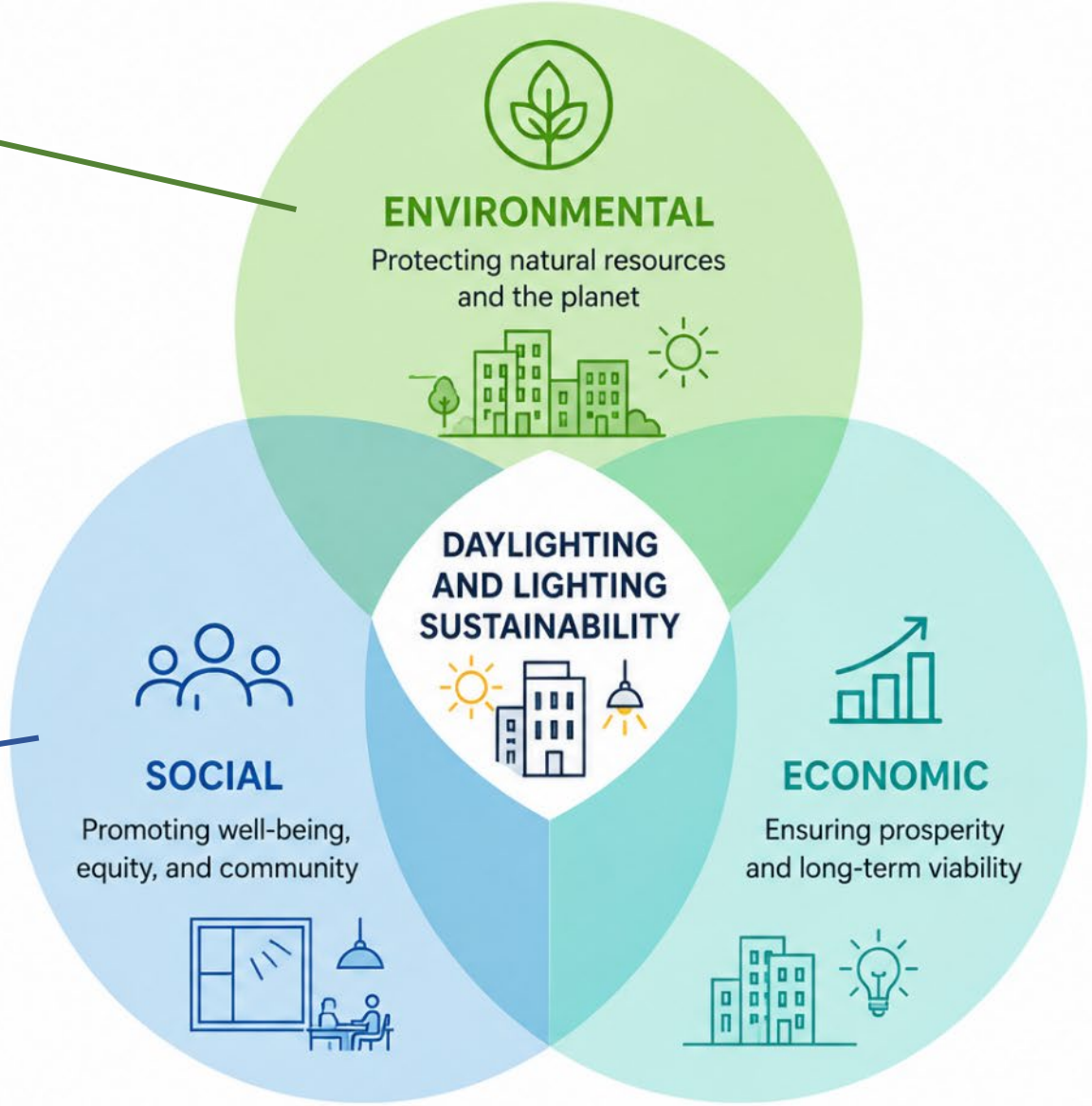
SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Application and Case studies – How do concepts prove in practice

Niko Gentile, Lund University, Sweden
IEA SHC Task 70 / EBC Annex 90 - Subtask D

Low Carbon



High Comfort

Generated with DALL-E

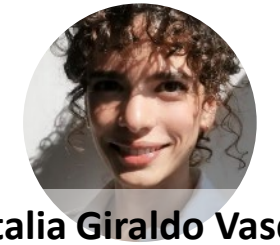
Overview

- Can “high comfort” and “low carbon” be achieved simultaneously?
- What about environmental impacts across building scales?
- Lessons for socially and environmentally sustainable (day)lighting design

Overview

Summarize insights on sustainable daylighting and lighting solutions balancing environmental impact and lighting quality.

COMPONENT, ROOM, AND BUILDING SCALE



Natalia Giraldo Vasquez
DTU, Denmark

Niko Gentile
Lund University, Sweden

Interplay between densification, urban form, daylight, and energy use

NEIGHBORHOOD SCALE

Justyna Martyniuk-Pęczek
Gdańsk University of Technology, Poland

…and the invaluable support of 50+ global experts in lighting and daylighting

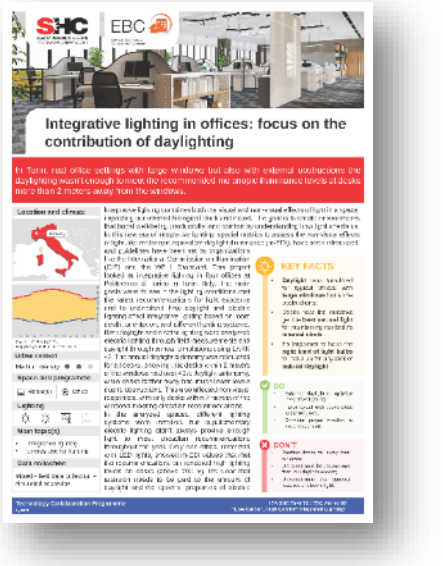
Overview – “products”

Expected after summer on task70.iea-shc.org

Summarize insights on sustainable daylighting and lighting solutions balancing environmental impact and lighting quality.

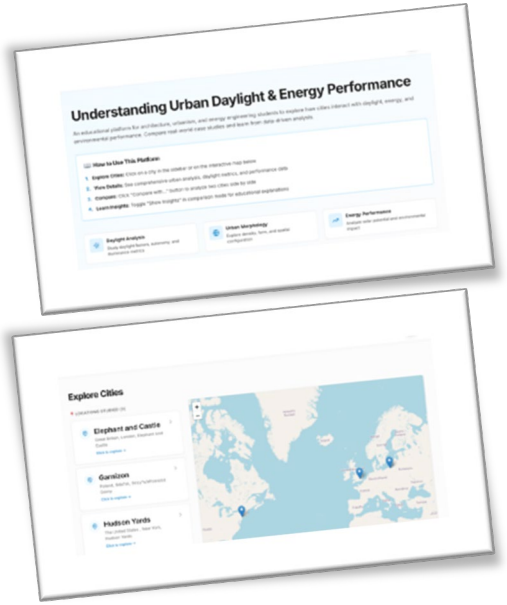
Interplay between densification, urban form, daylight, and energy use

COMPONENT, ROOM, AND BUILDING SCALE



Factsheets

NEIGHBORHOOD SCALE



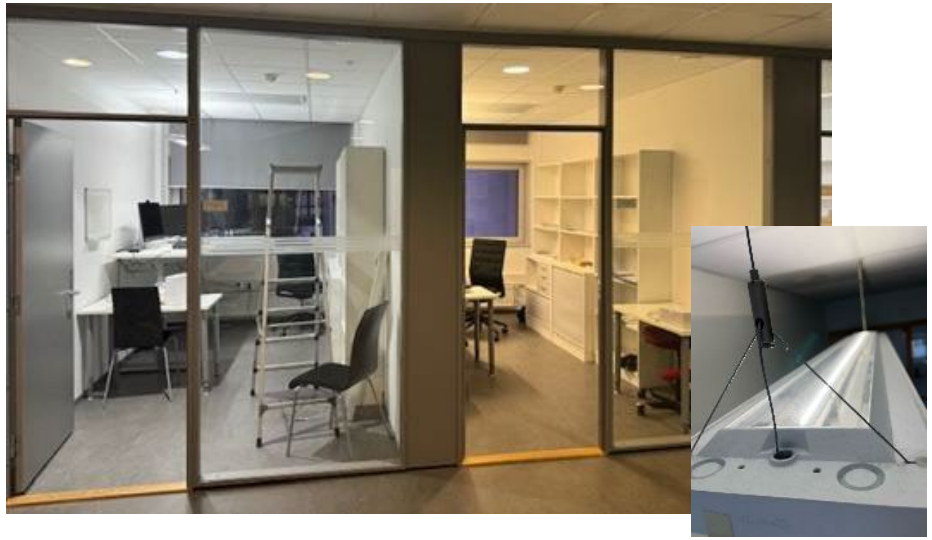
Web Atlases

Some examples

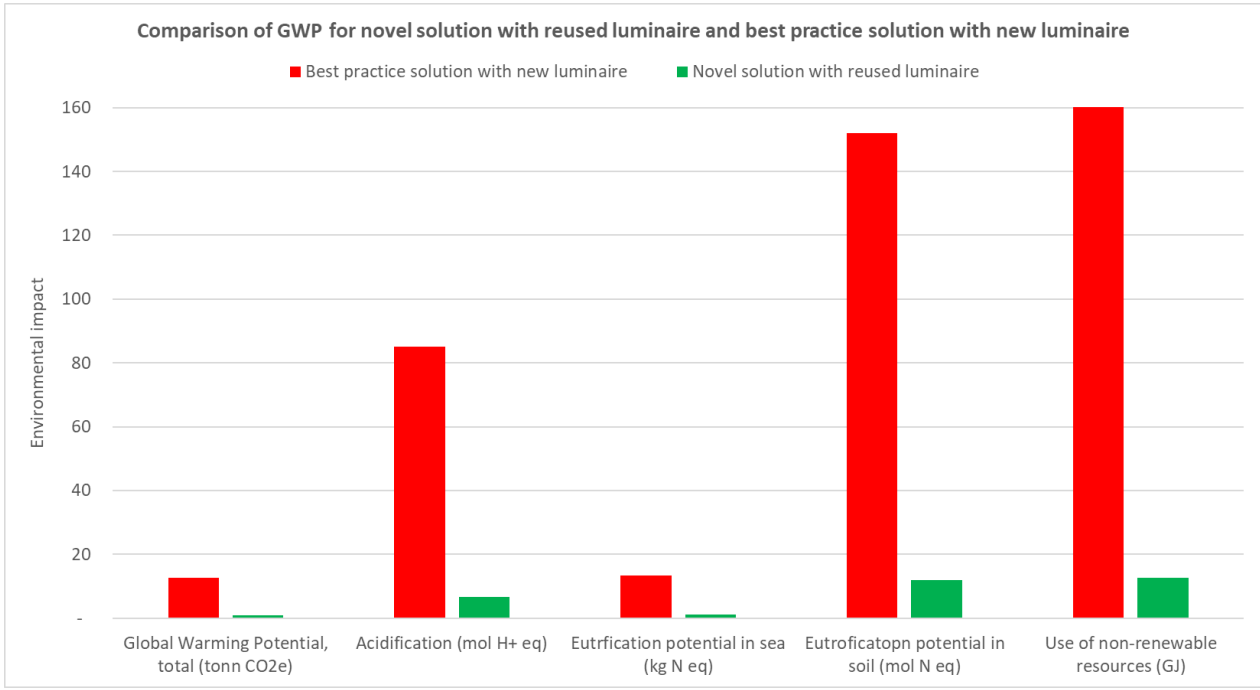
Component, room, and building scale

Low Carbon lighting, Norway

Upcycling of lighting systems



Biljana Obradovic



- Reduced luminaire replacement logistics
- Lower GHG emissions impact
- User feedback on seasonal implementation

Low Carbon daylighting, Sweden

Environmental impact of automated fenestration systems

Novie Stella Samosir

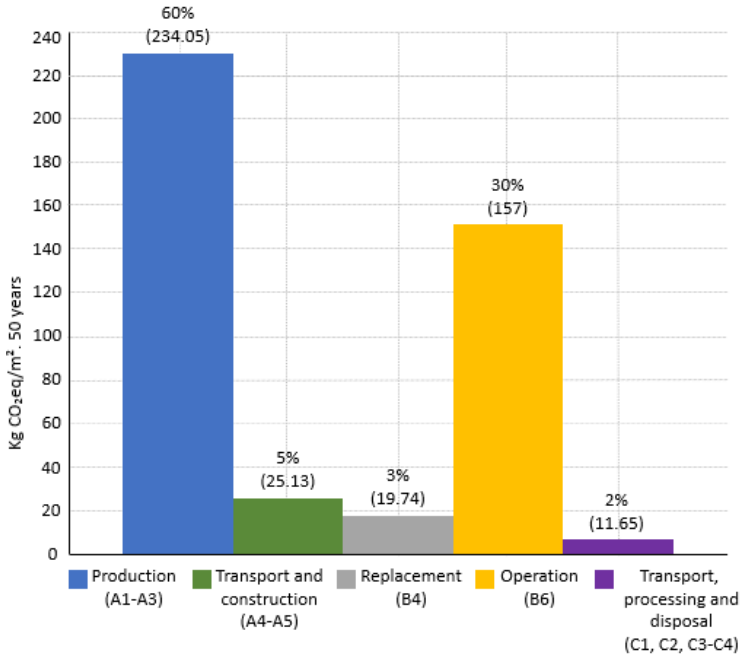
Hanifah Mahdiyyah

- Automated shading improved daylight and reduced cooling
- External venetian blind best energy performance
- GWP reduced by 0.04–1.88 $kgCO_2eq/m^2/year$

Low Carbon daylighting and lighting, Brazil

LabZero – UnB: a Zero-Energy Building on a Warm-Climate Campus

- NZEB building with demand of 30.78 kWh/m². year
- Good daylight autonomy and visual comfort
- Photovoltaic integrated shading devices (PVSD) reduce the total energy use and generate electricity.
- Total GHG emissions in 50 years (building envelope): 447 kg CO_2eq/m².



Claudía ND Amorim

Low Carbon, High Comfort, Denmark

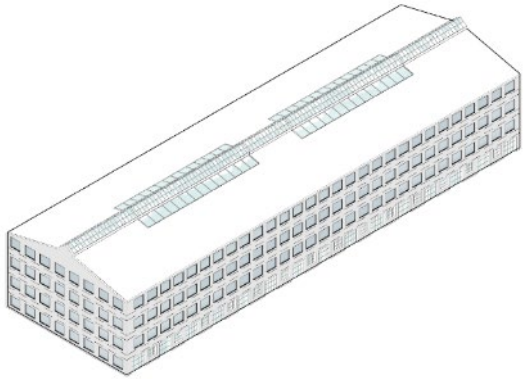
Pauline Carstens

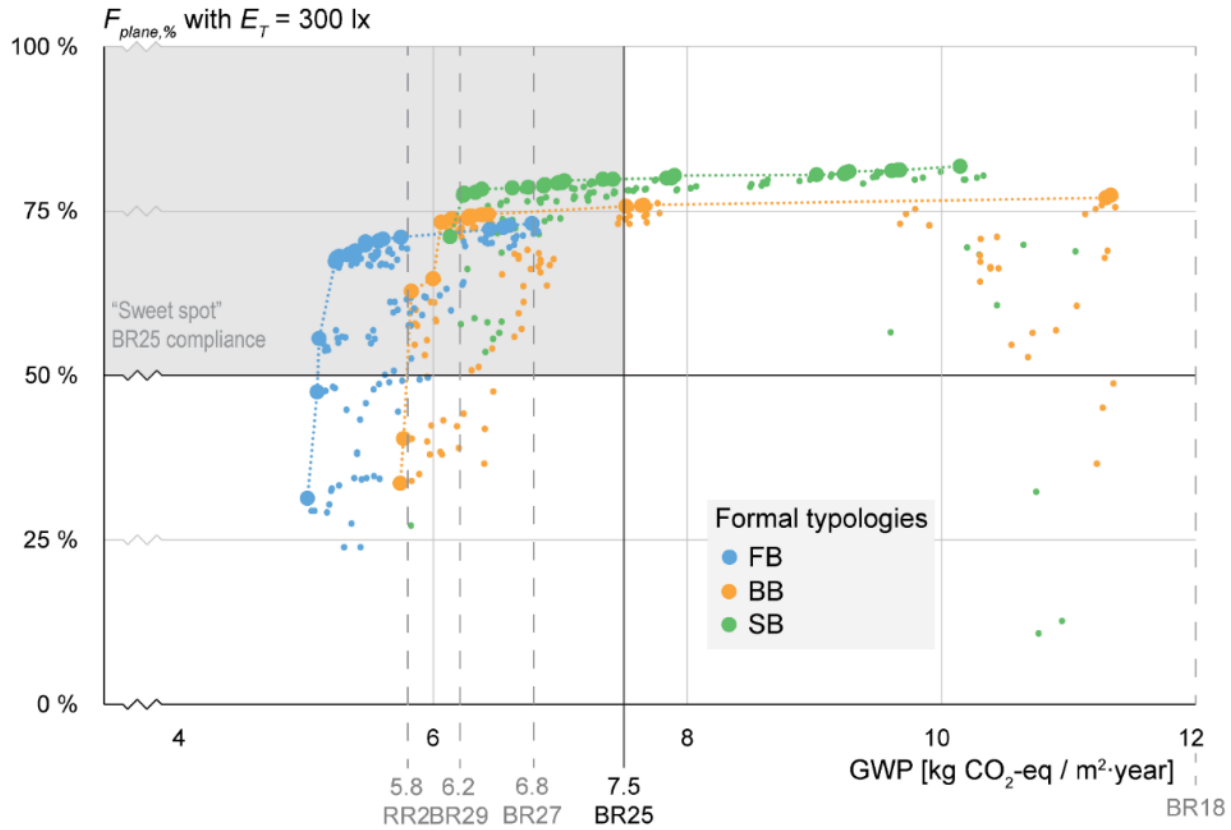
Luca Fokas

Environmental requirements may conflict with the daylighting ones

Parametric study based on actual feasible building conversions in Denmark

- Based on Danish building regulation
- Demanding carbon requirements combined with “EN17037-ish” daylighting approach
- Only very few design options can comply with both requirements by 2028

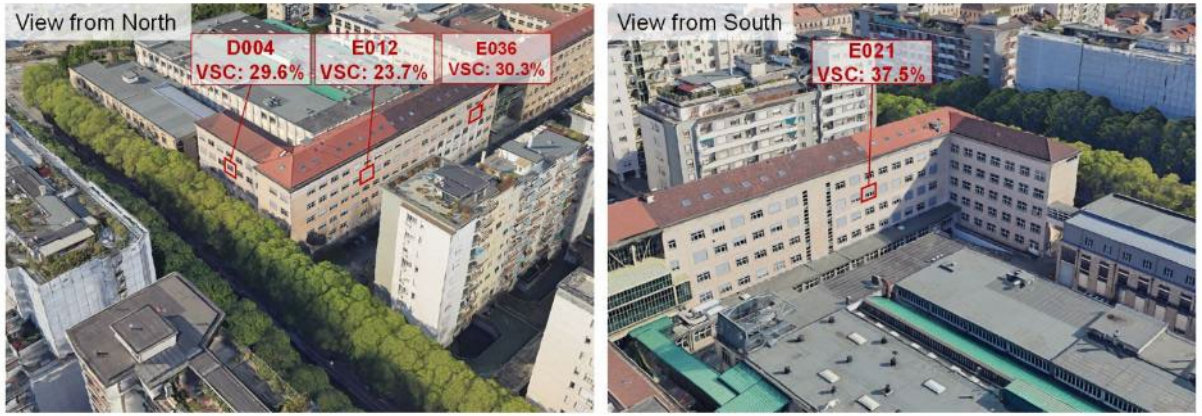


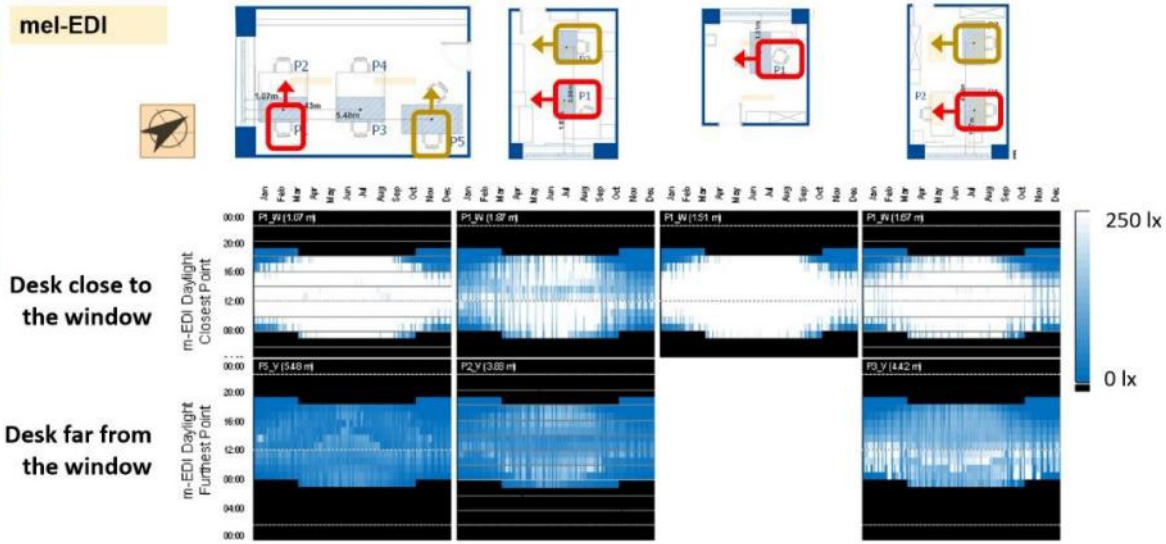


High Comfort, Italy

Integrative efficient lighting requires daylighting

New circadian requirements call for re-thinking lighting design





- Daylight simulated in offices with large windows
- Window-side desks received highest daylight exposure
- Electric lighting compensated for limited daylight

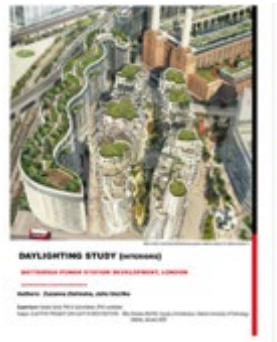
Neighborhoods

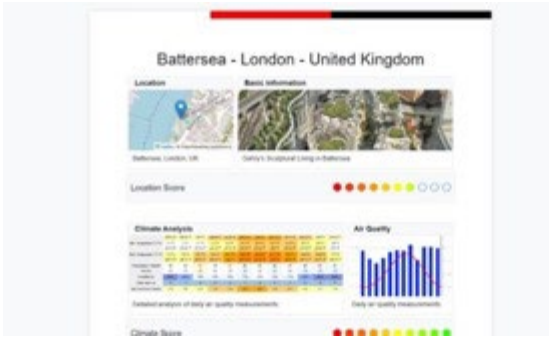
Overview

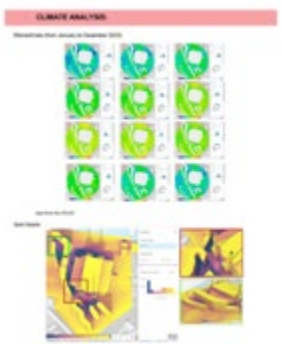
Case Study Atlas

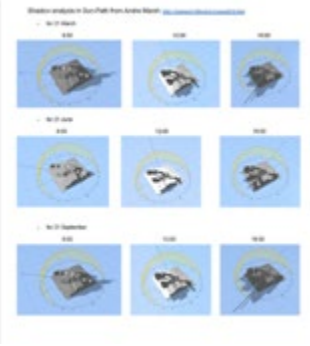
A **case study approach** - successful neighbourhoods of real-life conditions with the motto of urban densification scenarios.

1. Battersea Power Station Development, London, UK
2. Brunnshög, Lund, Sweden
3. Garnizon District, Gdańsk, Poland
4. King's Cross (Atlas Case Study), London, UK
5. La Courrouze, Rennes, France
6. Seestadt Aspern, Vienna, Austria
7. BedZED, London, UK
8. Hammarby Sjöstad, Stockholm, Sweden
9. Oceanhamnen, Helsingborg, Sweden
10. Pilestredet Park, Oslo, Norway
11. Västra Hamnen, Malmö, Sweden
12. ZAC de Bonne (Écoquartier), Grenoble, France
13. Ørestad, Copenhagen, Denmark
14. Zuidas District, Amsterdam, Netherlands
15. Hiedanranta, Tampere, Finland
16. Stockholm Royal Seaport, Stockholm, Sweden
17. Tengah "Forest Town," Singapore
18. North West Bicester, UK
19. Rieselfeld, Freiburg, Germany
20. Bahnstadt District, Heidelberg, Germany
21. Elephant and Castle, London, UK
22. Seaport District, Boston, USA
23. Mission Bay, San Francisco, USA
24. Hudson Yards, New York City, USA









In a nutshell

(some general lessons learned)

In a nutshell

- Upcycling promising for reducing embedded carbon
- (Day)lighting quality (“high comfort”) and “low carbon” may be achieved simultaneously
  - the two must always be checked together
  - even at neighborhood scale!
- Requirements for integrative lighting calls for innovation in lighting and better daylighting

INNOVATION

is calling

Thanks!

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