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Level(s) compared to European and Norwegian standards for life cycle assessment of buildings

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Abstract. Launched in 2021, the EU Level(s) calculation method for Global Warming Potential (GWP) of buildings could get increasing attention and complement the standards that are currently used in Europe and Norway, EN 15978 and NS 3720. To understand the possibility and consequences of using Level(s) in Norway, we assess how the Level(s) GWP calculation method differs from EN 15978 and NS 3720, and whether it is more specific and provides more guidance. Comparing fifteen methodological aspects, eleven were treated differently in the three methods. Both Level(s) and NS 3720 are based on EN 15978, hence they provide more, though different, specifications and guidelines than EN 15978 for most of the aspects, such as scope of building elements, life cycle stages to include, and reference study period. Level(s) provides more guidance for the development of scenarios for the operational and end-of-life stages, and for assessing data reliability. NS 3720 lists the scope of building elements in detail and accounts for operational transport (stage B8). Overall, a building GWP calculated with NS 3720 would need some adjustment to reflect the prescriptions of Level(s). These findings inform LCA assessors about key differences, supporting the broader use of Level(s) in Norway as in Europe, and helping towards a harmonization of NS 3720 to Level(s).

Keywords: building, LCA, Level(s), standards, Norway

1. Introduction

Life cycle assessment (LCA) is a relevant method to assess and improve the environmental performance of buildings, which reduces the risk of problem-shifting compared to other approaches focussing on specific aspects, such as operational energy use. Though the harmonization of the LCA method has been encouraged by the development of European and national standards, there is still lack of harmonized basic data, as well as inconsistencies and lack of transparency in the methodological choices [1–3].

To improve the transparency and comparability of LCA results among buildings in Europe, the European Commission (EC) launched the EU framework for building sustainability assessment Level(s). In December 2021, the EC proposed in the new Energy Performance for Buildings directive that the life-cycle Global Warming Potential (GWP) of new buildings should be calculated in accordance with the Level(s) framework starting in 2030 [4]. A similar initiative has been proposed in



Norway, where, in the upcoming revision of the Norwegian building code (TEK17), it is proposed to introduce a requirement for calculation and documentation of the GWP of buildings [5]. In the perspective of a wider use of Level(s), this paper shows some of the specificities of this framework with regards to European and Norwegian standards for life cycle assessment of buildings.

1.1. European and Norwegian standards for life cycle assessment of buildings

In Europe, EN 15978:2011 [6] provides a standardized methodology for calculating the life cycle environmental impact of buildings and construction products. It is used in combination with EN 15804:2019 [7], which defines an LCA methodology for construction products, with specific rules for the elaboration of an Environmental Product Declaration (EPD). EN 15978:2011 can be used to evaluate various building types and functions, both for new construction and renovation of existing buildings. While the standard defines some aspects of the LCA methodology, such as a modular structure for defining different life cycle stages (A1-5, B1-7, C1-4, and D), it still offers a lot of freedom to the LCA assessor (see Table 2 in Section 3).

To clarify EN 15978:2011 and provide additional guidance, Norway has developed its own national standard, NS 3720:2018 [8]. It provides a calculation method for greenhouse gas (GHG) emissions of an entire building (of any type) or a part of the building, throughout a building life cycle or parts of the life cycle. As an important difference with EN 15978:2011, NS 3720:2018 provides a method to account for GHG emissions from the transport of people, goods, and services during the operation of the building - in a new life cycle stage, B8.

1.2. The EU framework for building sustainability assessment Level(s)

Level(s) is a common EU framework of core indicators that provides the three main project actors (project design team, clients and investors, public policy makers and procurers) a common language to assess, compare, optimize, and report the sustainability of buildings [9]. The framework was developed by the European Commission Joint Research Centre (JRC) and was launched as a beta version in 2017 [10,11].

The framework can be applied to residential and office buildings, both new and renovated, at different project stages - from design until operation. The Level(s) framework distinguishes three assessment levels: conceptual design (level 1, qualitative), detailed design and construction stages (level 2, quantitative), and as-built and in-use stages (level 3, monitoring) [9]. It is structured according to six macro-objectives and sixteen indicators categorized per macro-objective (Table 1). It can be used to measure carbon, materials, water, health, comfort, and climate change impacts [11].

Table 1 Macro-objectives and indicators in the sustainability assessment framework Level(s) [9].

Macro-objective	Indicator
1. Greenhouse gas and air pollutant emissions along a building life cycle	1.1 Use stage energy performance
	1.2 Life cycle Global Warming Potential
2. Resource-efficient and circular material life cycles	2.1 Bill of quantities, materials and lifespans
	2.2 Construction & demolition waste and materials
	2.3 Design for adaptability and renovation
	2.4 Design for deconstruction
3. Efficient use of water resources	3.1 Use stage water consumption
4. Healthy and comfortable spaces	4.1 Indoor air quality
	4.2 Time outside of thermal comfort range
	4.3 Lighting and visual comfort
	4.4 Acoustics and protection against noise
5. Adaptation and resilience to climate change	5.1 Protection of occupier health and thermal comfort
	5.2 Increased risk of extreme weather events
	5.3 Sustainable drainage
6. Optimal life cycle cost and value	6.1 Life cycle costs

6.2 Value creation and risk exposure

Level(s) is not a certification scheme [11]. Unlike certification schemes such as BREEAM [12], DGNB [13], and WELL [14], it does not contain any benchmarking values to give accreditation. Level(s) is free to use and provides open-source tools [11]. Nevertheless, the EU-funded LIFE Level(s) project [15] is encouraging these building certification schemes to align with Level(s).

As an important difference between the beta version of Level(s) released in 2017 [10] and the 2021 version [9], the three assessment levels have been redefined. In the beta version of 2017, they differ by their objective (i.e., assessment, comparison, optimization), while in the 2021 version by the project stage they can be applied to (i.e., conceptual design stage, detailed design and construction stage, as-built and in-use stage). Also, the scenarios for lifespan, adaptability, and deconstruction (beta indicator 2.2) were revised into checklists and rated criteria in the 2021 version, to encourage and evaluate the aspects of Design for adaptability and renovation on one hand, and Design for deconstruction, reuse and recycling on another.

As Level(s) was released in 2021 in its first (non-beta) version, the number of critical reviews of the method and case studies available in the scientific literature is limited. Kanafani et al. [16] compared Level(s) beta version methodology for Cradle-to-Cradle Life Cycle Assessment to the European LCA standard EN 15978, and assessed the compliance of the Danish LCA tool LCAbyg to the Level(s) LCA indicator assessment. They conclude that, where definitions or guidance are missing in standards, Level(s) provides specifications from other initiatives and schemes worldwide, and Level(s) partially complies with the LCAbyg tool. Palumbo et al. [17] illustrated the differences in life cycle environmental impacts calculated with Level(s) version 2021 and DGNB on an Italian passive house. They concluded that there is a need for harmonisation of LCA stages, building elements, environmental impact categories and indicators, service life, maintenance, and replacement. Ramon et al. [18] have tested Level(s) on an office building after its completion. They concluded that, for most indicators, assessing a building with the Level(s) beta version requires that practitioners have information and experience which are currently not commonly available. Also, their LCA calculation shows that the use phase is an important contributor to the total environmental impacts. As another example, Birgisdottir and Haugbølle [19] have developed an extensive report on the use of Level(s) beta version "as a tool for documenting sustainable buildings". They followed the testing of Level(s) on case studies of 18 Danish buildings of different building types and at different project stages. They assess the expectations of building sustainability consultants towards Level(s) through surveys. The two main ones were "allow for a comparison between the assessment in Level(s) with either DGNB certification or future national regulation" and "provide them with information on whether sustainability goals had been achieved or could help set goals for the specific project.". The consultants were therefore deceived by the absence of benchmarks in Level(s) and by the extensive freedom of method in Level(s), which might hamper the relevance of a comparison of buildings evaluated with a different methodology. As a result, they judge that Level(s) in its beta version provides no or limited support to check whether the building complies with their sustainability goals. Based on these comments, we assume that the surveyed sustainability consultants expected Level(s) to be a certification scheme.

In summary, Level(s) has been developed to ease the assessment and reporting of a building's sustainability and increase the comparability of the results. However, to our knowledge, the methodological aspects in Level(s) GWP have not yet been compared to LCA methods and standards available in Norway, namely EN 15978 and NS 3720.

2. Objectives and method

As a first step towards assessing the potential of the EU framework Level(s) in the Norwegian context, it is important to know how it differs from LCA standards available in Norway. Therefore, we aimed to answer the following questions: *how does Level(s) Life cycle Global Warming Potential (macro-*

objective 1, indicator 1.2) methodology differ from EN 15978 and NS 3720? Is Level(s) more specific, or provide more guidance than the LCA methodology described in EN 15978 and NS 3720?

Therefore, we compared the specificity of the 2021 version of Level(s) for life cycle GWP calculation [20], the LCA methodology provided by EN 15978:2011 [6] (and complementary EN 15804+A2:2019 [7]), and Norwegian NS 3720:2018 for building GHG calculation [8]. Only the level 2 assessment in Level(s) is included in the comparison, since Level 1 does not constitute an assessment, but rather a guide for integrating sustainable building design concepts [20]. Level 3 is not included either since the methodological choices are identical to level 2, only differing in the certainty of the data [20].

We selected fifteen methodological aspects for the comparison, based on the previous comparative review of Level(s) with EN 15978 conducted by Kanafani et al. [16]:

1. Building elements to include (scope of the assessment): does the method specify the building elements that should be included and excluded and, if so, to what extent?
2. Cut-off rules for the exclusion of processes in the LCI: does it specify cut-off rules for the in- or exclusion of processes in the life cycle inventory?
3. GWP calculation rules for parts that can be later reused or recycled in another building: does it specify calculation rules for parts that can be later reused or recycled in another building, if so, which ones?
4. GWP calculation rules for reused or recycled parts used in the building: does it specify calculation rules for the integration of reused or recycled parts, if so, which ones?
5. Life cycle stages to report at minimum: does it specify the life cycle stage that must be reported at minimum and, if so, to what extent?
6. Reference study period (RSP): does it specify the RSP of the assessment?
7. Required service life (RSL) for the building: does it specify a default RSL for the building?
8. Environmental data types: does it specify the type (e.g., measured, specific, average) of environmental data to use?
9. Impact categories to include at minimum: does it specify the environmental impact categories that must be reported at minimum and, if so, to what extent?
10. Data reliability rating: does it provide a quantified way to evaluate the data reliability?
11. Scenarios for Module A1-A5: does it specify scenarios relevant for the Production (A1-A3)/Construction stage (A4-A5) and, if so, to what extent?
12. Scenarios for Module B2-5: does it the methodology specify scenarios relevant for material use for maintenance (B2), repair (B3), replacement (B4) and renovation (B5) during operational stages and, if so, to what extent?
13. Scenarios for Module B6 (and B8): does it specify scenarios relevant for energy use during operational stages (B6 and B8) and, if so, to what extent?
14. Scenarios for Modules C and D: does it specify scenarios relevant for the end of life of the building (C1-C4) and impacts beyond the system boundary (D) and, if so, to what extent?
15. Reporting: how should the LCA results be reported?

In this non-exhaustive list of relevant methodological aspects, all aspects except 3-4 (allocation rules for reuse), 6 (RSP), 7 (RSL) and 15 (reporting) were assessed in the previous comparative study [16]. We included aspects 3 and 4 in the review because of their relevance in the transition to a more circular economy, and aspects 7, 8, and 15 after detecting some differences between the methods.

First, we list similar and different aspects (Table 2). Based on that comparison, we evaluate where NS 3720 and Level(s) are more specific or provide better guidance than EN 15978. From this, we suggest points of attention for LCA assessors familiar with EN 15978 or NS 3720 and new to Level(s), as well as improvements for the further development of Level(s) and NS 3720.

3. Comparison of life cycle GWP calculation in Level(s) with EN 15978 and NS 3720

Level(s) indicator 1.2, EN 15978 and NS 3720 have a similar objective: to provide a standardized methodology for calculating the life cycle environmental performance of buildings, using modular life cycle principles and indicators (such as GWP). Both NS 3720 and Level(s) methodologies are based on EN 15978 and provide additional guidance and specification for several methodological choices.

The three methods are compared in Table 2¹. Four methodological aspects are defined in EN 15978 and generally followed by NS 3720 and Level(s): cut-offs, allocation for materials that can be later recovered, integration of recovered materials, and environmental data type to use (aspects 2, 3, 4, and 8). Cut-off rules in Level(s) and EN 15978 are identical: upper limit for the exclusion of processes corresponding to 5% of energy usage and mass per life cycle module (among other rules). NS 3720 differs by setting a limit for the total mass of products excluded in each element – this must not exceed 5% of the total building mass. Exclusion rules for processes are not specified in NS 3720, but they might implicitly follow EN 15978. Allocation of the impacts related to both the present use of recovered (i.e., reused or recycled) materials and their future recoverability follows the rules defined in the EN 15804+A2 for all three methods. In other words, the impact related to the use of secondary material is measured from the point where the secondary material enters the system from another system. The criteria to situate this point in the value chain, defined as the End-of-Waste state, are mentioned in EN 15804+A2. The materials that can be substituted in the future thanks to the reuse and recycling of building parts are accounted in Module D as net output flow (i.e., output flow minus input of secondary materials). Finally, all three methods specify the environmental data types to (preferably) use. EN 15978 and NS 3720 specify data types according to the project stage at which the assessment is conducted, while Level(s) provides a hierarchy of preferred data types.

Six other aspects are not specified by EN 15978 but are specified by NS 3720 and/or Level(s): scope, life cycle stages, RSL, RSP, data quality, and environmental impact indicators (aspects 1, 5, 6, 7, 9, and 10). To ensure comparability of the LCA results, both NS 3720 and Level(s) define the scope of the building elements to include in the assessment. In NS 3720, the scope depends on the type of assessment (basic or advanced, with or without building location). In Level(s), the scope is fixed by a list of building elements. The categorization of building elements in NS 3720 is done in accordance with the list of building elements given in NS 3451 [21] and is therefore less ambiguous than in Level(s). Additionally, as products that are procured and installed by building occupiers should be omitted in Level(s), the selling or leasing of buildings without fit-out and internal finishes could gain an environmental advantage compared to fully finished buildings. Similarly, both NS 3720 and Level(s) specify the life cycle stages to report at minimum, each method asking for different stages depending on the type of calculation. The required service life for the building should be defined by the building client in all three methods. Nevertheless, NS 3720 recommends a required service life of 60 years if the client does not specify any. The reference study period is set to 50 years in Level(s), and to the required service life of the building in NS 3720. While EN 15978 lets the assessors choose which environmental indicators to report, Level(s) requires GWP, while other categories are optional, and NS 3720 covers GWP only (Section 1.1). Finally, Level(s) is the only method to provide a way to quantify data reliability for technological, geographical, and time-related representativeness, as well as uncertainty, through calculation of a Data Quality Index. The Data Quality Index must be calculated for each hot spot identified with the GWP calculation, and overall based on the calculated index of all hot spots – there is then a minimal value required for the overall Data Quality Index.

All methods suggest testing the LCA results for different scenarios (aspects 11-14). Level(s) provides guidance to develop scenarios impacting the design (adaptability score) and the material replacements (lifespan of components). The adaptability of the building affects the number of years the building remains in use before final demolition or deconstruction. There is however no direct connection between the adaptability score calculated with Level(s) indicator 2.3 and the resulting

¹ A more detailed table with references can be sent by email upon request to the corresponding author.

building RSL. Waste treatment scenarios are more clearly defined, as Level(s) suggests a data quality hierarchy for waste treatment scenarios. Scenarios for different life cycle modules are summarised in Table 2.

LCA results should be reported similarly per life cycle stage in all methods, but in a more aggregated way in Level(s) than in EN 15978 and NS 3720 (aspect 15). LCA results in NS 3720 can be reported in various units, such as GWP per year, per user, or square meter. Unlike EN 15978, NS 3720 and Level(s) demand to report total GWP, GWP due to biogenic carbon, and GWP due to land use and land use changes.

Table 2. Comparison of EN 15978, NS 3720 and Level(s) 2021 GWP calculation (indicator 1.2).

	EN 15978:2011	NS 3720:2018	Level(s) GWP
1. Building elements to include (scope of the assessment)	Unspecified. List of building elements is shown in Annex A.	Specified list of elements based on NS 3451, depending on the calculation level and the specification of the site location.	Specified list of building parts categorised into Shell, Core, and External works, defined in User Manual 2. Table 11.
2. Cut-off rules for the exclusion of processes in the LCI	As in EN 15804.	Rules for exclusion of products per element of the building.	As in EN 15804.
3. Allocation of parts that can be later reused or recycled in another building	As in EN 15804.	As in EN 15804.	As in EN 15804.
4. Allocation of parts that reused or recycled in the building	As in EN 15804.	As in EN 15804	Not specified (follows EN 15804 by default).
5. Life cycle stages to report at minimum	Unspecified. It is recommended to cover all life cycle stages for new buildings and all life cycle stages representing the remaining service life and end of life stages of the existing building.	It depends on the calculation level and the specification of the building location. For basic and advanced without location: A1-A5, B1-B5, B6, and C1-C4, and possibly D. For basic and advanced with location, same with B8.	Standard calculation: all stages. Simplified reporting option 1: A1-3 + B4-6, Simplified reporting option 2: A1-3+B6+C3-4+D
6. Reference study period	Default value should be the building required service life.	"The greenhouse gas calculation must be carried out on the basis of the required service life" (60 years by default).	50 years.
7. Required service life for the building	Defined by the building client.	60 years (unless otherwise specified by the client).	Defined by the building client.

8. Environmental data types	Preferred data type for each life cycle module and per project stage.	At conceptual stage and detailed project stage, minimum data quality level 2. In detailed analysis, when choosing between products, and in as-built phase, data quality level 1 should be used where available.	Data quality hierarchy: specific data derived from specific production processes, average data from specific production processes, data from other appropriate sources, (when the producer of the building cannot influence performance) average data.
9. Impact categories to include at minimum	Optionally, the indicators listed in EN 15804.	GWP.	GWP. Optionally, full set of EN 15978 environmental impact categories
10. Data reliability rating	No rating specified. However, data quality requirements are specified.	No rating specified. Two levels of data quality: level 1 refers to specific data calculated and/or measured. Level 2 applies to any other type of data.	Data Quality Index to be calculated according to the guideline for each hot spot and in overall. Minimum value for overall data quality index.
11. Scenarios for Module A	For A1-3, as in EN 15804. For A4-, list of processes to include.	General suggestions for scenarios (e.g., material choices). Refer to requirements for scenarios in EN 15978.	Suggests comparing different levels of renovation to demolition-reconstruction, and different construction processes.
12. Scenarios for Module B2-5	Suggested processes to include. B2-5 scenarios as in ISO 15686-5. Calculation rules for material replacements.	Suggested scenarios (e.g., for maintenance). Requirements for B2-B5 scenarios as in EN 15978.	B2-5 scenarios as in ISO 15686-5. Default service lives for building parts. Potential of the building to adapt to changing needs and influence on the A stage must be assessed based on Level(s) Indicator 2.3 (Adaptability) and the local property market
13. Scenarios for Module B6 (and B8)	General information for B6. Operational transportation (B8) is not covered.	Introduced a new life cycle module (B8). Provides scenarios and guidelines to account for energy use and emissions in the operational phase (B6) and for transportation (B8).	Suggested scenarios for B6 (use of Level(s) indicator 1.1). General guidelines for energy use and for emissions from energy production scenarios, for future climatic conditions scenarios, and for pattern of future use. Operational transportation (B8) is not covered.
14. Scenarios for Modules C and D	List of processes to include in the scenarios.	Refer to requirements for scenarios in EN 15978.	General guidelines for end-of-life scenarios.

15. Reporting of the results	Per life cycle stage and per environmental indicator. Stages A1-A3 and A4-A5 can be aggregated. Module D reported separately. No distinction between types of GWP.	Per life cycle stage and per type of GWP. Only stages A1 to A3 can be aggregated. Materials and energy flows that can be assigned to module D are reported separately.	Results presented in five groups of modules (A1-3, A4-5, B1-7, C1-4, and D) and per type of GWP.
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4. Discussion

The comparison of Level(s) Life cycle GWP calculation (indicator 1.2) with EN 15978 and NS 3720 shows some important differences between the methods. Over the fifteen reviewed aspects, four (aspects 2, 3, 4, 8) are identical in all three methods. The other aspects are addressed differently and are thus points of attention for LCA assessors. The differences between the method also mean that buildings assessed with different methods cannot be directly compared.

Both Level(s) and NS 3720 succeed in better defining the LCA method in EN 15978. Out of the six methodological aspects that were unspecified in EN 15978 (aspects 1, 5-7, 9, 10), five are specified in NS 3720 (aspect 1, 5, 6, 7, 9) and five in Level(s) (aspects 1, 5, 6, 9, 10). The list of building elements to include (aspect 1) is more detailed in NS 3720 than for Level(s). A higher number of life cycle stages (aspect 5) must be reported for NS 3720 than Level(s). The RSP (6), should be 50 years for Level(s) and 60 years for NS 3720. Although NS 3720 does not mention explicitly the term 'Reference Study Period' in the main text, it states that the calculation must be conducted on basis of the building RSL, set to 60 years by default. Both NS 3720 and Level(s) asks to report the LCA results for the environmental indicator GWP (aspect 9). Only NS 3720 specifies a default building RSL (aspect 7), and only Level(s) provides a rating system for data quality and minimal representativeness level (aspect 10).

All three methods provide guidance for developing scenarios (aspects 11-14). Level(s) provides more guidance for scenario in Module B2-5 (aspect 12) with default service lives for building elements, and Module C and D (aspect 14) with guidance to select waste treatment scenarios. The development of scenarios in Level(s) GWP calculation also benefits from information provided by other Level(s) indicators such as 1.1, 2.1, 2.2, 2.3, 2.4, and 5.1 (Table 1), particularly relevant for Module B2-5, B6, C1-4 and D (aspects 12-14). The calculation of GWP due to the transport in the operation phase (B8) (aspect 13) is only included in NS 3720. The scenarios for module A (aspects 11) are not more specified in NS 3720 and Level(s) than they are in EN 15978. Concerning reporting of the results (aspect 15), the aggregation of various stages in Level(s) can simplify the reporting process but hinder the transparency of the assessment.

Overall, Level(s) streamlines the LCA method provided by EN 15978, but not really by NS 3720, since NS 3720 already provides more guidance than EN 15978. Level(s) and NS 3720 differ on aspects 1, 2, 5-7, 10, 12-15. Level(s) could benefit from some aspects of NS 3720 including the definition of a default building RSL and the accounting of transportation related to the use of the building in stage B8. Conversely, NS 3720 could introduce a Data Quality Index to evaluate and set minimal requirements for the reliability of the data used in the LCA.

The comparison of Level(s) with EN 15978 in our study and the previous comparative study by Kanafani et al. [16] is consistent. Both studies consider methodological aspects 'Building elements to include' (aspect 1), 'Data reliability rating' (aspect 10), and regarding the guidance for developing scenarios (aspects 11-14) more specific in Level(s) than EN 15978. They both consider cut-off rules identical. For the life cycle stages to assess, they both conclude that Level(s) is more specific, but Kanafani et al. state that full life cycle LCA is the regular approach for new buildings, while we note that EN 15978 does not specify life cycle stages to include at minimum. The conclusions from both studies regarding the environmental impact categories to include (aspect 9) cannot be compared because Kanafani et al. assessed all indicators, while our study is limited to GWP. The rules regarding environmental data types (aspect 8) cannot be compared since these rules have changed between the

2017 (beta) version and the 2021 version of Level(s). The other methodological aspects were not assessed by Kanafani et al.

Importantly, our critical review covers the 2021 version of Level(s), EN 15978:2011, and NS 3720:2018. We acknowledge that these methods are periodically updated, and that the conclusions drawn in this study might become outdated when new versions of the compared methods are published. For instance, the on-going revision of EN 15978 suggests including two new life cycle modules A0 (pre-construction) and B8 (building-related user activities not covered in B1-B7) [22].

5. Conclusion

As the EU sustainability framework Level(s) might get increasing attention, especially for the calculation of GWP, it is important to know the main methodological differences with the LCA standards that are currently in use, namely EN 15978 in Europe, and NS 3720 in Norway. The comparison of the three methods on fifteen aspects (Table 2) shows more differences than similarities. Overall, a building LCA conducted following EN 15978 or NS 3720 would need adjustment regarding ten methodological aspects to reflect the prescription of Level(s) indicator 1.2. Level(s) is more specific and provides more guidance than EN 15978 for most of the aspects. However, Level(s) is not more specific than NS 3720, as this standard already specifies many aspects in EN 15978.

More globally, a strength of Level(s) is to not be limited to GWP calculation but to provide guidance for various aspects of the building sustainability performance (Table 1). Level(s) could be further improved by providing a default building RSL and a stage for transport in operation (stage B8). Conversely, NS 3720 could introduce a Data Quality Index.

To further assess the potential of Level(s) in Norway, it will be needed to assess how Level(s) supports design decision-making by comparing two design options with Level(s) and analysing the information gained with the assessment. A comparative GWP calculation with different methodologies (e.g., Level(s), EN 15978, and NS 3720) would inherently result in different GWP scores, and hence would not contribute to a better understanding of the potential of Level(s) in the Norwegian context. In further development, we will review the indicators for Resource efficient and circular material life cycles (macro-objective 2) and conduct case studies on new and existing building typologies.

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