Nordic built challenge

Sattrup, Peter Andreas; Schipull Krauschen, Jan

Publication date:
2014

Citation (APA):
NORDIC BUILT CHALLENGE
TEAM JJW / WITRAZ / RAMBØLL
Jan Schipull Kauschen
phd-studerende CINARK/JJW arkitekter
arkitekt MAA

“Bæredygtige Systemleverancer
ved renovering og nybyggeri” (2010-14)

Peter Andreas Sattrup
Lektor, DTU.Byg
arkitekt MAA, PhD

Bæredygtighed, Klima, Energi,
Dagslys & Designmetoder

---

AGENDA

Metode
7 koncepter
Konkurrence fase 1 - NBC som case
Nordic Built Charter - to eksempler

Nordic Innovation
Our design methodology is structured according to Stewart Brand’s Shearing Layers. The shearing layers is a description of how buildings – metabolism and can be used as a framework to guide resource management by design, since the rate of exchange of each layer has very strong implications on the use of resources in a Life Cycle Analysis.

Recent research has also shown that the Shearing Layers can be used as a framework for environmental design, as the lasting environmental impacts of the larger and slower changing layers have strong accumulated impacts on the environmental performance of a design. Design decisions concerning the bigger and more permanent layers may have made at the smaller and rapidly changing layers. The Shearing Layers can be used as a Climate and Environmental Design hierarchy to guide decision making in the design process.

Together, the resource management and environmental design dimensions of the shearing layers, makes it a powerful tool in the design process. Each design decision on every layer can be evaluated according to its relation and impact on other design decisions. This allows the design team to navigate the design process and qualify decisions according to performance and impact in a more transparent way.

At each stage in the design process, - from the conceptual design covered in this competition to later stages such as preliminary and detailed design, - design options are evaluated according to their life-cycle impacts and environmental performance.

The Shearing Layers can metaphorically be called the gearbox of building metabolism. The shorter the life cycle of a layer, the higher the use of resources associated with it.

A building’s SITE conditions usually change very slowly over time. It can often be considered permanent. The STRUCTURE of a building is also very permanent, and is usually not altered very much over the entire life-cycle of the building, which may be 50-100+ years. The SKIN of a building changes more often, as the wear and tear of the natural environment inevitably leads to replacement of components, and technological upgrades may become feasible. Modern windows for instance, have a technical life of 20-50 years. The building SERVICES are often replaced due to technical obsolescence. 10-30 years. The SPACEPLAN is also susceptible to change, as the inhabitants years. STUFF is the most rapidly changing layer. Interior surfaces, furniture.

---

1 Brand, Stewart. How Buildings Learn. 1994

---
Bæredygtighed i byggeriet - håndtering af kompleksitet

Our design methodology is structured according to Stewart Brand's Shearing Layers. The shearing layers is a description of how buildings change over time, and how the different layers or scales of a building change at different speeds. It is a theoretical model of building metabolism and can be used as a framework to guide resource management by design, since the rate of exchange of each layer has very strong implications on the use of resources in a Life Cycle Analysis.

Recent research has also shown that the Shearing Layers can be used as a framework for environmental design, as the lasting environmental impacts of the larger and slower changing layers have strong accumulated impacts on the environmental performance of a design. Design decisions concerning the bigger and more permanent layers may have bigger environmental benefits and be cheaper than design decisions made at the smaller and rapidly changing layers. The Shearing Layers can be used as a Climate and Environmental Design hierarchy to guide decision making in the design process.

Together, the resource management and environmental design dimensions of the shearing layers, makes it a powerful tool in the design process. Each design decision on every layer can be evaluated according to its relation and impact on other design decisions. This allows the design team to navigate the design process and qualify decisions according to performance and impact in a more transparent way.

At each stage in the design process, from the conceptual design covered in this competition to later stages such as preliminary and detailed design, design options are evaluated according to their life-cycle impacts and environmental performance.

SHEARING LAYERS – THE GEARBOX OF CHANGE IN A BUILDING’S LIFE CYCLE

The Shearing Layers can metaphorically be called the gearbox of building metabolism. The shorter the life cycle of a layer, the higher the use of resources associated with it.

A building’s SITE conditions usually change very slowly over time. It can often be considered permanent.

The STRUCTURE of a building is also very permanent, and is usually not altered very much over the entire life-cycle of the building, which may be 50-100+ years.

The SKIN of a building changes more often, as the wear and tear of the natural environment inevitably leads to replacement of components, and technological upgrades may become feasible. Modern windows for instance, have a technical life of 20-50 years.

The building SERVICES are often replaced due to technical obsolescence. 10-30 years.

The SPACEPLAN is also susceptible to change, as the inhabitants change needs and reorganize their lives differently quite often. 5-10 years.

STUFF is the most rapidly changing layer. Interior surfaces, furniture and stuff is continuously replaced, often within 1-5 years.
Bæredygtighed i byggeriet - identificering af vigtigste parameter

STANDARDER / DE FACTO STANDARDER / PRINCIPPER
f.eks. EN15643 f.eks. DGNB, BREEAM f.eks. C2C, NBC

SOCIAL CONCEPT
BUSINESS CONCEPT
ENERGY CONCEPT
LIFECYCLE CONCEPT
ECOLOGICAL CONCEPT
RENOVATION CONCEPT
DESIGN CONCEPT

Nordic Built debatmøde 2014.03.26
Peter Andreas Sattrup / Jan Schipull Kauschen
NORDIC BUILT Challenge - som case

We, the Nordic building sector, will join forces and capitalise on our common strengths to deliver the sustainable solutions the Nordic region and the world demands. The time is now and the principles of Nordic Built Charter will lead the way.

OUR COMMITMENT
We commit to taking leadership and implement the Nordic Built principles in our work and our business plans. We commit to taking the necessary actions to deliver competitive concepts for a sustainable built environment that benefit users, the building sector, our region and the world.

OUR NORDIC BUILT PRINCIPLES
WE WILL CREATE A BUILT ENVIRONMENT THAT:

01 Is made for people and promotes quality of life
02 Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge
03 Merges urban living with the qualities of nature
04 Achieves zero emissions over its lifecycle
05 Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition
06 Is robust, durable, flexible and timeless - built to last
07 Utilises local resources and is adapted to local conditions
08 Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.
09 Employs concepts that are scalable and used globally
10 Profits people, business and the environment

APPENDIX

PRINCIPLES CONCEPTS
RELATIONS TO THE PRINCIPLES
Principles 1-2-3-4-5-6-7-8-9-10
Principles 1-2-3-4-9
Principles 1-2-3-5-9
Principles 1-2-3-6-9
Principles 1-2-3-7-9
Principles 1-2-4-5-6-7-8-9-10
Principles 1-2-4-6-9
Principles 1-2-4-7-9-10
We, the Nordic building sector, will join forces and capitalise on our common strengths to deliver the sustainable solutions the Nordic region and the world demands. The time is now and the principles of Nordic Built Charter will lead the way.

**OUR COMMITMENT**

We commit to taking leadership and implement the Nordic Built principles in our work and our business plans. We commit to taking the necessary actions to deliver competitive concepts for a sustainable built environment that benefit users, the building sector, our region and the world.

**OUR NORDIC BUILT PRINCIPLES**

We will create a built environment that:

1. Is made for people and promotes their quality of life.
2. Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge.
3. Merges urban living with the qualities of nature.
4. Achieves zero emissions over its lifecycle.
5. Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition.
6. Is robust, durable, flexible and timeless - built to last.
7. Utilises local resources and is adapted to local conditions.
8. Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.
9. Employs concepts that are scalable and used globally.
10. Profits people, business and the environment.

The ten principles in the Nordic Built Charter have been transformed into seven concepts which summarise the most important aspects of sustainable design. The seven concepts provide a multiple solutions space which breaks down the complexity of sustainable design into tangible elements.

**SOCIAL CONCEPT**

**BUSINESS CONCEPT**

**ENERGY CONCEPT**

**LIFECYCLE CONCEPT**

**ECOLOGICAL CONCEPT**

**RENOVATION CONCEPT**

**DESIGN CONCEPT**

Principles 1-2-3-4-6-9-10

Principles 2-6-8-9-10

Principles 2-4-7-9-10

Principles 2-4-6-9-10

Principles 2-4-7-8-9-10

Principles 2-6-9-10

Principles 1-2-3-4-5-6-7-8-9-10

Nordic Built debatmøde 2014.03.26
Peter Andreas Sattrup / Jan Schipull Kauschen
We, the Nordic building sector, will join forces and capitalise on our common strengths to deliver the sustainable solutions the Nordic region and the world demands. The time is now and the principles of Nordic Built Charter will lead the way.

**OUR COMMITMENT**

We commit to taking leadership and implement the Nordic Built principles in our work and our business plans. We commit to taking the necessary actions to deliver competitive concepts for a sustainable built environment that benefit users, the building sector, our region and the world.

**OUR NORDIC BUILT PRINCIPLES**

We will create a built environment that:

<table>
<thead>
<tr>
<th>PRINCIPLES</th>
<th>CONCEPTS</th>
<th>RELATIONS TO THE PRINCIPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>01</strong> Is made for people and promotes quality of life</td>
<td><strong>DESIGN CONCEPT</strong></td>
<td>Principles 1 2 3 4 5 6 7 8 9 10</td>
</tr>
<tr>
<td><strong>02</strong> Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge</td>
<td><strong>SOCIAL CONCEPT</strong></td>
<td>Principles 2 3 4 6 9 10</td>
</tr>
<tr>
<td><strong>03</strong> Merges urban living with the qualities of nature</td>
<td><strong>BUSINESS CONCEPT</strong></td>
<td>Principles 2 6 8 9 10</td>
</tr>
<tr>
<td><strong>04</strong> Achieves zero emissions over its lifecycle</td>
<td><strong>ENERGY CONCEPT</strong></td>
<td>Principles 2 4 7 9 10</td>
</tr>
<tr>
<td><strong>05</strong> Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition</td>
<td><strong>LIFECYCLE CONCEPT</strong></td>
<td>Principles 2 4 6 9</td>
</tr>
<tr>
<td><strong>06</strong> Is robust, durable, flexible and timeless - built to last</td>
<td><strong>ECOLOGICAL CONCEPT</strong></td>
<td>Principles 2 4 7 8 9 10</td>
</tr>
<tr>
<td><strong>07</strong> Utilises local resources and is adapted to local conditions</td>
<td><strong>RENOVATION CONCEPT</strong></td>
<td>Principles 2 6 8 9 10</td>
</tr>
<tr>
<td><strong>08</strong> Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.</td>
<td><strong>DESIGN CONCEPT</strong></td>
<td>Principles 1 2 3 4 6 9 10</td>
</tr>
<tr>
<td><strong>09</strong> Employs concepts that are scalable and used globally</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>10</strong> Profits people, business and the environment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ten principles in the Nordic Built Charter have been transformed into seven concepts which summarize the most important aspects of sustainable design. The seven concepts provide a multiple solutions space which breaks down the complexity of sustainable design into tangible elements.
NBChallenge
uddrag fra fase 1

LIFE CYCLE CONCEPT

ECONOMIC CONCEPT

ECOLOGICAL CONCEPT

DESIGN CONCEPT - LANDSCAPE AND ARCHITECTURE

RENOVATION CONCEPT

LIFECYCLE

KEYWORDS

- WITH REGARD TO THE PRESENTED RENOVATION CONCEPT, ARISES IF REPLACING THE BUILDING WITH A NEW ONE COULD

- RESULT IN MUCH HIGHER RENOVATION COSTS AS LAYERS

- ALL THE LAYERS, INCLUDING THE OUTER LAYER, IN EFFECT "BE TORN APART" OVER ITS LIFETIME. THIS

- 25 YEARS THE NUMBER OF FAMILIES WITH 3 OR MORE CHILDREN WILL INCREASE SIGNIFICANTLY. WITH AN INCREASE IN

- WE AIM TO PRODUCE A LIVING ENVIRONMENT WHICH

- WE AIM TO CREATE A CONCEPT AND A LIFESTYLE, WHICH

- THROUGH DIFFERENT ACTIVITIES THE RESIDENTS MUST BE

- RESIDENTS COMMUNITY

- THE STRATEGY

- THE METHODS

- REVITALIZING PLANS IN ORDER TO ALLOW TRANSPARENT/OVERLAPPING RENOVATION PROJECTS (NOW) AND THE EASE OF RENOVATION IN FUTURE.

- THE CHALLENGE IS HOW WE CAN BUILD ON AS MANY OF THE HUMAN RESOURCES IN A CERTAIN AREA WITHIN THE GENERAL CONTEXT OF THE BUILDING COMPLEX AND REACH POTENTIAL NEW RESIDENTS' GROUPS. IN THIS REGARD INITIATIVES THAT SUPPORT THE VISION SUCH AS OPEN THEME DAYS/LIBRARY EVENTS ARE IMPORTANT.

- THE BUILDING AS A BLOCK.

- THE BUILDING IS A MINI-CITY WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7

- THE BUILDING AS A BLOCK WITH AN ACTUALITY PROGRAM, THE FUTURE 7
NORDIC BUILT Challenge - Team JJW / WITRAZ / RAMBØLL
Fase 1

Ellebo / Danmark
JJW

med
Habitats (Lise Kloster Bro) - landskab
Novitas Innovation (Tanja Bisgaard) - sparring til økonomisk koncept

ReBootkyrka / Sverige
WITRAZ
NORDIC BUILT Challenge - to eksempler

Is made for people and promotes quality of life

Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge

Merges urban living with the qualities of nature

Achieves zero emissions over its lifecycle

Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition

Is robust, durable, flexible and timeless - built to last

Utilises local resources and is adapted to local conditions

Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.

Employs concepts that are scalable and used globally

Profits people, business and the environment
NORDIC BUILT Challenge - to eksempler

Achieves zero emissions over its lifecycle

04

?
NORDIC BUILT Challenge - to eksempler
Embodied Energy + driftsenergi / systemgrænser?

accumulated
Embodied
Energy
GJ

1. livscyklus
eller
én livscyklus

2. livscyklus


w/o renovation
building code requirements
zero-energy use
2015-level
1990-level
1960-level

1,8 GJ
16,3 GJ
17,3 GJ
24,8 GJ
26,2 GJ
32,5 GJ

130-180 kWh/m²a
~100 kWh/m²a
30 kWh/m²a
~15 kWh/m²a

~100 kWh/m²a

160 kWh/m²a

~160 kWh/m²a
The future Ellebo will stand out with its new expressions, leaving the notion of precast-housing blocks behind it. For the future a new basis for liking and loving buildings fashionable and loved again (as they were in the 1950-1975 era). The essence of Ellebo is foregrounded. For Ellebo to be a building of its time, it needs to be a building that tells a story.

As in Strategy C and D, the concrete elements from the existing buildings are reused as partition walls and built-in (app. 10,000 m² in total).

More new kitchen / bathrooms in block 2+4, insulation of penthouses and slate cladding.

Table 1: Relation of the different renovation strategies with respect to environmental footprints and costs (Percentages based on block inventory and a strategy assessment: 100% = new buildings (Strategy A)).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2eq</td>
<td>100%</td>
<td>128%</td>
<td>105%</td>
<td>93%</td>
<td>109%</td>
<td>108%</td>
</tr>
<tr>
<td>Waste</td>
<td>100%</td>
<td>120%</td>
<td>96%</td>
<td>95%</td>
<td>105%</td>
<td>105%</td>
</tr>
<tr>
<td>Embodied Energy</td>
<td>100%</td>
<td>94%</td>
<td>92%</td>
<td>101%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>100%</td>
<td>125%</td>
<td>102%</td>
<td>108%</td>
<td>115%</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>100%</td>
<td>120%</td>
<td>110%</td>
<td>90%</td>
<td>108%</td>
<td>107%</td>
</tr>
<tr>
<td>Costs</td>
<td>100%</td>
<td>133%</td>
<td>127%</td>
<td>141%</td>
<td>142%</td>
<td>134%</td>
</tr>
</tbody>
</table>

Table 2: Comparison of the 5 different design strategies.

2.7 m - 3.0 m room-height in the buildings base, opens up for alternative use other than apartments.

Figure 2: More room-height in the buildings base, opens up for alternative use other than apartments.

Figure 3: Direct reuse of Ellebo’s concrete facade elements within the new landscape design.

Table 3: Comparison of the 5 different design strategies.
**NORDIC BUILT Challenge** - to eksempler

BYSCO-konceptet:

Ellebo bliver til en Produkt-Service-System (PSS)

- incitament til at spare ressoucer
- skaber jobs (lokalt)
- skaber langvarige forretningsperspektiver
- begrænser (økonomiske) risici for beboerne
- ingen “point-of-sales” (kun et budget, ansvaret forbliver hos BYSCO)

men: hvem kan gøre dette (tillid)? hvem ejer bygningen? hvad med beboerdemokratiet? store byggeopgaver uden udbud? fungerer systemet kun ved høje materialepriser?
NORDIC BUILT Challenge - to eksempler

BYSCO-konceptet:

Ellebo bliver til en Produkt-Service-System (PSS)

-> incitament til at spare ressoucer

-> skaber jobs (lokal)

-> skaber langvarige forretningsperspektiver

-> begrænser (økonomiske) risici for beboerne

-> ingen “point-of-sales” (kun et budget, ansvaret forbliver hos BYSCO)

men: hvem kan gøre dette (tillid)? hvem ejer bygningen?
hvad med beboerdemokratiet? store byggeopgaver uden udbud?
fungerer systemet kun ved høje materialepriser?

Figure 1: budget structures, standard and BYSCO model
Nordic Built debatmøde 2014.03.26

Peter Andreas Sattrup / Jan Schipull Kauschen

Målsætning
Arkitektkonkurrence
Innovationspulje

THE CHARTER
THE CHALLENGE
THE FUNDING

MÅLSÆTNING
Arkitektkonkurrence
Innovationspulje

The Charter
The Challenge
The Funding

JJW Arkitekter
Rambøll
KADK / J. Schipull
DTU / P.A. Sattrup

DTU (DK)
KADK (DK)
NTNU (NO)
CTH (SE)

Ellebo, Ballerup
Krögarvägen, Stockholm
Metodisk værktøj, -
Begge forslag præmieret

JJW Arkitekter (DK)
Helen & Hard (NO)
White Arkitekter (SE)
Lassila Hirvilammi (SF)
Studio Granda (IS)
Innovationsansøgning på baggrund af erfaringerne fra arkitektkonkurrencen. Det designmetodiske værktøj bør komme flere til gode. Udfordringer:

- Bygninger står for størstedelen 40% af energiforbruget. Arkitektur er (også) ressourcestyring
- Helhedssynet udfordres, kompleksiteten stiger, kræver ny ekspertise
- Implementering og udvikling af ny viden i praksis kræver tid og ressourcer
- Rådgivervirksomheder er ofte små og mellemstore virksomheder, ressourcer er begrænsede, økonomi og tid er presset
Idé: Nyt Nordisk Netværk for Arkitektvirksomheder: *Nordic Built STED – Sustainable Transformation and Environmental Design*

- Kritisk masse: Flere virksomheder kan kollektivt skabe mere viden, accelerere udvikling, og skabe byggede demonstrationsprojekter

- Maksimal udnyttelse af nordiske styrkepositioner indenfor både arkitekt og ingeniørforskning: zero-energy, zero-carbon, zero-waste

- Stærk Nordisk arkitektonisk identitet og ekspertise via mix af etablerede og ny virksomheder med stærke faglige profiler (New Nordic, Louisiana)
Idé: Nyt Nordisk Netværk for Arkitektvirksomheder: *Nordic Built STED – Sustainable Transformation and Environmental Design*

- Fokus: Bæredygtige designløsninger for renovering og transformation

- Fokus: Forbedret brug af IT: BIM, simuleringsværktøjer og LCA redskaber i designprocessen. Ny tjenesteydelser

- Fokus: Struktureret vidensdeling gennem forsknings- og praksissamarbejde, udvikling af fælles databaser.
Close, - but no cigar! Udfordringer:

- Innovation i tjenesteydelser. EUDP havde et forholdsvis snævert teknologisk sigte mht. innovation, - ikke på IT, - ikke på services/tjenesteydelser

- Uens kriterier mellem Nordisk og de nationale niveauer (EUDP i Danmark), meget svært at navigere i

- Forskningsdimension måtte neddrosles pga krav om meget ‘markedsklare’ innovationer
Anbefalinger:

- Større og tydeligere fokus på designforskning, designinnovation og designløsninger:

  Godt design skaber mere værdi i flere dimensioner, sparer mere energi, og har bedre miljøprofil end suboptimerede teknologiske tiltag

- Bredere teknologisk sigte:

  Teknologi i designproces, Informationsteknologi til støtte for designkvalitet, teknologisk knowhow
Konkurrence vs forsknings- og udviklingsproces: forskellige tempi, omsættes langsomt i praksis

Målsætning: Arkitektkonkurrence Innovationspulje

NORDISK Forskning og Innovation

Designmetoder
Bæredygtigt byggeri

Demonstrationsprojekter

Ny tjenesteydelser systemleverancer

Nordic Built debatmøde 2014.03.26
Peter Andreas Sattrup / Jan Schipull Kauschen