Special Session

Natural Resources and Sustainability
ZIEGERT | ROSWAG | SEILER ARCHITEKTEN INGENIEURE
Creating natural change - researching, designing, building with earth, wood, bamboo
Dear Mayor Fernando Medina,

Berlin, July 2016

THE CASE:

● Germany and Portugal as part of Europe are models of the western, consumption-oriented fossil society

● The build environment, that means the habit for the people is consuming 60% of the overall used fossil energy to run the buildings

● Buildings are causing 50% of the overall produced waste through the construction and demolishing process

● Modern construction materials like cement, steel, and glass gave us the option to build against our climate conditions, like glassed towers in hot climates

● Buildings systems like mechanical ventilation systems, industrial, and chemical products are causing health and comfort problems for the inhabitants

● We are building a terrible heritage for our grand kids who have to pay the bill at the end, we are living at the expense of future generations

● Since the Club of Rome published 'The Limits to Growth' 1972 we know about these major problems

● Since this statement the growth of our carbon footprint started and was not turned up to now

POTENTIALS + OPTIONS:

● We should build climate adaptive or with the climate, like the human kind did up to the oil-period

● We should build with natural resources like earth, timber, and bamboo and design buildings in sustaining cycles with our environment

● We should keep and transform existing buildings, especially from the pre-oil period to use existing resources

● We should invest in long-term economical and ecological cycles and stop short-term profit-oriented projects

● We should invest 5% of all investments into innovation and give it into the hands of a young fresh generation

● We in Europe should be the showcase for the post oil society, the society of the future

Eike Roswag-Klinge, Ziegert Roswag Seiler Architekten Ingenieure, Berlin

EVOLUTION OF THE ARCHITECTURE

What will happen after the peak oil?

50% of the world population lives in climate adaptive natural buildings
REFERENCE FOR OUR BUILDING SYSTEM

Traditional “Fachwerkbau” out of wood earth and straw
TIMBER - EARTH BUILDING SYSTEM
Energy efficient without mech. ventilation

01 Building Ground
02 Concrete Floor Slab
03 Timber Construction, Wood Fibre Insulation
04 Timber Construction, Wood Fibre Insulation
05 Wood Fibre Insulation, Floor Heating
06 Timber - Earth Walls
07 Solid Timber Ceiling
08 Earth Cladding to condition room climate
09 Passive Sun Use
10 Floor Heating
11 Solar Hot Water Collector
12 Hot Water Storage, Additional Gas Heating
13 Passive Fireplace (Heat Exchanger)
LOW ENERGY HOUSE, REICHENOW, GERMANY
Wood as a load bearing construction, earth Blocks, earth plaster
TORFREMISE (PEAT SHED), SCHECHEN, GERMANY
4th life for a 18th century construction - integration of a basket weavers workshop + home

1/ NATURAL RESOURCE
2/ ROBUST STRUCTURE
3/ DISMANTLING
4/ REASSEMBLY
5/ REMODELING
6/ BUILDING IN-USE

ABANDONED [2006]
DOCUMENTATION
REUSE OF STRUCTURE

KOLBERMOOR
SCHÈCHELEN

60 m³ Wood

90 m³ Wood

NEW LOW ENERGY HOUSE
NEW LIFE FOR A PEAT SHED
WORKSHOP

15 KM

2nd FORM (1830)
REUSE OF STRUCTURE
NEW LIFE FOR A PEAT SHED
ZRS office and lab, Berlin Artis GmbH Workshop, Berlin

TORFREMISE, Schechen
TORFREMISE (PEAT SHED), SCHECHEN, GERMANY
Translocation, new foundation slab, integration of a natural low-energy construction

1. Existing situation before dismantling
   1.1 Foundation
   1.2 Historic timber structure

2. Re-erection at new location
   2.1 New foundation and floor slab (reinforced concrete)
   2.2 New landscape level
   2.3 Re-erection of historic timber structure

3. Integration low-energy house
   Highly-insulated vapour permeable building shell from sustainable raw materials (timber, wood fibre insulation, earth)
   3.1 Doubled roof structure, U-value: 0,15 W/m²K
   3.2 Exterior wall, U-value: 0,13 W/m²K
   3.3 Wooden window triple glazing, U-value: 1,0 W/m²K
   3.4 Floor build-up insulated, U-value: 0,1 W/m²K

4. Regenerative heat generation
   4.1 Hot water collector
   4.2 Stratified storage tanks
   4.3 Wood boiler
   4.4 Surface heating for heat distribution
TORFREMISE (PEAT SHED), SCHECHEN, GERMANY
High insulated structure out of timber, woodfibre and earth
Wohnen und Arbeiten in der Torfremise, Innenraum Obergeschoss, weißer Lehmfeinputz
LIFE CYCLE ACCESSIONMENT OF OFFICIS BUILDINGS

Natural building:
Mayor reduction in construction, 0% fossil services of the building (Plus Energy)

Substantial reduction of the demand of an energy efficient office building
Remaining fossil proportion

ENERGY EFFICIENT OFFICE BUILDING
50% Erection/50% Operation

CONVENTIONAL OFFICE BUILDING
30% Erection/70% Operation

Use of natural building materials
Regrowing
Regenerative

Renewable Operation
Lighting
Control Indoor climate

Demand User Computer etc.
LOWTECH HOUSING - 7 STOREYS VISIBLE TIMBER CONSTRUCTION
Climate active surfaces, reduction of mechanical ventilation (optional zero)
3.1 PV-Dünnschichtmodule, Ost-West-Orientierung, Leistung ca. 30kW
3.2 Nutzung von Prozeßwärme der Produktion
3.3 Zerkleinerung von Holzabschnitten aus der Produktion
3.4 Hackschnitzelbunker zur Speicherung von Brennstoff im Sommer, Volumen ca. 80m³
3.5 Beheizung zu 100% CO₂-neutral über Hackschnitzelheizkessel, automatische Beschickung
3.6 Wärmeverteilung über Betonkernaktivierung (EG) und Fußbodenheizung (OG)
3.7 Lüftung innenliegender Räume über Lüftungsgerät mit Rotationswärmetauscher
3.8 Spezial-Lüftungsanlage für Lackierraum, WRG über Plattenwärmetauscher, Nachterhitzung über Heizkessel
FLEXIM HEADQUARTERS, BERLIN
Natural build and ventilated production building in low-energy standard

1 Baugrund
1.1 Aufschüttung nicht tragfähig ca. 2,0 m
1.2 Gewachsener Baugrund

2 Gebäudehülle diffusionsoffen, feuchte- und temperatursteuernd
2.1 Gründung/UG als weiße Wanne; U-Wert ca. 0,15 W/m²k
2.2 Außenwände, Holzbau hochdämmend; U-Wert ca. 0,12 W/m²k
2.3 Gründach für sommerlichen Wärmeschutz, Holzbau hochdämmend; U-Wert ca. 0,12 W/m²k
2.4 Rohbau, hybrid, Holz-Beton-Verbunddecke
2.5 Fenster-Fassadenelemente; U-Wert ca. 1,0 W/m²k

3 Klimasteuerung passiv
3.1 Sonnenschutz außenliegend, beweglich
3.2 Lüftungsflügel zur Nachtauskühlung, wettergeschützt
3.3 Lichtband, Querlüftungsoffnungen
3.4 Nachtauskühlung, Feuchteaufnahme (Holz und Lehm)
3.5 Feuchteabgabe, Verdunstungskühlung
3.6 Offenbares Oberlicht

4 Klimasteuerung aktiv
4.1 Heizung an kalten Wintertagen
4.2 Optional Kühlung, heißer Sommertag
4.3 Industrieflächenheizung, Bauteilaktivierung

5 Energiequellen
5.1 PV-Anlage, Energiequelle elektrisch, Verschattung der Dachfläche
5.2 Wärmerückgewinnung aus Abwasser, kommunale Vernetzung
5.3 Wärmepumpe (deckt ca. 80% des Wärmebedarfs)
FLEXIM HEADQUARTERS, BERLIN
Concrete Timber Hybrid Construction, Multi- Funktional Working Space
FLEXIM HEADQUARTERS, BERLIN

Energy concept: Heat recovery from public waste water, heat pump
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)
Office extension to the existing building
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)

Compact and efficient floor planning
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)

Day- and artificial light controle through the inhabitant
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)
High summer and winter comfort without air condition, natural ventilation

- Natural night cooling over cross-ventilation
- "Charge" of the clay parts with cool night moisture
- Evaporation/cooling during the day at rising temperatures

WENIGER TECHNIK / MEHR RAUM
Through the selection of moisture-active and non-toxic natural building materials, the ventilation requirement is only based on the emission of CO2 and is therefore very low. The low ventilation requirement is ensured in the office areas through decentralized ventilation units with heat recovery. To achieve a balanced heat distribution in the building, an "energy swing" is integrated into the clay ceiling putty, which transports heat from the south to the north.

The building is divided into the following zones:

A) Office zone: CO2 controlled decentralized ventilation units in pendulum operation // high cut-off times (7 to 8 months) during summer night cooling,

B) Service cores in the office area: central intake and exhaust system with heat recovery // pure exhaust operation during summer, 

C) Assembly rooms: demand-controlled intake and exhaust system (CO2 and moisture) // change to natural ventilation at less intensive use // summer night cooling, optional additional cooling via adiabatic exhaust cooling.

Optimized window openings, transparent room dividers, and external sun protection with light redirection and transparency function allow for a large extent of daylight utilization. The artificial light is operated presence- and daylight-controlled.

The reduced technical requirement is assigned to the architectural-rational. Additional room volume relaxes the interior climate. An adaptively applicable usage and control concept ensures the user a high degree of influence at increased efficiency.
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)
Natural construction: Wood, cellulose, rammed earth, compressed gravel foundation
EXTENSION UMWELTBUNDESAMT, DESSAU (Competition)
Limited glassed elements, PV panels for shading in the south
DIE NACHWACHSENDE STADT
Network to research on and build a ressource positiv city model
Thank You for Your Patient Attention