

SMART E-BUILDINGS

Opportunities to Create Quality in the Built Environment – Crisis, the Mother of Innovation
Brussels 11/12/07

Livia Tirone

Iniciativa CONSTRUÇÃO SUSTENTÁVEL

www.construcaosustentavel.pt

We are **7 billion** people: **1/7** are hungry and don't have access to clean drinking water – How can we promote food security? Cities have **poor air quality** (indoor and outdoor), insufficient sanitation, **noise** levels, **discomfort** and **unemployment** are high: yet **1/2** of the world population lives in cities – How can we improve quality of life in cities? **1/3** of people ever reaching **65 years of age** are alive today – How can our built environment become more age friendly? In some first world countries 1 in every 2 people suffers from a chronic medical condition – How can we promote health? Social **unrest** and **revolt** are becoming common occurrences in the developed world - How can we increase Social Resilience based on Collaborative Governance? Relying on the finite natural resources our planet offers, to fuel our society and to make it function, is not a lasting solution: **40%** of the world's **energy consumption** is required to operate **buildings** - How can we improve the energy environmental performance of the built environment? The construction sector accounts for **50%** by weight of all **material taken from the Earth's crust** and the building industry depletes natural resources beyond sustainable levels – How can we live in harmony with the natural environment?

Our challenges in Europe?

How do we **work** our way **out of**:

hunger & poverty (also fuel)

old age vulnerability

unemployment

chronic medical condition

high energy consumption

natural resource depletion

poor air quality, bad sanitation, noise levels, discomfort

social unrest and revolt

Our challenges in Europe?

How do we **design** our way **in to**:

hunger & poverty (also fuel) **food and energy for all**
old age vulnerability **old age friendly environments**
unemployment **while there is things to do there is work**
chronic medical condition **health**
high energy consumption **efficient use of finite resources**
natural resource depletion **renewable resources**
poor air quality, **healthy and comfortable urban environments**
social resilience and inclusive collaborative governance

An aerial photograph of a large group of runners gathered on a cobblestone street, likely at the starting line of a marathon. The runners are wearing various athletic gear, including t-shirts, tank tops, shorts, and caps in a wide range of colors like blue, yellow, red, white, and black. The perspective is from directly above, showing the density of the crowd and the shadows cast on the ground.

How can we do better?

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EUROPEAN COMMISSION goals:

The **built environment** is responsible for:

- 40% of green house gas emissions;
- 40% of primary energy consumption;
- 50% (in weight) of raw materials extracted from the earth's crust;

The **European Commission** has defined goals for 2020 :

- Green house gas emissions **20%** lower than in 1990;
- **20%** of energy from renewable sources;
- **20%** increase in energy efficiency.



Smart E-Cities

... offer Resilience

Identity

Collaboration

Flexibility

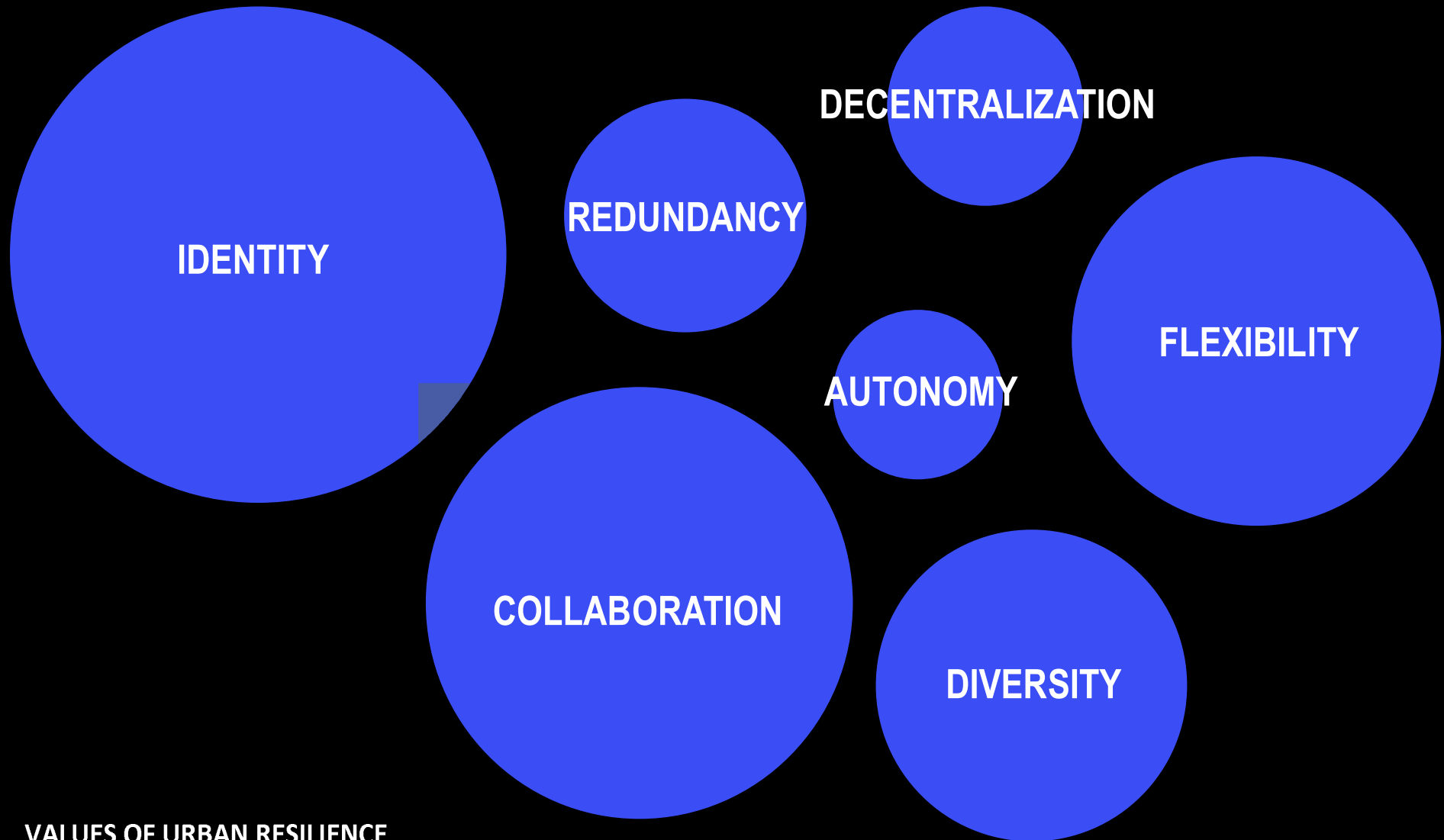
Diversity (Biodiversity)

Redundancy

Decentralization

Autonomy

Design for Resilience in our cities



VALUES OF URBAN RESILIENCE

Our **SOCIETY** is demanding:

A better performing **built environment**:

- **long lasting**
- **healthy**
- **comfortable**
- **affordable (buy / rent / operate)**

Our political model needs to facilitate mainstreaming of good practices in refurbishment of existing buildings, promoting a higher **Quality of Life** and **Prosperity** for people.

Smart E-Buildings

... offer Quality of Life

Robust

Efficient

Transparent

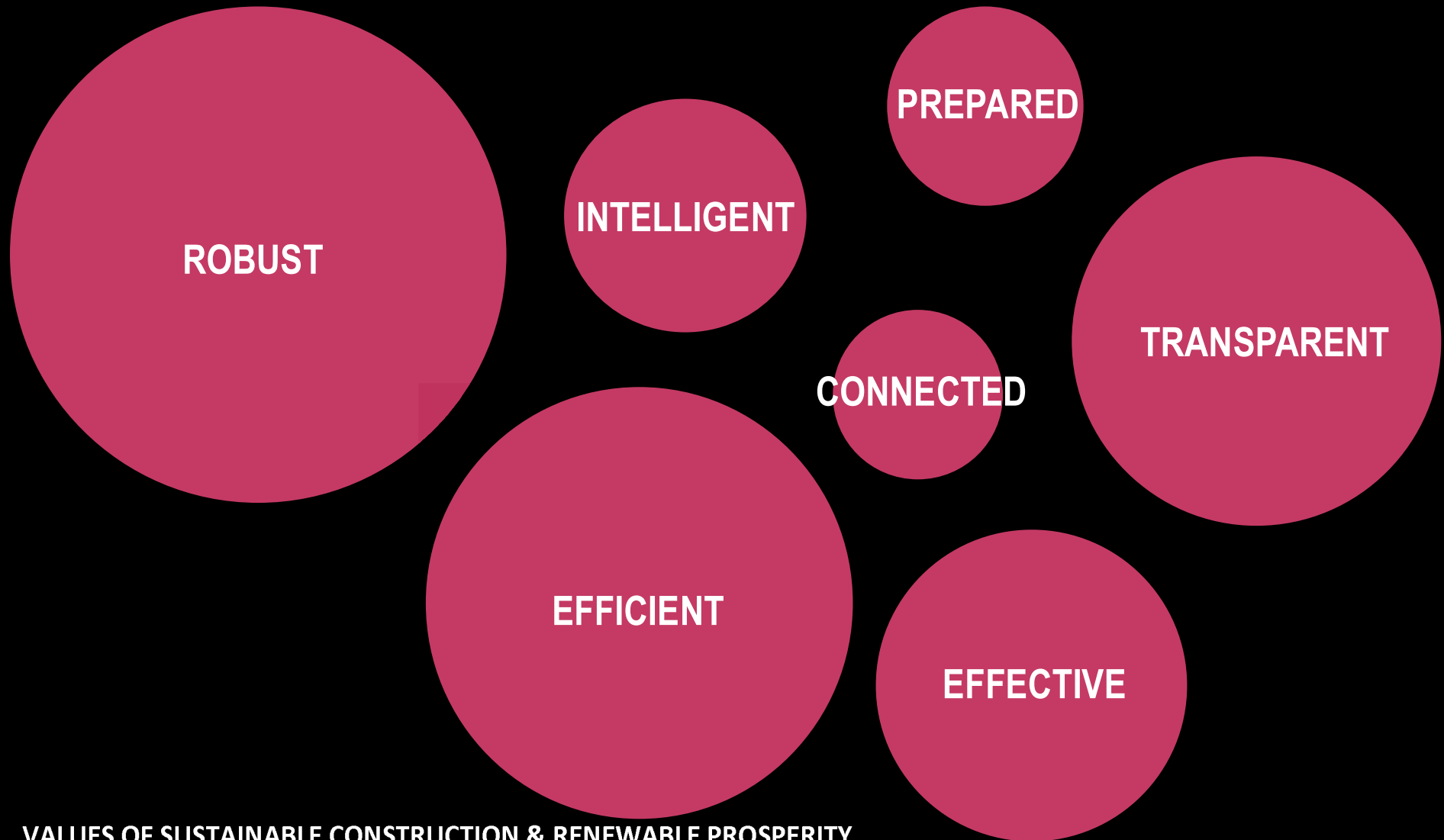
Effective

Intelligent

Prepared

Connected

Design for Sustainable Construction



VALUES OF SUSTAINABLE CONSTRUCTION & RENEWABLE PROSPERITY

Our **Economy** must add Value

We need to **create** new economic models

*“The new economical model can’t associate progress with quantitative growth. It needs to focus on **qualitative improvement**, that relies on the fact that nature is a finite, non growing and materially closed system.”*

Herman Daly, *Beyond Growth*

*“A **circular economy** is a regenerative economy that allows its waste to safely become part of the system again. In economic terms that would mean the waste of one product becomes the input to create a new cash flow...”*

*“**Renewable prosperity** - is an urban model that relies solely on renewable, endogenous resources to provide growth.”*

Livia Tirone

Our **Economy** must add Value

Can we have an economic model that intrinsically **promotes Value adding** activities?

Can we go for a **paradigm shift** in our economic model?

- **Cost** must be addressed in the context of the **integral life cycle of buildings**
- If **growth** is unavoidable in our economic model, then it needs to become sustainable and **rely predominantly on renewable resources** (energy, water and recycled and upcycled materials as well as good will, creativity and innovation)
- **Finance** must support the **activities that add value to Society** (as opposed to lateral and intermediary processes)
- **Incentives** must not distort positive market dynamics
- **Externalities** must be systematically included in cost analysis

Our **Economy** must add Value

We need to **design** new urban models

Renewable Energy

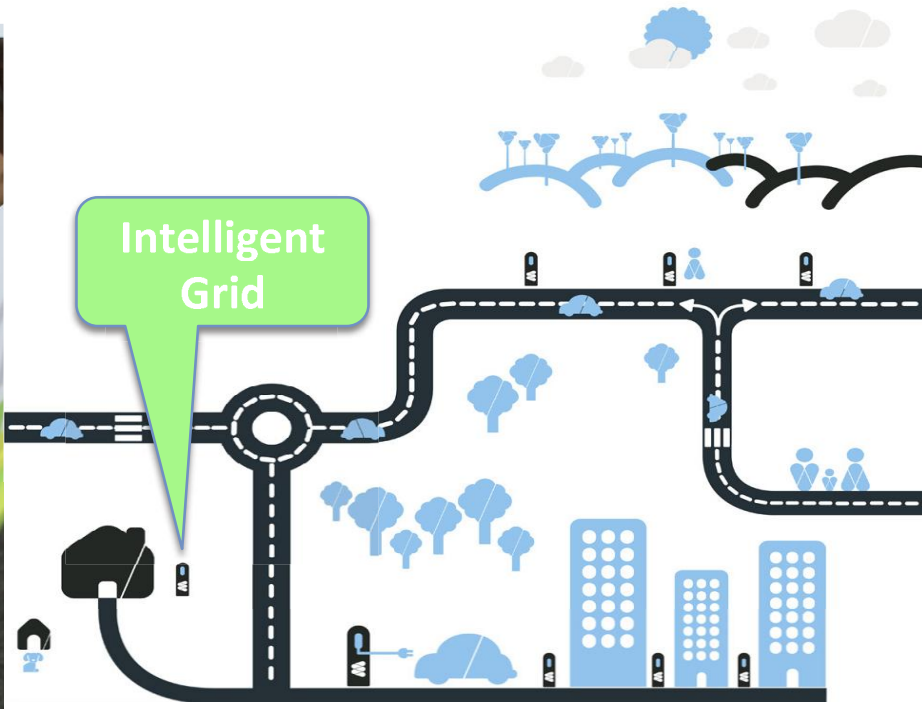


Renewable E-Buildings

Efficient E-Buildings



Decentralized E-Storage



Intelligent Grid

Renewable Prosperity

We must add value to the **Environment**

We need to **learn** to relate positively with the environment

“The natural world - an **ecosystem** which is **finite**, non growing and materially closed...”

Herman Daly

*“We must only use natural resources coming from **well managed ecosystems**, using them in the most efficient and productive way taking care of all modifications we impose on nature.”*

Karl-Henrik Robert – The Natural Step

*“**Food is waste is food** - all materials must be reintegrated in the biosphere or the technosphere to be up-cycled...”*

Michael Braungart - Cradle to Cradle

We must add value to the **Environment**

Can we live in **harmony** with the natural environment?

Can we go for a **paradigm shift** in the way we relate to the environment?

- **Finite resources should be used minimally** – renewable resources and already sourced and transformed materials must become the new raw materials
- **Endogenous resources must be given priority** (a lot of waste results from transport)
– local resources add to security of supply
- **Waste must be eliminated** (not hidden)
- **All ecosystems must be well managed**

We must add value to the Environment

“Ceci n’est pas une pipe.”

*“Do not repair what is not broken,
do not remanufacture something
that can be repaired, do not
recycle a product that can be
remanufactured”*

Walter Stahel - Product Life
Institute in Geneva

“32 Second Chair - Steelcase”

Michael Braungart - Cradle to Cradle design



Our **Society** must create Value

The built environment needs to support new social models

The city's public spaces are its first level of identity - the more people **identify with the built environment** they inhabit, the more they will care about it and the better they will contribute to maintaining it: Attractive urban contexts promote connected and collaborative communities and enjoy proportionally lower operating and maintenance costs.

Klas Tham

Inclusive collaborative governance leads to a higher level of Social Resilience – communities often need help by **facilitators** to identify their common ground and objectives. But once communities identify and **co-own solutions** and learn to collaborate positively, their prosperity grows.

Lia Vasconcelos

Our **Society** must create Value

Our cities must provide **quality of life** for all people!

Can we go for a **paradigm shift** in the way our society functions?

- **Governance models must be mainstreamed**
- **Communities must be inclusive and collaborative**
- **The built environment must adapt to its users needs**
- **Empower the individual** by providing real time information on the critical indicators

Our **Society** must create Value

Inclusive & Collaborative Governance



In times of Crisis Volunteer work is a precious renewable resource

Efficient E-Cities



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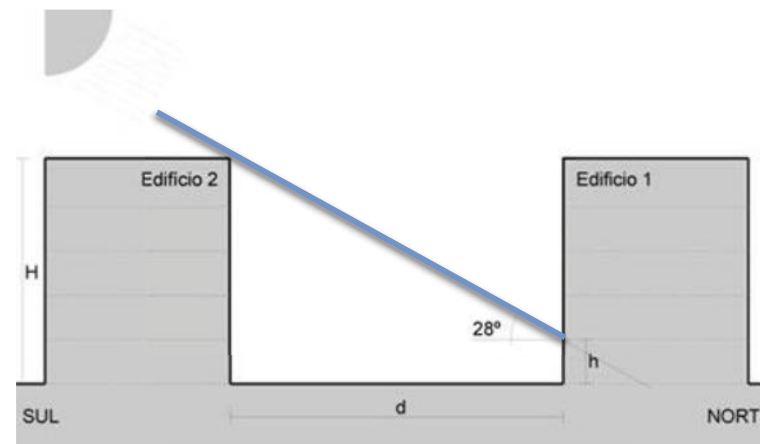
Efficient E-Cities

$$H \approx 0,6 d + h$$

H – Height of building 2

d – Distance between buildings

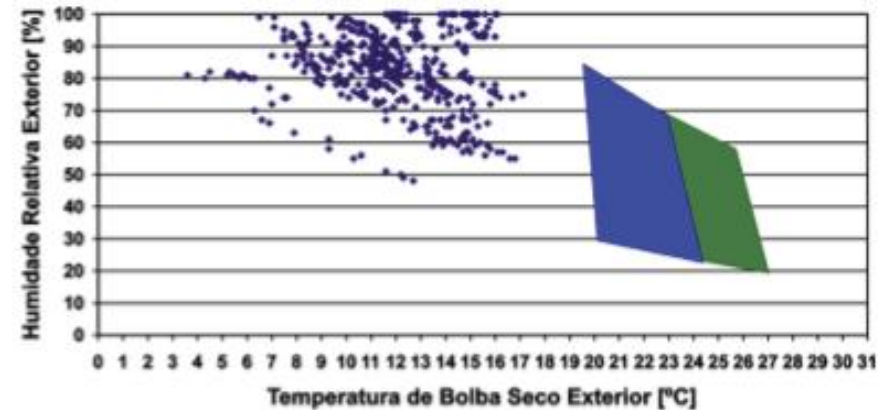
h – Height of Ground Level of building 1



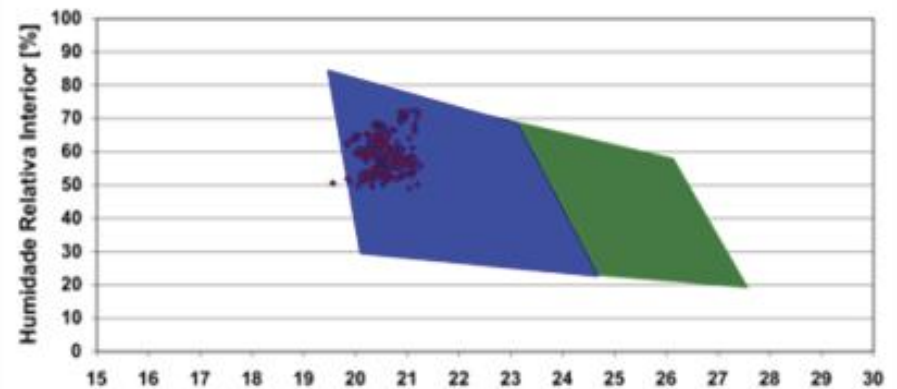
Efficient E-Buildings



Torre Verde in Lisbon – no heating January 2001 Monitorization Results



Dry Bulb Temperature EXTERIOR and INTERIOR (oC)



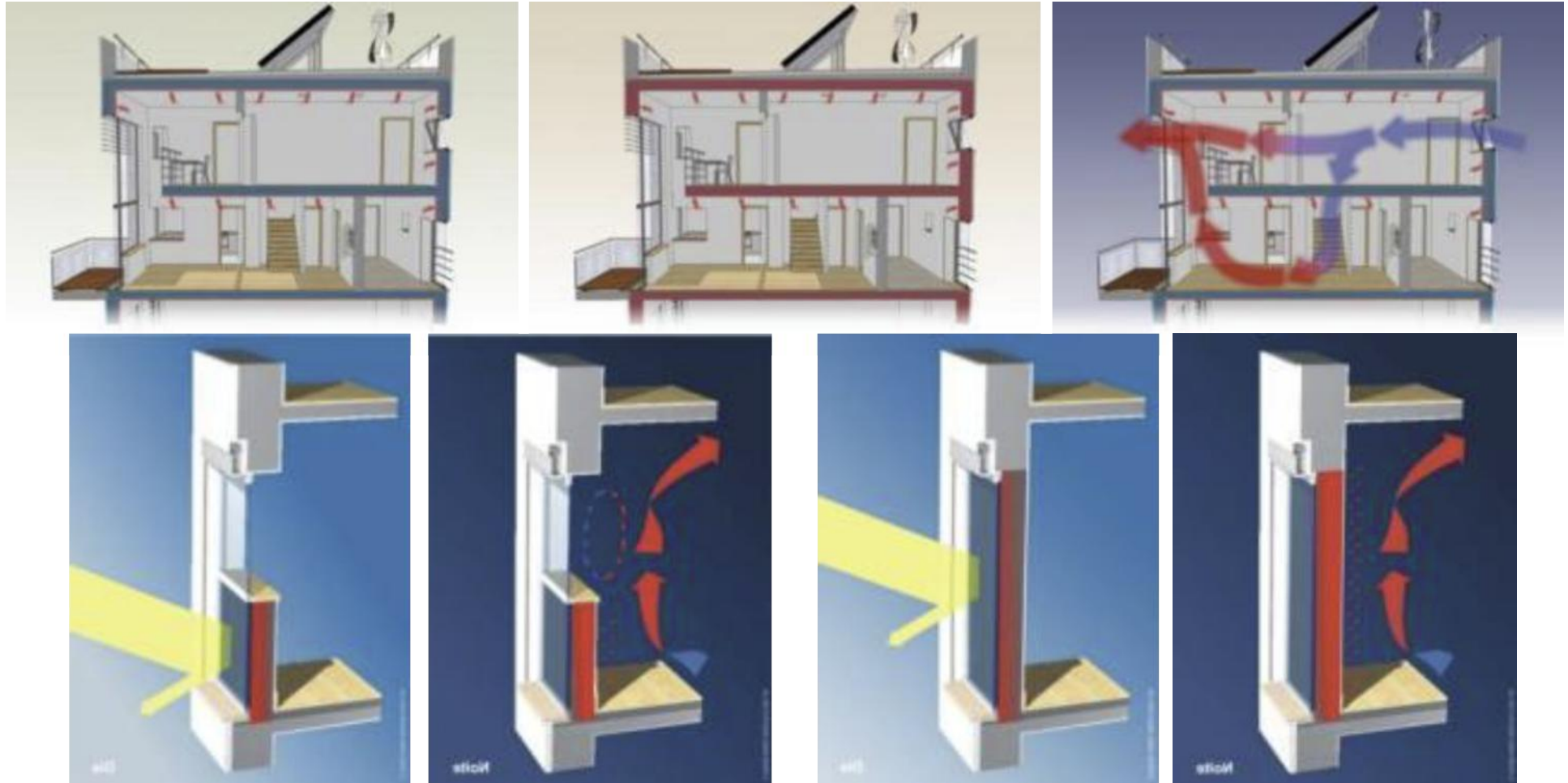
Efficient E-Buildings



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Efficient E-Buildings



Efficient E-Buildings

New, responsive Buildings

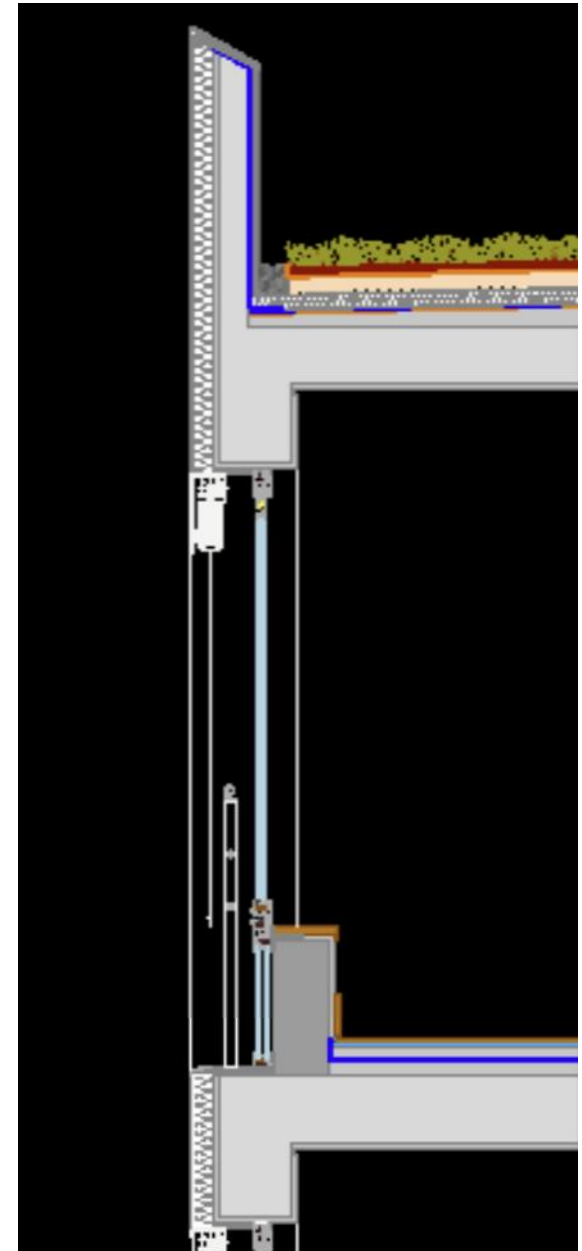
Reject

Store

Temper

Admit

Redirect



Efficient E-Buildings

Existing, responsive Buildings: E-Refurbishment

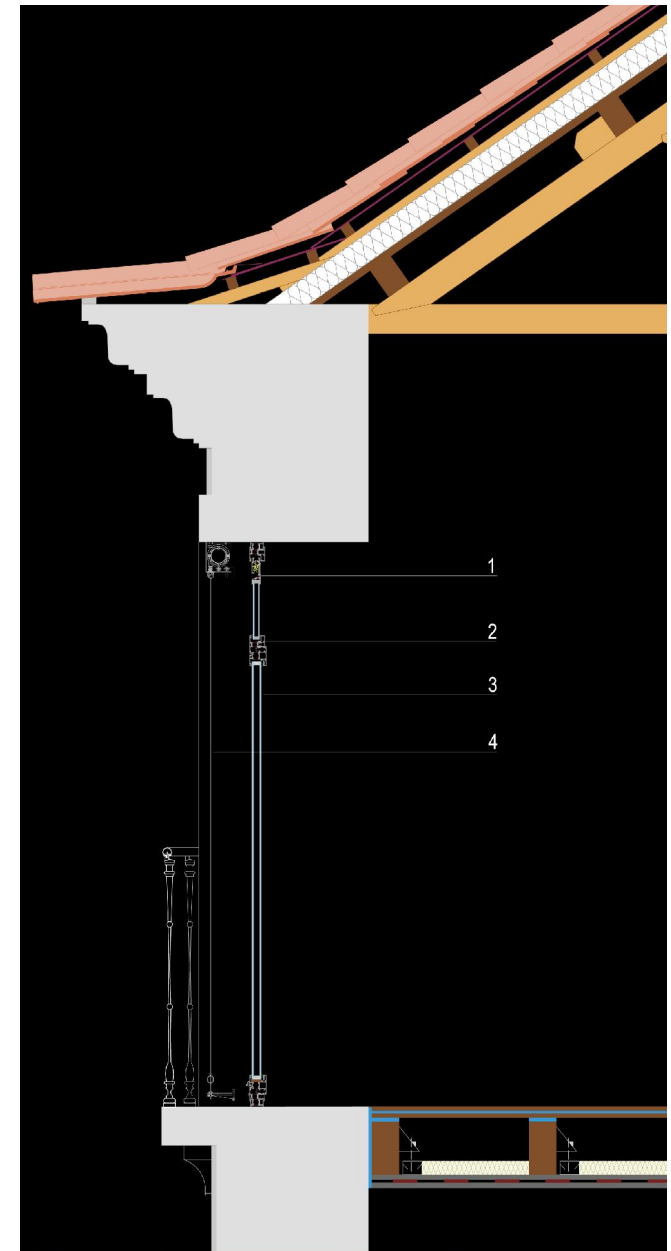
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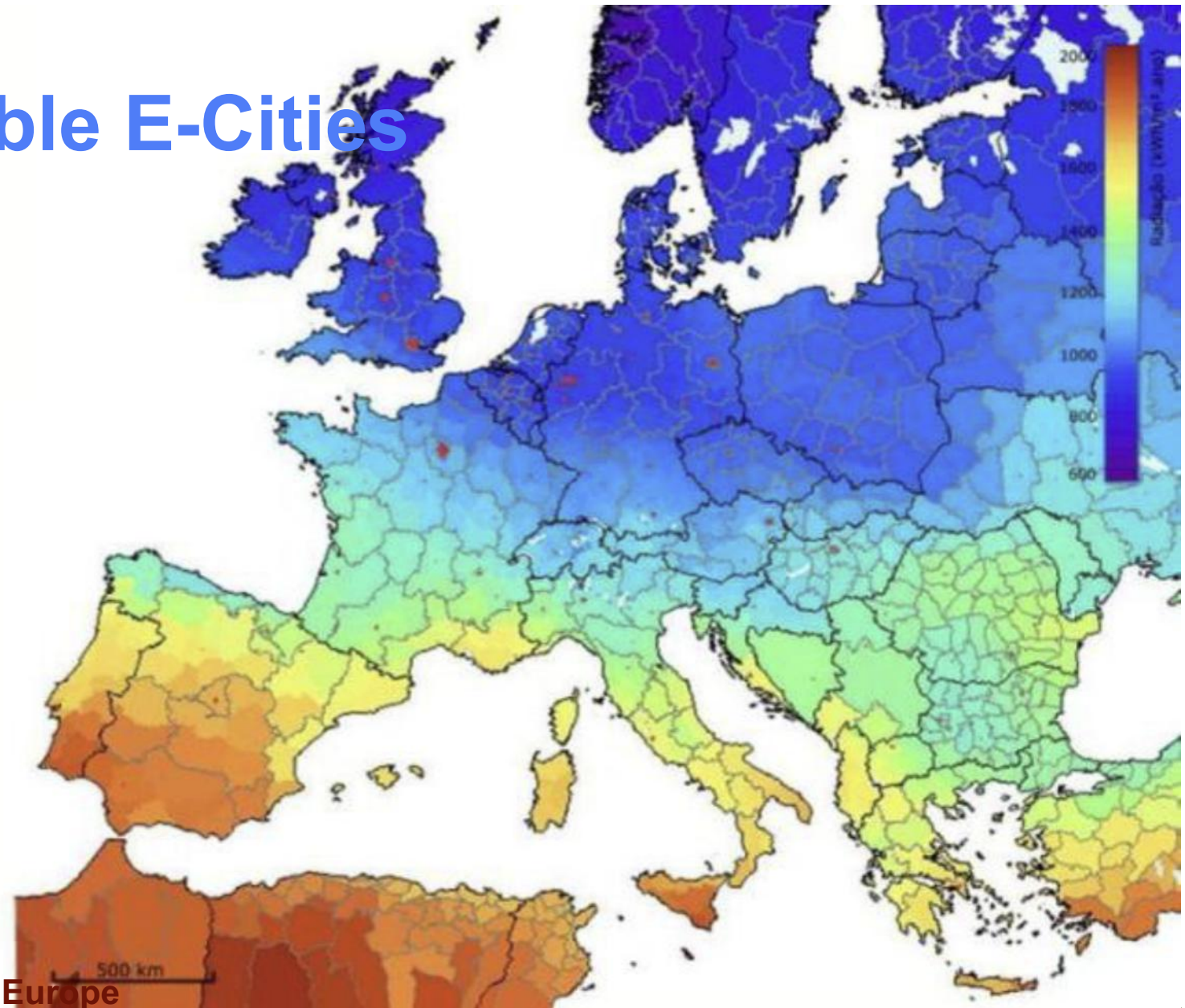
Temper

Admit

Redirect



Renewable E-Cities



Solar Radiation in Europe

Renewable E-Cities



ÁGUA DO TELHADO

Orientação Solar / Obstáculos	Radição Incidente [kWh/(m2.ano)]
Norte	1.164
Este	1.435
Este com obstáculos*	1.435
Sul	1.858
Sul com obstáculos*	1.858
Oeste	1.649
Oeste com obstáculos*	1.649
Obstáculos	0
Coberturas c/ mansardas	0
Superfícies actualmente inaptas	0

PRODUÇÃO ENERGIA

	Solar Térmico [kWh/(m2.ano)]	Solar Fotovoltaico [kWh/(m2.ano)]
Norte	497	126
Este	607	158
Este com obstáculos*	607	158
Sul	825	208
Sul com obstáculos*	825	208
Oeste	755	184
Oeste com obstáculos*	755	184
Obstáculos	0	0
Coberturas c/ mansardas	0	0
Superfícies actualmente inaptas	0	0



Baixa, Lisbon

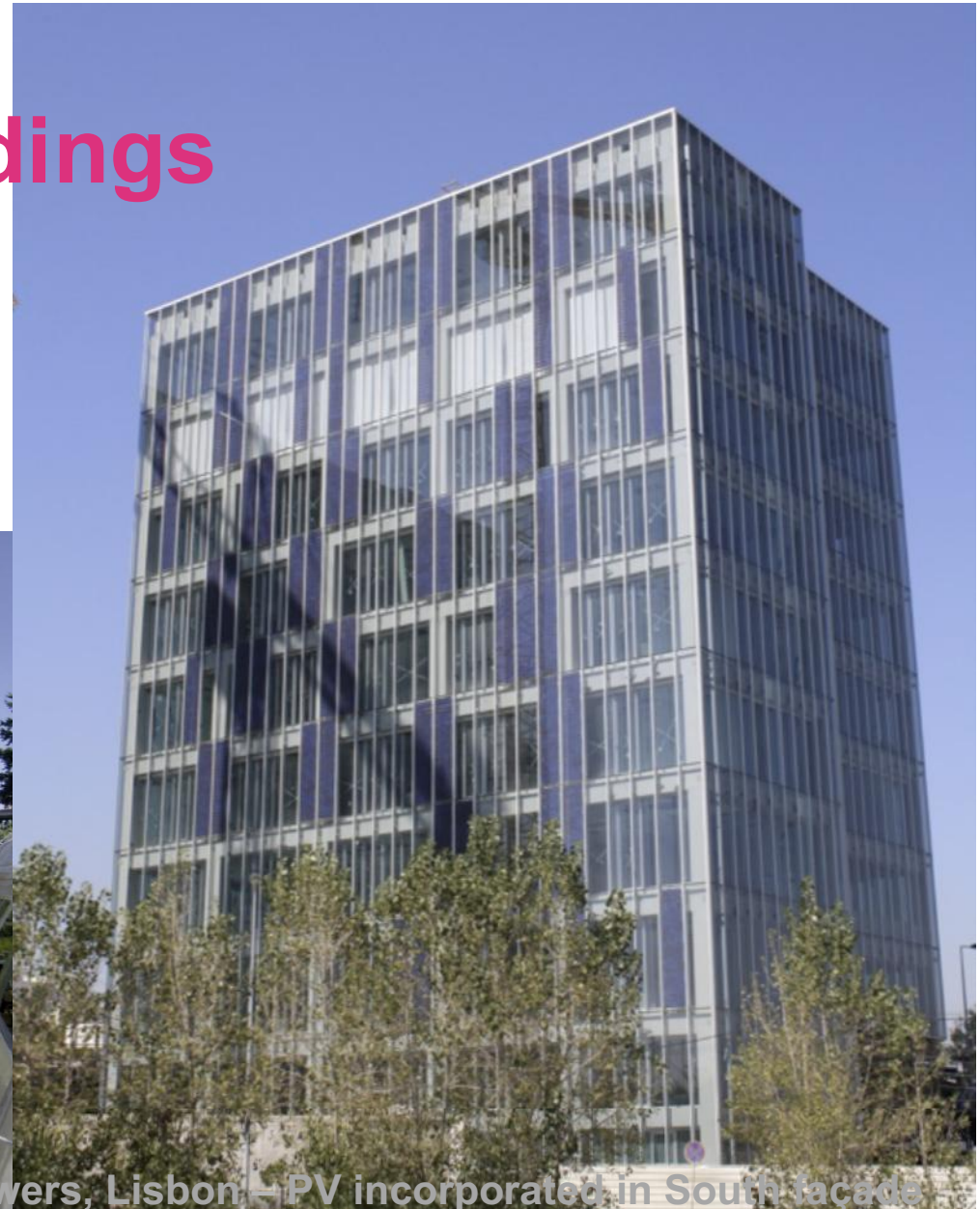
Urban Plan integrating Solar Potential

Renewable E-Buildings



Torre Verde in Lisbon – 70% of DHW supplied by collective solar thermal system

Renewable E-Buildings



Natura Towers, Lisbon – PV incorporated in South facade

What can the **European Commission** do?

Discourage bad building practices that result in poor energy performance:

(at present it is easier to promote average and low energy performance buildings, than excellent ones)

NO to unhealthy indoor environments and to discomfort

NO to fuel poverty

NO to profit on sale of finite energy resources

NO to low resource efficiency

NO to waste and obsolescence (superfluous, peak demand, distance of transport...)

NO to “disposable” construction

NO to non-transparent and insufficient information

What can the **European Commission** do?

Facilitate compliance with good building practices that contribute to reaching established 20/20/20 goals:

- **On-going and rigorous monitoring** of good practices that contribute to reach the 20 / 20 / 20 goals – finger on the EU pulse
- **Life Cycle Cost** approach in market procurement - low maintenance and operation costs
- **Flexibility of use** – to make the built environment longer lasting
- Building solutions that are **robust and efficient** – offering comfort and healthy indoor environments over a long life span
- Buildings with **low embodied CO₂** per year of use
- **Energy environmental refurbishment** of the existing built environment

What can the **European Commission** do?

Stimulate excellent building practices that contribute to reaching established 20/20/20 goals:

- **Community lead initiatives** improving the energy performance of the built environment
- **Demonstration projects** with innovative combinations of excellent and good practices
- **Financial models** that facilitate investment in excellent practices



High Line – New York

What can the **European Commission** do?

Create legislation and recommendations contributing to reaching established 20/20/20 goals:

- **Demanding Member States Targets** within the **Energy End Use Efficiency and Energy Services Directive – 2006/32/CE** – soon to be revised - **Energy services** to replace finite energy resource trading
- **Direct taxes** and **higher tariffs** to make real costs apparent (peak demand)
- **Incentives waving the direct taxes** for good practices (peak demand smoothing)
- **Waver global taxes** (such as VAT) for excellent practices
- ...



There are so many **Opportunities** to create
quality in the built environment ...

Livia Tirone

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