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Recherche en énergétique @ Longwy



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University of Lorraine



Nancy



Metz



Longwy

Nancy



Epinal

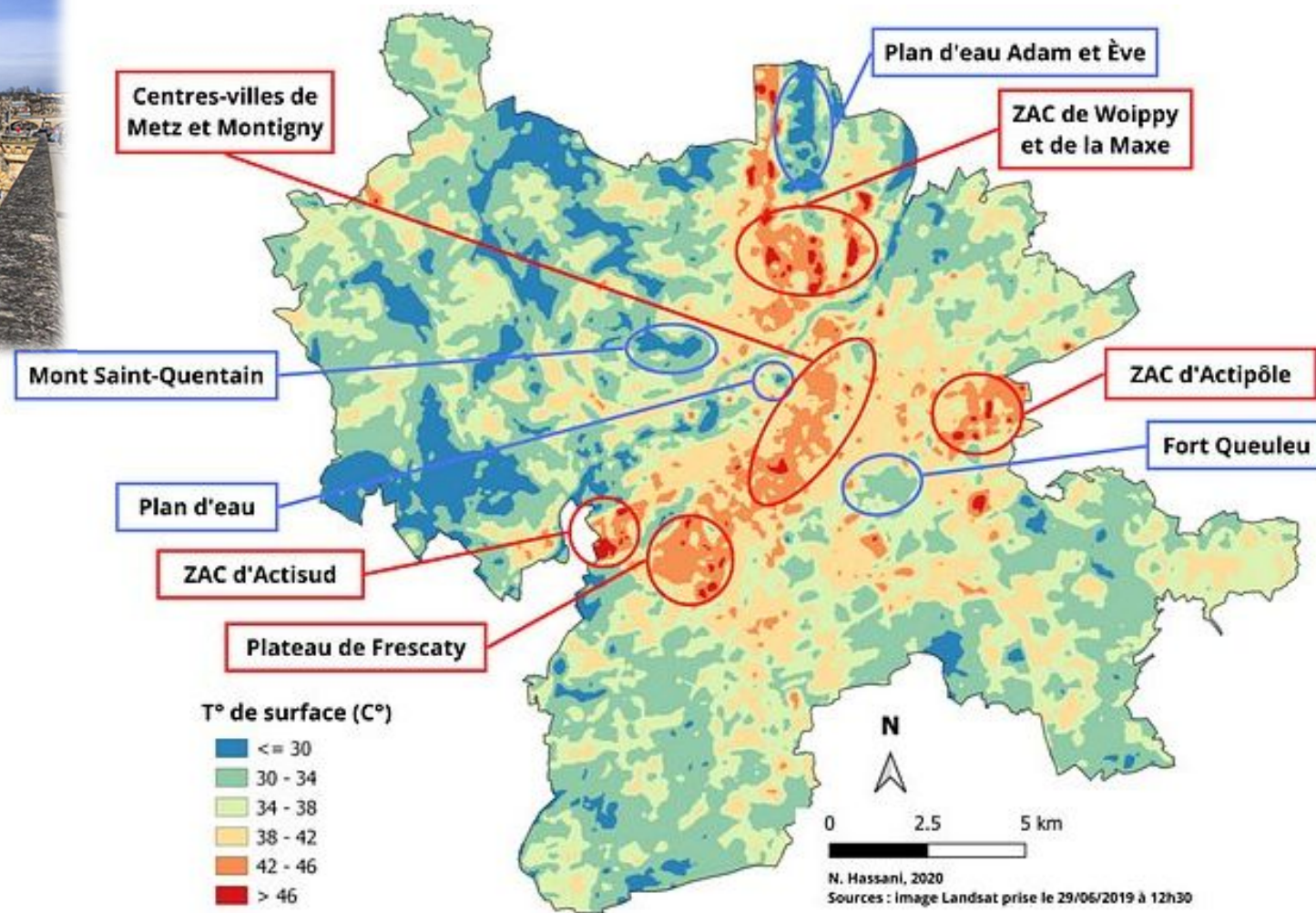




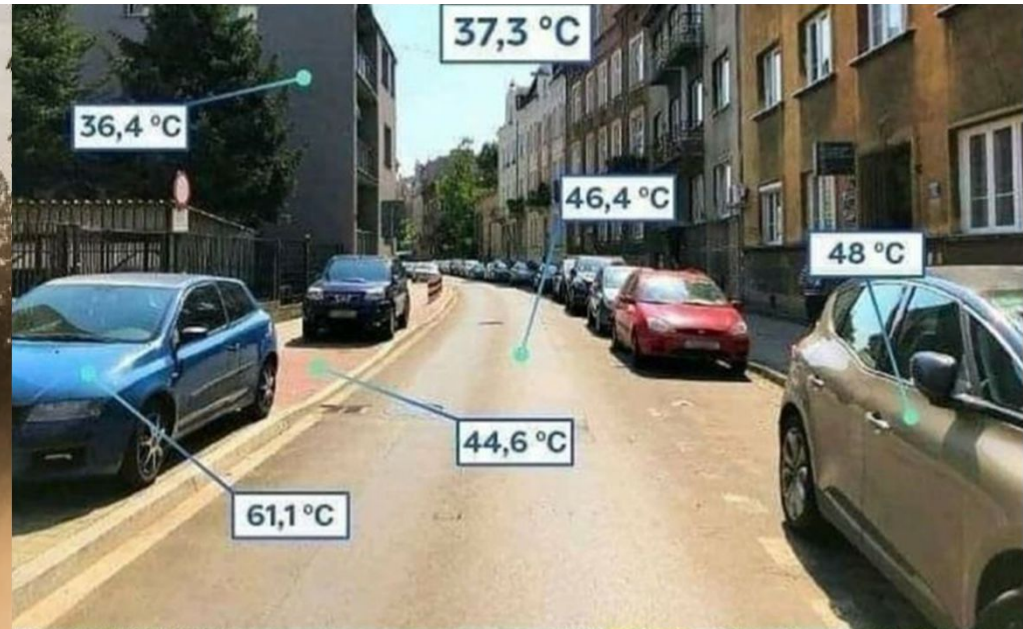
Last summer
> 3 ° Centre to Green peripherie



Exchange with Phd student Nassima Hassani







The Rodney & Otamatea Times

WAITEMATA & KAIPARA GAZETTE.

PRICE—10s per annum in advance

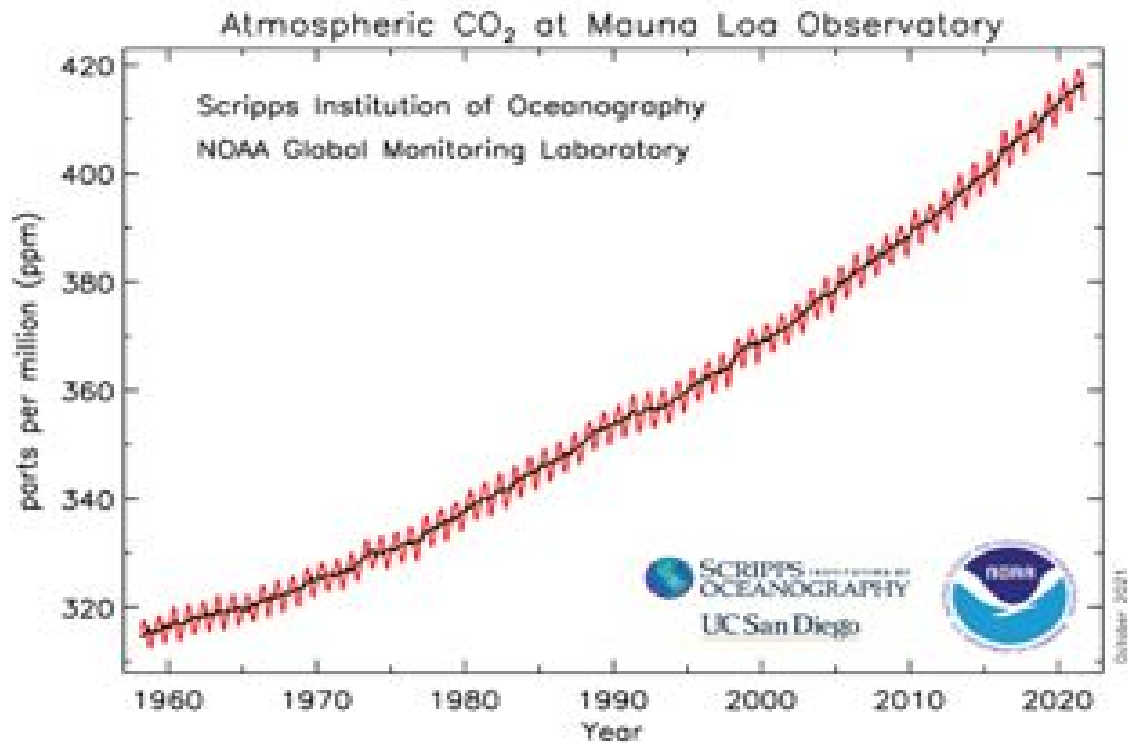
WARKWORTH, WEDNESDAY, AUGUST 14, 1912.

3d. per Copy.

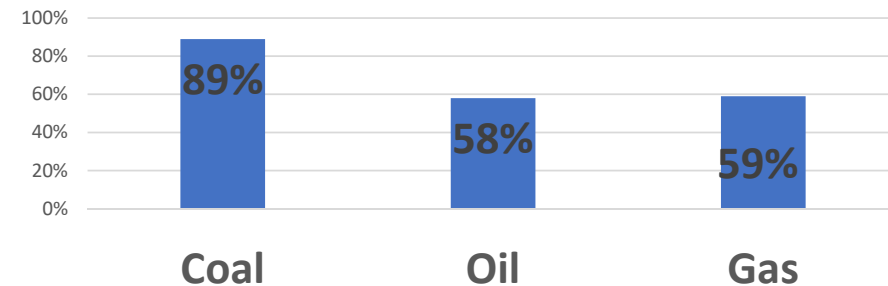
Science Notes and News.

COAL CONSUMPTION AFFECT- ING CLIMATE.

The furnaces of the world are now burning about 2,000,000,000 tons of coal a year. When this is burned, uniting with oxygen, it adds about 7,000,000,000 tons of carbon dioxide to the atmosphere yearly. This tends to make the air a more effective blanket for the earth and to raise its temperature. The effect may be considerable in a few centuries.

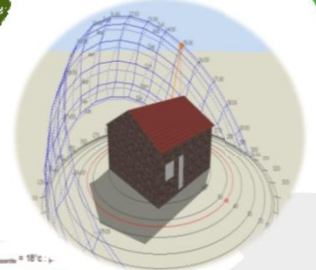
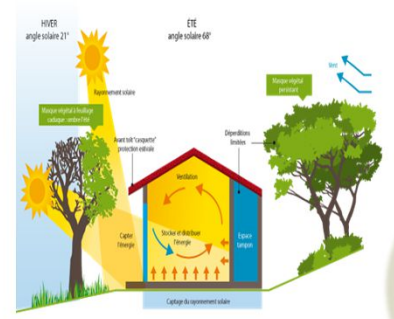
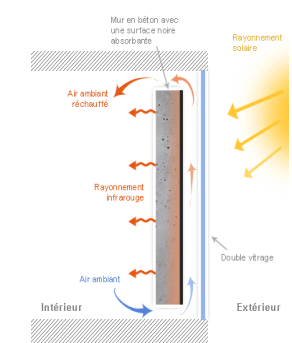


Fossil fuel to be left in the ground to keep to 1.5C limit

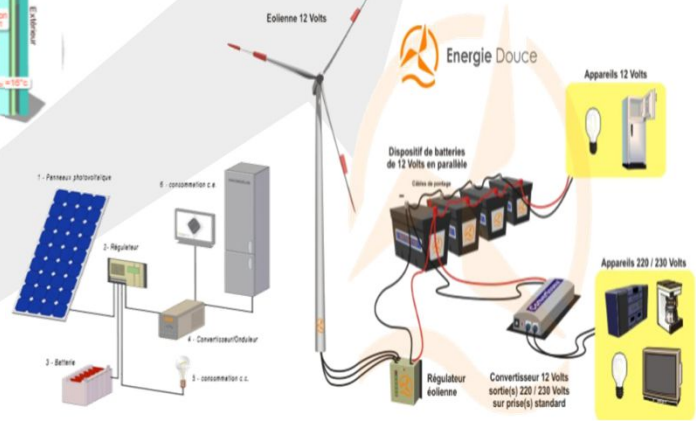
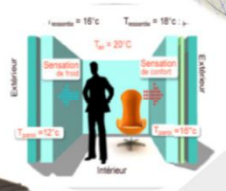


The challenge of staying below the 1.5°C is unlikely to be met
Morocco is now in 7th position in the Climate Change Performance Index indicating its potential and development.

Geoffrey Levermore at the Academy Talk November 2022.
Climate change and the net zero challenge



Passives Solutions



Active Solutions

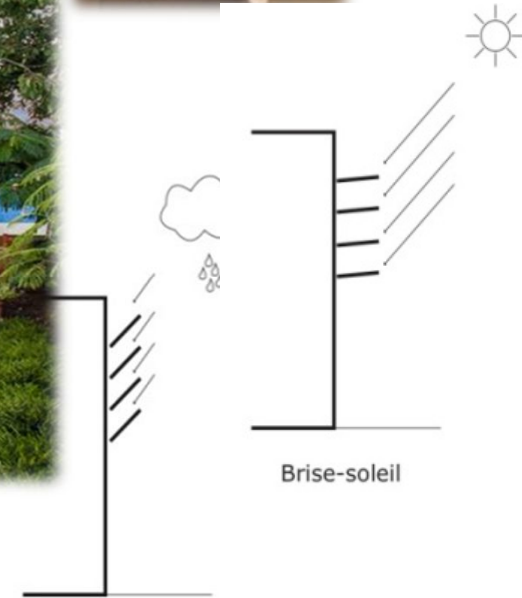
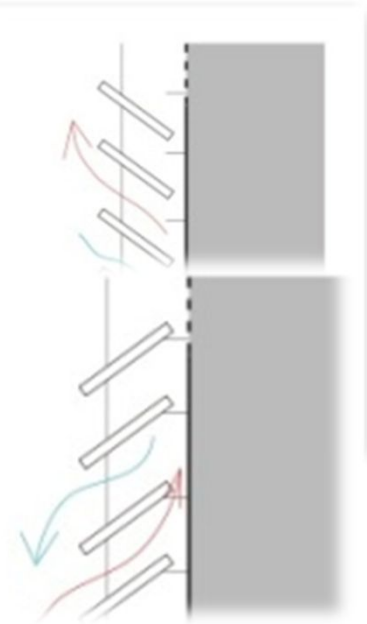
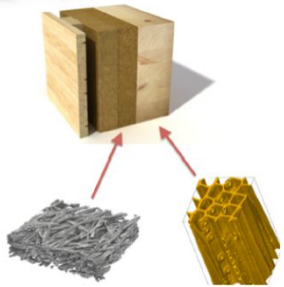
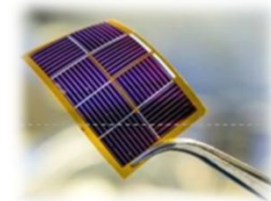
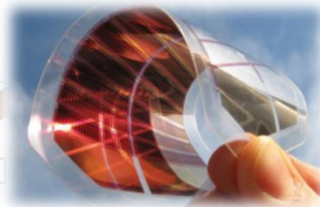
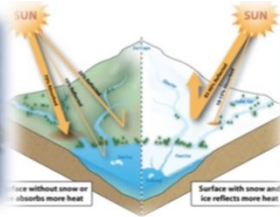
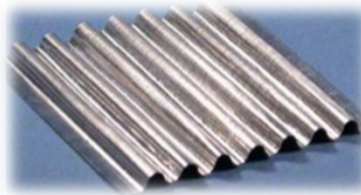
Building/environment: 60% of global resources consumption, 50% of global waste production, 35% of global energy consumption and 35% of global CO2 emissions.



From Protective to adaptative



Nature exhibits many possibilities of adaptation that architects and specialists on buildings are considering

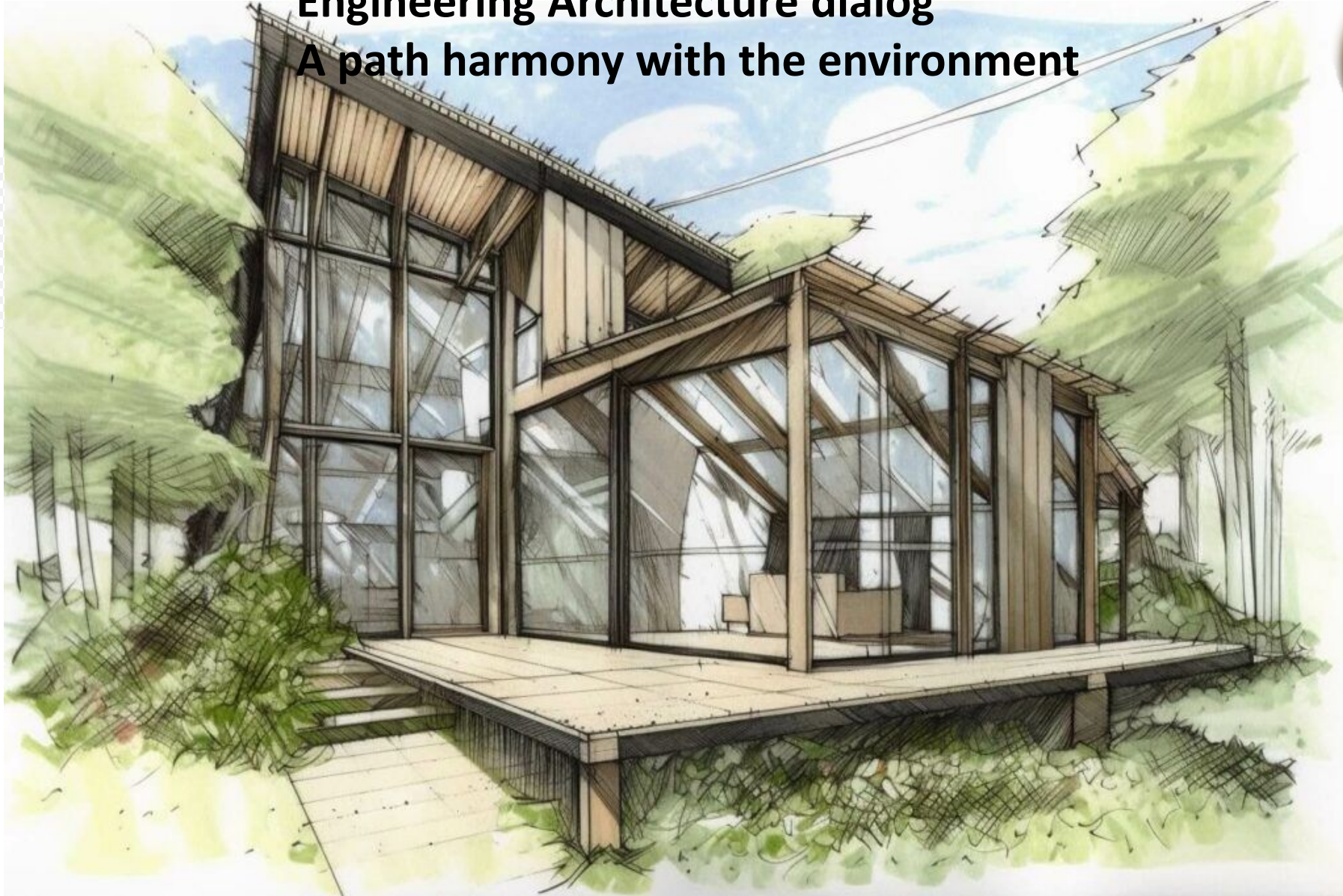


Récupération des eaux de pluies

Brise-soleil

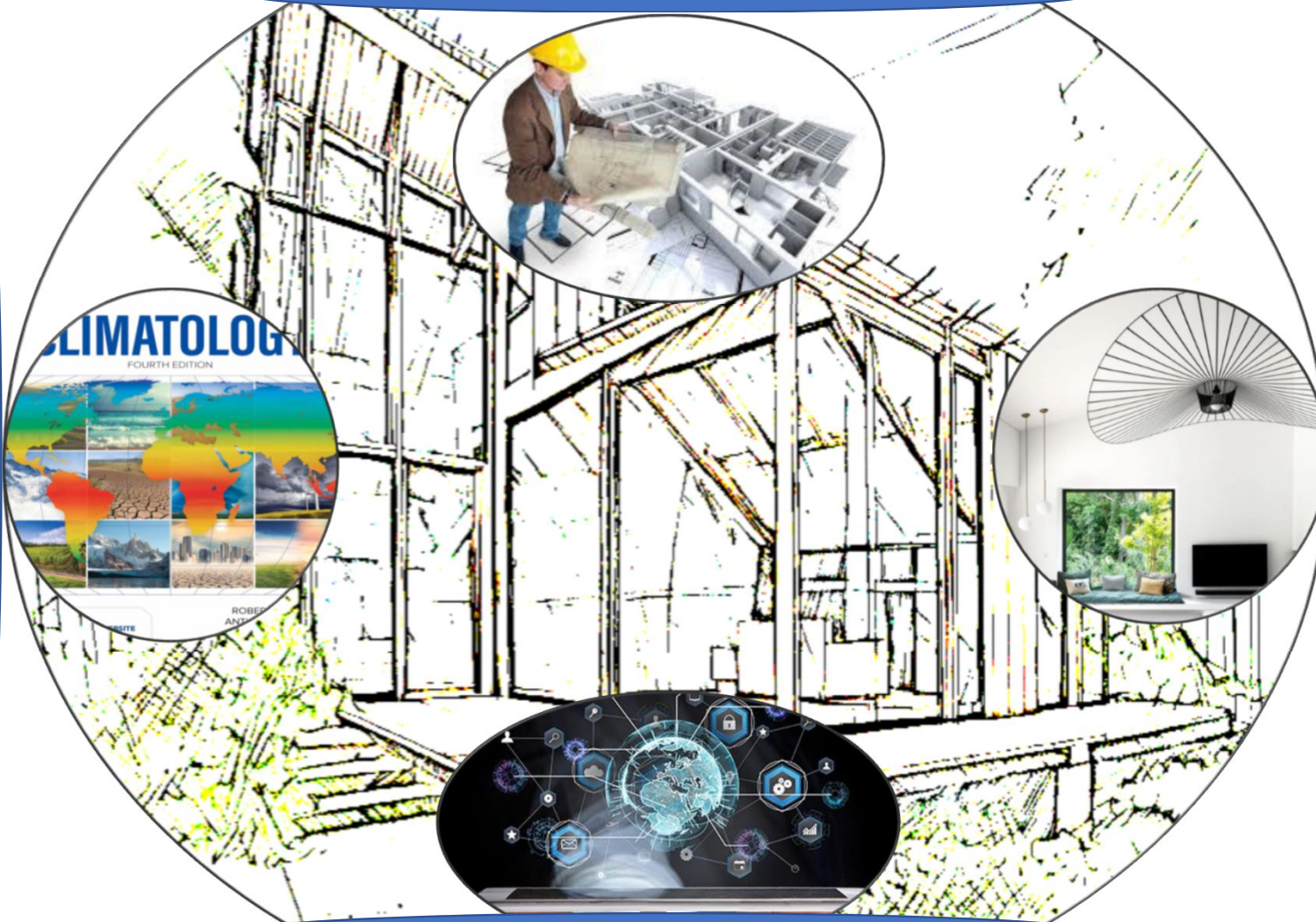
Engineering Architecture dialog

A path harmony with the environment



Architecture

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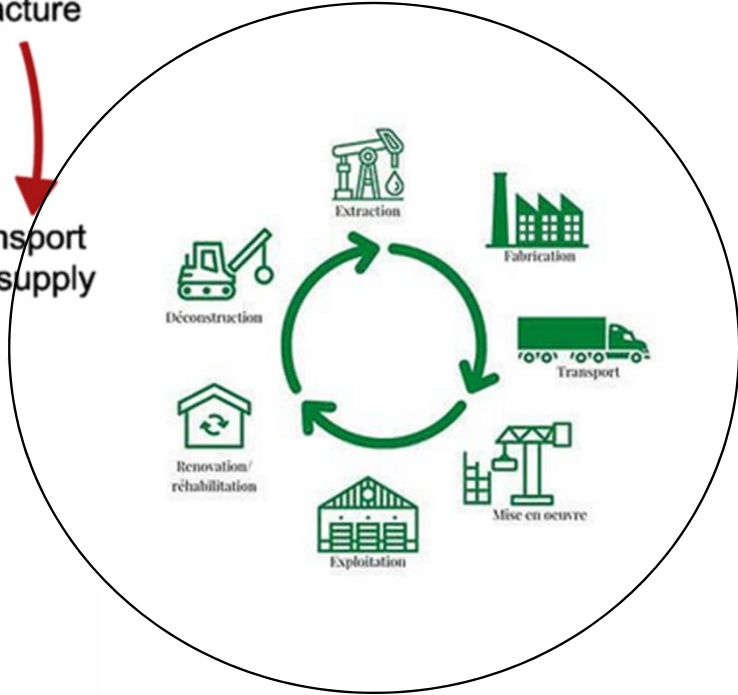
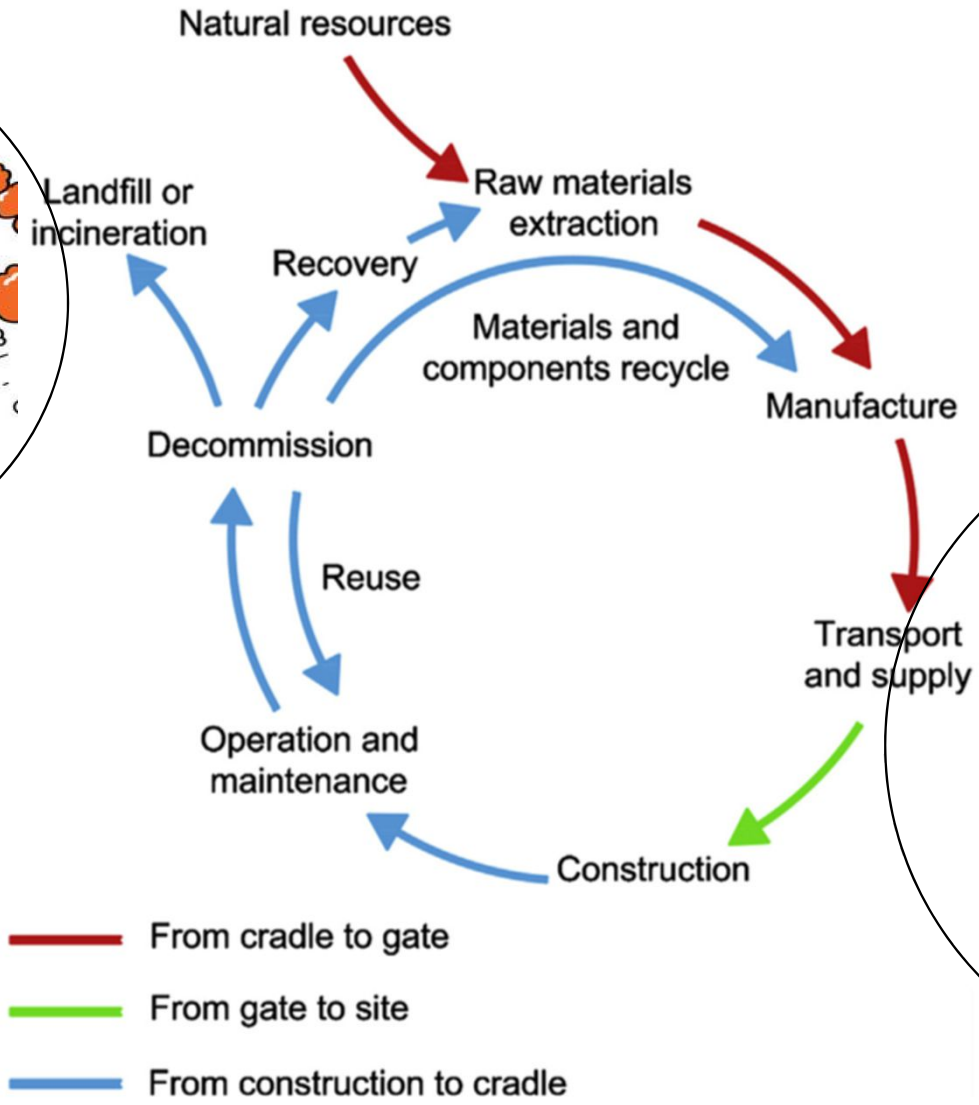
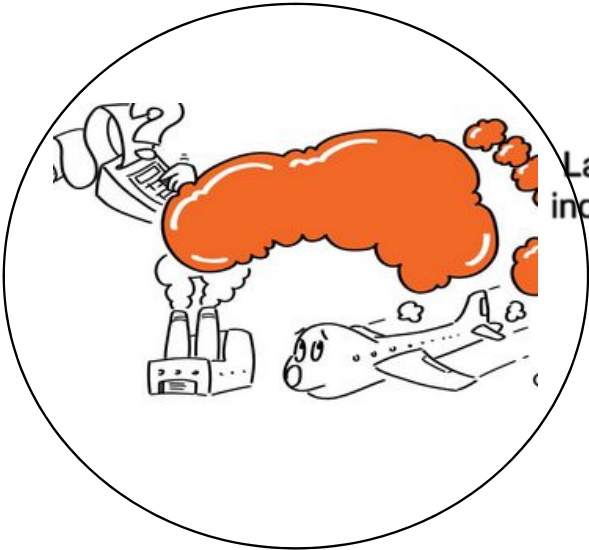


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Technology



Life cycle of building Materials and Products





Wood A promising material



Grâce au bois lamellé-collé, le Canadien Michael Green envisage de construire des immeubles de 30 étages



Architect
Andrew
Waugh
Immeuble
Londonien
9 nv

Up to 10% of annual global carbon emissions are stored in wood buildings.



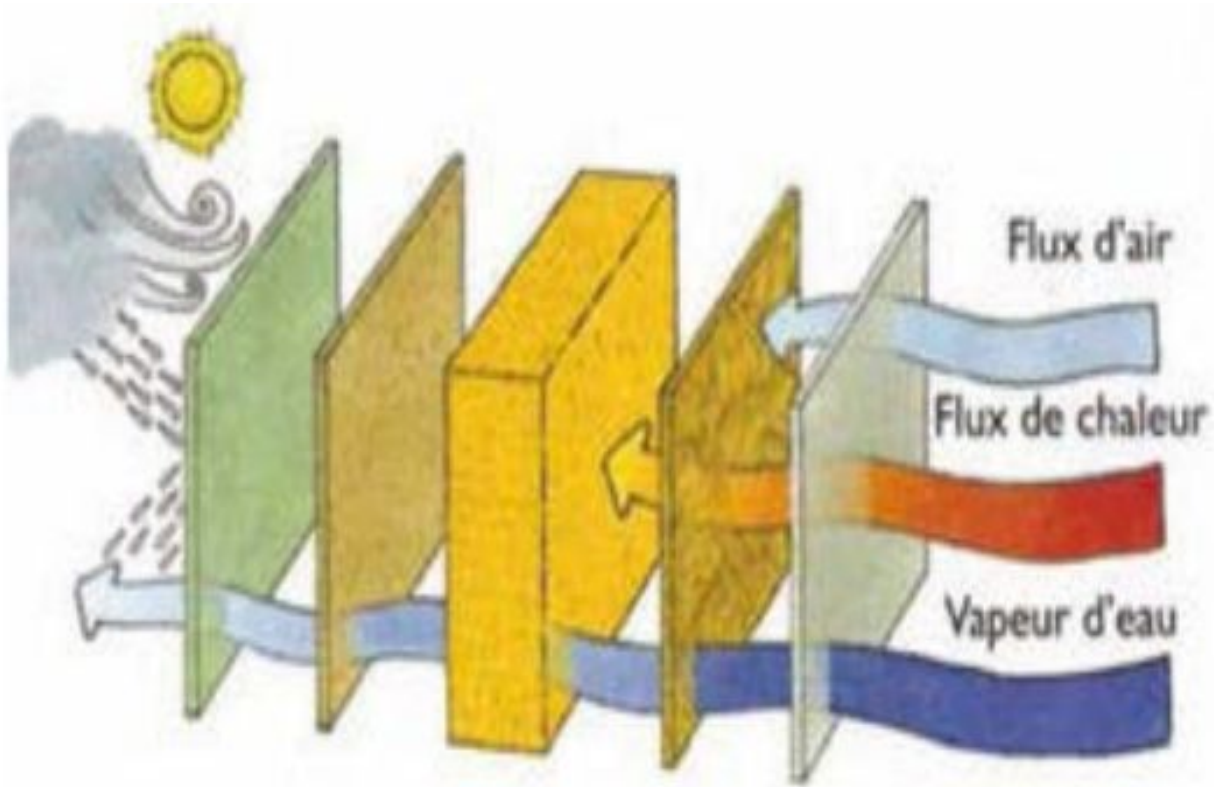
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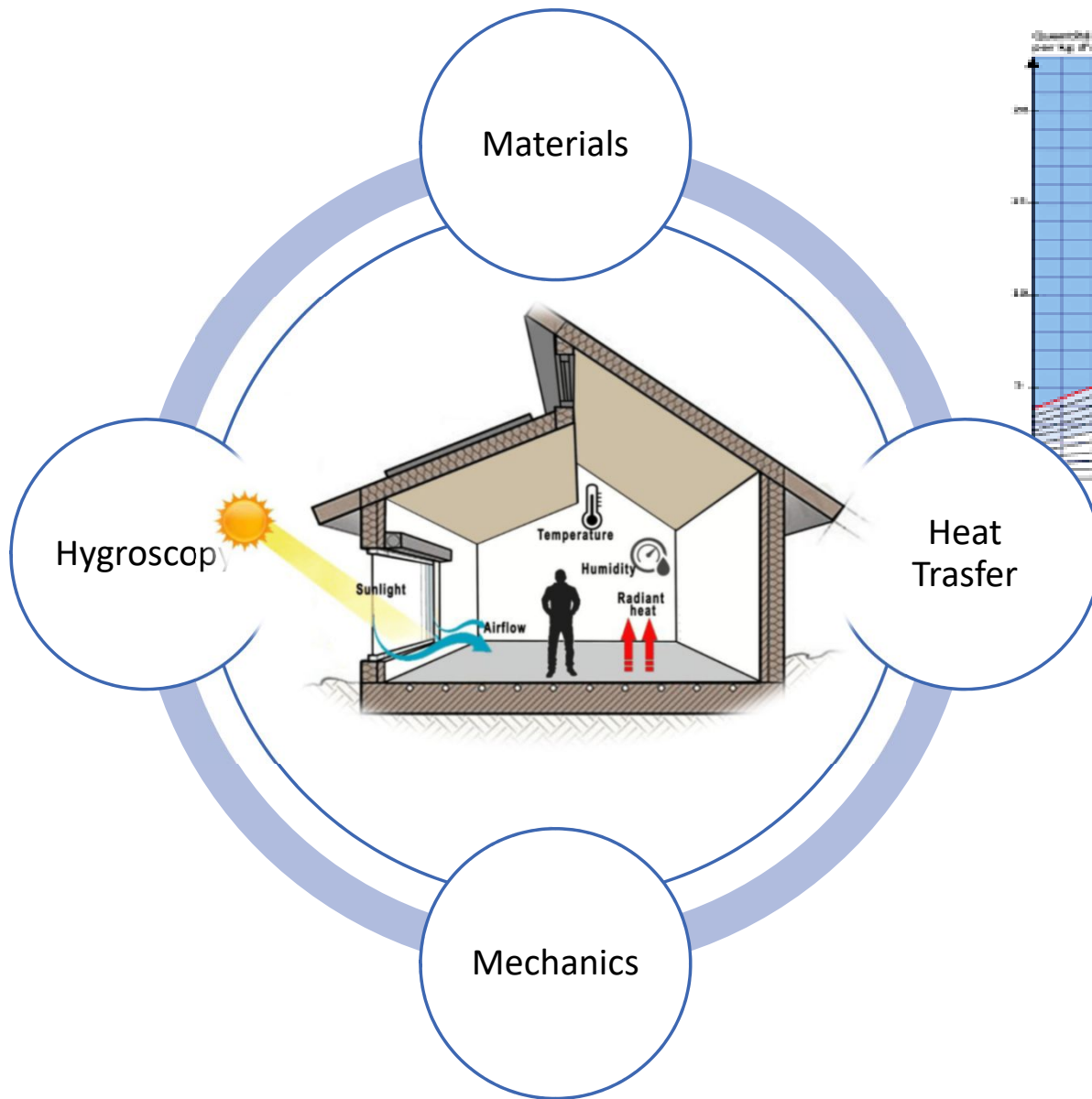
About 2 €/an/m², Heating / Hot Water

700 caissons de bois et paille constituent les parois de cet immeuble de 8 niveaux. Ils sont protégés d'un pare-pluie (rouge), puis d'un bardage de tuiles en terre cuite. Les 26 logements seront prêts en 2014.

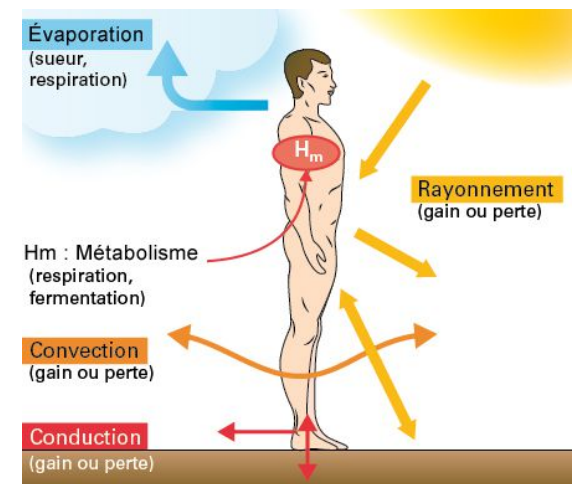
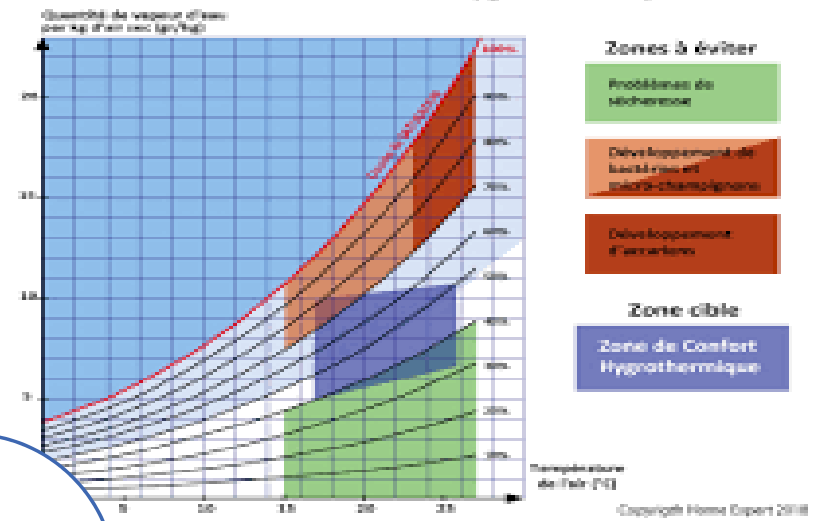


- **The best form of carbon sequestration is to chop down trees: use the resulting wood as a building material and to restore sustainable, managed short rotation forests.**
- **The cost of durable wood finishing is very high and sometimes not environmentally friendly. New systems like UV Powder finishes could be interesting for high rise buildings where the cost is less determining.**
- **Could it be possible to replace all the coatings only by cell wall modifications?**
- **No Treatment could be a good treatment....with “Genetically Modified” wood!**
- **Genetically creating fast growing species with good durability is an ultimate dream!**

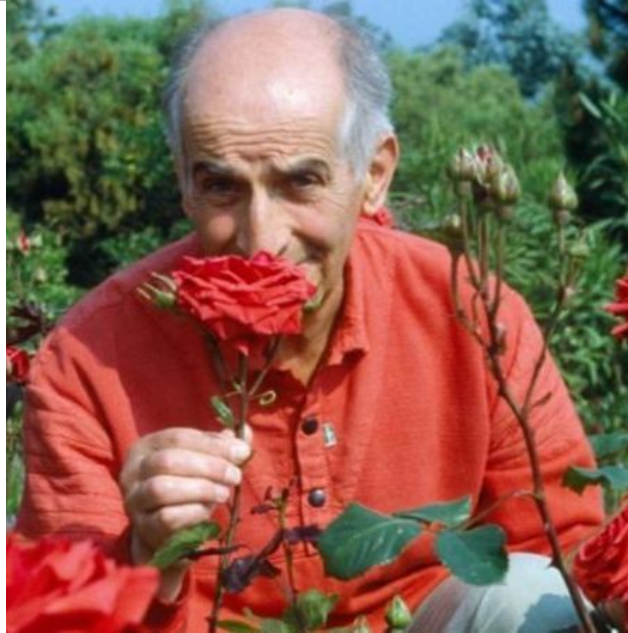




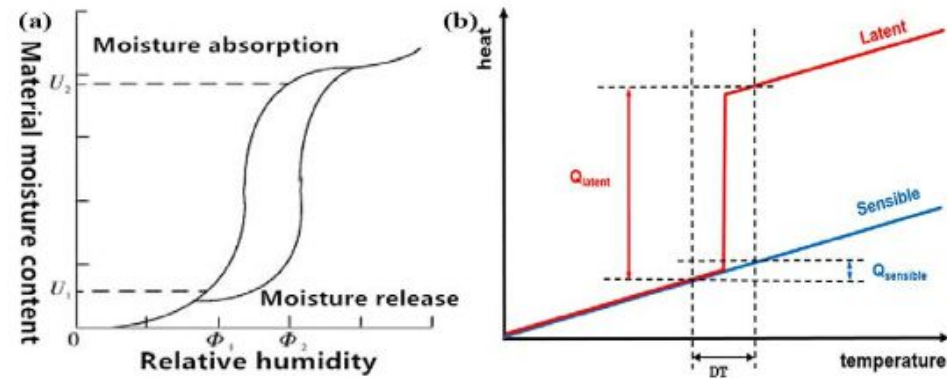
Confort thermique Zone de confort Hygrothermique



From RT 2012 to RT 2020



Hybrid / Combined solution



Photographie d'une plaque de MCP Energain (source : société Du- Pont de Nemours)



Maria Telkes



Mária Telkes 40's

Construite à Dover dans le Massachusetts en 1948, cette « Maison de l'après-demain » est la première résidence moderne au monde à être entièrement chauffée grâce à l'énergie solaire.





- (1) One-dimensional planar symmetry, measured by the Cartesian coordinate x .
- (2) Constant specific heats c_p , thermal conductivities k_p , and diffusivities α_p , of the solid $\mathcal{P} = S$ and the liquid phase $\mathcal{P} = L$, together with the constant heat of fusion h_M .
- (3) Material properties of the phases could differ in general. The exception is the constant and equal density $\rho = \rho_S = \rho_L$ of the solid and liquid phases.
- (4) Heat flux F_P in phase \mathcal{P} is governed by the Fourier constitutive relation

$$F_P = -k_P \frac{\partial}{\partial x} T_P \quad (1)$$

with T_P representing the temperature of the phase \mathcal{P} .

- (5) The temperature field $T_P(x, t)$ at time t at point x is governed by the Fourier equation

$$\frac{\partial}{\partial t} T_P(x, t) = \alpha_P \frac{\partial^2}{\partial x^2} T_P(x, t) \quad (2)$$

- (6) The solid-liquid interphase conditions at interphase point $x_M(t)$ at time t are

$$T_M = T_S(x_M, t) = T_L(x_M, t) \quad (3)$$

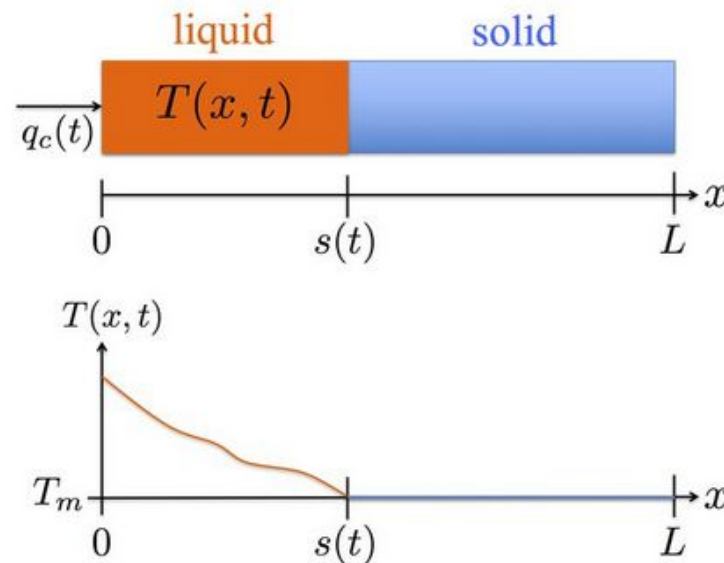
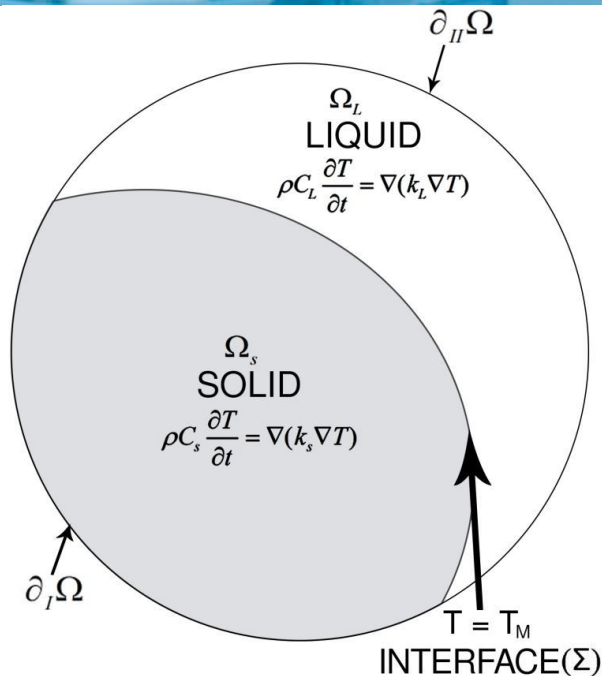
$$\rho h_M \frac{d}{dt} x_M(t) = -k_L \frac{\partial}{\partial x} T_L(x_M, t) + k_S \frac{\partial}{\partial x} T_S(x_M, t) \quad (4)$$

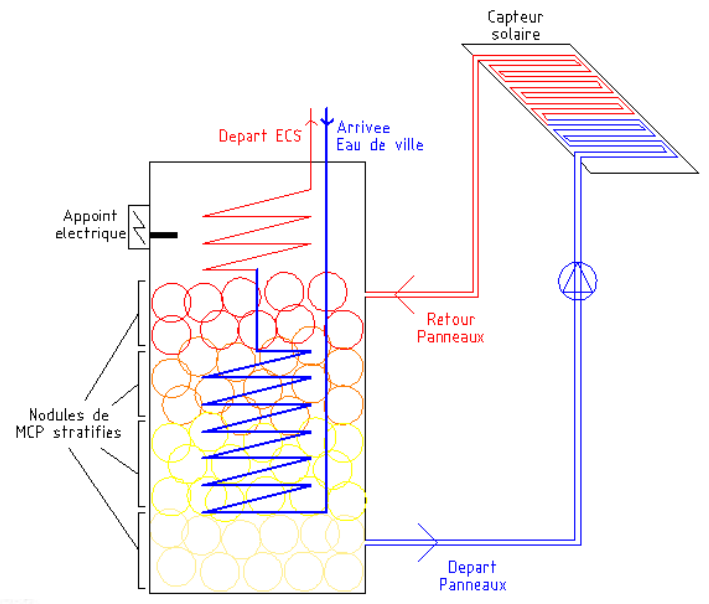
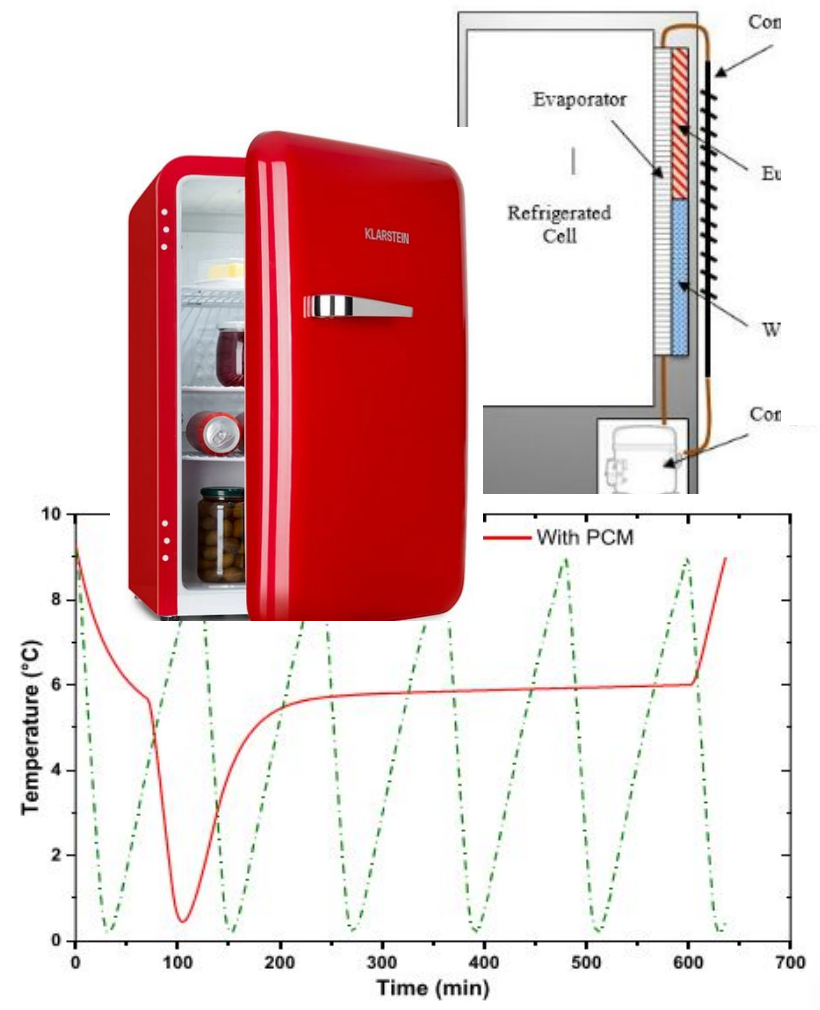
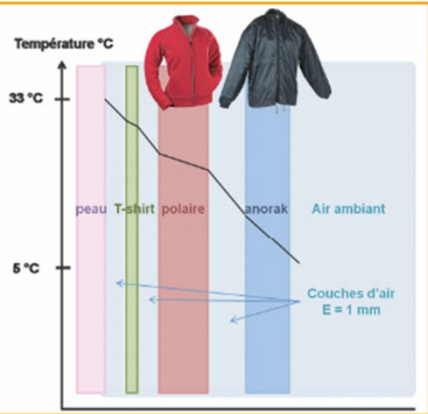
- (7) The temperatures of the phases are assumed to be in the general form

$$T_S = A_S + B_S \operatorname{erf} \left(\frac{x - x_0}{(4\alpha_S(t - t_0))^{1/2}} \right) \quad (5)$$

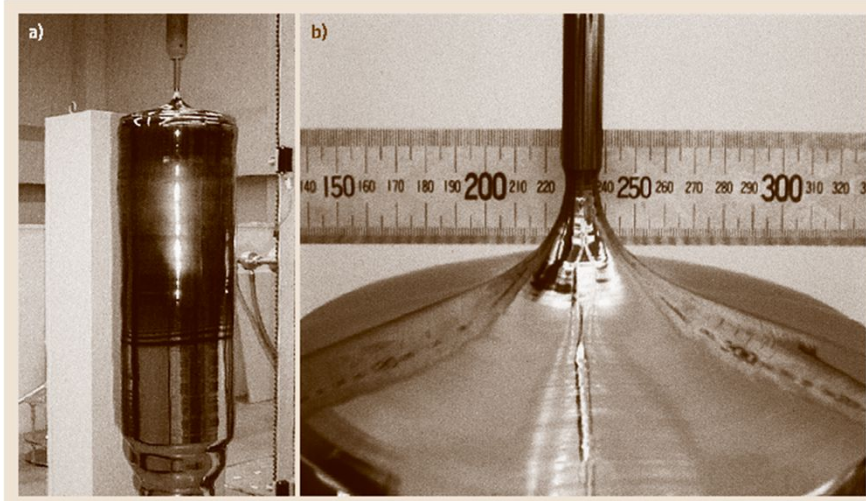
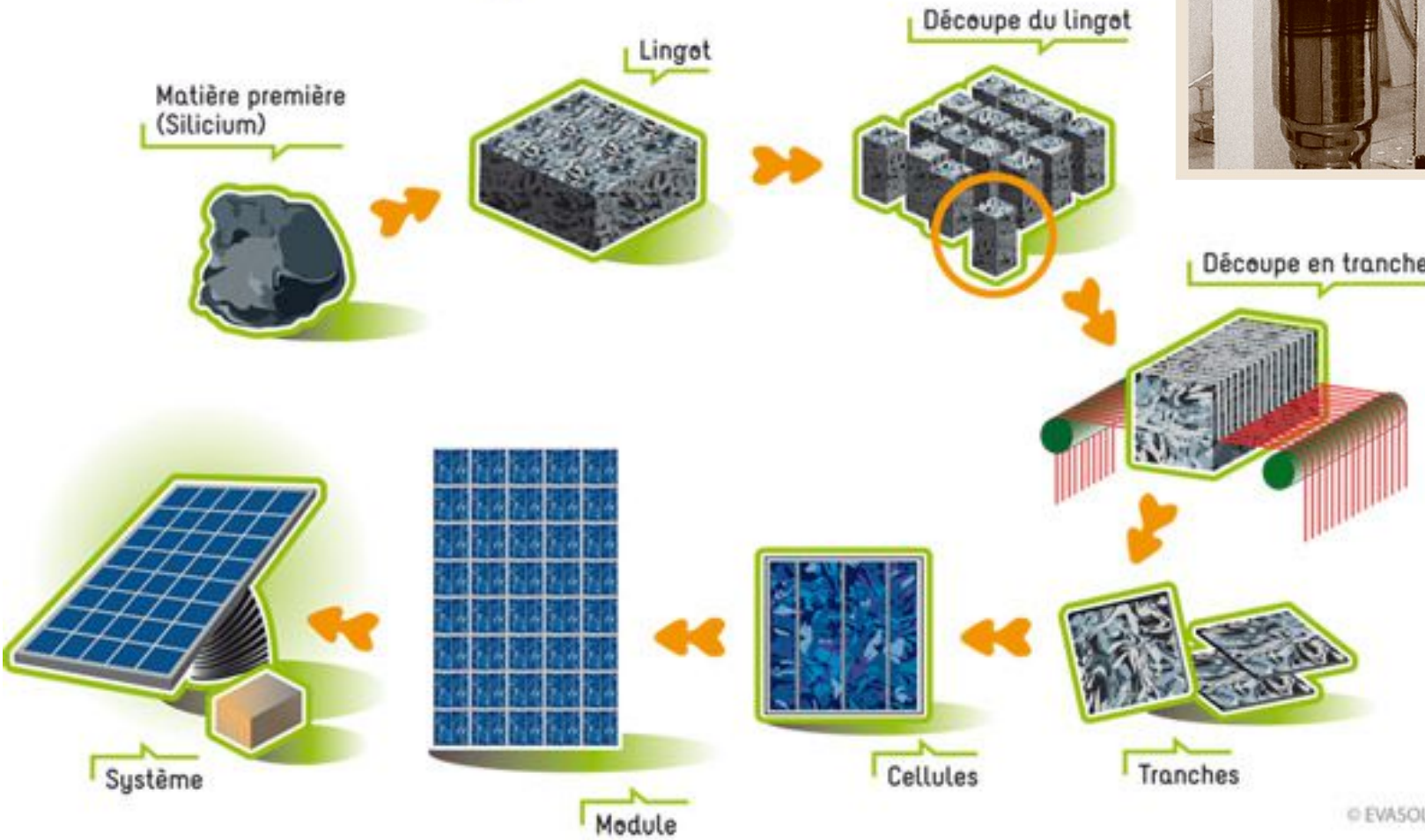
$$T_L = A_L + B_L \operatorname{erf} \left(\frac{x - x_0}{(4\alpha_L(t - t_0))^{1/2}} \right) \quad (6)$$

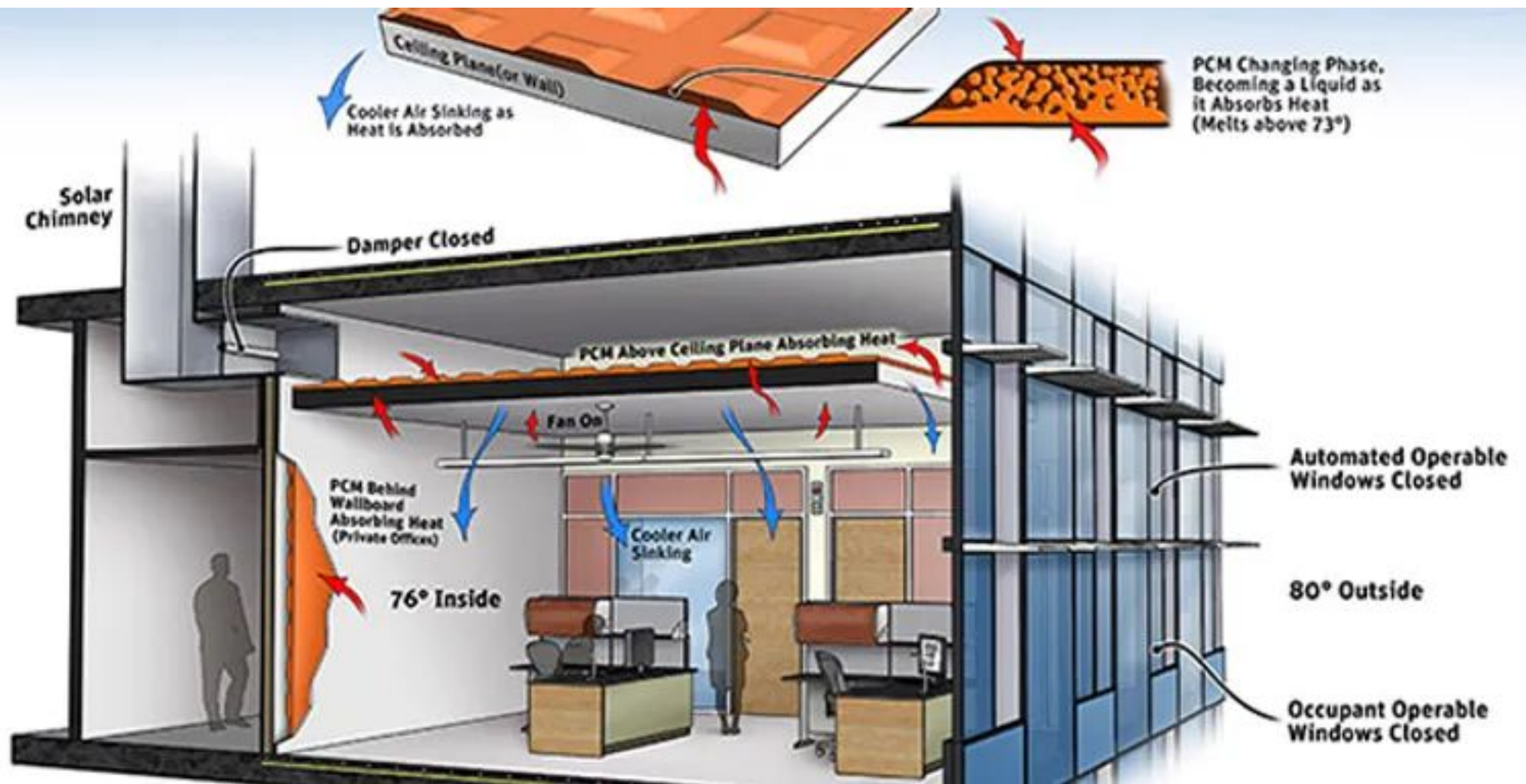
with the coefficients A_S, B_S, A_L, B_L, x_0 and t_0 , which have to be determined through the specific initial and boundary conditions.



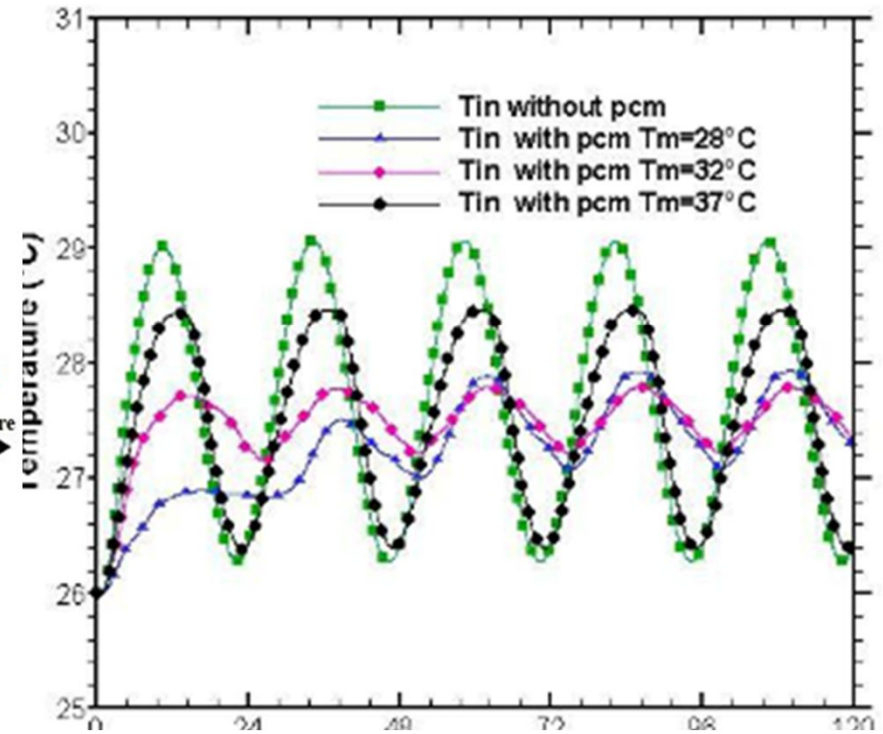
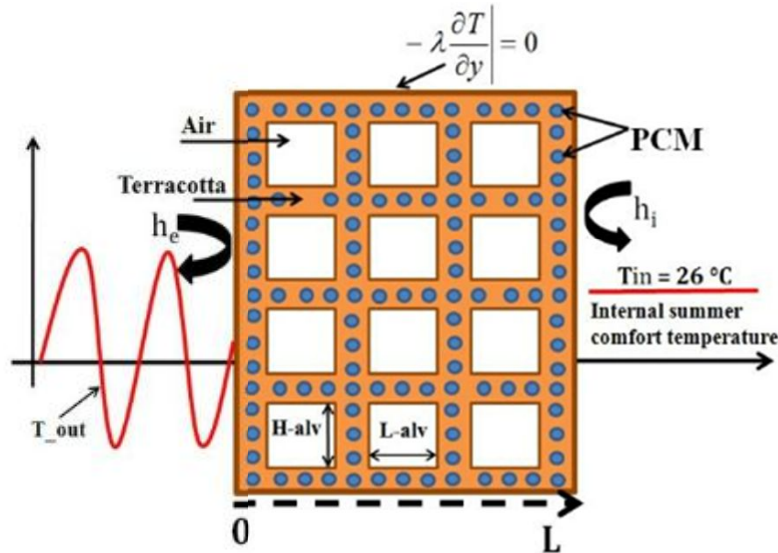
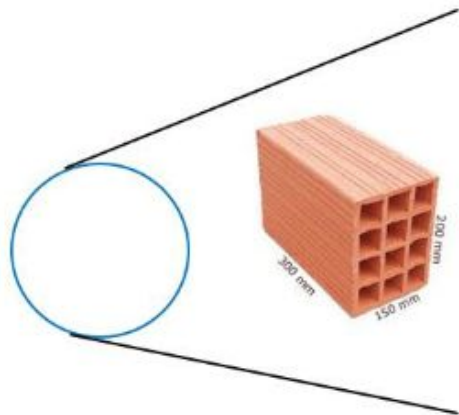
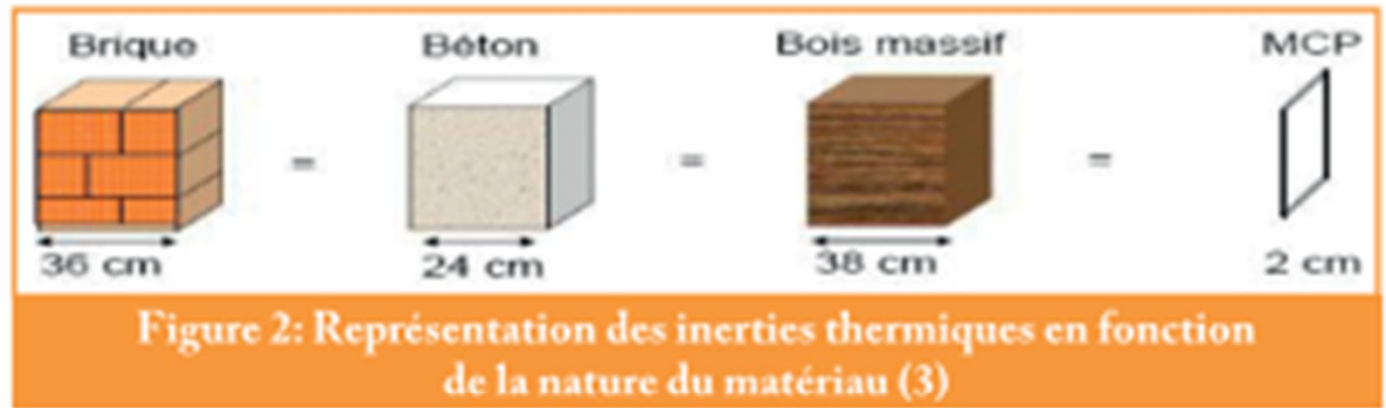
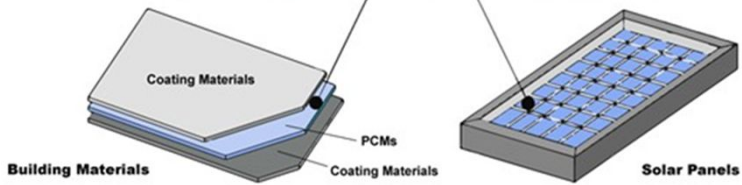


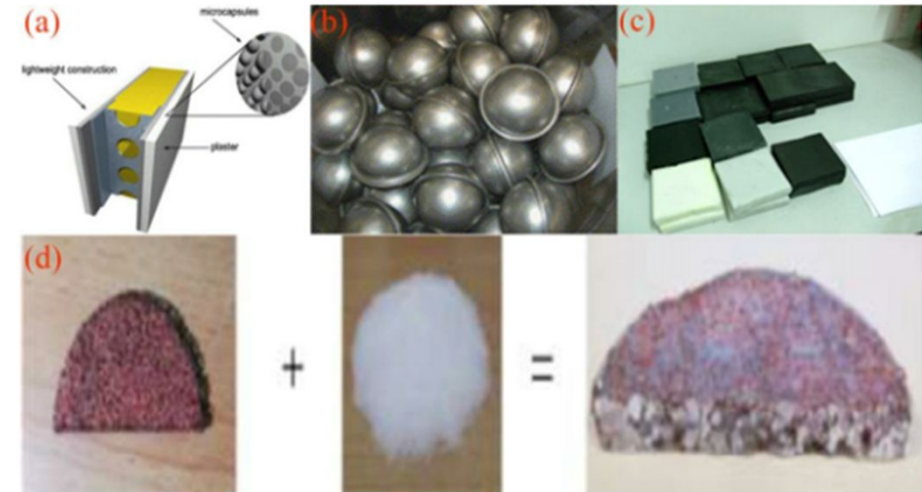
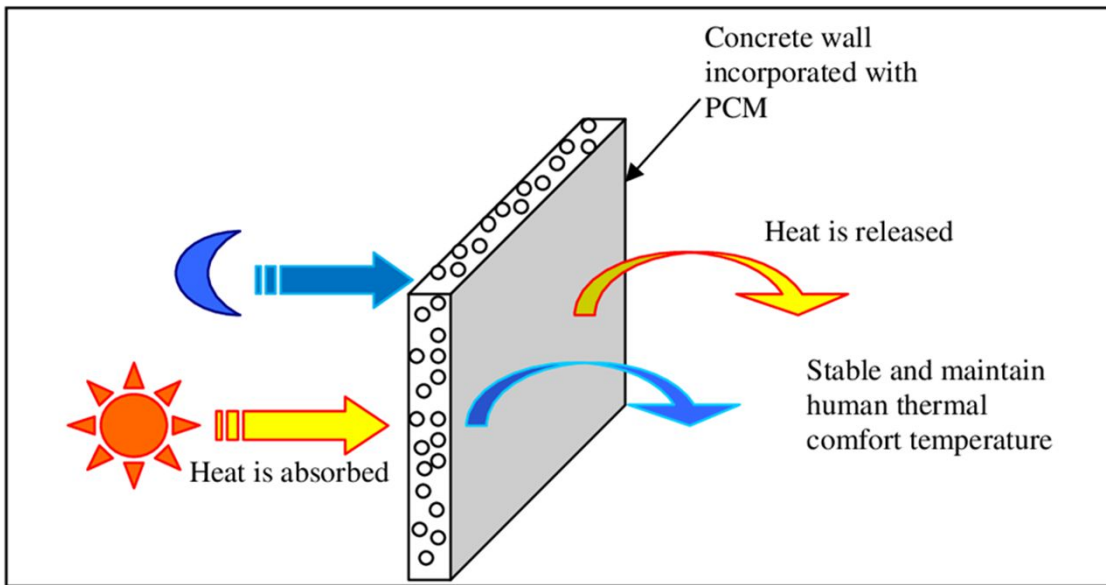
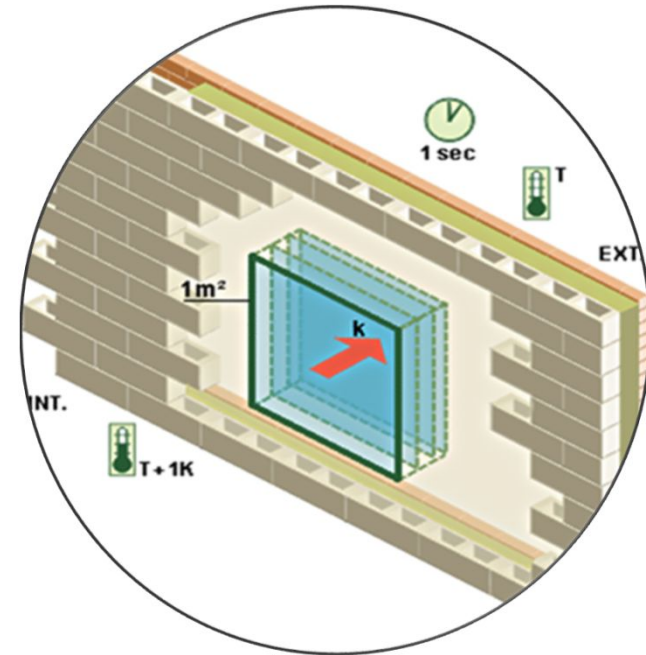
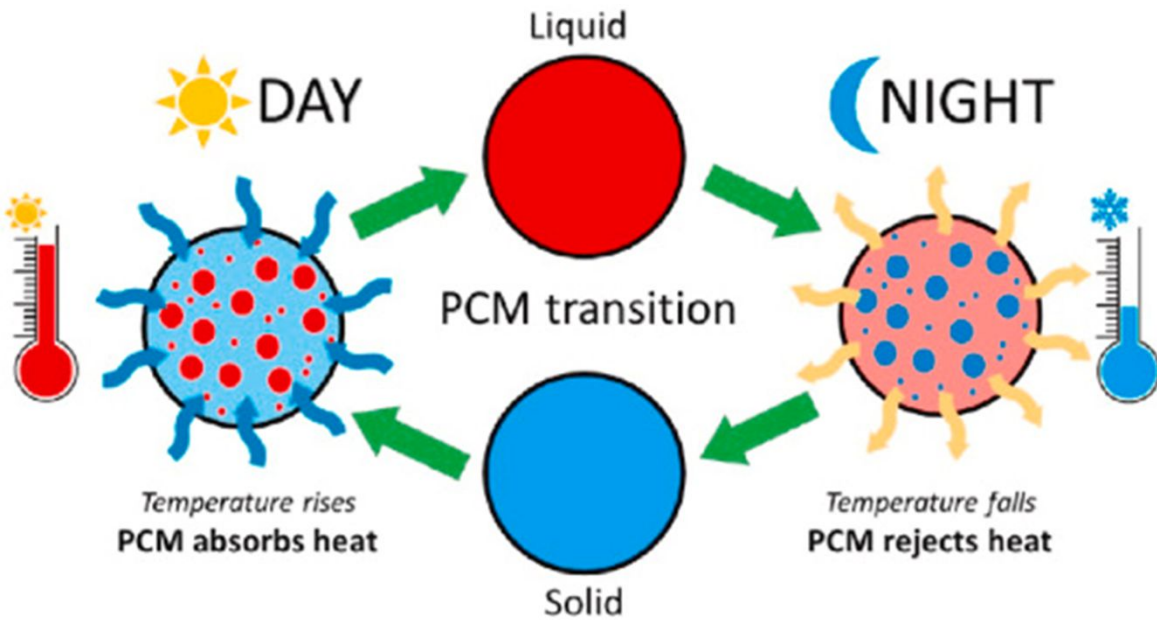
La chaîne de fabrication du photovoltaïque

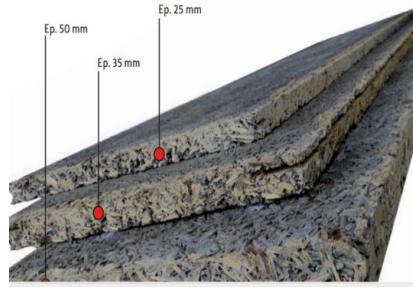
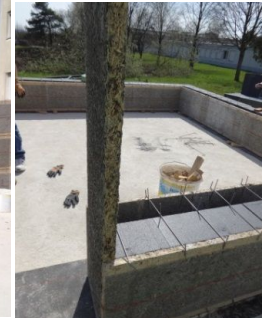




Phase Change Materials

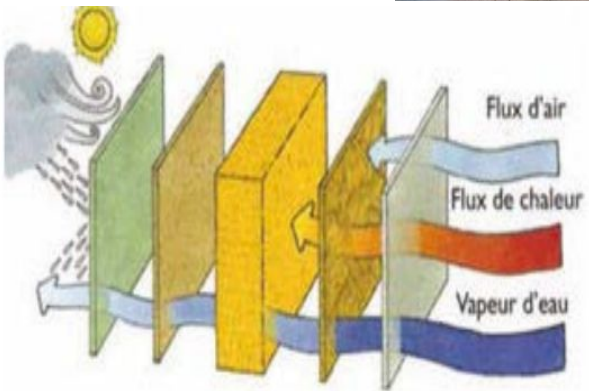




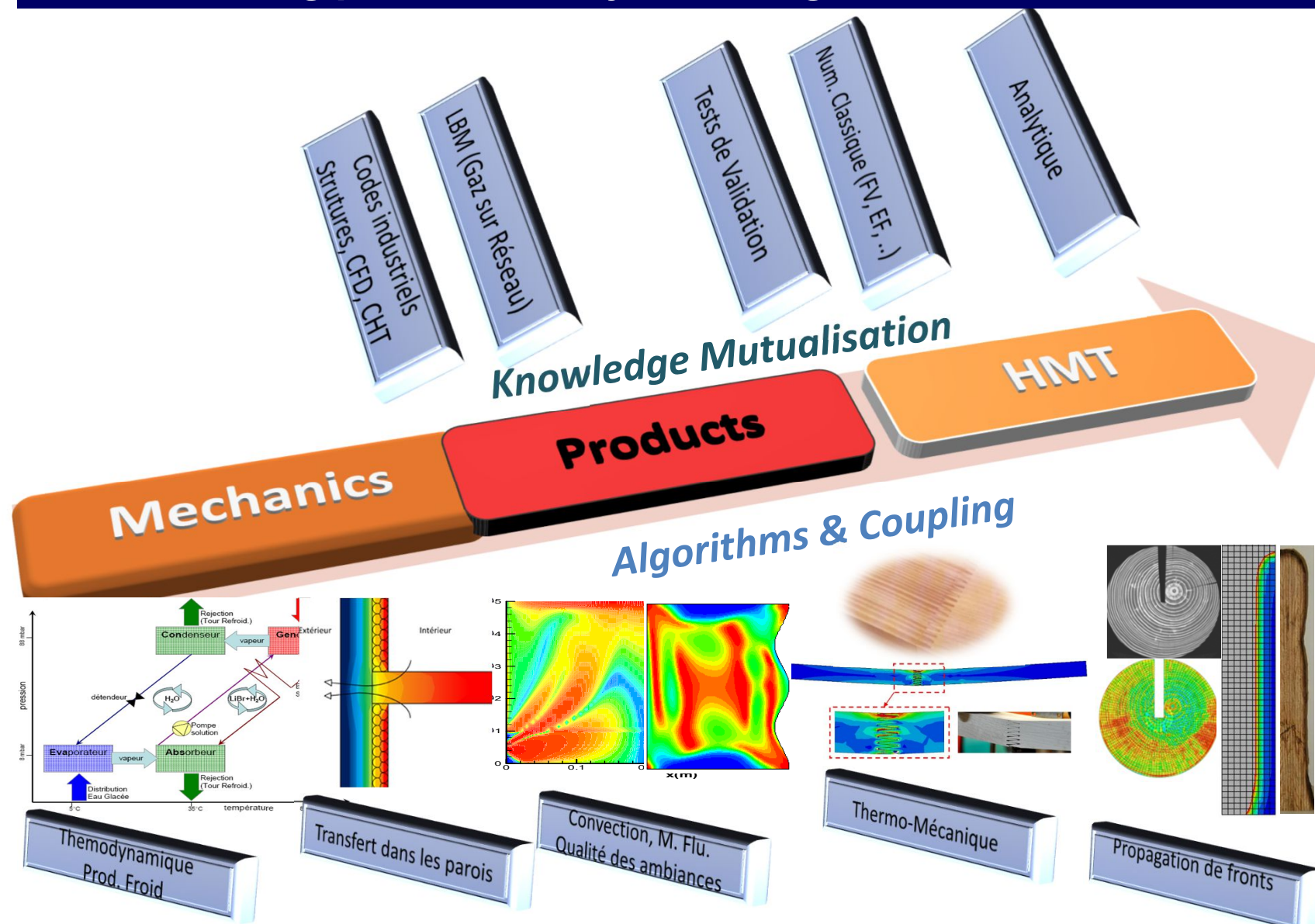




The inclusion experimental Loop



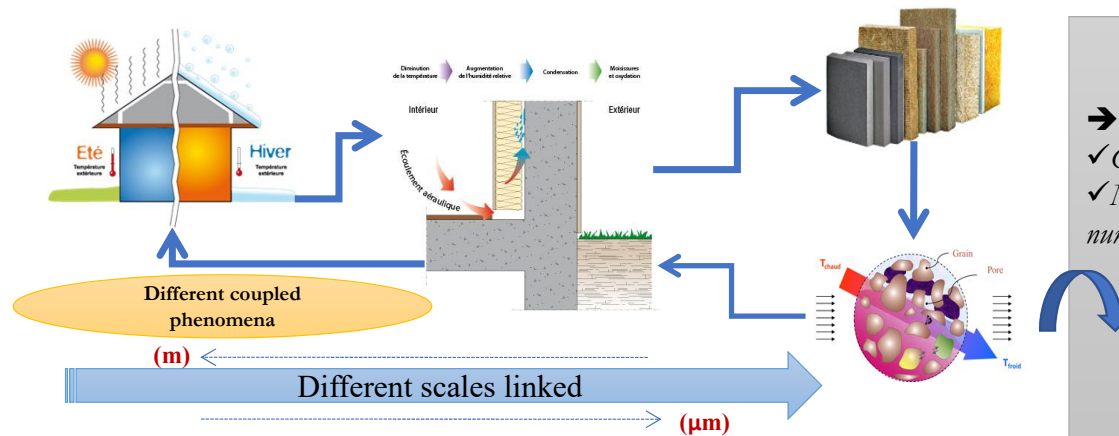
Understanding phenomena by modeling and simulation



Performance Of Biobased Materials In The Realization Of Sustainable Structures

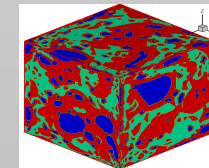


- Analysis of coupled heat and mass transfers in building materials.
- Improving the energy performance of a building



Microstructural Characterization

- ➔ Measuring equivalent properties:
 - ✓ Characterization at the microscopic scale .
 - ✓ Modeling of thermohydric properties using numerical computation (3D reconstruction).



- ✓ The thermos-hydro behavior of the material was evaluated experimentally at material scale.
- ✓ The properties were used for numerical modeling at building scale.



Orient the design of a new structure with controlled parameters.



LI Mengya
Doctorant en
Science de bois



**UNIVERSITÉ
DE LORRAINE**



Caractérisation expérimentale et modélisation des panneaux composites bois-ciment



**Copeaux de bois
Ciment**

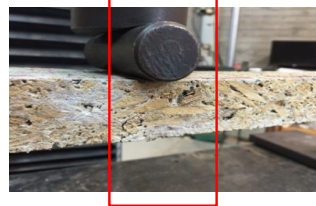
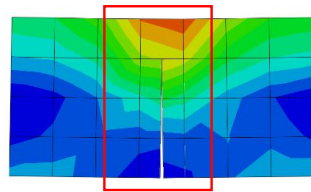


Composite bois-ciment

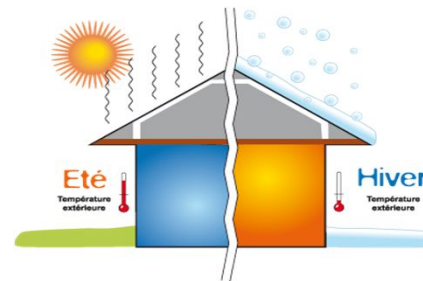


Coffrage permanent

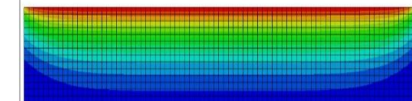
Comportement mécanique



**Comportement
hygrothermique**



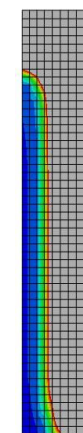
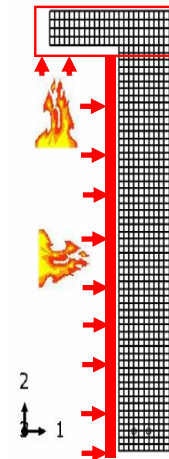
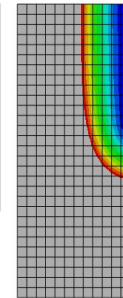
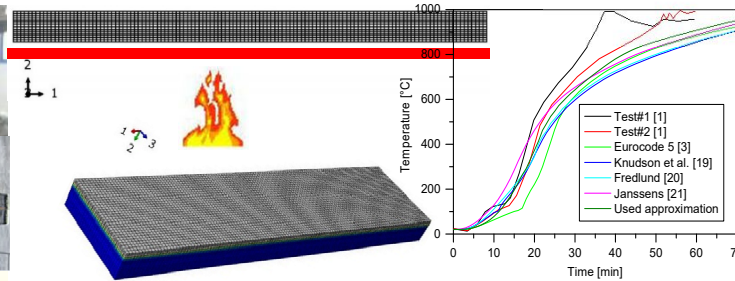
Comportement au feu



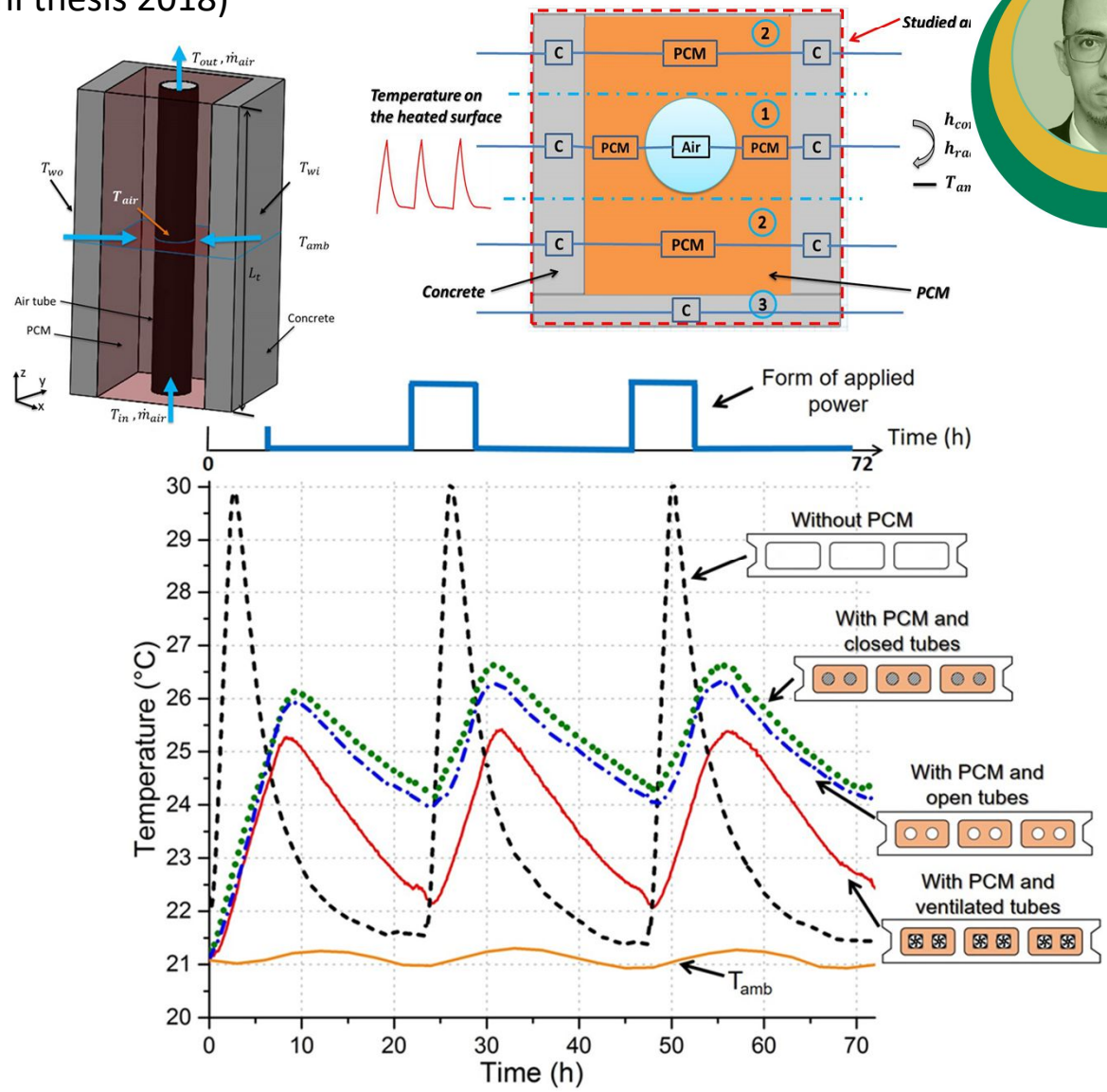
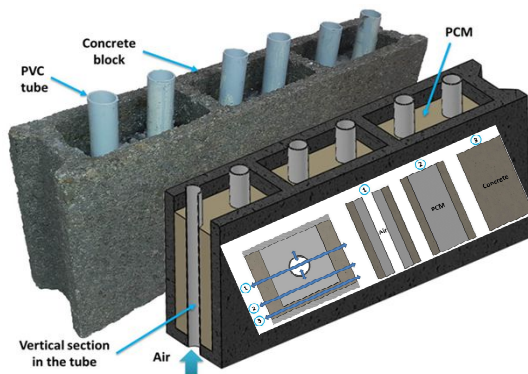


Dr. Thi Van Diem

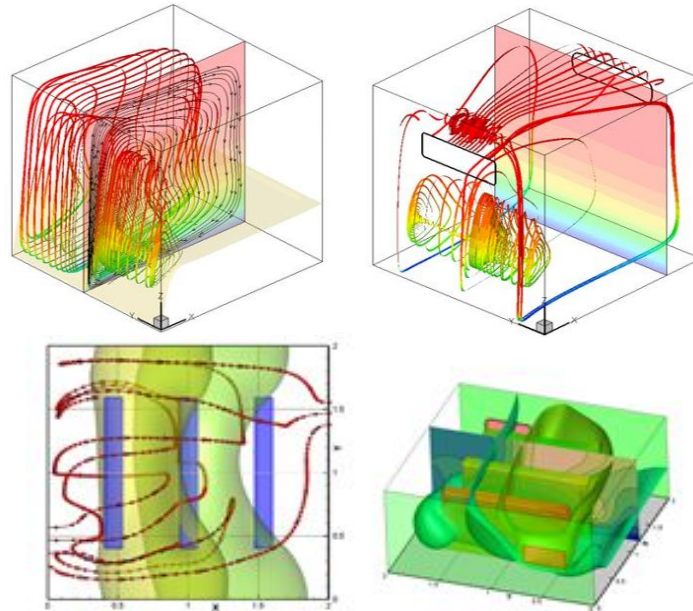
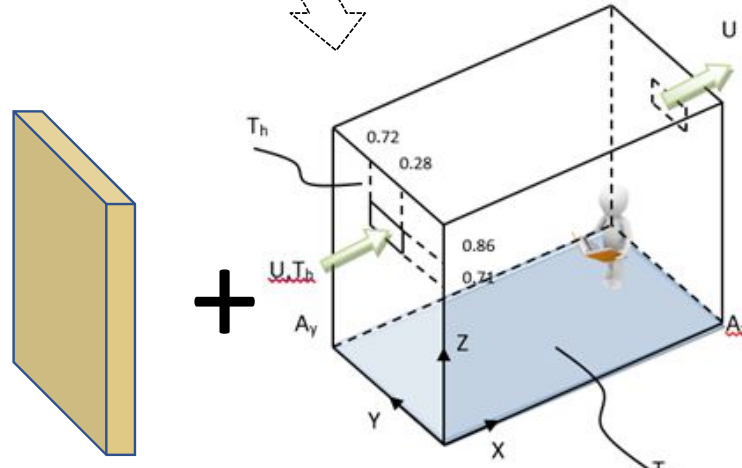
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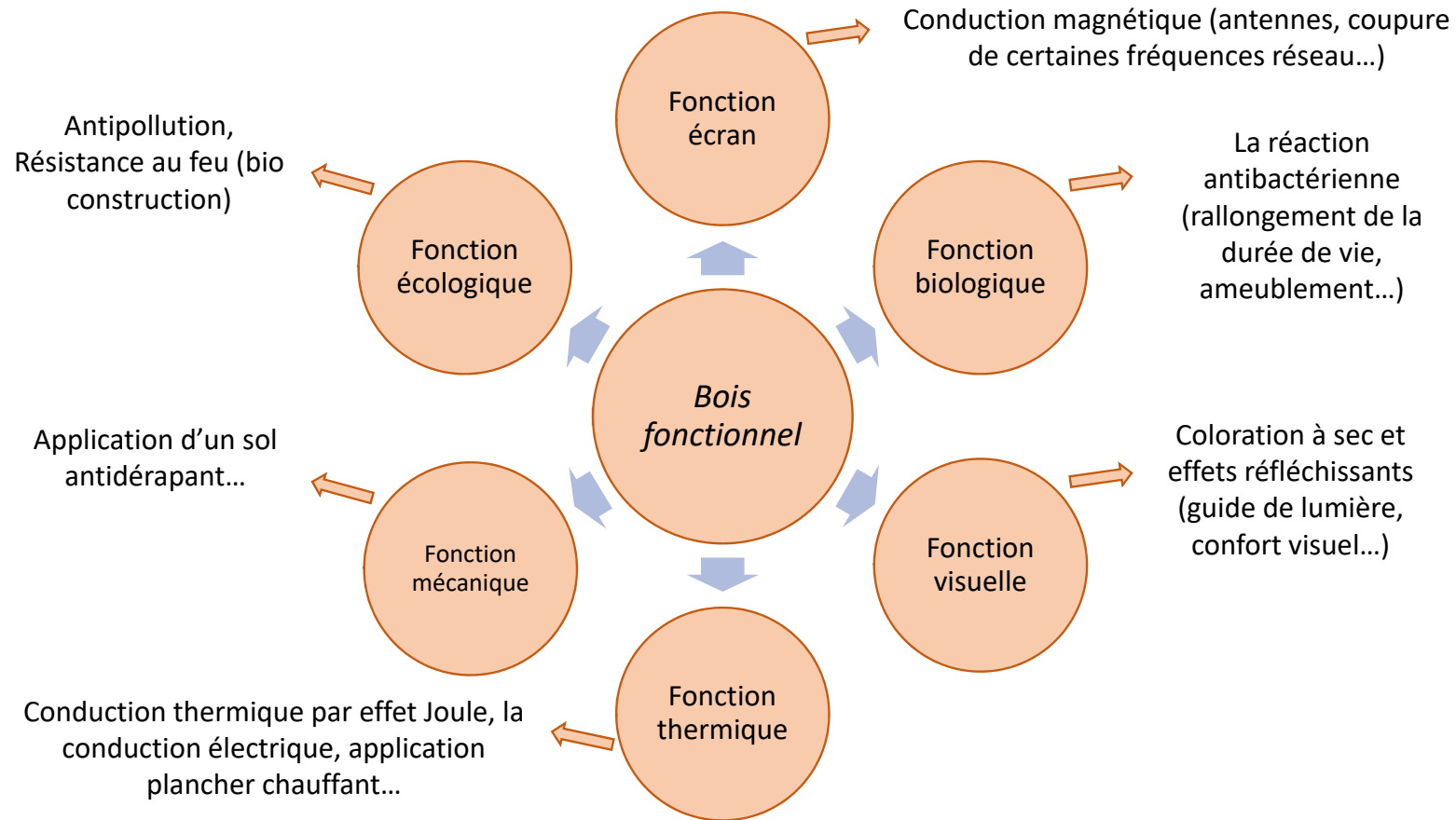


An Example of mixed solutions for Storage (Laouatni thesis 2018)



Project Tassili

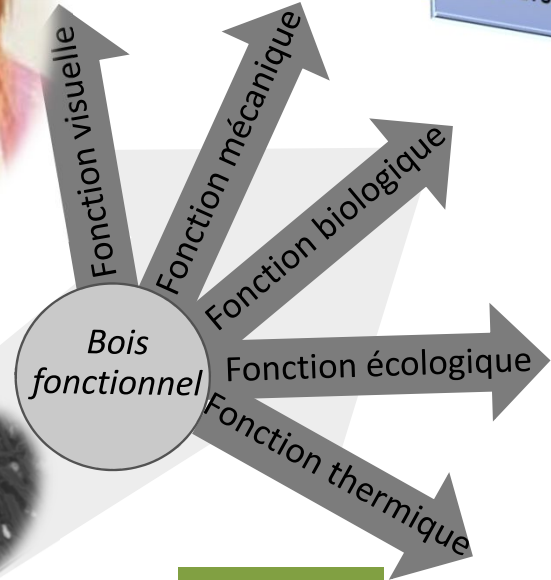
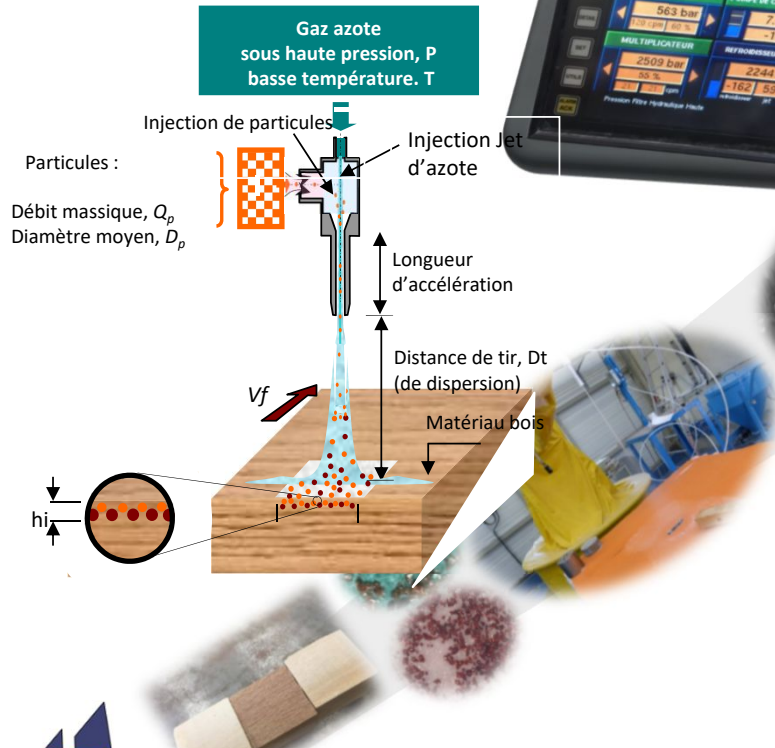




Fonctionnalisation de bois par injection de particules

Ch. Gérardin/M. El Ganaoui
Doctorat Mlle A. Zerriaa, en cours

Méthode et procédé



Résultats

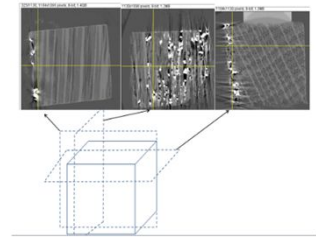
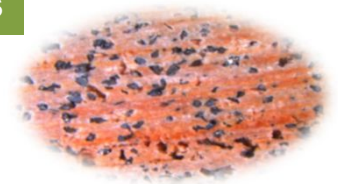
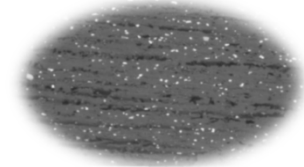


Image par Tomographie



Sapin + Grenaille



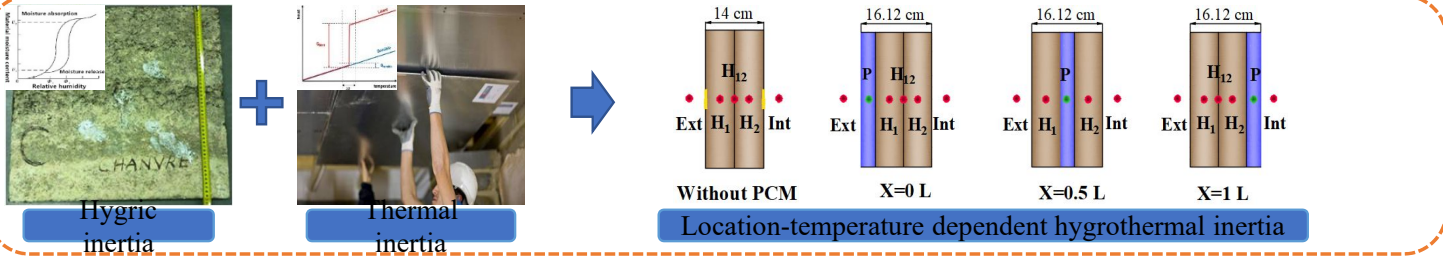
Peuplier + Cuivre



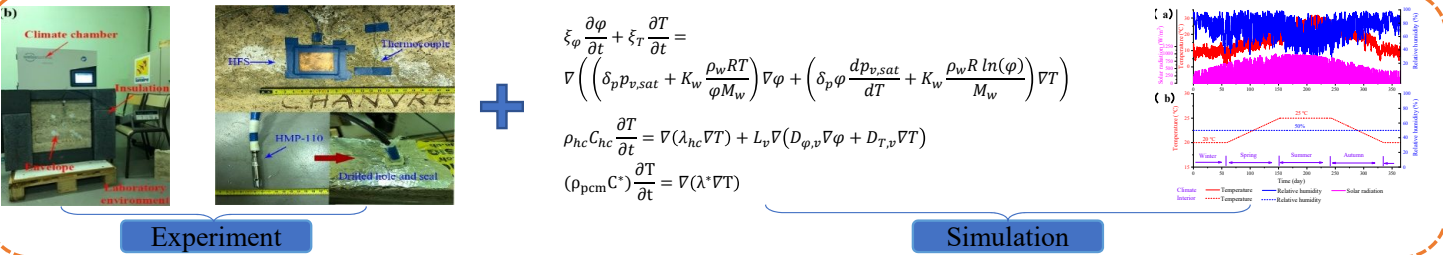
Dr. Dongxia WU

Motivation

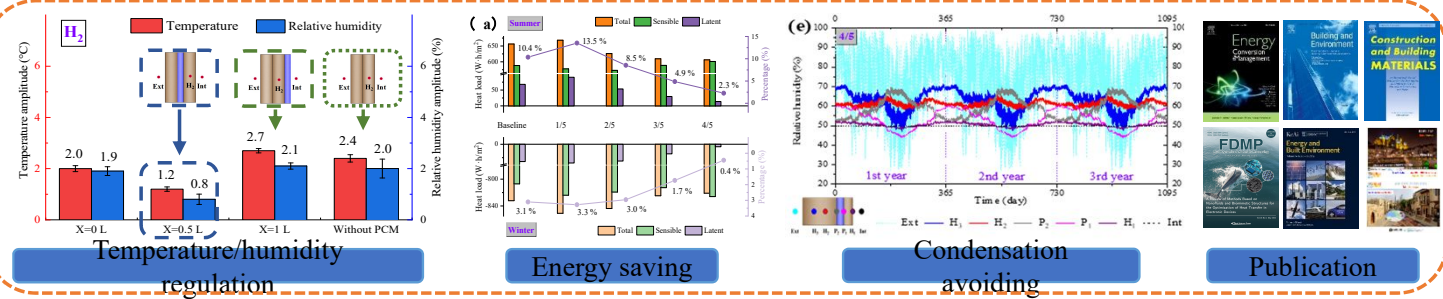
Experimental and numerical study on passive building envelope integrated by PCM and bio-based concrete



Methodology



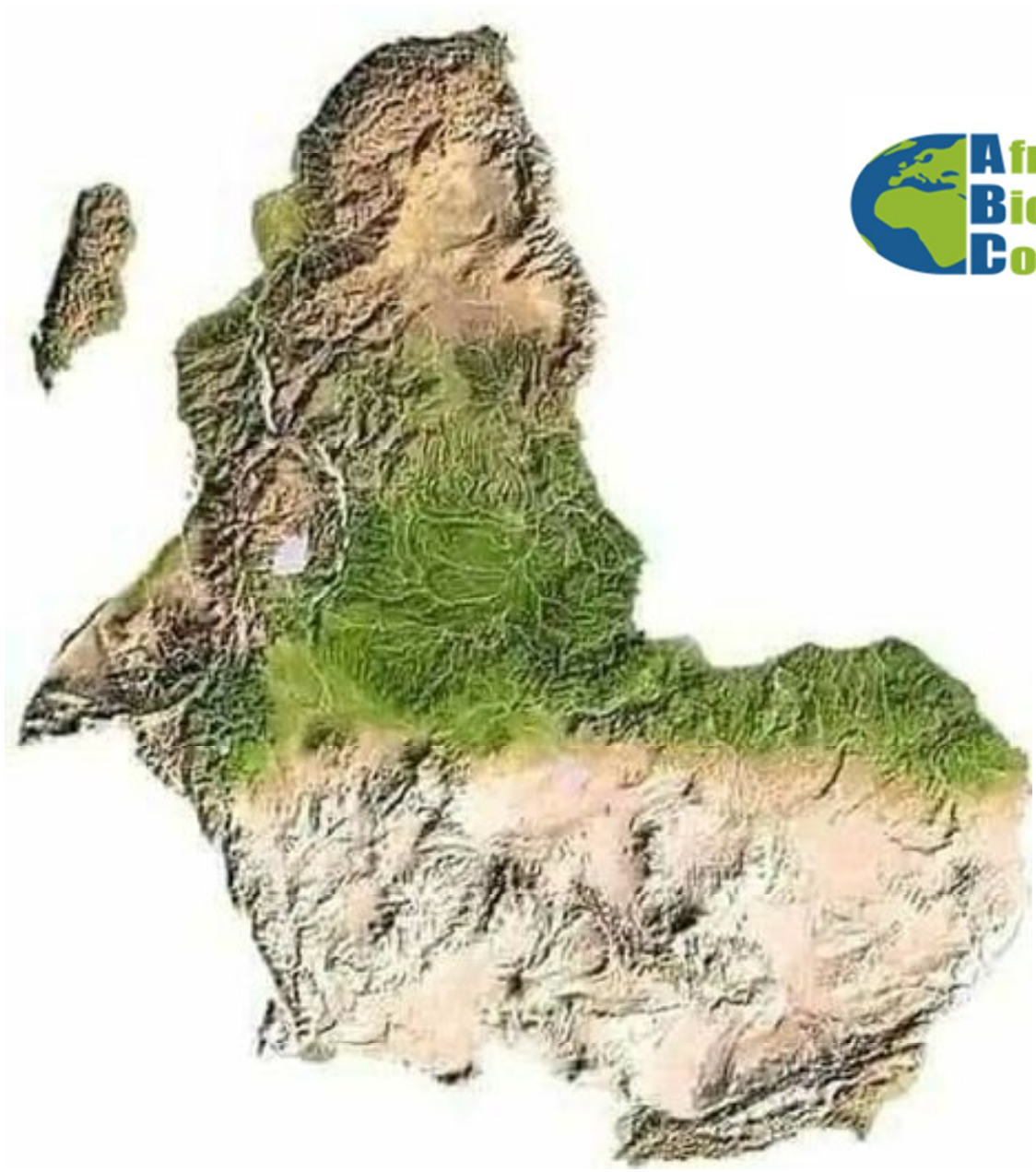
Results





Dr. Thi Van Diem
Pdoc

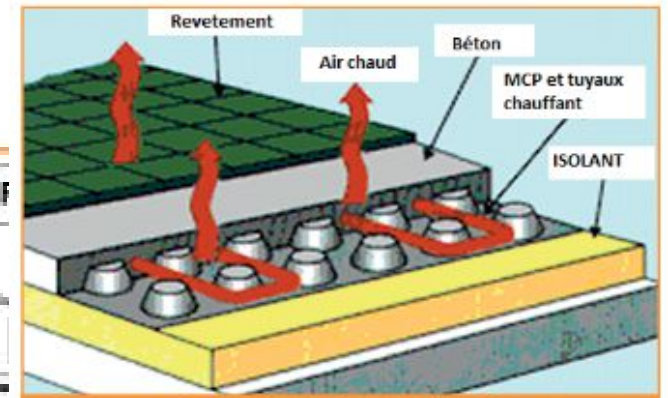
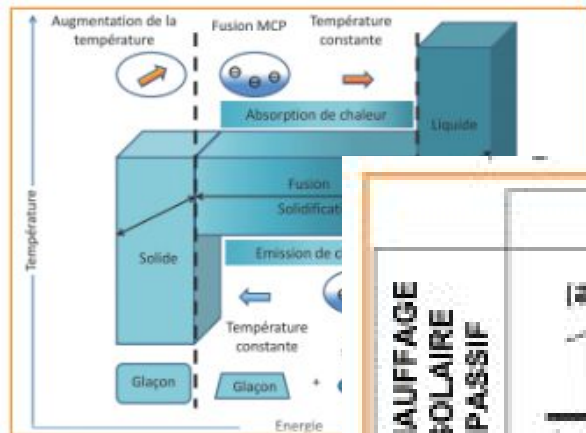




Int. Conf. Materials & Energy (ICOME 23 (Caserta)) Naple – Cote Amalfitane ITALY

Save the date 30,31 May -1 June 2023





	MURS	PLAFONDS / TOITURE	PLANCHEFS
CHAUFFAGE SOLAIRE PASSIF	(a) Avec un rayonnement solaire diurne	(b) Avec un rayonnement solaire diurne	(c) Avec un rayonnement solaire diurne
CHAUFFAGE ACTIF	(d) Avec un système de capteurs solaires	(e) Avec l'utilisation à faible coût de l'électricité la nuit	(f) Avec l'utilisation à faible coût de l'électricité la nuit
VENTILATION NATURELLE	(g) Avec un renouvellement d'air nocturne	(h) Avec un renouvellement d'air nocturne	(i) Avec un renouvellement d'air nocturne

