Green view factor and satisfaction with window views in urban offices

Koga, Yasuko
Kyushu University

Okamoto, Taisei
Kyushu University

Majima, Rintaro
Kyushu University

Fabian Estuardo Jarrin Mancero
Kyushu University

他

GREEN VIEW FACTOR AND SATISFACTION WITH WINDOW VIEWS IN URBAN OFFICES

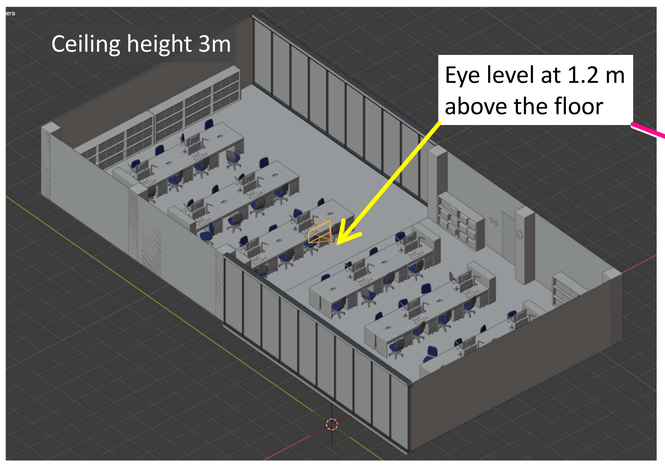
Y Koga* [koga@arch.kyushu-u.ac.jp], T Okamoto*, R Majima*, F Jarrin*, Y Kojima**, C Ohki**, A Kawano** & N Takagi**
*Kyushu University **Obayashi Corporation

OBJECTIVES

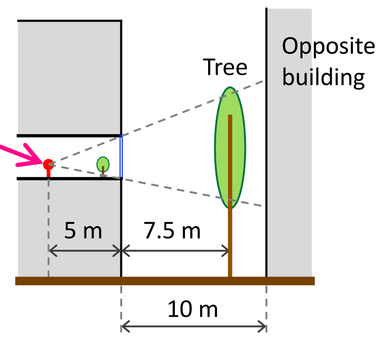
- Greenery is a key element of quality views out, but it is often difficult to see greenery outdoors in dense urban areas.
- It was reported that inclusion of any natural element improved assessment of view even if only a small amount.
- It was reported regarding indoor greening that 10 to 14% greenery in the field of view reduced office workers' stress.
- This study focuses on window views of urban offices and proposes green view factor (GVF) to measure greenery seen through windows.
- The questions are:
  – The more greenery, the more satisfactory view?
  – Do indoor plants have the same effect on view satisfaction as outdoor greenery seen through windows?

Greenery that can be seen from urban offices ← [its source]
street trees, greenery in parks, open green spaces, green walls, …

METHODOLOGY

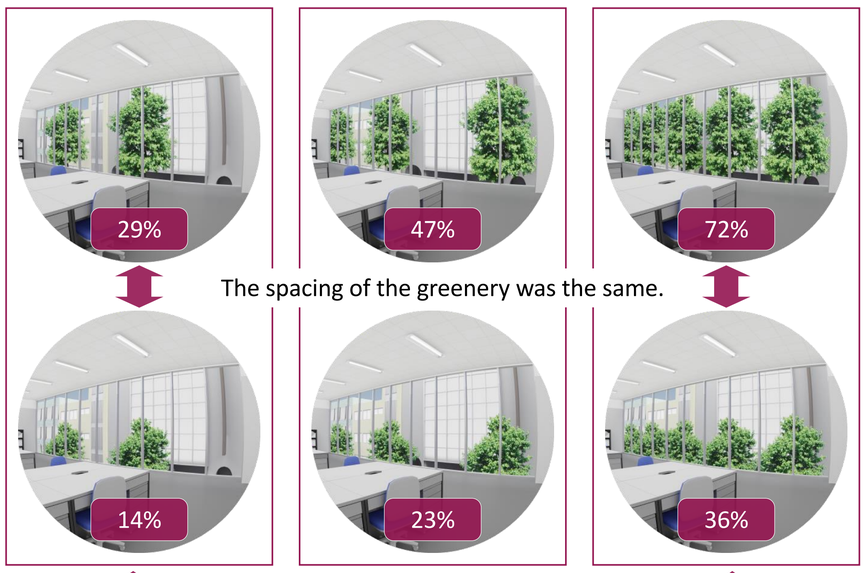


3D model of an open-plan office composed of two identical rooms

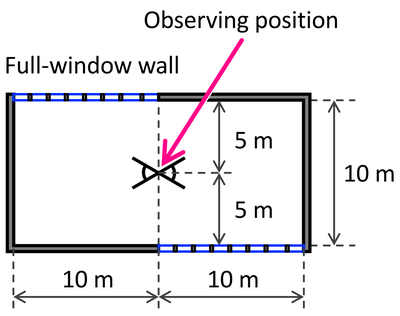


Outside configuration

Green view factor (**GVF**) —— defined as the ratio of greenery area to window area seen from indoors.



Stimulus images of eleven GVF conditions



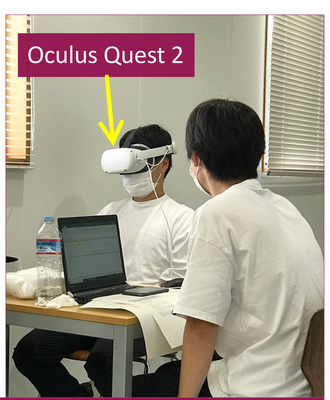
A plan view of the office

A fish-eye view

① The total area of the white area (the window glazing area) was calculated using the measurement function of Photoshop.
② The total area of the greenery area was calculated.
③ The ratio of the total greenery area to the total white area was calculated.

Calculation of the GVF in the stimulus images

The observer sitting in a swivel chair could compare two different GVF conditions at once by turning around in the virtual office.



Subjective evaluation using a virtual reality system

Experimental procedure

① Experimenter: explanation of the experiment
② Observer: provision of a written consent to participation
③ Observer: wearing of a VR head-mounted display (HMD)
④ Briefing on how to use the controllers of the VR-HMD
⑤ Observer: verbal evaluation of randomly presented conditions

【Experiment 1】 Comparative evaluation for two different GVF conditions

- The difference in satisfaction with the view on a 4-point scale from 0 (the same) to +3
- 12 observers in their 20s

【Experiment 2】 Evaluation for each of the eleven GVF conditions

- Satisfaction with the view on a 100-point scale
- 35 observers in their 20s to 50s

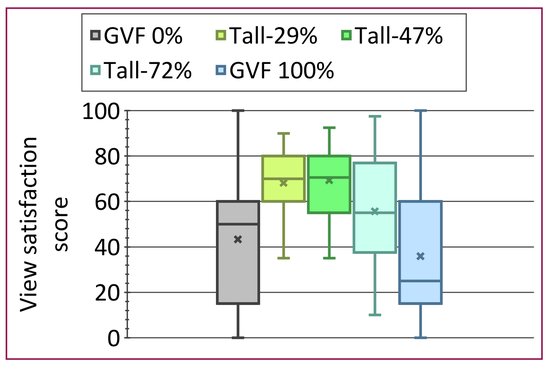
28 pairs of different GVF conditions were evaluated.
- GVF 0% ⇔ 100%, T-2, T-3, T-5, L-2, L-3, L-5, P-2, P-3, P-5
- GVF 100% ⇔ T-2, T-3, T-5, L-2, L-3, L-5
- L-2 ⇔ T-2 ・L-3 ⇔ T-3 ・L-5 ⇔ T-5
- L-2 ⇔ P-2 ・L-3 ⇔ P-3 ・L-5 ⇔ P-5
- L-2 ⇔ L-3 ・L-2 ⇔ L-5 ・L-3 ⇔ L-5
- T-2 ⇔ T-3 ・T-2 ⇔ T-5 ・T-3 ⇔ T-5

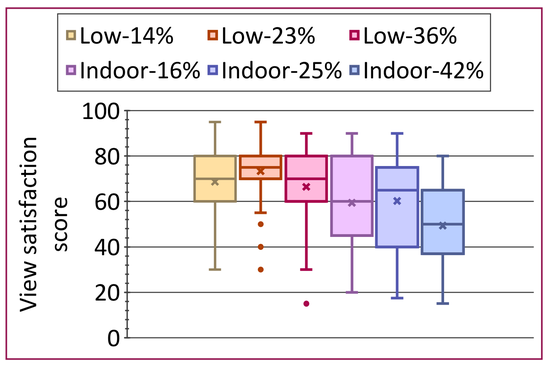
RESULTS

Comparative ratings of satisfaction with the view for different GVFs (N = 12)

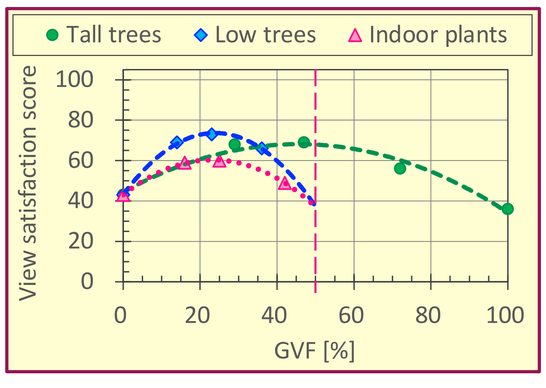
Main reasons for the comparative ratings

- There is greenery.
- The amount of greenery is just right.
- I feel surrounded by nature.
- It is good to have greenery nearby.
- The spacing of greenery is just right.
- There is too much greenery.
- I feel oppressed.
- The area of greenery is large.
- It is better to have greenery outdoors than indoors.
- Buildings can be seen.





Satisfaction scores for the view with different GVFs (N = 35)



Average satisfaction scores (N = 35)

CONCLUSIONS

- The results indicate that a complex view is better than a monotonous view.
- Greenery occupying about 50% of the window width at intervals maximizes satisfaction with the view in the case of full-window walls.
- The layout and horizontal spacing of greenery are key factors for satisfaction with the view.
- The GVF alone would be insufficient as a greenery-related parameter of the view quality in designing windows.
- Indoor plants can be an alternative to the lack of greenery outside the window.

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