www.domaineboesch.fr

www.produits.xpair.com

Reducing the greenhouse impact of the wine industry: EXAMPLE OF THE ECO-DESIGN OF WINERIES

JOËL ROCHARD

rochard.joel@gmail.com

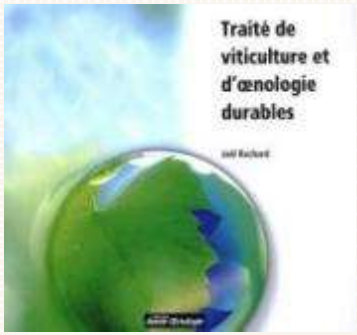
https://joel-rochard.com/fr/

www.en

Professional activities

+ 1980 to 1997 Champagne Committee CIVC
+ 1998 to 2019 Institut Français de la Vigne et du Vin/IFV
+ since 2000

- Expert International Organisation of Vine and Wine/OIV
- Science journalist
- Lecturer in oenology and Master's degree
- Trainer and taster in various competitions



https://joel-rochard.com/

List and links of publications FR and EN

https://scholar.google.fr/scholar?start=20&q=joel+rochard&hl=en&as_sdt=0,5

Expertise

+ Sustainable development strategy applied to the wine sector
+ Effluent and waste management
+ Knowledge, enhancement wine-growing landscapes and biodiversity
+ Greenhouse effect and climate change
+ Ecodesign of cellars
+ Indicators

(Carbon footprint, LCA, labels, etc.)

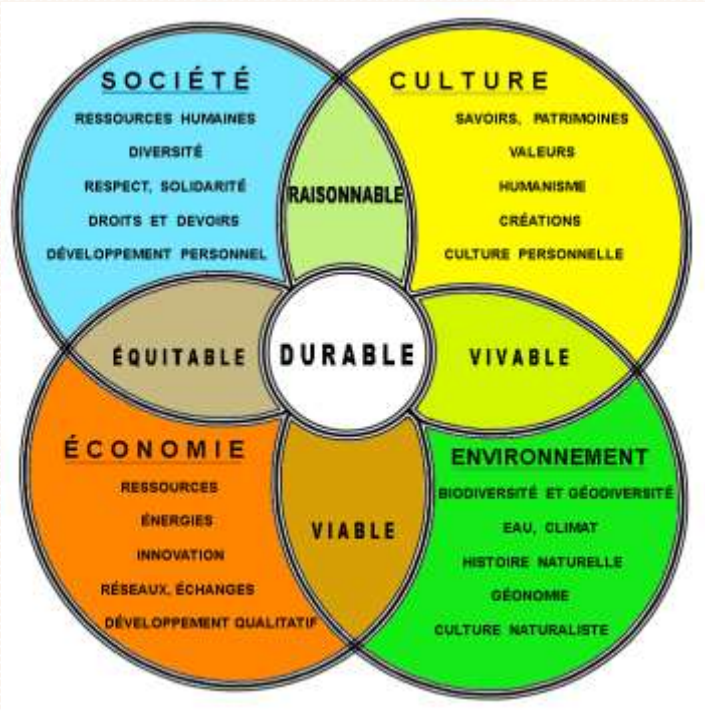


Schéma www.mer-nature.org

WHAT ARE THE BASICS OF A CLIMATE PLAN?

www.ademe.fr

The main operational aspects of these approaches are as follows:

GLOBAL STRATEGY

+ implementation of a "climate" plan
+ optimising the use of inputs and waste management,
+ Substitution of **inputs and supplies**, whose constituents are of fossil origin, by "biobased" products.
+ **Responsible purchasing** policy for goods and services with a low climate and ecological or climate footprint.

Valuation of biomass

Packing and packaging

ENERGY VINEYARD

+ reduction of fossil fuel **consumption** of **tractors** and **harvesting machines** (power, biofuel, electric).
+ reduction of **nitrous oxide emissions** from soils.
+ reduction of the **energy impact** of **spring frost control** devices.
+ carbon sinks (grassing, organic matter management, microbiology).
+ Valorisation of **vineyard biomass** (vine shoots, vines after grubbing up)

Plants that produce nitrogen in winter (IFV Sud-ouest)

ENERGIE OENOLOGICAL ITINERARIES

+ optimisation of **oenological processes** and energy saving in the production processes.
+ **energy** assessment and adaptation of **buildings** (insulation, alternative energies, use of biomass).
+ Energy efficiency and **bioclimatic** approach for **new cellars**.
+ Ecological management of **cellar effluent** treatment with **less energy consumption**.
+ Recovery and use of **fermentative CO2.**
+Valorisation of the oenological **biomass** (marc, lees, lees, tartaric acid).

Transport of staff and wine

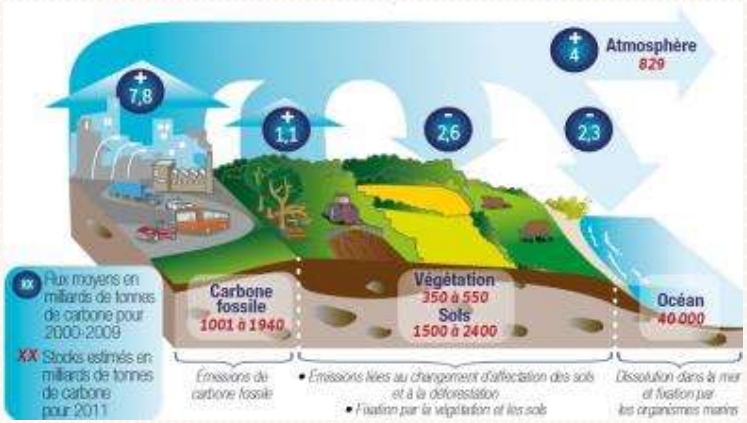
PACKAGING AND COMMERCIAL ACTIVITIES

+ Reduction of the **weight of the bottles** and optimisation of the packaging.
+ Optimisation of **employee and commercial travel** (carpooling, limiting air travel).
+ Less impactful way of **transporting wines.**
+ Integration of the "greenhouse effect" and more generally sustainable issues into **wine tourism** strategies

https://search.oeno.tm.fr/search/article/ac838116-6f8a-4c52-8d08-8d21355ca6bb?p=extrait&q=rochard%20serre

Joël Rochard
VitisPlanet.

CARBON STORAGE IN THE SOIL



In total, there is more carbon in the soil than in the vegetation that covers it and the atmosphere combined, since it is a minimum estimate of 1,500 to 2,400 billion tonnes of carbon in the organic matter of the world's soils), or two to three times the carbon of atmospheric CO2 (829 billion tonnes of C).

Biological life of a soil
www.billdonohoe.com

carbon storage and nitrogen capture wit
legumes www.pleinchamp.co

Estimation of the carbon stock according to soil occupation (in the first 30 centimetres). The stock of organic matter is on average high in forests and grasslands (around 80 t C/ha), average in orchards and crops (50 t C/ha) and fairly low in viticulture (35 t C/ha), although there are significant variations depending on soil management. *Diagram www.gissol.fr*

WHAT ARE THE NEW SOCIETAL CHALLENGES?

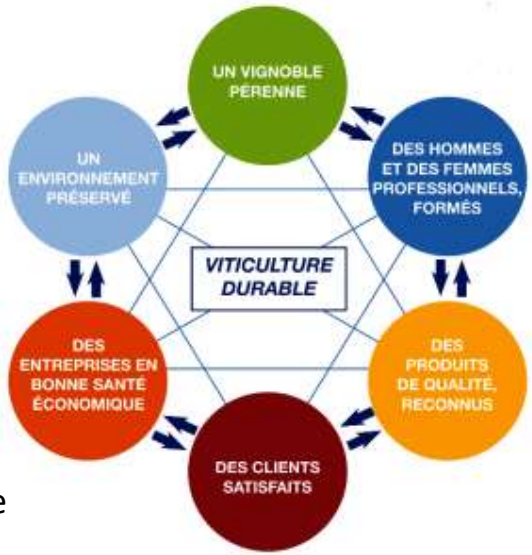
Wineries , which until now have been built mainly with **functional and aesthetic constraints** and according to the culture and financial means of the winegrower, are now becoming places (**built for the decades to come**) whose design must respond to **the concepts of sustainable development**. Thus, many constraints are taken into account:

+ aspects of **limiting energy** consumption, with the use of insulation and renewable energy;

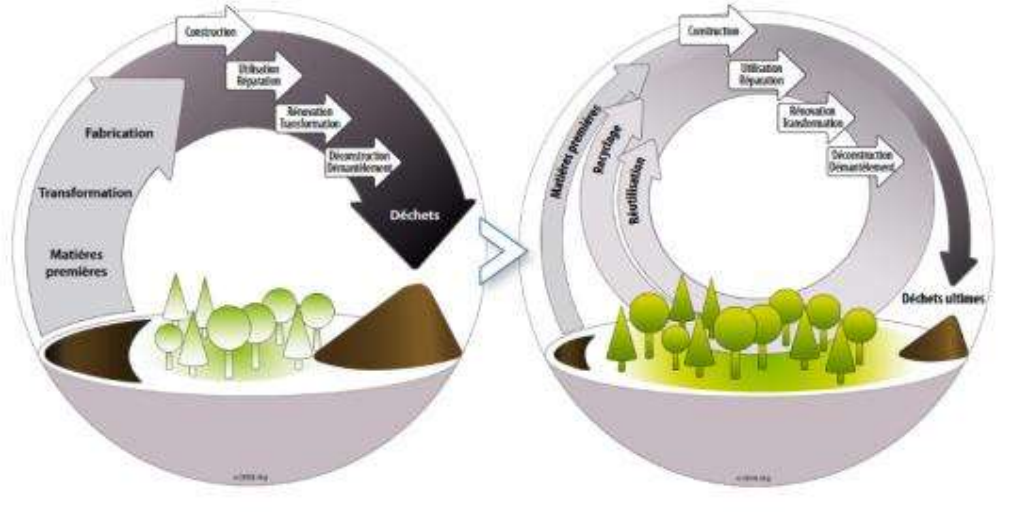
+ **water management** (whose consumption has been greatly increased to ensure hygiene and sanitary safety), combining both technologies allowing its preservation and concerns about its post-operational treatment;

+ **landscape integration**, so that the winery finds its place in the farm (in the same way as the other farm buildings), in visual and functional terms.

+ staff **comfort and safety**



Operational aspects of sustainable development, scheme *www.vins-bourgogne.fr*



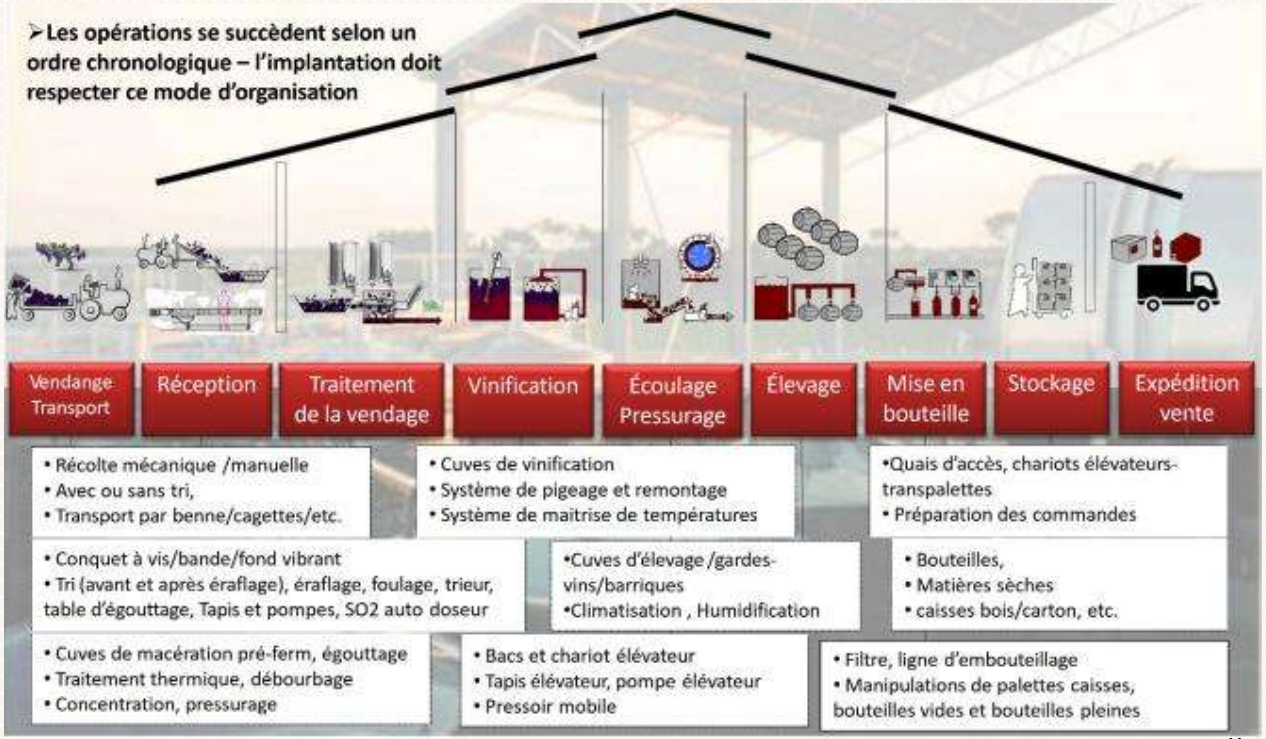
Construction waste management circular economy scheme *www.confederationconstruction.be*

WHAT ARE THE BASICS OF DESIGN?

An ecological cellar is first and foremost a well-designed cellar.

Unlike equipment that can eventually be replaced in the short or medium term, a winery is **built for the long term.** Any design **error** is **detrimental** for **several decades**. Thus, as a prerequisite to the integration of ecological elements, the eco-design of a winery requires that its **operation be rational**, from a qualitative point of view, but also with regard to the **comfort** and **safety of users**. This approach implies, with **the involvement of the operational** and **management staff**, to think very thoroughly, in conjunction with **architects and/or project managers** who, if possible, have **experience in the wine** sector, about the **functions** and **constraints** of the different compartments of the building, without forgetting the **external layout**.

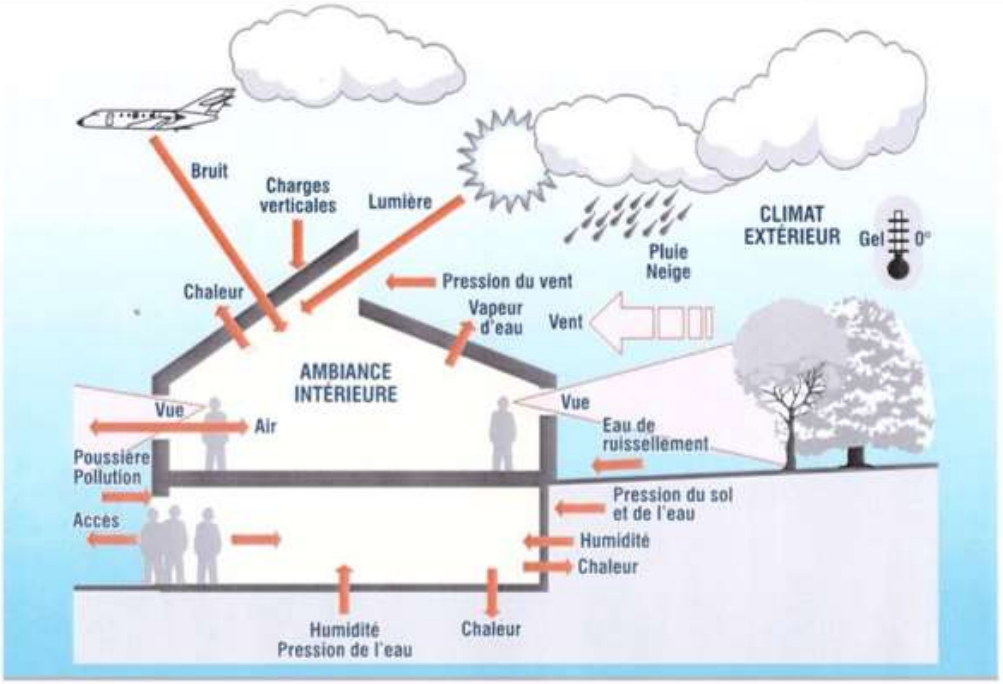
www.engie-axima.fr



Schèma Guilherme Martins Sciences Agro Bordeaux

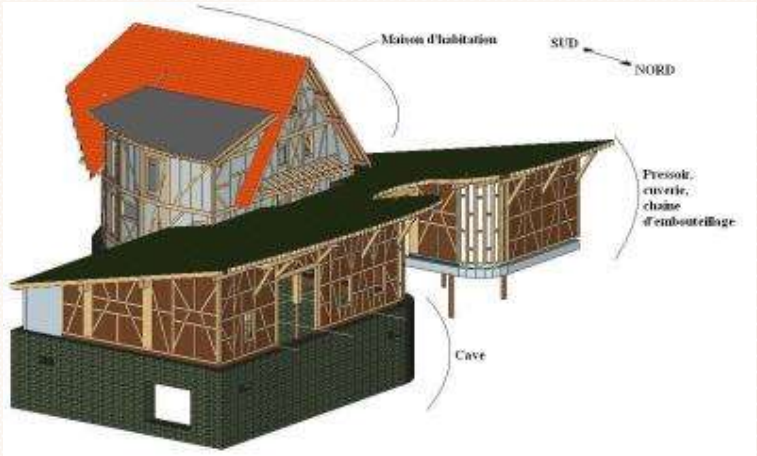
WHAT IS BIOCLIMATIC ARCHITECTURE?

This concept, which has emerged in recent years, is an art and **know-how** for making the most of the **specific features of** a site and its environment, for a desigr that is naturally as **operational** as possible for its users, while optimising **water** and **energy management** in particular. Bioclimatic architecture uses many simple strategies, techniques and construction systems that allow for the **heating, cooling and ventilation of the** interior of a building. These techniques generally use traditional skills and **local materials**, but also **control/regulation systems** that use electronic devices: designed to optimise the use of energy and water.



Les sollicitations de l'enveloppe (*d'après F. Simon*).

Schematic diagram of bioclimatic architecture
Source: Guide de l'architecture bioclimatique A. Liébard A. De Herde



An example of bioclimatic design of a cellar, Léon Boesch, Alsace
www.domaineboesch.fr

HOW TO REGULATE SUNLIGHT NATURALLY IN THE SUMMER AND WINTER?

In addition to the contribution to biodiversity and the aesthetics of the cellar, a pergola contributes to a shading effect in summer which limits excessive sunlight and, conversely, in autumn and winter after the loss of the leaves, allows the sunlight to pass through and provide natural lighting for the buildings

Pergola Winery Kleine
Stellenbosch region
South Africa

Skylight on green roof in
Pergolas Cava Gramona
Penedes Catalonia Spain

Parking in a pergola Bodega Casa
Madero valle de Paras in Mexico

Preferably use resistant varieties to avoid treatments (e.g. Perdin or Candin table grapes, etc.)

www.jardivigne.com

WHAT IS THE HQE (HIGH ENVIRONMENTAL QUALITY) APPROACH?

www.hqegbc.org

The **HQE charter** provides for the following **14 targets to be taken into account** for a better environmental quality of buildings:

- Eco-construction targets (1 to 3):
Harmonious relationship of buildings with their immediate environment, Integrated choice of construction processes and products, Low-nuisance building site.

- Eco-management targets (4 to 7):
Energy management, Water management, Waste management, Maintenance

- Comfort targets (8 to 11):
Hygrothermal comfort, Acoustic comfort, Visual comfort, Olfactory comfort.

- Health and safety targets (12 to 14):
Sanitary conditions, Air quality, Water quality.

HQE uses a multi-criteria approach. For a project to be certified, it must achieve a maximum of 7 targets, with at least 4 targets at the high performance level and 3 at the very high performance level.

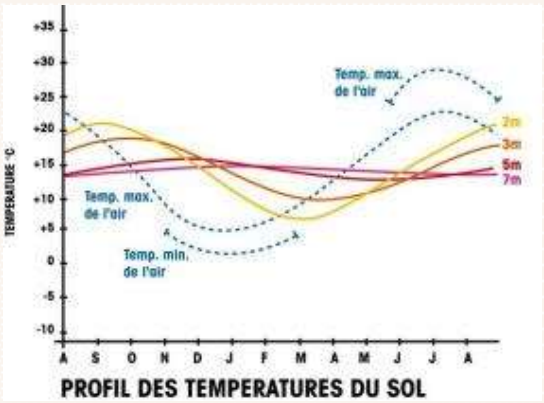
In parallel to the HQE standard in France, many other labels have been developed internationally

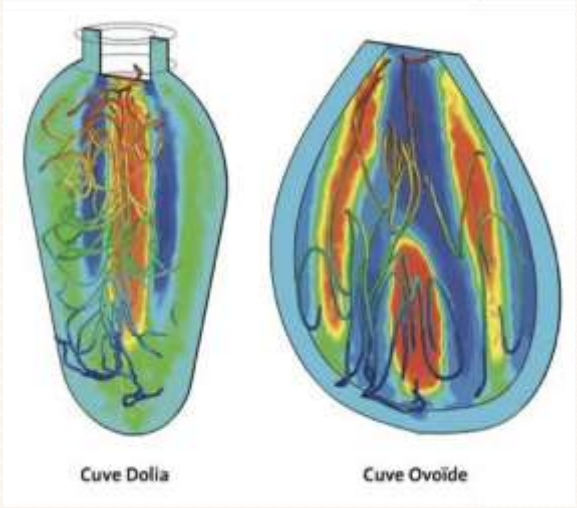
International sustainable building standards

DESIGN OF THE CELLAR: SINCE THE ORIGIN OF WINE, WINEGROWERS HAVE SOUGHT TO BENEFIT FROM THE THERMAL INERTIA OF THE SUBSOIL.

GEORGIA

Georgia's Qvevri ensures a small temperature variation between summer and winter. Photo wikipedia





Study of wine movement according to the shape of the vats R Guillaument Revue Française d'Œnologie May June 2021

ARMENIA

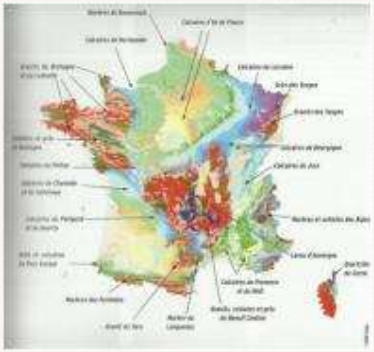
Cave of about 6,100 years in a cave, with a rudimentary press and a clay vat surrounded by grape seeds, dried out vines, and remains of pressed grapes. Arenie region in Armenia.

wikipedia photos

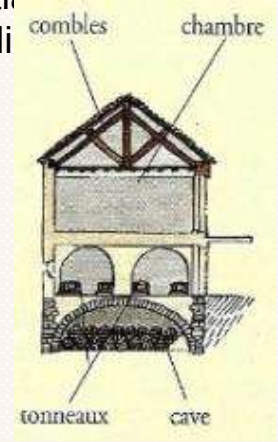
TRADITIONAL WINEGROWERS' HOUSES

The design favours local materials, the thermal inertia of the basement, natural insulation and ventilation according to prevailing winds.

Traditional Moldavian cellar with a green roof



Location of the major stone producing areas in France www.snroc.fr



Traditional winegrower's house with a semi-buried cellar Source encycoledie touristique des vins de France edition Hachette 1994

Traditional house in the Mâconnais region, French wine tourist encyclopedia, Hachette 1994 Drawing by D. Duplantier

Burgundy winegrower's house. Tourist Encyclopedia of French Wines Hachette Edition 1994

Winegrower's house in Alsace www.maisons-paysannes.org

TRADITIONAL UNDERGROUND CELLARS

Stone extraction cellars

Pencils in Reims en Champagne M. Jolyot
www.paysagesduchampagne.fr

Limestone quarry Moldova

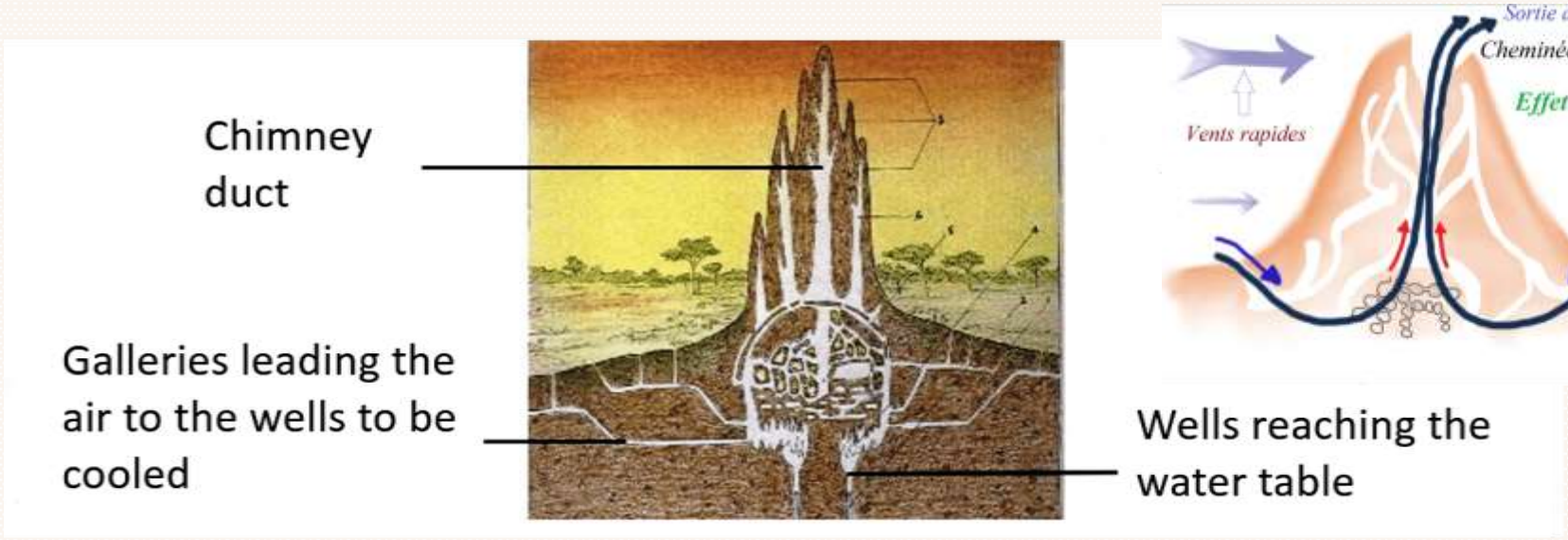
Traditional cellars Ribera Del Duero Spain
Source María José Yravedra.

Tuffeau Chinon Loire Valley

Traditional Tokaj cellars, Hungary © György Darabosbience

BIOMIMMETIC : TAKING INSPIRATION FROM TERMITES

scheme www.biomimtismesite.wordpress.com

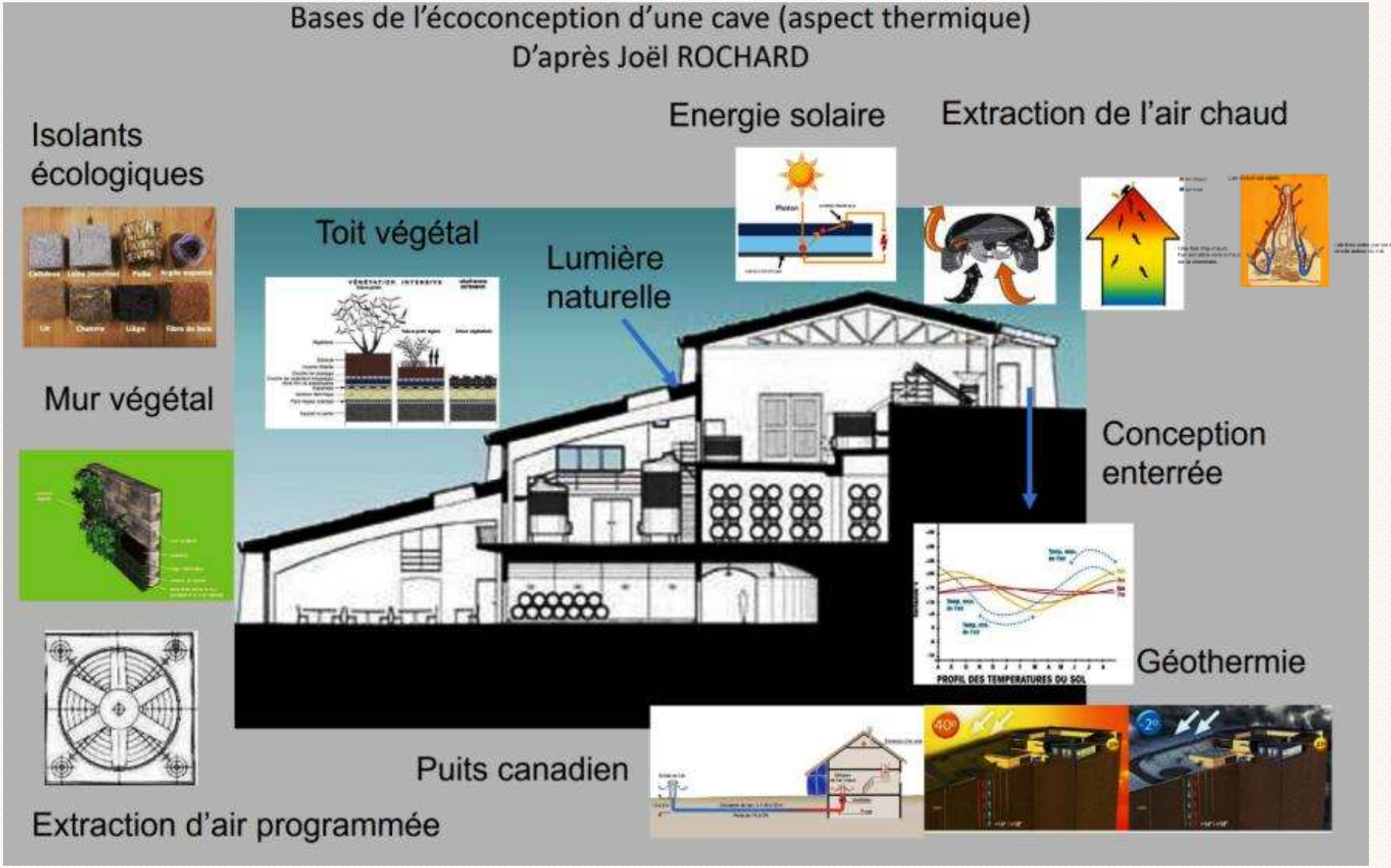


Because of its density, the hot air is drawn upwards and out of the nest through the chimneys. This phenomenon causes a current of air in the lower parts of the nest: the air is sucked by these lower parts thanks to the small holes located all around the nest.

This air circulates underground where it is cooled by contact with very deep wells (15 to 20 m in general, sometimes up to 70 m) that the workers dig to reach the water table.

At night, the temperature can reach 0°c, so they remove openings in order to keep the heat in the termite mound (and a temperature of about 27°)

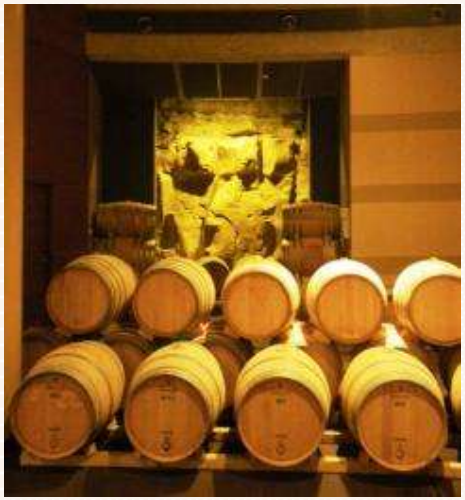
WHAT ARE THE BASICS OF ECO-DESIGN OF A WINERY?



HOW CAN THE LOCAL SOIL AND UNDERGROUND GEOLOGY BE ENHANCED IN THE TOUR CIRCUIT?

Where the local geological conditions are suitable (e.g. **absence of any risk of** excessive **moisture**), it is possible to **retain** at least part of the **local natural structure**. Under certain conditions, it is also possible to assemble **blocks of rock** extracted in the vicinity as an alternative to a concrete structure.

Amyana, San Antonio Valley/Chile

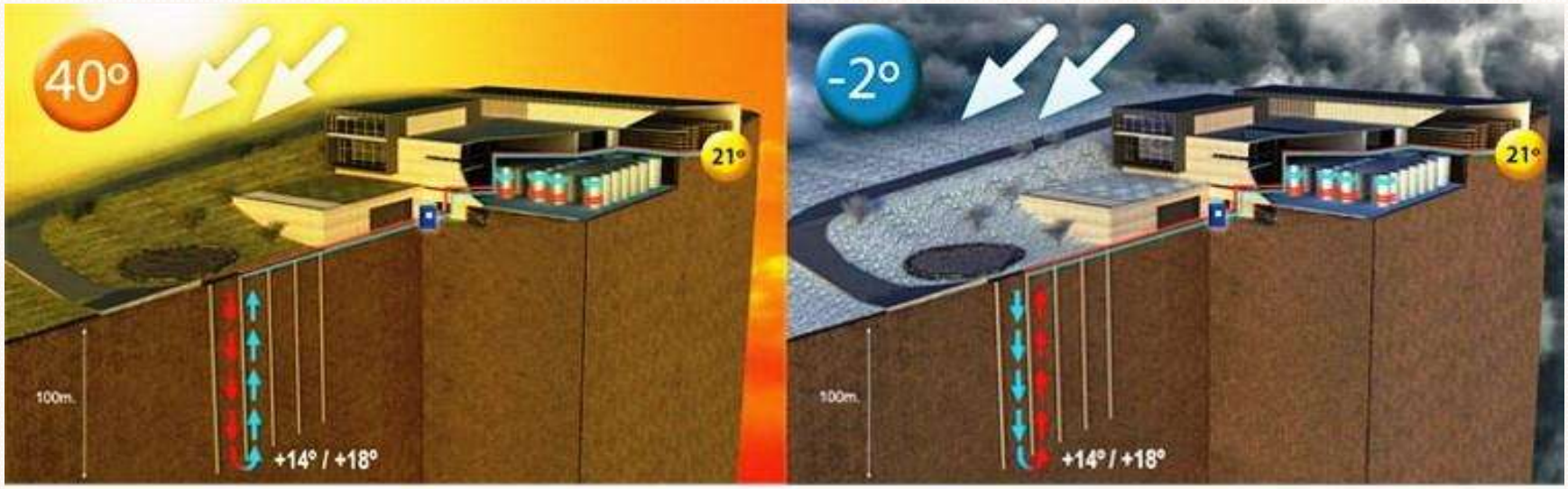


Cellar Le Mortelle Antinori in Tuscany, Italy

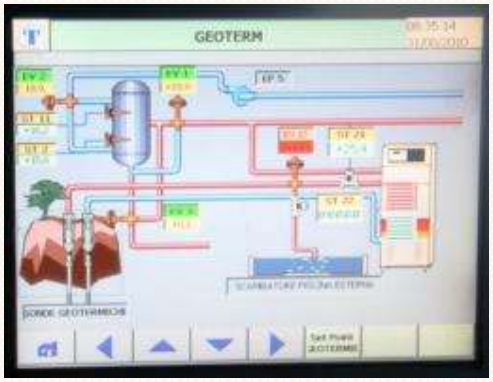
Lebanon Bekaa Chateau Saint Thomas

An example of the assembly of locally quarried stone blocks to form the structure of the Léon Boesch underground cellar, Alsace www.domaineboesch.fr

HOW TO IMPLEMENT LOW ENTHALPY GEOTHERMAL ENERGY?



Geothermal scheme
www.marquesdeteran.com

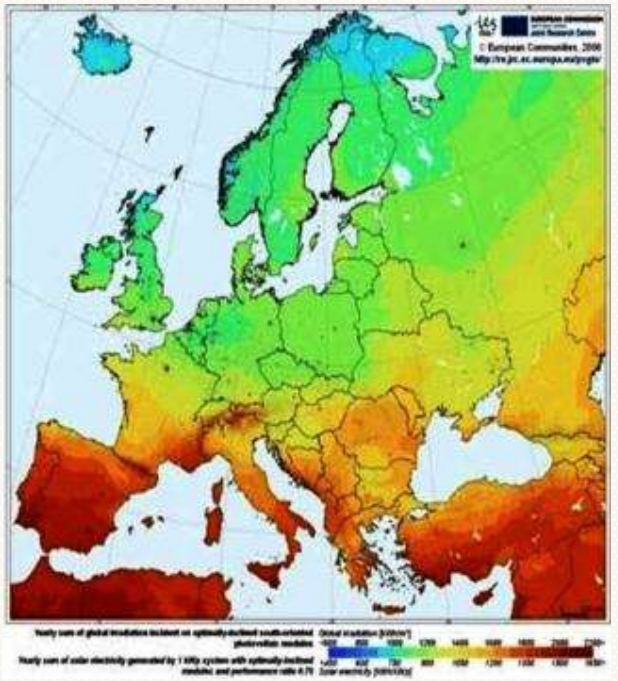


www.amethyst.it

HOW TO USE SOLAR ENERGY?

Solar energy provides temperature conditions favourable to life and drives the water, wind and carbon cycles in the biosphere. But it can also be used directly to produce heat at different temperature levels for a variety of purposes: space heating and cooling, hot water and steam production, and electricity generation through solar collector panels.

The potential for solar energy production varies according to the average local sunshine and the exposure and tilt of the collectors. In the northern hemisphere, the optimum is 35° from the horizontal with a southern orientation.



Potential for solar energy use in Europe (Source PVGIS © European Union, 2001-2012)

© www.ef4.be

orientation	inclinaison par rapport à l'horizontale (°) 0	15	25	35	50	70	90
est	88%	87%	85%	83%	77%	65%	50%
sud-est	88%	93%	95%	95%	92%	81%	64%
sud	88%	96%	99%	max 100%	98%	87%	68%
sud-ouest	88%	93%	95%	95%	92%	81%	64%
ouest	88%	87%	85%	82%	76%	65%	50%

Energy production potential in percentage according to the inclination and orientation of solar collectors (source www.ef4.be)

Miguel Torres Curico/Chili

HOW CAN SOLAR ENERGY PRODUCTION BE PROMOTED IN COMMUNICATION?

Lourensford Winery Stellenbosch
South Africa

LOURENSFORD
ANNO 1700

WHAT IS A GREEN ROOF?

The green roof is placed on a horizontal structure (concrete, steel or wood) which must support the weight of the installation. During rainfall or snow melt, this weight can double or even triple, so it is recommended to build on a slope of 1 to 2% to ensure drainage and limit the overload on the slab.

The waterproofing layer must be compression and root resistant. If the slope is not sufficient to ensure perimeter drainage, a drainage and filtration layer can be installed. This layer allows rainwater to be directed to the gutters and can be completed with a geotextile filter treated against roots to prevent clogging of the gutters and to provide a humid environment for the roots. A growth medium is used to avoid problems with heavy soil when it is waterlogged.

The extensive roof greening system is composed of succulent, creeping and resistant plants: sedums, whose foliage colour changes with the seasons. The interest of this solution is linked to its low weight (from 60 to 100 kg / m²) and its reduced maintenance.

Different components of a green roof *www.sti2d-erembert.fr*

Extensive green roof with sedum planting and drainage system
www.couverture-facile.fr

GREEN ROOF EXAMPLES

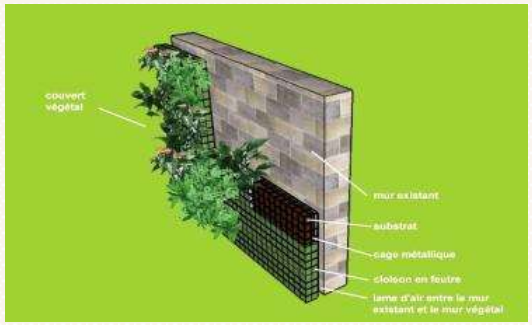
Example in Alsace

Example in Alentejo Portugal

Castel example in the Bordeaux region

HOW TO DESIGN A GREEN WALL?

Miguel Torres Curico/Chili



http://www.murmurevegetal.com/

There are several techniques for building a green wall. The most common is to **build a vertical steel structure parallel to** the building's facade to support it. The space between the wall and the structure allows **air to pass through** and keeps the wall away from the wet area. PVC sheets are attached to the structure to hold polyamide felt sheets for the plants. The **choice of plants** must be considered in relation to the available light, but also to the **climatic conditions** to which the wall is exposed.

Kit device ,
nature and discovery shop, Dijon

HOW TO DESIGN A GREEN WALL?

Grove Library
Perth, Australia

Domaine CHAPOUTIER
Côtes du Rhône

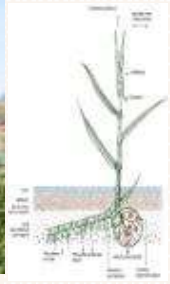
Château des Hospitaliers
(Languedoc)

Winery RUPERT and ROTHSCHILD
South Africa Stellenbosch regions

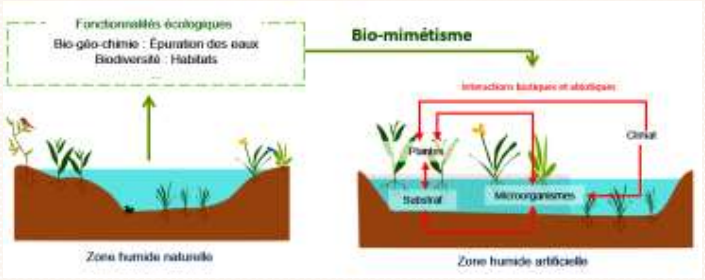
HOW TO SET UP AN ECOLOGICAL EFFLUENT TREATMENT

APPLICATION OF PHYTODEPURATION (ECO-INNOVATION)

Water reuse



Wetland with reeds in the Valais region of Switzerland

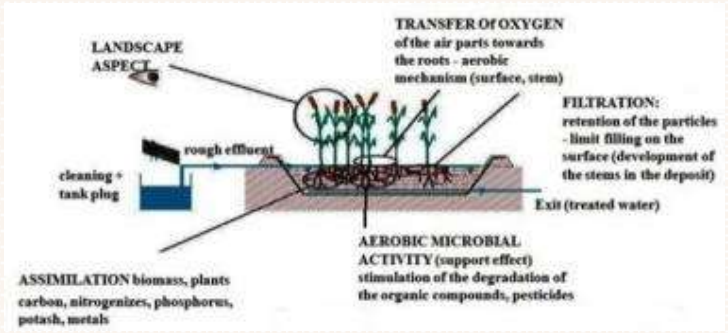


Comparison of a natural wetland with an artificial device. (Biomimicry)

Source Blueset

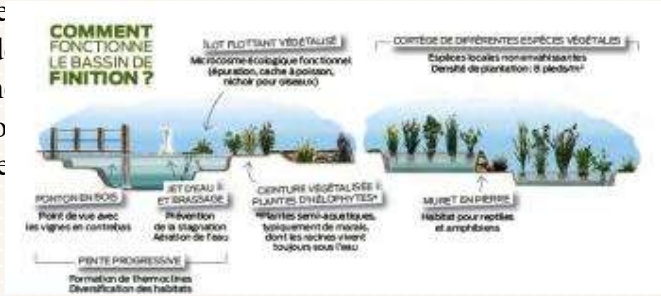
« Nous ignorons la valeur de l'eau tant que le puits n'est pas à sec » (Thomas Fuller).

Aeration tank with risk of olfactory, noise and landscape pollution.



Effluent treatment using a reed bed on a zeolite support with the Zeofito ® system (Baroli winery in the Italian Piedmont)

Bluese device in d Buzet in th south-west o France



https://search.oeno.tm.fr/search?q=novembre+2021

Château de Malleret
Le Pian Medoc Bordeaux

External air inlet

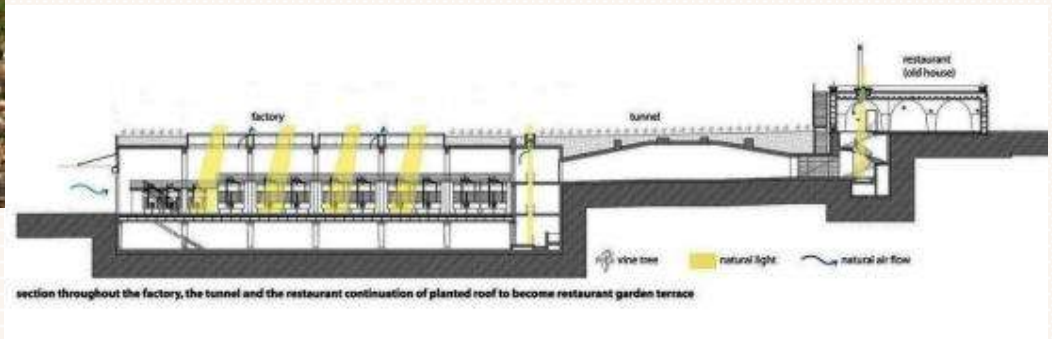
Indoor air diffuser

Dehumidification and distribution of basement air

Antinori Group Tuscany

İXSİR

Lebanon

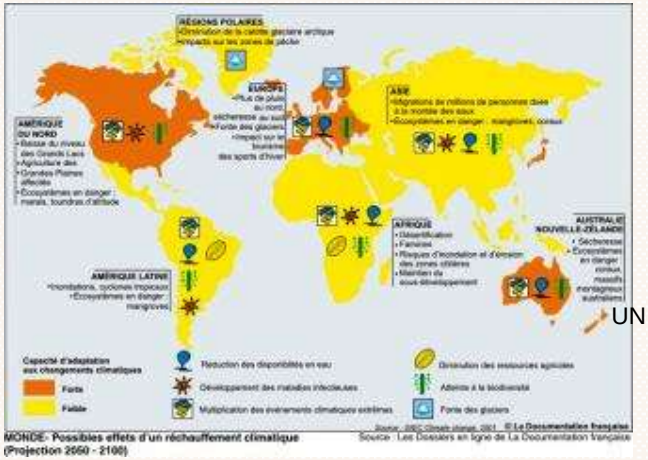


section throughout the factory, the tunnel and the restaurant continuation of planted roof to become restaurant garden terrace

DOMAINE LÉON BOESCH

ALSACE WESTHALTEN FRANCE

GLOBAL SOCIETAL IMPACTS OF THE HUMAN FOOTPRINT : CLIMATE, BIODIVERSITY, WATER, WASTE, etc.

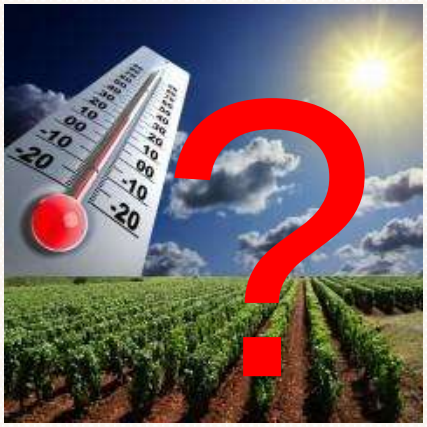


MONDE- Possibles effets d'un réchauffement climatique (Projection 2050 - 2100)
Source : Les Dossiers en ligne de La Documentation française

UN predicts 200 million climate refugees by 2050 www.coe.int

On the shore of an endangered island by photographer Daesung Lee © Musée du quai Branly

www.vie-publique.fr



www.terredevins.com

"The Mediterranean peoples began to emerge from barbarism when they learned to cultivate the olive tree and the vine.

« Les peuples méditerranéens commencèrent à sortir de la barbarie quand ils apprirent à cultiver l'olivier et la vigne. »

Thucydides, Athenian historian "The Peloponnesian War", late 5th century BC

We are simply borrowing our terroirs and landscapes from our children. Culture, including the art of wine tasting, is a mediator between animality and humanity, and is likely to foster links and empathy between people, which is essential for overcoming the challenges of the next few decades, particularly those linked to climate change.

Nous ne faisons qu'emprunter nos terroirs et paysages à nos enfants. La culture, y compris dans l'art de déguster un vin, est une médiatrice entre l'animalité et l'humanité, de nature à favoriser les liens et l'empathie entre les hommes, indispensable pour surmonter les défis des prochaines décennies, liés notamment aux changements climatiques.

Thank you for your attention