering the typical lifetime activity [in driving distance] for vehicle type (low-high lifetime km)	2	2.3	2.3	To be defined the +/- for sensitivity analysis.
Mandatory analysis of parameters	Usage: Variation of consumption energy mix	Q60: TranSensus LCA recommends the above guidelines for the mandatory scenario analysis on the usage:	At least an alternative scenario where the vehicle operates in a global context, using the global electricity mix;	2	1.0	2.0	

		variation of energy mix consumption.	Scenarios considering vehicle usage in specific countries				
Recommended analysis of parameters	Choice of secondary data	Q64: TranSensus LCA recommends the above guidelines for the sensitivity analysis on the choice of secondary data for the components/materials/flows that are deemed relevant, e.g., leading to hotspots (to be defined)	Changing one dataset at a time and evaluating the influence on the final results (e.g., changing the dataset for the cobalt sulphate used in battery manufacturing and evaluate the influence on the carbon footprint of the EV)	3	2.0	1.2	Hard to justify. We apply most representative datasets. Don't see a reason for investigating a case where we choose differently.
Recommended analysis of parameters	Location of the value chain: electricity mix	Q66: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on the location of the value chain and how it affects the electricity mix.	At a minimum, for the most critical tier-1 processes; potential production locations for the same product (e.g., synthetic graphite supply from China vs. USA). The alternative supply chains are modelled by varying the electricity mix (country-specific) used in key manufacturing processes	3	2.0	1.3	This can be useful for a prospective LCA/ explorative LCA/ Level 1 LCA. There is no need to model something for our product which is not true.
Recommended analysis of parameters	Supply chain improvements: recycled vs. primary materials	Q68: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on process improvements with respect to the use of recycled vs. primary materials.	Low scenario: 0% incorporation of recycled material, high scenario: maximum share of recycled material that is achievable	3	2.3	1.8	Straight forward using different available datasets.
Recommended	Usage: maintenance & wearing	Q70: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on	Low and high wearing and maintenance requirements	3	1.0	2.0	Definition of "high" and "low" requirement needed.

analysis of parameters		maintenance & wearing during usage.					
Recommended analysis of parameters	Usage: payload/number of passengers	Q72: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on the payload/ number of passengers during usage.	LDV: low is 1 passenger and high corresponds to the maximum capacity of the vehicle; HDV: payload range (e.g., 25-100%)	3	3.0	2.0	We (LDV) do not have access to changes in consumption values with more passengers; there is one type approval value and that's it. The vehicle is always approved for a maximum of load-weight (passengers or trailer/ payload).
Recommended analysis of parameters	Usage: temperature	Q74: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on the ambient temperature during usage.	Different annual average temperatures with effects on energy consumption	3	1.0	1.0	No proven data systematically available that could be used to change parameters.
Recommended analysis of parameters	Future mix: EoL electricity/fuel mix	Q76: TranSensus LCA recommends the following guidelines (refer to Supporting document) for the recommended scenario analysis on the EoL electricity/ fuel mix modelled with a future mix (whether static or dynamic).	Same method as for use phase	3	0.5	0.5	No information regarding location of EoL of vehicle neither electricity/ fuel mix (>15 years…).
Recommended analysis of parameters	Second use (split between vehicle and battery?)	Q78: TranSensus LCA recommends the above guidelines for the recommended scenario analysis on the second use.	Several processes including battery collection, battery dismantling to module/cell level, SoH testing, and battery refurbishment	3	0.5	0.5	These can be one-time studies, but it is not necessary for every product LCA.

Reporting	Public reporting content for Produc LCA: Minimum info (Goal and scope)	Q90: Transensus proposes TSLCA users to mandatory publish above information (at least) as applicable when publicly reporting Goal and Scope part of their study			2.0	1.5	

V.4.1 Minimum info for public reporting

As already stated, TranSensus-LCA recommends two different adherence levels for public reporting: Adherence level A (following the full TranSensus-LCA methodology) and Adherence level B (following the TranSensus-LCA methodology, reporting excluded).

The T2.5 subtask on reporting created a full list of all reporting requirements for Adherence level A. This full list was examined and discussed with the industry partners and a minimum info for reporting was suggested as part of T2.6. This suggested shortened list with minimum info for reporting tries to balance confidentiality concerns as well as need-to-know principles on the one hand and public transparency on the other hand.

This shortened list of minimum info for public reporting was incorporated in the D2.3 Deliverable as part of the Adherence level B. The detailed list of all reporting requirements for both, Adherence Level A and B can be found in D2.3, chapter X1.4 (List of all reporting requirements).

VI. Summary and Conclusion

In this Deliverable D2.4, the methodological choices made by TranSensus-LCA are tested regarding applicability and feasibility. The content of this deliverable D2.4 is based on the results of task T2.6. The methodological choices that are put up for voting as well as the respective voting results serve as a basis for this task.

In the Task T2.6, the development of methodological choices is supported by testing the applicability and feasibility in parallel to the voting sessions to be able to directly give feedback. Although all methodological choices are evaluated by the project's industry partners, the focus of the task is on sensitive issues with potential disagreements to support the voting preparations.

While T2.6 focuses on supporting the voting and methodological choices in parallel to the methodology development and the voting sessions, WP3 (T3.3) is building on the insights from T2.6 with applying the full methodology (based on Deliverable D2.3) on a zero emission vehicle LCA, once all methodological choices are made. The testing of the full methodology in T3.3 also covers testing the methodological choices regarding S-LCA in an extensive case study, which is why S-LCA testing is excluded from this report.

This Deliverable D2.4 provides an overview of the task T2.6 structure and testing approach as well as the applicability and feasibility testing method. Further, the testing results are displayed and the support on sensitive issues is described. Out of the total number of specific requirements, 47 were identified as relevant for testing, with the following distribution in the different life cycle assessment phases: 3 in Goal and Scope, 19 in Inventory analysis, 12 in Impact assessment and 13 in Interpretation. Based on the industry feedback on the respective requirements and focusing on the mandatory requirements, Table 7 summarizes the main outcome of T2.6, where methodological content was compiled, changes have been initiated or additional guidance is proposed. In a next step, the complete TranSensus-LCA methodology, including all 143 requirements, will be tested as part of WP3 in T3.3. The results of this road testing will be presented in D3.3.

Table 7: Summary of results from T2.6

Topic	Comment	Compiled / Changed for D2.3	Add Guid-ance	Transition pe-riod needed
Cut-off criteria	Changed from reference mass/energy to environmental significance, see chapter V.1.1.	x		
Minimum data requirements for Level 3 LCA	Transition period needed			x
Non-exhaust emissions (hydrogen leakage)	Guidance needed		x	
Electricity modelling - Location-based vs. Mar-ket-based	100% marked-based approach not feasible (missing data). 100% location based not possible (no accounting for decarbonisation effects). Mixed approach as widely applied in industry is recommended, see chapter V.2.1.	x		
LCIA - Cumulative H2 Emissions	How to calculate and integrate the flow?		x	
Global Planetary Boundary based normalization factors	Is it possible to do normalization acc. to TranSensus LCA within existing software?		x	
Public reporting	Feedback condensed as "minimum info for public report-ing", see chapter V.4.1.	x		

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