New Direction in the Culturally Inspired Urban Forms of Indonesia's New Capital City of Nusantara

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Abstract—The plan to relocate Indonesia's capital to Nusantara, Penajam Paser, Kalimantan Timur is a big leap in Indonesian history. Nusantara is envisioned to represent Indonesia's identity; establish social, economic, and environmental sustainability; and create a smart, modern, and international standard city (Smart Metropolis). Situated in the equator zone, Kalimantan Island, known also as Borneo, has a rain forest ecosystem with great biodiversity. Therefore, the relocation has sparked debate on deforestation in Borneo. From the contrary perspective, the existing environment of Nusantara is seen as an opportunity for Indonesia to forge an extraordinary example of city development that brings together nature and city as one ecosystem by rooting to Indonesia's nature and cultural heritage, and by adopting advanced smart technology as enablers to create a city for the future. Nusantara is designed to respect and emulate the wisdom enshrined in the forests and culture of Indonesia. The axis principle of mountains and ocean in traditional Indonesian cosmology is used to create the city's underlying structure. The tradition of stilt houses, the concept of the veranda in tropical buildings, and the provision of arcades for street vendors have been incorporated in the design in modern forms. This article describes the strategies and concepts underlying this new capital city of Nusantara.

Introduction: Relocating the capital to Kalimantan Timur

In August 2019, Indonesia's seventh President, Joko Widodo, announced the relocation of Indonesia's capital from Jakarta in Java to East Kalimantan in Borneo. The new capital is to be located at Kutai Kertanegara and Penajam Passer Utara, which are considered to be strategic locations, with minimal risk of natural disaster, between the current main cities, Balikpapan and Samarinda (BBC News, 2019). The relocation decision was made after three years of in-depth studies by the national government in light of the burden that Jakarta carries as the center of Indonesia's governance, business, finance, trade, and services since the nation's independence (BBC News, 2019; Lyons, 2019). In early 2022, the new capital city was named as Ibu Kota Nusantara (IKN), meaning the Capital City of Nusantara. According to the plans, it will accommodate about 500,000 people by 2024 in the first development stage and about two million people by 2039 (Lechner and Sibarani, 2022). The plan has until today been developed by the government at a very fast pace.

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For the area called Kawasan Inti Pusat Pemerintahan (KIPP) or Government Core Area, a design competition was held in 2019. The entry by URBAN+ and team titled "Nagara Rimba Nusa" won the competition and has now been brought forward to be implemented. Nagara Rimba Nusa translates as "State, Forest, Islands", meaning a city that is built on the wisdom of local Indonesian culture and forests, as envisioned by the President.

The plan of Nagara Rimba Nusa introduces "five transformations" for Indonesian society and culture – in nature preservation, nationalism, living, working, and mobility – as the key drivers to achieve the new vision for the capital city according to the President's direction. The "five transformations" offer new concepts of how people live, work, move/travel, preserve nature, and develop nationalism, that will create new life experiences for the Indonesian people.

> Transformation in Nature Preservation. The plan proposes dynamic urban spaces with minimal disruption of nature; encourages reforestation and rehabilitation of the natural ecosystem; provides ecological corridors as a contribution to biodiversity conservation and a good regional climate; all through the creation of ecological connectivity, biodiversity enhancement, and rainwater harvesting and management.
>
> Transformation in Nationalism. The plan celebrates Indonesian diversity, richness of culture, and treasures through the creation of spaces that represent Indonesia on the national stage as a symbol of the nation's progress and a showcase to the world.
>
> Transformation in Living. The plan creates an inclusive smart, collaborative, compact living environment through vertical housing, instead of landed houses, as the village of the future. The vision is achieved through shared living facilities, collaborative active-space at ground level, compact living modules, one-level connectivity, and green infrastructure technology in all residential areas and units.
>
> Transformation in Working. The plan develops an efficient and flexible collaborative work ecosystem, instead of the conventional cubical pattern, through high-performance, environmentally friendly, and integrated working spaces which blend with the natural environment.
>
> Transformation in Mobility. The plan envisions a 10-minute City through the Green Mobility concept, where pedestrians, cyclists, and integrated public transport are given priority in order to achieve sustainability goals.

The plan is governed by nine major design values delivered through a comprehensive framework of urban design reflecting the three pillars of the Nusantara vision: Indonesia's identity; sustainability in economy, society, and environment; and a smart, modern, and international standard city. The plan is further guided by five design principles: appreciation of natural land morphology (valley and hill), green fingers connectivity, connectivity system, formation of visual axis and corridor, and land zoning. The Capital City of Nusantara is planned as a pilot project city that will lead to the innovation and development of sustainable, smart, and future-ready cities in the country.

The new capital is sited in Kalimantan which is famous for its tropical rainforest ecosystem (Figure 1). Situated in the equatorial zone of the Indonesian archipelago, Kalimantan has a rich biodiversity of flora and fauna, sensitive environments, and the finest and most extensive remaining dipterocarp forest in Southeast Asia (Hairah et al., 2017). Borneo has thousands of endemic tree species, but its soil is less fertile than in Java. Borneo is often called the lungs of Southeast Asia as it has the potential to store enormous amounts of carbon in its forests. For years, however, Borneo has suffered from rapid deforestation. The biodiversity level has been gradually degraded through excessive exploitation of the forests and their products beyond carrying capacities (Hairah et al., 2017). According to Gaveau et al. (2016), the conversion of natural forests to industrial plantations has been increasing. The concept of Nagara Rimba Nusa highlights this issue and the need to restore the environmental condition of the Nusantara site by trying to bring back the rainforest ecosystem.

Figure 1. Location of the new Capital City of Nusantara (source: National Geographic Society).

The vision for the new capital also emphasizes the importance of Indonesian culture as the foundation for building the new capital city. Indonesian architecture and urban forms have evolved over a long period with influence from many local cultures, and infiltration from foreign cultures. Indonesia's history and geography have contributed to the shapes and forms in built environments, and have brought transformations in styles and construction techniques. In the post-independence era in Indonesia, modernism and Western culture have been influential. Silver (2007) explains how economic growth and the development of jobs, transportation and services drove the explosive expansion of a handful of mega-cities in Southeast Asia, including Indonesia, over the period from 1950 to 2000, resulting in urban sprawl and environmental degradation. The diversity of Indonesia's vernacular architecture was also eroded with the shift towards new global, modern architectural morphology, which accentuates the functional aspects and pays less attention to locality, community and contextual conditions. By reflecting this background, the concept of Nagara Rimba Nusa emphasizes the need to recover the philosophical and locality aspects of Indonesian culture in the Capital City of Nusantara's built environments and architecture for the future.

This article highlights these issues by examining how the heritage of Indonesian urban forms and architecture can be incorporated, and bring a new direction into future urban developments. It first expounds the thinking behind the concept of Nagara Rimba Nusa in making the forest and Indonesian culture fundamental elements in the design. It then elaborates how these concepts were translated into a distinctive and unique design approach rooted in Indonesia's natural environment and cultural heritage, but which also looks forward to the future by adopting smart technology to enhance the city's performance. The design of the new capital presents an opportunity to build a new and distinct form of sustainable and smart city that features a high degree of local context along with urban forms for the future.

Figure 2. The view of Borneo's rainforest from Bangkirai Hill (source: Diana Zerlina, 2021)

The nature and cultural heritage of Indonesia and Borneo

Geography, climate, geology, flora, and fauna

Located in the equatorial zone, Indonesia is well known for its tropical rainforest that covers 94.1 million hectares and stores an enormous amount of carbon (World Bank, 2022). The archipelago has more than 18,000 islands, stretching about 1,760 kilometers from north to south and 5,120 kilometers from east to west (Chepkemoi, 2017). Borneo is located at the heart of the Indonesian archipelago. The Indonesian portion, called Kalimantan, has four provinces, including Kalimantan Timur, the site for the Capital City of Nusantara.

Borneo has high rainfall and a temperature in the lowlands ranging between 25°C and 35°C, which are ideal conditions for plants, resulting in the island's rich biodiversity (MacKinnon et. al 1996). Unlike Java, Borneo has no active volcanoes, but an igneous mountain chain which makes the coastal area of East Kalimantan considerably drier

than other parts of the island. Kalimantan has several regions with a distinct soil condition, altitude, topography, geology, climate and vegetation. Most of Kalimantan is an area of rolling plains dissected by hills above sedimentary and old igneous rocks. The rocks are poor in metal elements and generally less fertile than the volcanic soils in Java (MacKinnon et al., 1996; Burnham 1984). The high rainfall leaches away the soil's soluble constituents. These rolling plains require extensive land improvement for development as a built environment. This is a high consideration in the development of the Capital City of Nusantara.

Borneo's forests are of several types—mangrove, peat swamp, freshwater swamp forest, heath forest (*kerangas*), lowland dipterocarp forest, ironwood forest (*ulin*),

Figure 3. The rolling hills of the Government Core Area covered with plantations (source: Diana Zerlina, 2021)

forest on limestone and ultrabasic soils, hill dipterocarp forest and various montane formations. In the coastal areas, there is beach vegetation, sea grass beds and coral reefs (MacKinnon et al., 1996). In the forests, trees towering over twenty meters tall create a canopy frameworks that shelters many smaller trees (Figure 2).

The site of the Government Core Area (Figure 3) is in the lowland rainforest, which includes both wet swamp forests (mangrove, freshwater swamps, and peat swamp forest) and dry lowland forests. Currently much of the land is used for industrial plantations, as a result of clearance and conversion over several decades. A mapping study found that Borneo lost 30.2 percent of its forest cover over the four decades from 1973, when the conversion of land began. In Kalimantan, 30.7 percent of the forest was lost in this period, and 97 percent of the loss was in the lowland area (Gaveau et al., 2014). According to MacKinnon, Kalimantan loses more than 500,000 hectares of forest every year, causing disruption to the flora and fauna species. The conservation and revival of the forest ecosystem is thus an urgent aim of the project to build the new capital city.

The cultural heritage of Nusantara

According to Hans-Dieter Evers, the term Nusantara was taken from two Sanskrit words: "nusa" meaning island and "antara" means in-between or including. Evers cited Benhard Vlekke (1961) who argued that the original meaning of Nusantara was "the other island" or "the outside world" as seen from Java or Bali, and became applied to mean the whole archipelago (Evers, 2016). In the anti-colonial struggle, the term Nusantara was used by Indonesia's first president, Soekarno, to mean "Greater Indonesia" (Indonesia Raya).

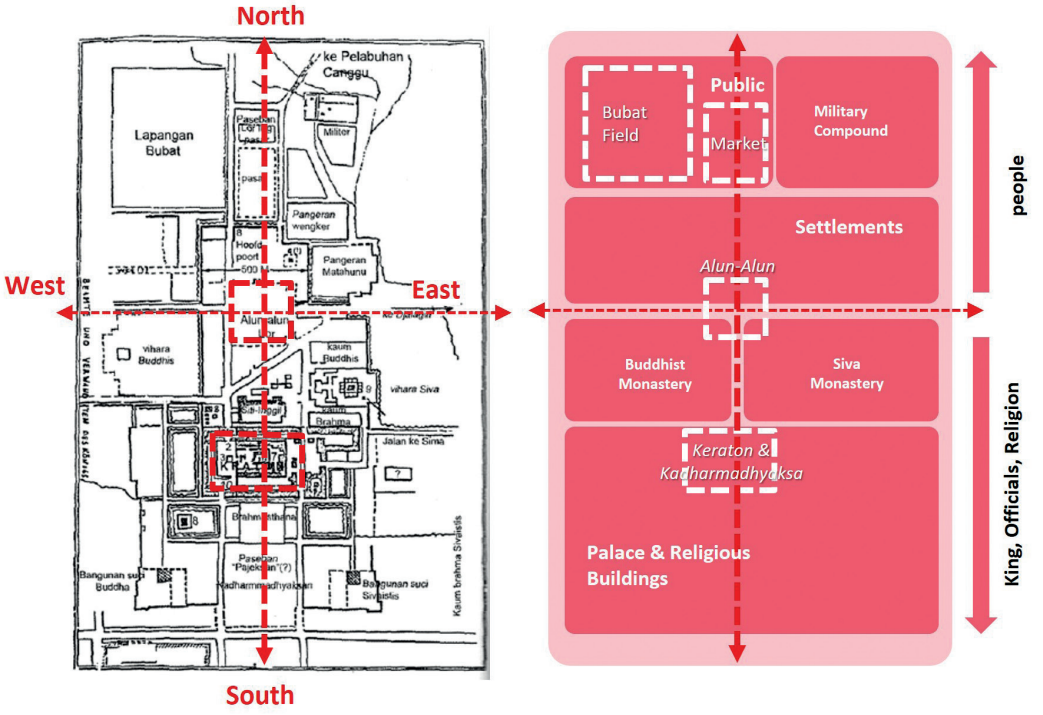

Figure 4. Cosmological principles and settlements in the cosmopolitan 13th-century city of Majapahit (source: Mitu M. Prie, 2021)

As an archipelago, Indonesia has a rich diversity of cultures, united in the concept of Nusantara representing the shared history, identity, cultural values, imageries and symbols. Mitu M. Prie explains that in the macro level of the Nusantara cosmology, there is a main axis or "high/above place", which is the residence of the Creator and the spirits of nature and the ancestors who protect humans and the universe (Prie 2014). At the micro level, humans occupy the middle realm and pay respect to the Creator and the ancestors who are responsible for maintaining and preserving nature and other creatures.

This cosmology has travelled from pre-history to modern times with its own dynamics and features in each period. It is represented in many aspects of life, including the spatial structure of a city and its architecture. The character and identity of modern Indonesia has evolved from the Nusantara civilization (*pucuk-pucuk peradaban*). The local wisdom and local genius of the archipelago have become the central values and foundations of the nation and the state (Prie, 2014).

The authentic culture of the archipelago has become Nusantara's distinctive values in the world. The descendants of Nusantara's original ethnic population have survived through the generations and have preserved the architecture, cosmology, residential technology, and customary arrangements of their ancestors. This inheritance still shapes the use of space and the form of buildings amidst intense socio-cultural changes (Prie, 2014). In the original Nusantara, the pattern of settlement reflected a balance between the macro and micro levels of the cosmology. The macro level was expressed in the overall layout, the head, body, and legs of a space or a building, while the micro level was expressed through the initiative, creativity, and work of the human population.

The culture of living has shaped the settlement pattern, which in turn has shaped the built environment or urban pattern. However, the protection, maintenance, management, and utilization of the natural environment have remained major considerations in shaping the cities in the archipelago because of the human dependence on the natural surroundings and the customary order (Prie, 2014). Meanwhile, the working culture has evolved under the impact of economic and political changes, especially trade, and the development of urban-based bureaucratic states from the 13th century CE onwards.

Until circa 500 BCE, the population was scattered in ethnic groups resident in villages. Over the next thousand years, interactions between these groups intensified and eventually evolved into cities with acculturation, assimilation, and diffusion from outside. The old cosmology from the ancestors regulated the traditional village order and the spatial location of the traditional elders and families (Prie 2014). The traces of this cosmology survive in the urbanized society of the present. Indonesian cities are planned along an axis with a community space in the strategic position at the center, which used to be called *Alun-Alun* (Figure 4). This term conveys both the idea of a focus of socio-cultural interaction and the balance between the macro and micro cosmos. This Nusantara Cosmology was adopted as the foundation for the design of the Government Core Area in Indonesia's new capital city.

Reflection upon Indonesian urbanism and architectural heritage

Indonesian cities and urban forms

Cultural identity and settlements in Indonesia evolved under the influence of cosmology and the dynamic trajectory of urban development. Inherited culture played a great role. At the beginning, the urban layout and building orientation followed a linear settlement pattern, shaped by river channels, coastlines, and certain areas in the hinterlands. The Nusantara cosmology evolved through different eras with different influences to become a unique and important identity in the repertoire of today's cities in the Indonesian archipelago.

The early peoples depended on nature to survive. They wandered from place to place; lived in the forest, caves, mountains, river valleys, fields, and forest. Later, the emergence of kingship and cities introduced a new harmony between human life and the natural surroundings, as represented on the Lalitavistara relief panels in Borobudur Temple built in the 8th century CE. Around sixty-three species of plants are depicted on

the relief panels, attesting to the awareness of biodiversity at that time (Metusala et al., 2020). The images indicate the deep connection between humans and environment as the plants provided food and drink, were used as trading commodities, served as aesthetic decorations, and gave off fragrance that helped to establish a peaceful atmosphere for deep meditation (Metusala et al., 2020). The concern to maintain the balance of nature, space, and buildings was evident in traditional Nusantara.

In modern times, cities in Indonesia are spaces of socio-cultural interaction between citizens from multicultural backgrounds including the Nusantara people along with foreign settlers from India, China, Portugal, the Netherlands, and other European countries who significantly enriched the diversity of the Indonesian national culture. These intense and complex interactions took place in the economy, technology, art, and religious activities. Under globalization, cities are driven by industrialization and capital, but retain the culture of community engagement down through the generations.

Nas (1989) described changes in urban society as a process of redefining the meaning of the urban through functions such as habitation, work, and recreation. Acculturation and assimilation contributed to Nusantara's heterogeneous and multicultural character. Those multicultural patterns varied across regions in spatial, architectural, and social aspects. The spirit of community and collaboration was defined as a root concept of the development of the Government Core Area.

Nature-inspired design and vernacular architecture

Local wisdom and tradition have been passed down by most Indonesian communities. The respect, protection, care, utilization, and supervision of nature have a long history. Traditional communities preserved the local wisdom on the environmental, cosmological, and customary order. Local wisdom reflected the people's views of life, knowledge, understanding, and habits within the local communities in responding to life's various problems, especially in their relations with one another and with nature.

Over recent centuries, cities around the world have expanded on a more-or-less common pattern with little variation according to the specific culture and context. The relocation of Indonesia's capital city is an unique opportunity to create a better model for a future city with greater respect for Mother Nature and for local culture and tradition. Unlike the current Indonesia capital of Jakarta, the site of the Capital City of Nusantara lies amid Borneo's dense tropical forest, rolling hills and valleys, and rich ecosystem. In the development of the new capital we aim to retain the elements of Borneo's environment within a new urban context.

The design of the Government Core Area is envisioned to return to the ancient principles of human settlements, where Mother Nature played an important role as the foundation of the universe. Indonesian vernacular architecture has always drawn inspiration from the natural surroundings and been respectful towards it. The architecture of the traditional Indonesian house resulted from a community's response to its environment and creative adaptations to suit the climatic conditions (Yeang, 1987).

The tropical architectural heritage of Nusantara is found in forms such as veranda, porch, balcony, ventilation, courtyard, and high ceiling. Traditional Indonesian houses

were built on stilts or pilotis to suit the natural surroundings (Figure 5). The structure allowed water to flow at ground level, made space for vegetation and wildlife to flourish, and minimized the building's footprint. This form of construction is also proven to be more resilient during disasters, such as earthquake and flooding. For instance, most of the structures that survived an earthquake of 6.5 on the Richter scale in Padang in 2009 were old stilt houses.

Figure 5. Indonesian traditional houses built on stilts (source: Indonesia Tourist Forum, 2014; Portal Informasi Indonesia. 2019; Beranda, 2023; Kikimunai, 2020)

Those principles of tropical and vernacular architecture are applied in the design development of the Government Core Area, although the process required inventive adaptations for contemporary use and construction. For instance, the stilt structure is planned for constructions on the Government Core Area site where it provides a solution to the rolling nature of the terrain. The concept of the veranda is being translated into porous or permeable building façades which allow for open vertical interior spaces, reduce the discomfort of the tropical climate, and give protection from the rain and sun. Learnings from vernacular architecture can be translated into advanced technology.

Regionalism and Nusantara architecture

Cities in Indonesia as elsewhere in Asia have tended to be homogenized under the influence of Western models. Ken Yeang (1987) argues that most cities in Asia have lost the indigenous and unique characteristics that made them Asian in the first place. Yeang emphasizes the importance of regionalist design that respects the specific regional context.

Western influence on architecture has combined with the pressures for economic

growth in a developing country. Indonesia and other developing countries are keen to compete on the international stage and to build cities that win global recognition. The same homogenized skyscrapers appear everywhere because of the neglect of regional context and identity. Regional designs have been gradually eroded.

In contrast to globalism that prioritizes universal values, regionalism prioritizes the characteristics and cultures of a specific geographical area (Tzonis and Lefaivre, 2021). Ken Yeang contended that: "Regionalist architecture seeks to incorporate in its design the spirit of the place in which it is located", including the deeper sensibilities and tangible realities of the place (Yeang 1987). A place has distinct physical, social, economic, and political characteristics as well as cultural and architectural heritage and natural history. Regionalist architecture emerges through adaptation to these characteristics and conditions of the place.

In tropical countries, there are three common attributes that shape the architecture (Tzonis and Lefaivre, 2021). The hot and humid climate is the first condition that impacts on people's productivity and mobility, and indirectly influences the architecture. The second attribute is the common historical and political condition of ex-colonial countries, which are influenced by Western models in many aspects of life. The third attribute is the architectural heritage inherited from the colonial period, which serves as a precedent for building types and urban patterns. These three attributes shape the regionalist tropical built environment. In Indonesia, this regionalist architecture is commonly called Nusantara architecture, but there are many interpretations of what this means.

Abidin Kusno (2020) positioned Nusantara architecture in five different ways within a historical timeline. In the first, Nussantara architecture is positioned as foreign or peripheral architecture when viewed from the imperial center of Majapahit, as described by Vlekke. In the second, Nusantara architecture is positioned as "Indonesian architecture" in the context of the decolonized nation-state after Independence. In the third, Nusantara architecture is positioned as the architecture of a maritime culture in the context of the surrounding oceans. The stilt house belongs to this position. In the fourth, Nusantara architecture is positioned as crossroads architecture, subject to the influence of external cultural interactions. In the fifth, Nusantara architecture is positioned as a space of resistance and defense that can equal Western architecture. In this last position, Nusantara architecture has the capacity to marry traditional or vernacular objects with contemporary materials in order to emulate other architectures. However, Kusno admits that urbanism has a significant influence in the construction of Nusantara architecture.

Nusantara architecture is widely accepted among Indonesian architects as the direction to represent Indonesian identity. However, the details of the means to represent Indonesian identity are the subject of debate. Across the geographical range from Sabang to Merauke, there are various cultural and natural backgrounds. Indonesian or Nusantara architecture cannot be identified by a single culture or characteristic. As noted by Yeang, climate, environment and culture shape the regionalist architecture. Architectural design must be adapted to function and context. Nusantara architecture must not only acknowledge the traditional or vernacular architecture of each region, but also encompass the aesthetic structure, construction technology, tectonics, styles,

philosophic meanings, customs, and traditions of the interaction between humans and the built environment. This perspective on Nusantara architecture is incorporated in the development of the Capital City of Nusantara.

Urban design approaches and strategies at the Capital City of Nusantara

As directed by President Jokowi from the very beginning, the development of the new capital of Nusantara must embrace and represents the identity of Indonesia. The design of the Government Core Area emphasizes the spirit of Nusantara. The concept of Nagara Rimba Nusa guided several aspects of the design process. In accordance with Vlekke (1961), the meaning of Nusantara as the Indonesian archipelago is implemented as a polycentric city in the new capital (Figure 6). There are several compact activity centers, each with a distinct main function, that are analogous to islands linked to one another through green corridors of existing nature that resemble the ocean. The macro and micro cosmology of Nusantara is implemented through an axis or backbone that represents the relation between the Creator, humanity, and nature. In addition, biophilic and biomimicry designs in all the building developments reflect the concept of Nusantara architecture and its respect for existing nature. The new capital is also conceived as a green and sustainable city which respects the valuable forest ecology of the site.

Figure 6. The Government Core Area as a polycentric city, inspired by the Indonesian archipelago (source: Urbanplus, 2021)

Land forming process

Yeang (1987) argues that considerations of climate, environment, and culture can be synthesized in a regionalist approach to architectural design. The design of the Government Core Area embraces the spirit of regionalist architecture and urbanism by highlighting the importance of nature as the foundation. The city structure was developed through elevation modeling and analyses to exploit the topographical values of the site (Figure 7). The road network was laid out following the contours of the land. The usage of land was differentiated by elevation. The valleys and riparian area were designated as landscape features. Hills and slopes were analyzed to preserve hilly areas as protected

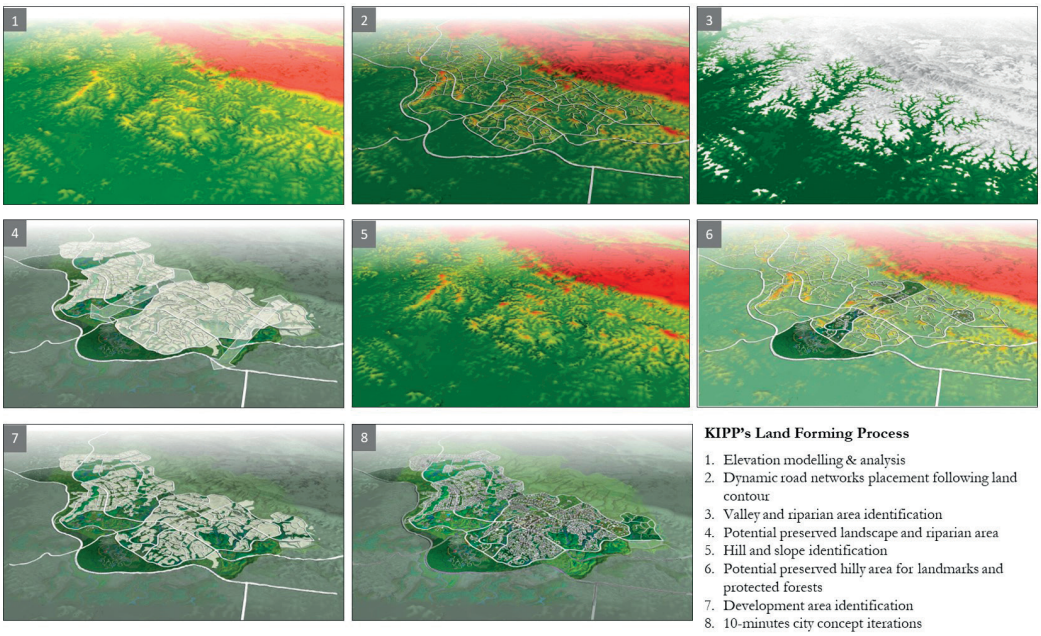

Figure 7. Land forming process at the Government Core Area site (source: Urbanplus, 2021)

forests and city landmarks. The built area was planned only after the placement of these natural elements of the overall design. In order to create a compact and livable city, the concept of the 10-minute City was adopted into a polycentric city scheme.

The axis cosmology

As noted earlier, in the traditional cosmology of Nusantara (Indonesia), the Creator and ancestors, who occupy the highest level of the cosmos, determine all primary and secondary aspects of human life and nature (Figure 8). This cosmology is reflected in the layout of Indonesian towns and cities and was adopted for the structure of the Government Core Area. The backbone is a Nationalism Axis (Sumbu Kebangsaan) reflecting the macro level of the traditional cosmology.

The Nationalism Axis is planned to stretch about three kilometers from the hilly area through the lowland mangrove zone towards the ocean at Balikpapan Bay (Figure 9). The hilly area represents the abode of the Creator and the ancestors; the urban center represents the abode of humans and the mangrove zone represents nature. The overall structure mimics the balance between the Creator,

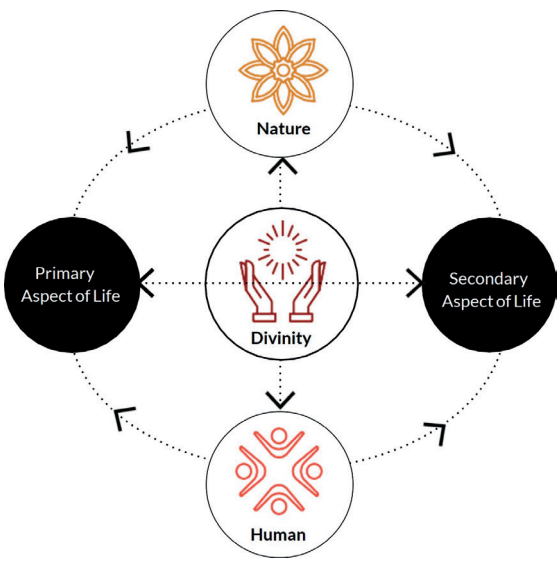

Figure 8. The cosmological principle of Indonesian cities' urban space (source: Mitu M.Prie, Urbanplus, 2021)

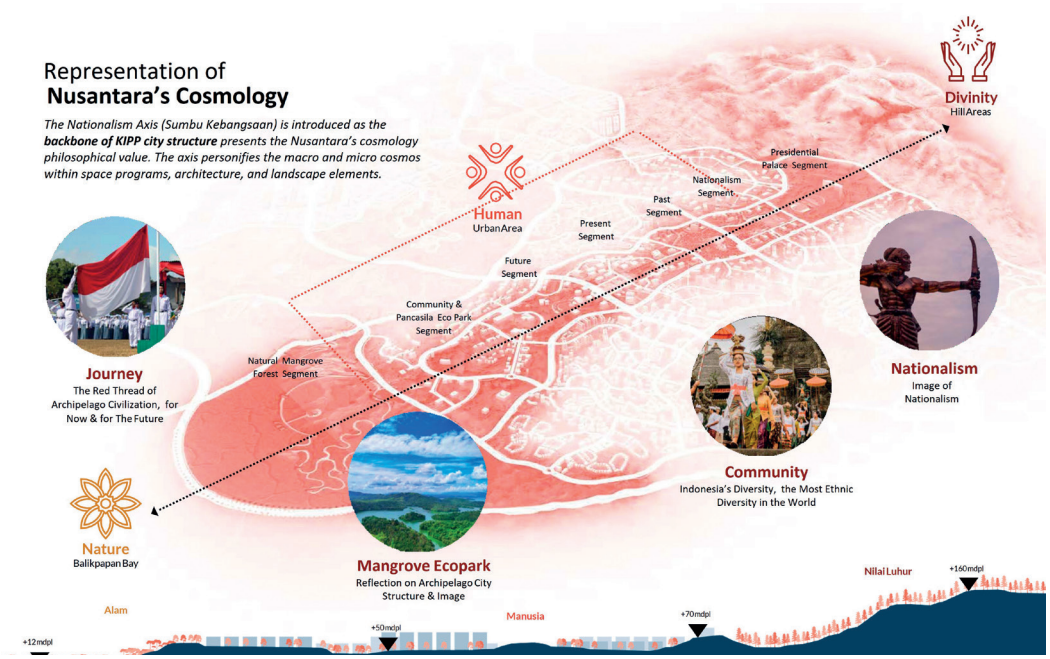

Figure 9. The principle of Sumbu Kebangsaan (Nationality Axis) in the Government Core Area (source: Urbanplus, 2022)

humanity, and nature, while the details of each segment along the Nationalism Axis tell stories about Indonesia.

Indonesian history and culture is showcased in the spaces and local elements along the landscape of the Nationalism Axis in five segments running from the Presidential Palace in the north to the Mangrove Ecopark in the south. Each segment has a theme taken from the story of the Indonesian nation, past, present, future. Each thematic zone has plazas with focal points and facilities to serve as the main public spaces in the Government Core Area.

Plaza Seremoni (Ceremonial Plaza) is a multifunction court for various formal and informal activities. The story of the Indonesian past is told through Plaza Sipil (Civilization Plaza), Bukit Bendera (Flag Hill), the museum of Beranda Nusantara and a display of the landscapes of the Indonesian ecoregion (Figures 10, 11). The story of the present is told through Plaza Bhinneka (Diversity Plaza), a series of three plazas framed by the cultural pillars of the government precinct. The ground zero of the new Capital City of Nusantara is located at this Diversity Plaza. The story of the future is told through a Science and Tech Park. Further south towards the Mangrove Ecopark, the story of Indonesian community and culture, along with the spirit of democracy, is told through Plaza Adi Budaya (Cultural Plaza) and Plaza Demokrasi (Democracy Plaza). The stories represented along the Nationalism Axis portray the macro and micro aspects of the Nusantara cosmology through space, architecture, and landscape elements.

Biophilic and biomimicry approaches

The architecture of the new Capital City of Nusantara's built environment is designed to be harmonious with the existing forest ecosystem. Biophilic and biomimicry approaches are the means to fulfill this vision.

Figures 10, 11. (above) Plaza Seremoni, (below) Plaza Sipil (source: Urbanplus, 2022)

The theory of biophilia recognizes that humanity has an "innate tendency to focus on life and lifelike processes" (E. O. Wilson), namely, a preference for adaptive responses to nature over pure human creations (Kellert and Calabrese, 2015). Biophilic approaches in architecture thus focus on human associations with nature. Biomimicry is the emulation of the models, systems, and elements of nature for the purpose of solving complex human problems through technology and engineering in a sustainable way (Ghisleni, 2020).

Biophilic design in architecture seeks to create a good habitat that contributes to human health and wellbeing through reconnecting people with nature. Kellert and Calabrese (2015) divide the approach into three ways of experiencing nature: direct experience, indirect experience, and the experience of space and place. Direct experience refers to direct contact with nature such as natural light, air, or landscape. Indirect

experience refers to the representation of nature through images, artworks, natural materials, and ornamentation inspired by natural shapes and form. The experience of space and place refers to spatial features characteristic of the natural environment, such as mobility, wayfinding, and transitional spaces.

Biomimicry design is also concerned with functional solutions (Pawlyn, 2016). The biomimicry approach seeks to understand how the natural ecosystem works and to preserve it by incorporating its principles into the built construction, rather than just using nature as inspiration for aesthetic aspects of design. Biomimicry accepts that nature has already provided the best adaptation to any set of conditions and seeks to render that adaptation through technology. The biomimicry approach is employed in today's architecture to address issues of climate change, waste, and sustainability.

The design of the Government Core Area was developed to harmonize with the existing condition of the site and the original landscape of Borneo's forest as the ecological model. The biomimicry approach is used to explore the principles and elements of the rainforest ecosystem and to incorporate them into an urban context. The rainforest provides clues on ways to establish connections between different elements of structures, to handle issues of light and shade like a rainforest canopy, to have permeable surfaces which harness nutrients like a rainforest floor, and to have sturdy and efficient constructions analogous with the buttress roots of the taller rainforest trees. All these clues were translated into the built environment in the Government Core Area. The designs allow sunlight to penetrate into internal building courts; create ways for air to ventilate the spaces within urban blocks and buildings; and allowing water and wind to move at ground level by elevating parts of the ground floor with stilts or pilotis structures. In this way, the design preserves most of the original land and creates minimal impact on the soil condition.

In accordance with the biophilic concept of reconnecting humanity with nature, the design of the Government Core Area is based on the natural conditions of land, forest, and rivers. The built environment works with the natural topography by embracing the existing contours instead of fighting against them (Figure 12). The buildings are organized to blend with the landscape, with many open spaces and green corridors between the multiple centers. Community and collective spaces at ground level serve

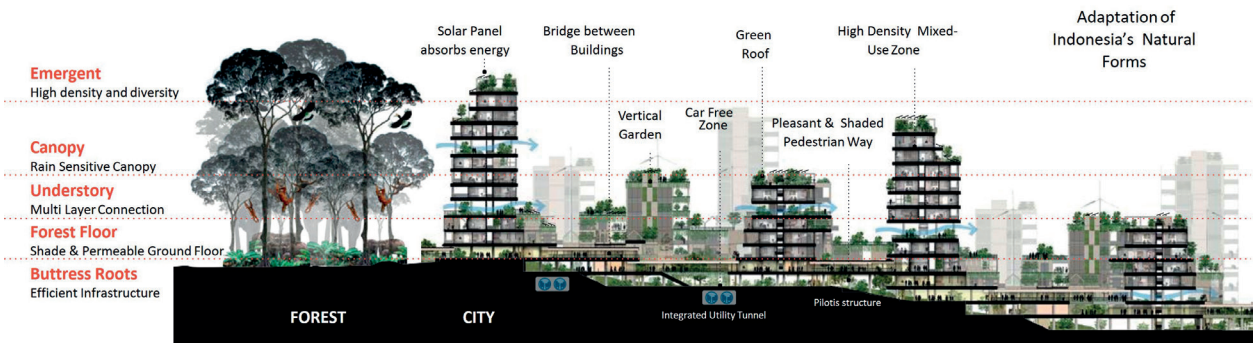

Figure 12. Biomimicry approach at the Government Core Area (source: Urbanplus, 2020)

as transitional space between buildings and nature. Stilts or pilotis are used in as many buildings as possible. The design follows the strategies of local Indonesian architecture, where humans respect Mother Nature and live harmoniously with other living organisms.

Figure 13. The Government Core Area as a compact city model (source: Urbanplus, 2022)

The Compact City and mixed developments

The existing land condition at the Government Core Area site presented challenges for the development of an urban environment, which is most easily achieved on flat ground. However, the undulating topography made the existing environment "rich" with features that allow designers to "play" with nature as a foundation and apply analytical thinking to elaborate an urban environment in a different way. The forest is seen as a background that coexists with the built environment. All the urban design strategies are conceived within this vision.

The city is designed to be compact and provide a mix of functions. Following New Urbanism theory, the Government Core Area is developed with a focus on the human. The design is based on a series of walkable urban blocks, where domiciles and activity centers are in close proximity, pedestrians and non-motorized vehicles have priority, and there are accessible public spaces. These urban blocks are connected through public transport interchange hubs. The 3D principles of Density, Diversity, and Design are adopted to establish an urban environment that contributes positively to the communities' health, livelihood, and environment.

The model of a Compact City has attracted attention around the globe as more than four billion people now live in urban areas (United Nations, 2018). The Compact City concept aims to create an efficient urban environment by creating self-sustaining communities within urban cores. According to Burton, Jenks and Williams (1996), the Compact City model is the most sustainable form of city because it offers completeness,

compactness, conservation, comfort, coordination, and collaboration within all its elements. The traditional Indonesian city followed the concept of a Compact City with all the main public buildings positioned within a confined area. As cities have grown

Figure 14. Second level pedestrian connections at the West Residential precinct of Government Core Area (source: PT. Mataram Surya Cipta, Indonesia Ministry of Public Works and Housing, 2021)

and become more complex, the Compact City model is achieved by building mixed use areas within the city center to support people's needs.

The pattern of the Government Core Area as a Compact City with mixed development allows the creation of an efficient city ecosystem which also conserves the existing natural features (Figure 13). The design of the Government Core Area has a fundamental structure of multiple urban core areas, each of which has a mix of functions. Each neighborhood core provides facilities for citizen's basic needs such as schools, clinics, retail and open spaces. Multi-layer and vertical stacking is used to concentrate the multiple functions within accessible distances, while also conforming to the existing topography and the background forest ecosystem. Mid- and high-density towers allow efficient use of the land along with flexibility for residential and commercial use, but are deployed with careful consideration of the carrying capacity of the land. Through this compact and mixed-use development, it is possible to create a sustainable and ecologically responsible city.

Pedestrian connections, amenities and main streets

The rolling nature of the site became the biggest challenge to creating an efficient system for mobility in the Government Core Area. As one of the goals of the development of the Capital City of Nusantara was to create a 10-minute City, studies were made of pedestrian walking distances. At the same time, pedestrian corridors are also conceived as spaces of community interaction. In the culture of Indonesian societies, people met

and mingled in the "main street" of compounds which served as the community space and the heart of the livelihood of Nusantara's people.

In Indonesian city planning, a distance of 350–400 meters is typically used as the benchmark for a 5-minute walk, and 750–800 meters for a 10-minute walk. However, this standard refers to a flat surface, while the rolling topography of the site of the Government Core Area has an average slope up to 20 percent, so the distance was reduced to 440 meters for a 10-minute walk and 220 meters for a 5-minute walk.

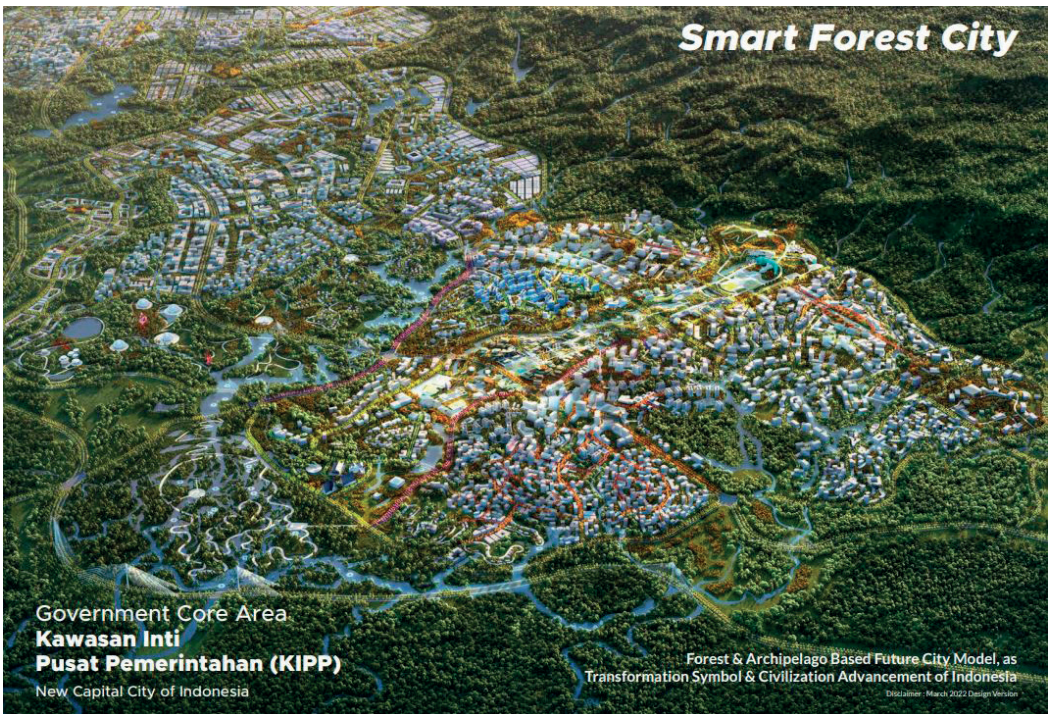

Figure 15. Overview of the plan for the Government Core area (source: Urbanplus, 2022)

To provide mobility between buildings in the core areas, reflecting "skywalk" pedestrian connections are provided at the second level, preserving the ground level in its natural form (Figure 14). The network of "skywalks" is linked to public transport nodes. This design mimics vernacular architecture's minimal footprint on the environment, while providing space for public and community engagement along this second level network.

In the traditional pattern, the main street of an Indonesian city was the site for various formal and informal interactions. These are accommodated within these layers of pedestrian corridors. The skywalks not only conserve the existing topography at ground level but also provide public amenities at the second level.

Conclusion

What do you think cities will look like in fifty to a hundred years? Will we see the same character of cities in the future? Will culture, geography, or climate have significance for the character of cities or will cities survive while ignoring them?

Rapid urbanization and the effects of climate change require critical thinking about the planning of the urban environment. Local conditions such as local wisdom, social traditions, climate, nature, landscape, and geography need to have a predominant consideration in urban design. The regionalist approach is considered essential to guiding appropriate and sustainable urban design. The cultural heritage of a place provides lessons learned in dealing with nature.

The plan for the Government Core Area in the new Capital City of Nusantara is designed to be sensitive to the natural conditions of the site and the value of Indonesia's cultural heritage. The forest ecosystem is the foundation on which the design is developed. The urban land forming process was planned to follow the existing topography and to preserve key features such as green corridors and riparian areas. The natural elements of the original landscape indirectly determine the urban structure. The concept of a Compact City allows the creation of an efficient urban environment that coexists with nature.

The Government Core Area design is respectful towards both local heritage and nature. The local traditions of Nusantara offer examples of living together with nature, promoting social life at the community level, and providing efficient, effective and livable urban spaces. Respect for nature is key to crafting a green and sustainable city. The natural landscape of Borneo's forest ecosystem is the foundation of the Government Core Area plan to explore the possibilities for developing a built environment on the site which is harmonized, agile, smart and sustainable. This respect for culture, heritage, and nature offers new possibilities for the sustainable cities of the future.

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