

PRESS RELEASE

To members of the press

January 23, 2024

Nomura Real Estate Development Co., Ltd.

Nomura Real Estate and Chiba University Joint Research “Seascape Relaxes the Human Body” Elucidation of Relaxation on Brain and Autonomic Nervous Activities

Nomura Real Estate Development Co., Ltd. (Head office: Shinjuku-ku, Tokyo; President and Representative Director: Daisaku Matsuo; hereinafter the “Company”) conducted joint research on the physiological effects of visual stimulation of a seascape from the Hamamatsucho Building with the Center for Environment, Health and Field Sciences, Chiba University (Emeritus Professor Yoshifumi Miyazaki; hereinafter “Chiba University”) from June 2022. The research has concluded that watching seascapes has relaxation effects on brain and autonomic activities.

The results were released at the 25th Annual Meeting of the Japan Society of Kansei Engineering held in November 2023.

1. The background of the joint research for the Shibaura Project

In the Shibaura Project (hereinafter the “Project”), the Company has been promoting the development of large-scale mixed-use facilities to create an international business and tourism hub as a new symbol of the Tokyo Bay area. The Project proposes a new work style “TOKYO WORKation,” which enables office workers to feel nature while enjoying urban convenience, commanding great views of the sky, sea, and newly developed green spaces stretching as far as the eye can see.

The number of people living in urban areas is on the increase globally due to urban development. Meanwhile, urban residents are unable to enjoy the affluence of nature in their daily life. As such, there are high expectations for the use and utilization of the natural environment in urban areas. Given this background, in February 2020, the Company commenced promoting joint research on natural therapies using physiological indices related to brain and autonomic activities, and the research has scientifically elucidated the effects of the characteristics of seaside locations on office workers and other people in modern urban areas. The details of the results are shown on the following page.



Shibaura Project (image)



Seascape from the Hamamatsucho Building

Key points in this release

1. Joint research with Chiba University on the physiological effects of visual stimulation of the seascape from the Hamamatsucho Building
2. Joint research revealed that watching seascapes has the following effects:
 - (1) Increased psychological comfort and relaxation as well as improved mood
 - (2) Physiological relaxation effect among individuals with a Type A behavior pattern, which is an intense Type of behavior

NEW VALUE, REAL VALUE



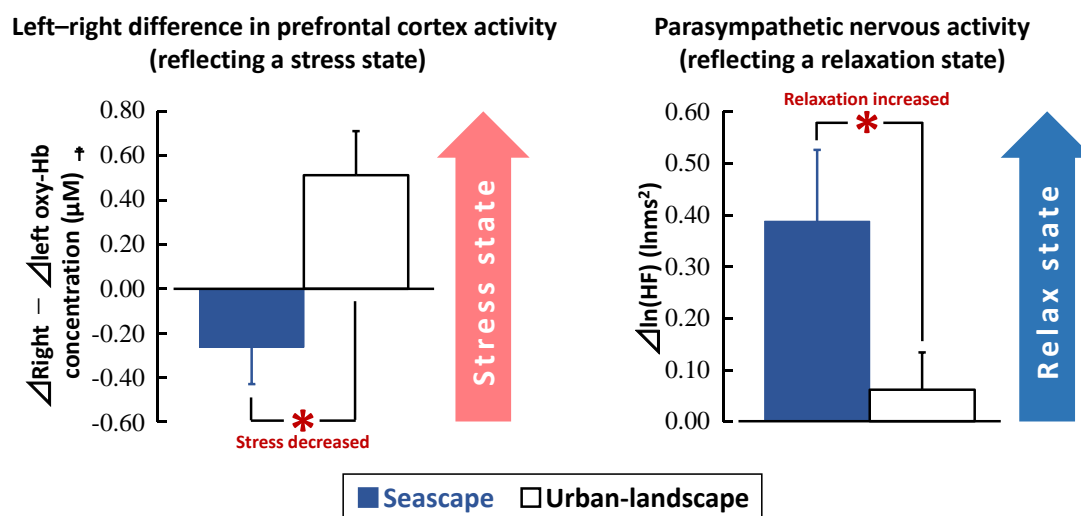
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2.Results of the joint research on seascapes

In July 2022, an experiment involving 25 participants was conducted on the 29th floor of the Hamamatsucho Building. The relaxation effect of watching the seascape was analyzed using objective physiological and subjective psychological indices. The results showed that, on average, watching seascapes enhanced psychological comfort and relaxation and improved mood of all study participants.

Furthermore, a detailed analysis of the physiological relaxation effects of seascapes on the Type A behavioral pattern (*1), which includes extroverted and intense behavioral characteristics, revealed that seascapes brought about significant physiological relaxation effects, as shown in the figure. The left figure shows the difference between right and left prefrontal activities. The left–right difference in the brain’s prefrontal activity reflects the “stress state.” Seascapes have a “lower stress state” than urban landscapes. The parasympathetic activity is shown on the right figure. Parasympathetic nervous activity reflects a “relaxation state,” and seascapes have a “greater relaxation state” than urban landscapes.



N = 10, Mean ± SE, *Statistically significant difference

Physiological relaxation effect of seascapes in participants with a type A behavior pattern

† Δ Right – Δ left oxy-Hb concentration (µM): unit of index indicating a stress state

Source: Modified from Ikei H, Miyazaki Y, et al., The 25th Annual Meeting of Japan Society of Kansei Engineering, P2-01, 2023

*1: Type A behavior pattern

The Type A behavior pattern, a concept proposed by Friedman and Rosenman in the 1950s, is a common behavioral trait observed in patients with heart disease. It is considered common among various types of leaders who are extroverted, intense, and always enthusiastic about their work and are considered to be in a chronic state of stress.

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About Chiba University co-researchers

Yoshifumi Miyazaki, Professor Emeritus, Chiba University

Specialty: Nature Therapy

Born in 1954, Ph. D. (Medical Science). He completed his master's program at Tokyo University of Agriculture and Technology in 1979 and worked as an assistant professor at the Faculty of Medicine, Tokyo Medical and Dental University. In 1988, he became a researcher at the Forestry and Forest Products Research Institute. He, then, became a professor at Chiba University from 2007 to 2019. He is currently a Professor Emeritus and Grand Fellow of Chiba University. He had received the Minister of Agriculture, Forestry, and Fisheries Award in 2000 and the Japanese Society of Physiological Anthropology Award in 2007. In 2019, his work "Shinrin-yoku" was published in 17 countries after its publication in the United Kingdom. In 2022, his other work "Waldbaden (German, forest bathing)" was published in Switzerland.

Harumi Ikei, Assistant Professor, Center for Environment, Health and Field Sciences, Chiba University

Specialty: Nature Therapy

Born in 1990, Ph. D. (Agricultural Science). She completed her master's degree at the Graduate School of Horticulture, Chiba University, in 2015. In 2017, she joined the Forestry and Forest Products Research Institute as a tenure-track researcher upon entering the doctoral course at the Graduate School of Horticulture, Chiba University. She has been in her current position since October 2019. She has been in her current position since October 2019. She had received the Japan Wood Research Society Progress Award in 2019 and the Japan Prize in Agricultural Science, Achievement Award for Young Scientists in 2021. Her work "Wood Therapy" was published in 2022.

Reference: The Blue Spaces (waterside) Study (UGBS) in the world

In September 2023, the manuscript "Advancing urban green and blue space contributions to public health, R.F. Hunter et al." was published in The Lancet, which is one of the five most highly regarded medical journals worldwide. Regarding the importance of urban green and blue spaces (UGBS), the authors mentioned, "much of the research to date has focused on green space. Blue space research indicates that public health is only considered indirectly in urban blue space regeneration, and the potential to use urban blue space regeneration as a community-based health intervention has yet to be realized." The importance of water spaces is now attracting worldwide attention.



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► Shibaura Project

[Project area]



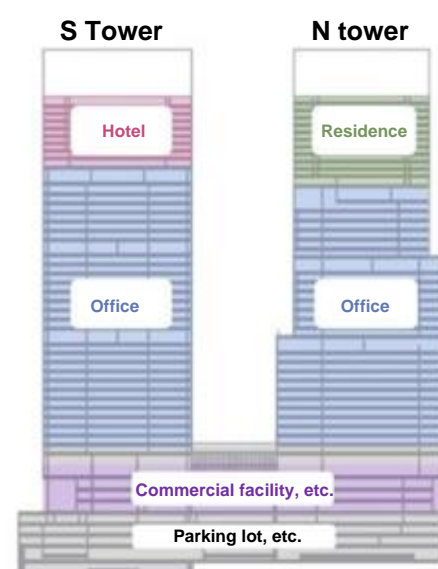
[Exterior image]



This is a large-scale mixed-use redevelopment project to rebuild the Hamamatsucho Building (Toshiba Building, 1-1-1 Shibaura, Minato-ku, Tokyo) into two towers—the S Tower and the N Tower: the construction of the S Tower commenced in October 2021 and will be completed in February 2025, and the construction of the N Tower will commence in FY2027 and will be completed in FY2030. With a site area of approximately 4.7 hectares and a gross floor area of approximately 550,000 square meters, the almost ten-year project includes offices, a hotel, commercial facilities, residential units, and other spaces, thereby creating an international business and tourism hub that will become a new symbol of the Tokyo Bay area. Through this project, the Company aims to develop a community that can make people and society happy both in the present and in the future. By taking advantage of the Shibaura area’s spectacular atmosphere with panoramic sky and sea views, the Company will provide a new way of spending time, contributing to the development of a sustainable society for the future.

Primary operators	Nomura Real Estate Development Co., Ltd. East Japan Railway Company	
Builder	S Tower: Shimizu Corporation; N Tower: undecided	
Designers	Maki and Associates, Shimizu Corporation Ove Arup & Partners Japan Ltd., Nikken Sekkei Ltd.	
Location	1-1-1 Shibaura, Minato-ku, Tokyo, etc.	
Site area	Approx. 47,000 m ²	
Gross Floor area	Approx. 550,000 m ²	
Main purpose of use	Office, commercial facility, hotel, residence, parking	
Building height	Approx. 230 m	
No. of floors	S Tower	43 floors above ground, 3 basement floors
	N Tower	45 floors above ground, 3 basement floors
Commencement/ Completion (planned)	S Tower	Commencement: Oct 2021; completion: Feb 2025
	N Tower	Commencement: FY2027; completion: FY2030

[Purpose of use]



This material is an English translation of Japanese announcement made on December 25, 2023, by Nomura Real Estate Development Co., Ltd.

Physiological effects of seascapes viewed from a skyscraper on young male participants : a study using behavioral characteristics

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(Keywords: Nature therapy, Physiological relaxation, Type-A behavior pattern)

Results and Discussion

On psychological measures, seascape viewing was subjectively rated as more comfortable, relaxing, and natural; as improving mood; and as decreasing anxiety relative to those after viewing the urban-landscape control ($p < 0.05$, Wilcoxon signed-rank test, $N = 25$).

On physiological measures, seascape viewing significantly increased left prefrontal oxy-Hb concentrations relative to those in the controls ($p < 0.05$, paired t -test, $N = 25$). No significant differences were found in the right prefrontal oxy-Hb and $\Delta\text{right} - \Delta\text{left}$ oxy-Hb concentrations. There were also no differences between the seascape viewers and controls in $\ln(\text{HF})$ and $\ln(\text{LF}/\text{HF})$, which are measures of autonomic nervous activity.

To examine individual differences in the effects of seascape viewing, the data were divided and rearranged according to behavioral characteristics. In the Type-A behavioral pattern group with extroverted and intense behavioral characteristics (Type-A group, $N = 10$), $\Delta\text{right} - \Delta\text{left}$ oxy-Hb concentrations was $-0.26 \pm 0.17 \mu\text{M}$ in the seascape viewers and $0.51 \pm 0.20 \mu\text{M}$ in the controls, indicating a significant decrease caused by seascape viewing relative to control-scene viewing ($p < 0.05$, Fig. 2A). Heart rate variability $\Delta\ln(\text{HF})$ was $0.39 \pm 0.14 \ln\text{ms}^2$ in the seascape group and $0.06 \pm 0.07 \ln\text{ms}^2$ in the control group, which showed a significant increase associated with seascape viewing ($p < 0.05$, Fig. 2B). In contrast, in the Type-B behavioral pattern group with introverted and calm behavioral characteristics (Type-B group, $N = 15$), there were no significant differences between seascape viewing and control viewing in all physiological indices, including $\Delta\text{right} - \Delta\text{left}$ oxy-Hb concentration and $\ln(\text{HF})$. Considering the psychological measures, seascape viewing was subjectively rated as more comfortable, relaxing, and natural; as improving the mood; and as decreasing anxiety relative to those after control-scene viewing in both the Type-A and Type-B groups ($p < 0.05$).

In the present study, in the Type-A group with extroverted and intense behavioral characteristics, seascape viewing was associated with significantly decreased Δright

Δleft oxy-Hb concentrations, which reflects the state of mental stress, and with significantly increased $\ln(\text{HF})$ (an index of parasympathetic nervous activity), which reflects the state of relaxation. Seascape viewing produced physiological relaxation effects but these effects varied depending on the behavioral characteristics of the participants.

Conclusions

This study showed that (1) a seascape viewed from the 29th floor of a high-rise building in Tokyo enhanced subjective comfort, promoted relaxation, and improved mood states relative to those associated with viewing an urban-landscape control and (2) an examination of behavioral characteristics revealed that in the Type-A group with extroverted and intense behavioral characteristics, seascape viewing was associated with significantly decreased $\Delta\text{right} - \Delta\text{left}$ oxy-Hb concentrations and significantly increased $\ln(\text{HF})$ values, resulting in physiological relaxation.

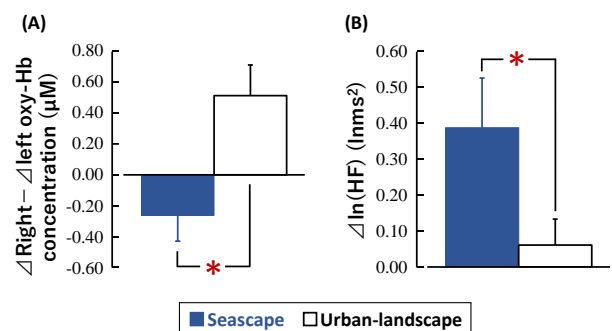


Figure 1. Effects of seascape viewing on physiological indices of the Type-A group. (A) (Δright oxy-Hb concentration) – (Δleft oxy-Hb concentration), (B) Heart rate variability $\Delta\ln(\text{HF})$, $N = 10$, mean \pm standard error, * $p < 0.05$, paired t -test.

Acknowledgment

This study is the result by joint research conducted with the Nomura Real Estate Development Co., Ltd. on “Physiological Effects of Visual Stimulation of Seascape Views from High-rise Floors.”