Adaptive Building Design \ Using low and high-tech Solutions

Prof. Dr. Uta Pottgiesser, Detmold School of Architecture and Interior Architecture
From Agropolis to Petropolis
Towards Ecopolis

Source: The Future of Cities Forum 2013
Urban Development and Planning

- Efficient use of energy, solar city development,
- Sustainable transport and water security,
- Local food and materials,
- Nature in the city, green businesses,
- A culture of restorative urbanization.

Source: List of Policies by Herbert Girardet
verticrop@news.buzzbuzzhome.com
www.alternativeconsumer.com
www.bmwblog.com

Producing renewable on-site energy

Reducing energy Demand

Net Zero-Energy-Building

Conventional Building

Plus-Energy-Building

Article 9
Nearly Zero-Energy Buildings

1. Member States shall ensure that:

(a) by 31 December 2020, all new buildings are nearly zero-energy buildings; and

(b) after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.
Low Carbon Building Culture

Common Sense for the World 2009
Manifest of BDA*

* Bund Deutscher Architekten

We must
• place the planning and layout of our cities and buildings on a new ecological footing,

We want
• sustainable cities,
• resource-saving architecture and civil engineering,
• a heightened awareness of sustainable development,

We will
• lend credibility to our commitment through personal involvement.
Certification Systems and Rating Tools

source: www.dgnb.de

source: www.greenmark.sg
Low-threshold Information
Implementation Process

• Regulations
• Financial drivers
• Information and awareness
• Key messages

Source: Fung Global Institute

Barriers to scale and action

- Misalignment of costs and benefits between stakeholders
- Weakened financial incentives due to subsidized prices
- High costs of financing
- Insufficient awareness of costs and benefits
- Organizational inertia
- Lack of technical know-how and labour shortage

Action Framework for Hongkong

Source: Fung Global Institute
Case Studies from West and East
Headquarter Federal Environmental Agency (UBA)
Sauerbruch-Hutton Architects \ Berlin \ 2006 + Anderhalten Architects \ Berlin \ 2015

Headquarter and plus-energy-extension in Dessau, Germany 2006 / 2012
Plus-Energy-Building for UBA Dessau

Source: Anderhalten Architekten
Plus-Energy-Extension to UBA
2226 \ Lochau \ be baumschlager eberle

No cooling, no heating, outer cavity wall 2 x 36 cm bricks
The human being is the only disruptive factor in the energy balance from an ideal world.
Life Cycle Tower One \ Dornbirn \ Herm. Kaufmann

First Hybrid Sky-Scraper with reduced glass-wall-ratio out of prefabricated elements
Life Cycle Tower One \ Dornbirn \ Herm. Kaufmann

Wooden Construction from local materials and energy production.
Sunlighthouse \ Vienna \ Hein-Troy Architects

www.detail.de
Just K \ Tübingen \ Martenson Nagel and Theissen
NREL – National Renewal Energy Laboratory \ Colorado

New Building Components: South Facing Windows

Light shelf reflects light and shades unlouvered windows

Light louvers deflect direct light to ceilings

Automatically and manually operable windows promote cross-ventilation

Pre-cast thermal mass wall
- 3” concrete
- 2” rigid insulation
- 6” concrete

NREL.gov
NZE: Monte Rosa Hut \ Zermatt \ ETH Zürich

- 120 beds, 90% general energy autarky,
- 70% cooking energy autarky,
- Aluminium envelope with PV production south,
- Solar thermal collectors for warm water,
- Melting water for toilets and showers

Source: www.neuemonterosahuette.ch
Farming Kindergarten \ Dong Nai \ Vo Trong Nghia
No 1 Moulmein Rise \ Singapore \ WOHA

Monsoon window as traditional feature
Diamond Building \ Kuala Lumpur \ NR Architects

ASEAN Energy Award 2012 – New Building

Credit: Energy Commission of Malaysia
Diamond Building \ Kuala Lumpur \ NR Architects
ASEAN Award \ Singapore \ Mall + Hotel

ASEAN Energy Award 2012 and 2013 – Refurbishment

Source: Fung Global Institute
Close Cavity + Insulation \ material driven factors
Kinetic + 3D Shapebility \ function driven factors
Translucency + Textile \ design driven factors
CONSIDER REUSING GREY WATER

TURN OFF ALL EQUIPMENTS WHEN NOT IN USE

USE AIR CONDITIONERS SPARINGLY

PLAN YOUR HOUSE FOR VENTILATION & NATURAL LIGHTING

Source: HS OWL_NID Bangalore
European Facade Network (efn)

Hochschule OWL, Detmold
TU Delft
Hochschule Luzern
Universidad San Sebastian
University of Bath

http://facades.ning.com/
EfnMOBILE 2013-15

Mockup 2013: Green + Generating Energy

Source: HS OWL
EfnMOBILE at Glasstec 2014
Thinking Skins – PhD Jens Böke

Source: Jens Böke
Thinking Skins – PhD Jens Böke

Optimization towards Requirements: Solar shading
IGBC School Competition 2012: DCRUSTM - HSOWL

Viktoria Kauffeld, Hochschule OWL
IGBC School Competition 2012: DCRUSTM - HSOWL

Functional Principle

Winter

- 2nd floor: enveloping structure of twining plants provides a microclimate for the inhabitants through shading and evaporation

- 1st floor: facade made of bottles, packed with sand, placed on their side and stacked up, and bound together with cement

Source: HS OWL
Be a Smart User and Activist

Sources

http://www.usgbc.org/leed
http://www.dgnb.de/de/
http://www.greenmark.sg/
www.gbcindonesia.org
http://www.greenshiphomes.org/
http://www.aseanenergy.org/index.php/publication/2013/03/28/aea-2012-02
http://www.hs-owl.de/creed/events/

www.hs-owl.de/creed/events/investigation/

Source: HS OWL_NID Bangalore