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Titel	What Is the Ideal Sauna Climate?
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Short answer: There is no single ideal sauna climate that can be defined by one temperature and one relative-humidity value. A traditional Finnish sauna is typically operated at high air temperature—commonly about 80–100 °C—with comparatively little water vapour between Aufguss events. But the thermal environment experienced by the bather is produced by several variables acting together: air temperature, mean radiant temperature, water-vapour pressure, evaporation from the skin, air movement, surface temperatures, bench position and exposure time. Relative humidity is useful for describing how close air is to saturation at a given temperature, but it is strongly temperature-dependent and does not by itself describe the amount of water vapour present. For sauna science, the better question is therefore not 'What is the ideal temperature and humidity?' but 'What combination produces a controllable, tolerable and reproducible thermal dose?'

The climate of a sauna is often reduced to two numbers: temperature and relative humidity. That is convenient for a display panel, but incomplete as physics. A person does not exchange heat with a thermometer or hygrometer. The body exchanges heat and water vapour with the entire surrounding environment.

This is why two sauna cabins showing the same air temperature and relative humidity can feel different. Their wall and ceiling temperatures may differ, the heater may produce different radiant exposure, ventilation may create different air velocities, and the bather may sit at a different height. During an Aufguss, the water-vapour content can change rapidly while the dry-bulb temperature changes very little.

> **Sauna climate is not a pair of numbers. It is a heat- and mass-transfer environment.**

What climate defines a traditional Finnish sauna?

Scientific descriptions commonly place Finnish sauna air at approximately 80–100 °C. A recent review describes traditional Finnish sauna as 80–100 °C with relative humidity around 10–20% [1]. Classic Finnish literature likewise describes 80–100 °C and emphasises air purity, moisture and thermal radiation as determinants of good löyly [2,3].

These ranges describe a recognised sauna form. They should not be mistaken for a universal physiological optimum. Sauna cabins, bathers and bathing practices differ, and an Aufguss temporarily changes the moisture conditions within the same cabin.

Why temperature matters

Air temperature influences convective heat exchange. When sauna air is much hotter than skin, convection can transfer heat toward the body rather than remove it. Increasing the difference between air and skin temperature increases the potential convective heat flow, although the actual transfer also depends on air movement and geometry.

Temperature also changes the physical meaning of humidity. Warm air has a much higher saturation water-vapour pressure than cool air. Consequently, the same relative humidity at two different temperatures does not represent the same amount or partial pressure of water vapour.

Why relative humidity is easy to misunderstand

Relative humidity is the ratio between the actual water-vapour pressure and the saturation vapour pressure at the same temperature. It therefore answers a specific question: how close is the air to saturation at this temperature?

It does not directly answer: how much water vapour is present? Because saturation vapour pressure rises steeply with temperature, 10% relative humidity in very hot sauna air can coexist with a substantial water-vapour pressure.

This is why relative humidity should never be interpreted without temperature. Reviews of atmospheric moisture make the same methodological point: variables such as vapour pressure, absolute humidity and mixing ratio describe moisture content differently from relative humidity, which contains a strong temperature dependence [4].

> **Relative humidity without temperature is incomplete information.**

Absolute humidity: how much water vapour is in the air?

Absolute humidity expresses the mass of water vapour per unit volume of moist air, commonly in g/m³. This makes it intuitively useful in sauna practice because an Aufguss literally adds a mass of water to a defined cabin volume.

If 600 g of water were completely vaporised and uniformly retained in a 30 m³ cabin, the simple arithmetic addition would be 20 g/m³. Real cabins are not closed, perfectly mixed vessels: ventilation removes vapour, some water may not remain airborne, and temperature and spatial gradients matter. Nevertheless, g/m³ provides a useful bridge between water quantity and cabin volume.

For professional Aufguss practice, this is often more informative than reporting relative humidity alone.

Water-vapour pressure: the thermophysiological variable

Water vapour is one component of the gas mixture in the sauna. Its partial pressure—water-vapour pressure—is especially useful for understanding evaporation at the skin.

Sweat can evaporate when there is a favourable vapour-pressure gradient between the wet skin surface and the surrounding air. As ambient water-vapour pressure rises, this gradient becomes smaller and evaporative heat loss becomes more difficult.

This is the central physical reason why adding water vapour can make a sauna feel dramatically hotter without requiring a large rise in air temperature.

Relative humidity, absolute humidity and vapour pressure are not rivals

The three quantities answer different questions. Relative humidity describes proximity to saturation. Absolute humidity describes water-vapour mass per air volume. Vapour pressure describes the pressure contribution of water vapour and is directly relevant to mass transfer from wet skin.

For everyday operation, temperature plus relative humidity may be convenient. For comparing Aufguss water quantities, absolute humidity can be useful. For explaining evaporation and condensation, water-vapour pressure and dew point are often more physically informative.

Good sauna science therefore chooses the humidity variable according to the question rather than treating one percentage as a complete description of the climate.

Why does Aufguss change the climate so quickly?

When water reaches sufficiently hot stones, a substantial fraction can evaporate rapidly. The additional vapour is transported into the cabin and redistributed by buoyancy, ventilation and fanning.

The dry-bulb air temperature need not rise. Indeed, evaporation itself consumes energy from the stones and local air. Yet the bather's heat exchange changes because the water-vapour pressure has increased and the evaporative gradient at the skin has decreased.

A 2026 study of 50 healthy adults under typical Finnish sauna conditions found that both air temperature and relative humidity were independently associated with heart-rate and core-temperature responses. Across the observed sessions, heart rate increased by an average of about 42 beats/min and core temperature by about 0.4 °C; higher temperature and higher RH were each associated with greater physiological strain [5].

> **An Aufguss can increase thermal strain without producing a meaningful rise in the thermometer reading.**

What about condensation on the skin?

Condensation is possible when the local water-vapour pressure is high enough that the dew-point temperature exceeds the temperature of the receiving surface. If vapour condenses on the skin, latent heat is released at that surface.

This mechanism is physically real, but it should not be invoked indiscriminately for every sensation of Aufguss heat. The 2026 Finnish-sauna study used the difference between dew point and skin temperature as an index of condensation potential and found only weak associations with heart rate and no significant association with core-temperature change [5].

The prudent interpretation is therefore that increased humidity clearly alters physiological strain, while the quantitative contribution of actual skin condensation under typical sauna conditions remains a question requiring more direct measurement.

Radiation: the climate variable that displays often ignore

Thermal radiation depends on the temperatures and emissive properties of the surfaces surrounding the bather. Hot walls, ceiling, heater and stones exchange infrared radiation with the skin.

A cabin in which the structural surfaces are thoroughly heated can therefore impose a different radiant load from one in which air temperature has risen rapidly but surfaces remain cooler. This difference may not appear on the ordinary wall thermometer.

Classic work on good löyly explicitly identified thermal radiation alongside temperature and moisture as a defining property of the sauna environment [2]. General human heat-balance models likewise treat radiation as a separate heat-exchange pathway [6].

Mean radiant temperature

In thermal science, the combined radiant influence of surrounding surfaces can be represented by mean radiant temperature. This is not normally displayed in public saunas, but conceptually it explains why air temperature alone cannot characterise the thermal environment.

A person facing a strongly radiating heater and another person shielded from it can experience different local heat fluxes even when both are surrounded by air at the same measured temperature.

Air movement: small variable, large local effect

Air velocity affects convective heat transfer and the transfer of water vapour at the skin. Moving air disrupts the warm, humid boundary layer adjacent to the body.

In a cool or dry environment, this can enhance evaporative and convective cooling. In a sauna, however, the moving air itself is hot. During Aufguss it may also be moisture-rich. Fanning therefore increases local heat and mass transfer and can produce a strong increase in perceived heat.

The fan does not create thermal energy. It changes how efficiently the existing heat and water vapour are transported to and from the skin.

Ventilation is part of sauna climate

Ventilation supplies fresh air, removes carbon dioxide, odours and excess moisture, and influences temperature and vapour distribution. It also creates air movement.

Too little ventilation can allow air quality and moisture distribution to deteriorate; poorly positioned or excessive airflows can create unwanted local cooling or disturb the intended temperature stratification. Sauna climate and indoor-air quality therefore cannot be designed independently.

Why bench height matters

Sauna air is vertically stratified. The upper part of the cabin is generally hotter than the lower part. The bather's position therefore changes the local air temperature and radiant environment without changing the heater setting.

This is one of the elegant features of a well-designed sauna: guests can regulate their own thermal dose by changing bench level. A single wall-mounted climate reading cannot represent every position in the cabin.

Where should temperature and humidity be measured?

Measurement location matters. A sensor near the ceiling, near the door, above the heater or close to a ventilation inlet can report conditions that differ substantially from those at the bather's body.

For scientific characterisation, multi-point measurements are preferable. The 2026 Finnish-sauna study used detailed multi-point environmental monitoring precisely because temperature and humidity vary spatially within the cabin [5].

For routine operation, sensors remain useful, but their readings should be interpreted as measurements at a defined location—not as the exact climate at every guest's skin.

Is there an ideal combination of temperature and humidity?

There is no single pair of values that can be defended as a universal biological optimum. A traditional Finnish sauna has a characteristic high-temperature, relatively dry baseline climate, but individual preference and thermal tolerance vary.

More importantly, an identical temperature/RH pair can occur with different radiant conditions, air velocities and exposure histories. The bather's actual thermal dose also depends on time.

An 'ideal' climate should therefore be defined functionally: it permits a controllable heat stimulus, supports evaporation between Aufguss events, provides acceptable air quality, allows guests to adjust exposure by position and time, and does not require extreme conditions to produce the intended sauna experience.

What does 'good löyly' mean scientifically?

The classic paper The Secret of Good Löyly argued that good löyly depends on the purity, temperature and moisture content of sauna air together with thermal radiation [2]. That remains a remarkably modern description because it treats sauna as a multivariable physical environment.

Contemporary physiology adds the bather to this system: sweat production, evaporation, skin temperature, circulation and individual tolerance determine how the same cabin climate is translated into physiological strain.

> **Good löyly is not maximum heat or maximum humidity. It is a well-controlled interaction between the cabin and the bather.**

Why a single 'felt temperature' is difficult

For outdoor weather, combined indices can estimate thermal stress from temperature, humidity, radiation and wind. Sauna conditions are more extreme and include large vertical gradients, strong radiant sources, sweating, minimal clothing and rapid transient changes during Aufguss.

A simple consumer 'feels like' value therefore risks hiding the mechanisms that professional sauna practice needs to understand. For training and standardisation, it is better to document the relevant physical variables explicitly.

A practical climate model

For professional purposes, sauna climate can be understood in six interacting layers: air temperature establishes the convective environment; surface temperatures establish the radiant environment; water-vapour content and pressure influence evaporation; air movement controls local heat and mass transfer; ventilation shapes air quality and distribution; and exposure time converts instantaneous conditions into thermal dose.

The bather then adds a seventh layer: body size, hydration, acclimatisation, health, posture and individual thermoregulatory response.

This model explains why temperature alone is insufficient and why humidity should not be reduced to a single relative-humidity percentage.

So, what is the ideal sauna climate?

For a traditional Finnish sauna, approximately 80–100 °C with comparatively dry baseline air is a well-established reference range in the scientific literature [1–3]. But the ideal climate cannot be specified responsibly by temperature alone, nor by a temperature/RH pair.

A high-quality climate is thermally coherent: surfaces are appropriately heated, radiation is not excessive or dangerously localised, ventilation provides good air quality, moisture can be controlled, Aufguss produces a predictable temporary vapour load, and bathers can regulate exposure by time and bench position.

In other words, the ideal climate is not the climate with the most impressive numbers. It is the climate whose heat transfer can be understood and controlled.

> **The ideal sauna climate is not a fixed point on a thermometer and hygrometer. It is a controllable thermal system.**

Conclusion

Sauna climate is created by the interaction of temperature, radiation, water vapour, evaporation, air movement and time. Relative humidity remains a useful operational measurement, but because it depends strongly on temperature it cannot describe moisture content on its own. Absolute humidity and water-vapour pressure answer different and often more useful questions.

Recent experimental evidence reinforces this multivariable view: both temperature and humidity independently contribute to acute physiological strain during Finnish sauna bathing [5]. Classic sauna engineering reached essentially the same conceptual conclusion decades earlier by identifying air purity, temperature, moisture and thermal radiation as the foundations of good löyly [2].

For sauna science and professional practice, the best climate is therefore not defined by maximising any single variable. It is defined by creating a reproducible, adjustable and physiologically tolerable heat-and-mass-transfer environment.

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Editorial note: This article is intended for scientific and educational information. Numerical climate values should always be interpreted together with measurement location, cabin design, exposure duration and the characteristics of the bather.