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Is There a Height Threshold For Optimum Sustainability?

As increased density has become more accepted as necessity, the scale of that density is still under debate. Thus we ask, "Is the threshold for optimum sustainability in a dense urban form significantly below the typical height of today's skyscrapers?"

YES

Jason McLennan

CEO, International Living Future Institute

There is a belief that more density and height is always better. I disagree. I believe that there is a "sweet spot" between density and height, beyond which the sustainability benefits of both diminish, then reverse. This sweet spot tends to be in the four-to-eight-story height range, at densities between 30 and 100 dwelling units/acre. Here's why:

Energy and Water Independence. Running a net-zero building based on available solar energy, wind, or rainfall gives a height range between two and six stories. Building anything taller would require more surface area than exists to capture enough solar energy or water. We need to move to cities powered by decentralized renewable energy systems

Density and Transportation Effectiveness.

A truly walkable community is the most democratic and socially just, allowing all people access to required services. Four to eight stories produces densities that make public transportation work well and also allows for reasonable walk-up heights.

Security and Passive Survivability. The taller the building, the more resources it consumes. In the event of a catastrophe, tall buildings are less resilient. The maximum height that works without elevators is six to eight stories.

Cultural Legacy. The most sought-after places to visit – the cities we view as cultural legacies of humanity – always fall within our sweet spot of height and density. Paris, Barcelona, Rome, and Kyoto are just a few.

Biophilia: The Need for Nature in the City.

When density is disproportionate to nature and we are disconnected from our earthly surroundings, we face the very real risk of what Richard Louv calls "nature deficit disorder." We need to bring more natural systems, urban agriculture and other species into our cities, all of which become difficult as densities and building height increase beyond a certain point.

Evolutionary Support for Limited Height. The ability to recognize human features diminishes as we move away from a person's face. As we go higher, what happens to our connection to life when people and nature are rarely more than a mere blur?

If livability and sustainability are the goals, then we must return our cities from the clouds to grounded, carbon-neutral communities. Perhaps, like our oil-addicted culture, the skyscraper was a brief interlude in human history – a 100-year experiment in density and height that was impressive but never meant to last?

NO

Dr. Antony Wood, *Executive Director, CTBUH / Research Professor, Illinois Institute of Technology / Visiting Professor of Tall Buildings, Tongji University*

The height threshold for "sustainability" within tall buildings – that "sweet spot" beyond which the concentration of people, infrastructure and resources becomes offset by the increased embodied and operating energy required to house them at that height – is perhaps the biggest, unanswered "holy grail" in our industry. The reality is that nobody really knows what that threshold is.

I have heard claims for the "most sustainable building type" varying from the four-story walkup, to the 100+ story megatall. Until all

aspects of energy and other data across all building types are captured and reported, most claims will be spurious.

This is why the Council is currently embarked on a research project to unearth real information in this field, covering five areas of data over a year in two very different communities in Chicago; a 86-story, 738-unit residential tower, and an inner suburban low-rise community comprising mostly single-family homes. The information captured includes; (i) operational energy of the home, (ii) embodied energy in the materials of the inhabitation, (iii) embodied and operating energy of the urban vs. suburban infrastructure, (iv) transport movements, (v) quality of life. We expect this project to be revealing in myriad dimensions.

Against the backdrop of our cities growing by a million new inhabitants every week, and as buildings get more energy and resource efficient, the threshold of "sustainability" for tall buildings is increasing in height. The real challenge for humanity becomes transitioning to greater height and density with social sustainability intact, not just environmental sustainability. To me it is clear that the "support layer" of the ground plane needs to be replicated at height as cities grow vertically and densify. Sidewalk and parks, shops and schools – where a sense of community develops – need be recreated at strategic levels in the sky, through connecting our buildings and creating quality urban habitat at height. It is starting to happen in many places around the world, which is encouraging. Moving away from the isolated single icons of our age to this intensified, connected three-dimensional city would completely alter the balance of sustainability thresholds in buildings – and only in a good way.