

DR ALI GHAFARIAN
DR AMIRHOSEIN GHAFARIAN

RESPONSIVE
+ GREEN
URBAN BUILT ENVIRONMENT LAB

BUILT
ENVIRONMENT
ENGINEERING

AUT

FROM INTELLIGENT
PROTOTYPES TO AN
ENERGY EFFICIENT
FUTURE





SUSTAINABILITY



SUSTAINABLE DEVELOPMENT GOALS



COP21/CMP11

Paris France





SUSTAINABILITY

Hardware VS Software

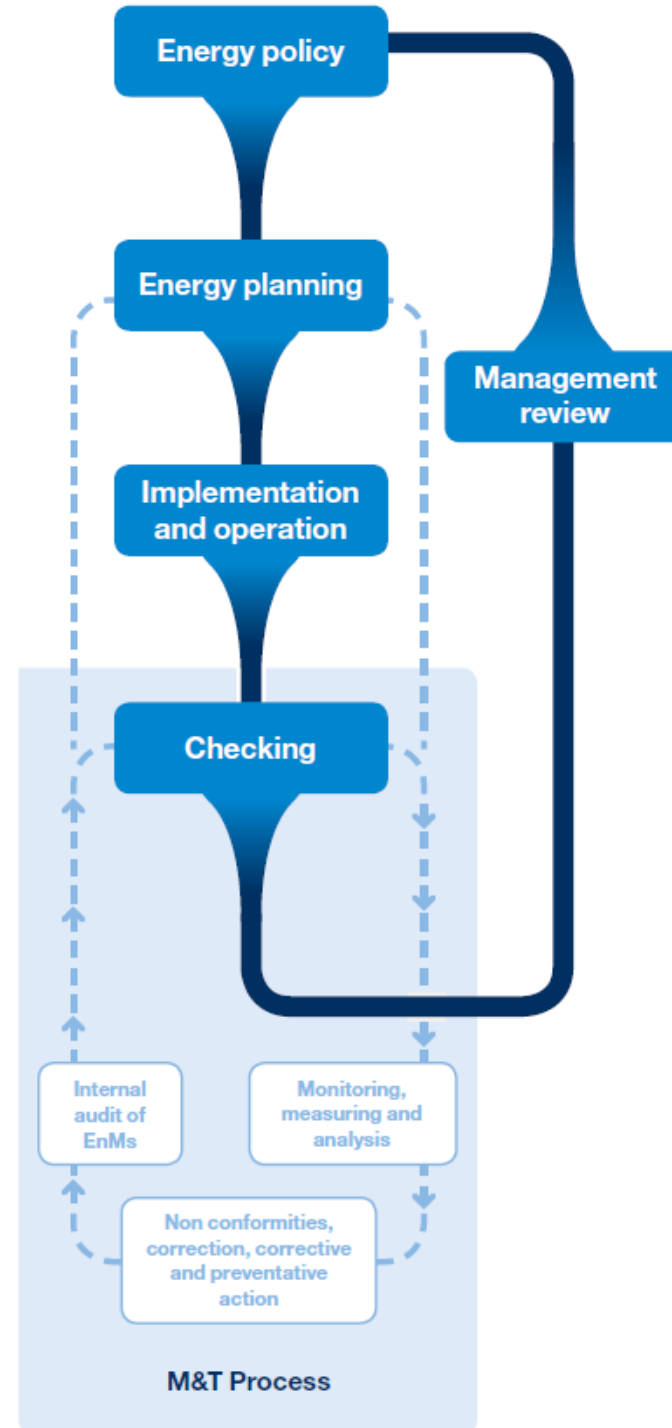


HARDWARE

- **INTELLIGENT BUILDINGS**

- **BMS**

- SMART & ENERGY EFFICIENT DEVICES
- ENERGY EFFICIENT MANAGEMENT & CONTROL





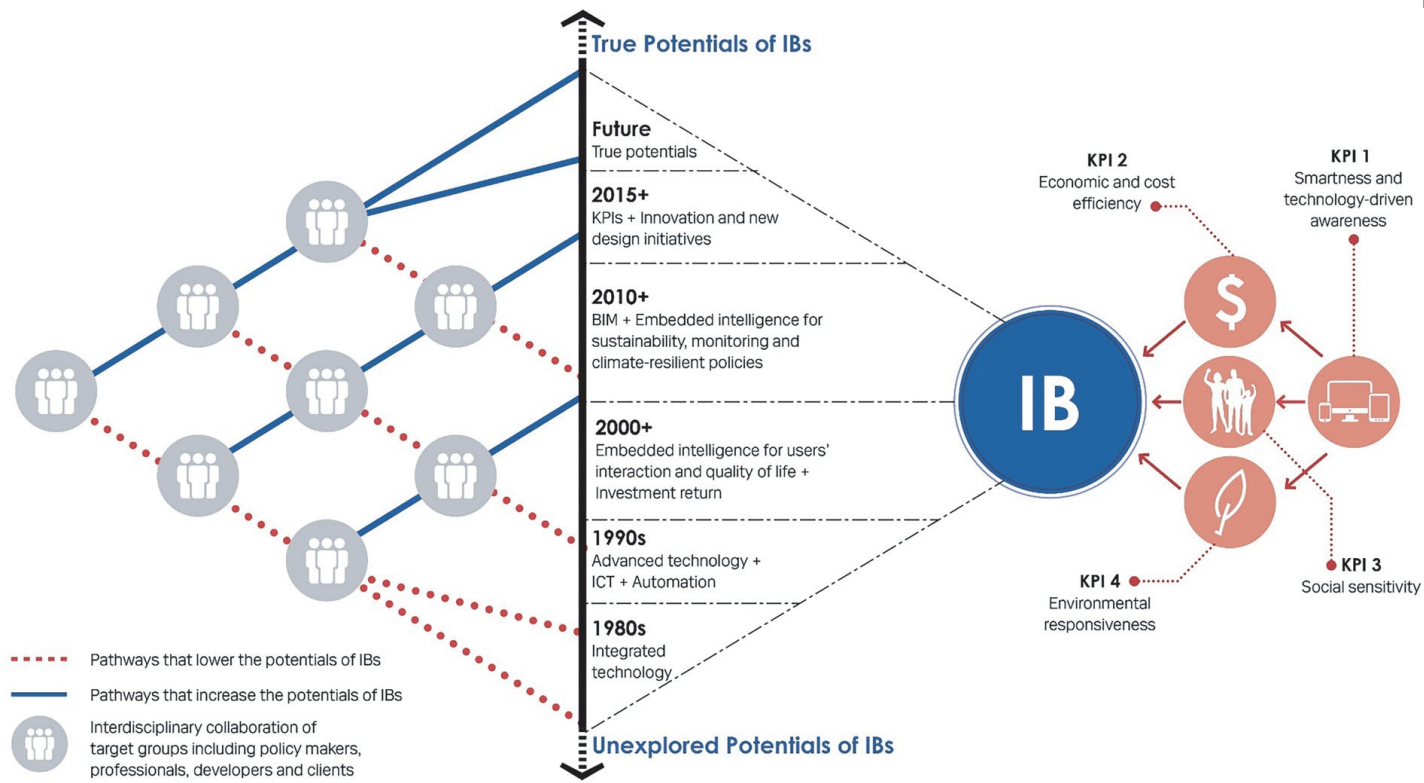
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SOFTWARE

• INTELLIGENT SYSTEMS

• BIM

- INTEGRATED INFORMATION MANAGEMENT
- SMART MONITORING & CONTROL





INTEGRATING

Hardware & Software



Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

Application of nD BIM Integrated Knowledge-based Building Management System (BIM-IKBMS) for inspecting post-construction energy efficiency

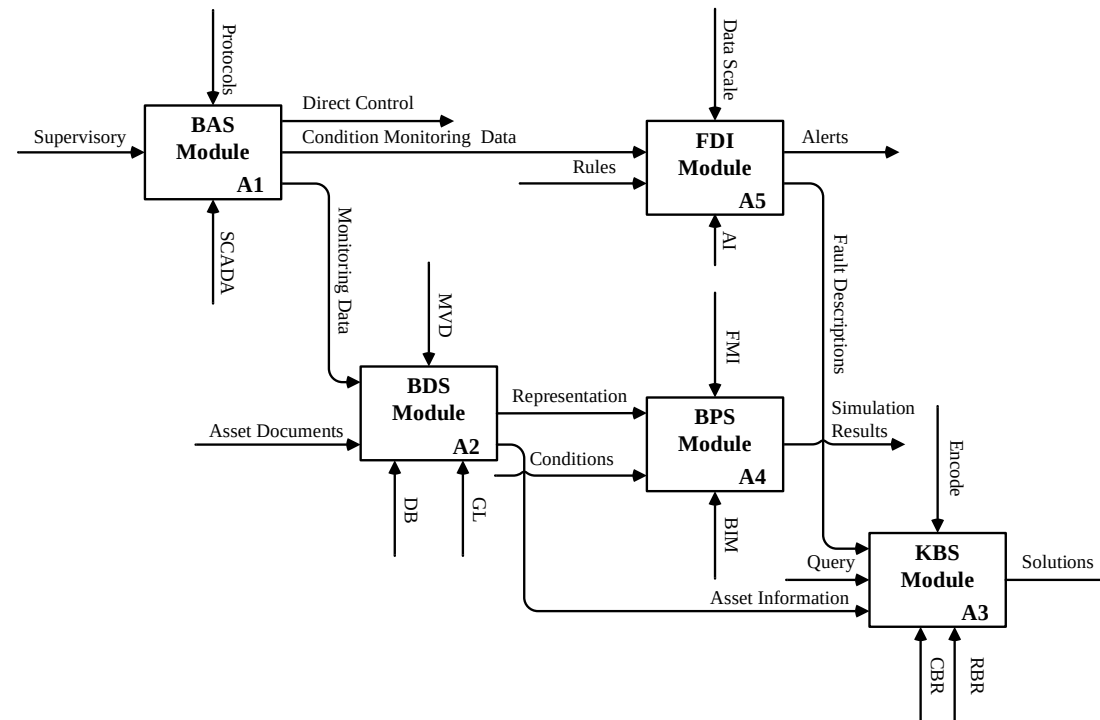


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FUTURE PROOFING

- **TECHNICAL YET INDIRECT**

- **HOLO-PORTATION**

- SMART & ENERGY EFFICIENT BUILDINGS
- SMART OFFICES
- NUMEROUS GREEN POTENTIALS
- FROM VIRTUALITY TO REALITY



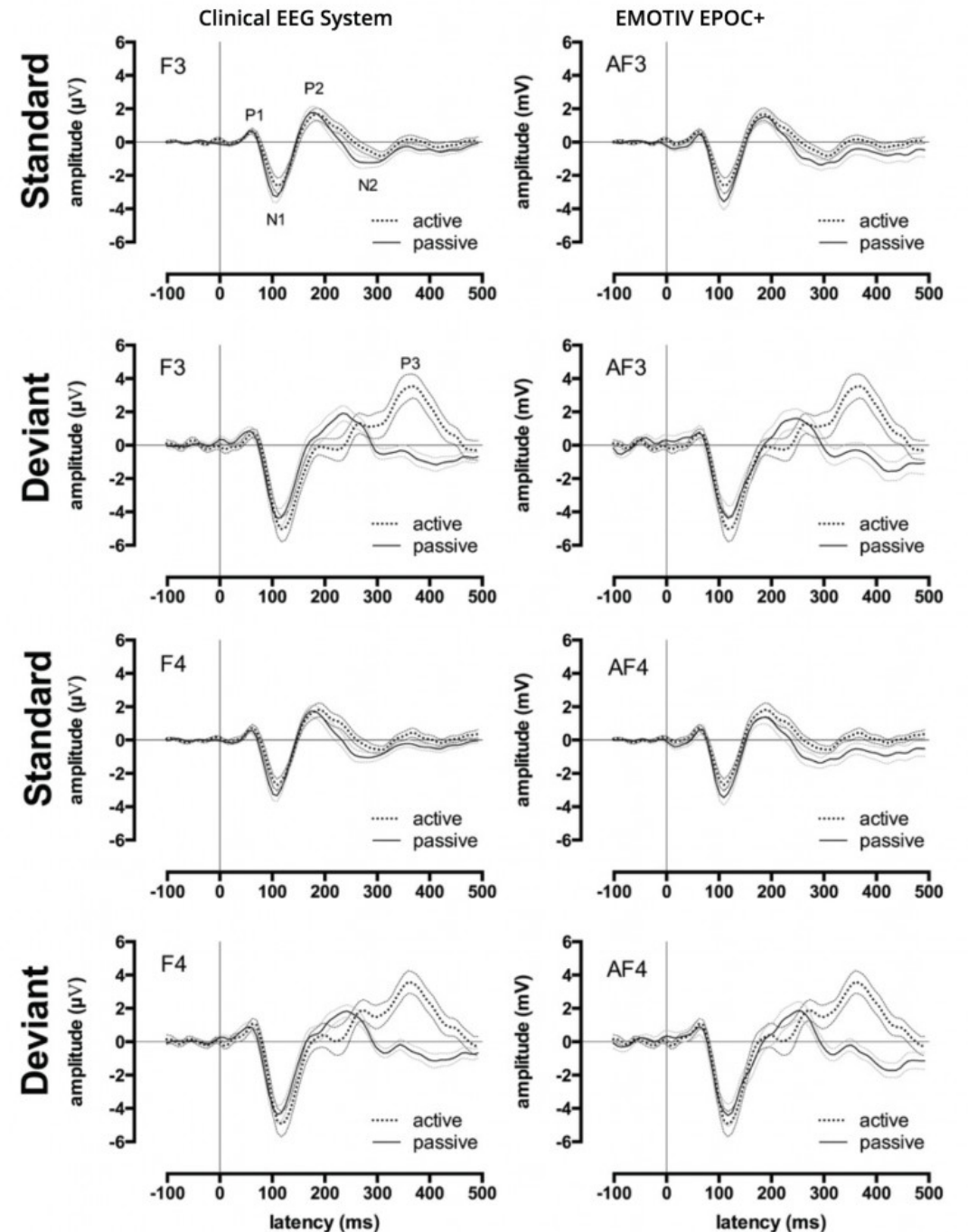
Image source: <https://www.microsoft.com/en-us/hololens/hardware>

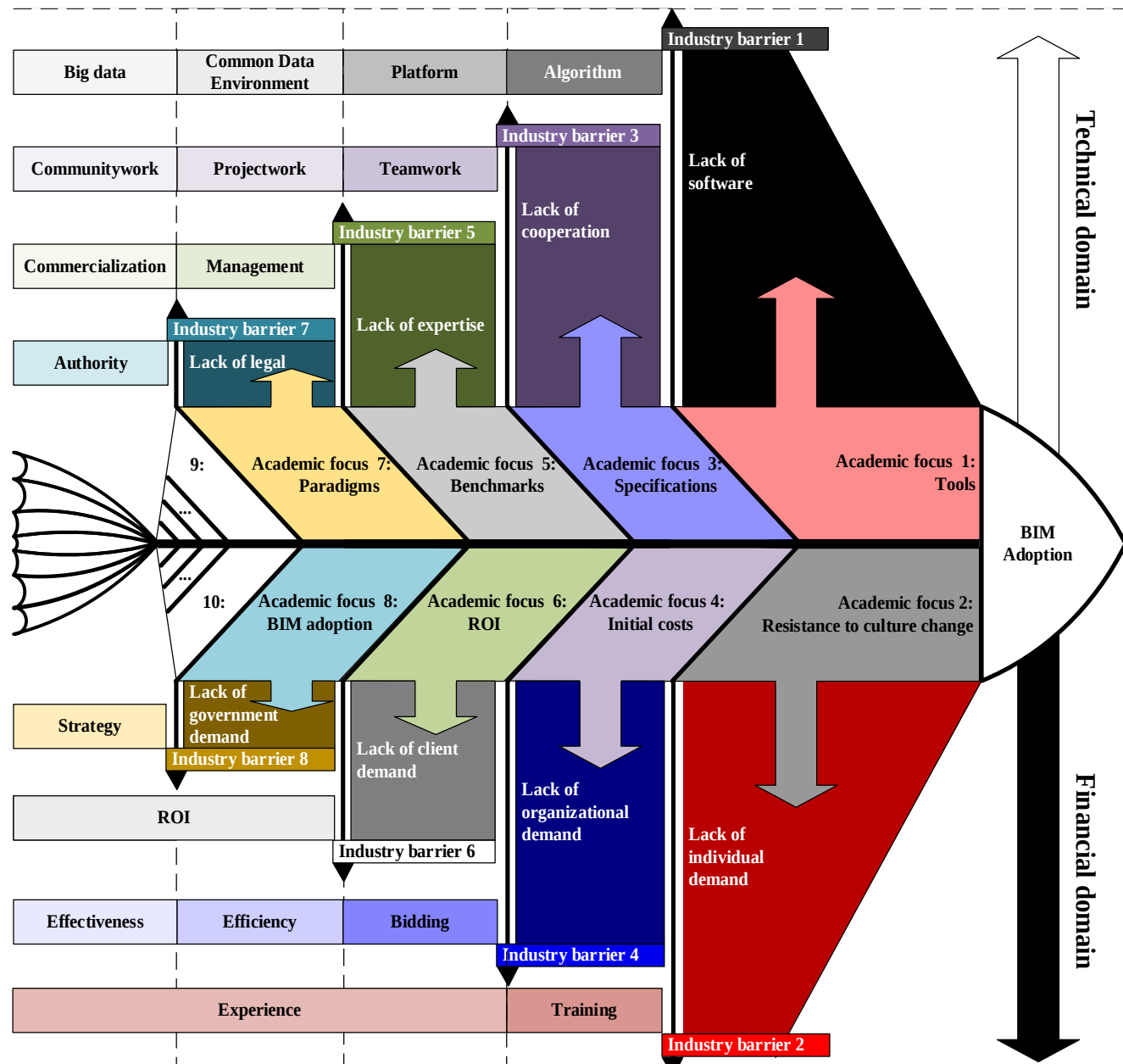
- BEYOND PHYSICS
- PSYCHOLOGICAL SUSTAINABILITY
 - ELECTROENCEPHALOGRAM (EEG)



source:

Image source: <https://www.emotiv.com/the-science/>

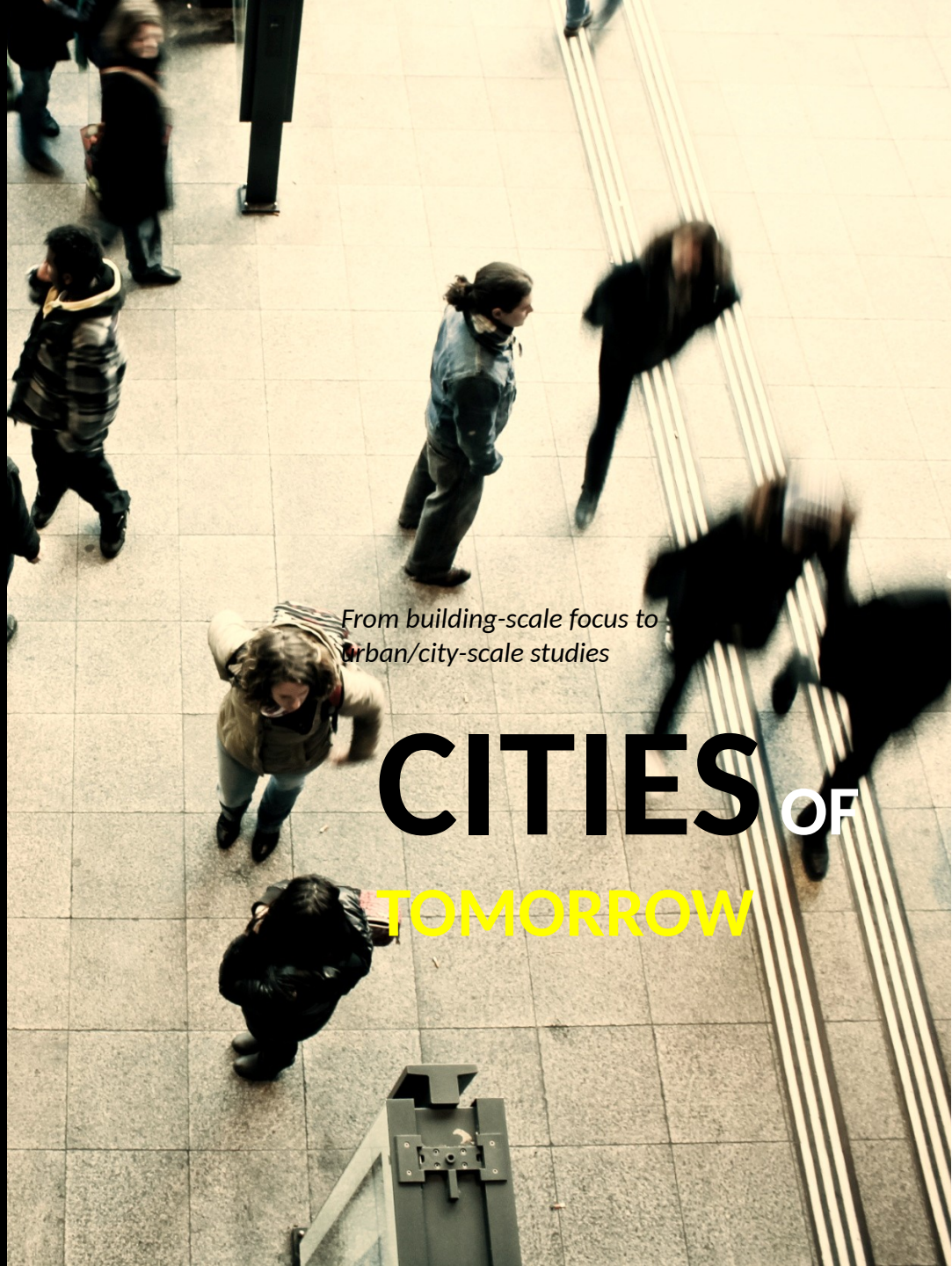




INTEGRATING ALLI

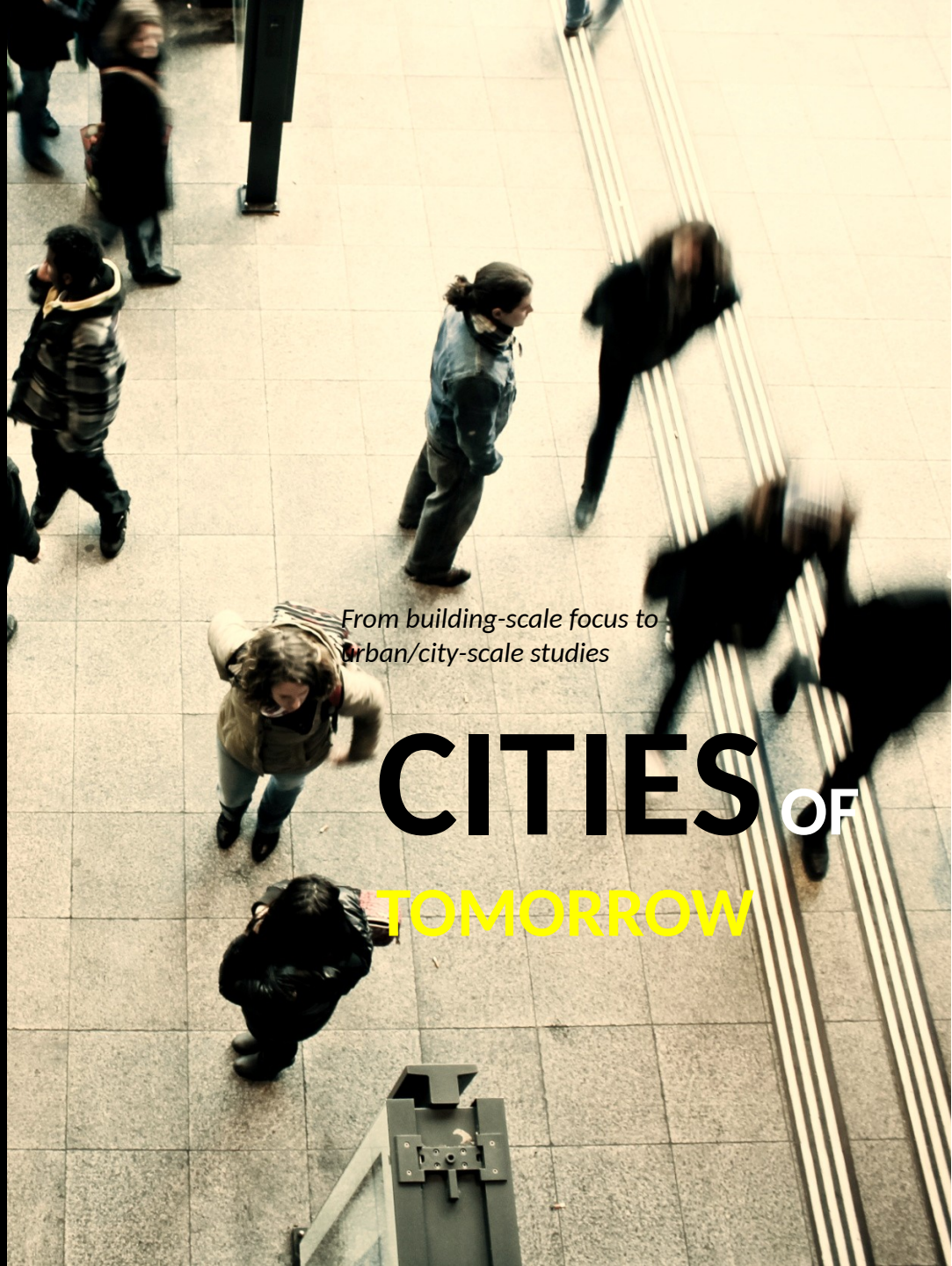
**THINK EFFECTIVELY
BEFORE ACTING SO!**

Integrating all of the above yet
avoiding to become a **victim of**
technology!



From building-scale focus to
urban/city-scale studies

CITIES OF TOMORROW



From building-scale focus to
urban/city-scale studies

CITIES OF TOMORROW



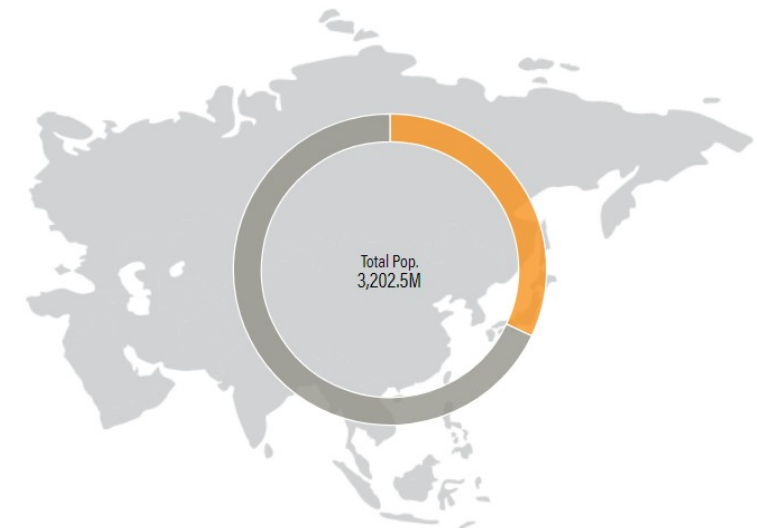
Image source: <http://publications.wri.org/buildingefficiency/>

ASIA, 2050

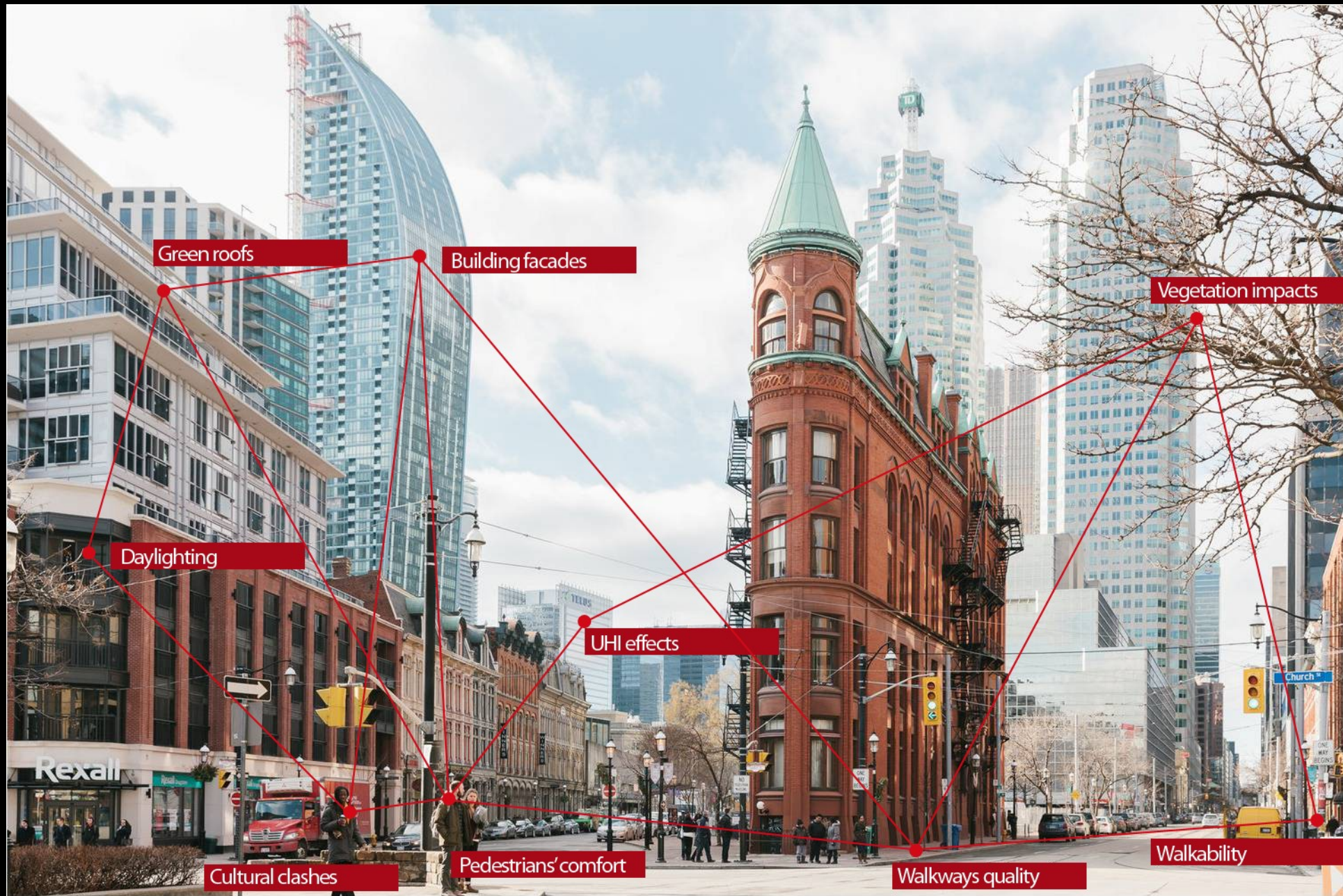


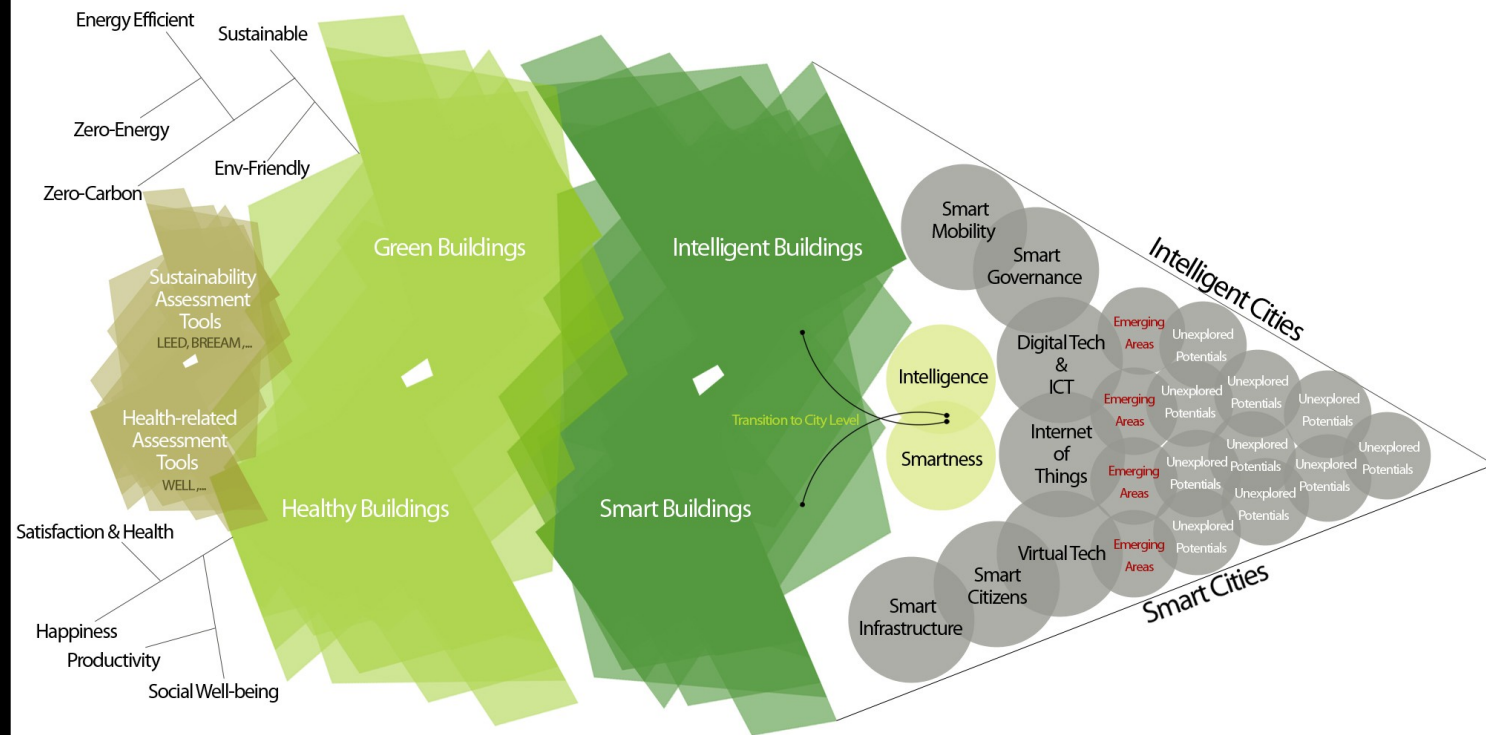
64%
Urban

ASIA, 1990



32%
Urban





Home > News & Media > Every building on the planet must be 'net zero carbon' by 2050 to keep global warming below 2°C - New report

Every building on the planet must be 'net zero carbon' by 2050 to keep global warming below 2°C - New report

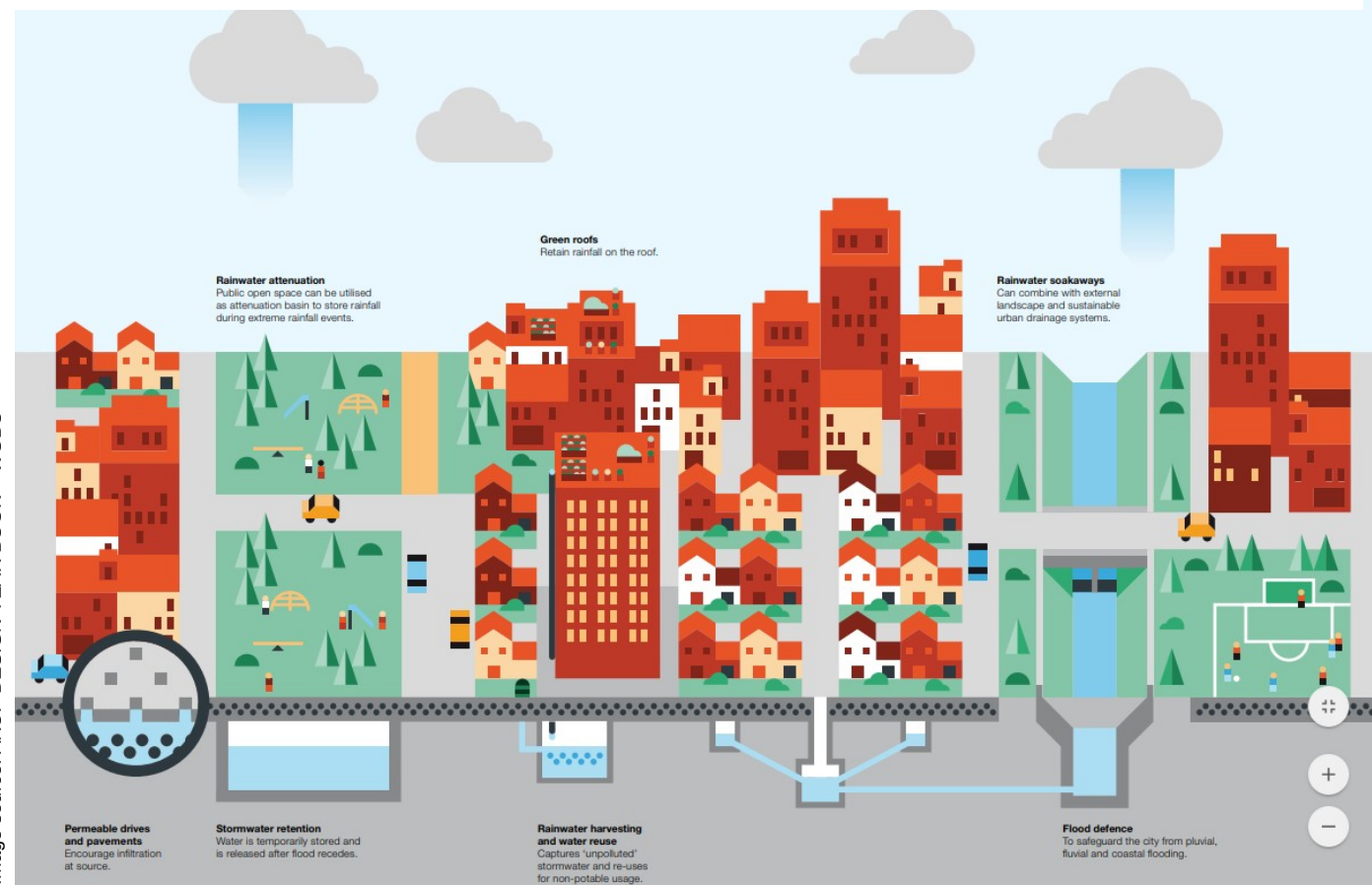
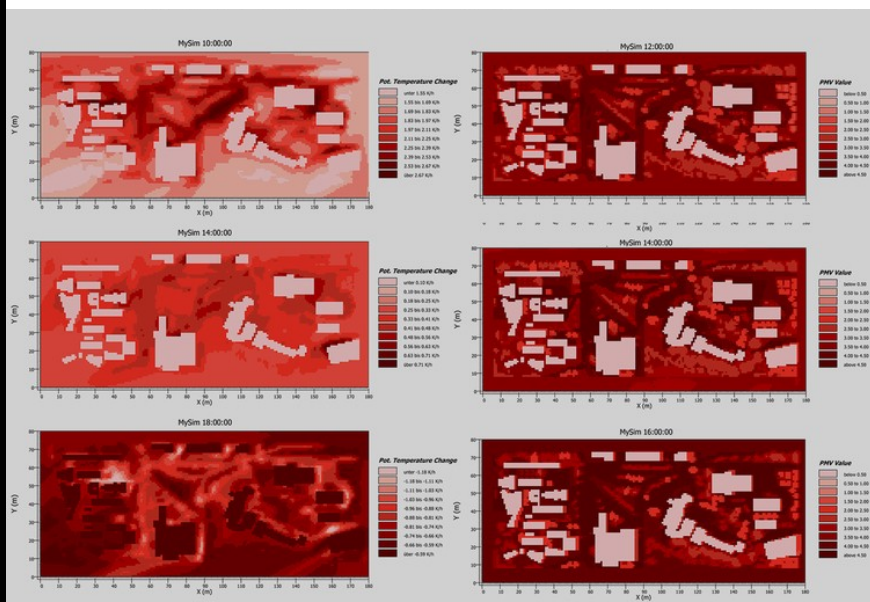
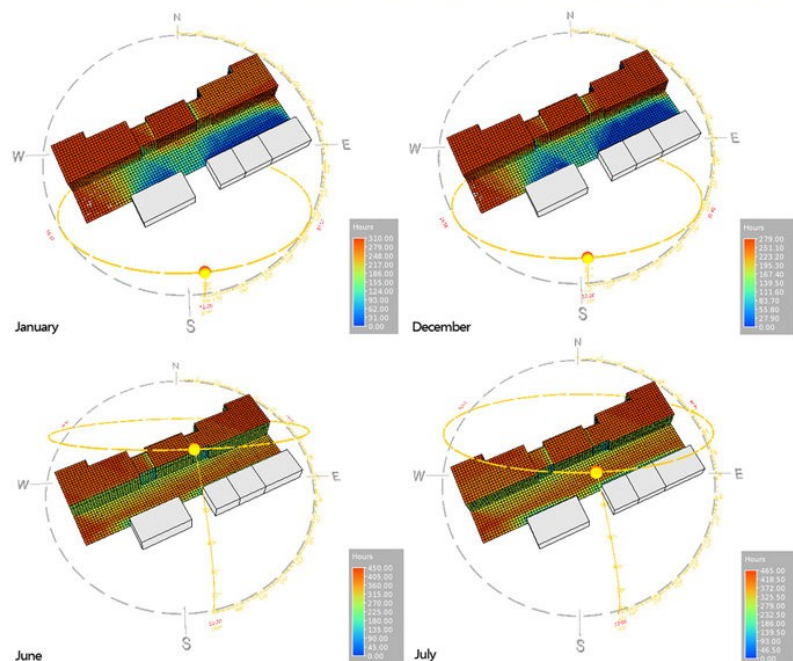
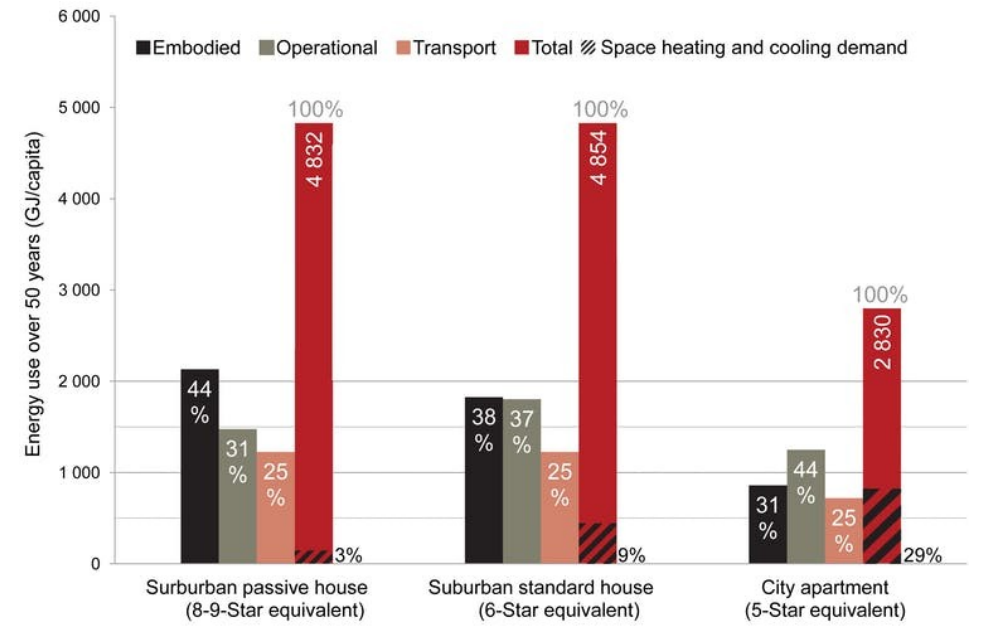


Image source: ARUP DESIGN YEAR BOOK + WGBC





Location Efficiency: Household and Transportation Energy Use by Location

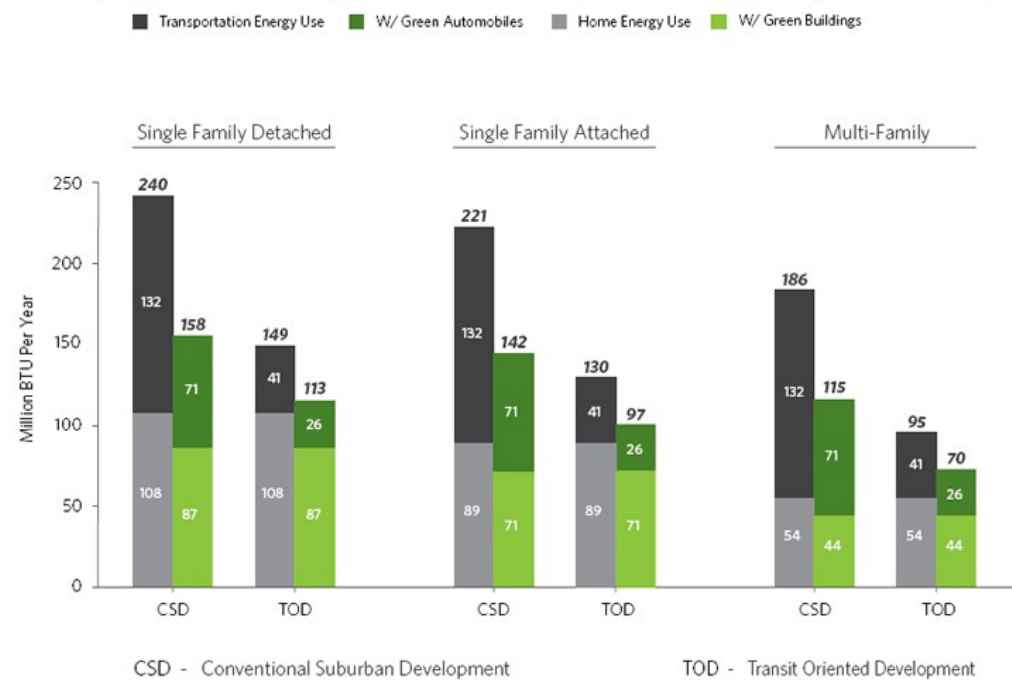
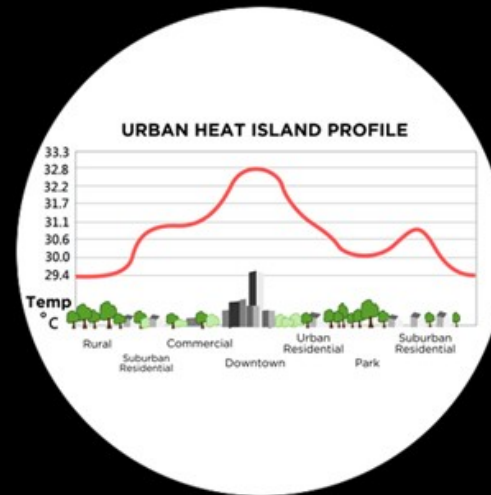
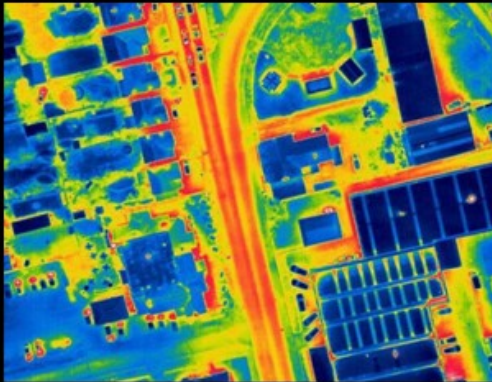
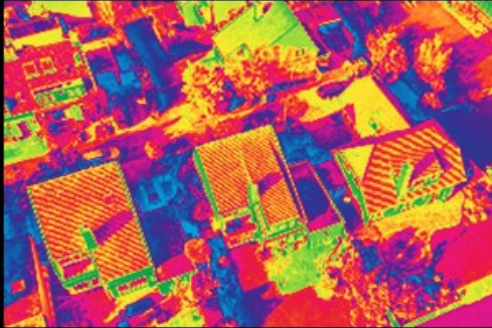


Image source: <https://www.trechugger.com> + <http://theconversation.com>



What is UHI?

Oversimplified Definition of UHI

Diurnal & seasonal variability

Dependence on UCZ models

Surface vs. air temperature heat island

Geographic and topographic causations

Other climatic parameters: i.e. RH, Tmrt, PET

Do we adequately care?

STATE-OF-THE-ART ANALYSIS OF THE ENVIRONMENTAL BENEFITS OF GREEN ROOFS

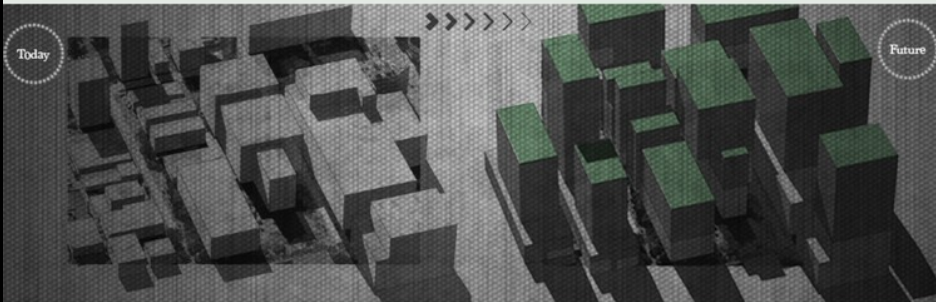
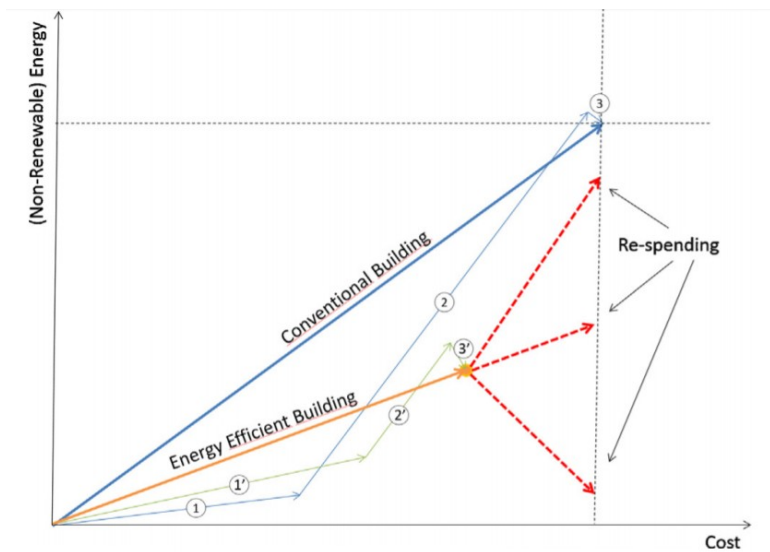


Image source: <https://modernfarmer.com>

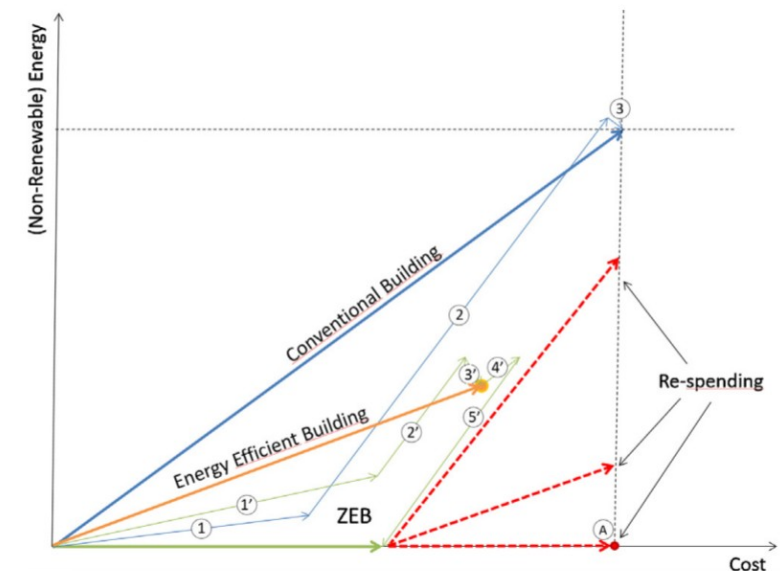


BIG's 8 House Wins the 2010 Scandinavian Green Roof Award

Image source: <http://www.architecturelist.com>

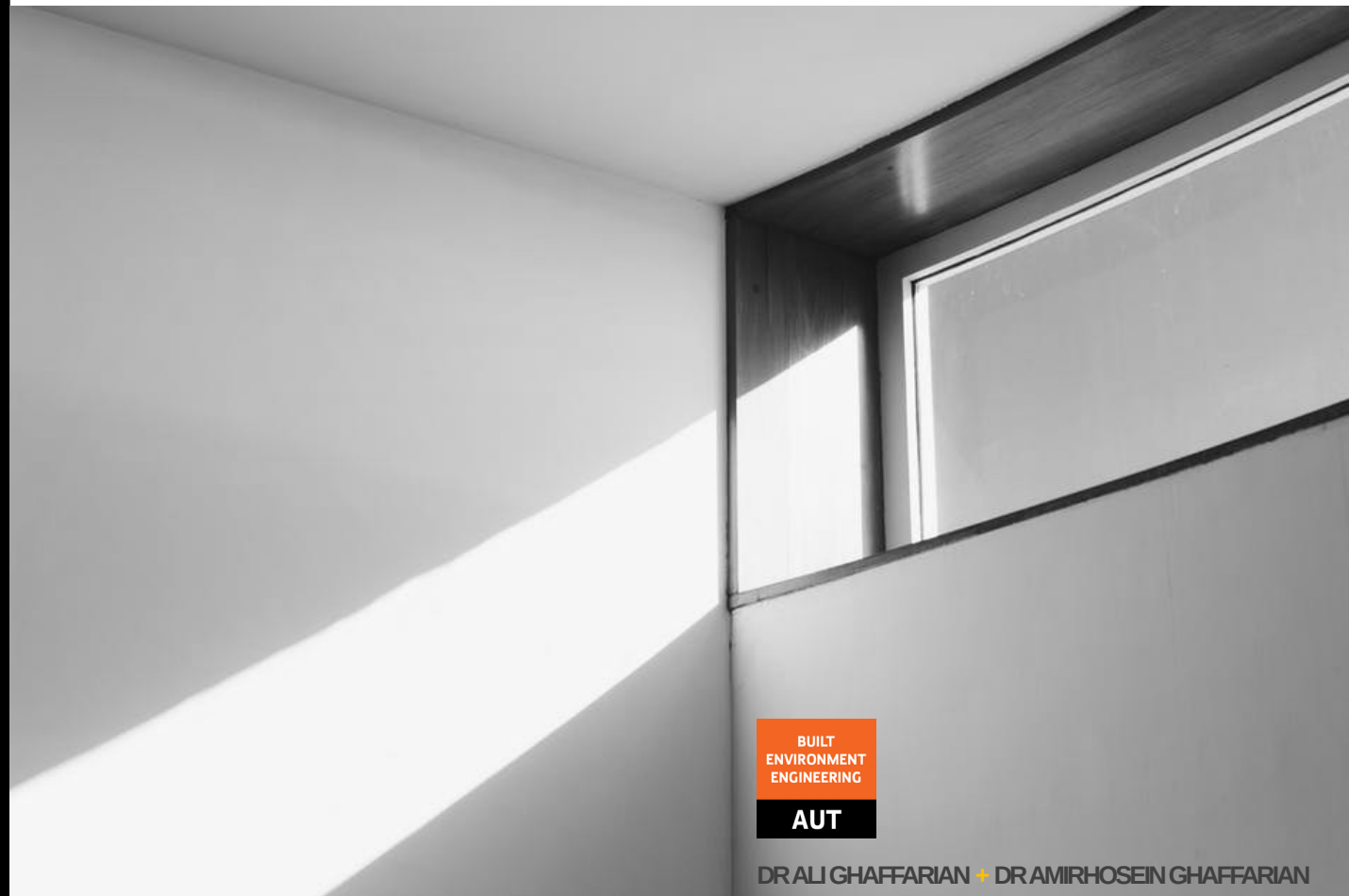


Possible rebound effects resulting from the cumulative life cycle energy/cost of a reference building and an energy efficient building. All vectors are E2 vectors illustrating the relationship between cost and non-renewable energy for the different building phases: Manufacturing/transportation/construction (1 and 1'),



Partial re-spending in renewable energy supply technologies leading to ZEBs. Manufacturing/transportation/installation of renewable energy supply systems (4') and renewable energy fed back into the grid (5').

Towards a sustainable + healthy urban
future...



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