TU Delft
BK Bouwkunde

PRACTICAL GUIDELINES TOWARDS A CIRCULAR-ADAPTABLE REUSE OF **VACANT AND OBSOLETE** REAL ESTATE: A PARTICULAR REFERENCE TO THE **DUTCH CONTEXT**.

Khalil Amrani

19 Januari 2024

CONTENT

RESEARCH GAP

- **Property obsolescence and vacancy** are two interrelated issues (Remøy, 2014).
- So, **adaptive reuse is an inevitable practice**. (Ross, 2017)
- Most of existing **buildings lack for adaptability** (Beadle et al., 2008)
- Although adaptive reuse is in line with CE principles, there is a **limitation** in implementing it in a **circular way in NL.** (Ikiz Kaya et al., 2021)
- Hamida et al. (2022) argued that **adaptability and circularity should be aligned in buildings,** in order to not overlook other contextual aspects (e.g. long-lasting functionality).
- ***All these facts and arguments necessitate providing professionals with guiding tools.***

WHO ARE THOSE PRACTITIONERS?

- **Professionals** from the building industry and property market who participate in the **design and redevelopment phases** of adaptive reuse projects.
- These professionals usually comprise **architects, engineers, contractors and building managers** (Hamida and Hassanain 2022).
- Building managers, in this research, are **facilities managers and real estate managers**, who are involved in the operation of the existing building.

RESEARCH AIM

This research aims to **develop practical guidelines** that could guide practitioners on how to operationalize circularity and adaptability in the reuse of vacant and obsolete real estate.

CONCEPTUAL MODEL

- ***Problem-solution*** oriented conceptual model.
- This model ***depicts 4 related problems,*** and 2 solutions for the relevant problems.
- The ***2 solutions are interconnected*** and can be brought together to ***tackle the 4 problems.***

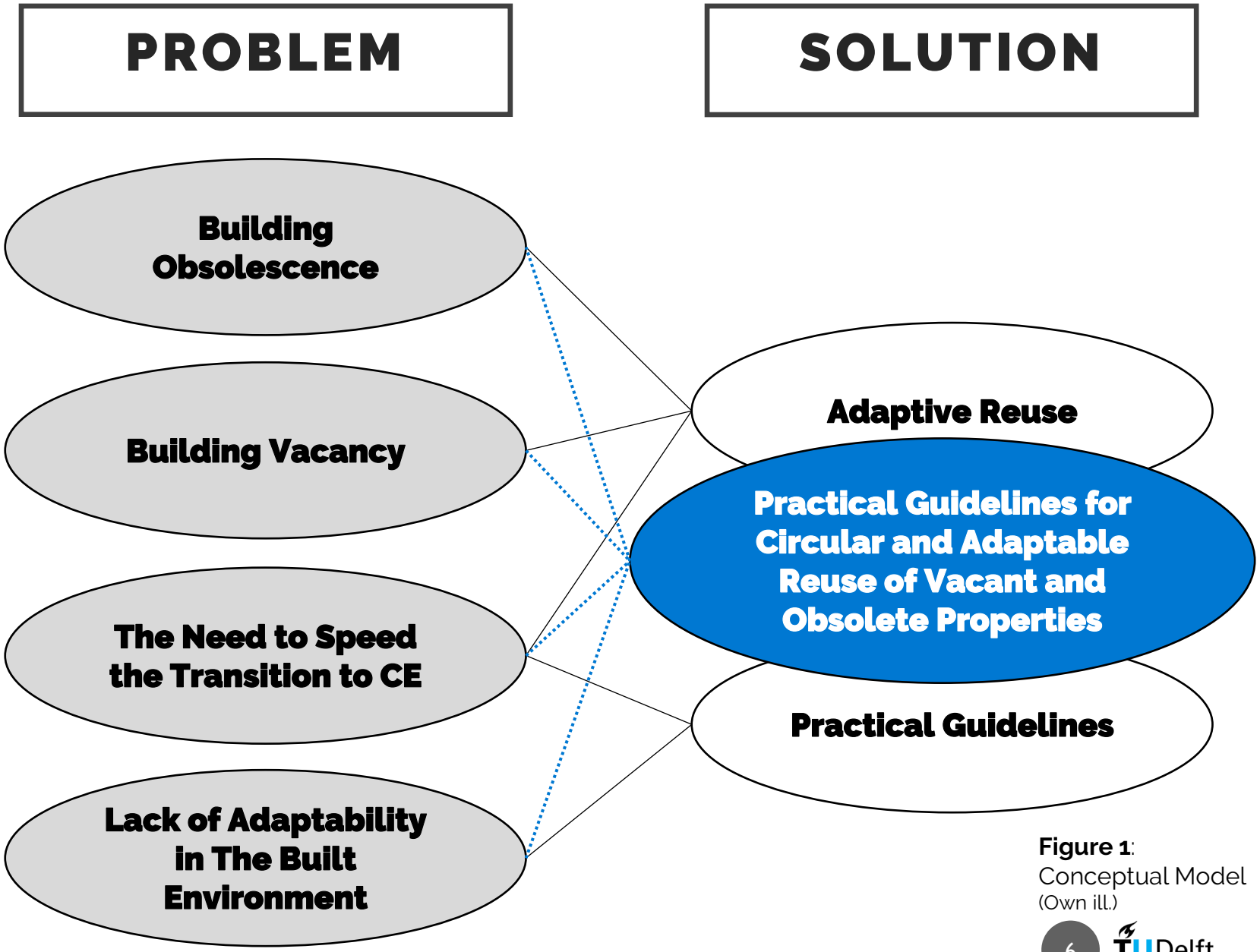


Figure 1: Conceptual Model (Own ill.)

RESEARCH QUESTIONS

How can circularity and adaptability be promoted in the reuse of vacant and obsolete real estate?

To answer the main research questions, the following sub-questions will be answered:

1. What are the criteria and measures for reusing obsolete and vacant building in a circular and adaptable manner?

2. To what extent are circularity- and adaptability- related measures implemented in reusing vacant and obsolete buildings?

3. How can guidelines guide professionals on how to promote circularity and adaptability related measures in the reuse of vacant and obsolete buildings?

RESEARCH DESIGN

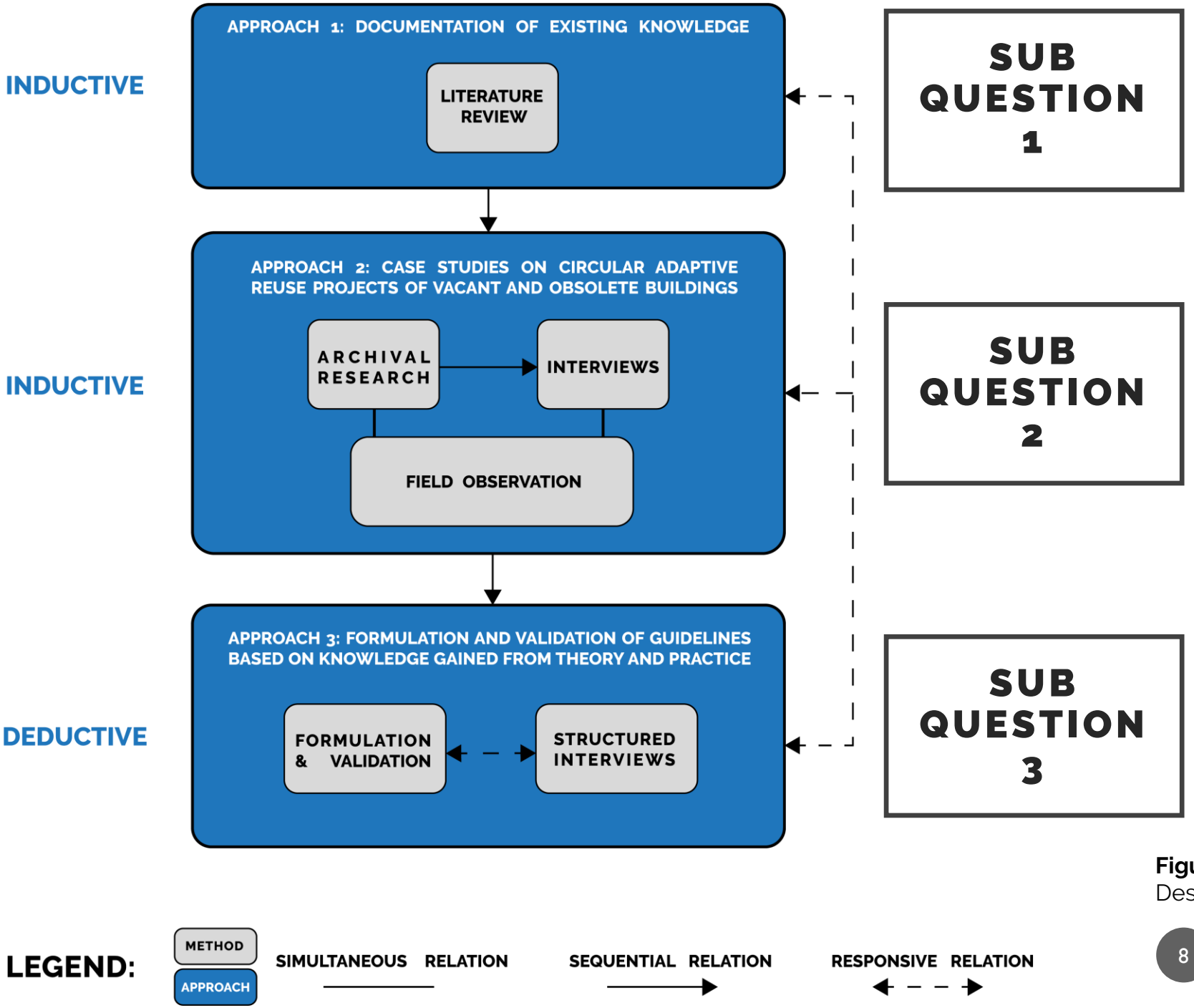


Figure 2: Research Design (Own ill.)

SUB QUESTION 1

1. What are the criteria and measures for reusing obsolete and vacant building in a circular and adaptable manner?

FINDINGS FROM LITERATURE

Table 1: Linked criteria and measures.

CRITERIA	MEASURES								Frequency
	Use Material Passports (MP): Documentation of characteristics and performance of building materials	**Use Recycled Materials:** The use of recycled materials in building applications	**Use Dismantlable Design**: The use of demountable products	**Use Unitized Design:** Modularization and standardization of the building design	**Use Digital Technologies:** The utilization of the digital technologies in the building design and operation	**Use Regenerative Design Principles:** The adoption of solutions that promote renewability of resources in buildings	**Share Resources:** The promotion of multiplicity of the use of resources in buildings	**Leasing Resources (Products as a service):** A procurement strategy where the facade builder oversees the entire lifecycle of the building envelope	
Design for Disassembly			X	X					2
Material Efficiency	X	X		X	X	X			5
Energy Efficiency					X		X		2
Reusability	X	X	X	X			X	X	6
Durability									0
Flexibility			X	X			X	X	4
Functional Convertibility				X					1
Technological Refit-Ability								X	1
Ecological Resilience						X	X		2
Social and Cultural Acceptability							X		1
Biodegradability		X				X			1
Energy Renewability						X			1
Frequency	2	3	3	5	2	4	5	3	

- The criteria ***"material efficiency"*** **and** ***"reusability"*** as reflected in the literature showed connections with most of the measures. This was also reflected by the measures in both case studies.

SUB QUESTION 2

2. To what extent are circularity- and adaptability- related measures implemented in reusing vacant and obsolete buildings?

CASE 1 (C1): SEAVIEW, SCHEVENINGEN

Figure 3: *Seaview. (Source: Archival Research: shared by Developer)*

Figure 4:
Zandkasteel.
(Source: Archival Research: shared by Director of Wonam)

SUB QUESTION 3

3. How can guidelines guide professionals on how to promote circularity and adaptability related measures in the reuse of vacant and obsolete buildings?

GUIDELINE 1

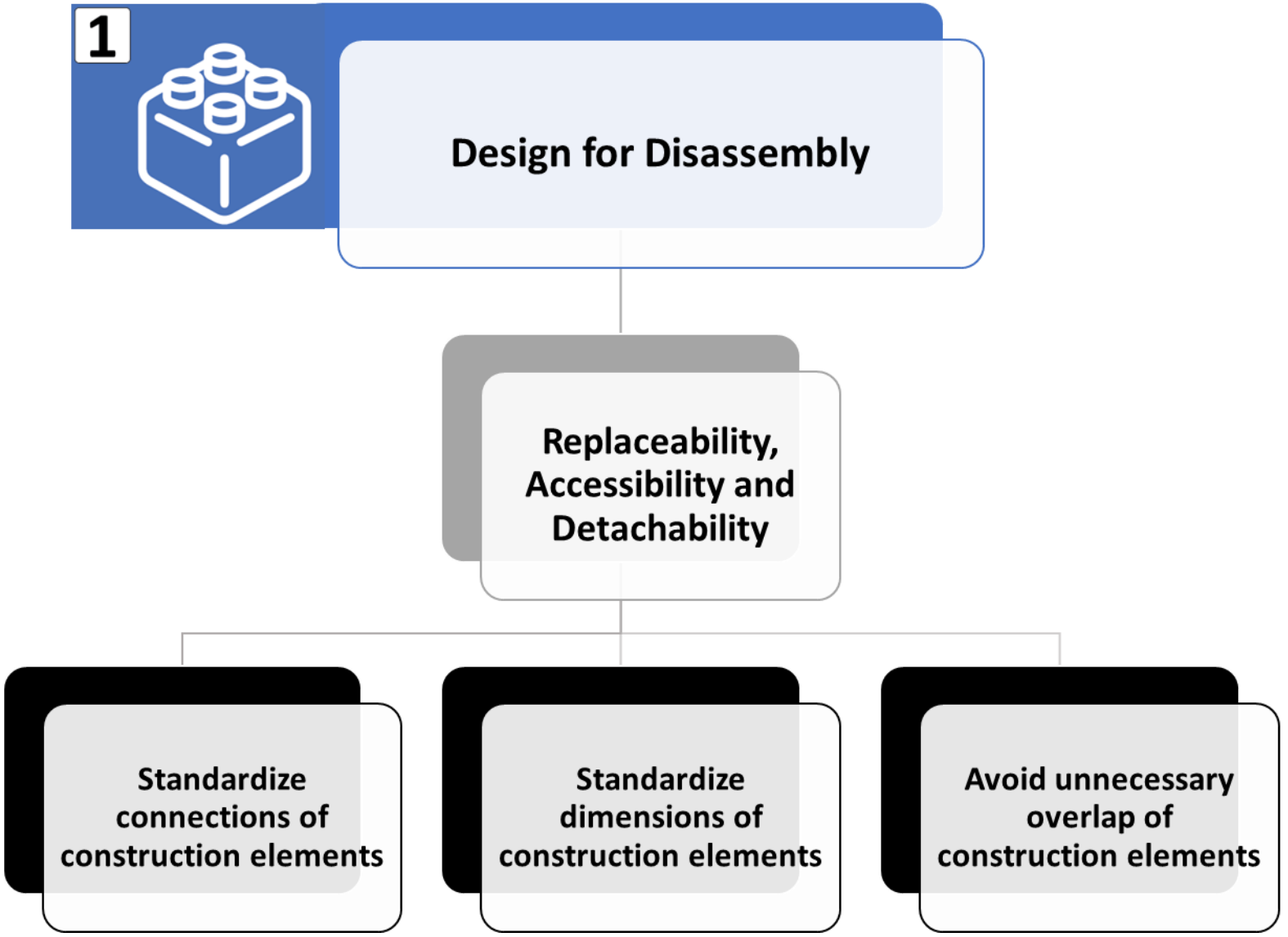


Figure 5: Possible measures to facilitate DfD in building transformation. (Source: own illustration, 2024)

GUIDELINE 2

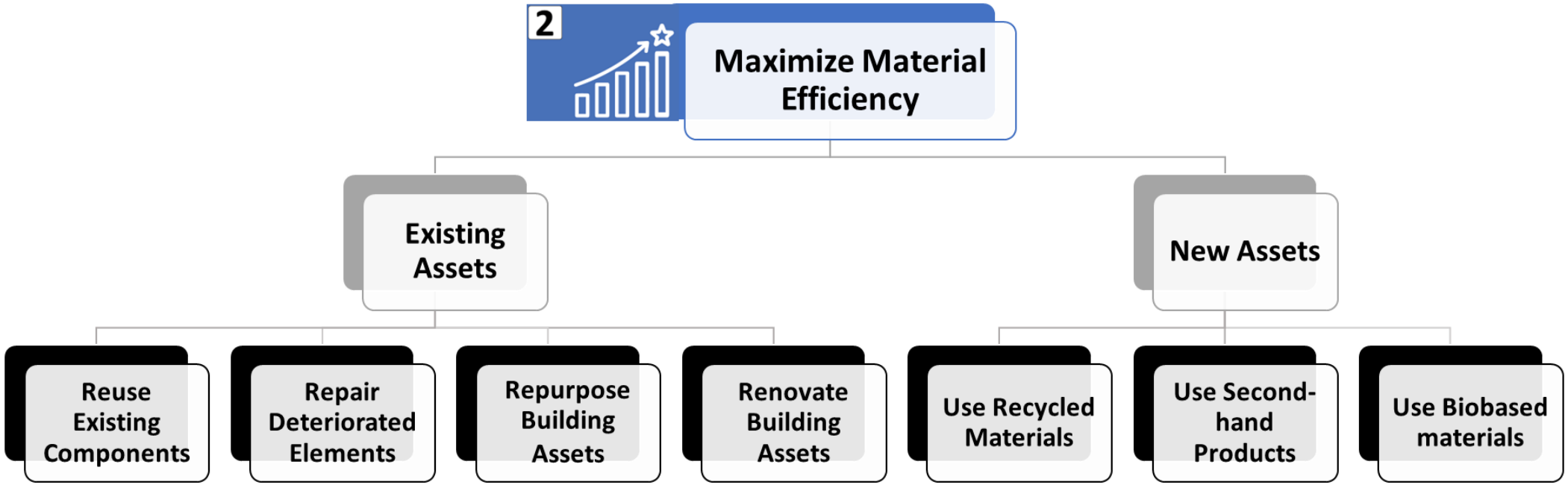


Figure 6: Possible measures for maximizing material efficiency in building transformations. (Source: own illustration, 2024)

GUIDELINE 3

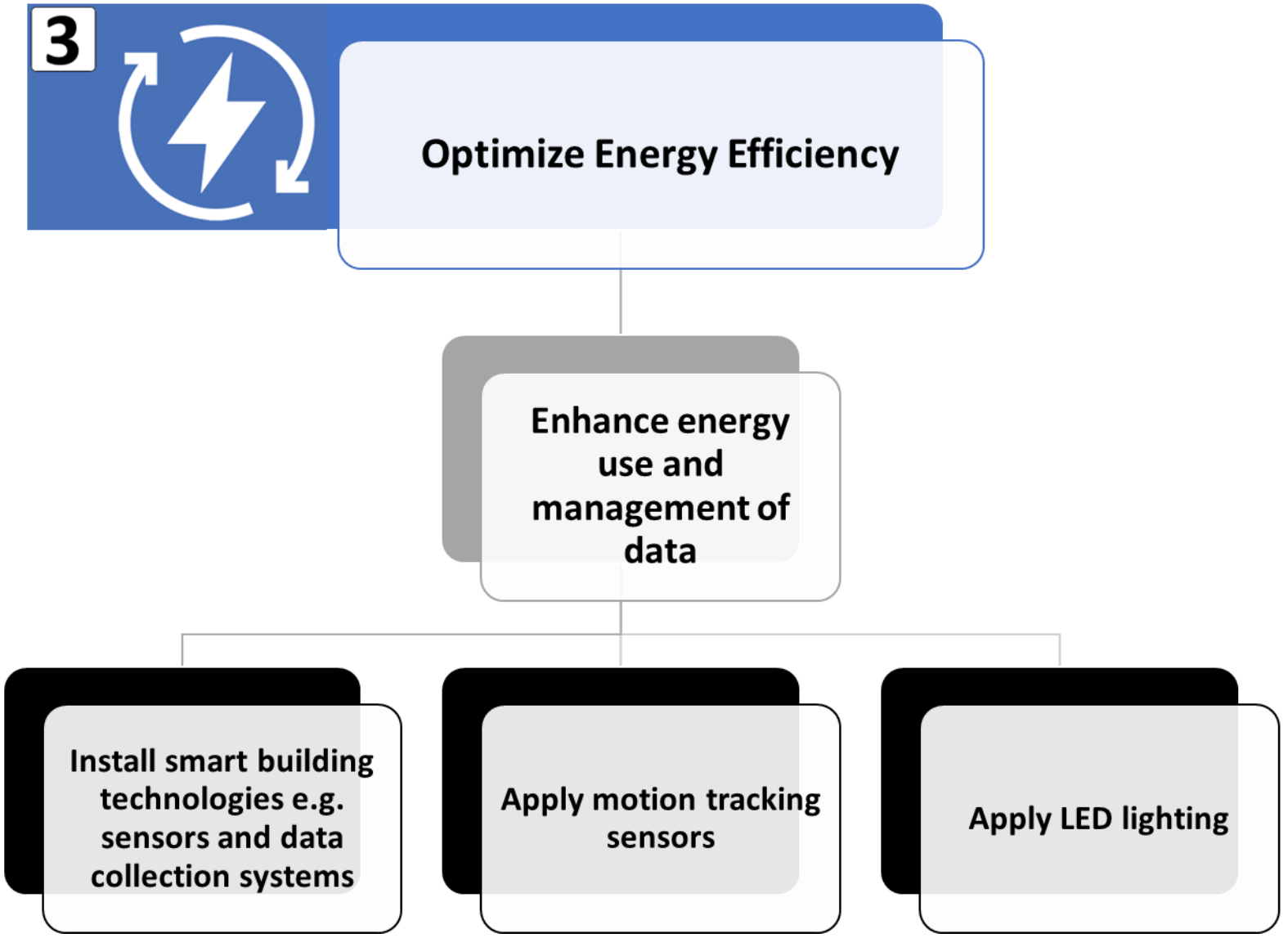


Figure 7: Possible measures for optimizing energy efficiency in building transformations. (Source: own illustration, 2024)

GUIDELINE 4

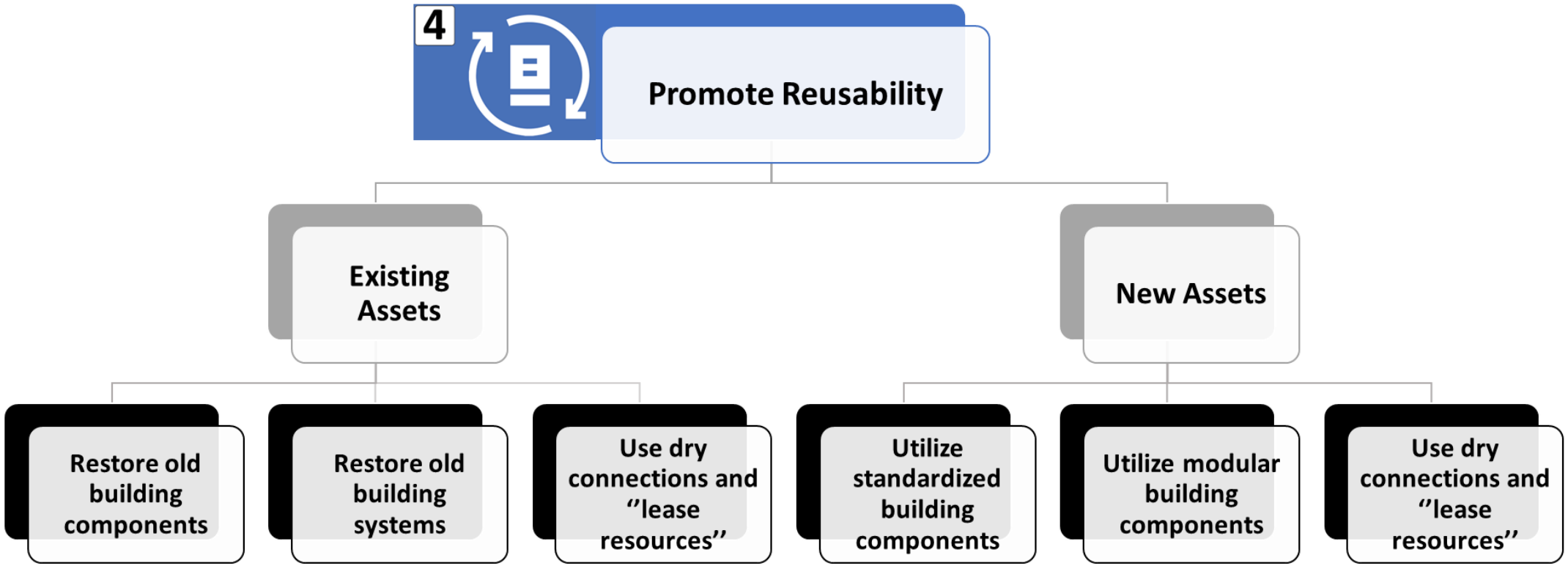


Figure 8: Possible measures for promoting reusability in building transformations. (Source: own illustration, 2024)

GUIDELINE 5

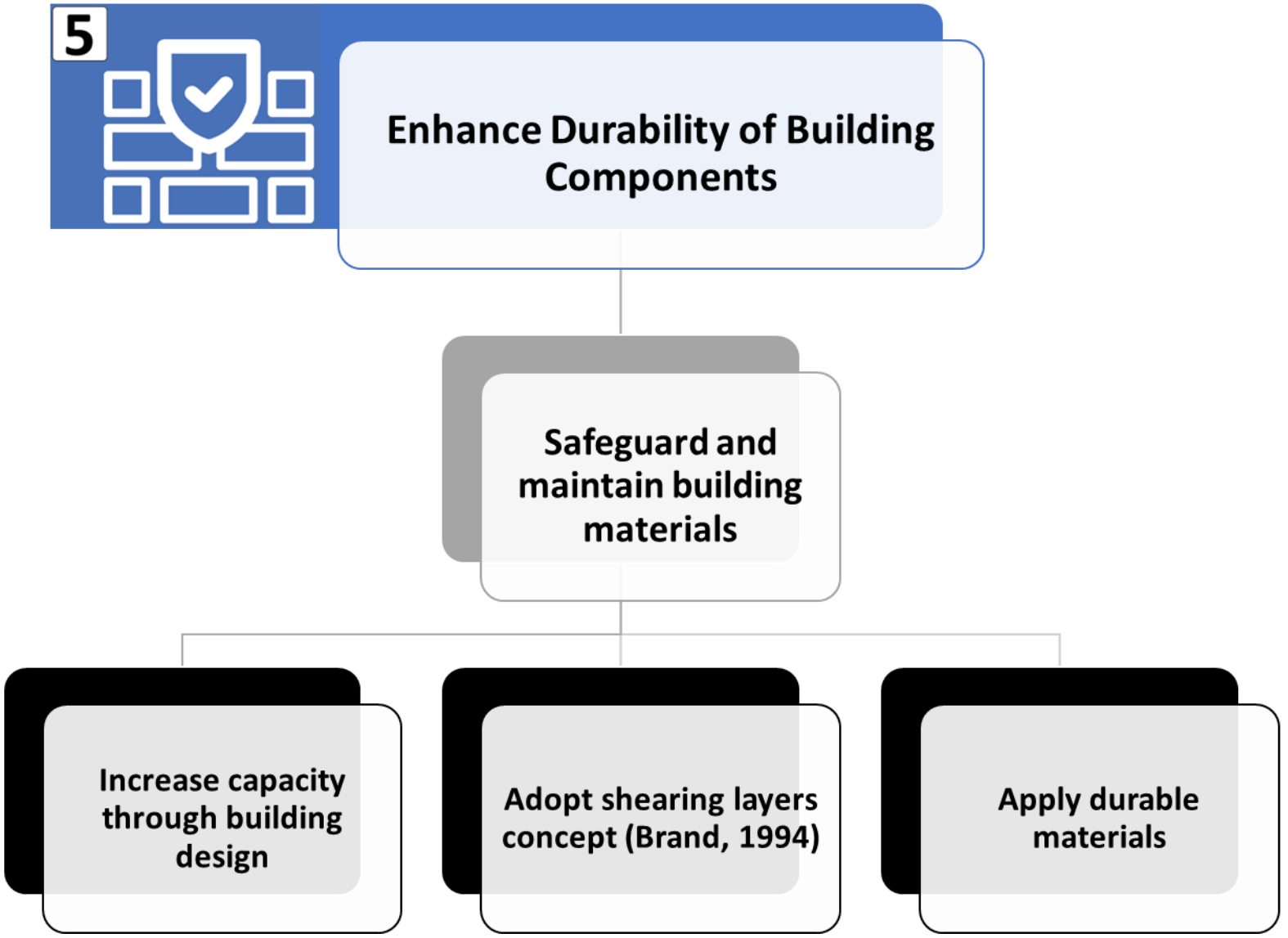


Figure 9: Possible measures for enhancing durability in building transformations. (Source: own illustration, 2024)

GUIDELINE 6

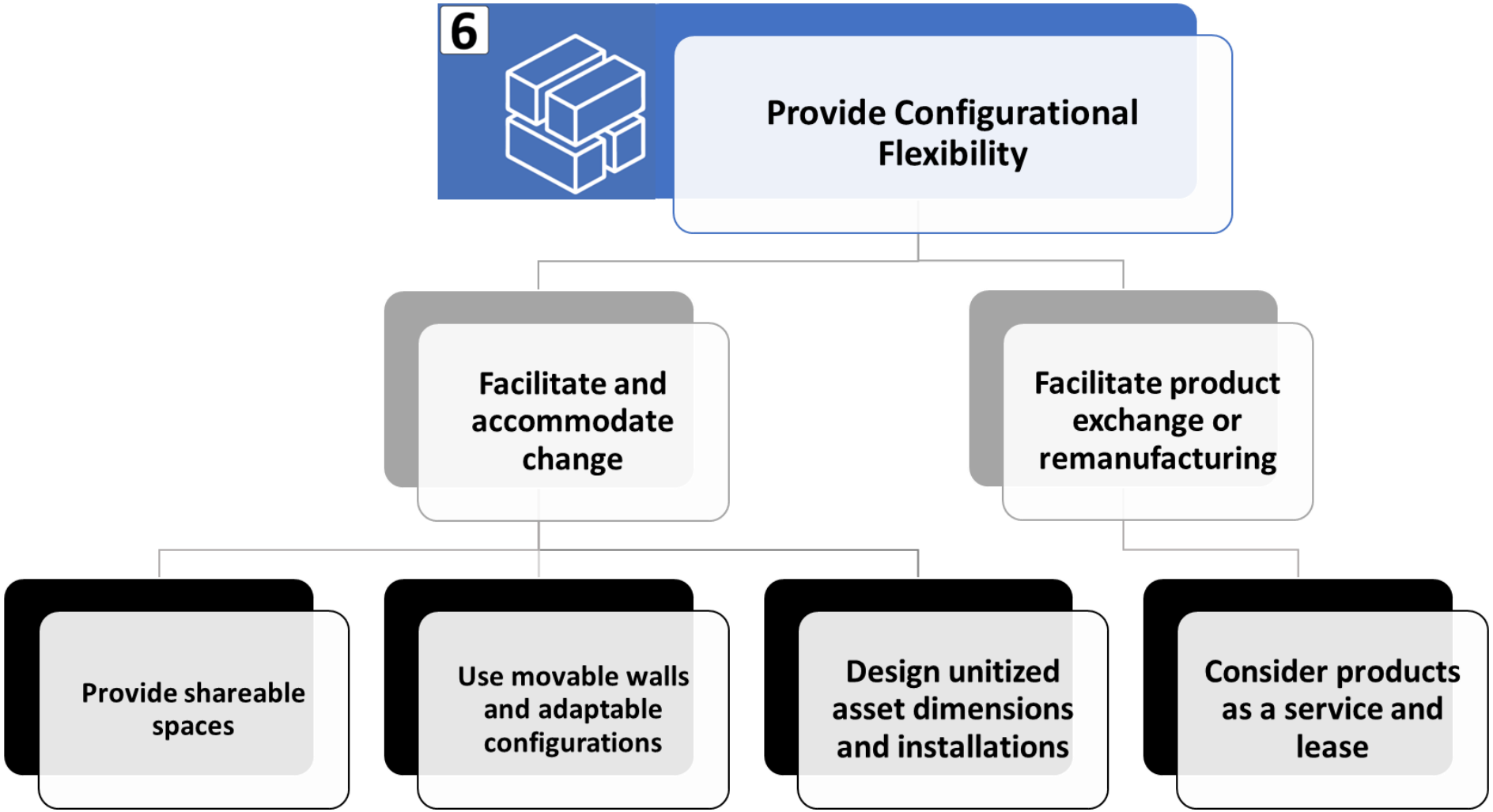


Figure 10: Possible measures for providing configurational flexibility in building transformations. (Source: own illustration, 2024)

GUIDELINE 7

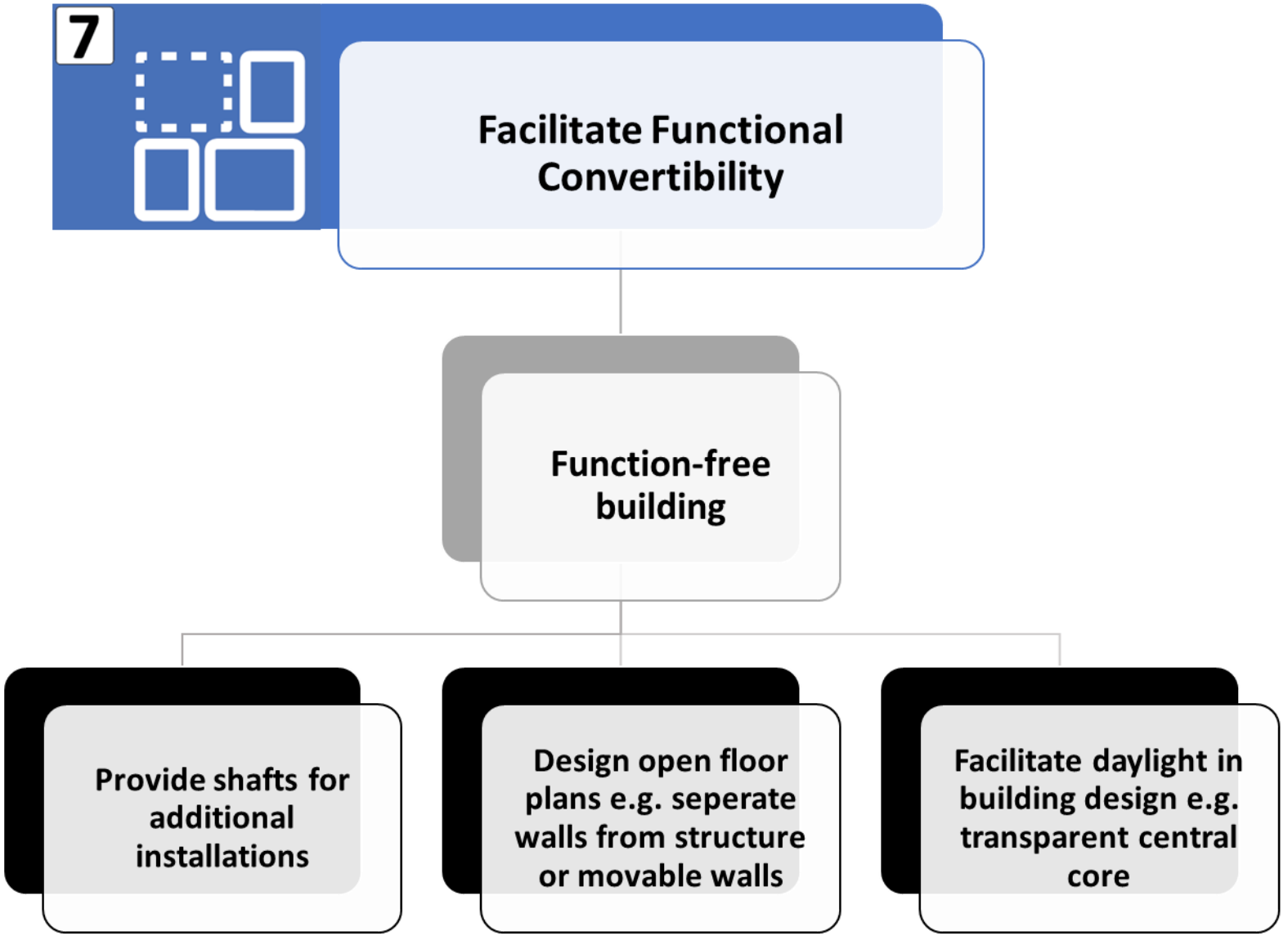


Figure 11: Possible measures for facilitating functional convertibility in building transformations. (Source: own illustration, 2024)

GUIDELINE 8

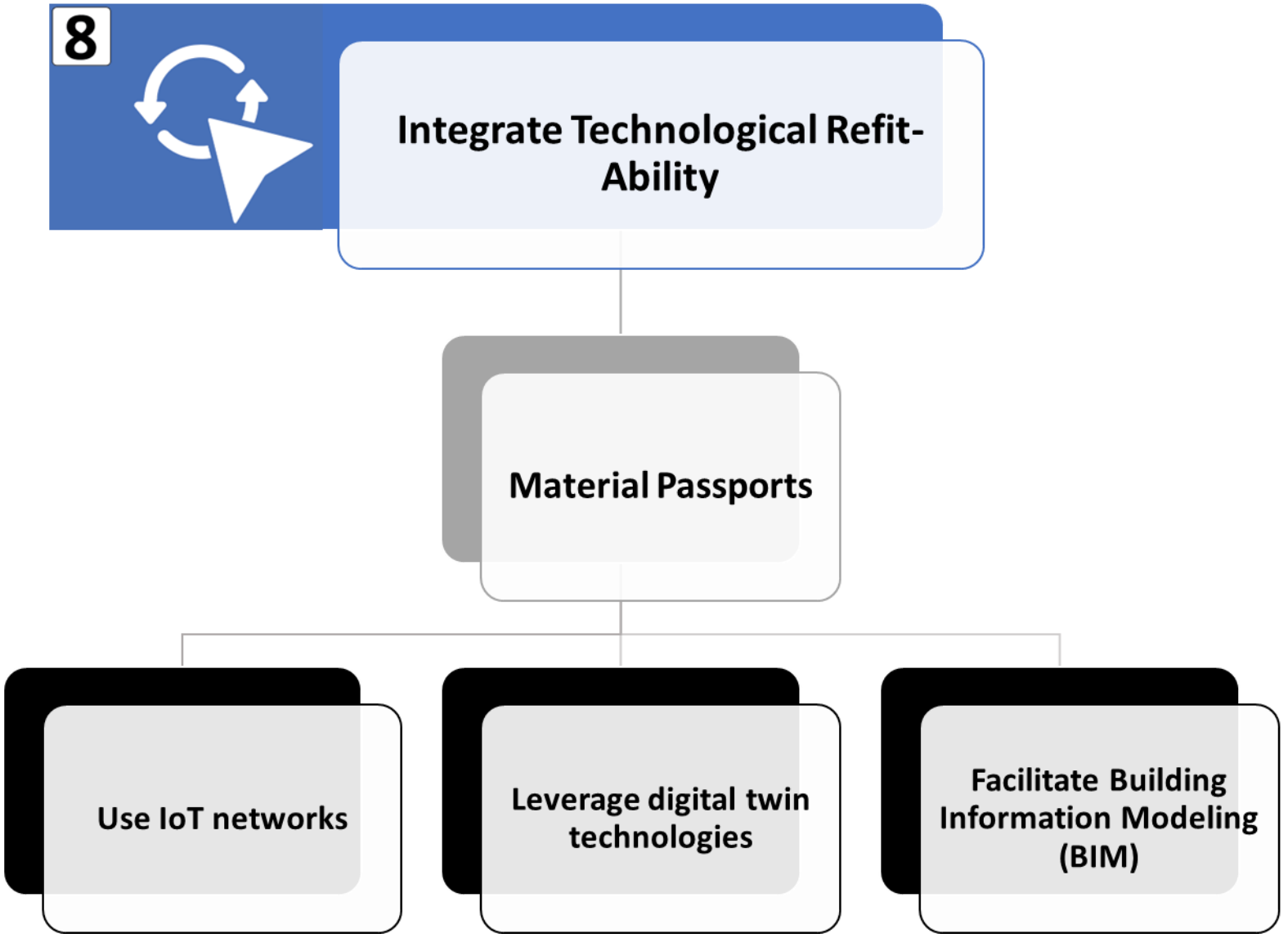


Figure 12: Possible measures for integrating technological refit-ability in building transformations. (Source: own illustration, 2024)

GUIDELINE 9

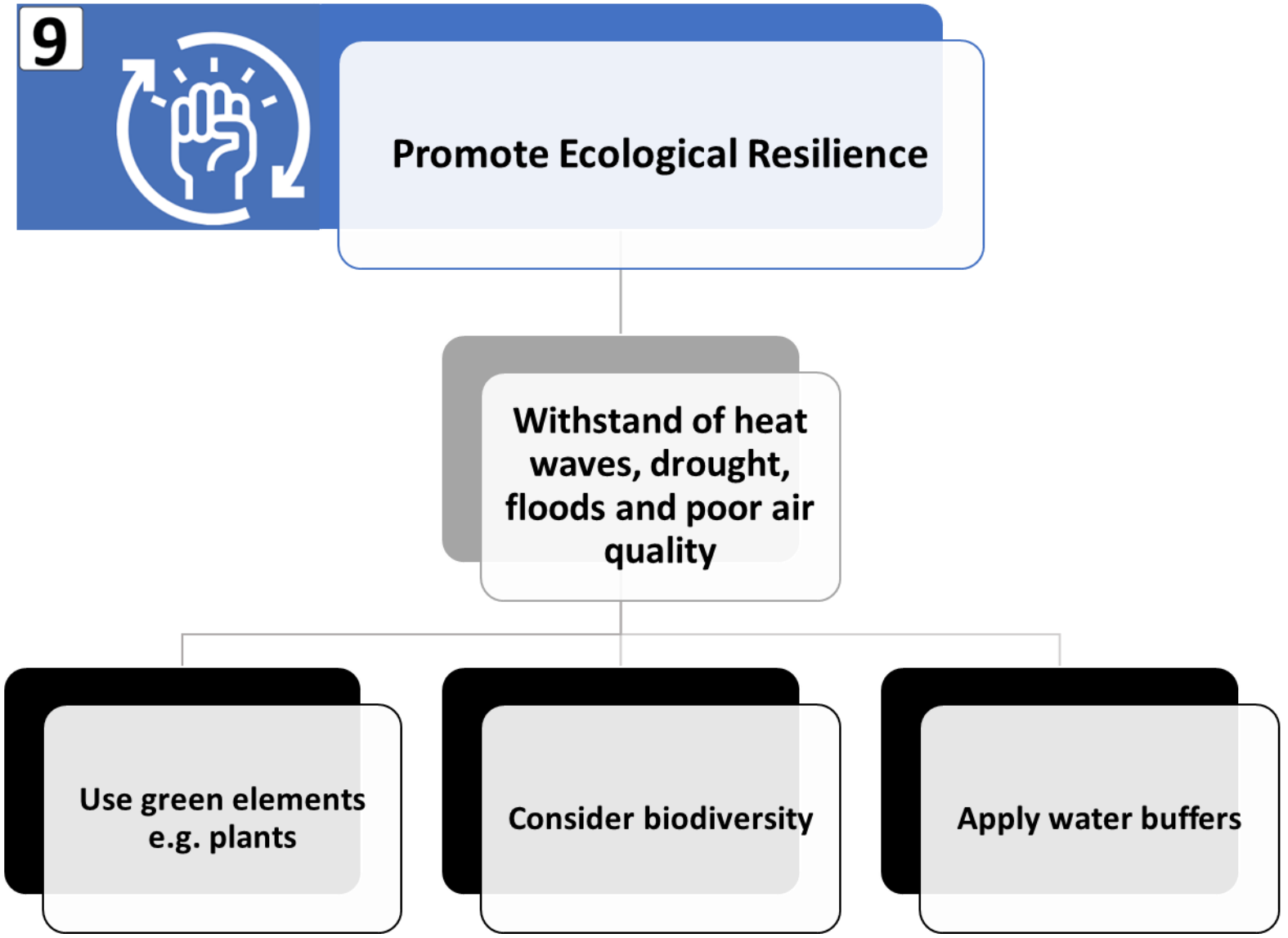


Figure 13: Possible measures for promoting ecological resilience in building transformations. (Source: own illustration, 2024)

GUIDELINE 10

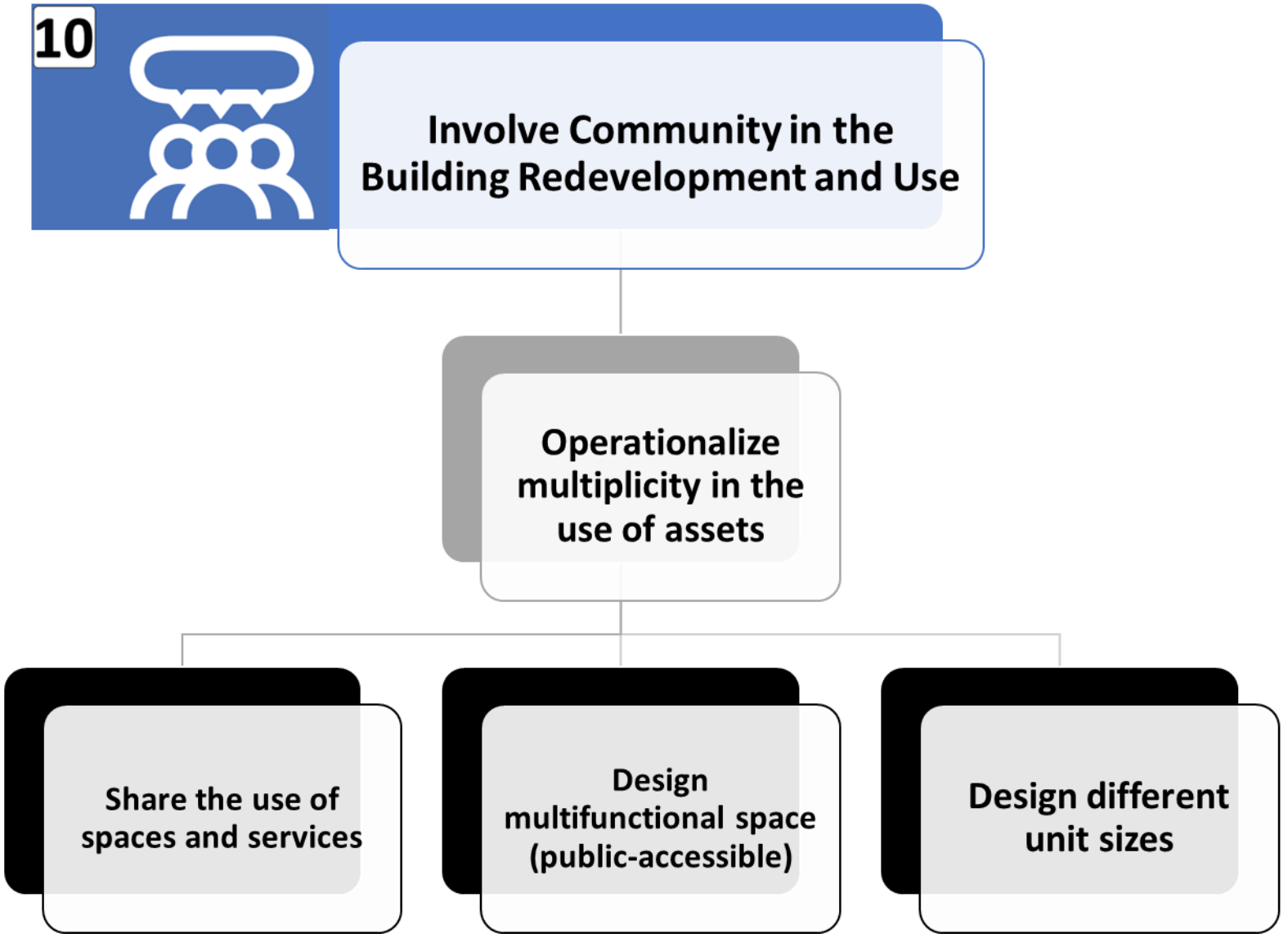


Figure 14: Possible measures for involving community in building transformations. (Source: own illustration, 2024)

GUIDELINE 11

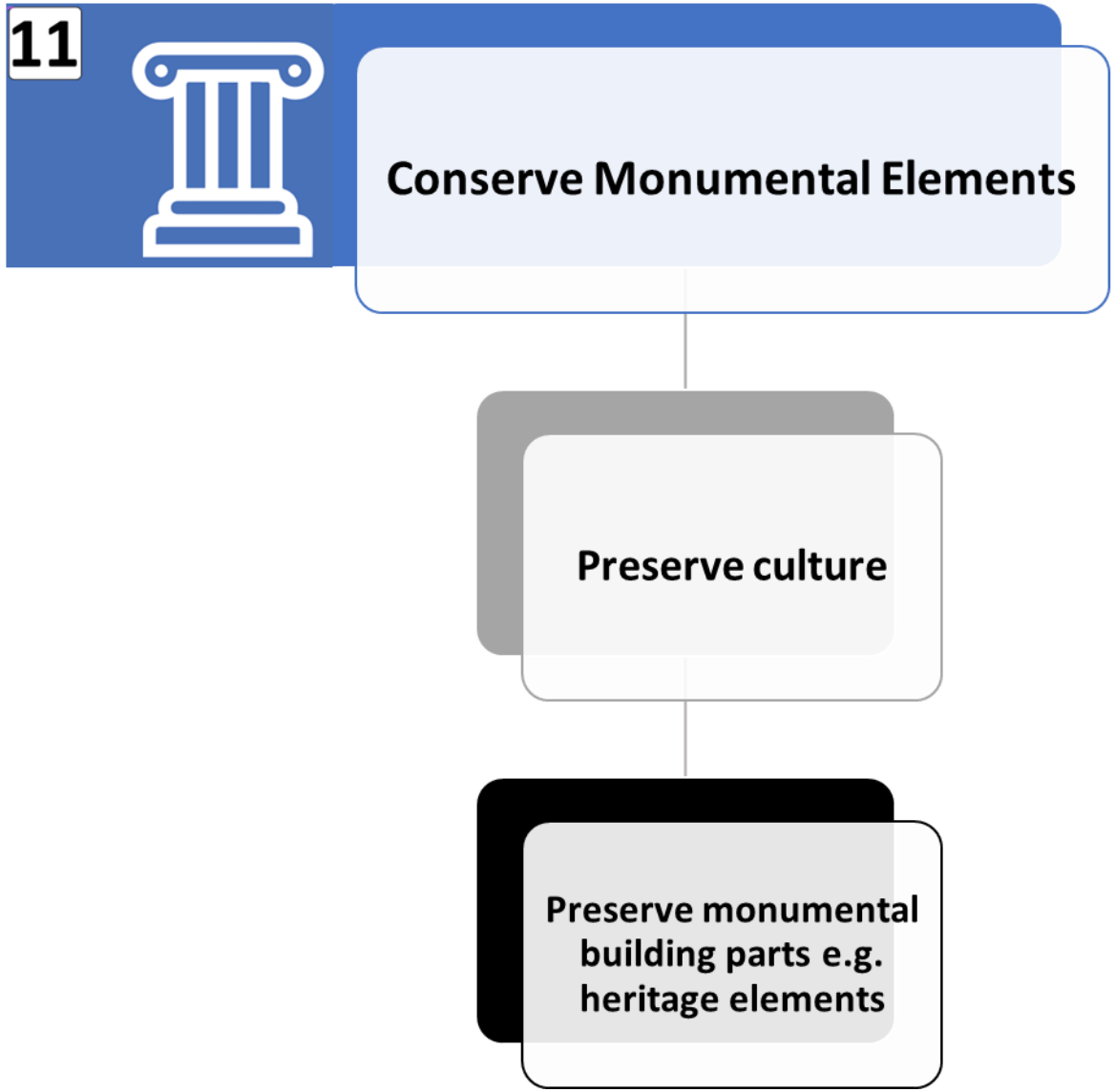


Figure 15: Possible measures for conserving monumental elements in building transformations. (Source: own illustration, 2024)

GUIDELINE 12

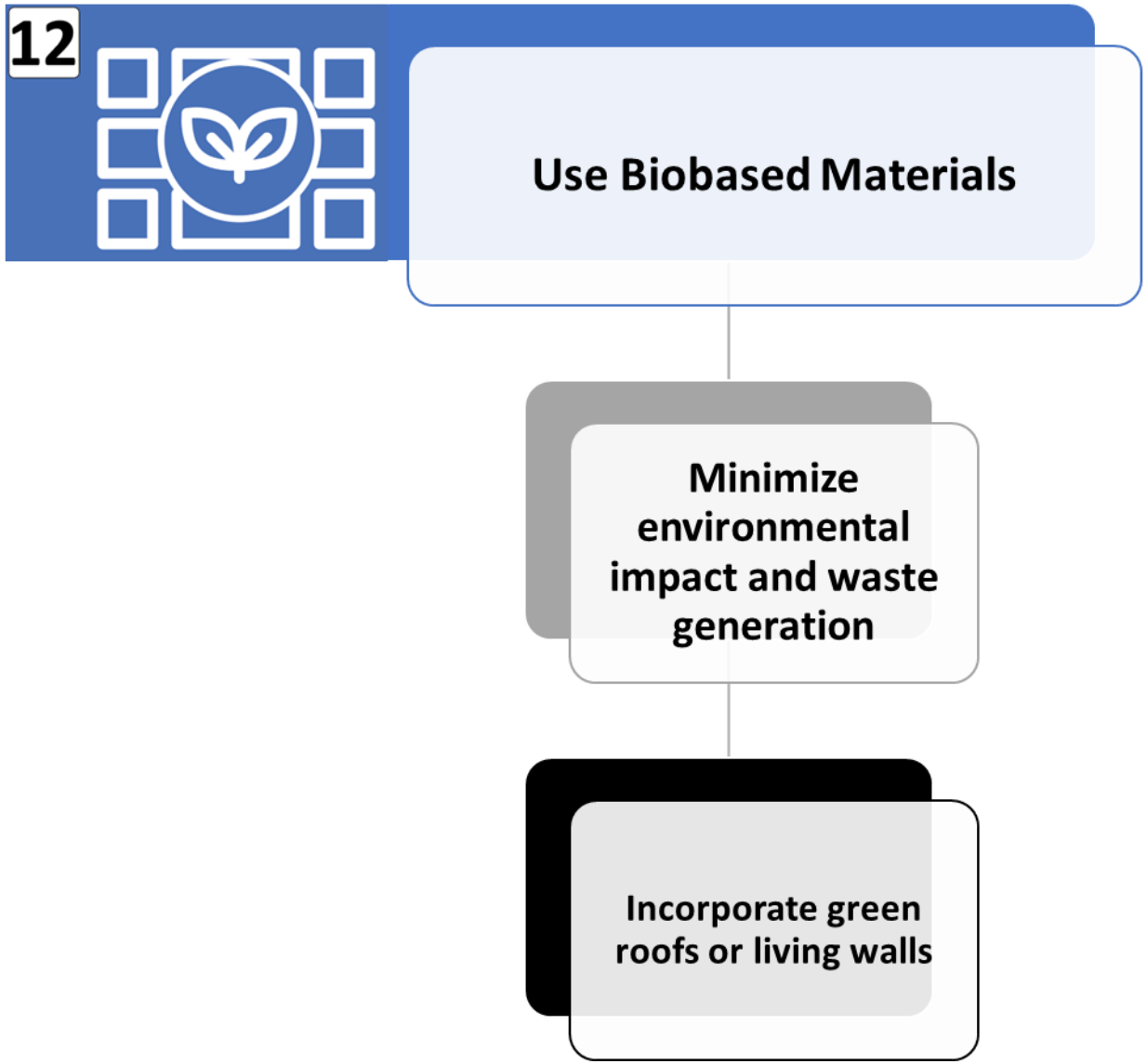


Figure 16: Possible measures for using biobased materials in building transformations. (Source: own illustration, 2024)

GUIDELINE 13

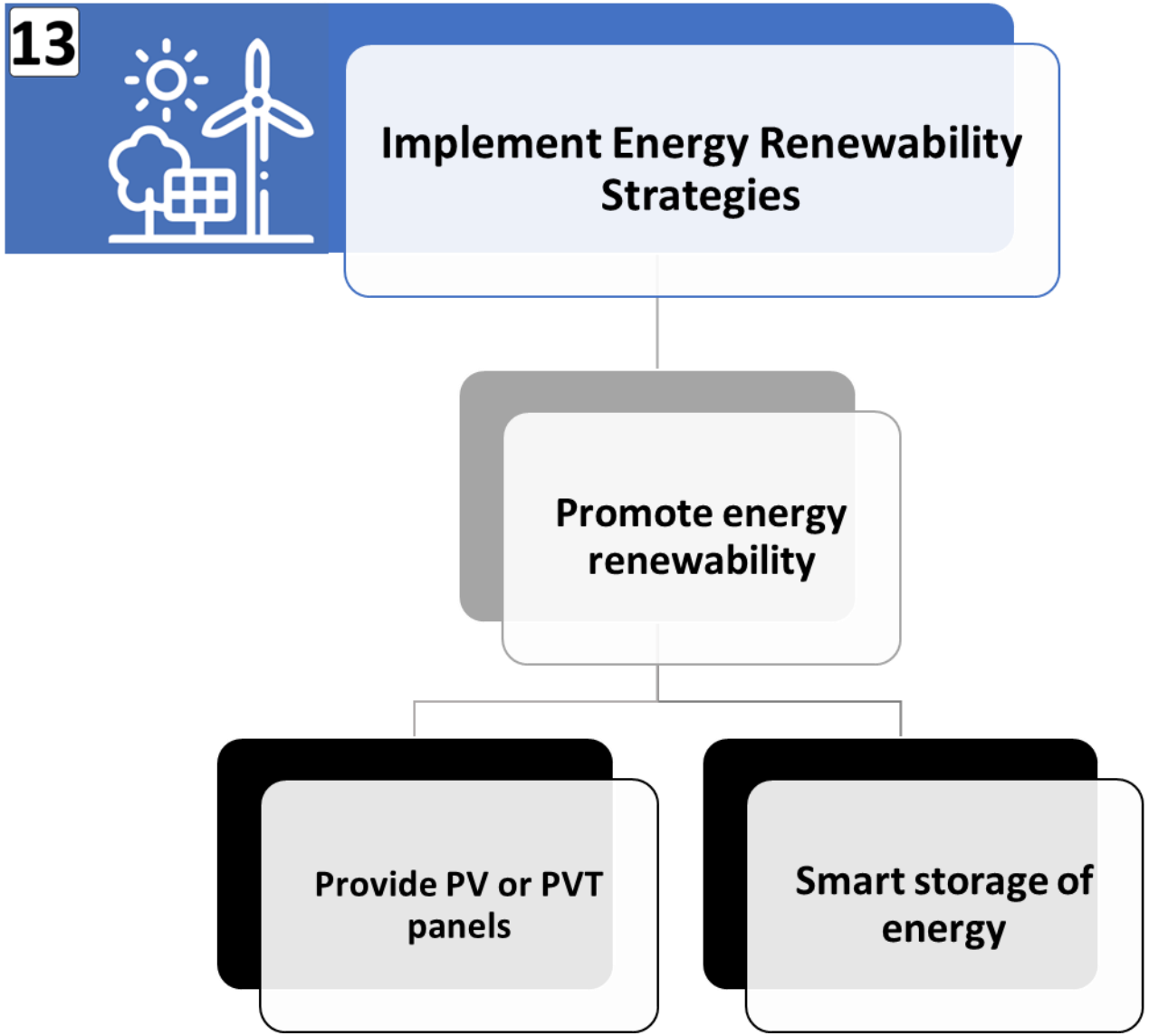


Figure 17: Possible measures for implementing energy renewability in building transformations. (Source: own illustration, 2024)

MAIN RESEARCH QUESTION

How can circularity and adaptability be promoted in the reuse of vacant and obsolete real estate?

By integrating these guidelines into their practices, architects, engineers, and contractors (AECs) as well as building managers can ensure that their strategies align with the broader goals of the circular economy.

CONCLUSIONS

- **The following can be concluded from this study:**
- The literature review concluded with an identification of ***12 practical criteria and 8 measures for circular and adaptable reuse of vacant and obsolete buildings.***
- ***Both cases,*** showing a consistent integration of reusable building products and components in the building transformation.
- In addition, ***"use recycled materials"*** was not applied in both cases.
- Furthermore, the application of environment-oriented measures that promote ***"biodegradability" and "ecological resilience"*** were barely applied in the two cases.
- Two other measures, namely ***"use material passports" and "leasing resources"***, from the literature were not implemented in both cases as well.
- Based on the knowledge gained from the theory and practice, in the third approach, ***13 guidelines were formulated and mapped to the relevant criteria.***

RECOMMENDATIONS

- **Based on the conclusion of this study, the following recommendations have been proposed:**
- Future research can involve ***testing the guidelines*** and learn from practice to enhance the effectiveness and applicability of them in practice.
- ***Policy makers*** can further ***consult researchers and practitioners*** to include the latest knowledge with the aim of amending existing legislation to facilitate a circular economy.
- ***To enhance the accessibility*** of the guidelines, it is recommended to ***develop a web application.*** The web application should enable the content to be presented in an interactive manner, taking into consideration the visual orientation of designers and prioritization of the guidelines in different contexts.
- ***Building professionals should consider and further promote environment-oriented criteria***, such as ***"biodegradability"*** by using recycled material and/or using regenerative design principles. Also, ***"ecological resilience"*** by using regenerative design principles and/or sharing resources.

LIMITATIONS

- **This research has several limitations:**
- The empirical evidence was limited to ***only two case studies.***
- The guidelines were formulated based on interpretations of the literature and findings of two case studies. Different researchers or practitioners may have different interpretations, leading to potential ***subjectivity in the development of guidelines***.
- The incorporated measures into the guidelines and the guidelines themselves were ***not prioritized*** in terms of their significance.
- The guidelines were validated in terms of their adequacy, clarity and usability, but ***have not been tested in practice*** nor in a pilot application.

THANK YOU

Any questions?

CRITERIA FOR CASE STUDIES

- **Operationalization of circular solutions**: Each project should demonstrate the operationalisation of circular solutions such as material reuse or recycling.
- **Operationalization of solutions for building adaptability**: Each project should demonstrate the inclusion of adaptable design means, such as the use of demountable building products and flexible building configuration.
- **The adaptive reuse will be carried out to tackle the problem of building obsolescence and/or vacancy**: The adaptive reuse of historic buildings was excluded. Because of case-specific considerations pertaining to heritage, cultural and physical qualities/values of these buildings.

CBA

- **Circular Building Adaptability (CBA):** Hamida et al. (2022) redefined circularity and adaptability with a new capitalization, so-called Circular Building Adaptability (CBA) as: ***"the capacity to contextually and physically alter the built environment and sustain its usefulness, while keeping the building asset in a closed-reversible value chain"***.
- CBA can be realized through **10 design and operation determinants;** configuration flexibility, product dismantlability, asset multi-usability, design regularity, functional convertibility, material reversibility, building maintainability, resource recovery, volume scalability and asset refit-ability.
- These determinants comprise configuration-, use- and operation-oriented solutions.

VACANCY

- **A vacant building** can be described as a built-asset that has become underutilized, unoccupied, or empty for a period of time (Insuranceopedia, 2018). Vacancy can take place due to market dynamics or even when the building itself becomes obsolete (Wilkinson et al., 2014). Generally, there are different types of building vacancy, such as:
- Structural Vacancy: is defined as emptiness of unit area within the building for three years or more (Remøy, 2010).
- Natural Vacancy: also known as 'healthy' which ranges between 3% to 10%, and it occurs usually when there is balance in the trends of supply and demand trends (Armstrong et al., 2021).
- This research considers the structural vacancy, as it is the problematic condition that could result from market dynamics.

OBSOLESCENCE

- **Obsolescence:** Building obsolescence is the decline in the performance of the building , leading to the end of the service life of the built asset (Thomsen and Van Der Flier, 2011). Building obsolescence can be manifested in 10 ways as follows (Remøy, 2014):
- Aesthetic obsolescence: when the building losses its aesthetic attraction.
- Functional obsolescence: occurs for instance when the users way of working changes.
- Legal obsolescence: resulting from new legal regulations (Langston et al., 2008).
- Social obsolescence: when the building does not reflect the users image anymore.
- Tenure obsolescence: is the disagreement between owner and user of the building.
- Structural obsolescence: deterioration of the supporting structure.
- Financial obsolescence: mismatch between costs and yield (Baum and Hartzell 1997).
- Environmental obsolescence: the result of environmental changes.
- Locational obsolescence: the effect of functional obsolescence and image issues of the location
- Site obsolescence: mismatch between site value and building value.

CIRCULARITY

- **Circular Economy:** is a sustainability paradigm that seeks out eliminating waste generation, and environmental impact closing the resource loops – also called the value chain, by adopting and applying R-strategies related solutions and processes (Kirchherr et al., 2017). Further, circularity seeks out adding value to existing resources and prolong their use, by keeping them at their highest utility and value (Ellen Macarthur Foundation, 2022). In a circular economy, almost all products are reprocessed by one of the R-strategies such as reuse and recycling. If a product is broken, it can be repaired as a strategy to prolong its usefulness (ARUP, 2016).

ADAPTIVE REUSE

- **Adaptive reuse :**– also known as conversion, across-use adaption or building transformation – is a type of building adaption that seek out refunctioning the use of a building (Shahi et al., 2020; Wilkinson et al., 2014).

- Numerous definitions were formulated to define adaptive reuse.

- One of the oldest definitions was defined as “Conversion of a facility or part of a facility to a use significantly different from that for which it was originally designed.” (Iselin and Lemer, 1993).

GUIDELINES

- **Design Guidelines :**–should not be exclusive to theory or beliefs of individual designers, but rather they should incorporate empirical evidence (Park and Hannafin, 1993).
- **For instance,** in the adaptive reuse literature, Hamida and Hassanain (2023) developed a list of practical guidelines to enhance the performance of designers, contractors and building mangers in adaptive reuse of buildings based on a case study research which was guided by a literature-based conceptual model.

RE:BORN REAL ESTATE

- **The expertise of RE:BORN** in developing circular buildings aligns perfectly with my research goal of formulating guidelines for circular adaptive reuse of vacant properties, making them an ideal collaborator for my research.

C2 MEASURES

AMSTERDAM

Circulaire transformatie oud-hoofdkantoor ING

Hergebruik installaties:

- ✓ 3 liften — Gerealiseerd
- ✓ Ca. 80 toiletten — Niet gerealiseerd
- ✓ Ca. 350 multizuilen — Gerealiseerd
- ✓ Bijna alle radiatoren — Gerealiseerd
- ✓ Groot deel elektrakabels — Gerealiseerd
- ✓ Ca. 850 toevoerroosters — Gerealiseerd
- ✓ Ca. 20 brandslanghaspels — Gerealiseerd
- ✓ 10 luchtbehandelingskasten — 4 LBK's gerealiseerd
- ✓ De gehele sprinklerinstallatie — Gerealiseerd
- ✓ De gehele drogeblusinstallatie — Gerealiseerd
- ✓ Ca. 2000 verlichtingsarmaturen — Gerealiseerd
- ✓ Gehele gevelonderhoudsinstallatie — Gerealiseerd
- ✓ Groot deel verwarmings- en koelleidingen — Gerealiseerd
- ✓ Groot deel hwa/vwa/water leidingen — Waterleidingen groot deel gerealiseerd, HWA/VWA alleen de standleidingen hergebruikt
- ✓ Gehele bliksembeveiliging en aardingsinstallatie — Gerealiseerd
- ✓ Data-installatie incl. patchkasten en bekabeling — Gerealiseerd

Bouwkundig hergebruik:

- ✓ Ca. 800 m² tapijttegels — Gerealiseerd
- ✓ De gehele gevel incl. herstelwerkzaamheden — Gerealiseerd
- ✓ Alle bestaande kozijnen — Gerealiseerd excl glas en rubbers
- ✓ Ca. 1500 m² plafondplaten — Gerealiseerd

Beeld: Alberts & Van Huut International Architects

Interessant om te weten:

- Kostenneutraal of kostenefficiënt hergebruik van veel installatietechnische componenten, ondanks ruim 30 jaar oude installaties, volledig gerenoveerd tot nieuwstaat.
- Niet traditioneel leegstrippen van het gebouw en dan renoveren, maar bekijken wat allemaal nog wel gebruikt kan worden.
- Verschillende innovatieve aanbestedingsmethoden toegepast.

Lees meer

Partners:

Gemeente Amsterdam, Alberts & Van Huut International Architects, a/d Amstel architecten (BIM model), ZRi, Bremen Bouwadviseurs, Arcadis, Aronsohn, , Esprit Scholen / Amsterdam International School

Merosch

P1 RESEARCH QUESTIONS

How can vacant and obsolete real estate be reused in a circular and adaptable manner?

To answer the main research questions, the following sub-questions will be answered:

1. What are the considerations to be taken for circular and adaptable buildings?
2. To what extent circularity- and adaptability- related measures are implemented in the reuse of vacant buildings?
3. How can vacant buildings be reused in circular and adaptable way ?

SOCIETAL AND SCIENTIFIC RELEVANCE

- Development of **practical guiding instruments** , like guidelines, that can be easily used and followed by professionals to adapt obsolete or vacant buildings in a circular and adaptable way. **With that,** future adaptive reuse would be more circular, and thus, this will **speed up the transition** to the Circular Economy (CE).
- **Expand** the existing theory and knowledge on circularity and adaptability in adaptive reuse **by** providing further **understanding** of **their practicality** in the real practice.

THESIS STRUCTURE

1. **Introduction.**

2. **Research design.**

3. **Literature review.**

4. **Case studies.**

5. **Practical guidelines.**

6. **Conclusions, recommendations and limitations.**

QUERIES

- Literature review is an important part of any research, as it provides researchers with an insight into what is already known. It is the foundation of every academic research (Xiao and Watson, 2019). The literature sources were obtained by searching in Google Scholar. The queries used are problem- and context- related and consists of four rounds;
- 1. Query 1: "circular" AND "adaptable" AND "building".
- 2. Query 2: "circularity" AND "adaptability" AND "building".
- 3. Query 3: "adaptive reuse" AND "circular" AND "obsolete".
- 4. Query 4: "adaptive reuse" AND "circular" AND "vacant".
- Query 1 and 2 are more related to the concepts of adaptability and circularity. And query 3 and 4 are related to the context of the problem and solutions.

POTENTIAL CASE STUDIES

LDE – THESIS LAB

- The laboratory program's supervisor has chosen to link the following organizations with my program, as they are deemed relevant to my research: **Province of Zuid-Holland, Antea Group, Ministry BZK.** The program encompasses **12 bi-weekly sessions**, in which students will acquire knowledge of the interdisciplinary nature of the challenge and learn how to effectively assume leadership roles in addressing it.

CB23 – ROYAL NEN

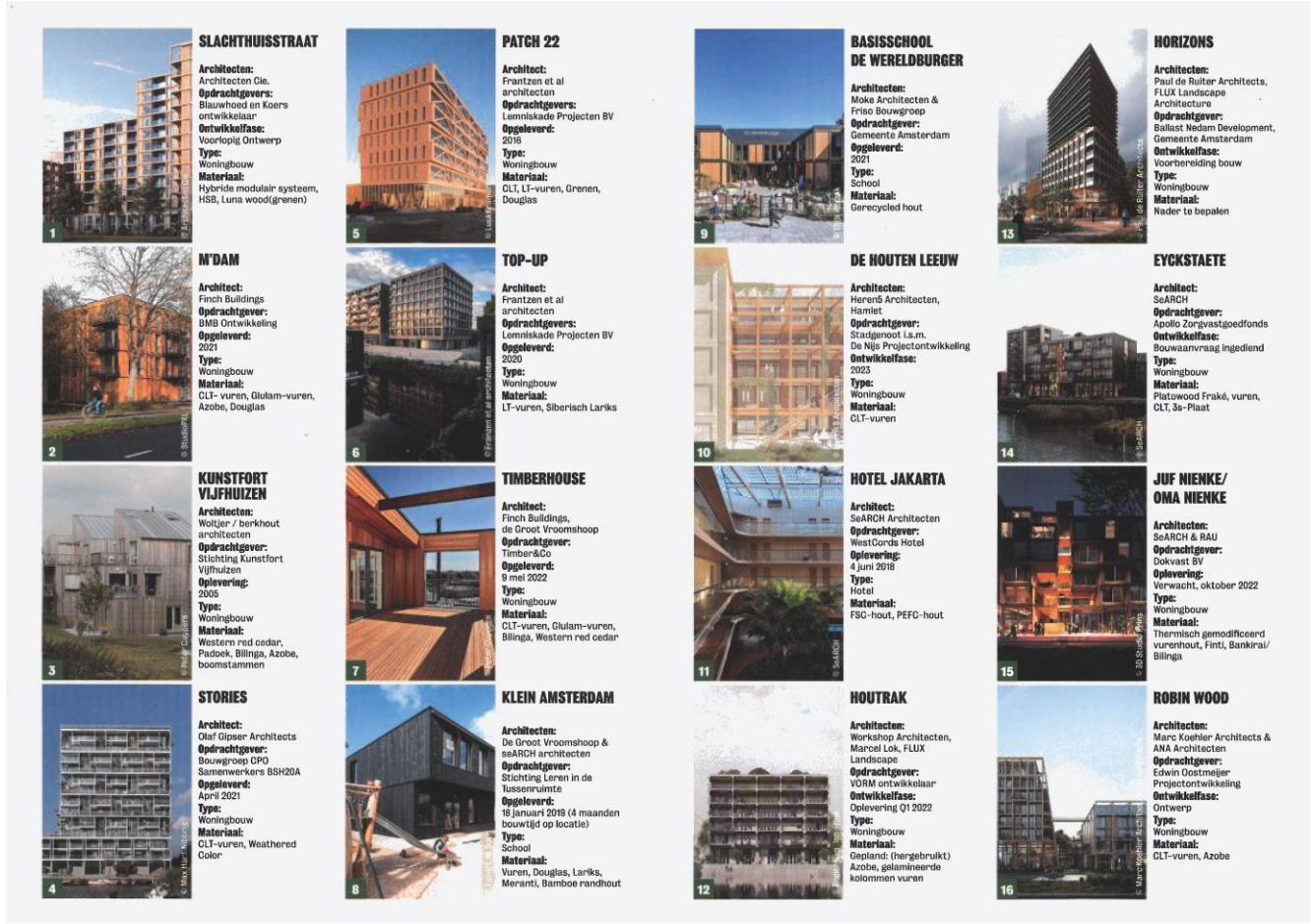
- The session with Professor Hans Wamelink led to the establishment of a new contact, Daan Jongejan, a policy maker from the **municipality of Amsterdam**. We have scheduled a meeting on Friday afternoon, February 10th, to discuss the possibility of one or more of the **TOP30 projects** being a suitable case study for my research.
- Additionally, Nan van Oldenbeek, a colleague at NEN and also involved in the CB23 chair, has invited me to participate in another meeting with the standards committee on circular construction on **Thursday February 16th**.

PLATFORM CB'23

NEN

TU Delft

MUNICIPALITY OF AMSTERDAM



SLACHTHUISSTRAAT
Architecten: Architecten Cie.
Opdrachtgevers: Blauwhoed en Koers ontwikkelaar
Ontwikkelfase: Voorlopig Ontwerp
Type: Woningbouw
Materiaal: Hybride modulair systeem, HSB, Luna wood(grenen)

M'DAM
Architect: Finch Buildings
Opdrachtgever: BMB Ontwikkeling
Opgeleverd: 2021
Type: Woningbouw
Materiaal: CLT- vuren, Glulam-vuren, Azobe, Douglas

KUNSTFORT VIJFHUIZEN
Architecten: Woltjer / berkhout architecten
Opdrachtgever: Stichting Kunstfort Vijfhuizen
Oplevering: 2005
Type: Woningbouw
Materiaal: Western red cedar, Padoek, Bilinga, Azobe, boomstammen

STORIES
Architect: Olaf Gipser Architects
Opdrachtgever: Bouwgroep CPO Samenwerkers BSH20A
Opgeleverd: April 2021
Type: Woningbouw
Materiaal: CLT-vuren, Weathered Color

PATCH 22
Architect: Frantzen et al architecten
Opdrachtgevers: Lemniskade Projecten BV
Opgeleverd: 2016
Type: Woningbouw
Materiaal: CLT, LT-vuren, Grenen, Douglas

TOP-UP
Architect: Frantzen et al architecten
Opdrachtgevers: Lemniskade Projecten BV
Opgeleverd: 2020
Type: Woningbouw
Materiaal: LT-vuren, Siberisch Lariks

TIMBERHOUSE
Architect: Finch Buildings, de Groot Vroomshoop
Opdrachtgever: Timber&Co
Opgeleverd: 9 mei 2022
Type: Woningbouw
Materiaal: CLT-vuren, Glulam-vuren, Bilinga, Western red cedar

KLEIN AMSTERDAM
Architecten: De Groot Vroomshoop & seARCH architecten
Opdrachtgever: Stichting Leren in de Tussenruimte
Opgeleverd: 18 januari 2019 (4 maanden bouwtijd op locatie)
Type: School
Materiaal: Vuren, Douglas, Lariks, Meranti, Bamboe randhout

BASISSCHOOL DE WERELDBURGER
Architecten: Moke Architecten & Friso Bouwgroep
Opdrachtgever: Gemeente Amsterdam
Opgeleverd: 2021
Type: School
Materiaal: Gerecycled hout

DE HOUTEN LEEUW
Architecten: Heren5 Architecten, Hamlet
Opdrachtgever: Stadgenoot i.s.m. De Nijs Projectontwikkeling
Ontwikkelfase: 2023
Type: Woningbouw
Materiaal: CLT-vuren

HOTEL JAKARTA
Architect: SeARCH Architecten
Opdrachtgever: WestCords Hotel
Oplevering: 4 juni 2018
Type: Hotel
Materiaal: FSC-hout, PEFC-hout

HOUTRAK
Architecten: Workshop Architecten, Marcel Lok, FLUX Landscape
Opdrachtgever: VORM ontwikkelaar
Ontwikkelfase: Oplevering Q1 2022
Type: Woningbouw
Materiaal: Gepland: (hergebruikt) Azobe, gelamineerde kolommen vuren

HORIZONS
Architecten: Paul de Ruiter Architects, FLUX Landscape Architecture
Opdrachtgever: Ballast Nedam Development, Gemeente Amsterdam
Ontwikkelfase: Voorbereiding bouw
Type: Woningbouw
Materiaal: Nader te bepalen

EYCKSTAETE
Architect: SeARCH
Opdrachtgever: Apollo Zorgvastgoedfonds
Ontwikkelfase: Bouwaanvraag ingediend
Type: Woningbouw
Materiaal: Platowood Fraké, vuren, CLT, 3s-Plaat

JUF NIENKE/ OMA NIENKE
Architecten: SeARCH & RAU
Opdrachtgever: Dokvast BV
Oplevering: Verwacht, oktober 2022
Type: Woningbouw
Materiaal: Thermisch gemodificeerd vurenhout, Finti, Bankirai/ Bilinga

ROBIN WOOD
Architecten: Marc Koehler Architects & ANA Architecten
Opdrachtgever: Edwin Oostmeijer Projectontwikkeling
Ontwikkelfase: Ontwerp
Type: Woningbouw
Materiaal: CLT-vuren, Azobe

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17 WOONCOÖPERATIE DE WARREN
Architecten: Natrufied
Opdrachtgever: De Warren
Ontwikkelfase: In aanbouw, oplevering augustus 2022
Type: Woningbouw
Materiaal: CLT-vuren, Accoya, Azobe, Basralocus, HSB-vuren, Azobe

18 MOOIJBURG PLEIN
Architecten: Natrufied
Opdrachtgever: Mooijburg BV
Opgeleverd: November 2022
Type: Woningbouw
Materiaal: CLT-vuren, HSB-vuren, Azobe, Accoya, Bamboe, Lariks

19 MOOIJBURG WATER
Architecten: Natrufied
Opdrachtgever: Mooijburg BV
Oplevering: Mei 2023
Type: Woningbouw
Materiaal: CLT-vuren, HSB-vuren, Azobe, Accoya, Bamboe, Lariks

20 MOOIJBURG PARK
Architecten: Natrufied
Opdrachtgever: Mooijburg BV
Oplevering: Juni 2023
Type: Woningbouw
Materiaal: CLT-vuren, HSB-vuren, Azobe, Accoya, Bamboe, Lariks

21 WOONCOÖPERATIE TORTELTUIN
Architecten: Natrufied
Opdrachtgever: Wooncoöperatie Torteltuin
Oplevering: Mei 2024
Type: Woningen
Materiaal: CLT-vuren, HSB-vuren, Azobe

22 WELL HOUSE
Architect: Dam & Partners Architecten
Opdrachtgever: NSI
Ontwikkelfase: Uitwerking technisch ontwerp, oplevering 2025
Type: Kantoorgebouw
Materiaal: Nader te bepalen

23 DE KOFFIEFABRIEK
Architecten: MeesVisser & BOOMlandscape
Opdrachtgever: Lister Buildings
Ontwikkelfase: In ontwikkeling
Type: Gemengd gebruik
Materiaal: CLT, Glulam, HSB-hergebruikt Azobe

24 HAUT AMSTERDAM
Architecten: Team V Architectuur
Opdrachtgevers: Lingotto, Adviseur Arup & Aannemer J.P. van Eesteren
Opgeleverd: 17 maart 2022
Type: Woningbouw
Materiaal: CLT-vuren, Glulam-vuren & Lariks

25 MEDIAVAERT
Architecten: Team V Architectuur i.s.m. Arup, DGMR & DELVA
Opdrachtgever: DPG Media
Oplevering: Eind 2023
Type: Kantoorgebouw
Materiaal: Europees vuren (FSC & PEFC) en andere houtsoorten

26 MEDIAVAERT
Architecten: Team V Architectuur i.s.m. Arup, DGMR & DELVA
Opdrachtgever: DPG Media
Oplevering: Eind 2023
Type: Kantoorgebouw
Materiaal: Europees vuren (FSC & PEFC) en andere houtsoorten

27 SWITI
Architecten: HOH Architecten
Opdrachtgever: BPD / Bouwfonds Gebiedsontwikkeling
Ontwikkelfase: Vergunning afgegeven, bouwvergunning 2021
Type: Woningbouw
Materiaal: CLT-vuren, Chipwood Houtplaten, Houtwolcement, Bamboe

28 NELSON MANDELABUURT
Architecten: Nader te bepalen
Opdrachtgever: Gemeente Amsterdam
Ontwikkelfase: Start bouw gepland in 2025
Type: Woningbouw
Materiaal: Nader te bepalen

29 XYLINO
Architecten: Arons en Gelauff
Opdrachtgevers: Synchroon,Koopmans & de Alliantie
Ontwikkelfase: Definitief Ontwerp
Type: Woningbouw
Materiaal: LVL-Hout, SPANO van Unilin en MDF

30 MALMÖHUS
Architecten: Tigchelaar Architecten en Adviseurs
Opdrachtgever: de Alliantie ontwikkeling
Oplevering: 2009
Type: Woningbouw
Materiaal: CLT, Kerto, Western red ceddar, Azobe, Bilinga

31 ECO-SCHOOL DE VERWONDERING
Architecten: ORGA architecten
Opdrachtgever: Gemeente Almere & Prisma
Oplevering: 2021
Type: School
Materiaal: CLT & HSB: Vuren, lariks, accoya hout, radiate pine, NobelWood

HOORT JOUW GEBOUW OOK OP DEZE KAART?
Mail dan naar info@dezwijger.nl

DISCLAIMERS:
Wij hebben ons best gedaan om deze kaart zo compleet mogelijk te maken. Mochten er onjuistheden inzitten, stel ons dan op de hoogte.

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