### Visualizing and Evaluating Views from Existing and Proposed Buildings

Holly Samuelson | Associate Professor | Harvard Graduate School of Design October 13, 2021



[1] P. Leather, M. Pyrgas, D. Beale, and C. Lawrence, "Windows in the workplace: sunlight, view, and occupational stress," *Environ. Behav.*, vol. 30, no. 6, pp. 739–762, 1998.

Research has linked good views, with: improved worker productivity <sup>[1]</sup> psychological benefits <sup>[2–4]</sup>

[2] E. O. Moore, "A Prison Environment's Effect on Health Care Service Demands," J. Environ. Syst., vol. 11, no. 1, pp. 17–34, Jan. 1981.
[3] R. Kaplan, "The Nature of the View from Home: Psychological Benefits," Environ. Behav., vol. 33, no. 4, pp. 507–542, Jul. 2001.

[4] M. B. C. Aries, J. A. Veitch, Guy. R. Newsham, "Windows, view, and office characteristics predict physical and psychological discomfort," J. Environ. Psychol., vol. 30, no. 4, pp. 533–541, 2010.

Research has linked good views, with: improved worker productivity [1] psychological benefits [2–4] health benefits [5,6]

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[5] S. Verderber, "Dimensions of Person-Window Transactions in the Hospital Environment," *Environ. Behav. Beverly Hills Calif*, vol. 18, no. 4, pp. 450–466, Jul. 1986.

[6] R. K. Raanaas, G. G. Patil, and T. Hartig, "Health benefits of a view of nature through the window: a quasi-experimental study of patients in a residential rehabilitation center," *Clin. Rehabil.*, vol. 26, no. 1, pp. 21–32, 2012.

Research has linked good views, with: improved worker productivity <sup>[1]</sup> psychological benefits <sup>[2–4]</sup> health benefits <sup>[5,6]</sup> reduced surgery recover times <sup>[7]</sup>

[7] R. S. Ulrich, "View through a window may influence recovery from surgery," Science, vol. 224, p. 420, 1984.





WWR = window-to-wall ratio

Parametric Energy Simulation in Early Design: High-Rise Res. Bldgs in Urban Contexts, H Samuelson, S Claussnitzer, A Goyal, Y Chen, A Romo, Building & Environment, 2016

Between 2030 and 2050, **climate change** is expected to cause approximately 250,000 additional deaths per year, from malnutrition, malaria, diarrhea and heat stress. –World Health Organization 2015 The Harvard Gazette

# 1 in 5 deaths caused by fossil fuel emissions



Study finds the number of deaths higher than previously thought

Vohra, Karn, et al. "Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem." Environmental Research 195 (2021). https://news.harvard.edu/gazette/story/2021/02/

### Considering energy without occupant health hasn't worked well...



Architecture post-1970's oil crisis

But, considering occupant wellness without energy (and thus global health) hasn't worked well either...



Early generation of LEED certified buildings

But, considering occupant wellness without energy (and thus global health) hasn't worked well either...



Early generation of LEED certified buildings

So, when it comes to windows, can we do more with less?

### The role of simulation



answers



trends

Visualizing and Evaluating Views from Existing and Proposed Buildings



Research with Wenting Li, Master of Design, Harvard GSD Environmental Performance specialist, KPF Simulating view content using Google Earth Studio

#### VICW+ simulate view content



### On-site photos



### Google Earth Studio Results



Li, Wenting, and Holly Samuelson. "A new method for visualizing and evaluating views in architectural design." Developments in the Built Environment (2020)

# Building a site model VS. Usin

## **Using Google Earth Studio**





Simulating view accessibility using our custom Grasshopper plug-in



### **View+** calculate view accessibility



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Li, Wenting, and Holly Samuelson. "A new method for visualizing and evaluating views in architectural design." Developments in the Built Environment (2020)







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Rating view quality using our custom Grasshopper plug-in









Integrating view quality into a parametric design workflow

#### **View+** integrating into a parametric design process









### **Future work**



### Make publicly available (with training)



Develop an industry standard view quality score

