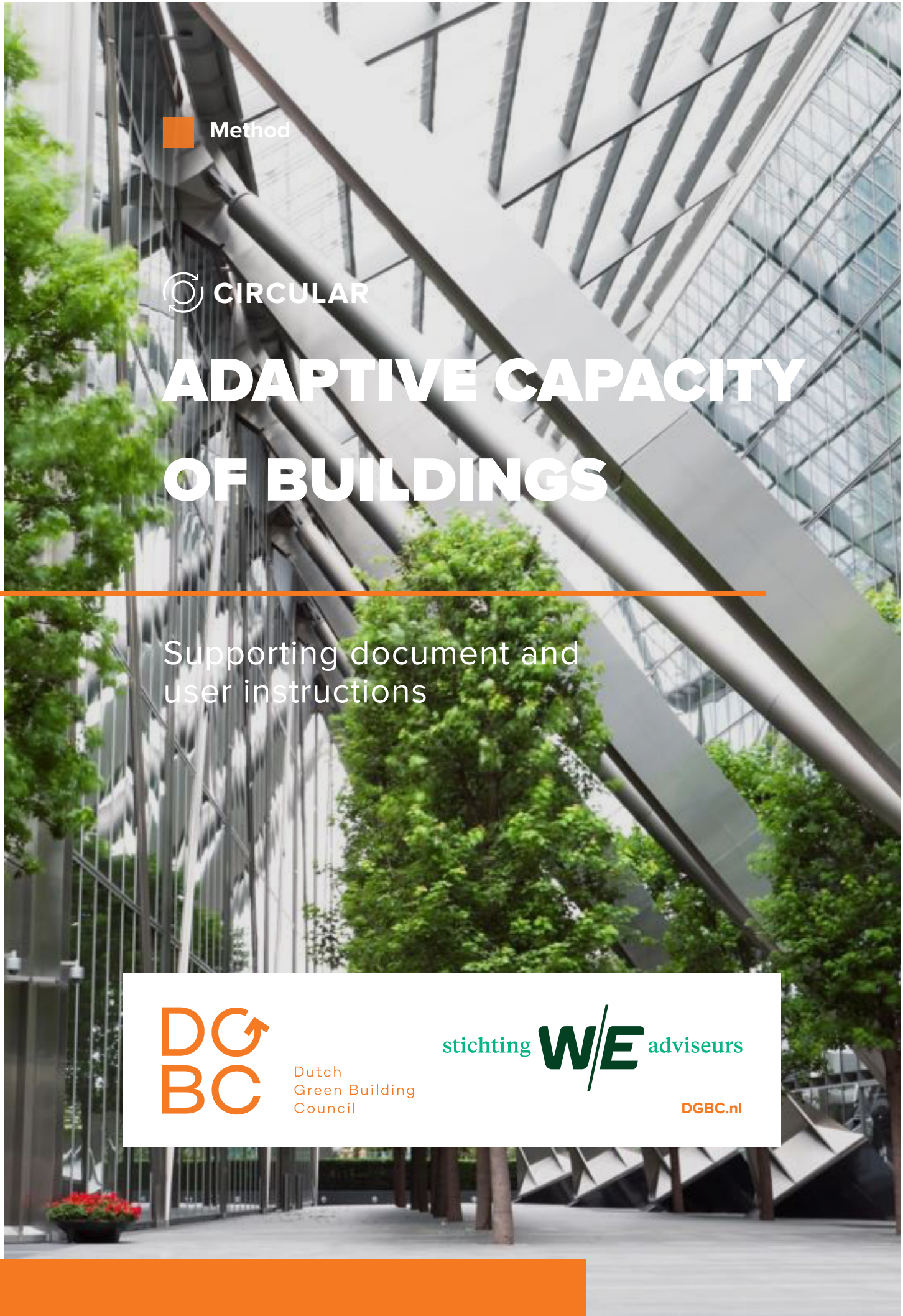


Method

CIRCULAR

ADAPTIVE CAPACITY OF BUILDINGS

Supporting document and user instructions

DGBC
Dutch Green Building Council

stichting WE adviseurs

DGBC.nl

Supporting document

Adaptive capacity of buildings 1.1

A collaboration between
W/E Adviseurs and Dutch Green Building
Council Commissioned by the Netherlands
Enterprise Agency (RVO)

Contents

1.INTRODUCTION

Within the circular economy, one of the principles is to as much as possible develop products in a form in which they last a long time and can be used in a new context with minor modifications. Of course, this also applies to buildings. When a building is (re)developed, the function that the building will have upon completion is usually the guiding principle in the design process. Over time, however, the demand for the functionalities in the building will change.
Innovations will require different functionalities for the same function, and the demand for some functions may decrease. A number of design interventions can ensure that the building is easily adaptable, making it more prepared for future changes. We call this the adaptive capacity of the building.

W/E and DGBC have worked together on a method for identifying this adaptivity, as a basis for the GPR Gebouw and BREEAM-NL instruments. The developed method gives an indication of the adaptive capacity of a building in an as yet unknown future. The method is not intended for assessing the suitability of a building to meet a need in the present (without or with limited intervention).
This method is a partial elaboration of the broad method described in the report Gebouwen met Toekomstwaarde [Buildings with Future Value] (Brink Groep and CPI, July 2014).

Elaboration

The method consists of three documents:

1. The adaptive capacity calculation tool (Methode Adapatief vermogen 1.1 Rekensheet.xls [Adaptive Capacity Method 1.1 Calculation Sheet.xls];
   An Excel document, with which the adaptive capacity of a building can be determined
2. The calculation tool user instructions); (Methode Adapatief vermogen 1.1 Gebruikersinstructie) [Adaptive Capacity Method 1.1 User instructions]; This instruction indicates how the calculation tool should be filled in
3. Indicators supporting document (Methode Adapatief vermogen 1.1 Onderbouwingsdocument) [Adaptive Capacity Method 1.1 Supporting Document]. For each indicator, the conditions that must be met in order to be able to select an answer option are elaborated here. (this document)

Context dependency

Due the to the methodical intended application, assessing/benchmarking at the building level, a context-independent assessment is desired. Only the physical building characteristics are decisive. A building should receive the same rating in the same context (location and function) as in another context.

During the validation phase within the Brink process, however, it became clear that the relationship between the context of the building and the adaptive capacity cannot be ignored. The context helps determine what the optimal adaptivity is. For example, a different eligibility for adaptive capacity may be expected in a rural area than in an urban area. For this reason, two contextual aspects were incorporated into the methodology. These contextual aspects have a major impact on the score that can be achieved.

1. Use function

There is a relationship between the use function of a building and its adaptive capacity. For a dwelling, the need for adaptivity will be different than for an office. It was decided to incorporate the following use functions into this methodology:

- Residential function;
- Office function;
- Shop function;
- Other utility function.

Buildings with an industrial function cannot be assessed using this method.

2. Area type

Several site characteristics can be identified that have a relationship to the optimal adaptivity of a building. When looking for the optimum for a specific building, all these characteristics can be considered. Often, however, the relationships are customized. Even if does not concern the current

situation, but the situation in the future, when the adaptive capacity of the building will be taken advantage of.

In this methodology, it is not possible to integrate this very sophisticatedly. Therefore, it was chosen to flatten the influence of the aspect of 'location' to the characteristic area type, with only two options:

- High-dynamic or urban
- Low-dynamic or non-urban.

Accepted dynamics

The method uses two different dynamics, which had already been defined by Brink Groep. A separate score can be obtained using both dynamics, which collectively arrive at a unified score.

1. Use dynamics
   Use dynamics involve the requirements of a building based on the need for the building to move with a change in requirements of the user organizations within the current use function.
1. Repurposing dynamics
   Repurposing dynamics involve the demands placed on a building from the need to be able to accommodate other use functions of the building as well.

Indicators

Subsequently, various indicators have been included. For each indicator, it is indicated whether this indicator is within use or repurposing dynamics. In addition, the indicators are divided into two different options for the consideration of adaptivity.

2. Load-bearing indicator
   Load-bearing indicators are considered essential for adaptive capacity. The load-bearing indicators will mainly relate to the long cyclical Layers of Brand, such as the shell and the skin. In view of the already applied principles of classification, it was decided not to explicitly use the Layers of Brand for the organization of the indicators.
2. Supplementary indicator
   The supplementary indicators are seen as influential, but not essential. The difference in relevance is, of course, reflected in the weighting factors.
   For the supplementary indicators, one can choose whether to use the default values or also specify them specifically. If the latter is chosen, then one will also have to indicate a level of performance (including evidence) for all supplementary indicators. However, the remaining points can also be won with this.

The load-bearing and supplementary indicators are included in the method in a different way. The idea is that with the load-bearing indicators, one is required to indicate the level of performance. The load-bearing indicators determine the majority of the score.

Points may be awarded for the various indicators. These are 0, 1, 2, or 4 points, depending on the performance of a given indicator. Indicators contribute to one or more forms of adaptivity. The score for the best performance is not linear. As a result, buildings with good adaptive capacity will be more likely to exceed the average.

For each indicator, subsequent to the document, it is elaborated on how to determine which of the answer options corresponds to the intended quality.

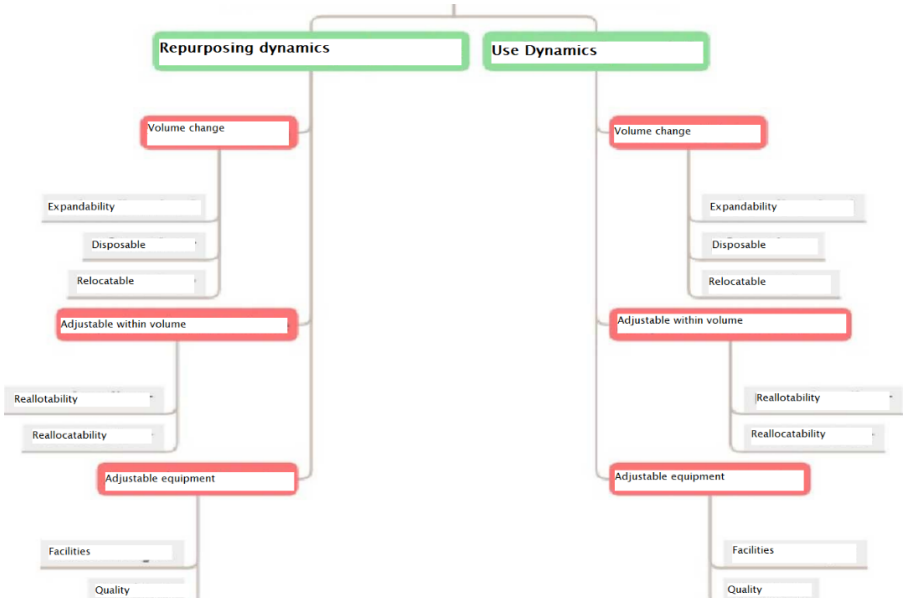
It will occur that a certain response option will apply to one part of the building and not to another. The response option that applies to 80% of the Gross Leasable Area (GLA, in Dutch : Gebruiksoppervlakte) should then be selected. This does not apply to indicators where the response options concern a percentage of area, or where other percentages of the area are mentioned.

Classification of indicators

There are seven different forms of adaptivity, which are clustered into three main forms. Indicators can be part of one or more of these forms of adaptivity. The forms of adaptivity then apply to both dynamics. The classification is as follows:

1. Volume change:
    - Expandability
        - The use area of the building must be able to increase in the future (horizontally and/or vertically).
    - Disposable
        - The use area of the building must be able to decrease in the future (horizontally and/or vertically).
    - Relocatable
        - The building must be able to be moved to another location in the future.
2. Adjustable within volume:
    - Reallotable
        - Requirements/wishes regarding the possibility of changing the layout at the building level (or parts of the building).
        - Requirements/wishes regarding the possibility of changing the functions at the building level (or parts of the building).
        - Requirements/wishes regarding the possibility of changing the number of user units in the building (or parts of the building).
    - Reclassifiable
        - Requirements/wishes regarding change in size and distribution of user units within the building (merge, split, redistribute).
3. Adjustable equipment
    - Provisions
        - Requirements/wishes regarding changes to facilities and systems within the building.
        - Requirements/wishes regarding facilities and systems outside the building, on site.
    - Quality
        - Possibility of changing (upgrading) the interior and finishing, finishing per user unit.
        - Possibility of changing (upgrading) the interior and finishing (parts of) the building.

Schematically, the layout is as follows:



Score calculation

Not all components carry equal weight in the calculation of the final result. This is determined on the basis of a weighting that depends on several factors. Initially, context has an important part in the adjustment of scoring. For example, if a building is built in a non-urban location, the likelihood that the building will be reused is lower and there will need to be more guidance on repurposing than in a location that is actually urban. The same applies to the function.

		Repurposing	Use
Residential function	Urban	30%	70%
	Non-urban	30%	70%
Office function	Urban	50%	50%
	Non-urban	60%	40%
Shop function	Urban	20%	80%
	Non-urban	30%	70%
Utility other	Urban	40%	60%
	Non-urban	50%	50%

The percentages are determined by an estimate of what is important in a certain environment. If the estimate is that the building will be used primarily in its current function, e.g., retail and residential, it is scored higher on use dynamics rather than repurposing dynamics. If it is estimated that this is the other way around, for example with an office function in a non-urban environment, repurposing dynamics will score higher.

In addition, the score structure differs per dynamic. When repurposing, it is more important that the building is adaptable. After all, an intervention will be required to put the building back into use in a new form. This is less for use dynamics. Of course, it would be nice if the volume could be changed and adaptations could be made, but it is more important that the equipment, systems, interior walls, et cetera, can be adapted. The following breakdown was chosen:

Dynamic	Repurposing	Use
Volume change	30%	30%
Adjustable within volume	50%	30%
Adjustable equipment	20%	40%

2. INDICATORS

In the description of the indicators, the indicators are split only if the elaboration and weighting of the indicators differ by dynamic (Use and Repurposing).

Load-bearing indicators

Load-bearing indicators are considered essential for adaptive capacity. The load-bearing indicators will mainly relate to the long cyclical Layers of Brand, such as the shell and the skin.

Indicator D01.a: Distinction between load-bearing structure and systems

Importance: Very important. If the load-bearing structure and systems are not interwoven, the unit can be classified differently.
Dynamic: Use
Load-bearing or supplementary: Load-bearing

Question	To what extent are the load-bearing structure and system components in the unit/home separate from each other?			
Answer options	This is <10% of a unit/house	This is 10 - 50% of a unit/house	This is 50 - 80% of a unit/house	This is > 80% of a unit/house
Criteria	1. Percentages are determined on the basis of the GLA that depend on the system (components) 2. Load-bearing elements include both the load-bearing structure and the floors and façade. 3. Separated means: detachable from each other 4. Dependent means: the systems required for indoor climate and electronic systems in a room. If one of the distribution channels or lines of these systems are intertwined with the load-bearing structure, the area of this space is assessed as not separated.			

Additional information/definitions:

If built-in components are connected to load-bearing elements, the flexibility of the layout is limited. For example, if lines or channels are cast into a concrete floor, they can be more difficult to adjust than if they are not an inseparable part.

Indicator D01.b: Distinction between load-bearing structure and systems

Importance: Very important. If the load-bearing structure and systems are not interwoven, the building can be classified differently.
Dynamic: Repurposing
Load-bearing or supplementary: Load-bearing

Question	To what extent are the load-bearing structure and system components in the building separate from each other?			
Answer options	It is <10% of the building	It is 10 - 30% of the building	It is 30 - 50% of the building	This is > 50% of the building

Criteria	1. Percentages are determined on the basis of the GLA that depend on the system (components) 2. Load-bearing elements include both the load-bearing structure and the floors and façade. 3. Separated means: detachable from each other 4. Dependent means: the systems required for indoor climate and electronic systems in a room. If one of the distribution channels or lines of these systems are intertwined with the load-bearing structure, the area of this space is assessed as not separated.

Additional information/definitions:

If built-in components are connected to load-bearing elements, the flexibility of the layout is limited. For example, if lines or channels are cast into a concrete floor, they can be more difficult to adjust than if they are not an inseparable part.

Indicator D02.a: Excess building area

Importance: Important. As more space/floor area becomes available (e.g. zoning system with margin spaces), then the reallotability, reallocatability and options in repurposing for future function changes increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	Is the building oversized in terms of required space or available floor area?			
Answer options	No	5 - 10% oversized	10 - 20% oversized	> 20% oversized
Criteria	1. Percentages will be determined on the basis of the GLA 2. Based on the program of requirements, the demand for the number of users is determined. The oversizing is then determined in relation to the standard occupancy rate from the building code.			

Additional information/definitions:
-

Indicator D02.b: Oversized home

Importance: Important! As more space/floor area becomes available (e.g. zoning system with margin spaces), then the reallotability, reallocatability and options in repurposing for future changes increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

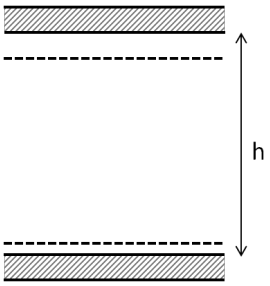
Answer options Question	No	With a major intervention, several layouts are possible	With the placement of an additional wall, an extra (bed) room can be created.	With the placement of one or two additional walls, an extra (bed) room can be created.
Criteria	1. Major intervention means that walls must be demolished. 2. An extra room meets the requirements of the building code for a bed space.			

Additional information/definitions:

-

Indicator D03: Free floor height

Importance: Important. As more space/floor area becomes available (e.g. zoning system with margin spaces), then the reallotability, reallocatability and options in repurposing for future function changes increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	What is the minimum free floor height?			
Answer options	> 2.60 m	2.60 - 3.00 m	3.00 - 3.40 m	> 3.40 m
Criteria	1. Clear floor height is the height between the top of a finished floor and the bottom of the lowest structural section above it. 2. At least 95% of the GLA must be in compliance. 			

Additional information/definitions:

Indicator D04: Oversizing building space/reservation for electrical & mechanical engineering (E&W) systems, and shafts

Importance: Important. If the space reservation for the systems is oversized, the extensibility for future function changes increases because additional systems can be added.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	Is the building space reserved for (W, E, ECT) systems oversized?			
Answer options	Not oversized	10 - 30% oversized	30 - 50% oversized	> 50% oversized
Criteria	1. Based on the system design (E & W), the minimum structural space for the distribution of E, W and ECT was determined. 2. Based on the spot with the smallest throughput, the percentage is determined. 3. The percentage is determined on the basis of the number of throughputs			

Additional information/definitions:

Reserved structural space for systems
This is understood to mean the space present in shafts, cable ducts and other spaces reserved for the distribution of W, E and ECT.

Indicator D05: Expandable building

Importance: Important. As a building can be expanded to accommodate new or larger existing functions, the options in repurposing and expandability of the building increases.
Dynamic: Repurposing
Load-bearing or supplementary: Load-bearing

Question	To what extent can the building be extended horizontally and/or vertically without modifying the main load-bearing structure?			
Answer options	Individual horizontal and/or vertical expansion of the building is not possible.	10 - 30% expandable	30 - 50% expandable	> 50% expandable
Criteria	1. Percentages are determined based on the GLA of the current building relative to the potential expansion. 2. Land is available for horizontal expansion where this expansion could take place. 3. For vertical expansion, the main load-bearing structure is suitable for placing one or more floors.			

Additional information/definitions:

GLA: Gross Leasable Area, in dutch GO (Gebruiksoppervlakte) determined in accordance with NEN 2580

Indicator D06: Adjustability of systems

Importance: Important. The greater the adjustability and controllability of the system components, the greater the expandability and adaptability of the building.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	To what extent can the (W, E, ICT) systems respond easily to changing functional requirements? How adjustable are the systems?			
Answer options	Poor adjustability (monofunctional or fixed use)	Limited adjustability, only after extensive measures	Partial adjustability, after simple measures	Properly and easily adjustable: measurement/control with different use is possible immediately
Criteria	1. Properly and easily adjustable means that the systems are controlled remotely and that no physical work needs to take place to control the systems. 2. If only E or W are properly and easily adjustable, the answer option can be chosen in part.			

Additional information/definitions:

System components
System components include building-related elements, such as air treatment, heat and cold generation, as well as delivery points such as blow-in units and lighting.

Indicator D07: Relocatable interior walls

As interior walls become easier to move, the relocatability of the building increases.

Importance: Important.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	To which extent are interior walls, both space and/or function-separating, easy to move?			
Answer options	Interior walls are not relocatable without major/costly structural intervention.	Interior walls are not movable, but are degradable.	Interior walls are movable by tearing them down and rebuilding them.	Interior walls are easily relocatable without major/costly structural intervention (e.g.-system walls).
Criteria	1. If a significant portion of the walls (>20% of the linear meters of wall) has a load-bearing function, answer option 1 should be chosen. 2. Interior walls that are degradable do not have a load-bearing function. 3. Interior walls are relocatable if they can perform the same function in another location without losing materials. 4. Interior walls can be moved if the floor load permits.			

Additional information/definitions:
-

Indicator D08: Disconnectability and accessibility of system components

Importance: Important. As the accessibility and disconnectability of system

components increases, so does the reallocability and transformability.

Dynamic: Use and Repurposing

Load-bearing or supplementary: Load-bearing

Question	Can system components be easily disconnected?			
Answer options	Components are poorly accessible and, among other things, that is why they are not disconnectable, dismountable and accessible.	Some of the components are difficult to reach and therefore, among other things, they are poorly disconnectable, dismountable, or accessible.	Components are easily accessible (components at installation level) and can be (largely) disconnected and disassembled.	Components are very easily accessible (at the installation level) and are fully disconnectable, dismountable and pluggable.
Criteria	1. Components are poorly accessible if they are part of the load-bearing structure and, for example, are embedded in concrete. 2. If a considerable part (>40% of the number) of the components is easily accessible, the answer option 'partial' can be chosen			

Additional information/definitions:

-

Indicator D09: Positioning of load-bearing structure obstacles

Importance: Important The fewer components of the supporting structure that are "in the way," the greater the reallotability and reallocability of a building.

Dynamic: Use and Repurposing

Load-bearing or supplementary: Load-bearing

Question	In what ways do components of the support structure impede the reallocability of the units/residences?			
Answer options	The possibility for reallocation or reclassification in the building will be entirely hampered by difficult or impossible to remove obstacles. Units/homes smaller than 75 m2 are impossible.	The possibility for reallocation or reclassification in the building will be severely hampered: units/homes between 50-75 m2 are possible.	The possibility for reallocation or reclassification in the building will be hampered to a limited extent: units/homes between 25-50 m2 are possible.	The possibility for reallocation or reclassification in the building is not hampered by difficult or impossible to remove obstacles. Units/homes < 25 m2 are possible.
Criteria	1. Areas are determined in GLA. 2. When determining the reallocability, it is assumed that the load-bearing structure will not be modified.			

Additional information/definitions:
-

Indicator D10: Daylighting

Importance: Important. The more daylight that enters the building's spaces, the better to meet changing demands with regard to modifying the building's layout and quality.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

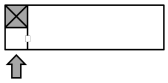
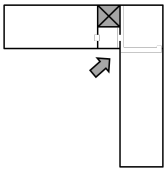
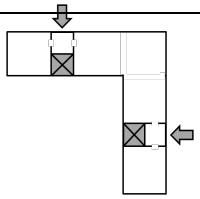
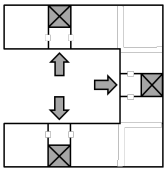
Question	To what extent are the spaces in the building provided with daylight?			
Answer options	Daylight equivalent < 1/20	Daylight equivalent 1/20-1/10	Daylight equivalent 1/10-1/5	Daylight equivalent 1/5
Criteria	1. The daylight equivalent has been determined in accordance with NEN 2057			

Additional information/definitions:
-

Indicator D11: Presence and position of stairs and/or elevators, or expansion options for stairs/elevators.

Importance: Important. As each of the building's cores has stairs and/or elevators, the quality of the repurposing to other functions increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	For each core, are there enough stairs and elevators in the building, or is it possible to add new stairs and/or elevators and reuse existing ones?			
Answer options	There is only one decentralized stairwell and/or elevator shaft present in the building and no new stairs/elevators can be added without drastic and costly measures.	There is a central stairwell and/or elevator shaft - and/or it is potentially possible to add new stairs/elevator and reuse existing ones.	Building divided into wings with central stairwell and/or elevator shaft - and/or it is possible to add new stairs/elevators to a limited extent to add and reuse existing ones.	Each wing has a central stairwell and/or elevator shaft - and/or new stairs/elevators are relatively easy to add with reuse of existing ones.

Examples				
Criteria	1. Stairwell and or elevator shaft in the central area which gives access to the different floors of the building.			

Additional information/definitions:
-

Indicator D12: Multifunctional use of building/units over time

Importance: Important. As a building or unit can accommodate more changes in function, its adaptive capacity increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	Can the building or unit accommodate multiple function changes in the current situation?			
Answer options	Suitable only for one specific function (offices, or housing, or healthcare, or …).	Suitable for two functions.	Suitable for three functions.	Suitable for more than three functions (suitable for living, offices, healthcare and retail).
Criteria	1. With minimal interventions, the building or unit can be made suitable for different functions. 2. In the case of a building, the functions can also take place in various places in the building. 3. The load-bearing structure is suitable for the various functions.			

Additional information/definitions:
-

Indicator D13: Load-bearing floors

Importance: Important. As load-bearing floors are composed of prefabricated/demountable parts, the reallotability, reallocability and transformability increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Load-bearing

Question	How are the load-bearing floors composed?			
Answer options	Fully monolithic floors.	Monolithic floors with demountable zones.	Segmented floors with demountable finish layer.	(Prefab) demountable floors.
Criteria	1. Demountable zones mean that the floor takes into account that part of the flooring can be removed. 2. A demountable floor can be disassembled without any chopping and breaking.			

Additional information/definitions:

Concrete floors
A concrete floor can also meet the answer options, but there are limitations. For example, a wide slab floor allows for the retrofit of a shaft.

Indicator D14: Possibility of layout through a free floor plan

Importance: Important. The more the load-bearing structure consists of independent modules, the greater the reallocability of part of the building.
Dynamic: Repurposing
Load-bearing or supplementary: Load-bearing

Question	What is the size of the floor area which is not interrupted by elements of the load-bearing structure?			
Answer options	< 29 m^2 GLA	29 m^2 GLA – 65 m^2 GLA	There are obstacles in the floor area, but the size > 65 m^2 GLA	There are no obstacles in the floor area
Criteria	1. Toilet facilities, elevators and stairwells are not applicable for the determination. 2. Floor areas should have a length to width ratio of no more than 1:3.			

Additional information/definitions:

A free floor area facilitates the reallocability of an object. Surface area ratios of 5.4 x 5.4 (29 m2) and 8.1 x 8.1 (65 m2) were used to determine the surface area. The reallocability decreases with other form ratios. A maximum ratio has therefore been included.

Supplementary indicators

The supplementary indicators are seen as influential, but not essential. The difference in relevance is, of course, reflected in the weighting factors.

Indicator A01: Disposable part of building, user unit or home

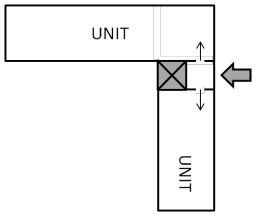
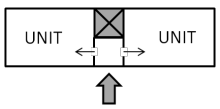
Importance: When part of the building can be disposed of (rented out/demolished), the disposability increases.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Supplementary

Question	Disposable part of building, user unit or home, horizontally or vertically.			
Answer options	No.	Disposal of a unit is very limited possible to a limited extent for some units/residences in the building.	Disposal of a unit/house is possible only by a general reallocation of all/multiple units	The individual disposal of a unit is easily accomplished without affecting other units/residences.
Criteria	1. Easy disposal of a unit/residences is possible if they are connected to a central entrance or have their own entrance.			

Additional information/definitions:
Not applicable to dwellings

Indicator A02: Office function - Possibility of dividing the area into units of the size indicated.

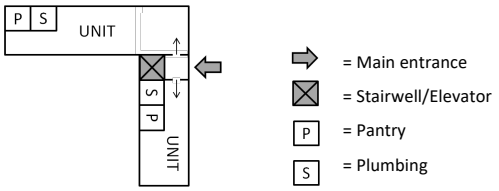
Importance: Supplementary. The more finely tuned the units can be distributed or moved, the more opportunities there are to customize the building.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Supplementary

Question	What size of units are possible in the building?			
Answer options	Larger than 600 m2 GLA	Between 400 and 600 m2 GLA	2. Between 200 and 400 m2 GLA	Less than 200 m2 GLA
Examples				
Criteria	1. 80% of the total floor area (GLA) meets the stated criterion. 2. Units have their own entrance and can be used as a separate space.			

;Additional information/definitions:
Not applicable to dwellings

Indicator A03: User unit self-reliance provisions

Importance: The more amenities per unit the more independent the unit can function in relation to other units.
Dynamic: Use dynamics
Load-bearing or supplementary: Supplementary

Question	How many facilities are available in the individual units?			
Answer options	No facilities are available	One to two facilities available	Three to four facilities available	Four or more amenities available
Examples				
Criteria	1. Amenities include pantry, meter cabinet, system, plumbing and kitchenette. 2. 80% of the total floor area (GLA) meets the stated criterion.			

Additional information/definitions:
Not applicable to dwellings

Indicator A04: Openable windows

Importance: The more windows that can be opened, the more rapid changes to the layout and quality are possible.
Dynamic: Use and Repurposing
Load-bearing or supplementary: Supplementary

Question	Are there windows that can be opened per 3.6 running metres of façade per floor?			
Answer options	None or < 10%	10 - 30%	30 - 80%	80 - 100%
Criteria	1. Percentage is determined: a/b x 100% a. The number of 3.6-metre façade sections with openable windows b. Total number of 3.6-metre façade sections			

Additional information/definitions:
Not applicable to dwellings

Indicator A05: Demountable façade

Importance: The reallotability, reallocatability, transformability, or reuse options are increased if façade components can be dismantled.
Dynamic: Repurposing
Load-bearing or supplementary: Supplementary

Question	To what extent can façade components be dismantled during transformation?			
Answer options	Façade components are difficult or impossible to dismantle and must be completely dismantled and removed (< 20%)	A small part of the façade components can be dismantled (between 20 and 50%)	A large part of the façade components can be dismantled (between 50 and 90%)	All façade components can almost be completely dismantled > 90%)
Criteria	1. The percentage is determined on the basis of the linear metres of façade per storey			

Additional information/definitions:

-

Indicator A06: Façade (components) adaptability

Importance: If the components can be retained and reused during transformation, it is better to meet requirements with regard to changing the quality of a building without unnecessary loss of existing materials/ façade components.

Dynamic: Repurposing

Load-bearing or supplementary: Supplementary

Question	To what extent can the existing components in the building façade be retained or adapted and used permanently during transformation?			
Answer options	Not possible without very radical changes to/loss of other façade components or because of monument status.	A limited possibility with major adjustments to the other façade components.	A limited possibility with simple adjustments to the other façade.	Easily possible without drastic adjustments to the other façade components.
Criteria	1. Major adjustments are understood to mean that chopping and breaking work are required to realize the adjustment. A simple adjustment does not require any chopping or breaking work.			

Additional information/definitions:

-

Indicator A07: Possibility of balconies on the façade

Importance: If balconies can easily be added, the building can easily be changed in terms of quality.

Dynamic: Repurposing

Load-bearing or supplementary: Supplementary

Question	To what extent can balconies or other outdoor spaces be attached to the façade?			
Answer options	Not possible without very extensive renovations or due to monument status.	A limited possibility with major renovations.	A limited possibility with simple renovations.	Easily possible without extensive renovations.
Criteria	1. Major renovations require changes to the load-bearing structure.			

Additional information/definitions:

Other outdoor spaces. These can be, for example, gardens or an indoor balcony.

Indicator A08: Vertical expansion: accessibility

Importance: If the existing elevator shafts/stairwells can be easily expanded vertically with new building levels for functions, the options in repurposing and vertical expandability increase.
Dynamic: Repurposing
Load-bearing or supplementary: Supplementary

Question	Can vertical building entrances (elevators and/or stairs) easily be extended?			
Answer options	Elevator shaft/stairwell cannot be vertically routed without radical and costly measures.	Elevator shaft/stairwell can hardly be extended.	Elevator shaft/stairwell can be easily extended without extensive and costly measures.	Elevator shaft/stairwell is long enough; an extension is not necessary.
Criteria	1. Drastic measures require adjustments to the load-bearing structure.			

Additional information/definitions:

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Calculation Tool User Instructions

Adaptive capacity of buildings method

A collaboration between
W/E Adviseurs and Dutch Green Building
Council Commissioned by the Netherlands
Enterprise Agency (RVO)

1 Status

Commissioned by Netherlands Enterprise Agency (RVO), W/E adviseurs, involved together along with a number of experts including DGBC and Brink, developed the draft method for adaptive capacity, version 1.0. Based on the method, a calculation tool was prepared, which was tested in a case study. On this basis, the method was refined and the calculation tool updated. This document contains a brief user instruction for the calculation tool '30133-Methode Adapatief vermogen 1.0 Rekensheet' [30133-Adaptive Capacity Method 1.0 Calculation Sheet].

For more information, please refer to:

- 'WE30133-Rapportage Methode Adaptief Vermogen' [WE30133-Adaptive Capacity Reporting Method], in which the method and backgrounds are described.
- 30133- Methode Adapatief vermogen 1.0 Onderbouwingsdocument [30133- Adaptive Capacity Method 1.0 Supporting Document]

2 Method operation

The Adaptive Capacity 1.0 method has been elaborated in the form of a step-by-step plan to be followed by the user of the method (the complete plan can be found in the annex). Three steps have been distinguished, which are explained in sections 3, 4 and 5:

- Step 1: establishing context (section 3)
- Step 2: indication of the performance levels (section 4)
- Step 3: Presentation of results (section 5)

3 Establishing context

Step 1: input context

In this step, the user indicates the context of the building.

The user selects the relevant option for the building under the attributes Use function and Location type. The following options are provided:

- Use function: residential, office, education, utility, other
- Location type: inner-city, non-inner-city

The 2 selected characteristics are combined into the context type (8 in total), e.g., Office, inner-city, with the code 3.KA.BI.

Based on this context type, the weighing set linked to this context type is selected from a database with weighing sets (Weegfactoren, 14-06-21 tab [Weighting Factors]). The weighing set contains weighting factors at 3 levels:

1. Perspective
2. Cluster
3. Adaptivity type

The weighting factors for the weighing of mutual indicators cannot be adjusted. Unlike the other weighting factors, these are considered context-independent. In the case of the supporting indicator, the mutual weighting factor is always 1.00 and in the case of supplementary indicators 0.25. The absolute weighting factor of the indicators for an adaptivity type depends on the number of load-bearing and supplementary indicators. The sum of the weighting factors of the indicators per adaptivity type is always 100%.

In the example:

- 3x load-bearing: 31% =1/(3*1+1*0.25)
- 1x supplementary: 8% = 0.25 /(3*1+1*0.25)

	weighting	
	40%	
	60%	
	Weighting factors	
cluster	type	indicator
30%		
	50%	
		31%
		31%
		31%
		8%

The calculation tool includes standard weighing sets for the 8 context types. For specific applications, it may be desirable to work with in-house weighing sets.

These weighing sets can then be modified before the calculation starts. This can be done by adjusting the percentages in the white fields (the last option can always be left blank, as it is automatically determined on the basis that all options in a column are 100%).

Weighing set all contexts				Adaptivity type				
Item / context	1.WO-BI	2.WO-NB	3.KA-BI	4.KA-NB	5.WI-BI	6.WI-NB	7.UO-BI	8.UO-NB
Use dynamics								
Building volume								
Expandability	50%	50%	50%	50%	50%	50%	50%	50%
Disposability	50%	50%	50%	50%	50%	50%	50%	50%
Relocatability	0%	0%	0%	0%	0%	0%	0%	0%

4 Indication of the performance levels

The performance levels of the building are specified in 2 steps.

Step 2: input performance for load-bearing indicators

The user goes through all the load-bearing indicators. For each indicator, they choose the most appropriate performance level. A performance level can be chosen if the criteria for that level have been demonstrably met.

The user indicates the performance by placing an ‘x’ in the white fields. Only one performance can be specified at a time. The choice of bad, normal, better or good is translated into 0, 1, 2, or 4 points respectively.

INPUT PERFORMANCE BY INDICATOR							
	Choice of additional input specification	performance	poor	normal	better	good	points
		number per performance	0	24	0	0	0/1/2/4
D01a	Distinction between load-bearing structure and systems (use dynamics)			x			1
D01b	Distinction between load-bearing structure and systems (repurposing dynamics)			x			1
D02a	Excess building area			x			1
D02b	Oversized home			x			1

There are 2 indicators that trigger a red-flag mechanism when an ‘x’ is placed at ‘bad‘ performance. The indicators are:

- D3: Free floor height
  If the storey height is (too) low, it is assumed that there is little to be gained from the perspective of ‘repurposing dynamics’.

If the 'red flag' is triggered, the score for this perspective is always 0.00.

- D10: Daylighting
  When there is (too) little daylight, it is assumed that there is little to be gained from the adaptivity types 'reallotability' and 'reallocatability'.
  If the 'red flag' is triggered, the scores for these adaptivity type are always 0.00.

D03	Free floor height	'red flag' for repurposing dynamics	x	height ≤ 260 mm
D10	Daylighting	'red flag' for reallotability and reallocatability		daylight access/depth ≤ 0.5

Step 3: input performance for supplementary indicators

The user makes the choice of whether or not to use the default performance levels with the supplementary indicators.

If the user chooses 'use defaults', they do not have to fill in anything else. For all supplementary indicators, the level of 'normal' (1 point) is then automatically applied.

A01	Utility function: disposable part of the building, horizontally or vertically, or disposable user unit.
A02	Utility function: possibility of dividing the area into units of the size indicated.
A03	Utility function: user unit self-reliance provisions.
A04	Utility function: openable windows
A05	Demountable façade

If the user chooses to specify, they must also indicate the performance level for all additional indicators. This is done in the same way as for the load-bearing indicators. In contrast to the default route, as with the load-bearing indicators, a burden of proof is applicable.

There are a number of additional indicators that do not apply to the residential function. The name of these indicators begins with 'Utility function:'. If 'residential' is selected, the score for these indicators is 0. In the Results, the weighting factors per indicator are then adjusted, making it possible again to achieve the maximum score (100% over the indicators per type) for each adaptivity type.

A01	Utility function: disposable part of the building, horizontally or vertically, or disposable user unit.
A02	Utility function: possibility of dividing the area into units of the size indicated.
A03	Utility function: user unit self-reliance provisions.
A04	Utility function: openable windows
A05	Demountable façade
A06	Façade (components) adaptability
A07	Possibility of balconies on the façade
A08	Vertical expansion: accessibility

5 Presentation results

After step 3, the input is ready. This yields (partial) results. It is up to the user of the calculation tool to apply/interpret it.

Step 4: interpreting the results

The score per indicator (last column) is calculated on the basis of the following:

- the number of points (see the points at the input at the indicator)
- the combined weighting factor at the levels:
  - cluster
  - adaptivity type
  - indicator

D04	Oversizing building space/reservation for electrical & mechanical engineering (E&W) systems and shaf	1.0			31%	0,05
D05	Expandable building or dwelling/unit, horizontally and/or vertically	1.0			31%	0,05
D06	Adjustability of systems	1.0			31%	0,05
A02	Utility function: possibility of dividing the area into units of the size indicated.	1.0			8%	0,01

This is followed by summations at the four levels:

- all indicators per adaptivity type
- all adaptivity types per cluster
- all clusters per perspective
- all perspectives per adaptive capacity score

The summations over the first three levels are unweighted, because the weighting factors are already included in the score per indicator. This does not apply to the weighting factors for the perspective. This is because it should be possible to utilize the use dynamics and repurposing dynamics as separate results. Only when using the 'adaptive capacity' one-point score are the two perspectives weighted and added up.

			weighting	partial score
	ADAPTIVE CAPACITY (weighted summation over both perspectives) minimum = 0.00 / maximum = 4.00		100%	1,00
	USE DYNAMICS		40%	1,00
	REPURPOSING DYNAMICS		60%	1,00

			Weighting factors			SCORE
	USE DYNAMICS	points	cluster	type	indicator	1,00
	Building volume		30%			0,30
	Expandability			50%		0,15
D04	Oversizing building space/reservation for electrical & mechanical engineering (E&W) systems and shaf	1.0			31%	0,05
D05	Expandable building or dwelling/unit, horizontally and/or vertically	1.0			31%	0,05

The above summations result in a score for Adaptive Capacity between 0.00 and 4.00.
Because such an absolute score is difficult to interpret, it is converted into a relative score between 0% and 100%. This score indicates what proportion of the total options has been used. In the example where the option 'normal' is chosen for all indicators, the absolute score for adaptive capacity is 1.00 and the relative score is 25%.

RESULTS		SCORE
ADAPTIVE CAPACITY (utilized share)	minimum = 0% / maximum = 100%	25%

		weighting	partial score
ADAPTIVE CAPACITY (weighted summation over both perspectives)	minimum = 0.00 / maximum = 4.00	100%	1,00
USE DYNAMICS		40%	1,00
REPURPOSING DYNAMICS		60%	1,00

Annex: Schematic representation of the adaptive capacity method