The Korean Hanok as a Model for Sustainable Architecture in South Korea

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THE KOREAN HANOK AS A MODEL FOR SUSTAINABLE ARCHITECTURE IN SOUTH KOREA

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in partial fulfillment of the degree of Bachelor of Arts
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Abstract

This thesis analyzes the traditional Korean hanok within the Western framework for sustainability across environmental, social, and economic dimensions. It then cross-references the findings of this analysis with existing theory on the cultural role of architecture to elucidate how the traditional Korean hanok can serve as a model for sustainable architecture in South Korea. Through a comprehensive analysis this thesis highlights the importance of architectural vernacular to define a sustainable building, and critiques contemporary Western ideas of sustainable architecture. Furthermore, this thesis synthesizes two current approaches to sustainable development in South Korea, the u-eco-city and the Green Standard for Energy and Environmental Design (G-SEED), with the findings on the hanok's sustainable attributes. It concludes with a proposal for a comprehensive and culturally rooted model for sustainable architecture. This holistic model emphasizes the importance of considering culturally appropriate, place-based design in the built environment to stray from Western ideas of both modernity and sustainability. The research contributes to a deeper understanding of sustainability by bridging the gap between Eastern architectural traditions and Western sustainability paradigms and advocating for a more culturally sensitive approach to sustainable development. Further research on this topic on implementing a bottom-up aspect into G-SEED is recommended.
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Introduction

The climate crisis demands reconsidering our built environment. Sustainable architecture certifications are becoming increasingly popular worldwide. The most used standard across the globe is the Leadership in Energy and Environmental Design (LEED) certification. While the United States ranks number one for the most LEED certified square footage, countries such as Mainland China, India, Canada, and South Korea followed next with 40 to over 1,000 LEED certified projects in 2021. As LEED states, “green building is a truly global movement” (Daisy Verdinez, 2023). LEED emphasizes energy efficiency to determine what makes a building sustainable, but recently researchers have begun to critique this idea. Architecture reflects a society’s values. In Design and Truth, Robert Grudin claims, “each new design is a new discovery, conveying a specific truth about our relationship to nature and to each other” (Robert Grudin, 2010, p. 4). Design possesses a certain truth about the world and ourselves that is relevant to sustainability. As many researchers point out, prioritizing technology in design furthers the concept of human control over the natural world. In Reinterpreting Sustainable Architecture: The Place of Technology, Simon Guy and Graham Farmer acknowledge that the technological framework that is prevalent nowadays tends to “ignore the essentially social questions implicated in the practice of sustainable architecture” (Guy & Farmer, 2001). Before stating their six logics for sustainable architecture, Guy and Farmer assert that they “challenge the assumption that the environment is merely a physical entity and resist the categorisation of it only in scientific terms” (Guy & Farmer, 2001). There is a spiritual aspect to the environment to which technology cannot relate. The eco-technic logic, or belief that science and technology will solve the climate crisis, furthers the human-nature divide. There exists a belief in human control
over the environment within eco-technicism that does not align with the spiritual aspect of nature.

In addition, in *Role of Culture in Sustainable Architecture*, Sinem Kultur asserts that culture has a critical place in sustainable architecture. The United Nations Educational Scientific and Cultural Organization (UNESCO) “coined the term ‘whole life sustainability’ in order to expand the general meaning of sustainable architecture from designing environmentally friendly buildings to architecture incorporating local identity into [the] design process” (Sinem Kultur, 2012). In Kenneth Frampton’s 1983 essay “Towards Critical Regionalism, Six Points of an Architecture of Resistance,” he “seeks to simultaneously address local conditions and contemporary global culture of architecture... underlin[ing] the importance of engaging sustainable architecture not only as technique or method, but as a cultural paradigm” (Frampton, 1983). A sustainable building should therefore reflect regional cultural values and design, and bridge the human-nature divide by rejecting ideas of human dominion. In this thesis I will analyze how the traditional Korean hanok operates within the Western definition of sustainability through the three pillars– ecological, social, and economic. I will then cross-analyze the findings with the cultural role of architecture to portray what the hanok does for a landscape and its people. Finally, I will provide a discussion of the current sustainable development plans in South Korea, and how my findings regarding the hanok can create a holistic model for sustainable architecture.

**Background on Urbanization in South Korea**

Urbanization changed Korea’s national identity. The first urbanization occurred during the Japanese colonial period. Since Japan had already started its own modernization when it colonized Korea in 1907, the roots of Korea’s first urbanization are attributed to Japanese
Japanese colonizers built railways, roads, and ports that led to great expansion during this time. During the first urbanization, the urban population in Korea increased from three percent of the entire population to 13 percent. In the 1920s, Japan began to adopt Western ideas of urban planning for Korea’s colonial cities. The colonial government researched Western ideas such as Ebenezer Howard’s idea of the garden city, and a plan for Seoul’s new downtown area developed that centered around implementing Western-style roadside buildings. Western ideas of modernization only grew from here. The 1920s brought a younger generation to the city who shifted its culture to an avant-garde atmosphere: “to them, the city was both the distillation of modernity and, because it was the essence of the modern, the place where the representation of modernity was embodied” (Inha Jung, 2013, p. 14). The “essence of the modern” became an important driver for Korean people to reject what was once traditional and old. Modernization became an obsession— a justification of belonging, of progress. Architecture was a way to embody modernity. The Japanese colonial architects of the 1930s rejected traditional Korean techniques and embraced Western, mainly European, styles. Educational institutions, for example, were modeled after higher education buildings in Europe, “reflecting again an identity of being modern and in tune with tertiary educational universities elsewhere in the world” (Peter G. Rowe et al., 2021). Japanese architects in Korea employed Western styles to align Japan with other imperial nations and colonial powers of the time (Rowe, et.al). As a result, “there was little or no attempt to be locally or regionally unique in what might be seen as a Korean or Japanese manner” (Peter G. Rowe et al., 2021).

The introduction of new construction materials furthered the cessation from traditional systems. However, technology did not truly take its course until modern appliances became widely available in the 1970s (Inha Jung, 2013). After the Korean War, South Korea’s economy
lay in ruins. The reconstruction period relied on foreign aid, and thus the military overtook control of the government. The result was an export-oriented economy with industrialization as the top priority. Urban expansion during the 1970s led to changes in Korean living and thinking. Apartments became the dominant housing structures as density led to housing shortages in cities. Between 1960 and 1980, urban households increased by 3.2 million, but housing units only increased by 1.7 million (Kim Yong-Woong, 1999). The urban hanok was no longer sufficient to house the extensive population. South Korea ranks third in the world in population density, and “congestion has been a constant factor in its urbanization. Since there has never been enough land to build large housing estates filled with detached houses, Korean planners sought to make high-rise apartments an attractive alternative by surrounding them with urban amenities and the open spaces that are rarely found in cramped cities” (Inha Jung, 2013, pp. 70-71). An apartment culture developed, and with it so did concerns regarding the loss of community: “The primary fear associated with large-scale apartment complexes was the loss of a familiar community-based neighborhood, and of the dwelling place as part of something coherent and comprehensive… Residents no longer felt the same community spirit” (Inha Jung, 2013, p.78). A loss of community can be viewed as a push towards Western individualism. People no longer come into contact with one another, valuing privacy, efficiency, and access to vehicles. The younger generation idealized modernity because it “symbolized their escape from an impoverished past and was a promise of an enhanced social standing still to come” (Inha Jung, 2013, p. 70).

Innovations in housing transformed tradition into a style more homogenous with the West. The spec house became popular amongst middle-class families, and it changed the orientation of space within a Korean home. For example, the interior courtyard (madang) of the hanok was replaced with a Western-style living room (Inha Jung, 2013). The courtyard was a principal
element of the *hanok* that regulated climate, brought people closer to nature, and facilitated gathering. Introducing a living room eradicated aspects that reflected traditional thought and values.

The word *hanok* first appeared in Korea in 1907 (Jung-hye Shin, 2012). At this time, new styles of residential houses were introduced in Korea by Japan. The word was used throughout the 20th century, though it was sparse and did not possess the same meaning it does today. The style continued to gain recognition throughout the 1970s “at the same time that the authoritarian military regime’s national modernization project reached its full swing and Western-style houses and high-rise apartment buildings were quickly replacing Korean traditional buildings” (Jung-hye Shin, 2012). The term *hanok* was used to refer to the Korean style houses in general as opposed to the Western-style houses and high-rise apartments, collectively called *yangok*, that started dominating the built environment. The *hanok* was seen as “an embodiment of pre-modern inefficiency and a roadblock to the successful modernization of Korea” (Jung-hye Shin, 2012). It could not coexist with the adoption of Western practices. Demolition of *hanok* continued after independence from Japan. The civil war in the 1950s resulted in mass destruction of existing *hanok*. The regime of the 1970s did keep the traditional style to construct large-scale buildings projects such as the president's house, public museums, and cultural centers. These buildings, however, included modern materials such as reinforced concrete (Jung-hye Shin, 2012).

The Seoul Metropolitan Government designated the Bukchon *hanok* as Local Cultural Assets in 1977, and the entire town as an aesthetic zone in 1983 (Jung-hye Shin, 2012). Safekeeping these buildings proves a desire to maintain Korea’s identity in terms of cultural architecture: “it was the first step in recognizing cultural environment as ‘ours’– a conscious activity that surfaced when ‘others’ became present, or more succinctly when ‘others’ (modern
buildings) replaced ‘ours’ (traditional buildings)” (Jung-hye Shin, 2012). However, although the preservation of hanok here revitalizes a sense of cultural identity, there is still a disconnect between traditional values and modern values represented in this village. The hanok buildings in Bukchon are used “as cultural centers or small gallery spaces for Korean traditional teas, dinnerware boutiques, and artisans’ shops. In these spaces, the total experience of traditional life was packaged and sold to both Koreans and tourists from other countries” (Jung-hye Shin, 2012). There was an economic benefit to replicating an experience of the traditional Korean environment. While this idea may function as a bridge between newer generations and cultural roots, the objectification of culture for capitalistic benefits should not be ignored. In a case study titled “A rethink of the incentives programme in the conservation of South Korea's historic villages,” researchers interviewed Bukchon residents: “One respondent pointed out that: ‘Bukchon is changing to be a more capitalistic district; our heritage value should be preserved and kept” (Indera Syahrul Mat Radzuan et al., 2015, p. 192). This respondent illustrates that commodifying culture in Bukchon strays from traditional Korean values. In fact, most respondents disapproved of any further tourism developments in Bukchon due to the materialism that had already developed. Evidently, the tension here between tradition and modernity is a common theme in South Korea’s built environment.

The integration of Western thought into Korea’s built environment results in the loss of architectural identity that is crucial to a culture. Until the 1960s, East Asia did not have a word for “tradition.” However, with the rise in modernization Japan created the word “dentou” to refer to “each region’s identity and sense of its own cultural continuity when confronting Western culture” (Inha Jung, 2013, p. 82). Homogeneity is evidently an issue with modern architecture. The loss of a regional style creates uniform landscapes that fail to incorporate both local climates
and cultures. This was furthered with architectural sustainability rating standards. The most widely used standard in the world is the Leadership in Energy and Environmental Design (LEED). Developed in 1994 by the United States Green Building Council (USGBC), LEED established a universally agreed upon baseline to measure and define a “green building” (LEED, n.d.). However, one architectural standard does not fit within the environmental and social contexts across the globe. South Korea developed their own architectural standard, Green Standard for Energy and Environmental Design (G-SEED), drawing upon Western influences (Seung-Ju Choe & Seung-Hoon Han, 2019). A study titled “Analysis of Green Building Certification Systems for Developing G-SEED” concluded that LEED’s global certification program only requires USGBC approval for energy efficiency to meet local certification standards (Yun et al., 2018). This is not surprising as LEED prioritizes energy to determine what makes a building sustainable. However, energy efficiency should not be the only aspect of a building that needs to comply with local environments. G-SEED possesses 25 local certification items compared to LEED’s 16. This equates to 58% of G-SEED’s total certification system and 31% of LEED’s system (Yun et al., 2018).

At this point, it may appear that G-SEED performs better in terms of considering locality, but other researchers have pointed out that “indexes for its evaluations are somewhat ambiguous. Accordingly, assessment has been limited due to these problems. Under these circumstances, the applicability of the assessment system needs to be reconsidered so that the architectural philosophy reflecting the locality and identity of Koreans could be applied to its procedures” (Seung-Ju Choe & Seung-Hoon Han, 2019). A universal standard for sustainability is difficult to achieve when regional differences matter. Architectural identity needs to be incorporated for what is deemed “sustainable.” There is a reason why there exists a social pillar of sustainability.
The social context is essential for development to be sustainable. Culture adds to community, and living with each other is vital for the health of our planet and ourselves. In the next three sections, I will explore how the Korean *hanok*, or traditional home, fulfills the social, environmental, and economic pillars of sustainability, and may provide insight into how to create modern sustainable residential buildings. This may be useful in conveying the viability of such design practices in the Western world.

Before engaging in further analysis, I want to clarify my position and some of the language I use in this thesis. I want to acknowledge my position as an American conducting research on a foreign country. Although I am Korean-American, my American identity inherently upholds Western empire. Any critiques I employ towards South Korean sustainability solely comes from a place of respect towards the nation. In addition, my inability to read Korean limits the scope of my research. In this thesis, I will use the Environmental Protection Agency’s\(^1\) definition for the social, environmental, and economic pillars to frame my analysis. Finally, I will use the word *architect* to refer to any builder, carpenter, architect, or constructor-type person. Only in the Economic Pillar section will the words *architect* and *carpenter* be used interchangeably.

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\(^1\) According to the Environmental Protection Agency, the social pillar of sustainability refers to Environmental Justice (protect health of communities over-burdened by pollution by empowering them to take action to improve their health and environment); Human Health (protect, sustain, and improve human health); Participation (use open and transparent processes that engage relevant stakeholders); Education (enhance the education about sustainability of the general public, stakeholders, and potentially affected groups); Resource Security (protect, maintain, and restore access to basic resources (e.g. water, food, land, and energy) for current and future generations); and Sustainable Communities (promote the development, planning, building, or modification of communities to promote sustainable living). The environmental pillar refers to Ecosystem Services (protect, sustain, and restore the health of critical natural habitats and ecosystems); Green Engineering and Chemistry (design chemical products and processes to: eliminate toxic hazards, reuse or recycle chemicals, and reduce total lifecycle costs); Air quality (attain and maintain air-quality standards and reduce the risk from toxic air pollutants); Water Quality (reduce exposure to contaminants in water systems and infrastructure); Stressors (reduce effects by stressors (e.g. pollutants, greenhouse gas emissions, genetically modified organisms) to the ecosystem and vulnerable populations); and Resource Integrity (reduce adverse effects by minimizing waste generation to prevent accidental release and future cleanup). The economic pillar refers to Jobs (strengthen and maintain current and future jobs); Incentives (promote incentives that work with human nature to encourage sustainable practices); Supply and Demand (promote fully informed accounting and market practices to promote environmental health and social prosperity); Natural Resource Accounting (improve understanding and quantification of ecosystem services in cost benefit analysis); Costs (positively impact costs of processes, services, and products throughout the full lifecycle); and Prices (promote cost structures that reduce risk and premium for new technologies) (EPA Sustainability Primer v9).
Social Pillar

P’ungsu

The Korean concept of geomancy refers to the combination of p’ungsu which means “wind and water” and chiri which means “the patterns of the earth” or “the principles of the earth” (Hong-Key Yoon, 2018). Chiri refers to both geography and geomancy, as they are intertwined in this practice. P’ungsu cannot be defined by Western standards because it is a type of environmental study that does not translate in the West. Both terms indicate geomancy, and p’ungsu chiri (or just p’ungsu) is often used interchangeably with geomancy. Rather than a superstition, religion, or science, geomancy is “a unique comprehensive system of conceptualizing the physical environment that regulates human ecology by influencing man to select auspicious environments and to build harmonious structures such as graces, houses, and cities on them” (Hong-Key Yoon, 2018, p.11). Geomancy is the Korean translation of Chinese feng shui (Hong-Key Yoon, 2018). Westerners adopted the term as a translation of this Chinese art, and since the nineteenth century geomancy has been popularized to mean the art of “situating buildings and tombs auspiciously” (Hong-Key Yoon, 2018, p.12). In this thesis, I will use the term p’ungsu to refer to this concept in Korea.

Before diving into the analysis, I would like to provide ecological validity for p’ungsu. The terms p’ungsu and feng shui are used interchangeably throughout this section. A study by Seung-Ju Choe and Seung-Hoon Han titled, “Applicability of Feng Shui Thoughts for Sustainable Space Planning and Evaluation in Korea Verified Using Three Dimensional Digital Mapping and Simulations,” analyzed the performance of traditional Korean architecture in regards to sustainability. Choe and Han selected five sites to analyze the climatic conditions in relation to building design, and found that the buildings “tended to be located in a place where
the geographical condition was set up so that target sites could control the climatic elements like the sun and wind according to local characteristics” (Seung-Ju Choe & Seung-Hoon Han, 2019, p. 14). In other words, the original architects understood the landscape characteristics in each site, and therefore could optimize how natural energy moved through the space for the people who lived there. Choe and Han concluded that “it can be inferred that feng shui thoughts are supported by a sufficient scientific basis and that the current environmental index can possibly be interpreted in or replaced with the traditional point of view” (Seung-Ju Choe & Seung-Hoon Han, 2019, p. 14).

To select a building site, p’ungsu offered insight as the “fundamental decision-making method to judge the appropriateness of the site condition with its surroundings, including its contours, mountains, and rivers” (Seung-Ju Choe & Seung-Hoon Han, 2019, p.2). Selecting a site thus required an ecological understanding of the land and climate. Mountains and rivers were the most important elements in p’ungsu. In East Asian tradition, “nature is a world of abundant energy, or gi (often known in the West by its Chinese pronunciation, qi), that is constantly moving and changing. The wind transports the energy of the sky to the earth, while water carries the energy of the earth” (Ben Jackson & Robert Koehler, 2012, Location 86). Qi is an ancient Chinese concept that lies at the root of spiritual and philosophical practices such as Buddhism and Daoism (Yu Huan Zhang & Ken Rose, 2001, p. vi). Ancient Chinese philosophers believed that “the birth, existence, transformation, and disappearance of everything in the world happen under the influence of qi” (Yu Huan Zhang & Ken Rose, 2001, p.vii). Qi informs how to maintain balance in all aspects of life. This includes the relationship between humans and nature: “this fundamental concern with establishing harmony between humans and nature appears in the oldest traditions native to China” (Yu Huan Zhang & Ken Rose, 2001, p.41). In Ancient Chinese
thought “all things in nature are ordered and move circularly. What people need to do is harmonize themselves with nature” (Hou, 1997, p.486). Lin Yutang, Chinese philosopher, linguist, inventor, novelist, and translator, stated that the characteristic of qi “is not supremacy over nature but harmony with nature” (Yu Huan Zhang & Ken Rose, 2001, p.59). Qi is embedded in the practice of feng shui: “the theoretical basis of Feng Shui relies on the concept of Qi, which represents the ‘cosmic spirit that vitalises and infuses all things, giving energy to human being, life to nature, movement to water and growth to plants” (Mak & Thomas Ng, 2005). Feng Shui could then provide the basis of understanding the elements of a landscape as “Qi presence on earth is linked with geographical features” (Mak & Thomas Ng, 2005). In other words, understanding where qi lives in a landscape illuminates the conditions for a good location. Knowledge of feng shui, and consequently qi, was required for site selection in the built environment. In Korean p’ungsu mountains were thought to harness the wind and rivers to hold water. An auspicious site was therefore one with both mountains and a river to channel natural energy, provide abundance, and consequently “flow into the people living in a house built there” (Ben Jackson & Robert Koehler, 2012, Location 91). The idea here is not to utilize the biosphere to strengthen the functions of the building, but instead to emphasize harmony with the existing landscape (Hong-Key Yoon, 2018).

The orientation of the building on the site was often more important than the site itself. This was first due to the emphasis on what the building looked out upon, “indicating that psychological perspectives could take precedence over functional considerations” (Ben Jackson & Robert Koehler, 2012, Location 99). Prioritizing mental effects relates to the manifestation of qi in the built environment. The holistic approach, where the mind is taken in consideration, to architecture is a direct contrast against Western pragmatism. It wasn’t until 1984 that Edward O.
Wilson coined the term *biophilia* to describe the inherent human desire to relate to and understand nature (David S. Jones & Phillip B. Roös, 2023). LEED now incorporates biophilia into their sustainability standard, awarding two points in the *Innovation* category for biophilic design (*Discover the Elements of Biophilic Design | U.S. Green Building Council*, 2022). Its intent is to “support and improve human health, well-being, and productivity by incorporating elements of nature in the indoor environment” (*Innovation*, n.d.). Besides the addition of productivity in the reason for *biophilia*, the Korean and Western ideas are very similar. However, the concept for Koreans was understood well before it was given a name in the Western world. It was inherent to *qi*—tied to their understanding of *p’ungsu* and building with nature. In addition, the forest served as “a refuge to hide and defend the village from invaders during a war” (Hong-Key Yoon, 2018, p.120). A sense of protection is important to determine where people live. Prospect-refuge is a design theory outlined by geographer Jay Alton in 1975 (Manolakelli, 2023). It proposes “that humans are naturally drawn to spaces that give them opportunities to respond to their needs for reviewing their surrounding environment for potential opportunities (prospect), without being visible (refuge), something that creates a sense of safety” (Manolakelli, 2023). The orientation of the city aligns with this theory. The buildings look out onto the river and vast landscape (prospect), while feeling protected from the mountain and forests (refuge). Though it is not necessary to justify the orientation of traditional Korean villages with Western theory, it is helpful to support its viability and ground it in a modern context.

The materials used in the *hanok* are earth, trees, and stone (Ben Jackson & Robert Koehler, 2012). The optimal method to use timber is displayed in the construction of Korea’s royal palaces. Since wood is a living material, architects were conscious of the tree’s origin. For example, wood from trees that grew on the mountains’ southern slope should be used on the
southern face of a house, while trees that grew on the northern slope should be used on the rear, shaded side of the house (Ben Jackson & Robert Koehler, 2012). Aligning wood with climate conditions is easier in tandem with the orientation of the hanok on the land. Since p’ungsu theory takes into consideration abiotic landscape aspects, the tree’s microclimate is replicated. The architects who built Korea’s royal palaces “selected a mountain several years before the start of construction and examined the characteristics of the trees from various areas on it before deciding what wood from which tree would be used for each part of the building” (Ben Jackson & Robert Koehler, 2012, Location 151). Pillars and girders in the hanok must bear significant weight. The wood for these elements came from trees that survived harsh conditions atop a high mountain ridge, and are therefore resilient and sturdy (Ben Jackson & Robert Koehler, 2012). Walls came from trees that grew in humid valleys with milder temperatures because their wood is more pliable (Ben Jackson & Robert Koehler, 2012). This careful attention shows respect to the natural world. The chosen trees will become a part of the built environment, the human world. It matters which trees are chosen to ensure their wood will succeed in a new environment. 

In addition, this selection process illuminates how variable nature is. Choosing the right mountain and the right tree suggests a complicated and deep understanding of the land. There is an analytical process here that is slow, and even spiritual. This type of timber process would not be successful in the fast-paced and mass-produced consumption of the Western world. Instead, this process embodies p’ungsu as a framework for harmony with nature, and the manifestation of qi in all things. Rather than prioritizing the consumer through quick and efficient results, consideration is given to the tree itself. As a result, some power is restored to the taken tree. Taking from the natural world should be a careful process, where the taker is conscious of their
power over another living being. Therefore, these architects illustrate a holistic way of using materials in construction that encourages balance with nature, and as a result, sustainability.

**Social Practices**

The identity of a building extends to its inhabitants. Human practices within a building can impact its overall sustainability. The hanok holds wastewater management practices that exhibit both sustainability and traditional values. To understand this wastewater management system, one needs to understand the social as well as ecological knowledge. Traditional Korean villages created self-purifying wastewater management systems (Hao et al., 2010). These consisted of small, decentralized ponds to “minimize the impacts on downstream areas” (Andreas N. Angelakis & Joan B. Rose, 2014, p. 304) and irrigate farmland. A traditional Korean village positioned their rice paddies next to a pond (Andreas N. Angelakis & Joan B. Rose, 2014). The flow of water contained self-purification processes and was used for multiple purposes before eventually discharging into the river or stream. The water flowed from the mountains to the village where it was used for drinking and cleaning. The water was then transported to the pond which served “as a primary treatment facility” (Andreas N. Angelakis & Joan B. Rose, 2014, pp.303-304) before being recycled to irrigate farmland. In addition to the ponds, villagers grew water dropwort fields, a wetland environment that functions as a natural purifier, in man-made puddles around the houses and farmlands to cleanse the wastewater that passes through this area before reaching the farmland and river. Water-dropworts are an herbaceous plant native to East Asia and popular in many Korean dishes (What Is Minari? | Cooking School | Food Network, n.d.). Domestic water use was also reused: “the collected water
effluents from laundry and washing activities were kept in a specific vessel called ‘ttun-multong’ - which can be easily reclaimed for fodder making” (Andreas N. Angelakis & Joan B. Rose, 2014, p. 302). These recycling practices illustrate a conservationist attitude towards water that reflects modern sustainability.

Traditional Korean villages also reused human excreta for agricultural fertilizer (Andreas N. Angelakis & Joan B. Rose, 2014). Three types of toilets existed to collect and ferment excreta. The first is the pit latrine, which was dug out in the backyard of the hanok. The latrine was installed at a depth and width to permit feces fermentation. This compost takes time before being a suitable fertilizer, so villagers constructed wide storage facilities to contain the process. Villagers then dug out puddles and placed special pots around the latrine to collect the fermented fertilizer. The cyclical practice here between agriculture and consumption results in zero waste. In addition, reusing excreta eliminates the need for off-site fertilizer, connecting to the locality aspect of sustainability. Time was also a necessary consideration due to the microbiological contamination of fresh feces. Koreans recognized the sanitary dangers of handling human waste, and therefore only allowed the use of fresh or unsuccessFully composted feces in the spring or after the harvest in the autumn. The fully composted waste was saved for the vegetation period. The second type of toilet is the Jetgan, which consists of two large stepping stones with furnace ashes in between that collect the excreta. The chaff of grains was mixed in with the ashes, urine, and feces before being stored in a container to suppress the odor and make fertilizer. Traditional Koreans often separated the excreta because it was more effective as fertilizer compared to mixed waste, exemplifying trial and error that results in an extensive understanding of land and agriculture. During the Joseon Dynasty, Koreans commonly placed urine jars outside of rooms for easier access. Solid and liquid waste was stored in separate jars that went through separate
fermentation processes. These are the third type of traditional toilet. Once ready for agricultural use, they carried urine in an *ojum-janggun* and feces in a *ddeung-janggun* to the field (Andreas N. Angelakis & Joan B. Rose, 2014).

![Figure 3: Ojum-janggun (left) and ddeng-janggun (right) (Andreas N. Angelakis & Joan B. Rose, 2014).](image)

Social education through traditional proverbs promulgated the reuse of excreta and safety practices in its handling (Andreas N. Angelakis & Joan B. Rose, 2014). One translation reads, “I would rather give a bowl of rice, than a basket of excreta and ashes” (Andreas N. Angelakis & Joan B. Rose, 2014, p. 307). Another reads, “if you pee in streams your penis will swell” (Andreas N. Angelakis & Joan B. Rose, 2014, p. 307) or “if men and women pee in streams, they will have trouble having babies in the future” (Andreas N. Angelakis & Joan B. Rose, 2014, p. 307). The first presents the value in excreta, by claiming that it is worth more than food. Evidently, a basket of fertilizer will yield more than a bowl of rice, so it is wise to place more value in it. However, by stating that one would want to keep their feces, they reject modern ideas of waste that arose from the West. Across the world and for millennia, farmers relied on human excrement for fertilizer known as “night soil” (Kawa et al., 2019). Both European and Asian
countries employed systems for night soil, where human excrement was collected for agricultural purposes. However, European industrialization gave rise to the sewage system for the removal of human waste. This sewage system prevailed in Europe, North America, and Australia until the early twentieth century when “urban growth, the development of less land-intensive wastewater treatment technology, greater sensitivity to odor nuisances, and a growing awareness of the hygienic and public health risks led to its decline” (Borowy, 2021, p. 521). Asian countries still relied on night soil at this time, which signified a primitive practice compared to their European counterparts:

The exploitation of human excrement and urine as fertilizer, and the degraded figures of scavengers, night soil men, and sweepers in Asia, served as just another indicator of the poverty and traditional methods of Asian agriculture and urban planning, when compared to European alternatives. (Ferguson, 2014, p. 381)

Europe also invented the flush toilet, and by “the middle of the twentieth century, the practice was widely perceived as part of a universally applicable form of modernization, assumed to be a prerequisite for progress and health protection” (Borowy, 2021, p. 522). The West, therefore, associated the flush toilet with modernization and progress. On the contrary, night soil, or re-using human waste for fertilizer, was held in negative regard. Evidently, one element that pushed for new systems to deal with human waste was sanitation. Korean tradition confronted sanitation as well through their proverbs. The second and third proverbs previously stated are warnings against urinating in streams and rivers, for health and sanitation purposes. Therefore, traditional Korean villagers understood the risks and consequences of bacterial contamination, and practiced safe composting methods. A graded pricing system in Korea existed for marketing feces until 1900 (Hao et al., 2010). Excreta from households in the city was collected and transported to the agricultural land. However, the application of human waste disappeared “with the gradual introduction of centralized water supply [and] waterborne sanitation and sewer
systems in the 20th century” (Hao et al., 2010). Chemical fertilizer replaced traditional methods, resulting in the ban of urine and feces fertilizer in the 1960s. This time period coincides with the rise in Korea’s modernization and adoption of Western philosophy. The transition away from recycled excreta suggests the rejection of sustainability in a traditional sense. Sustainability in Korea began to rely on Western definitions to create meaning because traditional ways were viewed as uncivilized.

**Collectivism**

Korean society involved a collectivist mindset which stemmed from the Confucian tradition (Greenspan et al., 2022). A collectivist culture refers to one where “individuals remain tightly integrated into groups and are supposed to let the interests of the group prevail over their own interests” (van Hoorn, 2015). Families living in hanok were multi-generational, connecting to the traditional norm of familialism (Greenspan et al., 2022). In Korean Confucianism familialism “is conceptualized by three key characteristics of Confucian views of family: family-centeredness, generation and gender-based hierarchy, and gendered division” (Lee, 2018). I would like to acknowledge that there are conservative practices in collectivist societies such as low gender parity (Greenspan et al., 2022) that do not align with my personal beliefs nor serve a holistic definition of sustainability that takes into account gender equality; however, I will only be focusing on practices regarding communal living and frugality in this thesis. Multiple generations living under one roof results in higher energy efficiency. In the case of the traditional hanok this means less wood to keep the same amount of people warm, compared to if each generation lived in their own house. Multi-generational living also reduces consumption of material goods as they are shared between generations. In addition, the collective society
emphasizes frugality (Greenspan et. al, 2022, p. 104). Therefore, purchase decisions were “often based on a product’s functional benefits more than hedonistic preferences, influencing family conservation, consumerist practices and environmental IGT [intergeneration transmission] among family members” (Greenspan et. al, 2022, p. 104). The collective society combined with the multi-generational home provided space for frugality to environmentally conscious ideals such as frugality and community to be passed down through generations.

Environmental Pillar

In p’ungsu theory, abiotic factors were considered elements of the landscape. Wind was thought to be a natural purifier by “removing the latent heat inside the room through air supply and exhaust and by discharging polluted air to improve the indoor air quality” (Seung-Ju Choe & Seung-Hoon Han, 2019). Koreans thus factored wind movement into the site selection process and building orientation. For example, building a house near a windbreak forest directs the wind differently than an open space (see Figure 1). Evidently, this practice developed before the existence of machine air conditioners, but its effectiveness is still applicable today.

Figure 1. An illustration of how natural and built aspects of the landscape influence wind patterns (Seung-Ju Choe & Seung-Hoon Han, 2019). P’ungsu experts conducted this type of site analysis.
The building orientation provided benefits related to its overall sustainability. The custom was to build “south-facing front elevation aiming at inducing the smooth inflow of sunlight” (Seung-Ju Choe & Seung-Hoon Han, 2019). As a result, the building was naturally heated and well-lit. Land use was assigned from observations of land morphology, topography, and climate with the assumption that soil remained unchanged for long periods of time. This scientific language, however, was not how Korean people analyzed the land. P’ungsu practices shaped “the specific spatial configuration” (Hong-Key Yoon, 2018, p. 120) of land. For example, the mountain stood behind the village with the river flowing through the rice fields in front. The village therefore faced south, protecting it from strong Siberian winds during the winter and providing optimal sunshine during the summer. As a result, the “land is properly dry and the village residents can use less firewood to heat the rooms” (Hong-Key Yoon, 2018, p. 122). Maximizing the sun’s energy thus conserved natural resources, and as a result protected the land.

Water acquisition and retention is necessary for a thriving community. As previously mentioned, rivers were an essential element in site selection for a village. The p’ungsu practice to retain water in residential and agricultural areas is called “tuksu pibo, which means practices to compensate for weakness in the acquisition of water” (Hong-Key Yoon, 2018, p. 119). Weakness in water acquisition referred to straight-flowing waters. These were avoided due to their rapid water loss and soil erosion. Meandering rivers were favored because water moved slower, staying with people longer. If the natural conditions did not fulfill the auspicious meandering river, then Koreans intervened with the landscape by “making ditches, digging ponds, or nurturing forests or groves. These practices helped to retain water, thereby conserving soil moisture, recharging groundwater, and mitigating the dryness of the air with increased evapotranspiration” (Hong-Key Yoon, 2018, p. 119).
Physical Hanok Elements

Windows provide opportunities for heat, light, ventilation, and noise control in a building. However, achieving all four of these aspects equally is difficult. In traditional Korean architecture, the term *changhoji* refers to a fiber made from mulberry bark that was used in windows and doors. As a semi-transparent material, *changhoji* offers a pleasant filtered light that is “neither hot nor glaring” (Ben Jackson & Robert Koehler, 2012, Location 217). In addition, the “fine spaces between the changhoji fibers block out strong winds but allow the passing of fine air particles. In a traditional Korean house with a well-designed system of windows and doors, it is said that a person will never catch a cold” (Ben Jackson & Robert Koehler, 2012, Location 220). The ability to obtain natural air circulation, light, and wind protection at the same time is unique to paper windows. The limitations here are noise control and heat retention. Although the paper does retain some heat, it is minimal. As a result, the traditional *hanok* commonly had several layers of windows and doors: “These came in a variety of forms, including those that were opened and closed by sliding from side to side (a form still found in most modern Korean windows); those that could be folded, lifted up outwards, and suspended horizontally from the outer ceiling or roof eaves” (Ben Jackson & Robert Koehler, 2012, Location 605).
Paper windows offer a softer edge between the structure and its external environment. Houses are not implicitly anti-nature. The *hanok* portrays how houses can exist in harmony with nature. Designing in accordance with natural energy such as sunlight and wind are one way to accept the natural world into the built environment.

The design of the roof factored heavily into year-round climate control. The zenith of the sun is low in the winter and high in the summer (Ben Jackson & Robert Koehler, 2012). As a result, the roof has eaves which curve slightly upwards to draw “sunlight into the house in winter while providing shade in summer, thus helping to keep the interior of the house warm and cool in each of these respective seasons” (Ben Jackson & Robert Koehler, 2012, Location 193). The roof portrays a passive heating and cooling system, a method for lowering a building's energy use through designing in accordance with renewable energy such as solar (Chan et. al, 2010). In regards to the building envelope, what separates the exterior from the interior, the “roof is believed to be the most important when it comes to developing passive measures. This is because it is the most exposed part of a building to direct solar radiation and there is enough evidence
indicating that roof alone can be responsible for up to about 50% of heat load in a single or two story building during summer” (Sharifi and Yamagata, 2015). The curve of the eaves, or cheoma, also provides rain protection (Ben Jackson & Robert Koehler, 2012). The Korean peninsula experiences between 1,000 to 1,800 mm of annual rainfall depending on region (Climate Monitoring > Climate, n.d.). The perfect slope of the roof is important to prevent rain accumulation from a roof that is too flat and tiles falling off from a roof that is too steep. The cheoma offers a balance to keep the rain off the house while protecting the roof materials (Ben Jackson & Robert Koehler, 2012). The roof also offers elegance to the building, an aesthetic benefit that will be explored more later.

The hanok illustrates how humans can adapt to environmental conditions instead of mitigating them. In climate change discussions, mitigation refers to the reduction of greenhouse gas emissions. Therefore, mitigating climate change impacts could refer to energy efficient heating and cooling technologies such as solar energy and electrification. Adapting to climate change means adjusting to current and future effects of climate change. This includes large-scale infrastructure changes as well as individual behavioral shifts (What Is the Difference between Adaptation and Mitigation?, n.d.). The hanok does not change climate conditions for the people inside the building. Rather, it filters the environment to provide livable conditions while using natural materials and energy. As a result, the residents adapt to their environment rather than mitigating it. Natural heating and cooling not only reduces greenhouse gas emissions, but reflects harmonizing the built and natural environments.

The primary heating mechanism in the hanok was the ondol, an underfloor heating system consisting of a series of flutes (gorae) that re-used heat from the kitchen’s wood burning firebox (agungi) (Ben Jackson & Robert Koehler, 2012). The opening of the channels (bulmok)
was small to prevent an overflow of smoke, spreading of fire, and flow of cold air after the fire was out. The gorae was slightly angled to facilitate the flow of hot air towards the chimney that was located on the other side of the room. Koreans used stones and bricks to enclose the system, keeping the heat from escaping. Recycling heat from cooking for the entire house is not widely practiced in the West. To reiterate, energy efficiency is the main focus of architectural sustainability standards. LEED offers 33 points for energy operations within a building in addition to the required prerequisites (LEED Credit Library | U.S. Green Building Council, n.d.). This is almost one third of the total possible points. This makes sense given the main goal of Western sustainability standards is to reduce greenhouse gas emissions. Energy for heating and cooling a building is the most significant contributor to its emissions (Use of Energy in Commercial Buildings - U.S. Energy Information Administration (EIA), n.d.). However, LEED emphasizes energy efficiency in terms of renewable sources, daylighting, and efficient HVAC and service water heating systems (Optimize Energy Performance | U.S. Green Building Council, n.d.). Energy efficiency thus still refers to single use energy even if it originates from a sustainable source. The ondol offers a different approach to what energy efficiency can signify, and insight into the meticulous ways Koreans used resources. Furthermore, since Koreans slept on the floor, the floor was a main source of climate control. Traditional rooms consisted of two types of floors: ondol and maru. The ondol kept people warm during the winter months. When heated floors are less desirable in the summertime, Koreans slept on a raised, hollow wooden platform called a maru. The maru kept interiors cool, especially in Korea’s humid climate (Ben Jackson & Robert Koehler, 2012). The alternation between sleeping on the ondol and maru reflects natural climate control methods.
Traditional Korean construction also used materials as close to their original states as possible. To secure the base of pillars into the ground, Koreans carved the base to match the natural curvature of a large stone (Ben Jackson & Robert Koehler, 2012). This process is called geurengijil and requires two different tools: one for drawing the curves onto the pillar, and an adze for the actual carving. The process of locking the wood into the stone is called deombeong jucho, and reflects both a care for the wood and a trust that preserving its natural form enables its optimal performance. Furthermore, the wood was kept in all its bends and curves. In Jackson and Koehler’s words, “such methods of coping with weather and environmental conditions reveal the wisdom of accepting nature as it is.” Nature is imperfect, but possesses an intelligence beyond human capacity. Letting nature be imperfect in a built environment acknowledges this intelligence. Another benefit to the deombeong jucho is its rainwater resistance. Korea’s heavy rainfalls pose danger for wood rot in the hanok. By merging the wood into stone, water that runs down pillars will not cause the wood to rot (Ben Jackson & Robert Koehler, 2012).

Figure 4: Deombeong jucho, the process of locking wood into stone (Ben Jackson & Robert Koehler, 2012, Location 133)
The *hanok* courtyard possesses multiple functions that provide social, climatic, and cultural benefits. The design “resulted from centuries of trial and experimentation and normally consisted of a courtyard or group of courtyards around which rooms and other spaces were grouped to make the dwelling complex. Such a house became deeply associated with the Korean way of life” (Lee, 1991, p. 66). The courtyard was therefore the center of the house. To enter any room of the house, one must pass through the courtyard. As a result, the courtyard offers a ceremonial future to the entry and exit of the house— a ritual that aids in the cultural identity of what a Korean house entails and the feelings one experiences as they occupy this space. Furthermore, it offered a space for gathering, or a “threshing ground during the harvest season, a meeting place for ceremonial occasions, an outdoor resting place during warm weather, or a playground for children” (Lee, 1991, p. 68). The courtyard brought people together. It was central to the spirit of the house and protecting the family from outside conditions. In urban settings, the courtyard served as a buffer between the street and the house, providing shelter to the house by “reducing noise and maintaining privacy” (Lee, 1991, p. 68). The courtyard also aided in climate control especially once cities became denser: “it was an important facilitator of the development of a compact urban fabric. It also afforded the urban dwelling good access to sunshine and ventilation, even within relatively narrow sites” (Lee, 1991, p. 68). Dwellings in urban areas often do not receive much sunlight due to the abundance of buildings. The courtyard aided this problem by providing space for sunlight to navigate through to reach people’s windows. The courtyard also “acted as efficient micro-climate controllers. Since habitable rooms looked inward with a defensive, introverted posture, inhabitants were protected from both hot and cold weather” (Lee, 1991, p. 69). Korean people could receive cool breezes in the summer, and in the cold winter, the courtyard was blocked by interior dwelling space.
The courtyard further blurred the lines between the indoor and outdoor environments. The flow of movement between inside and outside the building promotes the connection between people and nature—“there being no clear-cut division between the interior and exterior of the house” (Lee, 1991, p. 68). The courtyard eliminated a need for corridors, an entrance porch, or a hall. All the rooms were oriented around it, opening inwards. Residents thus must go outside to move between rooms, and are urged to experience the sunshine, rain, or wind outside the house. This flow of movement creates a softer, permeable edge between indoor and outdoor spaces.

**Economic Pillar**

Constructing a *hanok* required specific carpentry skill. Consequently, the construction process was realized through human hands. Using hands to craft a house takes more time than a machine. This slow construction process offers an opportunity for sustainability. It is more difficult to create materials or houses in excess with human skill. Architects are hired because there is a direct need. In opposition, technological progress forced *hanok* architects to be obsolete. New construction processes were designed to create fast results to address density issues, profit, and individual buyers:

Apartments were mass produced through the workings of a powerful mechanism after the 1980s. The mechanism depended on the overlapping interests of a government that wanted to eliminate a housing shortage; developers and construction companies pursuing maximal profits through the sale of apartments; and individual buyers who expected to realize some profit from rising housing prices. (Inha Jung, 2013, p. 78)

As capitalist drivers replaced traditional construction techniques, sustainability embedded in South Korea’s built environment decreased. Mass produced apartments result in uninspiring structures that subtract from regional identity. The intricate carvings in wood gave the *hanok* character. This is a crucial element to sustainability that will be discussed more in following
sections. Moreover, mass production suggests a centralized economy. A centralized economy for production does not address local needs, which in turn rejects sustainable principles: “Geographically independent or distributed production facilities composed of reconfigurable and mobile production systems allow quick adjustments of production capacity and functionality with respect to local customer needs and enable a sustainable production and supply chain” (Rauch et al., 2015, p. 544). The traditional hanok falls in line with the ideas presented here. Local architects are these distributed production facilities, where materials are locally sourced from the land. Without technology, Korean architects built hanok with the wood, mud, clay, and straw. As a result, there is no necessary energy expenditure to transport materials to a central location. Furthermore, since architects are commissioned to construct the home, there exists a relationship between the producer (architect) and the consumer (family). Communication can be facilitated and local needs are addressed.

In addition, the apartments that replaced the spec house were not built to last. In fact, “most Korean apartment buildings had structural limitations that prevented remodeling, so their life cycle usually did not exceed thirty years” (Inha Jung, 2013, p. 80). A sustainable building should be durable to ensure the least amount of resources are used. The traditional hanok village in Bukchon is almost six hundred years old. Granted there have been some conservation efforts to preserve the buildings, this is still a very long life cycle. Master carpenter (daemokjang), Choi Gi-young, states that “Hanok built from nature can last a thousand years alongside people. How is that possible? First, all of (Hanok’s) materials come from nature. Second, it is built by carpenters who abide by principles and fundamentals” (Kim You-rim, 2020). Choi has been a carpenter since 1961, participating in restorations such as the Bongjeongsa Temple in Andong. The intricate technique that carpenters such as Choi used permitted the structures to last for
centuries. Evidently, the durability of hanok is rooted in its fusion with nature. There is something very unique about an architect whose appreciation for nature is exhibited in their design. I think the carpenter’s role here is important. The dedication to pay close attention to the patterns in a landscape to design a building that coexists with nature has a role in the architecture’s sustainability.

While these ideas of a decentralized economy, durability, and experienced carpentry help the hanok’s economic sustainability, this aspect of sustainability is lacking overall. Hanok villages were demolished due to economic concerns—especially regarding density. Though traditionally multi-generational, the hanok is a single family home. The building expands horizontally, occupying a lot of land without providing density. This subtracts from the building’s sustainability. Housing shortages in Korean urban areas required new ideas for living, leading to the transition towards apartment culture. While the apartments signified modern life and Western influence, they allowed for multiple families to live in one building. Multi-family housing is crucial when considering South Korea’s urban built environment; however, the current apartments are insufficient for sustainability standards. A blend of traditional and modern architecture can be adopted as a prototype to transform South Korea’s contemporary landscape so future generations can live in an environment that nurtures Korean identity.

**Technological Optimism**

Technology in Western homes brought convenience to many lives. The accessibility and affordability of cooking appliances, air conditioning, Internet, security systems, and more provide numerous benefits in people’s everyday lives. These technologies encourage equity across gender and socio-economic barriers as domestic chores are alleviated (*A Call to Action on Efficient and Smart Appliances – Analysis, 2021*) and access to the Internet stimulates economic
opportunity. Currently, however, technology in the home is moving in a harmful direction. Out of Western technological optimism, a model for a sustainable house developed called the smart home. These houses are designed with high-level information and communications technology (ICT). ICT includes all categories of gathering, storing, transmitting, retrieving, or processing information (Computer Security Resource Center). The most important component in a smart home is thus the rapid exchange of information produced in the home without delay (Saito & Menga, 2015). The categories of technological elements in a smart home include: networks, relevant environments, and equipment; software; energy management; integrated applications; and design considerations.

Everything in the smart home is connected to a central network. This allows for easy data transmission from sensors all around the home to a mobile phone, or smartphone (Menga and Santo, 2015). These sensors are used for various purposes such as motion, light, temperature, sound, and humidity. The hardware to engineer each of these components consists of a power line network, femtocells, and a home network gateway. The power line network is usually electrified through an electric company, personal solar panels, or a combination of both. The femtocell is a wireless communication service to connect mobile devices to a mobile operator’s network using a residential digital subscriber line, which is generally a copper telephone landline that receives data (RingCentral). The home network gateway is a central hub for electronic services such as “phone communication, television and radio broadcasting, home security service, and emergency communication for natural disasters” (Saito & Menga, 2015, p. 11). The software to operate a smart home involves an operating system, an integrated platform for the network system, user interface, interaction and operation, security and privacy, and standardization. Currently, the popular operating systems include Linux, Android, and iOS.
These perform “basic tasks such as file, memory and process management, handling input and output, and controlling peripheral devices such as disk drives and printers” (Understanding Operating Systems - University of Wollongong – UOW, n.d.). User interface, interaction, and operation is important to ensure family members of all ages have a positive experience with the technology in the home. The interface includes keyboards, push buttons, and voice and sound interfaces (Saito & Menga, 2015). Every aspect of the smart home is designed for optimal time and energy efficiency. There is not an emphasis on regional culture as a factor in its design.

The smart home is the microscale of sustainable development in South Korea. This type of ICT is important to understand when analyzing South Korea’s sustainable city plans. Since the 1990s, South Korea has “continuously developed national strategies for sustainable urban development through different ICT-based strategies” (Yigitcanlar & Lee, 2014, p. 106). The most recent strategy, u-Korea, includes a philosophy based on six visions: safety, convenience, efficiency, high-quality amenities, cultural values, and participatory nature of development. U-Korea’s principles included behavioral change, equity, market-orientation, coexistence with nature, and building for the future (Yigitcanlar & Lee, 2014, p. 106). In 2009, South Korea led the discussion on smart cities with their u-city model. The u-city, or ubiquitous city, was a way for the central and local government(s) to monitor almost everything happening in the city (Dong-Hee Shin, 2009). While most technologies used in u-cities were developed in the West, they are tested in South Korea. The u-city idea was to give residents a more convenient lifestyle while building a more secure, environmental, and humane way of life through integrating IT infrastructure (ubiquitous sensor networks, home networking, wireless broadband, digital multimedia broadcasting, telematics, geographic information systems, location-based systems, and smart card systems) into urban space. However, “through such a computing driven approach,
social and cultural aspects have been neglected and absent from discussion of the design of the u-city” (Dong-Hee Shin, 2009, p. 522). The u-city was a top-down government approach that failed to include relevant social groups in its design. Not only does this model not meet local community needs, but it resulted in little public participation compared to the large investments made in the technology, and the amount of infrastructure built. Shin concludes that “to build effective urban information systems, it is necessary to include a plurality of actors in the design and link digital developments to more traditional activities and initiatives that aim at enhancing public participation. The involvement of a plurality of actors means a bottom-up approach” (Dong-Hee Shin, 2009, p. 524).

The u-city did not have a strong emphasis on the ecological dimension of a city. This is where South Korea’s new smart city model becomes relevant. The newer u-eco-city is an “ICT and eco-technology (EcoT) embedded smart and sustainable city” (Yigitcanlar & Lee, 2014, p. 105). It combines the eco-city, a city striving to mitigate impacts of global climate change through a low-carbon economy and new green industries focused on energy technology (such as renewable energy), with the u-city. However, the continued top-down approach prevents the strategy from performing in a way that aligns with the visions and principles of u-Korea. The top-down government strategy puts emphasis on the supply-side of technology: “Korean u-eco-city examples are largely based on ‘supply-push instead of ‘demand-driven’” (Yigitcanlar & Lee, 2014, p. 112). Not only is it an unsustainable practice to produce excessive goods, but the participatory nature of development, market-orientation, behavioral change, equity, and cultural values goals are not being met. There is a disconnect between the available infrastructure and the people who would use it, where the “the technology and services seem to be lacking focus on the social infrastructures and needs of the communities” (Yigitcanlar & Lee, 2014, p. 112). There is
a need for South Korea to adopt bottom-up practices in order to have successful sustainable urban development. Planners and designers can accomplish this by developing “an environment that best matches their image about prospective users, and shape a socio-technical environment in which social and technological aspects are intimately related to, and define and redefine, each other” (Yigitcanlar & Lee, 2014, p. 112). When the u-city was introduced, social and cultural aspects were neglected from the design of the city. The u-eco-city currently faces the same issue, but there is potential for change. Focusing on residential architectural design can serve as a model for addressing the missing social and cultural pieces in South Korea’s sustainable development goals. The answer, however, is not in the smart home. I will end the section with a quote by Alberto Pérez-Gómez, architectural historian, in The Cultural Role of Architecture that made me consider the extent to which eco-technic buildings impact my life:

Self-referential buildings expressing no more than a marketable style, a technological process, or a single fashionable meaning, play a crucial role in forming, if not increasing, our psychosomatic pathologies and political crises. We need to question the assumed neutrality of techno-capitalism and the false values that often ground our way of living and producing such as the unceasing pursuit of ever more efficient means while always postponing an accountability of end. (Emmons et al., 2012)

Architecture has incredible power to contribute meaning to a landscape. When thinking about sustainability, we must consider who benefits from the current models and frameworks such as the u-eco-city and LEED. Though the focus for sustainability has been on technology, I propose an increase on cultural advances to create holistic sustainable development in South Korea that serves local communities. Drawing from the research I have conducted for this thesis, the following two sections will outline my personal ideas for what a sustainable building should do for its landscape and people.
Community-Based Planning

Modernization in the 1980s to 1990s realized Western values in the South Korean built environment, exemplifying modern globalization (Inha Jung, 2013, p. 111). Though there were attempts to transform established design principles to define the Korean identity, Korean architects’ perceptions were filtered through a preestablished Western lens (Inha Jung, 2013). Consequently, efforts to bring previous Korean architectural design into the contemporary landscape could not succeed. Korea’s modernization “can be defined as the realization of a discursive system imported from the West…When, decades later, this discursive system was transferred to Korea, it already included within it hegemonic relationships built on Western power and dominance” (Inha Jung, 2013, p. 111). The expanse of Western architecture adds to its empire. Values implicit in Western landscapes then get adopted into new cultures. South Korea’s contemporary urban landscape rejects the traditional architecture seen in the hanok. An article from The Korea Times titled “Filthy shades of grey” meditates on Seoul’s modern built environment. Author, Kim Tong-hyun, states that “while the city’s urban landscape went through some major adjustments over the past 20 years, the incoherence and lack of visual cohesion between architecture has been constant” (Kim Tong-hyung, 2013). Seoul’s concrete jungle does not contribute to defining a sense of place for Korean people. Valuing economic interests over arts and culture leaves the city devoid of traditional principles. Joeonghoon Lee, architect and chairman of JOHO Architecture, critiques the lack of cultural history in Seoul’s landscape. He states that the urban planning process in Korea “needs a more specialized system. There has to be an organization that can control the process, balance different interests and ensure that the city’s culture and history is valued just as much as its economy” (Kim Tong-hyung, 2013). Modifying the urban planning system is a top-down approach to increasing culture in the
landscape. I am not suggesting that this should be done, but can be put in dialogue with a bottom-up approach to create a new model for development.

The bottom-up approach is a community-based plan built around local knowledge. Local knowledge is crucial for successful climate adaptation urban planning because “it is derived from individuals who have closely encountered environmental issues in their community” (Kim & Kang, 2020). This type of knowledge is informed by location-based values, situations, and relationships. The “situations” here refer to environmental conditions and typical responses within the community, and the “relationships” include the residents’ characteristics and how they interact with one another. This is further explained by the four categories of conditions within a community: history and culture, climate and disaster, residents’ behavior and characteristics, and physical conditions. This type of information is difficult for outsiders to attain, especially without directly interacting with individuals from the community (Kim & Kang, 2020). Therefore, researchers suggest a combination of field investigation and interviews to acquire local knowledge and identify local needs. In a study conducted in Busan’s Bandong Pilnongoreum community, researchers proposed a three step process to identifying local knowledge within a community. Step one is a preliminary field investigation, and interviews. Rather than using a structured questionnaire here, researchers advise listening to the “residents’ views about local problems. In addition, through interviews with local residents, the key stakeholders in the community are identified” (Kim & Kang, 2020). Step two is building a consensus of local needs. Through conducting interviews, facilitating group discussions, and coordinating community workshops, planners narrow down the most important issues in the community. Planners do not express their opinions or solutions, but listen to what the residents say. In the last step, planners convert the information into a structured format by extracting
keywords from the interviews, discussions, and workshops. These keywords are grouped together based on cause and effect, order, and parallel relationships to draw conclusions about local knowledge and needs.

Figure 4: Three step process for urban planners to identify local knowledge within a community (Kim & Kang, 2020).

Community-based adaptation plans offer a holistic approach that can strengthen social resilience within communities, better integrate resilience efforts against extreme weather events, and ultimately make climate change adaptation possible (Kim & Kang, 2020). Thus, it is necessary for sustainable development. There is a relevant difference between scientific knowledge and local knowledge here: “Scientific knowledge includes the principles and theories underlying observable phenomena, while local knowledge can be deduced through observation and experience and is more tacit, implicit, and context-dependent” (Kim & Kang, 2020). In South Korea, p’ungsu practice is local knowledge, and its implementation in hanok design illustrates community-based planning. In p’ungsu practice, experts understood local conditions through
observation and experience. I propose a similar approach be adopted into the Korean sustainable architecture certification, G-SEED. As discussed earlier, G-SEED was adopted from Western frameworks and therefore does not emphasize locality in their standard. G-SEED has eight categories: land use and transportation; energy and environmental pollution; materials and resources; water management; maintenance; ecology; indoor environment; and innovative design (Chae et. al, 2018). Currently, there is no category that considers the local environment. Before building on land, I suggest developers consult with residents living in the immediate surrounding city blocks to align the existing community with new development. Using the three step process, developers will identify local needs and grasp the local knowledge within the community.

G-SEED should then include a category titled Community-Based Design where points can be earned for carrying out this type of research to understand the local environment and people. Sustainable architecture must “demonstrate the strength of the need, desire and capacity of human beings all around the world to be in control of their own built environment, to create buildings that are intimately related to their own sense of identity” (Vellinga, 2005, p. 7). Therefore, people from the community should be involved in the design and construction processes. Place-based design is crucial to the sustainability of a building. Furthermore, adding the Community-Based Design category addresses the concern of Seoul’s lack of culture within the built environment. Since history and culture are one of the four categories of conditions within a community, adding this category can urge developers to revitalize the gray cityscape. Adding cultural vernacular to modern apartment buildings is explored in the next section.

Adapting Hanok Elements into Modern Apartment Buildings

The current sustainable architecture frameworks fall short in addressing regional culture. In order to reimagine a built environment that is culturally appropriate and ecologically
responsive, the eco-cultural logic should take precedence over eco-technicism. The Korean hanok offers insight into what such a building encompasses. A sustainable building must have architectural vernacular. This includes revisiting historic versions of regional architecture to revitalise that sense of place. In Seoul, this could look like adding elements of the hanok to modern buildings. Tall skyscrapers do not reflect traditional practices. Rather, these Western buildings push Koreans further from their original identity. Density does need to be addressed in urban areas like Seoul. Over half of the South Korean population lives in apartment buildings (Gu, 2020). Rather than designing bland buildings, however, traditional ideas can be modified to fit the contemporary landscape. P’ungsu was a fundamental driver of Korean architecture that facilitated harmony between people and nature. P’ungsu helped give the peninsula its architectural vernacular, and should continue to be a reference for development. I would like to clarify that I am not suggesting a return to pre-modern ideas. This is not realistic nor advantageous. Oftentimes, historic architecture is idealized for its simpler times and closeness with nature. However, the tendency to romanticize pre-modern architecture is unfortunate because “instead of doing justice to the adaptive nature of vernacular traditions, it effectively marginalizes them by reinforcing the persistent stereotypical image that vernacular architecture comprises traditions of the past that are no longer relevant to the future” (Vellinga, 2005, p. 3). Instead of contrasting one with the other, there can be a fluid exchange between historic vernacular architecture and its adaptation into the modern era.

According to Article Two of the Green Building Act in South Korea, a green building “is a building that minimizes its impact on the environment while at the same time providing a comfortable and healthy living environment” (Chae et. al, 2018). The “green building” here is interchangeable with the “sustainable building.” This definition meets some of the expectations
of a sustainable building, but does not directly point to cultural importance. In addition, the “energy and environmental pollution category constitutes the largest portion of the [G-SEED] assessment” (Chae et. al, 2018). G-SEED can offer more to address the cultural deficit in South Korea’s urban landscapes. Within the aforementioned Community-Based Design category for G-SEED, a subcategory can be added with the title Architectural Vernacular. Points in this subcategory can be earned by adopting traditional elements into new designs.

There are many aspects of the hanok that are nonviable in a dense urban setting. Paper windows, for example, do not offer enough noise reduction to live comfortably in a home. However, there are some elements that should be adopted. The most common apartment building in South Korea is the “flat-type” block, “which consists of two rectangular units side by side like a wide box” (Baek et. al, 2016). Rather than designing the flat-type apartment block, Korean architects could use the courtyard model from the hanok. Multiple detached housing complexes could be built around a central courtyard to form one apartment block. The courtyard has many benefits that are relevant to modern sustainability. First, it allows for natural ventilation through cross-wind. Wind was traditionally thought to be a natural purifier. Encouraging wind through the home can both restore p’ungsu ideas and passively regulate temperature. Second, the courtyard allows for inward facing terraces. Terraces provide space to grow plants which “absorbs disturbing noise, purifies the air that enters the building, and shades the building facade” (Badamchizadeh et. al, 2010). Regulating noise, air, and temperature reduces the need for technology to mitigate these elements. Residents can therefore gain a deeper understanding of their natural environment by not relying on synthetic energy as heavily for comfort. In addition, terraces improve social interactions between neighbors (Badamchizadeh et. al, 2010). When large-scale apartment complexes were first introduced to the Korean built environment, people
worried about losing the familiar community-based neighborhood. These fears were validated by the adoption of Western ideas of individuality into the Korean apartment design. One way in which this was done involved staircases that led directly from the street to the door: “In the apartment culture of Korea, segregating family unit takes precedence over community interests, as reflected in the preference for staircase access” (Inha Jung, 2013, p. 79). People no longer needed to see their neighbors when entering their home. Adding terraces builds community through allowing people to be outdoors together. Individual terraces mean privacy is still somewhat maintained while neighbors share a moment outside together.

The courtyard itself also builds community. As a central location, residents can connect with each other. The traditional courtyard was a place for gathering. Meals, celebrations, and conversations were shared here. It was the center of the hanok both literally and spiritually. The ceremonial aspect of the courtyard can also be maintained in the apartment. The entrance and exit into and out of the apartment building should be in the interior. This will require residents to pass through the courtyard before entering the building on the way in and before reaching the busy street on the way out. It is a moment to be neither in nor out– a moment to ground oneself within the larger cityscape. Furthermore, the courtyard obscures the edge between indoor and outdoor environments. While existing in this space, residents can still feel at home while feeling the sunlight or wind. The human-nature divide is lessened as more people choose natural light over electricity and hear the sounds in their environment instead of blocking them out behind walls. Since it offers a respite from the busy streets and a change in scenery from the apartment, it is a place to urge people to spend more time outside. Consequently, humans coexist with nature more harmoniously than if they stayed indoors. Finally, points can be earned for smaller adaptations of hanok elements. There are many ways to restore cultural vernacular. For example,
mimicking the tile *hanok* roof by adding eaves to terrace overhangs, employing sliding doors with wooden frames, and being deliberate with daylighting techniques can accomplish this goal. Adopting *hanok* practices into G-SEED grounds the certification in South Korea’s physical and cultural built environment. Moreover, considering culture in the certification sets it apart from LEED, and restores traditional ideas of sustainability and Korean identity.

**Final Statements**

The South Korean flag is a combination of *t’aegŭk* and *p’algwae* (Hong-Key Yoon, 2018). *T’aegŭk* is the East Asian philosophical interpretation of the shape of the flow of water, an S-shape. It is “the heart and soul of the traditional Korean cultural landscape in all its myriad forms” (Nemeth, 2008, p. 308). At the center of the flag, *t’aegŭk* appears where the yin and yang symbol is separated by this S-shaped curve. Yin and yang are two halves that create the *Dao* in Chinese (Robin R. Wang, 2012).

![South Korean flag](image)

**Figure 5:** South Korean flag (Nemeth, 2008)

The *Dao* literally translates to “the way,” and it is both the source of everything and empty or void (Robin R. Wang, 2012, p. 56). The *Dao* “materialized in *qi* and thus, in space and time. In fact, in… many Neo-Confucian texts, *Dao and qi* are practically interchangeable” (Robin R. Wang, 2012, p. 60). The yin yang symbol at the center of the flag represents these two forces
together to form a balanced *Dao*, or *qi*. Furthermore, *palgwae* refers to the eight trigrams derived from yin and yang, and outlined in the ancient Chinese text *Yijing* [Classic of Changes], one of the oldest Confucian classics (*Taegeuk* | *Asia Society*, n.d.). Yang is represented by a solid line (—), while yin is represented by a broken line (— -). Four of these trigrams appear on the South Korean flag: heaven (☰), earth (☷), water (☵), and fire (☲) (Robin R. Wang, 2012). The flag is a simplified version of *p’ungsu* maps from after the Sung Dynasty (A.D. 960~1279) (Nemeth, 2008). As *p’ungsu* scholar David J. Nemeth states, “*p’ungsu* maps offer insight into Nature’s self-organizing principles and thus are heuristic devices that might increase worldwide appreciation of Taeguk thinking” (Nemeth, 2008, p. 290). *P’ungsu* resides at the core of the Korean identity. It is reflected in traditional ways of living, thinking, and being. Its symbolism creates the most significant national identifier, the flag. The *hanok* reflected *p’ungsu* theory as a method for humans to coexist with nature. It was another representation of Korean identity.

South Korea has relied on other nations such as Japan, the United States, and European countries to define what its modernization looked like. As a result, the Korean identity washed away from the built environment. My hope is that South Korea’s built environment can adopt *hanok* beauty to engage in *p’ungsu* theory, and ultimately restore cultural vernacular to the landscape. By incorporating the Community-Based Design category, South Korea has the potential to transform its urban environments and restore its cultural identity. I suggest that further research is needed to specify how to incorporate a bottom-up aspect to G-SEED, and include architectural vernacular in the certification. This would include deeper analysis into the certification process, and current housing policies in South Korea to develop a specific strategy within the current models.
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