Tower of Atmospheric Relations

2008

Project by fabric | ch

Competition: Climate Clock

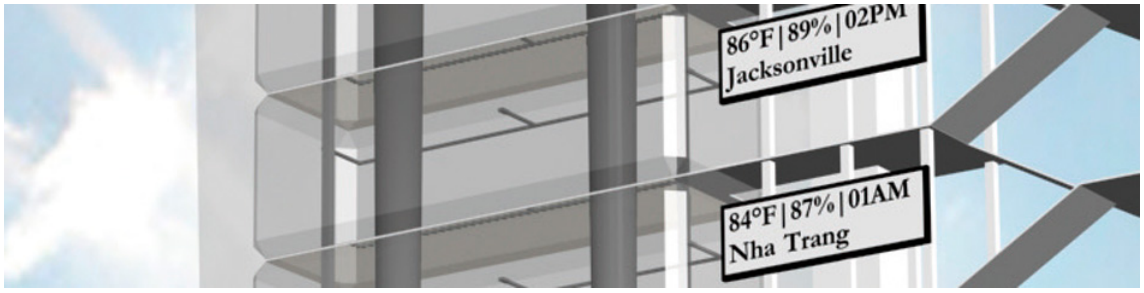
Location: San Jose City (CA, USA)

Exhibition during the Climate Clock Colloquium in San Jose (CA, USA)

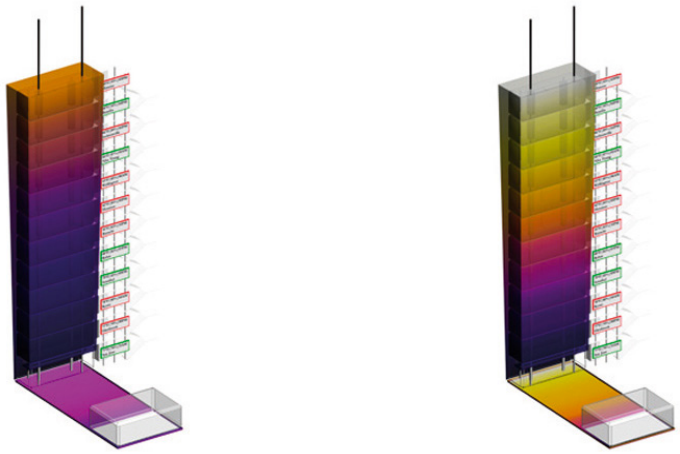
- Architecture as a monitored volume of air
- Communicating, “Channeled” & “breathing” space
- Climate tower, based on greenhouses & albedo principles, thermal inertia & exchanges
- Enclosed and networked atmospheric environment
- Monitored & comparative architecture
  (CO2 levels, climate data & energy consumption comparisons between locations on the planet)


90°F | 93% | 03PM
Manaus
88°F | 91% | 04PM
Brasilia
86°F | 89% | 02PM
Jacksonville
84°F | 87% | 01AM
Nha Trang
83°F | 85% | 06AM
Wellington
82°F | 84% | 01PM
Houston
81°F | 83% | 11PM
Karachi
80°F | 82% | 07PM
Rabat
79°F | 81% | 09PM
Istanbul
78°F | 80% | 04AM
Kyoto
77°F | 79% | 00PM
Glenbrook
77°F | 78% | 11AM
San Jose

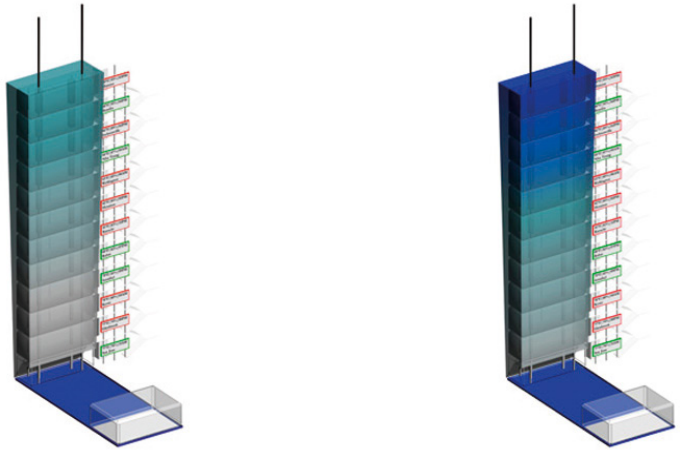
[Img. 1]


86°F | 89% | 02PM
Jacksonville
84°F | 87% | 01AM
Nha Trang

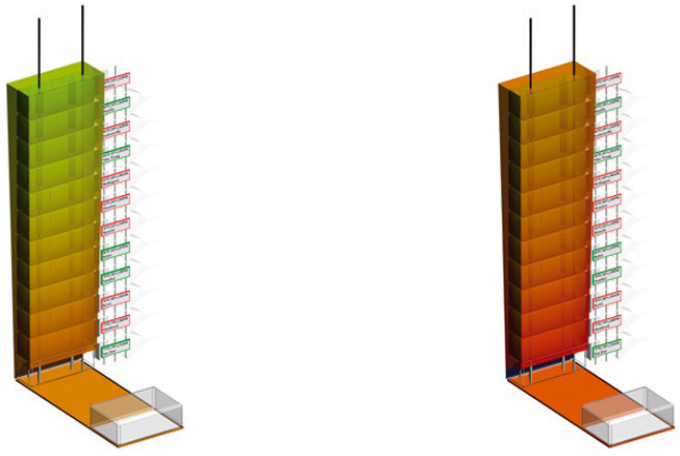
[Img. 2]



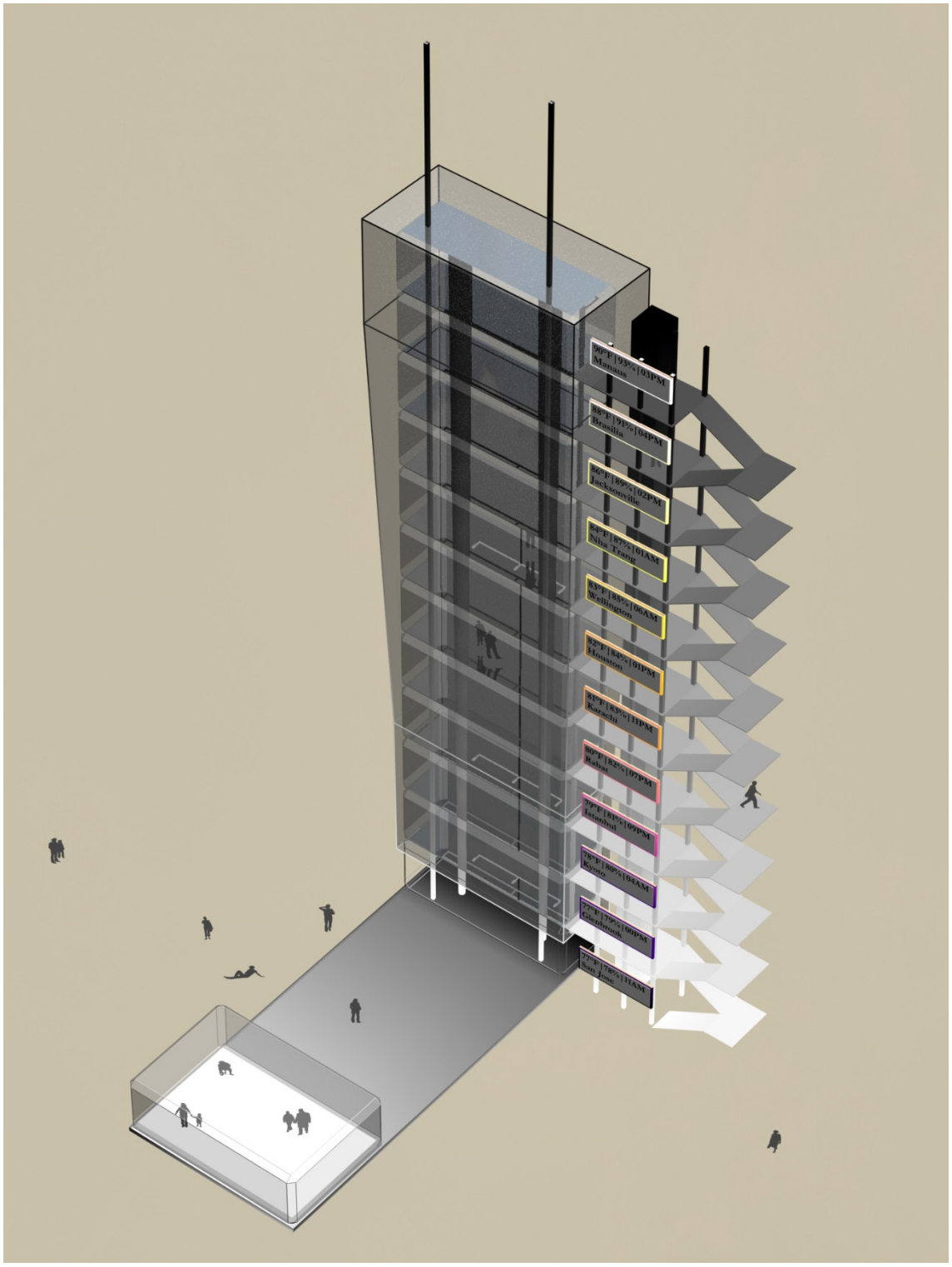
[Img. 3]



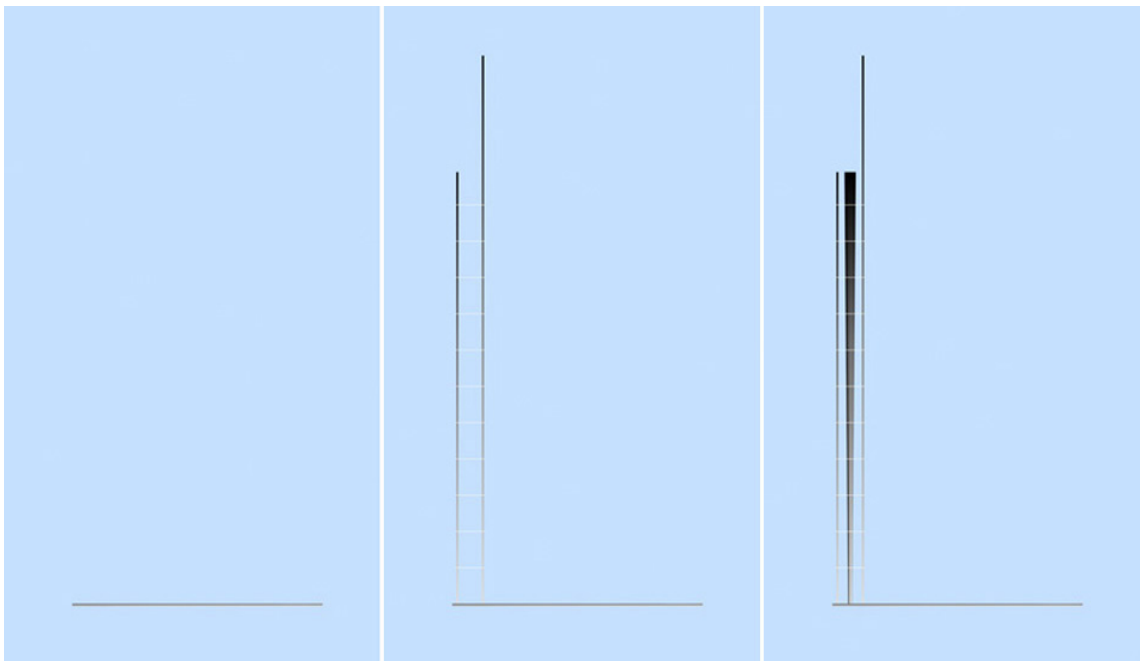
[Img. 4]



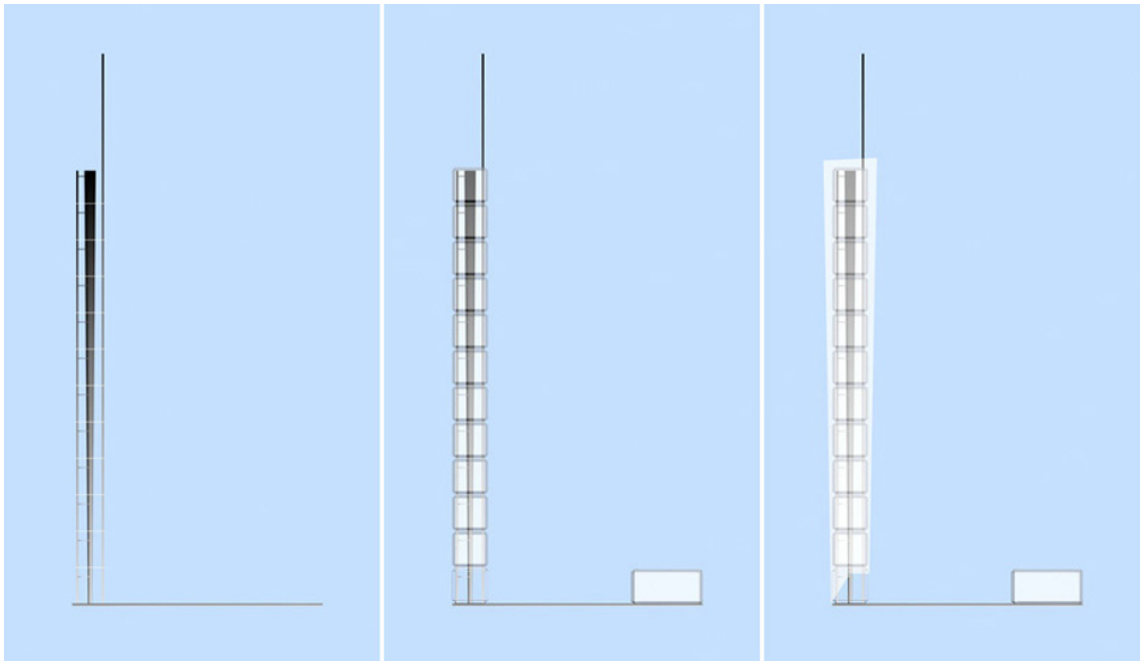
[Img. 5]


90°F | 93% | 03PM
Manaus
89°F | 91% | 03PM
Brasilia
85°F | 92% | 02PM
Jacksonville
83°F | 87% | 10AM
Nha Trang
83°F | 83% | 06AM
Wellington
82°F | 84% | 10PM
Houston
81°F | 83% | 11PM
Karachi
80°F | 82% | 07PM
Rabat
79°F | 81% | 09PM
Istanbul
78°F | 80% | 10AM
Kyoto
77°F | 76% | 09PM
Gothenburg
76°F | 78% | 11AM
San Jose

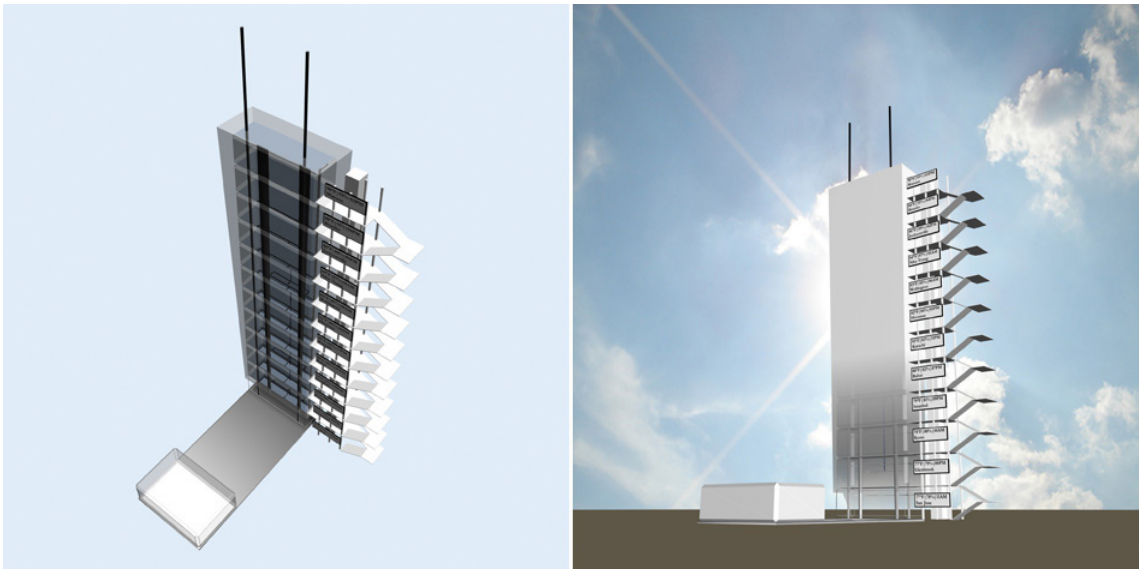
[Img. 6]



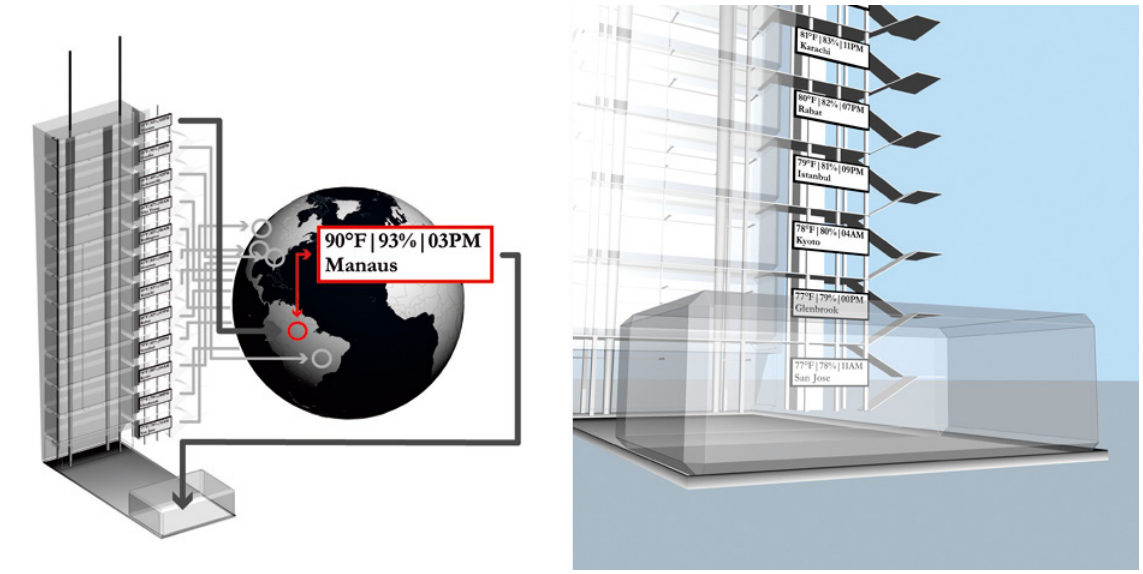
[Img. 7]



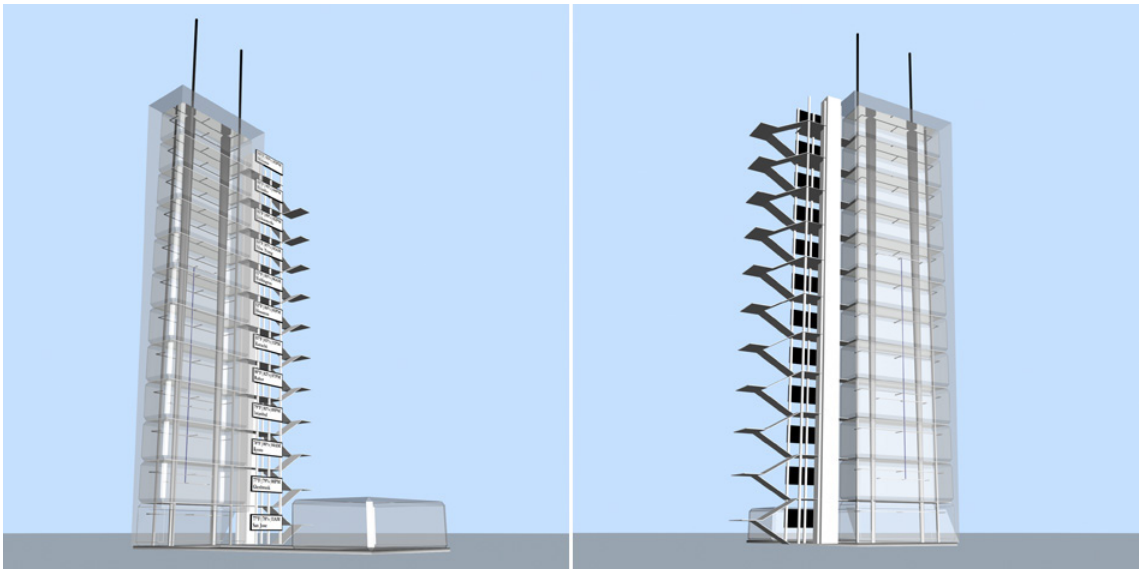
[Img. 8]



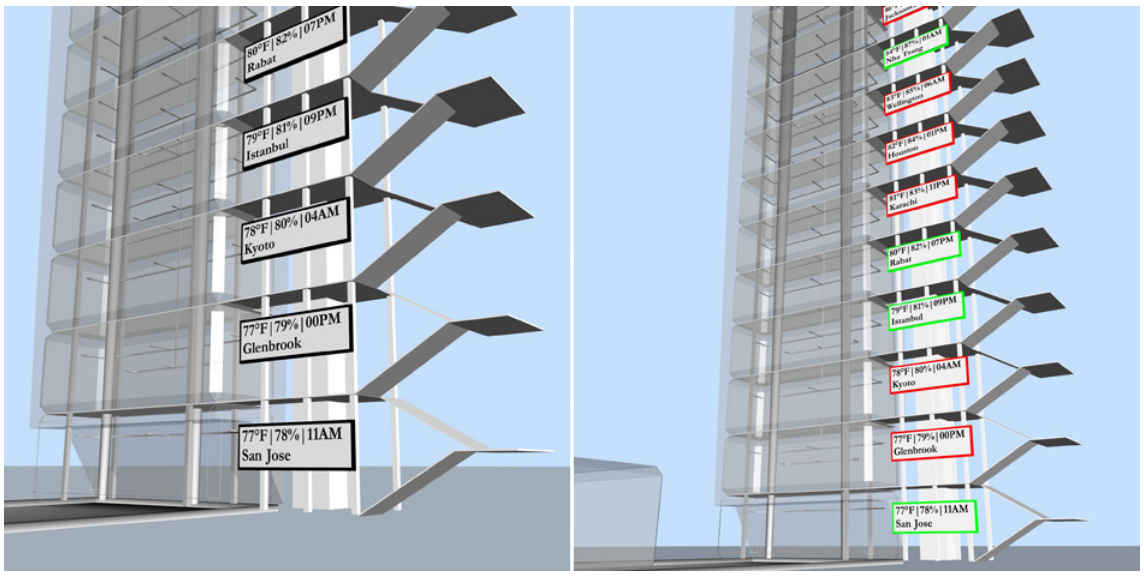
[Img. 9]



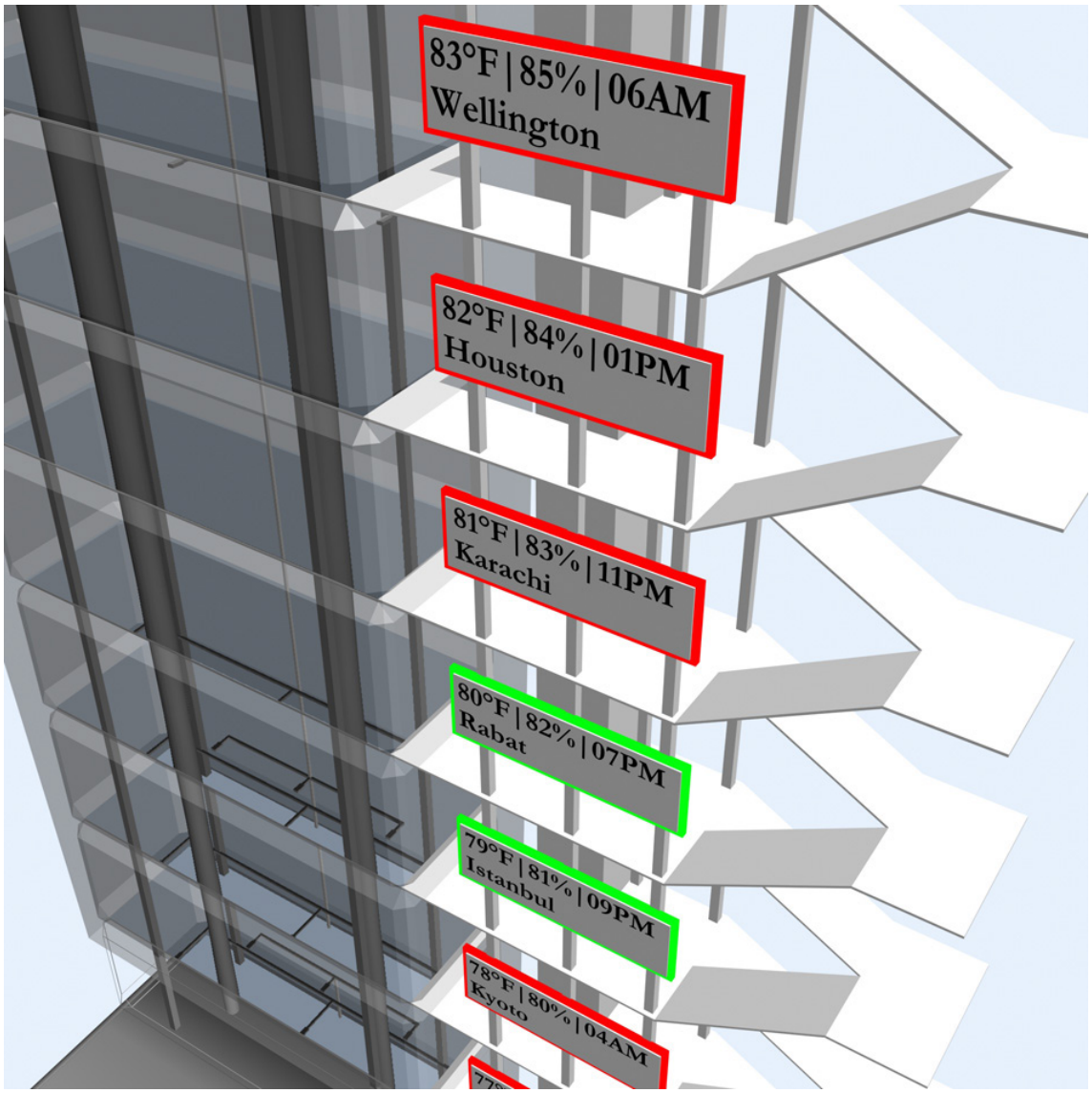
[Img. 10]



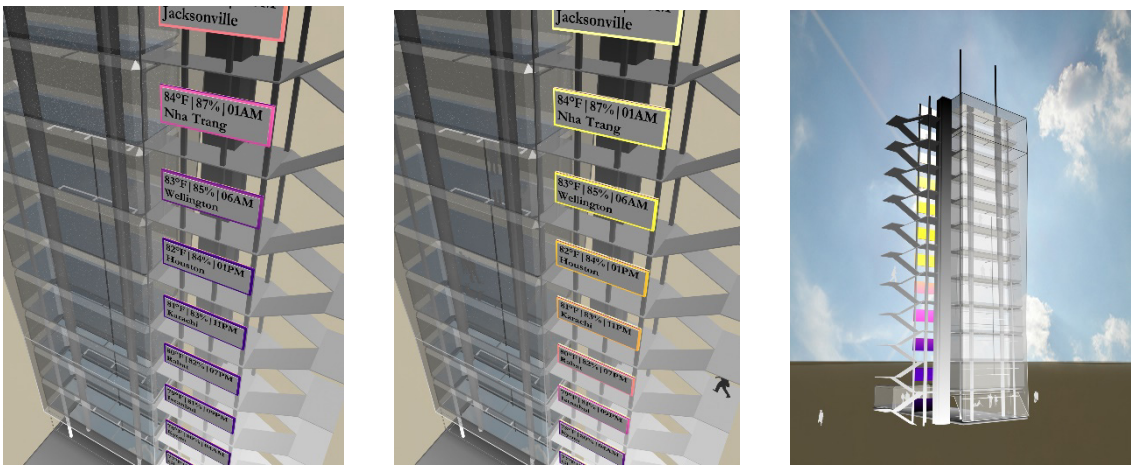
[Img. 11]


80°F | 82% | 07PM
Rabat
79°F | 81% | 09PM
Istanbul
78°F | 80% | 04AM
Kyoto
77°F | 79% | 00PM
Glenbrook
77°F | 78% | 11AM
San Jose

[Img. 12]


83°F | 85% | 06AM
Wellington
82°F | 84% | 01PM
Houston
81°F | 83% | 11PM
Karachi
80°F | 82% | 07PM
Rabat
79°F | 81% | 09PM
Istanbul
78°F | 80% | 04AM
Kyoto

[Img. 13]


Jacksonville
84°F | 87% | 01AM
Nha Trang
83°F | 85% | 06AM
Wellington
82°F | 84% | 01PM
Houston
Jacksonville
84°F | 87% | 01AM
Nha Trang
83°F | 85% | 06AM
Wellington
82°F | 84% | 01PM
Houston

[Img. 14]


90°F | 93% | 03PM
Manaus
88°F | 91% | 04PM
Brasília
86°F | 89% | 02PM
Jacksonville
84°F | 87% | 01AM
Nha Trang
83°F | 85% | 06AM
Wellington
82°F | 84% | 01PM
Houston
81°F | 83% | 11PM
Karachi

[Img. 15]

Image captions:

[Img. 1] The Tower of Atmospheric Relations is an enclosed volume of air divided into twelve different sub-volumes. The main building's envelope (a second skin) is open on the bottom and closed on the top so that the enclosed air cannot "escape": it must undergo thermal changes. The air can circulate vertically in the tower due to the "porosity" of the floors and ceilings (surfaces treated as mirrors) of each of the twelve sub-volumes. A thin layer of water evaporates constantly from the ground into the tower.

[Img. 2] Picture detail on the tower: on the right, electronic ink screens display information about each related sub-volume. Inside each box, a mesh of climatic and atmospheric sensors is found. Another less dense mesh of jet nozzles that produce water mist can modify the overall thermal balance of the tower from time to time (i.e., when the temperature is the same everywhere and/or too polluted). The tower "breathes."

[Img. 3] Basic heating scheme during a regular day in San Jose: the tower's air is relatively cold in the morning (a variation in temperature between the top and bottom of the tower remains from the day before), it heats during the day. The hotter air concentrates at the top. The thin layer of water on the floor also gets warmer and evaporates (partly into the tower).

[Img. 4] Basic evaporation scheme during a regular day: the thin layer of water on the ground between the "displaced-information-cafe" and tower evaporates. The air contained in the tower, getting warmer along with the day, can concentrate more humidity. The hotter air at the top of the structure is getting more humid. It condenses eventually on the glass walls (in particular, at the end of the day, cooling down the temperature) and runs down again to the ground and into the basin.

[Img. 5] Basic greenhouse gas (different than H_2O) and pollution particulate concentration scheme during a regular day in San Jose: it is assumed that the air is less polluted in the morning and that the particulates, being heavier than air, will concentrate more densely on the lower levels of the Tower of Atmospheric Relations.

[Img. 6] The albedo gradient on the different surfaces of the tower, as well as the color treatment on the electronic ink billboards: these panels obtain their color through the current heat, evaporation-humidity and greenhouse schemes captured by the sensors inside each of the the 12 sub-volumes.

[Img. 7] Structural layers of the tower, from left to right (side view):
Left: a thin layer of water on the ground.
Center: the main structure of the building, also supporting all communication and sensor devices (varnished bottom to top in a white to black gradient).
Right: two "albedo" cylinders that reduce the volume of air from bottom to top in the main 12 sub-volumes (and varnished into a white to black gradient, as well). The overall structure tends therefore to reflect the sun on the lower levels and absorb its rays on the higher ones.

[Img. 8] Structural layers of the tower, from left to right (side view):
L: it is hard to see on the image, but a sub-network of sensors is attached to the main structure on the left. It contains climate (heat, humidity, pressure, and so on) and atmospheric (greenhouse gases + pollution particulates) sensors.
C: the twelve glass boxes have sealed sides, porous floors, and ceilings (with the exception of the fully open ground floor level) + the "displaced-information-café" (info box) on the right (also a glass volume, but confined and conditioned).
R: a second skin envelops the 12 sub-volumes. It acts as an insulation air layer for the overall structure. Being larger at the top than at the bottom, the thermal inertia is larger on the higher levels than on the lower ones: it increases the atmospheric fluctuations within the tower and the difference with the outside climatic conditions.

[Img. 9] L: the shallow water basin on the ground is also coated with a black to white gradient: white on the "displaced-information-café" side and black under the tower. It increases the heating and evaporation of the water under the tower. R: the tower façade is a bit porous on the lower levels and totally hermetic on the higher ones.

[Img. 10] L: thanks to the mesh of sensors inside the Tower of Atmospheric Relations, each of the 12 sub-volumes comprising it are compared to global climatic information. Each of the twelve sub-volumes finds a match through network analyses and data collection: a "climate twin" somewhere else on the earth undergoing the same climatic conditions as it does. This information is displayed on a big electronic ink billboard on the right of each volume.
Every hour, one level is selected and transmitted, artificially reproduced (air conditioning) into the "displaced-information-café," along with other climatic information regarding this distant place.
R: the overall tower can be observed from within the "displaced-information-café." Information about the actual energy consumption of the Tower of Atmospheric Relations is also displayed in the information box.

[Img. 11] The Tower of Atmospheric Relations, front and back views. The "mirror" floors and ceilings tend to erase sub-levels and strengthen the visual continuity of the volume of air and the two "albedo" cylinders. The volumes can be visited and experienced by visitors. They have the choice to use stairs or electric lift elevators to do so. In the latter case, this will have a direct effect on the energy consumption display in the information box.

[Img. 12] Detail on the electronic ink billboards. Each one displays the atmospheric information for the related distant location connected temporarily to its sub-volume (these "connections" and climatic "links" change when the weather conditions in the tower or at the distant location change, when the "match conditions" are lost and need to be refreshed). Every 30 minutes, as an alternative to the black-framed version or the heat, evaporation and greenhouse schemes, the billboards also display different colors: red or green. This is to underline the fact that the related locations are decreasing or increasing their average annual CO2 emissions.

[Img. 13] Detail on the colored information billboards, atmospheric information and distant locations.

[Img. 14] Heat scheme, a.m. & p.m., front and back sides.

[Img. 15] Close view of the font façade, the mesh of sensors and the mirrored floors and ceilings of the Tower of Atmospheric Relations, plus the two "albedo" cylinders.

Txt

Tower of Atmospheric Relations

About the Climate Clock competition in San Jose (excerpt from brief): Climate Clock will be a work of landmark art that should incorporate Silicon Valley's measurement, data management, and communications technologies to help people understand climate change while encouraging them to continue reducing their carbon footprint on planet Earth.
The only way the Climate Clock can be realized is through cross-disciplinary collaboration, a skill that is deeply ingrained in Silicon Valley's culture. The project will bring together media artists, climatologists, psychologists, physicists, statisticians, linguists, anthropologists, programmers, network engineers, industrial designers, and many more.
It's an instrument | It's a work of art | It's a destination | It informs, educates, and motivates | It's always there (it should at least last for 100 years)

Atmospheric Relations is a small size tower designed to enable natural climate cycles within its transparent facades. It is an informative symbol and a visual sign of climate variations and inhabitable space that is basically a 136 ft-high, semi-enclosed volume of air exposed to the sun, within which natural meteorological phenomenon occur: hot air goes up, cold air down, evaporation of water occurs, humidity is present, there are infrared reflections on the different surfaces of the structure, heating of the air occurs, the greenhouse effect is visible, condensation takes place, and so on.
In a similar way to vernacular architecture, the Atmospheric Relations tower tries to set up climatic exchanges and variations without the use of external energy, apart the energy from the sun. Occasionally and upon need, it will use artificial systems (mist nozzles, controlled variations of its façade's porosity) to modify its internal atmospheric balance. In doing so, it gives some indications of how contemporary architectures that remain open to climatic diversity and variations could behave.

Vertically divided into twelve different samples (for twelve different hours, am & pm), the inside weather and air conditions of the main volume will be analyzed constantly by a network of dedicated sensors. The tower can therefore be seen as a climatic "test-tube," generating variable atmospheric conditions. These collected climate data will then be compared to distant situations on a global scale, permanently. Therefore, a connection (a networked, a mental and an almost "telepathic" relation) will be established between here and there through similar atmospheric conditions. Related distant climatic situations will be experienced within the tower so that the evolution of a local climate in which the greenhouse effect occurs (the upper volume of the tower could also be perceived of as a future condition of the lower one if nothing is made to prevent global warming).
It is expected that the micro-climate established within the tower will vary a lot depending on external conditions (day, night, seasons), but will also differ noticeably from them due to its own climatic design. The resulting and matching comparisons between the internal climate data of the tower and the distant related ones will be

displayed for visitors on the outside of the tower on dedicated information screens (non-light-emitting screens). A color (green or red) will accompany the display of this information to underline the fact that this specific location is decreasing or increasing its average CO2 emissions.

Every hour, one sub-volume out of the twelve that compose the tower will be chosen and displayed in another ground floor glass box: the "displaced café." In this small volume, the selected situation (a different climate, time zone and location) will be reproduced artificially and accompanied with displayed information about its current climatic status, energy consumption and greenhouse gas emissions. The actual energy consumption of the air-conditioned information area as well as its CO2 emission counterpart will also be displayed for visitors.

fabric | ch, June 2008

Contact

fabric | ch (97-23)

Architecture/Art direction:
Patrick Keller
Christophe Guignard
-
Technical/Technological direction:
Christian Babski
Stéphane Carion
-
Collaborators:
Nicolas Besson

Contact:
fabric | ch
6, rue de Langallerie
1003 Lausanne
Switzerland
-
www.fabric.ch
-
t. +41(0)21-3511021 // **f.** +41(0)21-3511022 // **m.** info@fabric.ch