CULTURE, CLIMATE, AND COMPUTATION

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Writing Team:
Chun Hyunjin, Prompt Udomdech, Nappy L. Navarra, Lisana Shidqina, Faiz Ramadiansyah, Dominikus Aditya Fitriyanto, Rizka Tiara Maharani, Yusvika Ratri Harmunisa, Darini Yusrina Abidah, Nabila Andindya W

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Website: www.penerbitwidina.com
Instagram: @penerbitwidina
Telephone: (022) 87355370

PREFACE

Praise be to God Almighty for His grace and blessings, which have made the preparation of this book, *Culture, Climate, and Computation*, possible.

The development of artificial intelligence (AI) and computational technologies has opened new possibilities in architecture and landscape design. These advancements are transforming the ways designers explore ideas, understand places, and create spaces in response to cultural and environmental challenges. However, design is not merely about technology or visual appearance. It also involves cultural identity, climate responsiveness, human experiences, and the relationship between people and their environments.

This book invites readers to explore the interconnected roles of culture, climate, and computation in shaping contemporary architecture and cultural landscapes. It highlights the importance of integrating technological innovation with cultural preservation, environmental awareness, and sensitivity to the unique characteristics of each place.

Through this book, readers are encouraged to understand computation and artificial intelligence not as replacements for human creativity, but as tools that can support innovative thinking, improve design exploration, and broaden architectural possibilities. Ultimately, meaningful design requires a balance between computational advancement, cultural values, and environmental responsibility.

May this book provide new insights and inspiration for architects, landscape designers, academics, students, and everyone interested in the evolving relationship between culture, climate, and computational approaches to design.

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CHAPTER 1

EMPATHETIC CULTURAL LANDSCAPE DESIGN THEORY IN THE ERA OF ARTIFICIAL INTELLIGENCE

By: Chun Hyunjin

A. WHEN LANDSCAPE IS NOT JUST A MAP

In the 1960s, North America suffered a severe ecological crisis triggered by large-scale industrialization and unrestrained urban sprawl, which led to the rapid degradation of natural ecosystems. In *Design with Nature*, Ian McHarg pioneered the GIS overlay analysis framework, creating an analytical system that objectively demarcates development-restricted zones for extensive natural landscapes. By introducing numerical, objective evaluation criteria to landscape design, a field previously dominated by subjective judgments, his work earned profound academic recognition. To this day, McHarg's GIS overlay method has been incorporated into landscape architecture curricula worldwide and adopted as the standard analytical tool for national large-scale environmental governance policies. Nevertheless, McHarg's entire theoretical system is founded on the core philosophical premise of environmental determinism, which holds that the physical attributes of nature constrain all human spatial activities. His GIS evaluation layers only adopt quantifiable natural indicators including terrain gradient, hydrological networks and vegetation coverage as assessment benchmarks, while entirely excluding qualitative cultural information such as village traditions, intergenerational living customs and regional symbolic spaces from analytical objects. When this framework is solely applied to small rural villages across Asia, critical cultural assets within designated nature conservation zones are consistently deprioritized in analytical outputs. This results in the sacrifice of cultural heritage, alongside recurring public

CHAPTER 2

STANDARDIZED DESIGN AS A BARRIER TO RESILIENCE: A CASE FROM THAI PUBLIC SCHOOLS

By: Prompt Udomdech

A. STANDARDIZED SCHOOLS AND THE CHALLENGE OF CLIMATE ADAPTATION

Most Thai public schools are not designed individually. They are assembled from a fixed catalogue of building types issued by the Office of the Basic Education Commission (OBEC). It is the agency responsible for most of the Thai public and basic education infrastructure. OBEC currently administer 29,312 schools, serving approximately 6.4 million of the 11.9 million enrolled Thai students. The *School Building Design and Construction Standard* from OBEC contains 47 building archetypes (Office of the Basic Education, 2024b). Despite covering all school sizes and locations, Thailand is consistently identified as a high-risk country for climate exposure of children (UNICEF, 2025). Flooding, in particular, has been linked to recurring disruptions and learning loss across most of the exposed provinces (TDRI & UNICEF, 2022). The wider development literature has long argued that climate adaptation and education quality are, in effect, two parts of the same agenda, each dependent on the other (Bangay & Blum, 2010).

At the level of the individual building, it remains unclear which features of the standardised school designs are responsible for this exposure, and which, if any, already protect against it. Passive design principles that mitigate heat and flooding in hot and humid climates are well documented in the broader literature. Effective shading and cross-ventilation reduce reliance on mechanical cooling. Acceptable indoor comfort in naturally ventilated buildings extends well beyond thresholds developed for air-

CHAPTER 3

DE-COLONIZING TROPICAL LANDSCAPES

By: Nappy L. Navarra

A. STARTING WITH A LIVING LANDSCAPE

When one examines the period when certain cultures reached the height of their landscape design style, it is notable that most European styles reached their zenith the same time they reached their economic and technological levels. Italian and French garden styles coincided when Europe was experiencing *renaissance*, fueled mainly by colonial expansion and technological innovations as resources and information reached the European shores.



Figure 1: Rice Terraces in Bontoc, Philippines

Imperialism became a new means of accumulating wealth, opening possibilities of cultural expression and refinement as they built their expansive palaces with elaborate *parterre* and intricate hedges. These landscapes became their symbol of power as they manipulated the land to exhibit their global ambition and dominance.

CHAPTER 4

SEMIOTIC PALIMPSESTS OF YOGYAKARTA'S LANDSCAPE

By: Lisana Shidqina

A. LANDSCAPE AS A CULTURAL PALIMPSEST

The continuously revisited definition of landscape spans beyond geology and nature to accumulation of societal, cultural, and psychological constitutions which are written and re-written over time like the layers of a palimpsest (Denzer, 2025; Kühne, 2025b; Schama, 1995). Landscape visual archives act as subjective representations of these layers (Protschky, 2011). They represent the societal, cultural, and psychological projections of their maker towards their landscape subject, written semiotically through aesthetic language (Denzer, 2025). The more narratives are "written" of a landscape, the more richly layered their aesthetic quality is considered to be (von Bonsdorff, 2005). Deeper investigation over time may also discover the contested perceptions of society towards the landscape that they live in (Weber, 2025). This is particularly important, especially in non-Western context, where Western aesthetic paradigms may have failed to capture the profound relationships between people and their environment (Bruns & Münderlein, 2025).

One notably rich cultural landscape is the Daerah Istimewa (special region) of Yogyakarta, Indonesia. Long considered to be one of the cultural capitals of Java, the identity has been cemented by recognition of Yogyakarta's Cosmological axis by UNESCO in 2023 (Rachmawati *et al*., 2026; UNESCO, 2023). The axis sits partly between nature, mythology, and culture, following a *Mandala* concept (Remmelink, 2022) which links Mount Merapi, the Yogyakarta *keraton* (palace), and the Southern Sea in one imaginary straight line from north to south. This macrocosmos is also considered as

CHAPTER 5

RE-PARAMETERIZING THE PARAMETER: AI RENDERING AS A GENERATIVE TOOL FOR PARAMETRIC ARCHITECTURE

By: Faiz Ramadiansyah[1], Dominikus Aditya Fitriyanto[2], Rizka Tiara Maharani[3], Yusvika Ratri Harmunisa[4]

A. FROM PARAMETRIC MODELLING TO DESIGN OPTIMIZATION

The flexibility of parametric systems enables designers to move beyond the production of a single predetermined solution toward the systematic exploration of multiple design alternatives. In this process, parameters can be modified, combined, and evaluated iteratively to identify solutions that respond to particular design objectives. This approach is particularly relevant to contemporary architectural design, in which *avant-garde* design practices frequently incorporate optimization processes to identify acceptable levels of performance while satisfying predefined design constraints (Vazquez, 2024). Optimization therefore becomes an important connection between parametric modeling and architectural decision-making, as it allows design alternatives to be evaluated according to measurable criteria rather than solely through formal or aesthetic considerations.

Beyond geometric and formal exploration, the optimization capability of parametric design provides an opportunity to incorporate performance-related variables into the design process. Environmental conditions, spatial dimensions, material properties, building systems, and user-related characteristics can be treated as parameters that influence the resulting architectural configuration. . Parametric design is described as a method with an algorithmic approach that contains parameters and rules that codify the designers' intent (Caetano *et al*., 2020). Consequently, the design process can be understood as an iterative relationship between parameters,

CHAPTER 6

NUSANTARA ARCHITECTURE: RETHINKING INDONESIAN ARCHITECTURAL IDENTITY BEYOND WESTERN PARADIGMS

By: Darini Yusrina Abidah

A. NUSANTARA ARCHITECTURE: UNITY IN DIVERSITY

Indonesia's architectural landscape is inseparable from the extraordinary cultural, geographic, and environmental diversity of the archipelago. The principle of *Bhinneka Tunggal Ika*, commonly translated as "Unity in Diversity," provides an appropriate conceptual point of departure for understanding this condition. Indonesia consists of numerous islands and cultural communities whose distinctive belief systems, social organizations, environmental conditions, and construction traditions have generated equally diverse architectural expressions. The architectural diversity should be regarded as a strength of *Nusantara* architecture rather than something that must be reduced through formal generalization (Prijotomo, 2014).

This perspective challenges the tendency to define Indonesian traditional architecture primarily according to recognizable visual forms. The curved *gonjong* roof of Rumah Gadang, the monumental saddle-shaped roof of Tongkonan, the elongated Dayak longhouse, and the conical form of Mbaru Niang are visually different. Nevertheless, beneath these differences are recurring architectural principles concerning climate, materials, structural organization, social relationships, and relationships between human communities and their environments.

Prijotomo (2014) also reinforces this understanding that *Nusantara* architecture as an architectural phenomenon in which local identity and cultural meaning are manifested through physical form. Traditional

CHAPTER 7

HOTEL AS AN EMOTIONAL TRANSITION SPACE: AN INTERIOR PSYCHOLOGY STUDY OF PINE GARDEN TRAWAS HOTEL ROOMS

By: Nabila Andindya W

A. THE PSYCHOLOGY OF RECREATIONAL HOTEL SPACES

Recreational spaces serve as a medium that psychologically enables individuals to pause their routines, replenish their energy, and regain emotional balance. Within the context of interior psychology, hotel spaces are designed not merely to meet physical needs but also to serve as environments that accommodate the presence and emotional requirements of their users.

In her book of *Place Advantage* (2009), Sally Augustin asserts that the quality of the physical environment can directly influence psychological well-being. A space designed with an understanding of human behavior can foster positive experiences, shaped by elements such as lighting, materiality, spatial configuration, and the atmosphere created within. While hotels were once sought merely as places to stay and sleep, they have now become an integral part of the recreational experience itself. Tourism trends reveal a shift in traveler preferences: the focus is no longer solely on luxury, but rather on spaces that hold emotional significance, spaces that offer a connection to nature, simplicity, and a sense of comfort.

Hotels, particularly those featuring an *eco-lodge* concept, often serve as a meeting point between recreational and emotional needs. From the perspective of interior psychology, a hotel can be understood as an "emotional transition space", a place where an individual shifts from the intense rhythm of daily life to moments of rest and self-reflection. In *Designing for Behavior Change*, Stephen Wendel (2021) states that spatial

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CULTURE, CLIMATE, AND COMPUTATION

The relationship among these three dimensions is complex. Culture influences how societies respond to environmental challenges. Climate change can reshape traditions, livelihoods, patterns of settlement, and collective identities. At the same time, computation provides new possibilities for understanding environmental conditions, analyzing large amounts of information, predicting changes, and developing innovative responses. Yet technology itself also raises important questions about responsibility, access, ethics, and the future of human life.

This book chapter seeks to bring these perspectives into a shared conversation. Rather than viewing culture, climate, and computation as isolated subjects, the discussion encourages readers to see how they intersect and shape one another. Such an approach is increasingly important because many of today's challenges cannot be understood through a single discipline or perspective. Environmental problems, technological transformation, and cultural change are deeply interconnected.

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