Nordic built challenge

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NORDIC BUILT CHALLENGE
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arkitekt MAA  

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

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Bæredygtighed, Klima, Energi,  
Dagslys & Designmetoder

AGENDA

<table>
<thead>
<tr>
<th>Metode</th>
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</tr>
</thead>
<tbody>
<tr>
<td>7 koncepter</td>
<td></td>
</tr>
<tr>
<td>Konkurrence fase 1 - NBC som case</td>
<td></td>
</tr>
<tr>
<td>Nordic Built Charter - to eksempler</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nordic Innovation</td>
</tr>
</tbody>
</table>
"Shearing Layers of Change"\textsuperscript{1} - som design strategy for bæredygtigt byggeri

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

Social Concept

Business Concept

Energy Concept

Lifecycle Concept

Ecological Concept

Renovation Concept

Design Concept

Standarder / De Facto Standarder / Principper

f.eks. EN15643

f.eks. DGNB, BREEAM

f.eks. C2C, NBC
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:

- O1 Is made for people and promotes quality of life
- O2 Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge
- O3 Merges urban living with the qualities of nature
- O4 Achieves zero emissions over its lifecycle
- O5 Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition
- O6 Is robust, durable, flexible and timeless - built to last
- O7 Utilises local resources and is adapted to local conditions
- O8 Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines.
- O9 Employs concepts that are scalable and used globally
- O10 Profits people, business and the environment

APPENDIX
PRINCIPLES CONCEPTS CONCEPTS RELATIONS

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.
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**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 2-6-9-10

Principles 1-2-3-4-5-6-7-8-9-10
We, the Nordic building sector, invite the Nordic governments and public authorities, investors and financial business plans. We commit to taking the necessary actions to deliver competitive concepts for a sustainable performance, as a result of our innovative mind-set and high level of knowledge. We commit to taking leadership and implement the Nordic Built principles in our work and our built environment that benefit users, the building sector, our region and the world.

Merges urban living with the qualities of nature.
Achieves zero emissions over its lifecycle.
Is made for people and promotes quality of life.
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.

PRINCIPLES

Nordic Built Charter will lead the way.

CONCEPTS

TO THE PRINCIPLES

SOCIAL CONCEPT
BUSINESS CONCEPT
ENERGY CONCEPT
LIFECYCLE CONCEPT
ECOLOGICAL CONCEPT
RENOVATION CONCEPT
DESIGN CONCEPT
NBChallenge uddrag fra fase 1

LIFE CYCLE CONCEPT

The problem is light on the Problem of the Project to build (1) and the Future Vision of the Project (2) and what needs to be improved in the project. The team is working on the Future Vision and the Problem of the Project. The team is working on the Future Vision and the Problem of the Project. The team is working on the Future Vision and the Problem of the Project.

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ECOLOGICAL CONCEPT

We have a vision of a future Nordic built, where buildings are designed and built in a way that they can be easily altered and maintained in the future. The vision is to create buildings that are sustainable and fair, and that they can be easily adapted to the changing needs of the tenants.

The building is a regular in-and out-migration. These movements give a stronger sense of identity in every housing area. Residents are proud of their ap­artment and it is accompanied by a new way of making every resident take more responsibility for maintaining their function.

LEAN-construction and thorough planning. But also right materials and components to be used, regarding the Nordic Built Charter especially seems to be the least problematic of the challenges awaiting us. The second task will be to make resources - that materials, components and elements are chosen, during design stage. Referring to Stewart Brand's ecosystem of energy, in consequence steel prices will increase and the use of these means we are actually able to seep away on-site, without stressing the local building as a landscape design.

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We use design to achieve favourable microclimate, which is quite typical for precast-concrete building elements. And if we wanted to make this concept yet more lo­cally by contributing to knowledge and awareness as part of a landscape design. The methods that give more than they take.

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We therefore suggest passive design solutions such as solar collectors, photovaltaics, heat pumps, which will reduce the CO2-gross energy consumption can be reduced by pro­duct Service Systems (PSS). PSS describe products that have ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable. We wish to produce an aesthetic product that has ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable. We wish to produce an aesthetic product that has ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable. We wish to produce an aesthetic product that has ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable. We wish to produce an aesthetic product that has ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable. We wish to produce an aesthetic product that has ecological concept. We aim to create a concept and a lifestyle, which is liveable and loveable.
**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 **01**
- Pushes the limits of sustainable performance, as a result of our innovative mind-set and high level of knowledge **02**
- Merges urban living with the qualities of nature **03**
- Achieves zero emissions over its lifecycle **04**
- Is functional, smart and aesthetically appealing, building on the best of the Nordic design tradition **05**
- Is robust, durable, flexible and timeless - built to last **06**
- Utilises local resources and is adapted to local conditions **07**
- Is produced and maintained through partnerships founded on transparent collaboration across borders and disciplines **08**
- Employs concepts that are scalable and used globally **09**
- Profits people, business and the environment **10**
NORDIC BUILT Challenge - to eksempler

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Our Nordic Built principles

We will create a built environment that:

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- 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

Our invitation

We, the Nordic building sector, invite the Nordic governments and public authorities, investors and financial institutions, end-users and building owners, the energy sector and all others who have a stake in our mission, to join us in our efforts to accelerate the transition to a sustainable built environment.

Signed by:

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
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Profits people, business and the environment

APPENDIX

The ten principles in the Nordic Built Charter have been transformed into seven concepts which summarise the most important underpinnings of the principles.

The concepts and their relation to the principles:

- 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
- 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 Challenge** - to eksempler
Embodied Energy + driftsenergi / systemgrænser?

1. livscyklus

2. livscyklus

**130-180 kwh/m²a**

**~100 kwh/m²a**

**30 kwh/m²a**

**0 kwh/m²a**

**-15 kwh/m²a**

**-160 kwh/m²a**

**2015-level**

**1990-level**

**1960-level**

**w/o renovation**

**building code requirements**

**zero-energy use**
buildings are built, reusing some of the material from are renovated, and move back afterwards. More new
On the SPACEPLAN level, allow a particular rehousing strategy. The new build-
gy B, creating larger family apartments spanning over Ellebo is created, making it last longer just by this fact.
As in Strategy C and D, the concrete elements from removes app. 7000m2 from the existing blocks al-
will have access to daylight from all orientations, re-
On the STRUCTURE level, blocks, changing the impression of the former precast-
results in a reduction of apartments in the existing 1960s)?
Strategy E should exemplify the scalability of the con-

Table 1: Relation of the different renovation strategies with respect to environmental footprints and costs
(Percentages are based on a cost estimate and a Lifecycle Assessment (LCA). 100% relates to the base case (Strategy A).

<table>
<thead>
<tr>
<th>SYSTEMS</th>
<th>SITE</th>
<th>STRUCTURE</th>
<th>SKIN</th>
<th>SYSTEMS</th>
<th>SPACE PLAN</th>
<th>STUFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2eq.</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>WASTE</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>EMBODIED ENERGY</td>
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<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>WATER</td>
<td>100%</td>
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<td>0%</td>
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<tr>
<td>RESOURCES</td>
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<tr>
<td>COSTS</td>
<td>100%</td>
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<td>0%</td>
<td>0%</td>
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</table>

Table 2: Comparison of the 5 different design strategies.
NORDIC BUILT Challenge - to eksempler

BYSKO-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?
**NORDIC BUILT Challenge** - to eksempler

**BYSCO-konceptet:**

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

Målsætning  Arkitektkonkurrence  Innovationspulje

THE CHARTER  THE CHALLENGE  THE FUNDING

JJW Arkitekter  DTU (DK)
Rambøll  KADK (DK)
KADK / J. Schipull  NTNU (NO)
DTU / P.A. Sattrup  CTH (SE)

Ellebo, Ballerup  JJW Arkitekter (DK)
Krögarvägen, Stockholm  Helen & Hard (NO)
Metodisk værktøj, -  White Arkitekter (SE)
Begge forslag præmieret  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