Designing in the framework of sustainability certification systems – a survey of trends

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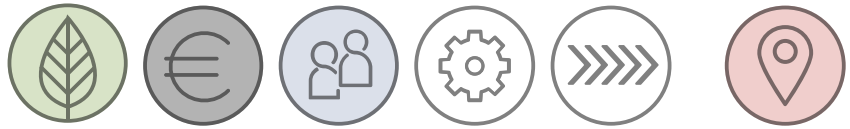


Introduction

The Dilemma

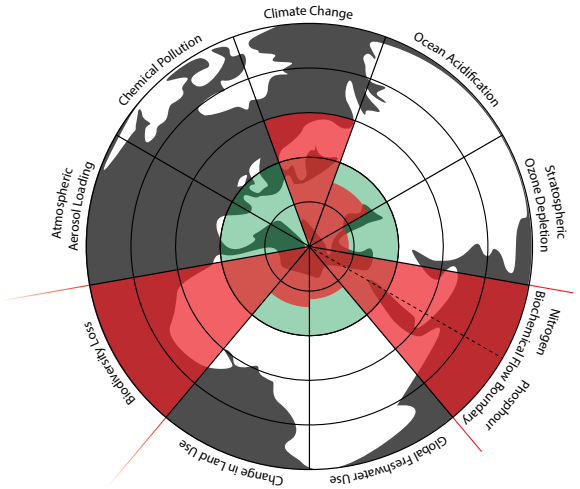
Global warming is not the only challenge we are facing with. Many more exists and they has their roots in the build environment.

Biodiversity loss and aerosol loading are just one other in the environmental dimension that is ciritical.

The building sector of the world. It is related to 10-40% of countries GDP and accounts for about 10% of all jobs in the world (UNEP SBCI, 2013).

We spend the majority of our time indoors.

The building mass in Europe accounts for about 40% of the total energy consumption.



The planetary boundaries by Rockström et al. (2009)

The Dilemma

This has led to the creation of the different Building Sustainability Assessment Tools (BSATs)

In previous times was the focus on the energy usage, and this led to the creation of the IDP, IED and IDP assessments.

The use of a BSAT is a complex affair because of the many requirements and trade-offs made during the design process (Schweber, 2013; Kreiner et al., 2015).

The BSAT assessor that acts as a process manager tries to cultivate this process. This places a significant pressure and dependency on the assessor who, due to this, has a considerable impact on the final outcome (Brunsgaard, 2016).

How can this be optimized?

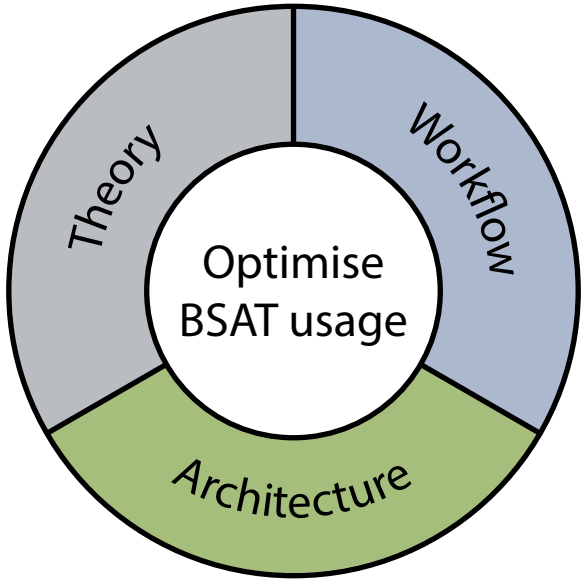
Research aim and questions

Aim
To investigate and map the structure of BSATs in order to find, understand and synthesize key aspects that together can catalyse the usage og BSATs in a design process.

Theory
Which criteria are important to address and how difficult are they to work with due to their complexity and interrelations to other criteria?

Workflow
How are BSATs implemented in the design process and which criteria should be addressed earlier than others during the design phases?

Architecture
Does BSATs have an impact on the architecture of a building when there is an aim of achieving a high score in BSATs?



Delimitations

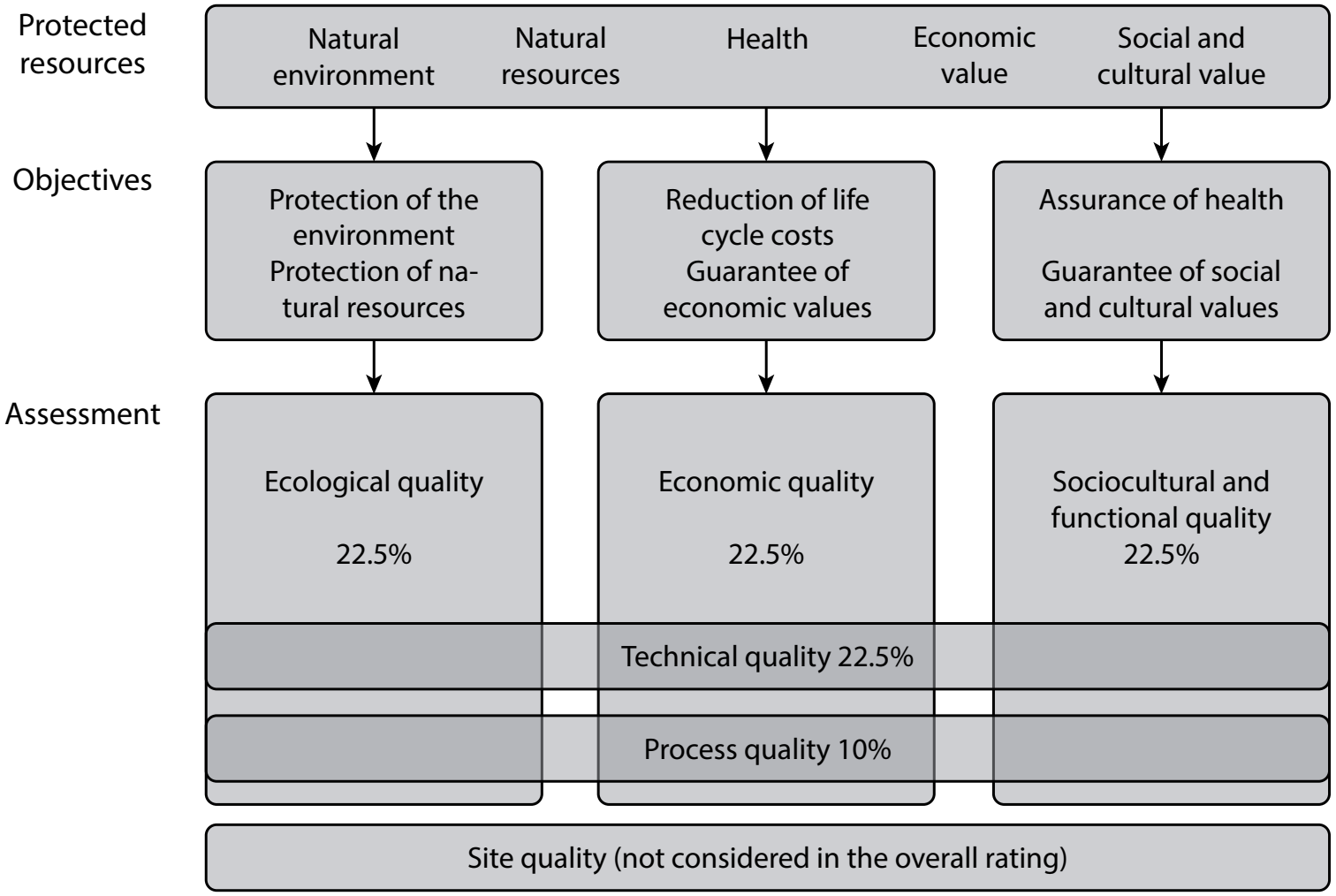
Delimitations	Description
BSAT	DGNB
Location	Denmark
Certification scheme	DGNB Office Building

Location
Denmark was chosen as a location to obtain and get access to as much knowledge as possible.

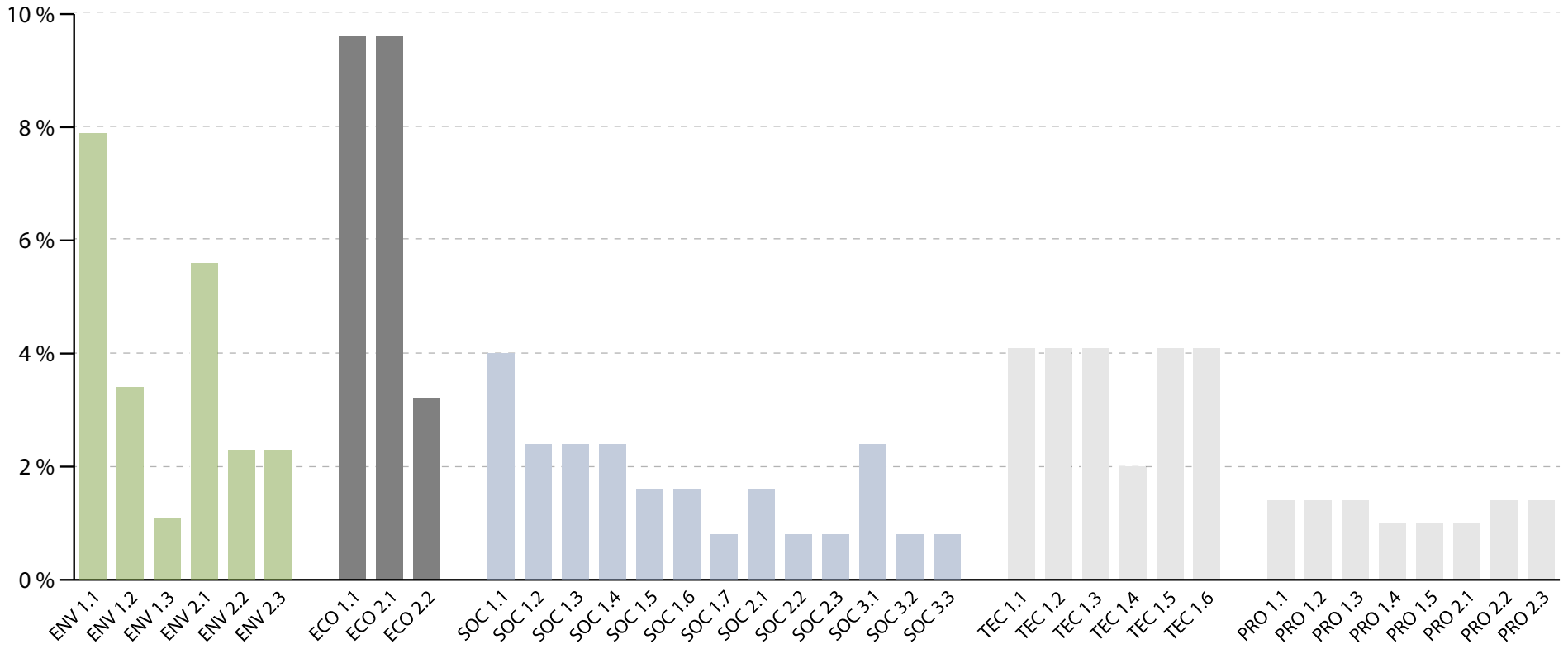
Amount of BSATs
Only DGNB since several BSATs required consideration of climatic, cultural and legal differences.

Certification scheme -
The focus was only on DGNB Office Buildings since it was the first certification system to be implemented in Denmark.

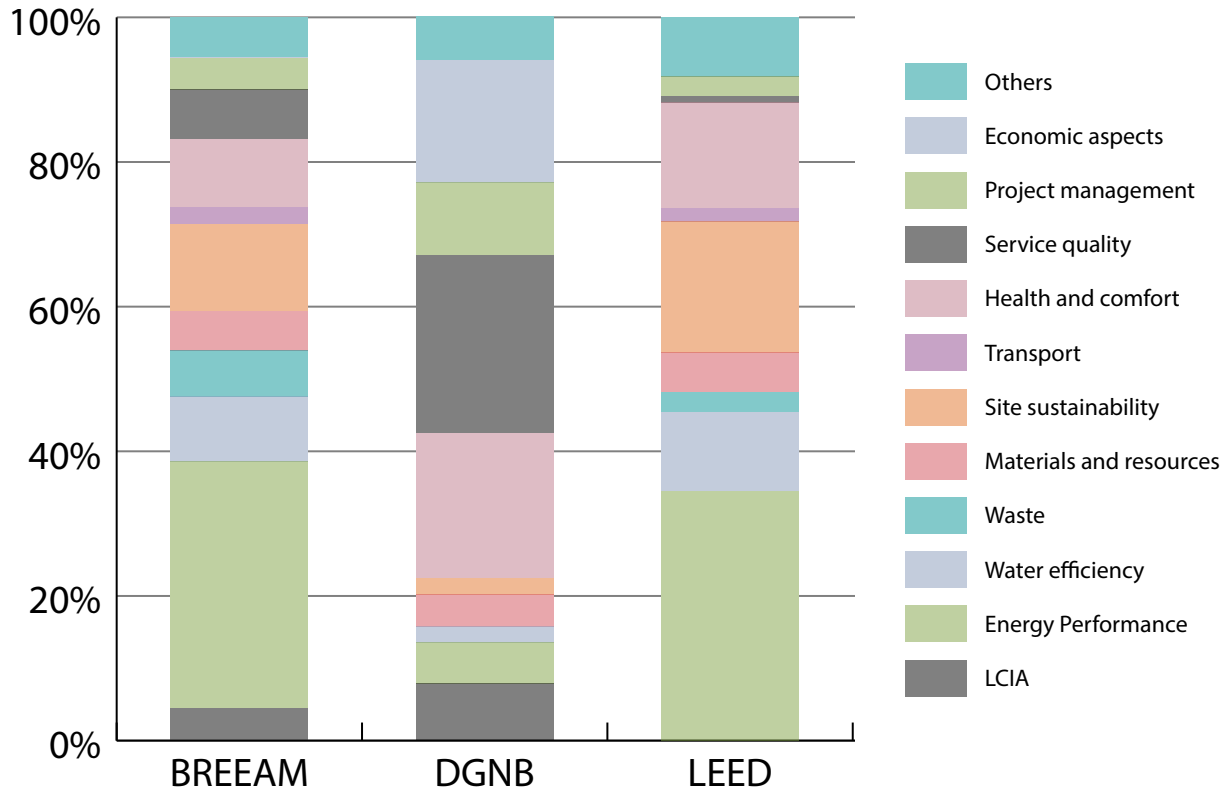
DGNB Office Building



DGNB Office Building



DGNB Office Building



DGNB is defined as a second generation tool because it is the only tool that truly scopes all three aspects of sustainability (Ebert, Eißig & Hauser, 2011),

Method

Participants

Four experts from the Danish building sector agreed to participate.

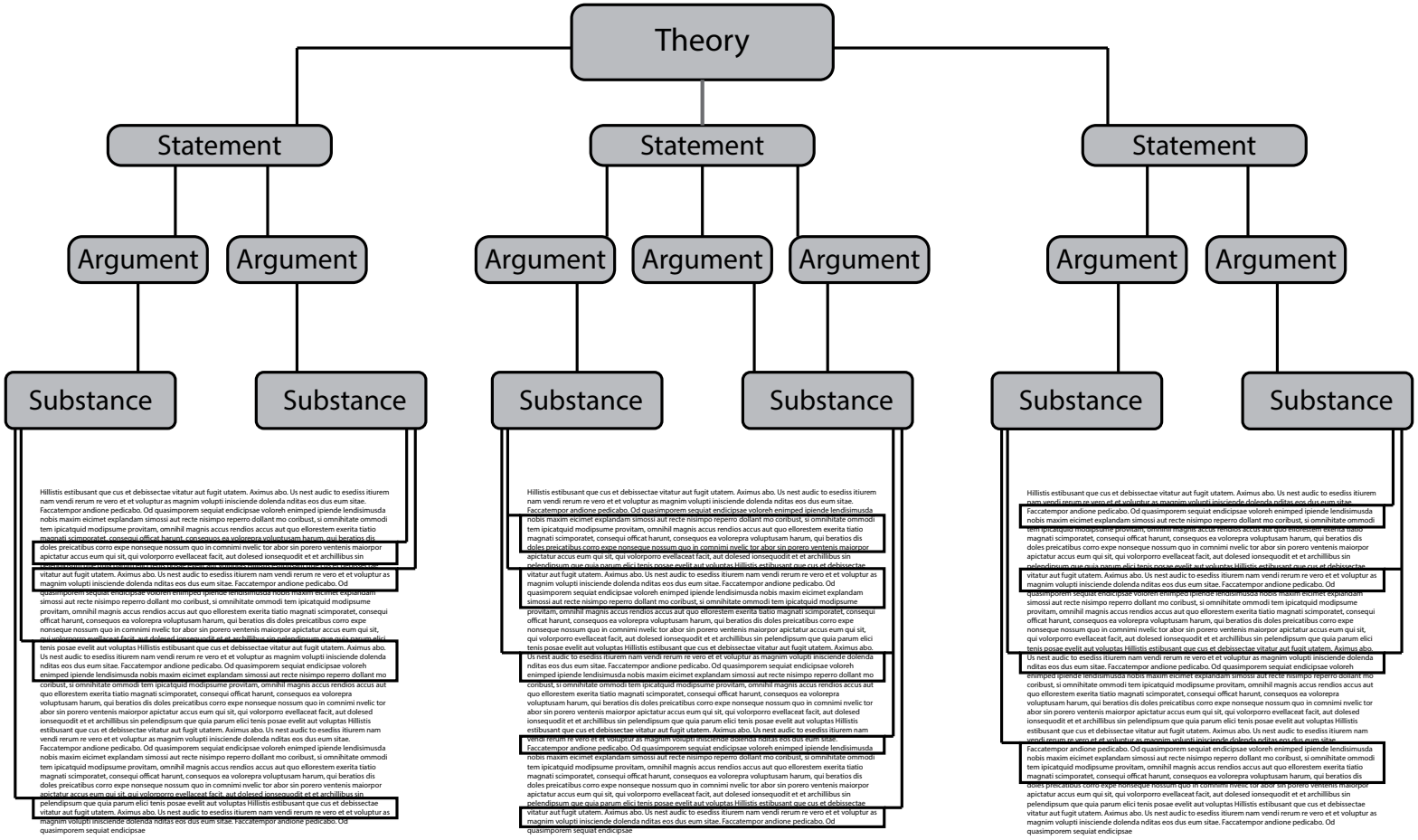
They were found through a filtering of possible participants through three requirements.

Knowledge
The participant had to have a thorough understanding of the DGNB structure.

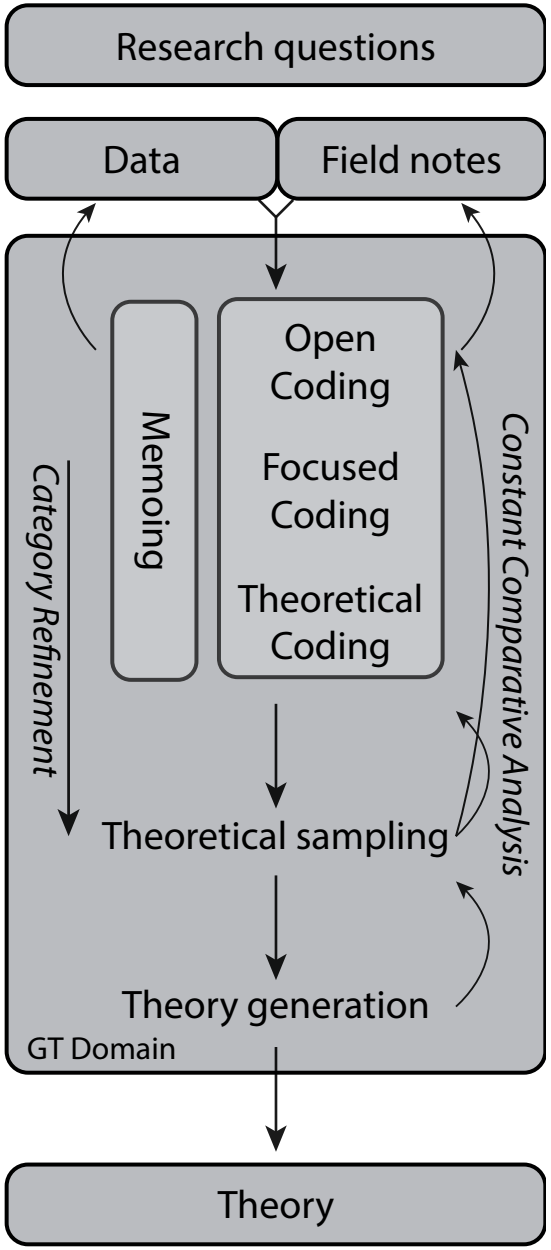
Professional Area
A mix of participants from different parts of the Danish building sector should give a variation in the responses

Experience
The participants had to have worked with a project where DGNB was implemented.

Grounded Theory



Grounded Theory



The process of Grounded Theory defined by Charmaz (2006).

Findings

Overall

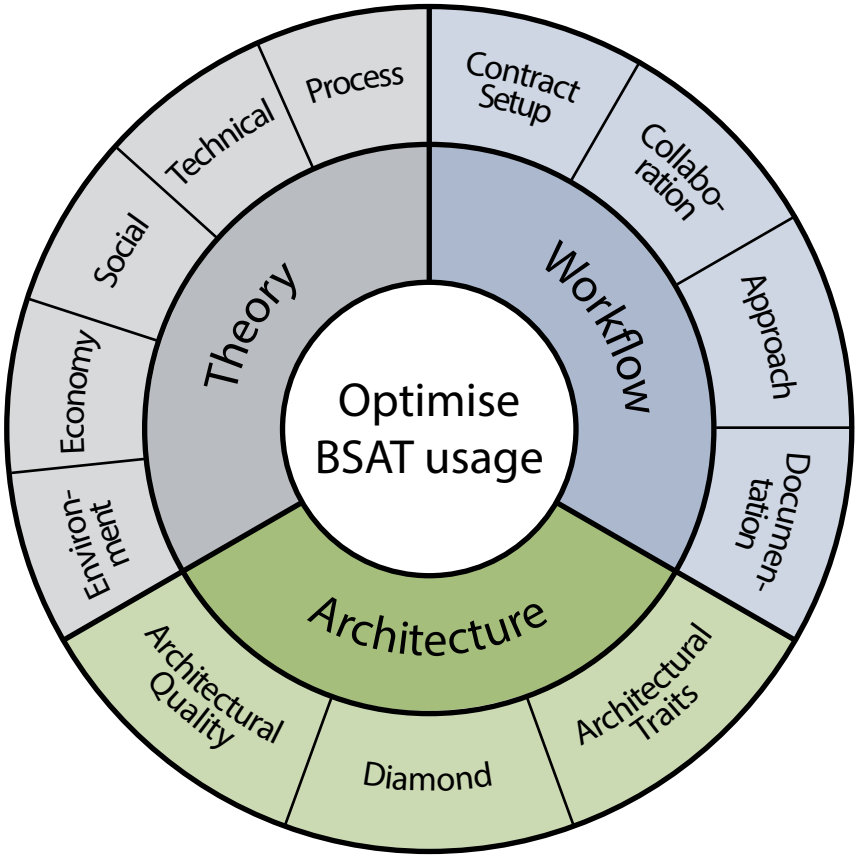
12 categories emerged

5 in the Theory aspect
- Environment, Economy, Social, Technical and Process

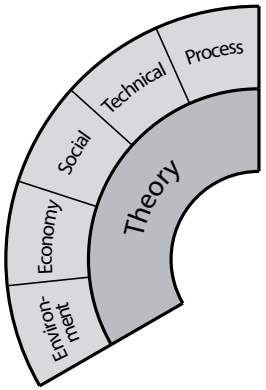
4 in the Workflow aspect
- Contract, Collaboration, Approach, Documentation

3 in the Architecture aspect
- Arhcitectural Quality, Architectural Traits, Diamond

The categories of the theory aspect was pre-determined whereas the two others emerged during the use of Grounded Theory



Theory research question



> *My opinion is that the certification must bring value to the client that has ordered it. This means that I, regardless of the difficulty, must strive to fulfil the criteria related to indoor climate and de-gassing from materials, if a client has a specific focus on these.*
>
> *- CD*

Economical Categories

Life Cycle Cost (LCC)	IG	JSK	JK	CD
The LCC criterion is of high importance due to the criteria size, its interrelations and interest from the client and stake-holders.	x	x		x
The LCC is not difficult but takes time partly because of its indirect relations to all aspects of the a building.	x			x

Environmental Categories

Life cycle Assessment (LCA)	IG	JSK	JK	CD
The LCA analysis is important due to its size in DGNB and its influence on other criteria and areas like architecture and energy supply systems.	x	x	x	
The complexity of LCA is high due to rules the of calculation that together with data collection like EPD's and ma-terial amounts makes it very time con-suming.	x	x	x	

Local Environmental Impact	IG	JSK	JK	CD
The ENV 2.1 has a simple process but requires a significant amount of work in documentation.	x	x	x	x
The time spend versus the points gained makes people avoid the criteri-on to the latest or even skip it.	x	x	x	x

Theory research question

Social categories

Indoor Climate	IG	JSK	JK	CD
The many of the aspects of indoor climate are already highly in focus and in high quality within the building sector.	x	x		
Acoustics are a considerable factor due to its ability to ruin concentration.	x	x		

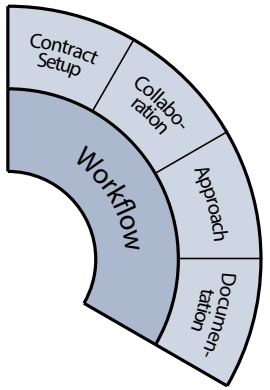
Safety, Accessibility, Cyclist facilities	IG	JSK	JK	CD
The smaller criteria are normally not thought of and is generally easier to implement due to their limited impact within the project.	x	x		

Process categories

Contract and tender phase	IG	JSK	JK	CD
The contract should contain a clear set of requirements to the process and the delivery, preferably directly from DGNB, in order to avoid misconceptions.	x	x	x	x
An aim and approach should be set on the how the rest of the criteria should be addressed.			x	x
The client councillor has a big responsibility of creating a healthy underlying basis for the contract in the earliest phases	x	x	x	

Design Concept Creation	IG	JSK	JK	CD
The creation of design concepts comes by itself in some areas like energy design. It is therefore important to focus on concept creation for overlooked parts	x	x	x	
Creating simple and sound concepts makes it tangible for the client.	x			x

Workflow research question



Contractual setup

Requirements	IG	JSK	JK	CD
Just as general contract requirements should there also be set specific requirements to workflow / collaboration	x	x	x	x

Documentation

Amount	IG	JSK	JK	CD
DGNB places considerable requirements to the amount of documentation, though, it is reasonable since most of the documentation is made anyway.	x	x	x	

Consequence	IG	JSK	JK	CD
The consequence of a high level of documentation is generally resistance.	x	x	x	
Some parts of the documentation will not be made because no extra funding has been given to this.		x		

Workflow research question

> *The open variant is ... where you go through the list and use the criteria as a kind of questions that you must answer.*
>
> - JSK

Approach

Early Stage Assessment	IG	JSK	JK	CD
The early stage should be addressed in a qualitative matter, scoping as much as possible. Focus areas from clients should be addressed more specifically.		x	x	
The process category must be addressed in detail within the early stage to create a good foundation for collaboration.	x			x

General Assessment	IG	JSK	JK	CD
It is important is to maintain the holistic perspective and avoid sub-optimising a certain criterion.	x		x	x
Criteria that are normally not in focus should be drawn into light by the design or its individual experts.	x			x
The biggest criteria should be addressed stepwise and multiple times through the phases	x	x	x	

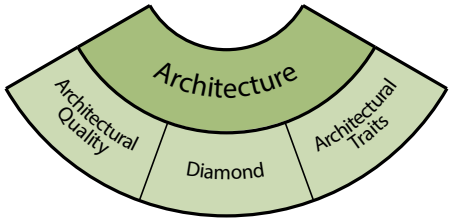
Collaboration

Design process	IG	JSK	JK	CD
The design process incorporated in DGNB is similar to IED, but everyone must understand the method to have a smooth process.		x	x	x

DGNB assessor	IG	JSK	JK	CD
There needs to be a definitive distinguish between the project managers and the process managers (DGNB assessor) areas of responsibilities.	x			x
The DGNB assessor need to focus on communication and documentation. These two also has to work closely together.	x			x

Stakeholders	IG	JSK	JK	CD
Avoid binding the architect too much via requirements from other (especially DGNB) since it can undermine architectural quality.			x	x
The stakeholder interests can be segmented into the three areas of sustainability.				x

Architecture research question



> *... Every time an LCC is done it becomes an advantage to our architecture. It supports the choices within the design process because we work with robust, good and long lasting materials.*
>
> - JSK

Architectural Quality

Materials and Solutions	IG	JSK	JK	CD
The LCC advocates for robust, good and long lasting materials due to maintenance, fixing etc.		x		
DGNB advocates for simpler solutions through the desire of design disassembly.			x	

Contract	IG	JSK	JK	CD
The contractual setup has an impact on the architectural quality due to money control and funds available.			x	x
Having architectural competitions is an indirect approach from DGNB's site to cultivate architectural quality.	x	x	x	x

DGNB and Quality Measure	IG	JSK	JK	CD
There is an insufficient amount of points that directly evaluates the architectural quality in DGNB.		x	x	x

Architecture research question

Architectural Traits

DGNB Impact	IG	JSK	JK	CD
DGNB does provoke architectural traits and it is not always for the better.	x	x	x	x

Specific Consequences	IG	JSK	JK	CD
DGNB's specific solutions were e.g. passive design approach, or windows in two sides of a building is a must.		x	x	x

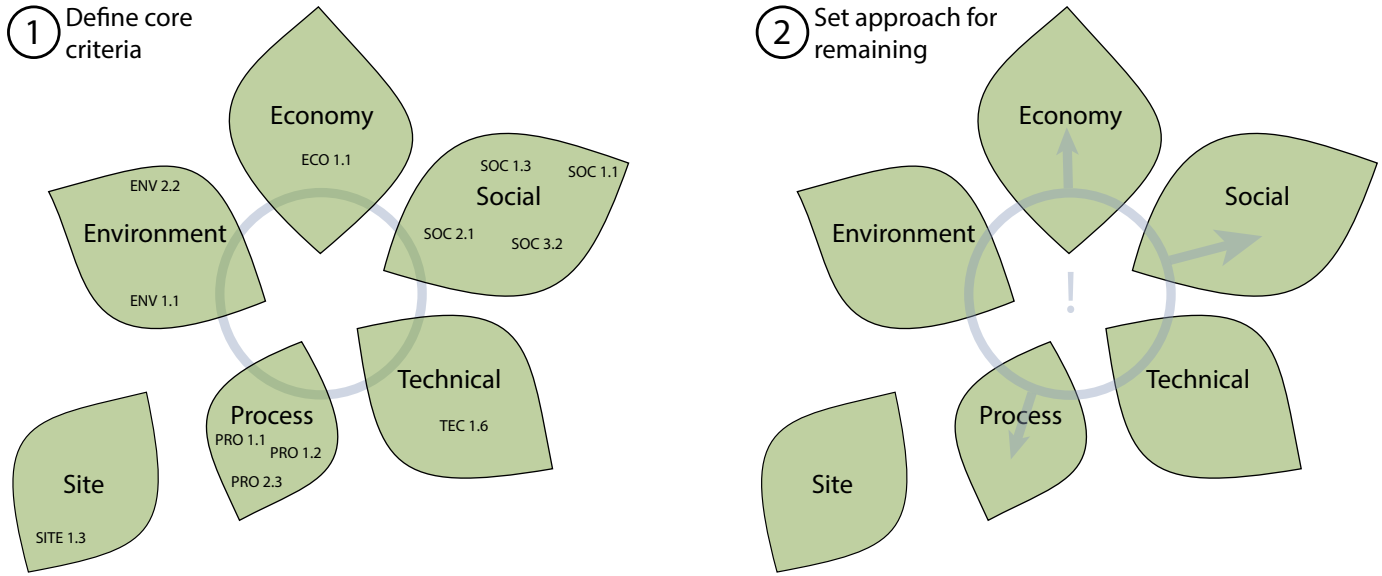
Diamond

First impression advantages	IG	JSK	JK	CD
The diamond assessment will bring more focus to the architecture by explicitly evaluate the architectural values.	x	x		

First impression weaknesses	IG	JSK	JK	CD
The diamond assessment is not in line with the thoughts about DGNB by not having anything measurable and is furthermore not integrated as other criteria, thus making it look like an emergency solution.	x		x	x

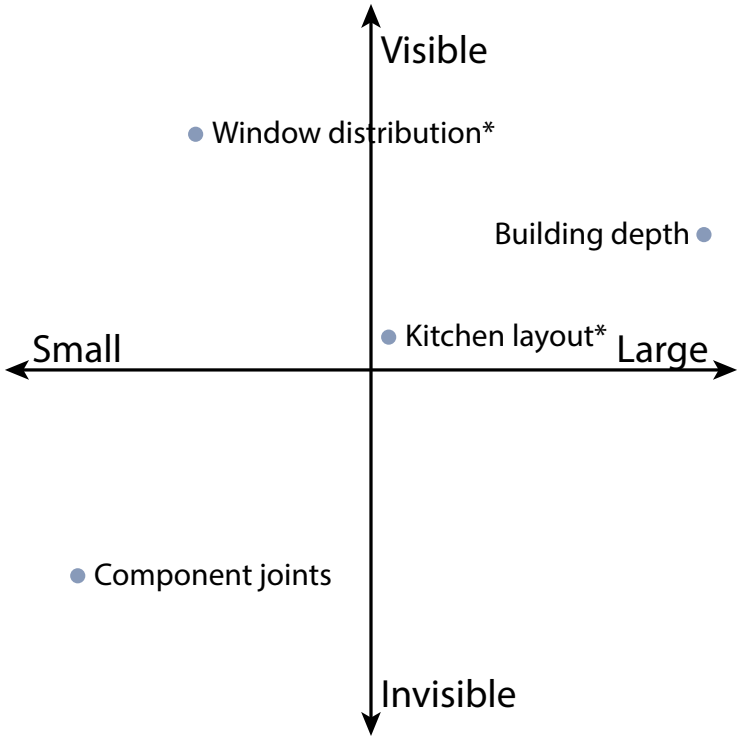
Evaluation

Criteria approach



A two step approach should be created along with the client to obtain the required points for the DGNB level.

Architectural Traits



DGNB has an impact on architecture both in terms of scale/size and visibility. Example can design for disassembly be defined as a smaller impact, which is also not that visible.

Future Research

More research data hence more interviews. Preferably with consultants and contractors

Case based application to test and edit the findings.

Investigation in a higher level of detail in specific criteria such as LCA, LCC or Flexibility and adaptability.

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