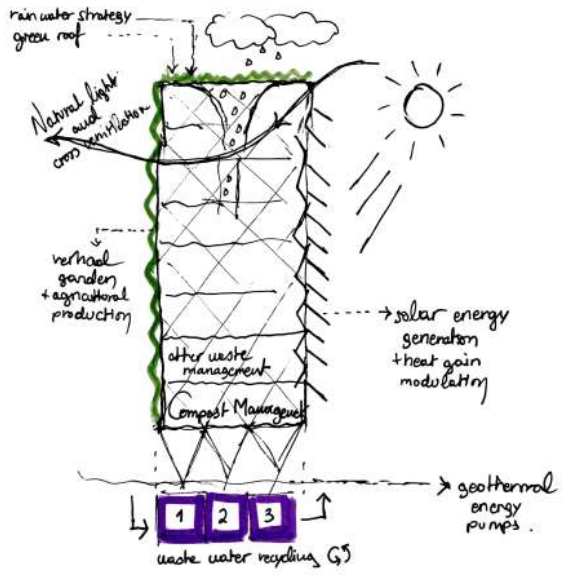
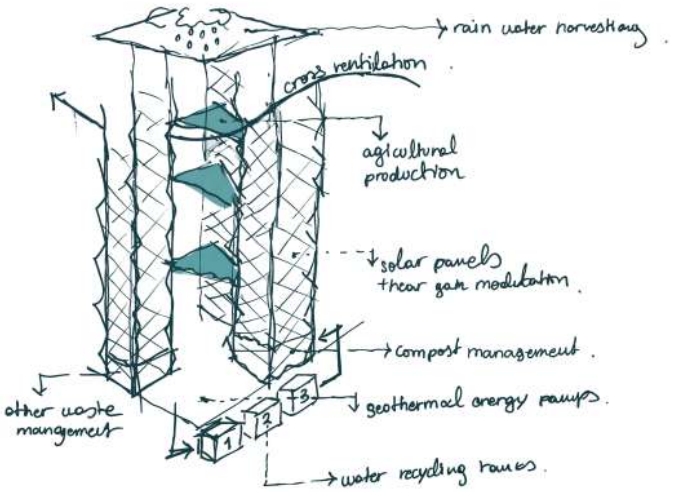
The Pro-Sumer: From Modular Logic to a Regenerative Urban Ecosystem

What if computational design were not primarily about producing more complex forms, but about asking better architectural questions?

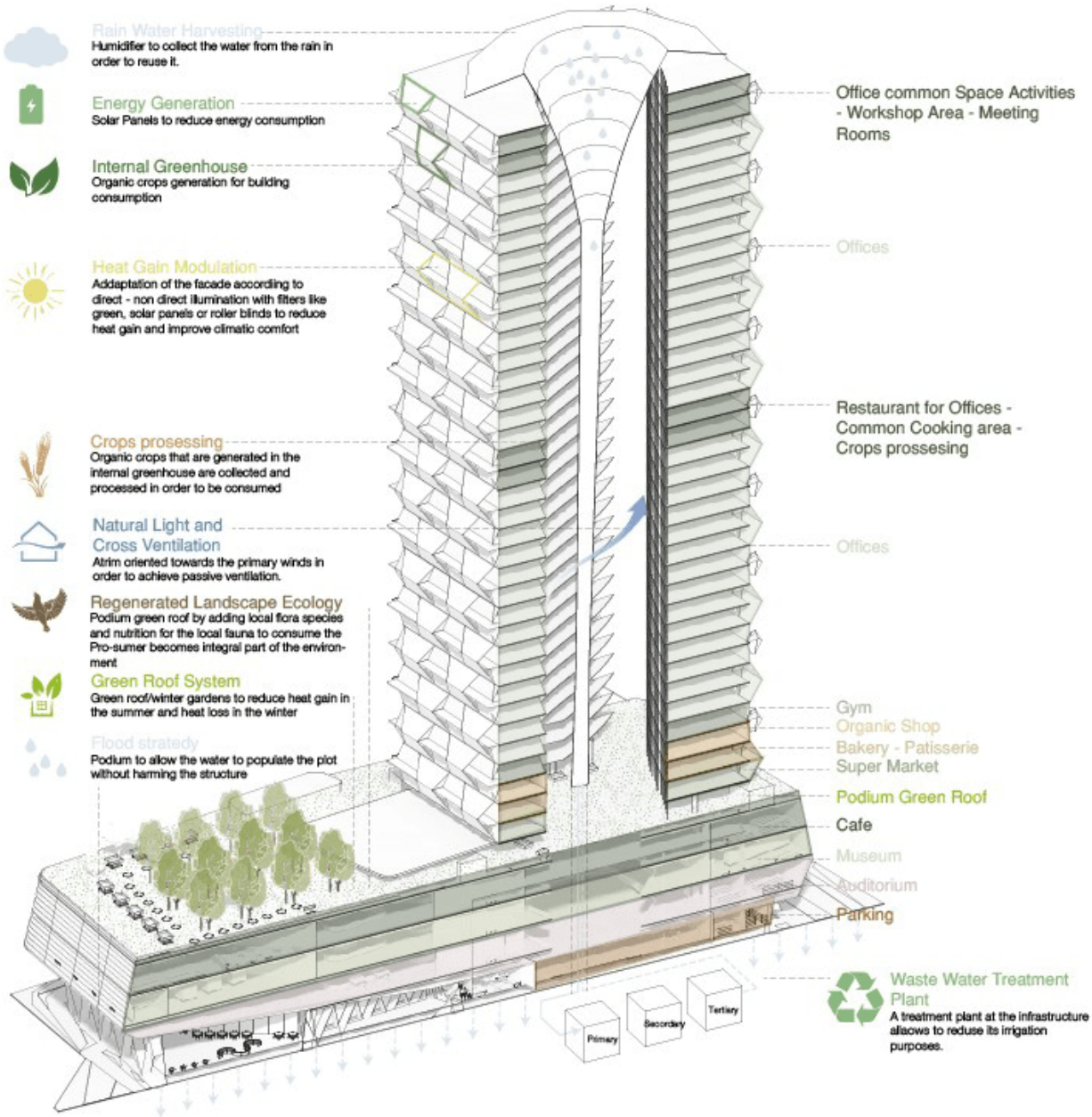
Designed by Sofia Michopoulou for Ho Chi Minh City, The Pro-Sumer reconsiders the conventional office tower as a productive piece of urban infrastructure. Instead of treating sustainability as a layer added after the building has been designed, the proposal integrates renewable energy generation, rainwater harvesting, food cultivation, passive environmental strategies and shared green spaces into its architectural logic from the outset.





Early concept sketches exploring energy, water, food production and vegetation as generators of the architectural system.

The project was developed for Buildner's Timber SkyHive Skyscraper Challenge, where it received Second Prize. It was later selected for presentation at the Architecture Through Media Forums 2026 at the Architectural Association School of Architecture in London.



Environmental section showing how productive and passive strategies are distributed throughout the tower.

A PRODUCTIVE MODULAR SYSTEM

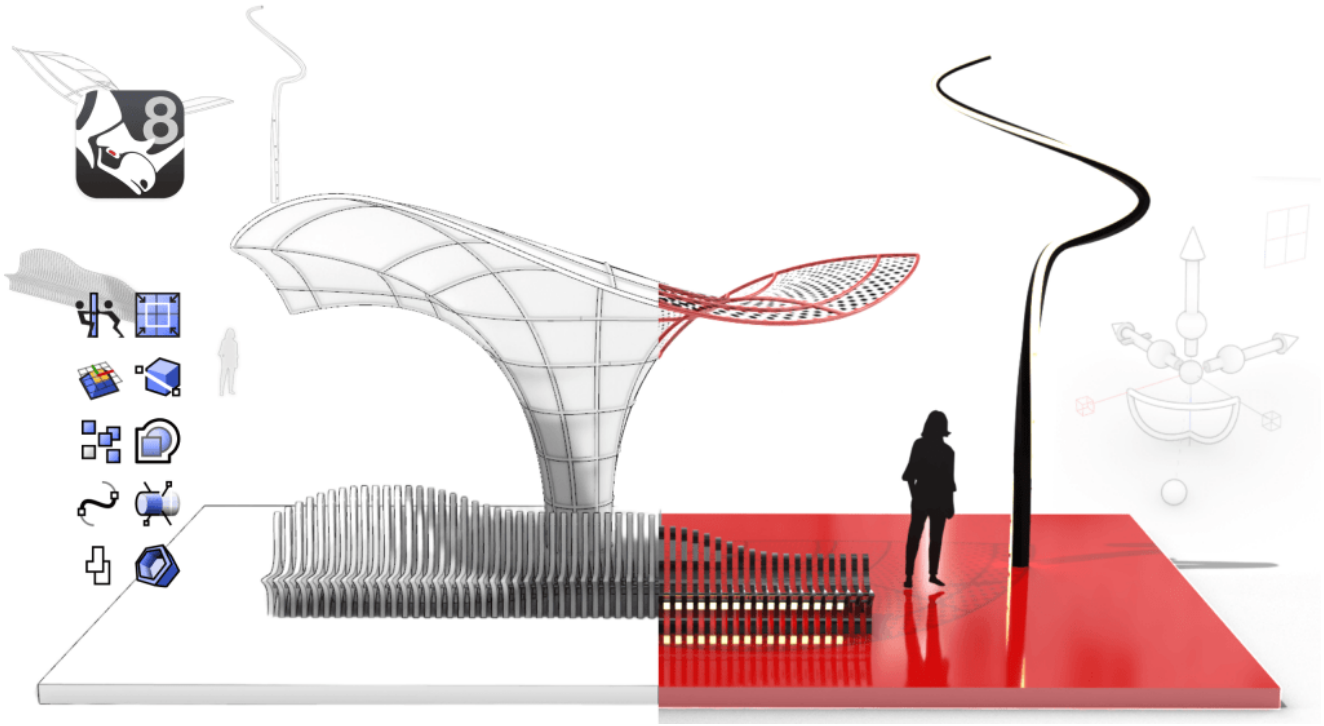
The design process did not begin with the final silhouette of the skyscraper. Early sketches and environmental sections focused first on the relationships between energy, water, vegetation, ventilation, food production and communal space.

These systems became generators of the architecture rather than technical additions to it. Photovoltaic surfaces influenced orientation and façade geometry, cultivation areas shaped balconies

and shared spaces, and the interior organisation responded to daylight, natural ventilation and occupant comfort.

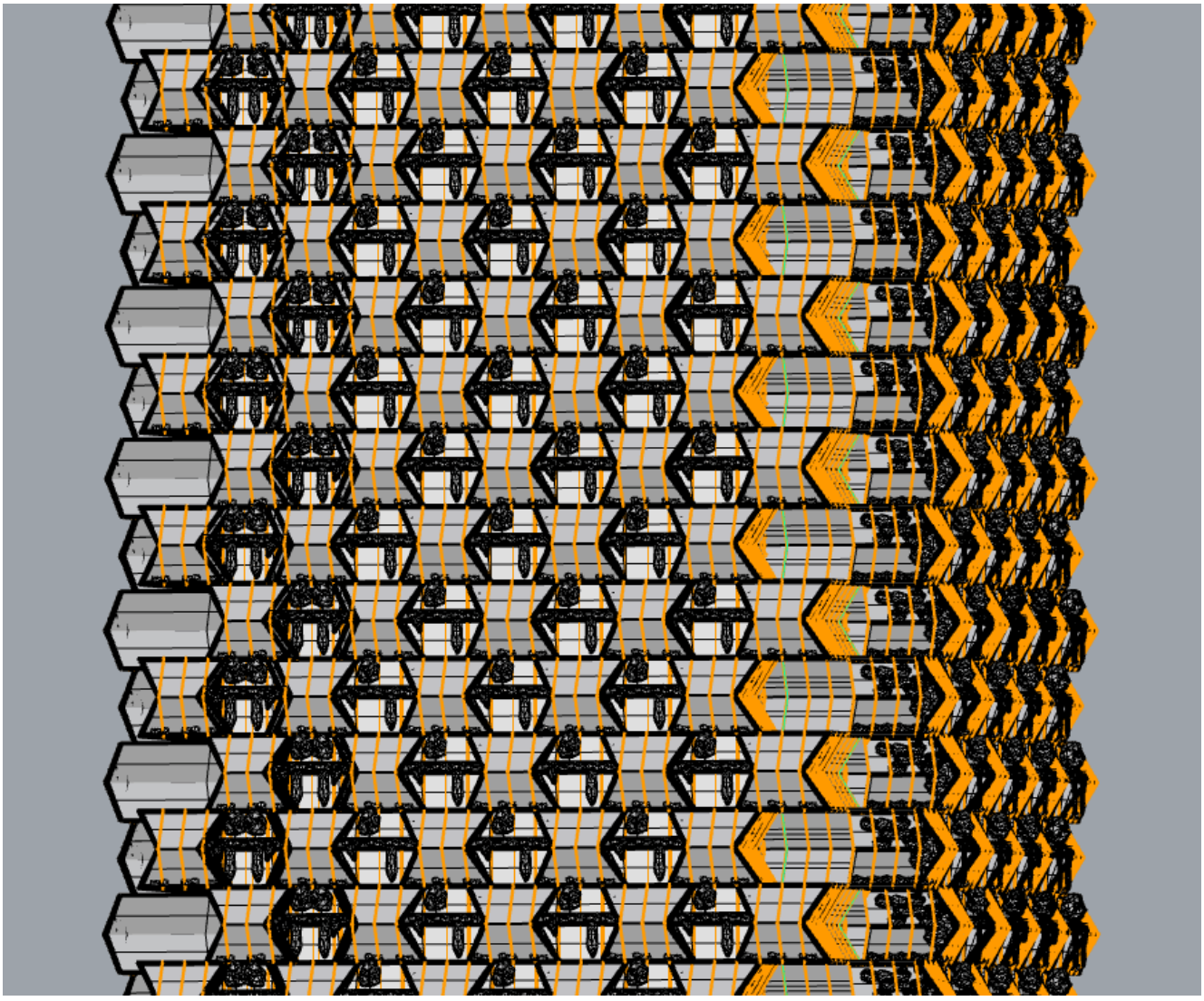
Refined Rhino module integrating folded façade geometry, balconies and structural timber elements within a repeatable component.

Rather than modelling the tower as a single object, Michopoulou developed the proposal from a repeatable office module. Working at this smaller scale made it possible to study how several architectural and environmental conditions could be coordinated within one component.



[See Also]

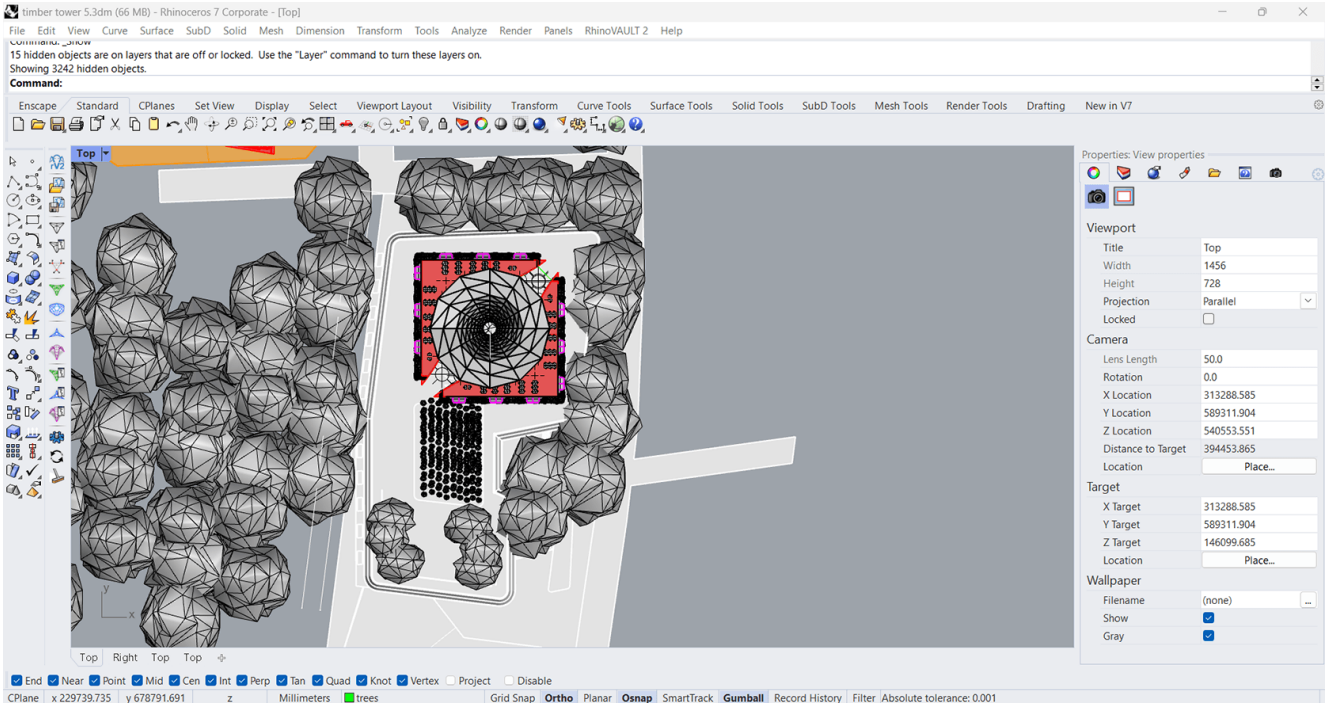
The module was refined iteratively in Rhino, balancing orientation, balcony depth, greenhouse placement, photovoltaic inclination, daylight and repetition. Each adjustment was considered in relation to the rest of the system. Increasing the depth of a balcony, for example, could improve shading and create more planting space, but it could also affect daylight levels, façade proportions and the experience of the interior.



Digital aggregation of the modules demonstrating how repetition, mirroring and rotation generate the overall tower geometry

The process therefore relied on computational thinking rather than automated form generation alone. The model provided a framework for testing how individual decisions influenced the performance and

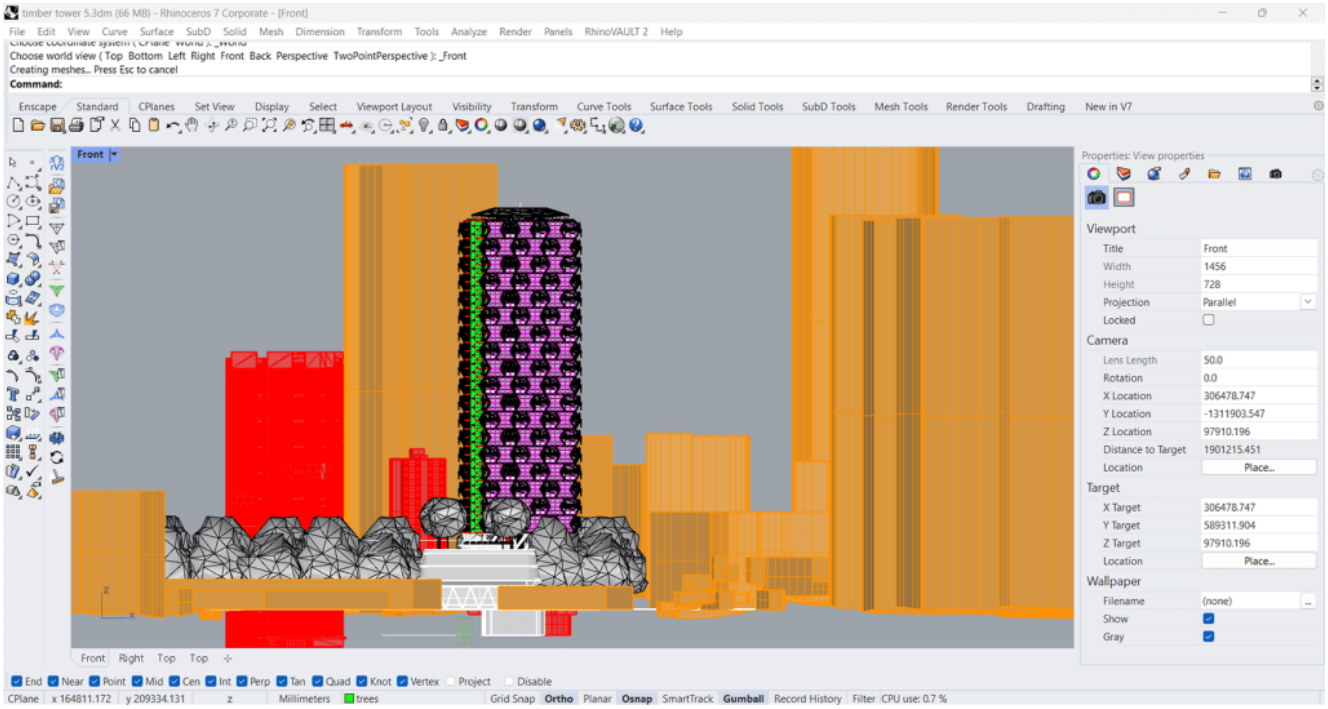
spatial quality of the wider building.



Rhino site model used to assess the tower's scale, position and relationship to its urban surroundings.

Rhino Blocks became central to managing this logic. Two principal environmental module families were developed: one responding to stronger direct solar exposure and another adapted to shaded orientations. Because repeated elements remained linked, revisions could be applied consistently across the tower without rebuilding every instance individually.

This allowed the module to remain repeatable without becoming rigid. Variation could be introduced in response to orientation and environmental conditions while maintaining a coherent architectural language across the building.



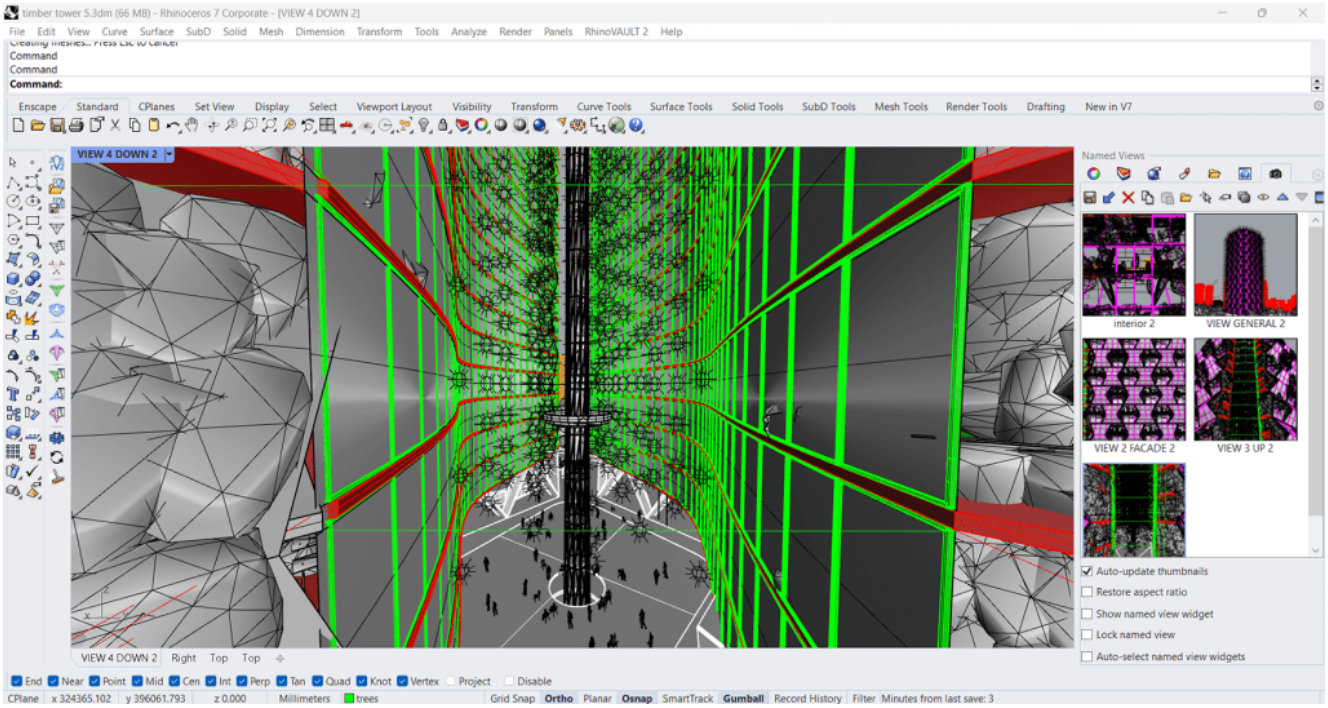
Front elevation study examining the tower's proportions, modular rhythm and skyline presence.

FROM MODULE TO TOWER

Once the basic component had been established, the tower was developed through repetition, mirroring and rotation.

Rather than composing each façade independently, the building emerged from the controlled aggregation of an adaptable module. Different arrangements could be explored quickly in Rhino, making it possible to compare changes in massing, proportion, internal organisation and skyline presence.

This method also allowed constructability, environmental performance and architectural expression to develop together. The structural timber system, balconies, photovoltaic surfaces and planting areas were not resolved as separate layers; they evolved as interdependent parts of the same modular assembly.



Interior Rhino model looking upward through the central atrium, where the repeated modules define a continuous vertical space

As the building grew, its productive capacity expanded with it. Energy-generating surfaces, planted terraces, water collection systems and cultivation areas became distributed throughout the high-rise, transforming the tower from an isolated object into an active environmental system.

The workflow moved continuously between scales. Decisions made at the level of a façade fold or balcony were assessed alongside the complete tower and its relationship to the surrounding city. Rhino provided a shared environment in which the logic of the original module could be preserved as the proposal developed into a larger urban structure.

COORDINATING THE ENVIRONMENTAL ENVELOPE

The building envelope was refined through successive digital iterations rather than defined as a fixed façade composition from the beginning.

Folded geometries, structural timber members, balconies, planting systems and photovoltaic panels were coordinated into a continuous

environmental layer. Each element contributed simultaneously to the appearance, performance and spatial experience of the tower.

Final exterior visualization highlighting the completed timber façade, integrated vegetation and environmental envelope.

Orientation became one of the most important design parameters. Modules receiving stronger solar exposure prioritised photovoltaic generation and shading, while modules in more shaded positions focused on daylight, views and occupant comfort.

The distinction between these module families allowed the façade to respond to changing environmental conditions without losing the overall clarity of the modular system.

At the centre of the tower, a vertical atrium brings together circulation, vegetation, daylight and natural ventilation. It operates as both a social space and an environmental device, connecting the different levels of the building while making its ecological systems visible to occupants.

Interior Rhino model looking upward through the central atrium, where the repeated modules define a continuous vertical space.

The atrium also shifts the experience of the office tower away from a collection of enclosed floor plates. Instead, shared spaces, planting and natural light become part of a continuous vertical interior landscape.

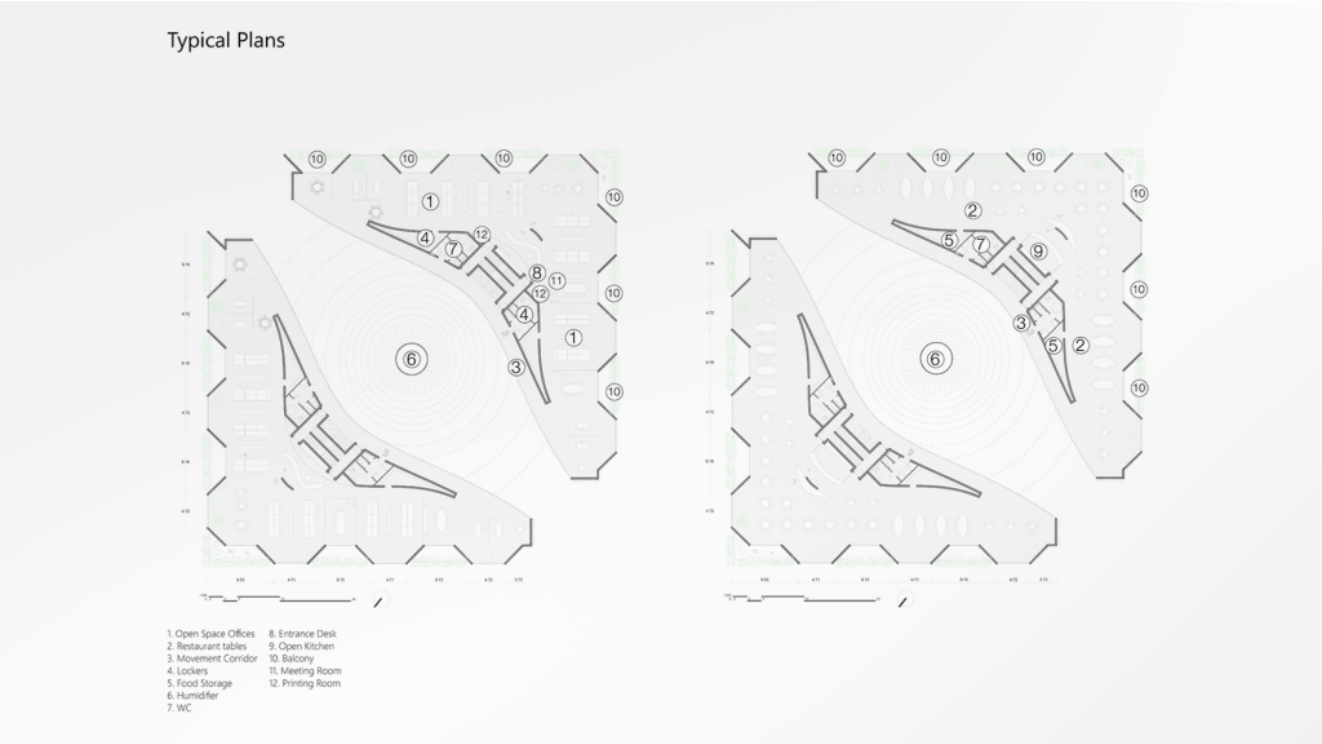
Although no external environmental simulation plugins were used, solar orientation and passive design principles were evaluated throughout the modelling process. The evolving Rhino model allowed these considerations to influence the architectural form directly rather than being assessed only after the geometry had been completed.

FROM MODEL TO DOCUMENTATION

Rhino remained central during the technical development of the project.

The same three-dimensional model used for design exploration was also used to produce plans, sections, elevations and analytical drawings. Make2D generated two-dimensional information directly from the model,

helping maintain consistency between architectural development, documentation and final presentation.



Typical floor plans demonstrating the spatial organization and modular arrangement of the office levels.

This continuity reduced the separation between conceptual modelling and technical representation. As the building evolved, changes could be incorporated into the drawing set without reconstructing the project through an entirely disconnected workflow.

Sofia worked exclusively in Rhino, using Blocks and Make2D throughout the design process. The visualizations were rendered in Enscape, and the final graphics were completed using Adobe Photoshop and Adobe Illustrator.

BEYOND FORMAL COMPLEXITY

One of the central challenges of The Pro-Sumer was maintaining a single modular system capable of responding to different environmental conditions without losing architectural coherence.

Its significance lies not in producing complexity for its own sake, but in showing how computational design can support a more integrated decision-making process. Rhino made it possible to coordinate relationships across multiple scales, from one office module to the

building envelope, the complete tower and its urban context.

Interior and public podium visualization illustrating the spatial experience created by the central atrium and shared communal spaces.

The Pro-Sumer demonstrates how a relatively simple repeatable component can develop into a layered architectural ecosystem when environmental performance, spatial organisation and construction logic are considered together.

In this sense, computation becomes less a tool for generating unusual form and more a method for structuring questions, comparing alternatives and understanding the consequences of architectural decisions.

CREDITS

Designer: Sofia Michopoulou