The 7th International Energy Agency Annex 44 Forum

**Integrating Environmentally Responsive Elements in Buildings**

24 Oct 2007, HKU

**The Sustainable S3P2E2R4 BIREATH Approach in Building Design & its application in enhancing an existing high-rise residential unit in HK**

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The Sustainable S3P2E2R4 BIREATH Approach

BIREATH
Building Integrated Renewable resources and Energy, optimized Air quality, Total Harvest

S3
Environmental and ecological sustainability
Economical sustainability
Cultural sustainability

P2
Pollution Prevention

E2
Energy Efficiency

R4
Reduce Reuse Recycle Recover [or Regenerate]
The Sustainable S3P2E2R4 BIREATH/ CIREATH/ UIREATH Approach

**BIREATH**
Building Integrated Renewable resources and Energy, optimized Air quality, Total Harvest

**CIREATH**
City Integrated Renewable resources and Energy, optimized Air quality, Total Harvest

**UIREATH**
Urban Integrated Renewable resources and Energy, optimized Air quality, Total Harvest

Priority:
**Safety, Health, Sustainability, Comfort**

- an obligation to take a positive response to climatic change as a directive for human activities including architectural design
- the Sustainable S3P2E2R4 BIREATH approach to building design matches this directive
Application of the Sustainable S3P2E2R4 BIREATH Approach in building design in enhancing an existing high-rise residential unit in HK

Aims at:
- significantly **reducing consumption** of operating energy and water
- harvesting as much **solar & wind energy** as possible
- for providing **food, hot water & optimized air quality** for the residents

Basic data of the residential unit:
- generally North facing
- approx. 11 sq.m. UFA + 14 sq.m. flat roof area
- location: Sai Ying Pun (NW part of HK Island)
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original condition
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intended use
- a studio flat
- an experimental & demonstration flat for investigating the principles & application of the Sustainable S3P2E2R4 BIREATH Approach

20/F plan

21/F plan

300mm raised floor modules
Modular wooden raised floor deck panels
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Harvesting solar energy by:

a. solar hot water panel / solar PV panel, small wind turbine, big Fresnel lens of 1.2m diameter for solar oven

b. 2 layers of green plants at flat roof / balcony:
   i. top layer - fast organic growing of food plants e.g. melons & fast growing vegetables in hot summer for food, which will reduce transportation of food & farmland demand
   ii. lower layer of grass - grows well in less sunshine, to harvest residual sunshine & daylight
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Harvesting **solar energy** by:

c. growing of plants of herbal & health value for improving AIR quality, so that closing up the façade & operating the A/C, rejecting the optimized AIR quality, will surely be a regretful loss.

d. performing TOTAL HARVEST of solar energy by maximizing the surface areas of the façade for growing plants, & intake of daylight by increasing glazed surface & skylight, yet without overheating the interior.

e. solar air chimney

f. sunlight reflecting system by ventilation tube

[ Converting CO₂ into solid C stored inside food ]
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Harvesting wind energy by:

a. enlarging the openable areas of the façade, and adding a skylight, which will allow a staircase to connect the studio flat & the roof above.

b. providing “true cross ventilation” i.e. each room will have 2 air passages independently connected to outside surface of the flat

c. wind turbine

[ No A/C will be required
- electrical fans to be provided ]
Application of the Sustainable S3P2E2R4 BIREATH Approach in building design in enhancing an existing high-rise residential unit in HK

P2  Pollution Prevention:

Gas supply is terminated – no local emission of pollution of combustion gases

E2  Energy Efficiency – and to REDUCE energy use

a. No A/C will be required – electrical fans will be provided
b. Heat pump is used for hot water generation if solar hot water is not sufficient, especially in winter days when the roof cannot receive sunshine.
c. Light emitting diodes will be used for illumination as far as practicable
d. Use of energy efficient electrical appliances such as electrical induction cookers

RECOVER of space in the flat by installing a raised floor with the floor void for storage & for ventilation & installation of building services
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Other features:

a. Harvesting rain by collecting rain for growing plants
b. Flexible interior spatial organization, allowing good day light transmission as desirable & true cross ventilation
c. **RECYCLE** - collection of grey water for growing plants (subject to filtering) & flushing toilet

Reasonable initial & running cost, certainly good for living with environmental contribution, hence **S3** - Environmental & ecological, Economical, Cultural Sustainability
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Thank you

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