ORIENTING THE BUILDING AND ITS SPACES

HAZARD

HEAT

STORMS AND STRONG WINDS

IMPLEMENTATION STEP

CONSTRUCTION

RENOVATION

AREA OF ACTION

ENVELOPE

COST

€ € €

low **medium** high

LEVEL OF SKILL

medium

Many building design plans still do not give any indicator of the building's orientation. Yet the optimal orientation of a building and its interior spaces can significantly increase its resilience to climate hazards (heat waves, rising temperatures, storms and violent winds). The pertinence of this age-old architectural principle is being revived in contemporary bioclimatic designs.

IMPACTS

Optimum building orientation can **significantly improve occupant comfort** in several ways. In summer, west-facing walls, which are exposed to the sun's rays for the longest, can easily reach 60°C. Optimising or limiting the surfaces exposed to solar radiation can lower indoor temperatures by a few degrees in summer, without resorting to intensive air conditioning. Similarly, **winter heating costs can be reduced**, and appropriate sizing of facades exposed to prevailing winds can **bring down the risks of storms and violent winds**.

INSTALLATION GUIDE

In the northern hemisphere, it is possible to optimise solar gain throughout the year. **A north/south building orientation** maximises solar gain in winter, combined with **limited openings on the east/west facades**, which are the most exposed in summer (the angle of incidence of irradiation on the south facade is high, and it is easy to limit solar gain (a)). To protect these facades, options include installing climbing plants (b), **integrating plants directly on a green wall, and** planting trees alongside buildings to provide shade.

In addition, the facade most exposed to wind, which varies according to a number of parameters (regions, plots, topography, etc.), must be identified and designed accordingly. Its repeated exposure to local air flows means that this facade will be cooler.

The **creation of a buffer space** (c) on the north facade, which is less exposed to the sun's rays in both summer and winter, can provide cool islands for use during heatwaves and the summer months. These could be meeting rooms or computer rooms that are used less frequently in an office building, for example.

The internal organisation of the building can also be exploited to improve thermal comfort. Bear in mind that an **atrium design** in commercial buildings can create a favourable environment and improve the thermal comfort (in summer and winter) of adjacent spaces. However, an effective air renewal system, such as ventilation or an adiabatic method, must be carefully implemented to avoid overheating.

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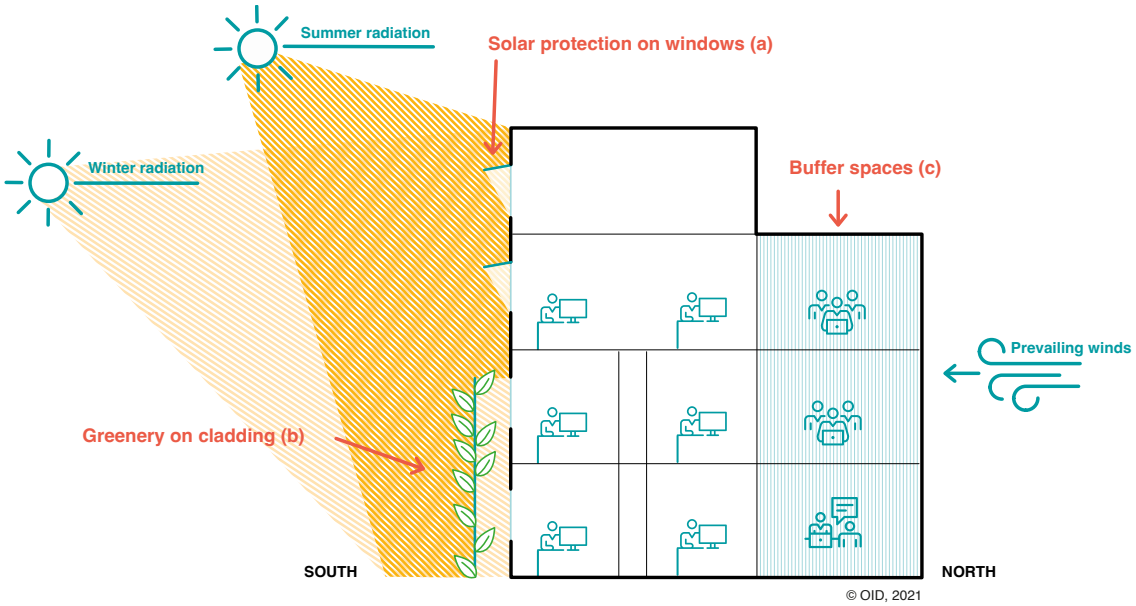
DIAGRAM OF A BUILDING WITH BIOCLIMATIC DESIGN



WEAK POINTS AND STRONG POINTS

⊖ The orientation of the building is not always a matter of choice. For example, in urban areas, this **orientation may be constrained** by proximity to neighbouring buildings.

⊕ This measure mainly applies to buildings under construction, but **the layout of interior spaces** can be reorganised during renovation works to optimise solar gain all year round. **The choice of interior colours** (reflective or non-reflective) can also play a role.

⊕ Bioclimatism is not limited to optimising solar gain, and can be complemented by optimising air flows for **passive cooling** of the building.

MALADAPTATION

Maladaptation can result from the following:

Failure to consider future climate variations

Traditional architectural choices can fail to consider future climate variations. For example, in the northern hemisphere, the tendency is to orient buildings southwards to benefit from the sun's rays in winter. However, in summer, this causes overheating, making interior spaces uncomfortable. Climate change should influence the building's orientation by looking at regions whose climate corresponds to the climate of the future, rather than regions whose climate only resembles the immediate reality of the building's location.

Failure to consider seasonal specificities

Ideally, the orientation of the building should ensure thermal comfort in winter and summer, taking into account the current climate and future climate projections. Adaptations for one season should not have a negative impact on the others. However, a trade-off needs to be made between ensuring coolness in a context of increasingly hot temperatures and providing warmth in cold periods.

Alteration of ecosystems

The siting and orientation of a building must take account of natural ecosystems to avoid the fragmentation of habitats and preserve their integrity. Aquatic ecosystems, which are essential to biodiversity, are particularly sensitive and can be damaged by poor siting that restricts access to wetlands or disrupts water regimes. Building orientation can affect local water systems, such as rainwater collection and drainage. Natural drainage channels should be left clear to prevent flooding and damage to neighbouring structures.

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MONITORING INDICATORS

ESSENTIAL RECOMMENDATIONS WORTH THINKING ABOUT

- CONSTRUCT BUILDINGS IN STAGGERED ROWS
- ORIENT BUILDINGS NORTH/SOUTH
- DESIGN ATRIUM-SHAPED BUILDINGS (COMMERCIAL)

MONITOR MY ACTIONS FOR CLIMATE CHANGE ADAPTATION

+/− : Quantitative indicator ★ : Qualitative indicator

INDICATORS OF MEANS	INTERPRETATION
+/− Percentage of openings on east/west facades (%)	To be minimised
+/− Number of buffer spaces on north facade	To be maximised
+/− Percentage of essential recommendations followed (%)	The maximum number of recommendations must be implemented

INDICATORS OF RESULTS	INTERPRETATION
+/− Temperature in rooms on west-facing side of the building without cooling system (°C)	To be minimised during summer
+/− Number of people who can be accommodated temporarily in buffer spaces on the north facade	To be maximised without reducing user comfort

**The control situation is defined by the parameters set to isolate the influence of the adaptive action (similar conditions: weather, time of measurement, space, etc.).*

TOOL

- Cerema has designed the *RITE* tool (***Risque d'Inconfort Thermique d'Été*** **- Risk of Summer Thermal Discomfort**) to rapidly evaluate the indoor summer comfort of new buildings and renovations in response to climate change. Easy to use by all actors in the building sector, *RITE* has so far only been developed for residential housing.

FIND OUT MORE

Bluetek (2020), *Atriums et confort d'été*

Cerema (2023), *Evaluation du Risque d'Inconfort Thermique d'été face au changement climatique. Présentation et notice d'utilisation*

CLER (2018), *Conception bioclimatique en rénovation*

Observatoire de l'Immobilier Durable (2022), *Architecture bio-climatique et constructions traditionnelles*

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