Sufficiency as a Criterion for Sustainability Assessment

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Abstract. Key instruments of the German sustainability strategy for federal buildings are the ‘Guideline for Sustainable Building’ (LFNB) and the ‘Assessment System for Sustainable Building’ (BNB). Based on the three pillars of sustainability (ecological, economic and social dimensions) and expanded by building related cross-sections (technical, process and location), sustainability research is opposing sustainability strategies of consistency, efficiency, resilience and in particular sufficiency. Likewise, the New European Bauhaus (NEB), initiated by the EU-Commission in 2021, acknowledges the recognition of the finite nature of resources and introduces the term sufficiency as a relevant aspect. This requires a consistent rethinking of the way we plan, construct, and operate buildings. However, sufficiency is often not or only partially addressed in sustainability assessments. The available research points towards a necessity to rethink the classic pillars of sustainability. Sufficiency should not be seen as relinquishment, but the basis for a successful efficiency and consistency implementation. Up to now, the environmental impacts of buildings have usually been determined and evaluated as area-related parameters, omitting saving effects of area reduction. This paper proposes a reconsideration of reference values and evaluates possibilities for a BNB system integration of sufficiency criteria. The investigation does not aim to determine specific valuation criteria, but outlines possible locations for adaptation or inclusion within the pillars of sustainability.

Keywords: Sustainability dimensions for sufficiency measurement in sustainability assessment for buildings, sufficiency, sustainability assessmen, New European Bauhaus

1. Introduction
Sustainability assessment is an identification and measurement process to evaluate environmental impacts in respect of sustainability. The ‘Assessment System for Sustainable Building’ (BNB) is developed by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) and represents the sustainability assessment tool for federal and public buildings. Its variants introduced by degree provide sustainability rating criteria for non-residential buildings, in particular office, educational, and laboratory buildings, as well as outdoor facilities. The superior guiding principles of sustainable development policy pose the foundation of the principles and valuation basis. Outlined in three dimensions, the classical Pillars of Sustainability are derived from the protection of common commodities, such as environment, resources, culture, health and capital [2]. Based on the Guideline for Sustainable Building (LFNB), the underlying Pillars of Sustainability and their application on sustainable building assessment present the object of the herein investigated study.
The New European Bauhaus (NEB), initiated by the EU-Commission in 2021, introduces an ambitious and extensive process towards the European Green Deal targets in the building sector. Sustainability, aesthetics and inclusion are presented as central aspects, supporting the renovation of existing building stock. Sufficiency is thereby noted as a relevant aspect [1]. In respect of compliance with climate targets, Landgraf et al. [3] highlight the need to optimize the Sustainability Criteria used for the BNB towards sufficiency measures. The findings of the study outline sufficiency potential and are contributing to this fundamental research on sufficiency integration for approaching BNB2.0 development. Beyond, considerations of neighborhood synergies, human behavior and future reutilization are added in favor of sufficiency planning and evaluated in the following investigation.

Accordingly, this paper evaluates the presence of sustainability strategies naming efficiency, consistency, sufficiency and resilience within sustainability assessment on basis of the BNB – determining potential for an inclusion in the currently developed system update BNB2.0 and outlining further research demands. With that, the following research question is addressed: “To what extent is the sustainability strategy of sufficiency currently incorporated within the ‘Assessment System of Sustainable Building’ (BNB) and how can the framework offered by the Pillars of Sustainability address resulting valuation gaps?”

2. Methodology and Structure
To address the research question, the discussion will first have a closer look at the four aforementioned sustainability strategies that ought to guide the planning, construction and operation of buildings: efficiency, consistency, sufficiency and resilience within sustainability assessment. It then outlines a qualitative analysis of the 46 criteria applied in the BNB system towards sufficiency measures. Second, the paper summarizes a qualitative investigation of previous research on sufficiency criteria for sustainable building. The final draws these findings together and reflects on the identified reference values regarding their contribution to a validation of sufficiency measures in the BNB system. The paper concludes with a discussion on the strength and weaknesses of the paper.

3. Key Sustainability Strategies – An Overview
Within sustainability research, efficiency, consistency and sufficiency are indicated as sustainability strategies, describing different objectives for reaching sustainability goals. While they join together in the overall aim to reduce resource consumption to sustain human society, they diverge in their approach [5]. In the following, the three strategies will be elaborated in reference to the building sector. Further, the strategy of resilience is added in order to address the weather extremes that are already now and prospectively more likely to be expected due to climate change, putting additional pressure on a sustainable and safe infrastructure. While the assessment system applies to a specific building, it can be noted that the built environment is defined by multiple functions – i.e. workspace, housing and service – collectively, shaping our infrastructure and defining our societal surroundings. Therewith, there are essential implications regarding environmental impacts of a single building in resonance with its neighborhood [5].

3.1. Efficiency
By improving the input-output relation, the economic performance is to be reduced to a minimal use of material and energy. These gains are leading to an increased material-, resource- and energy-efficiency by the optimization of technique, process and product [6]. In the building sector, energy efficiency is strongly emphasized in the heating, cooling and power systems, as well as for electrical appliances. Product efficiency finds itself in material technology and innovation, as i.e. carbon concrete, while process efficiency is approached by the integration of software in the planning process such as Building Information Modeling (BIM). For the goal of the consistency strategy of a 100% renewable energy supply, efficiency plays a major role in form of flexibility, to efficiently integrate the fluctuation of solar and wind energy [7]. As summarized by [8], absolute emission reductions are limited by economic growth and the rebound effect.
3.2. Consistency
Consistency represents the reduction of negative environmental impacts of resource flows, aiming either towards closed material cycles or to the relatively full integration of the material flow into the natural metabolism [6], constituting a change of material and energy quality. Consistency strategies are the basis of a circular economy and represented in renewable energies and the material based cradle-to-cradle approach – noting thereby that i.e. recycling is a form of consistency improvement, while only a complete circularity agrees with zero resource input and is respecting the finity of resources and the environmental impacts of their extraction. The limitations of consistency are assigned to the uncertainty of technological optimization and global justice [8], underlining the need of sufficiency considerations.

3.3. Sufficiency
Posing the questions of ‘less’ and ‘enough’, sufficiency is addressing a reduction of consumption by the way of usage. While it may also include technological innovations, it is mainly referring to societal and behavior change, leading to a gentle use of resources. Sufficiency should thereby not be seen as an alternative, but the basis: Only if there is a consistent orientation towards sufficiency, efficiency and consistency measures can unfold positive effects resulting in emission reduction [5]. Referring to the built environment, sufficiency presents an appreciation of basic needs, simplicity and a reduction of scale: collectively, a reduction of physical input [10]. A very essential approach is the reduction of built-up area per capita. This implies a reduction of privately used area, behavioral change and functionality [9]. Area sufficiency, technical sufficiency and user behavior influence sufficiency in the built environment, including the buildings adaptability as a parameter for its flexibility in use and extension of lifetime, surpassing quantity by long-term quality [4]. Cultural acceptance and behavior change mark crucial parameters for successful sufficiency measures, while literature also underlines the need of regulation to facilitate a fair distribution of land and material [11]. Conclusively, sufficiency in the building sector comprises the appropriateness of constructional effort in relation to its usefulness [4].

3.4. Resilience
Resilience – also understood as ‘preparedness’ or ‘readiness’ – refers to the capacity of a system to react on and handle a crisis: Preventing a system collapse by absorbing disruptions and maintaining the basis function and structure [12]. Gibbert [18] approaches resilience on two levels, this being the natural and the artificial system. Natural resilience comprises the ecosystems function connected to land use changes. Ecosystem services provide the resources for human society and mark the dependency of natural system and social system resilience. Artificial systems offer services (i.e. water or energy supply, communication and transportation infrastructure), covering social and economic systems. The same is referring to the concept of resilient cities, responding to long-term effects such as climate change as well as abrupt impacts such as flooding. The absorption of water in case of heavy rainfall and the prevention of urban heat islands by urban green can be named. Focused on the building itself, various factors can contribute to resilience, naming allocation and microclimate, while site security may be named as the most important [12]. With its objectives of preservation and protection, resilience is posing a crucial mainstay for sustainability.

4. The Pillars of Sustainability for Sustainable Building Assessment in a Sufficiency Perspective
The Kyoto-protocol lead Germany to a national climate protection program and already before the Conference of Rio, the Enquete-Commission of the German Bundestag on Human and Environmental Protection was introduced in 1992. Building and Housing were a main focus of the discussion to set a specific example of sustainability targets. In their final report in 1998, the Commission called for a sustainable, future-compatible development with an integral and equal consideration of ecological, economic and social dimensions: the three pillars of sustainability [13]. A Guideline for Sustainable Building (LJNB) was introduced in 2001 and fully redefined in 2013 in respect of a constant development of political and societal goals. For the regulatory area of federal buildings, the built upon
Assessment System for Sustainable Building (BNB) is obligatory, presenting a scientifically profound and planning based assessment method [2].

Substantial critique, however, addresses the necessity of a stable ecological environment for cultural activities and subordinate, the economic system – posing a cascade instead of equally ranked pillars. Respecting global and intergenerational justice, European climate scenarios have already been noted limitations to reach climate goals in cost optimal scenarios [20] and on top, the building sector has been exceeding its national targets the past two years [21].

4.1. Overview of Criteria

The three pillars of sustainability represent the basis for the principles and assessment prerequisites of sustainable building: The ecological quality, the socio-cultural quality and the economical quality. Additionally, the cross-section qualities, technical and process, are part of the assessment criteria. The location profile is a separate main criteria group, and not part of the overall assessment of the building, reasoned with the consideration that site characteristics can only be influenced to a minor extend by the building itself, the planning and planning process [2].

![Figure 1: The BNB criteria table basis variant for office and administration buildings. The outlined sufficiency potential of existing criteria is recorded and the inclusion of new criteria is proposed.](image)

The criteria catalog for office buildings presents a table of 11 criteria groups and 46 criteria profiles, further based on about 150 indicators. In the following investigation, the criteria profiles will be evaluated qualitatively in their contribution towards efficiency, consistency, sufficiency or resilience strategies, to gain a first impression of emphases. Leaving the closer look on the indicators aside, limitations due to an analysis only on the criterion level are recognized, however regarded as sufficient for this fundamental investigation. Figure 1 presents the criteria table of the office and administration...
building system basis variant according to the LFNB, including an overview of the criteria considered in the qualitative analysis of this section.

4.2. **Representation of Sustainability Strategies**

In this subsection, the Ecological Quality, Economic Quality, Socio-Cultural Quality, Technical Quality, Process Quality and Location Profile are addressed in respect of the sustainability strategies [14].

4.2.1. **Ecological Quality.** The Ecological Quality includes two criteria groups, one of them being ‘Effects on Global and Local Environment’. Thereby, the accounting rule of ecological assessment is used, calculating environmental impact [e\(_{\text{ges},i}\)] of the full lifecycle of a building, from production over utilisation and refurbishment all the way to dismantling and disposal [E\(_{\text{ges},i}\)]. As a reference value, the net floor area is used [NF\(_A\)], describing the usable area of the building. Accordingly, the indication of quantity is always divided by area, presenting an efficiency gain in area consumption. While consistency strategies find their expression within the material- and energy-related lifecycle, the overall land consumption and with that, a decisive sufficiency approach within buildings, is not addressed.

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e_{\text{ges},i} = \frac{E_{\text{ges},i}}{\text{NF}_A}
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The criterion on ‘Sustainable Material extraction and Biodiversity’ applies for all wood used in the construction, verifying sustainable forest management by certification. Approaching consistency, material considerations are relevant for other materials on circularity (including reused or reusable), locality and impact of extraction. Within the second criteria group, ‘Demand of Resources’, the demand of space is a directly addressed criterion. The change of area consumption and use is rated qualitatively, whereas site recycling as well as the realisation of green roofs and facades are positive factors. However, the rating of area consumption follows the ratio of floor space by sealed space. An optimisation can therefore be reached by an increase of floor space (i.e. an additional story) – addressing primarily the efficiency strategy, while only offering voluntary sufficiency integration.

4.2.2. **Economic Quality.** This sustainability pillar contains two criteria groups, ‘Life Cycle Costs’ and ‘Economic Efficiency and Value Stability’. Life cycle costing includes the full lifecycle of a building [c\(_i\)]. The present value method used depicts the sum of all occurring costs in relevance of their temporal performance [C\(_0\)]. This sum – the present value – is referred to the gross floor area [BGF], resulting in a quantitative rating. Instead of the previously used NFA, the BGF includes the constructive enclosures as material dimensions are relevant for cost-analysis.

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c_0 = \frac{C_0}{\text{GFA}}
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As addressed in the previous case of ecological assessment, the indication of quantity is divided by area and directly addressing efficiency gains. Economic quality is thus not related to area sufficiency. However, ‘Area Efficiency’ and ‘Capability of Conversion’ are indicators within the second criteria group. Area efficiency reduces the enclosed space and thus, resource input. Capability of conversion is representing the sufficiency strategy of multiple usage and reutilisation.

The economic system and the monetary factor must thereby be addressed critically. While a yearly cost increase for service and energy is incorporated in the profile, the monetary value of nature is not clearly set, as i.e. regarding the CO2 pricing. Noting a CO2 price of 55€/tCO2\(_{\text{aq}}\) to be expected for 2025, environmental cost may be not sufficiently depicted here. About 180€/tCO2\(_{\text{aq}}\) are noted by the German Environmental Agency for 2016 [15], while there was not any accounted in Germany. In the aforementioned report by Landgraf et al. [3] it is therefore recommended that the external environmental costs be assessed as a separate criterion in an additional BNB profile. Besides, a relevant sufficiency potential is identified in form of area sufficiency.
4.2.3. Socio-Cultural and functional Quality. The three criteria groups within this quality are ‘Health, Comfort and User Satisfaction’, ‘Functionality’ and ‘Ensuring Design Quality’. Health, comfort and user satisfaction are no area-related parameters, while still related to material and design. Essentially, not the environmental impact, but its impact on the users is the subjective. As human behaviour is a key carrier for the success of sufficiency strategies [8], user satisfaction is of a general interest as long as it is staying with the concept of basic needs. The criterion of ‘Use qualities’ is thereby supporting shared spaces for social exchange. Similarly, ‘Safety and Incident Risks’ as criterion is mainly referring to subjective safety in form of lighting, while the factor of fire protection can thereby be assigned to resilience. ‘Functionality’ is offering the most direct implementation of sustainability strategies in this quality, including the criterion of mobility, which addresses bicycle infrastructure, carsharing, e-Mobility as well as showers (to offer sanitary facilities for cyclists) and workshops (offering reparation tools). It can thus be recognized as consistency as well as sufficiency measures and highlights the importance of socio-cultural criteria for sufficiency assessment.

4.2.4. Technical Quality. The technical quality, containing only one criteria group ‘Technical Execution’, presents in its profile the aim of optimization with a focus on user comfort. However, there is a critical discussion connected to user comfort, as a general raise of standard (i.e. sound insulation) often goes align with an increase of material input (i.e. wall thickness). Building on the previous definition of sufficiency, material efficiency and the appropriateness of constructional effort are to be considered [17]. The same accounts for energy consumption and thermal comfort [9]. The consideration of lifetime within the criterion ‘Cleaning and Maintenance’ as well as the criteria of the dismantling process and the maintenance friendliness are highlighting consistency strategies. ‘Heat Insulation and Protection against Condensate’ is a clear efficiency approach to minimize the heat demand of the building – the mass or material is thereby of no consideration. So far, the need of resilience is acknowledged within the buildings resistance against nature hazards. Sufficiency can only be found in incorporated mentioning of simplicity and long lifetime of the building technology, while posing relevant sufficiency criteria in form of low-tech and robust buildings [16].

4.2.5. Process Quality. While the previous four qualities carry 22.5% of the overall rating, process quality accounts for 10% – accounting that a well-planned process contributes to the quality of the final product. It consists of two criteria groups, ‘Planning’ and ‘Construction Process’. Addressing the complexity of a building process, parameters include safety, energy, water, light, waste, and further. While optimization is the focus, sufficiency cannot be found directly. The criterion of ‘Integrated design’, incorporating public and user participation as well as the interdisciplinary project team, supports a comprehensive approach and social acceptance. It is to note that by integrating sufficiency consideration into the BNB, additional expenses for the planning process are to be expected [3]. Also, to successfully implement sufficiency measures, it is crucial to already address sufficiency in the planning process. The same accounts for resilience, as the situation of a project as well as its general design is relevant for is readiness considering social, political and environmental disturbances [18].

4.2.6. Location Profile. The location profile is the only quality not being included in the percentage share of overall results. In one criteria group, it encompasses six criteria. With its highlight on a positive image, synergy effects of customer attractiveness and low crime rate, the criterion ‘Image and Character of Location and Quarter’ strongly presents an economical perspective, triggering gentrification processes [10]. Instead of passive benefits of the existing situation, an evaluation of the buildings influence on the district could depict a societal perspective. The benefits of short distances (‘Vicinity to use-specific services’) address the following societal needs to support mixed-used neighbourhoods: gastronomy, local supply, parks and open spaces, education, public administration, medical care, sport facilities, leisure facilities, and service. Regarding ecology as well as comfort, the incorporation of housing is noted to be missing. In terms of resilience – and thus sustainability –, it is highly important to consider the existing ‘Risks at the Micro-Site’. This criterion is represented here, including human-
made and nature hazards. Also parts of the location profile are considerations about heating grid, solar energy, broadband connection and rainwater infiltration (‘Supply lines/ site development’). Consequently, while strengthening resilience, the location profile offers a strong potential for including sufficiency in the overall assessment in form of percentage. However, influencing the total share of valuation, a responsible integration implies a major discussion.

5. Reference Values for sufficiency

Reaching the strategy of sufficiency, a path towards a reduction of resource consumption needs to be shaped within sustainable building assessment criteria, asking for a determination of sufficiency oriented reference values. Based on the previous analyses of sufficiency in sustainable building assessment, sufficiency criteria are summarized and result in the consideration of the findings integration in the BNB system.

5.1. Sufficiency Criteria

Before directly addressing reference values, sufficiency in buildings is depicted on three stages: first, the overall necessity of the building, representing the sufficiency measure of preservation and an overall reduction of resource consumption. Second, the buildings integration in the surrounding neighbourhood to include synergy effects. Third, the utilisation to approach the adequacy of the buildings use.

Life cycle assessment is already including environmental impacts of the full lifecycle of a building, from production over utilisation and refurbishment all the way to dismantling and disposal. However, the most sustainable building is still the one not being built – addressing the need for an evaluation of necessity, including a comprehensive study on potential refurbishment and reutilisation within the already existing building stock, respecting their already embodied energy. While modern technical standards and construction-policy guidelines are easy to be accomplished within new construction, more complex boundary conditions need to be addressed in case of existing building stock, benefitting new construction in attractiveness. Intermediate use and temporary architecture need to be represented in land use plans, respecting the general approach of multiple use concepts [16]. Indicators therefore can be found in the location profile. Further, refurbishment needs to be generally prioritized for sufficiency in the built environment.

Mixed uses in neighbourhoods support short distances, encourage climate friendly mobility in form of public transportation and cycling [5]. Having mobility to a minor percentage addressed in the socio-cultural quality, the location profile with its criterion on ‘Public Transport Connections’ as well as ‘Vicinity to Use-Specific Services’ is again depicting its relevance for sufficiency measures.

Functional and well-planned buildings offer sufficient space while reducing the general amount of area consumption per person. Flexible floor plans allow different kinds of use in respect of future changes in behaviour and requirement. A general simplicity is recommended, highlighting maintenance and lifetime, while a low-tech approach may be limited in such as office buildings [3]. However, the appropriateness of comfort standards needs to be evaluated in respect of planetary boundaries and thus, the ecologic quality. An integration of area sufficiency and environmental costs within the economic quality as well as simplicity within the technical quality as additional criteria are considered. Moreover, sufficiency planning needs to be incorporated in the beginning of the building process. The sufficiency potential by behaviour change in form of utilisation is recognized for its relevance of the ecological quality of a building, however, difficult to valued objectively due to lack of data [9].

5.2. Reference Values

Depicting environmental impact in area-related parameters, the sustainability strategies of efficiency and consistency are leading the determination within sustainability assessment. Following the idea of optimization, these parameters represent the improvement of input-output relation and circularity. However, neither the overall land consumption, nor the overall mass consumption are considered in relation to their actual use and need. Based on outlined sufficiency criteria, four reference-values are introduced for the subsequent discussion.
Approaching a ‘less’ in a planning perspective, the strong connection between the building sector and economic growth needs to be addressed previously, depicting its macroeconomic performance in such as employment, income and investment. With the societal focus of economic growth, this entanglement is critically addressed as a consistent limitation of built-up area reduction beyond relying on individual behavior change. According to an investigation on land consumption in the housing sector [11], the environmentally critical sufficiency goal of land use reduction needs to be addressed regulatory in order to provide an equal and fair distribution.

5.2.1. Area. The issue of area-related reference values has been elaborated in 4.2.1. Global warming potential is addressed in kg/m² or primary energy demand in kWh/m². This ratio – in a solely perspective – can still fulfill the indicators of global and local environmental impacts in case of massive area sealing within the current accounting method, highlighting its limitation. It is therefore necessary to include area reduction in sustainability assessment systems. While an increase in density in form area per capita is noted as a sufficiency measure, parameters such as ceiling height and buildings depth are not about minimalism, but adaptability [9] – highlighting the relevance of a buildings utilization neutrality and flexibility.

5.2.2. Cost. For including environmental impacts in the economic system, the pricing needs to incorporate global- and intergenerational constraints as i.e. in form of adequate €/tCO2eq [15]. This will influence cost of land and material, encouraging sustainability strategies of efficiency, consistency and sufficiency. Overall, the assessment of economic sustainability needs to support national climate targets [4.2.2]. Thus, the implementation of environmental damage compensation costs in the LCC is to be discussed, as well as the introduction of restraining budgets or contingents.

5.2.3. Time. Respecting the aspect of time, assessment systems are already criticized when it comes to circularity, emphasising a differential treatment of present and future emissions, especially regarding the goal of carbon storage. While currently not applied in the BNB, this consideration of time difference is relevant for the carbon content of building products and the respect of time needed for biomass regeneration [19]. Also in reference of time, longer lifetimes of buildings are noted to intensify product use [17], offering a basis for sufficiency.

5.2.4. Use. Approaching behaviour changes, sufficiency is depended on the intensification of use of built-up area, as well as a determination of ‘enoughness’ within this use. Therefore, use-related reference values need to be addressed in sustainability assessment of buildings. This can be determined as built-up area per person (m²/p). Flexibility in down- or upsizing of living spaces could comply with changing needs depending on stages of life (i.e. family formation or ageing process). For non-residential buildings, it further includes a quantification of use options according to daytime, weekend or vacation, including flexibility in accordance with telework [16].

5.3. Recommendations for Sufficiency Integration
The creation of additional criteria profiles versus a sufficiency measure integration within existing criteria profiles pose two possibilities of sufficiency integration in the BNB system. Further, regulative decision can form requirements, such as a general prioritization of refurbishment versus new construction. This is currently a qualitative valuation before the application of the BNB and respected, while not accounted – posing a regulative sufficiency potential. Additionally, consideration should be given to the incorporation of the location profile. Its current additional status is not adequately addressing environmental needs.

Generally, the pillars of sustainability as well as the cross-section qualities have shown their relevance towards sufficiency in the building assessment. For the ecological quality, area-consumption poses a crucial and currently neglected parameter. However, the incorporation of a sufficiency factor to the formula [4.2.1.] needs to be scientifically founded and regulated, posing a current research gap. The
economic quality is to be evaluated regarding area sufficiency, the inclusion of environmental costs and a budgeting according to climate targets. While socio-cultural quality is generally important in regards of user-satisfaction, comfort standards might interfere with sufficiency strategies, addressing the societal question of adequateness. In a system perspective, this interference highlights the relevance of the relational structure between criteria of different qualities. Simplicity and robust buildings pose sufficiency criteria for the technical quality, while sufficiency needs to be directly addressed already in the planning process for a successful implementation.

Reference-values are relevant to consider for sufficiency incorporation, as area-relation has shown a critical loss of land consumption criteria. Time-related reference values are acknowledged as valuable contributors to integral consistency measures if respecting time needed for biomass reproduction. Counteracting the overconsumption of natural resources, this underlines the relevance of sufficiency within consistency measures. Tackling reduction, a valuation of use-intensity is outlined as a potential carrier of sufficiency within the assessment tool. Incorporation into sustainability assessment could be considered if setting a limitation for square meter per capita and a determined quantification or flexibility of use.

6. Conclusion
A great potential for sufficiency criteria in sustainable building assessment can be concluded by the findings of the article. However, a reconsideration of current reference values needs to be investigated and further developed, such as the role of use-related reference values to adequately depict need, intensity of use and flexibility of built-up area. A first determination of sufficiency measures has been summarized by this article: a consequent prioritization of existing building stock, a defined limitation for square meter per capita and a determined quantification of use. Area consumption should have an influence on the valuation of environmental impact in the ecological quality, to adequately address the consumption of natural resources.

This article investigates on a stronger representation of sufficiency in sustainable building assessment, outlining the case of the BNB. Limitations are seen in the papers focus on the BNB, not comparing other assessment tools. Further, approaching sufficiency as assessment criteria for the build environment is presently still noted to lack in data as well as expertise [4]. The investigation thus not aims to determine specific valuation criteria, but outlines possible locations for adaptation or inclusion within the pillars of sustainability and seeks to offer a basis for further and more specific assessment research. Further research on the integration of sufficiency measures as well as additional sufficiency oriented criteria profiles is emphasized regarding the BNB2.0 development.

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