

Virtual Velocities: Urban and Ecological Trajectories in Planning for a New Indonesian Capital

DIANE VALERIE WILDSMITH

Urban trajectories forecast across ecological epistemologies may help predict scenarios for the planning and development of a smart, sustainable new capital city for the Republic of Indonesia. At the same time, virtual velocities and “disruptive traditions” attributed to the coronavirus pandemic will likely affect the traditional and virtual realities of all cities in years to come. In particular, the correlation between density and contagion may imply a reconfiguration of urban environments according to a more biomorphic design philosophy. Research related to these topics further indicates that digital technologies and virtual representations will be instrumental in reinforcing urban traditions and imagining marketable smart-city scenarios in a future of planetary urbanization.

Planning for a new Indonesian capital is currently centered on devising a comprehensive strategy to build an entirely new, smart, sustainable city in the Bornean province of East Kalimantan. Foreseen as a diplomatic and administrative hub for 1.5 million residents built partly on restored oil-palm plantations and surrounded by wetlands and tropical forests, initial work on the project was targeted for completion by 2025. With a projected budget of US\$33 billion, the new capital has been envisioned as merging traditional attributes of urban compactness with contemporary thinking about ecologically responsible, data-driven design.¹

After an extensive three-year analysis, the president of the Republic of Indonesia, Joko Widodo, announced his country’s selection of a preferred site for the project on August 26, 2019. On the island of Borneo, near the geographic center of the Indonesian archipelago, the new capital site comprises 40,000-hectares (99,000 acres) west of the newly opened Balikpapan-Samarinda toll road, which links the two major population centers of the North Penajam Paser and Kutai Kartanegara regencies, in an area that includes

FIGURE 1. Map showing the location proposed in August 2019 for a new Indonesian capital city in East Kalimantan. Source: <https://www.scmp.com/news/asia/southeast-asia/article/3024352/indonesia-announces-site-new-capital-city-reduce-jakartas>.



Bukit Suharto National Park (FIG. 1). “The [new] capital is not only a symbol of our nation’s identity, but also represents our nation’s development,” Jokowi explained. “It’s for the sake of realizing an equitable and just economy.”²

This article examines the feasibility of planning for this new administrative center through the lens of urban and ecological epistemologies. The effort is being undertaken against the bleak future predicted for Indonesia’s current capital, Jakarta, which is threatened by pollution, overcrowding, and sea-level rise. The project has thus been presented as realizing an alternative, environmentally responsive, energy-efficient urban model for Indonesians — and to a certain extent for the international community.

Toward this end, government branding of the project as a “Forest City” has explicitly reflected a tradition of utopian design for new capitals on greenfield sites. And to give virtual form to these ideas, it held a conceptual design competition in late 2019, which was won by the Jakarta-based urban design firm Urban+, and whose entry evoked the image of a “Forest Archipelago” [“Nagara Rimba Nusa”]. However, after staging the design competition and beginning to identify local and international consultants and funding sources, the Indonesian government put the entire venture on hold in 2020 due to the coronavirus pandemic.

This article additionally examines this project with regard to several important theories about the design of future cities. First is Henri Lefebvre’s idea of “forecasting,” developed in his 1970 *La Révolution Urbaine*, which he used to assess how the acceleration of urban growth will lead inevitably to planetary urbanization.³ Second is Simon Elias Bibri and

John Krogstie’s alternative, iterative “backcasting” approach to the problem of pervasive urbanization, which begins with the vision of a smart, sustainable city as the end-result of a desired, normative trajectory.⁴ Third are the ideas of Neil Brenner and Christian Schmid for addressing contemporary urbanization by moving beyond urban-rural binaries, nineteenth- and twentieth-century metrocentric cartographies of agglomeration, and the imposition of a technocratic, normalizing template across the global South.⁵ Brenner, in particular, has instead advocated a new urban epistemology based on the territorial impact of resource extraction and the virtual velocities of satellite urban processes.⁶

As an archipelago nation, the Republic of Indonesia faces severe impacts from climate change and sea-level rise across its vast coastal territories. In response, guidelines for the design competition for the new national capital [Ibu Kota Negara — IKN] aspired to give form to a smart, green paradigm. Such an eco-city model is universally seen as enabling a reduction in carbon emissions, with the attendant benefits of improving air quality and encouraging sustainable urbanism. This research explores how digital visualization media will be instrumental to this effort to address the challenges of planetary urbanization. However, it also considers the impact of “disruptive traditions” on future urban typologies, such as that revealed by the coronavirus pandemic. In particular, it seeks to investigate how public-health considerations could shape the effort to build a new Indonesian capital.

The article will proceed through four phases of inquiry. First, tracing the trajectories of virtual and historical traditions, it will reveal the importance of circular iconographies

in gathering civic power in capital cities. Second, illuminating urban epistemologies, it will show how new knowledge platforms may be used to generate future urban spaces. Third, it will explore the importance of virtual reality and new electronic media in imagining a data-driven, smart, sustainable capital city. And fourth, investigating environmental epistemologies, particularly as these may be associated with the coronavirus pandemic, it will reimagine the future of global cities.⁷ By way of a conclusion, it will seek to forecast future scenarios for a new post-pandemic Indonesian capital.

The article thus seeks to reveal how virtual velocities and ecological epistemologies will shape the trajectories that digital technologies and virtual representations will take in reinforcing existing urban traditions. Eventually, these may create new virtual traditions, altering the shape of future, marketable, smart-city scenarios, which may be critical in efforts to address planetary urbanization.

TRACING TRAJECTORIES OF VIRTUAL TRADITIONS

The philosopher and philosophy can do nothing by themselves, but what can we do without them? Shouldn't we make use of the entire realm of philosophy, along with scientific understanding, in our approach to the urban phenomenon? So, we can examine its processes, its trajectory, its horizon, and especially, when considering "humankind's being," its realization or failure in the coming urban society?

— Henri Lefebvre⁸

In response to the IASTE 2020–21 conference theme of “Virtual Traditions,” this article investigates the relationship between “real world” physicality and “imaginary” virtual landscapes in the configuration of a scenario for a new, sustainable, capital city for Indonesia. To begin this project, it is useful to consider the existing trajectory of virtual traditions related to capital cities. A typical capital-city cartography is revealed, for example, in a NASA satellite view of Paris at night (FIG. 2). Within Paris, one can point to the Eiffel Tower as an iconic beacon of French culture and engineering expertise (FIG. 3). However, the use of a traditional, circular iconography of power may be even more important, as seen in the Place Charles de Gaulle (Place de l'Étoile) at the end of the Champs Élysées Boulevard (FIG. 4).

The expression of a tradition of state power dominated the redesign of Paris throughout the nineteenth century. This began with the authoritarianism of Emperor Napoleon I, and continued later in the century with the engineering of an entirely new urban infrastructure by Baron Georges-Eugène Haussmann. However, as Lefebvre has observed: “Ever since its origins, the State [has] expressed itself through the void: empty space, broad avenues, and plazas of gigantic proportions open to spectacular processions. Bonapartism simply



FIGURE 2. View from the international space station of Paris at night. Henri Lefebvre assessed the acceleration of urban growth in 1970 as leading toward planetary urbanization. Photo by ISS Digital Camera, NASA Earth Science and Remote Sensing Unit, July 11, 2016. Available at <https://www.nasa.gov/image-feature/paris-at-night>.



FIGURE 3. The Eiffel Tower is an iconic beacon of French culture and engineering expertise. Photo by Paul Gaudriault, September 12, 2017, from UnSplash.



FIGURE 4. The Place Charles DeGaulle (Étoile) with the Arc de Triomphe expresses the circular iconography of state power. Photo by Jeffrey Milstein, August 8, 2015, from Flickr (used by permission).



FIGURE 5. *The Mall in Washington, D.C., expresses the symbolic power of egalitarian connectivity. Photo by Carol M. Highsmith. Courtesy of United States Library of Congress Prints and Photographs Division, Digital ID No. highsm.01901.*

carried on the tradition by applying it to a historic city, to a highly complex urban space.⁹

The tradition of centralized public spaces connected by grand boulevards has provided a powerful precedent in the construction of other iconic capitals, including Washington, D.C., Brasilia, and Canberra. Circular geometries provide an important iconography in all such cities because they express centralized power. However, diagonal boulevards provide an equally potent symbol, dramatizing the sense of connectivity in capitals from Paris to Washington, D.C., and from Canberra to Astana (now Nur-Sultan) in Kazakhstan (FIG. 5). In the last case, Turkic and Sumerian cultural traditions related to the tree of life, the bird of paradise, and the fertility of a golden egg are also reflected in the design of the Bayterek Tower, commemorating the country's independence (FIG. 6).¹⁰

In Indonesia, meanwhile, the very meaning of tradition within local culture was disrupted by the European colonial interlude. Thus, as Nezar AlSayyad has noted, in Bahasa Indonesia, the country's national language, "tradition is *tradisi*, a word possibly invented during Dutch colonialism, and simply meaning 'manners' or 'customs'."¹¹

With regard to this disruption, Abidin Kusno has traced the "turmoil in the realm" in Javanese built form during the Dutch colonial period. He thus described how, in order to reestablish his authority after a rebellion, Sunan [Sultan] Pakubuwana II (Pakubuwono II, 1711–1749), moved out of the old palace of Kartasura, and built the new Kasunan Palace [Kasunan Surakarta] in Surakarta (also known as Solo).¹² Traditionally, the sultan's palace [*keraton*] served as the seat of power in Javanese society and was located to the north of a principal public square [*alun-alun*]. As in the long-serving capital of Yogyakarta, this architectural arrangement provided the *genius loci* for ceremonies and public spectacles. The relocation of a capital thus represented an assertion of power in the realm of tradition.



FIGURE 6. *The Bayterek Tower in Astana (Nur Sultan), Kazakhstan, symbolizes the tree of life and a golden egg. Source: <https://canada.constructconnect.com/dcn/news/projects/2017/08/myth-and-architecture-in-the-futuristic-city-of-astana-1026797w>.*

Beyond such older instances of relocation, however, Kusno also documented Indonesia's seemingly unending postcolonial legacy of new capital planning. This has so far included the efforts of President Sukarno in Jakarta and Palangkaraya, President Suharto in Jonggol, and President Susilo Bambang Yudhoyono in Central Kalimantan (Vision Indonesia 2033).¹³ They now include the proposals of President Jokowi for East Kalimantan.

Such exercises reveal the existence of virtual trajectories. The analogy here derives from physics, where the flight of an object typically follows a certain path through space as a function of time. Virtual reality is ordinarily thought to involve the creation of a three-dimensional, computer-generated environment, which may be manipulated by a person using or wearing electronic equipment. However, virtual tradition may additionally be thought of as combining such a "real" cybernetic imaginary with "virtual" beliefs, customs and practices. As AlSayyad has noted, "Indeed, everyday life is only one example of 'virtual reality.' In other words, the virtual is distilled throughout real life in a way that makes it hard to claim its independence from reality."¹⁴

Conceived in this manner, the idea of virtual velocities may be used to envision possible future city scenarios. In a mechanical world, virtual velocity is typically used to describe a potential for movement, the hypothetical displacement of an object in space. Thus, in the virtual world of urban imaginaries, "disruptive traditions," or what Kusno referred to as "turmoil in the realm," may intervene to alter the perception and use of real environments before actual change takes place. As a contemporary example, one might point to the potential for cultural impacts inherent in the present coronavirus pandemic. Alternative trajectories partaking of the relationship between the virtual and the traditional may thus stimulate new strategies for the design and planning of future cities.

ILLUMINATING EPISTEMOLOGIES OF THE URBAN

Or, to pose the same question as a challenge of intellectual reconstruction: is there — could there be — a new epistemology of the urban that might illuminate the emergent conditions, processes and transformations associated in a world of generalized urbanization?

— Neil Brenner and Christian Schmid¹⁵

Urban epistemologies are essential to establishing a knowledge platform for use in realizing spaces such as public parks, dwellings, and workplaces for city residents. In the context of future-city research, the present investigation proposes three trajectories by which this might occur with regard to a new Indonesian capital.

The first such trajectory involves Henri Lefebvre's notion of "forecasting," which he defined as extrapolating from known facts and trends. Actors in such an effort are typically government officials, academicians, architects, politicians, economists, engineers, and community leaders. These people thus become instrumental in the "branding" and subsequent physical realization and governance of future cities.

Within such a positivist frame, Lefebvre recognized that data collection typically reflects the scale and quantification of existing typologies. A project such as a new Indonesian administrative capital would thus begin with a literature search to assess comparative capital-city data and establish relative urban metrics. Such data collection might consider such sources as media reports, Google maps, and images of major capital cities — including satellite views at night to represent urban sprawl and energy consumption. As a manifestation of praxis (which involves processing a theory for its eventual realization), the forecasting of a future capital city in East Kalimantan might then be expanded to test the application of ecological epistemologies.

In contrast to Lefebvre, Bibri and Krogstie's trajectory of inquiry engages the idea of "backcasting." Citing the work of Holmberg and Robèrt, they thus devised a step-by-step methodology for working toward the planning of a smart, sustainable city from its successful realization.¹⁶ The actors in such a data-driven effort would include city planners, technologists, and experts in artificial intelligence. Their plans and predictions might, for example, encompass such future aspirations as energy-efficient, autonomous electric cars to reduce carbon emissions. As applied to Indonesia, however, such an ontological model would require cultural verification, bearing in mind the social, spatial and economic differences between developed and developing countries.

The third possible trajectory of inquiry is based on Brenner and Schmid's call for an alternative urban epistemology, one that challenges conventional notions of the urban/rural divide.¹⁷ Actors here might include economists and strategists who plan on a macro scale for food production, as well as farmers who cultivate crops in periurban regions. It

might consider the impact of people who live in peripheral areas but commute to work in a central business district. And, in the Indonesian context, it might include logging, coal-mining, and oil and gas production interests, because companies engaged in the extraction of natural resources are, literally and figuratively, fueling the country's urbanization.

Brenner has further noted the porosity and territoriality of urban agglomerations, in the sense that the boundaries between urban and rural flows are now fluid, amorphous, and transnational.¹⁸ Aerial views of coal-mining operations in East Kalimantan might thus be used to expand the urban imaginary and presumed ecological footprint of a new capital city to include the economic processes necessary to its electrification. In reference to critical urban studies and the concept of urban political ecology, Brenner has thus observed:

Clearly, the relation between the capitalist urban fabric and the web of life under the capitalocene requires further exploration, at once as a problem of social ontology, as a question of conceptualization, as a focal point for historical and contemporary investigation, and as a terrain for future politico-institutional experimentation.¹⁹

Envisioned as a product of ideological discourse between "Nature and People," ecological notions are thus central to the strategy for developing a new capital for Indonesia. Yet, as President Jokowi has also stated, "The new capital is set to boast cutting-edge technology, a more efficient urban system, and online applications to improve the delivery of public services."²⁰ In planning scenarios, these two strands are ultimately interconnected. As an archipelago nation, Indonesia faces severe impacts from climate change and sea-level rise. And in response both to environmental destabilization and population displacement (as a contemporary example of "turmoil in the realm"), the government is touting the promise of a new era of smart, data-driven cities.

The digital datafication needed to work toward such an outcome will eventually require quantification of existing urban metrics for green space. However, because of limitations on access to information, Bibri and Krogstie have so far applied their "backcasting" approach only to cities in ecologically and technologically advanced environments. And they have further critiqued the weak connection between, and extreme fragmentation of, efforts to design cities that are both smart and sustainable. Nevertheless, in assessing future data-driven ecological urbanism, they have contended that

In a nutshell, the Fourth Scientific Revolution is set to erupt in cities, break out suddenly and dramatically throughout the world. This is manifested in bits meeting bricks on a vast scale as instrumentation, datafication and computerization are permeating the space we live in.²¹

Taking such a view, it is only a matter of time until digital datafication will be able to define the scale and taxonomy of a new capital city such as that planned for Indonesia. In a virtual sense, data collection for site areas and building footprints might be derived from such sources as LANDSAT images and the quantification of Google Earth apps. A similar approach might be applied to the quantifying of metrics such as green space per capita, air quality, and energy demand.

Such a design process might thus not only be able to step backwards from the future, but to step backwards from the present to refer to historical capital-city trajectories such as those of Washington, D.C., Brasilia and Canberra. The same might apply to the analysis of New York City as a financial capital or Singapore as a city-state. And, in stepping forward toward the future, a further iteration might invite comparisons derived from contemporary green-city iconography in places such as Sejong, South Korea, and Putrajaya, Malaysia.

FORECASTING A VIRTUAL REALITY SCENARIO FOR A SMART, SUSTAINABLE CITY

I'll begin with the following hypothesis: Society has been completely urbanized. This hypothesis implies a definition: An urban society is a society that results from a process of complete urbanization. This urbanization is virtual today, but it will become real in the future.

— Henri Lefebvre²²

As the above passage intimates, visualization using digital media is an essential strategy for imagining a future of planetary urbanization — as it is for forecasting a virtual scenario for a new Indonesian capital. And, as part of its efforts to sell the idea of a new capital, the Indonesian government has sought to depict a future that emulates the Silicon Valley region of the San Francisco Bay Area.

Among iconic projects in Silicon Valley, Apple Park, the corporate headquarters of Apple, Inc., may be particularly influential. Designed by Foster + Partners and completed in 2018, this gigantic structure deploys the symbolic power of the circle to communicate the company's dominant position in high-tech innovation (FIG. 7). A continuous ring with a one-mile radius, the structure was also seen as a way to connect the Apple "people" inside with views of an idyllic "nature" outside. It is just such a belief that nature's vitality can inspire human innovation the Republic of Indonesia is seeking to reproduce by moving its capital to East Kalimantan.

Such a connection between people and nature is radically different from current conditions in Jakarta. Conceived as a modernist, postcolonial capital after the country achieved independence in 1949, Jakarta soon also developed into a major financial hub. Its primacy as a commercial center is symbolized by the Welcome Statue [Selamat Datang Monumen], designed by the sculptor Edhi Sunarso in 1961 and situated

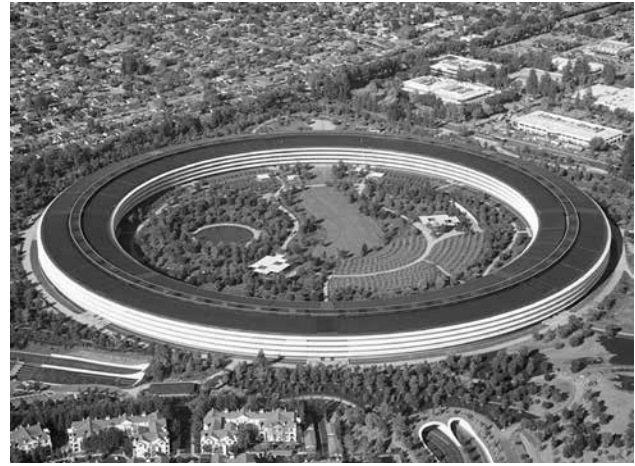


FIGURE 7. The iconography of circular power as seen in Apple Park in Silicon Valley. Source: <https://appleinsider.com/inside/apple-park>.

in its central public space, the Hotel Indonesia roundabout (FIG. 8). This prominence is matched in the political realm by the National Monument [MONAS], originally designed by Frederich Silaban in 1955, at Merdeka Square, across from the Presidential Palace.

Its unquestioned centrality to the functioning of the country in both political and economic terms has, however, caused Jakarta's population to explode to 10,770,487 people.²³ And the megacity region in which it is located now accommodates a population of 34.5 million, second in the world only to the Tokyo-Yokohama metropolitan region. Spread over an area of 3,540 square kilometers on the densely populated island of Java, this translates to an overall density of 9,756 people per square kilometer.²⁴



FIGURE 8. The Hotel Indonesia roundabout is the central public space in the business district of the present Indonesian capital of Jakarta. "Street Life/Bunderan HI," photo by Hengki Koentjoro, October 3, 2014, from Flickr (used by permission).



FIGURE 9. *Extreme flooding in Jakarta at the Hotel Indonesia roundabout, January 28, 2013. Source: <https://alexanderhenry.wordpress.com/2013/01/18/what-flood-taught-us-jakartans/>.*

Jakarta's extreme regional growth since independence has raised a number of resiliency issues related to local transport, land settlement, and flooding. For example, traffic congestion is estimated to incur losses ranging from US\$4.5 billion (Rp.65 trillion) to US\$7 billion (Rp.100 trillion) per year. And areas of Jakarta are sinking at a rate of up to 25 centimeters (10 inches) per year, exacerbating problems of flooding during the monsoon season (FIG. 9).

The choice of a largely undeveloped site for a new capital in East Kalimantan near the city and port of Balikpapan is indicative of the desire for a fresh start (FIG. 10). Not only was it selected over a number of other sites on Java, but, to signal a clear break with the country's violent Cold War past, it was also chosen over the city of Palangkaraya in Central Kalimantan, which had been studied as a new capital site by the country's first president, Sukarno.

However, the impact on this largely undeveloped area would be tremendous. Current figures put the population of the area's two major cities, Balikpapan and Samarinda, at 684,184 and 1,010,413, respectively. Adding the estimated 1.5

million new residents of the proposed capital city (200,000 of whom would be civil servants), and considering ancillary migration, this might result in the creation of a new megacity with a population of nearly four million.²⁵ The first phase of this project would be the construction of a government administrative center, requiring between 2,000 and 6,000 hectares of the total 40,000-hectare site.

In terms of access, the new city would be situated along the recently completed 99-kilometer Balikpapan-Samarinda toll road, developed through a public-private partnership under a 40-year concession at a cost of US\$767 million. Transport of people, food and cargo to the region would take place through the existing Balikpapan Semayang Port and airports at Balikpapan and Samarinda, all major facilities within the network of airports and seaports connecting population centers in the Indonesian archipelago. The eventual development of a third airport, directly serving the capital city, has also been mentioned in its master planning.

On a greenfield site, development of the new capital city, however, offers the possibility for realizing a largely transit-oriented development. This might involve the creation of an integrated mobility network, based on 70 percent local mass transport usage and incorporating pedestrian paths, bike-ways, autonomous cars, autonomous rail transit (ART), and mass rapid transit (MRT).

In terms of national identity and nation-building, the new capital is also foreseen as being designed and built "by Indonesians for Indonesians." As mentioned, the first step here was a design ideas competition for a New Capital City Region [Sayembara Gagasan Desain Kawasan Ibu Kota Negara] (FIG. 11). When the Ministry of Public Works and Social Housing (PUPR) announced this on October 3, 2019, it specified that non-Indonesians could only participate if they were included on a ten-member team whose chairman was an Indonesian. Criteria for the new capital city design included "1) Reflecting the nation's identity; 2) Ensuring environmental, social and economic sustainability; and 3) Creating a smart, modern and international standard city."²⁶ Given the third criteria, it was clear the project's intention was also to create prototypes for smart-city design in the ASEAN region.



FIGURE 10. *Balikpapan, East Kalimantan, the largest urban area near the proposed site of the future Indonesian capital. Photo by Jonathan Wikasana, October 13, 2011, from Flickr.*



FIGURE 11. Winning design in the Capital City Design Competition, “Forest Archipelago,” by URBAN+, Dec. 23, 2019. Source: <https://setkab.go.id/en/govt-announces-winner-of-new-capital-competition-design/> and <https://www.youtube.com/watch?v=7-B-jTss5WA>

A total of 755 contestants entered the ideas competition. The winning “Forest Archipelago” [“Nagara Rimba Nusa”] scheme by Urban+ derived its inspiration from the Indonesian archipelago, proposing a series of landmark plazas connected to a system of smart transport arterials (FIG. 12). Sofian Sibarani, the founder of Urban+ and lead designer for its competition entry, described to the BBC how his firm’s entry attempted to define a new ideal of green city design. As the BBC reported,

[Sibarani says the plan is that 70% of the 2500 sq km (965 sq mile) area allotted for the new city will be green space, and that the built areas will include an institute which will specialise in reforestation, and



FIGURE 12. Pancasila Square and Monument, illustration from the Indonesian Capital City [Ibu Kota Negara — IKN] Design Competition Brief, sponsored by the Indonesian Ministry of Public Works and Social Housing (PUPR). Image from Tempo.Co, October 3, 2019.

a botanical garden. . . . He adds that the idea is to make it a compact walkable city, with areas that are pedestrian-only, and that the additional transport that is needed will be electric.²⁷

The scheme by URBAN+ was in part realized by means of a zoning concept diagram that divided urban functions into layers. A first layer included residential, business and government functions and green areas. A second focused on realizing the government’s “Forest City” concept, locating the Presidential Palace in the north, a Forest Discovery Research Center and Botanical Garden in the east, and Marine Coastal Pods in the south — with car-free zones located along a north-south main axis.

However, the purpose of the design competition was not just to select a winner, but to provoke a panoply of sustainable-city concepts. And the visualization process itself offered evidence of the influence of media in creating new digital spaces and tools for virtual engagement. Other significant visions, for example, included the “Circular City” design credited to the Vietnamese/Singaporean firm EnCity (FIG. 13).²⁸ Another entry, entitled “Infinite City,” by Anti-Statics Architecture of Beijing and New York, included undulating cyber towers, presumably responsive to solar power generation (FIG. 14).²⁹

Despite the argument that planning for a “Forest City” would produce a greater than normal percentage of green cover in new urbanized areas, the main environmental concern related to the project, however, is that a huge area of land will need to be cleared to build it, further exacerbating the ill effects of global warming. Thus, Tjokorda Samadhi et al. have cautioned about the effects of a program to eventually clear an area the size of New York City in East Kalimantan for the new capital.



FIGURE 13. “Circular City” entry in the Indonesian Capital City Design Competition, by EnCity (2019). Source: <https://encity.co/encity-staff-joins-the-design-competition-for-indonesias-new-capital/>



FIGURE 14. “Infinite City” highrises by AntiStatic Architects, Indonesian Capital City Design Competition, second place, 2019. Source: <https://www.forbes.com/sites/jimdobson/2020/01/20/as-jakarta-sinks-a-new-futuristic-capital-city-will-be-built-on-borneo/#243afe527b>

Clearing 100,000 hectares (247,000 acres) of intact forests in East Kalimantan will potentially release 48 million tons of CO₂ into the atmosphere, equivalent to emissions released by 9.3 million passenger vehicles driven for a year. Destroying the province’s vital peatlands would also release massive amount of emissions. And drained peatlands in particular are highly prone to fires, especially during the dry season. In 2015 alone, more than 69,000 hectares (170,500 acres) of forests and peatland areas were burned in East Kalimantan, causing serious environmental, economic and health issues.³⁰

Supporters, however, point out that the project includes strengthening protections for the nearby Bukit Suharto National Park (62,000 hectares). And ongoing slash-and-burn methods of clearing land by logging, agricultural, and palm oil interests, as well as indigenous farmers on Kalimantan, is already a major concern. Indeed, the annual haze from fires in Kalimantan has become a transnational issue, affecting Singapore and Malaysia as well as Indonesia.

Crucial to the capital city development and the related need to boost the area’s agricultural production will also be the provision of shelter, food and water for future residents. A need for seven new dams was forecast to provide enough water for a total additional population of 6 million people.³¹ The Indonesian government proposed covering 19 percent of such development costs, subject to passage of legislation through Parliament. But it proposed that additional funds be raised through public-private development partnerships. A proposal was also floated to finance aspects of the project through the sale of urban properties to middle-class buyers at a rate of Rp.2,000,000 per square meter, well below the cost of land in Jakarta. Yet other proposals have involved leasing government assets to raise funds.

As of February 2020, a steering committee charged with seeking sources of financing for the new capital included

SoftBank founder and CEO Masayoshi Son, United Arab Emirates Crown Prince Sheikh Mohammad Zayed al Nahyan, and former U.K. Prime Minister Tony Blair. According to Blair,

The President’s vision for this capital city is one in which the city itself is going to be attractive. It’s going to be a place where people want to come, live and to work, [and] also a capital city that is able to offer a whole new dimension to the Indonesian economy.³²

In late 2019 and early 2020 Indonesia’s Coordinating Maritime Affairs and Investment Minister Luhut Binsar Pandjaitan likewise announced the involvement of several high-profile international firms in its design. These included the American engineering company AECOM, the consulting firm McKinsey & Company, and the Japanese architectural and engineering firm Nikken Sekkei. A US\$22.8 billion initial development fund was also arranged through the United Arab Emirates and the United States International Development Finance Corporation.³³

Yet, immediately following the project’s announcement, in addition to citing environmental and economic problems, political analysts and journalists weighed in on the largely symbolic nature of the decision to move the capital from Jakarta. An article in the *South China Morning Post* pointed out how the move would do little to solve the environmental problems facing Jakarta, large portions of which might be underwater by 2050.

“Moving the capital off Java is a gesture that aims to solidify unity,” said Jakarta-based political-risk analyst Kevin O’Rourke. “Jakarta will continue to be a megacity — as a centre for finance and commerce — for a few more decades, but ultimately it is at severe risk to climate change.”³⁴

Similarly, writing in the *New York Times*, Elizabeth Pisani, a senior research fellow at Kings College in London, raised issues of social justice.

But will moving political institutions to Kalimantan really do much to promote national unity? It’s hard to see how shifting ministries will erode the increasingly visible gap between the haves and the have-nots. That’s shaped by companies, banks and factories that will remain firmly wedded to the Javanese lodestone. And without an increased sense of equity, outer-island Indonesians are unlikely to acquire a deepened sense of national belonging.³⁵

A harmonious integration of civil servants from Jakarta with existing residents of East Kalimantan might certainly help strengthen cultural and social relationships across the

archipelago. But the mass movement of migrants in support of a national motto of “Unity in Diversity” could also backfire, since Pisani observed that politicians and government officials may shuttle back and forth from the new capital to Jakarta for business dealings.³⁶

Building a clean, sustainable new city will also require a massive investment in new sources of electric power. The current capacity of the South and East Kalimantan power grid is 2,000 megawatts (MW). Estimates of increased demand from the new capital city vary, starting at an additional 500 megawatts. To meet this forecast, John McBeth of *Asia Times* reported that the state-run utility Perusahaan Listrik Negara (PLN) “is planning a 200MW mine-mouth coal facility, northwest of Samarinda, as well as a \$2 billion hydroelectric plant on neighboring North Kalimantan’s Kayan River, one of the priority projects targeted under China’s Belt and Road scheme for aluminium smelting.”³⁷

Greenpeace, however, regards the use of coal-fired power as counter-productive to the construction of smart, green cities. As Leonard Simunjuntak, the country director for Greenpeace Indonesia, wrote:

*Construction of these mine-mouth coal-fired power plants will entirely subvert the smart, green city concept touted for the nation’s new capital. They must be stopped, and the city’s energy source should be provided with clean, renewable energy. The presence of these coal mines will not only ensure air pollution but risk other environmental impacts. . . . The way to achieve this is to apply a “compact city” concept, deploying electricity-based mass public transportation, with the city’s primary energy source being renewables, and with waste management geared towards a zero-waste city.*³⁸

In addition to fossil fuels, increased reliance on solar, hydroelectric, and wind-power sources, as well as bio-gas and waste-to-energy, could certainly help power the new capital city.

In terms of green metrics for the new capital city, a handy reference may be Central Park in New York City, which measures 843 acres (341 hectares) (FIG. 15). The World City Culture Forum has also published data comparing the percentage of public green space in cities around the world. Based on 2011 information from its National Parks Board, the city-state of Singapore ranks among the highest in this measure at 47 percent (FIG. 16).³⁹ In comparison, based on 2010 information from its Department of City Planning and Land Use, the land area of New York is 27 percent green space; and based on 2015 Green Space Information for Greater London, the total area of green space in that city is slightly higher, 33 percent.

According to GeoTabs, there are 146 square feet (18.2 square meters) of green space in New York City per person; in San Francisco that figure is 224 square feet (20.81 square



FIGURE 15. Central Park, New York City, panoramic view looking north. A potential future green urban metric, this iconic public space measures 843 acres (341.15 ha., 3.41 sq.km.). Photo by Martin St-Amant, October 11, 2008, from Wikipedia commons.



FIGURE 16. Gardens by the Bay comprises some of the 47 percent of land area in the city-state of Singapore occupied by green parks. Design by Wilkinson-Eyre, 2006. Source: <https://www.wilkinsoneyre.com/projects/cooled-conservatories-gardens-by-the-bay>.

meters); and in Washington, D.C., there are 592 square feet (55 square meters) of green area per person.⁴⁰

Such metrics will be very useful as planning for the new capital progresses. In addition, the “Forest City” design concept is a recognizable trope within biomorphic design. Previous examples of its application include La Forêt Blanche, a “vertical forest” designed in 2017 by Stefano Boeri Architetti as part of the larger “Balcon sur Paris” project in Villiers sur Marne (FIG. 17). According to the architect, that proposal provides a total green surface area equivalent to a hectare of forest, ten times that of the lot on which it sits.



FIGURE 17. *La Forêt Blanche*, part of the proposed “Balcon sur Paris” project, Villiers sur Marne, France. Design by Stefano Boeri Architetti (2017). Source: <https://www.stefano-boeri-architetti.net/en/news/in-paris-the-first-french-vertical-forest-by-stefano-boeri-architetti/>

INVESTIGATING ECOLOGICAL EPISTEMOLOGIES AND DISRUPTIVE TRADITIONS

The urban problematic, urbanism as ideology and institution, urbanization as a global trend, are global facts. The urban revolution is a planetary phenomenon.

— Henri Lefebvre⁴¹

An investigation of environmental epistemologies related to the disruptions of climate change and the coronavirus pandemic may be further useful in forecasting the virtual reality of a post-pandemic city. In his 1909 novella *The Machine Stops*, E.M. Forster described a dystopian world that was hauntingly prescient of urban life under lockdown during the current pandemic.⁴² According to one synopsis:

The story describes a world in which most of the human population has lost the ability to live on the surface of the Earth. Each individual now lives in isolation below ground in a standard room, with all bodily and spiritual needs met by the omnipotent, global Machine. Travel is permitted, but is unpopular and rarely necessary. Communication is made via a kind of instant messaging/video conferencing machine with which people conduct their only activity: the sharing of ideas and what passes for knowledge.

The two main characters, Vashti and Kuno, live on opposite sides of the world. Vashti is content with her life, which, like most inhabitants of the world, she spends producing and endlessly discussing secondhand “ideas.” Her son Kuno, however, is a sensualist and a rebel. He

persuades a reluctant Vashti to endure the journey (and the resultant unwelcome personal interaction) to his room. There, he tells her of his disenchantment with the sanitised, mechanical world.

He confides to her that he has visited the surface of the Earth without permission and that he saw other humans living outside the world of the Machine. However, the Machine recaptures him, and he is threatened with “Homelessness”: expulsion from the underground environment and presumed death. Vashti, however, dismisses her son’s concerns as dangerous madness and returns to her part of the world.

As time passes, and Vashti continues the routine of her daily life, there are two important developments. First, the life-support apparatus required to visit the outer world is abolished. Most welcome this development, as they are sceptical and fearful of first-hand experience and of those who desire it. Secondly, “Technopoly,” a kind of religion, is re-established, in which the Machine is the object of worship. People forget that humans created the Machine, and treat it as a mystical entity whose needs supersede their own.

Those who do not accept the deity of the Machine are viewed as “unmechanical” and threatened with Homelessness. The Mending Apparatus — the system charged with repairing defects that appear in the Machine proper — has also failed by this time, but concerns about this are dismissed in the context of the supposed omnipotence of the Machine itself.

During this time, Kuno is transferred to a room near Vashti’s. He comes to believe that the Machine is breaking down, and tells her cryptically “The Machine stops.” Vashti continues with her life, but eventually defects begin to appear in the Machine. At first, humans accept the deteriorations as the whim of the Machine, to which they are now wholly subservient, but the situation continues to deteriorate, as the knowledge of how to repair the Machine has been lost.

Finally, the Machine collapses, bringing “civilization” down with it. Kuno comes to Vashti’s ruined room. Before they perish, they realise that humanity and its connection to the natural world are what truly matter, and that it will fall to the surface-dwellers who still exist to rebuild the human race and to prevent the mistake of the Machine from being repeated.⁴³

Increasing concern over the unsustainability of contemporary urbanism, as mirrored in such apocalyptic scenarios, has caused urban futurology to shift away from a strictly urban epistemology to one that incorporates broader ecological concerns. According to Isabel Carvalho, such a new ecological epistemology “demarcates an area of convergence between

contemporary theories whose common core is the recognition of the agency of natural processes, objects and materials.⁴⁴

In relation to the impacts of climate change, this work has begun to approach the design of cities based on their carbon footprints. In this regard, in what is now known as the Moran Report, researchers from the Norwegian University of Science and Technology studied 13,000 world cities to compare their carbon footprints relative to such factors as population, wealth, and patterns of consumption.⁴⁵ For example, New York (ranked third in population at 13,648,999) and Singapore (ranked sixth at 5,235,000) were both among the top ten cities in total carbon emitted to the atmosphere, and London and Jakarta were among the top twenty for carbon emissions. However, contrary to the assumption that higher populations necessarily result in higher carbon emissions, in an analysis of data from the Moran Report, NASA observed that, “The urban agglomerations of Cairo, Jakarta, and Tokyo all had populations that exceeded 30 million people, for instance, but these cities had comparatively low carbon footprints (below 150 million tons).”⁴⁶

Such findings indicate that changes to the design of cities might do much to reduce human impact on the environment. Changes in urban life related to the coronavirus already reveal such a potential. And not only have restrictions on travel within and between cities since the onset of the pandemic reduced overall carbon emissions, they have reduced the level of other pollutants as well. For example, from March to April 2020, nitrogen dioxide levels decreased by 54 percent in Paris due to the coronavirus lockdown. The effect across France was also documented by the European Space Agency using a visual comparison of air pollution from March 2019 and March 2020.⁴⁷

Once a “new normal” emerges and people resume transport, work, and manufacturing activities, however, an increase in carbon emissions is predictable. But a return to old levels may be blunted by new urban practices created in reaction to the virus. For example, walking and bike-riding may increase, and more people may choose to work at least part time from their homes.

The importance of urban green space is another pivotal insight derived from the coronavirus lockdown. Not only do parks serve as a city’s lungs, but they have been important to the psychological health of urban residents as places of relaxation and relief from isolation during quarantine. In this regard, Harriet Constable recently asked in a report on *BBC Future*: “How do you build a city for a pandemic?” On the one hand, she noted the positive effect of therapeutic gardens in Singapore. But, on the other, she observed that “Even with big green spaces like Central Park in Manhattan and Prospect Park in Brooklyn, residents have struggled to stay far enough away from one another to curb the spread of the disease.”⁴⁸

In addition to mask-wearing in public, the approximately two-meter (six-foot) social distancing required to curb the coronavirus contagion has also emerged as a critical new ur-

ban metric. However, from state parks in California to Central Park in New York City to beaches in Florida, experience now shows how difficult this is to maintain. Indeed, outdoor public places in the U.S. were so overwhelmed with people escaping statutory “shelter-in-place” directives after March 19, 2020, that many urban parks and playgrounds had to be closed due to public health concerns.

In contrast to crowded urban parks and beaches, the disruptive impact of the pandemic has also been revealed by powerful images of empty urban spaces. Lockdowns in New York, Paris and Jakarta produced sobering visions of global cityscapes devoid of people — signaling damaging corollary economic impacts, especially on trade and tourism. In Paris, iconic urban monuments, such as the Eiffel Tower, were closed to urbanites and tourists alike. And the Musée du Louvre, Jardins les Tuilleries, and Cour Carrée, shuttered indefinitely in mid-March 2020, were only tentatively reopened to limited numbers of visitors on June 15.

Public-health restrictions ordered under the authority of federal, state and municipal agencies were likewise responsible for the almost complete depopulation of Times Square in New York City. The image of this vibrant entertainment nexus as a vacant boulevard, flanked by shuttered shops, brought home just how powerfully the spatial distancing precautions required to curb the spread of the coronavirus, disrupted economic, civic and social life (FIG. 18).

Images of this dystopian reality reinforce Brenner and Schmid’s thesis that what is thought to be “urban” is merely a temporary materialization of a socio-spatial transformation — a process, not a form.⁴⁹ Thus the operation of the New York subway system and Grand Central Station were strictly curtailed when it was recognized that they placed public-transit passengers and workers at risk of encountering and spreading the contagion. Yet, at the same time, the virus has also revealed how it is possible to close city streets to vehicles to enhance pedestrian activity and create safe new bike lanes, instead of being solely concerned about traffic flow and congestion.

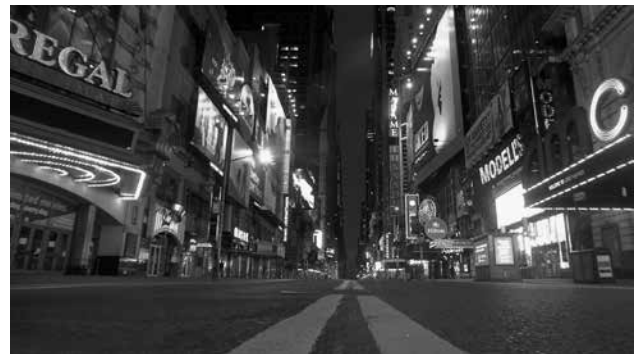


FIGURE 18. New York City’s Times Square during the early days of the COVID pandemic. Photo by Steven Siegel, March 28, 2020, from Flickr (used by permission).



FIGURE 19. *The Pyramid at the Musée du Louvre. Cultural space pre-COVID. Photo by Neil Cornwall, October 3, 2019, from Flickr (used by permission).*

Clearly, the pandemic has allowed public health issues to spill over into the realm of governance in a way they never have before, complicating future-city metanarratives. When cultural tourism will rebound to peak-level queues at the Pyramide du Louvre is impossible to forecast (FIG. 19). Similarly, the virus has revealed how an urban inquiry which initially sought to link ecological epistemologies to traditional urban typologies may be evolving to consider entirely new virtual velocities and “disruptive traditions.” Thus the pandemic may raise serious concerns related to issues of urban scale, morphology, and spatial organization. As individuals and families self-quarantine or “shelter-in-place,” urban society has increasingly come to occupy a virtual world, reliant on on-line courses and electronic communication with coworkers, family and friends.

In the physical world, too, space needs are being transformed by the need for social distancing. For example, office environments have been transformed both because more people are working from home and because the area per person in remaining offices must increase to allow a two-meter (six-foot) space bubble around each person. In terms of residential space, except for desirable balcony units, apartment rental rates are falling in New York and San Francisco, and an increase in properties for sale is providing evidence of urban flight. The increase in demand for living space in the suburbs is another indication of growing interest in personal space, both indoors and out.

The economic impact of the COVID-19 pandemic, which was central to IASTE’s first virtual seminar on “Disruptive Traditions,” in September 2020, has also taken its toll on high-profile new urban developments. Thus, the pandemic, combined with data-privacy concerns and political ramifications, resulted in the withdrawal of Sidewalk Labs from the 12-acre (4.85-hectare) Smart City Quayside project in Toronto.

And, as mentioned, further planning for the new Indonesian capital was placed on hold on August 19, 2020. In an interview with Reuters, Planning Minister Suharso Monoarfa stated, “We’re putting as our number one priority the recovery of the economy and overcoming the pandemic.”⁵⁰

When planning for the project is revived, however, the dystopian reality signaled by the pandemic will certainly have altered the future city envisioned as the outcome of the utopian ideal of smart, green urbanism.

REINFORCING URBAN TRADITIONS AND CREATING VIRTUAL REALITIES

Urban trajectories forecast across ecological epistemologies may be used to predict future scenarios for smart, sustainable cities. With this principle in mind, this article has sought to explore a number of issues related to the realization of a new capital city for Indonesia.

First, it has tried to illustrate how digital data and virtual engagement only reinforce the circular iconography of capital cities in conveying state power. It has further attempted to show how new epistemologies of the urban allow quantification and accumulation of data, which may be used to produce a new positivist urban ontology based on measurable typologies, spatial types, and cartographies. Third, through an analysis of economic, environmental and equity issues related to the proposal for the new Indonesian capital, it has highlighted several key obstacles: the cost of new infrastructure, environmental impacts on forested lands, and the social impact on indigenous people. However, it has also tried to reveal the power of new media, digital space, and virtual engagement in visualizing such a project. Finally, the article has underscored the dystopian power of “disruptive traditions” as evidenced by the coronavirus pandemic, in contrast to the utopian ideals originally foreseen as driving the new capital-city development.

Virtual velocities attributed to the impact of the coronavirus may alter the morphology of both traditional and virtual spaces. The initial impact of the pandemic was thus to enhance daily involvement in digital space under “shelter-in-place” orders, with many employees working on-line from home using new communication technologies such as Zoom conference calls. But in the future, physical spaces may also change: home offices may become a standard feature of residences, and previously open office space may need to be reconfigured to allow for social distancing in self-contained individual spaces. In addition, redundant office buildings may need to be reused for other purposes; residential units may need to be reconfigured so they have better access to green space; and the construction of high-tech urban villages may replace more standard residential complexes. Mass-transit use may need to be rethought, and work shifts may need to be staggered to reduce rush hours for daily commuters.

A correlation between density and contagion also points toward a potential reconfiguration of urban environments. Mixed-use residential, office and commercial spaces along pedestrian-scale streets, enhanced with green roofs, urban parks, and autonomous electric vehicles may be imagined as future urban scenarios. One-way traffic systems may improve the possibility for pedestrian streets; wider sidewalks may allow for social distancing; dedicated bike lanes may facilitate urban recreation; and sidewalk cafes under glazed roofs may allow for both natural ventilation and protection from the weather. Urban gardens may be envisioned as a way to provide local sources of food and further reduce carbon emissions.

Future-city planning, such as that underway for a new Indonesian capital, may also benefit from a new capacity to map and analyze the demographics of existing capitals such as Washington, D.C., Brasilia, Canberra, and Astana. Combining population data with new urban metrics for green space may thus produce a new positivist urban ontology based on measurable typologies, spatial types, and relational geographies. In general, the transfer of “big data” to smart cities could result in a digitized urban taxonomy for future cities.

Coronavirus-related lockdowns in such cities as New York, Paris and Jakarta, however, also revealed stark new images of grand public spaces and boulevards devoid of people. These images reinforce Brenner and Schmid’s thesis that urban form is merely a temporary materialization of socio-spatial forces: that the urban is a process, not a form. Thus, once a coronavirus vaccine is available, it is predictable that civic places such as these will evolve to represent a different kind of normality, possibly one highlighting the cohabitation of virtual and real traditions (FIG. 20).

The design, development and financing of a smart, sustainable, new Indonesian capital city has been postponed because of the coronavirus pandemic. Yet the delay provides further evidence of how global are the networks of finance, design and engineering that underlie the potential to cre-



FIGURE 20. Hotel Indonesia roundabout on Jakarta’s car-free day in 2016. Photo by Between Photos. Source: <https://jakrev.com/megapolitan/mulai-6-mei-cfd-dijaga-satpol-pp-dan-dishub-dki/>.

ate new healthy cities. In the meantime, the trajectory for planetary urbanization based on traditional typologies will be adjusted in a post-pandemic world to consider issues related to density and transport as well as self-sustaining neighborhoods. A new appreciation for the correlation between density and contagion may help establish a trend toward a more biomorphic urban design philosophy.

The urban is a constantly evolving discourse requiring epistemological, financial, social and political insight. Together, these forces will determine the shape of future data-driven, smart, sustainable cities such as the proposed new Indonesian capital. And toward this end, this article has further sought to reveal how digital technologies and virtual representation will be instrumental to reinforcing urban traditions and creating new virtual realities as a response to future planetary urbanization.

REFERENCE NOTES

1. R. Henschke and A. Utama, “When Your Capital Is Sinking . . . Start Again?” *BBC News*, March 5, 2020, available at https://www.bbc.co.uk/news/extra/xsyGF2fhsL/Indonesia_new_capital.
2. M.I. Gorbiano, “BREAKING: Jokowi Announces East Kalimantan as Site of New Capital,” *Jakarta Post*, August 26, 2019, available at <https://www.thejakartapost.com/news/2019/08/26/breaking-jokowi-announces-east-kalimantan-as-site-of-new-capital.html>.
3. H. Lefebvre, *The Urban Revolution*, N. Smith, foreword, R. Bononno, trans. (Minneapolis and London: University of Minnesota Press, 2003), originally published as *La Révolution Urbaine* (Paris: Editions Gallimard, 1970).
4. S.E. Bibri and J. Krogstie, “Generating a Vision for Smart Sustainable Cities of the Future: A Scholarly Backcasting Approach,” *European Journal of Futures Research*, Vol.7 Article 5 (2019), available at <https://eujournalfuturesresearch.springeropen.com/articles/10.1186/s40309-019-0157-0>.
5. N. Brenner and C. Schmid, “Towards a New Epistemology of the Urban,” *City*, Vol.19 No.2–3 (2015), available at <http://urbantheorylab.net/publications/towards-a-new-epistemology-of-the-urban/> and <https://www.tandfonline.com/doi/full/10.1080/13604813.2015.1014712>.
6. N. Brenner, *New Urban Spaces: Urban Theory and the Scale Question* (New York: Oxford University Press, 2019).
7. IASTE, “Disruptive Traditions: The Pandemic and Its Impact on Traditional Built Environments,” Virtual Seminar, September 5, 2020, program and recording available at <http://iaste.org/virtual-events-2/>.
8. Lefebvre, *The Urban Revolution*, p.64.
9. Ibid., p.109.
10. O. Wainright, “Secret Stans: ‘Norman Said the President Wants a Pyramid’: How Star Architects Built Astana,” *The Guardian*, October 17, 2017, available at <https://www.theguardian.com/cities/2017/oct/17/norman-foster-president-pyramid-architects-built-astana>.
11. N. AlSayyad, *Traditions: The ‘Real,’ the Hyper, and the Virtual in the Built Environment* (Abingdon, Oxon, U.K., and New York: Routledge, 2014), p.x.

12. A. Kusno, "Escape from Jakarta?" *Current History*, University of California Press, Vol.118 No.809 (September 1, 2019), p.236, available at <https://online.ucpress.edu/currenthistory/article/118/809/235/107509/Escape-from-Jakarta>.
13. *Ibid.*, p.238.
14. AlSayyad, *Traditions*, p.204.
15. Brenner and Schmid, "Towards a New Epistemology of the Urban," pp.155.
16. J. Holmberg and K.H. Robèrt, "Backcasting from Non-Overlapping Sustainability Principles: A Framework for Strategic Planning," *International Journal of Sustainable Development and World Ecology*, Vol.7 No.4 (2002), pp.291-308, available at https://www.researchgate.net/publication/249060842_Backcasting_-_A_framework_for_for_strategic_planning. As cited in Bibri and Krogstie, "A Scholarly Backcasting Approach."
17. Bibri and Krogstie, "A Scholarly Backcasting Approach."
18. Brenner, *New Urban Spaces*.
19. *Ibid.*, p.33.
20. N. Patria, M.A. Sadie, and G. Holiya, "Jokowi's Grand Vision for New Capital: Smart Metropolis Similar to Silicon Valley," *Jakarta Post*, September 4, 2019, available at <https://www.thejakartapost.com/news/2019/09/03/jokowis-grand-vision-for-new-capital-smart-metropolis-similar-to-silicon-valley.html>.
21. Bibri and Krogstie, "A Scholarly Backcasting Approach," p.4/20.
22. Lefebvre, *The Urban Revolution*, p.1.
23. World Population Review, 2020, available at <https://worldpopulationreview.com/>.
24. Demographia World Urban Areas, 16th Annual Edition 2020.06, Table 2 Largest Built-up Urban Areas in the World, 2020, available at <http://www.demographia.com/db-worldua.pdf>.
25. World Population Review, 2020; and J. McBeth, "Why Widodo Really Wants out of Jakarta," *Asia Times*, August 30, 2019, available at <https://www.asiatimes.com/2019/08/article/why-widodo-really-wants-out-of-jakarta/>.
26. Ministry of Public Works and Social Housing, "Sayembara Gagasan Desain Kawasan Ibu Kota Negara" ["Design Ideas Competition for the State Capital Region"], October 3, 2019. No longer available online. See N. Adri, "Wanted: Designs for Indonesia's New, Smart Green Capital City," *Jakarta Post*, October 3, 2019, available at <https://www.thejakartapost.com/news/2019/10/03/wanted-designs-for-indonesias-new-smart-green-capital-city.html>.
27. Henschke and Utama, "When Your Capital Is Sinking . . . Start Again?"
28. EnCity, "EnCity Planners Join the Design Competition for Indonesia's New Capital City," December 21, 2019, available at <http://encity.co/encity-staff-joins-the-design-competition-for-indonesias-new-capital/>.
29. C. Harrouk, "An Indonesian Smart City Design and a Contemporary Art School in Vienna: 10 Unbuilt Projects Submitted by Our Readers," *ArchDaily*, May 2020, available at <https://www.archdaily.com/938921/an-indonesian-smart-city-design-and-a-contemporary-art-school-in-vienna-10-unbuilt-projects-submitted-by-our-readers>.
30. T.N.K. Samadhi, A. Wijaya, R. Juliane, and D. Affandi, "3 Things to Consider before Moving Indonesia's Capital from Jakarta," World Resources Institute, August 7, 2019, updated August 29, 2019, available at <https://www.wri.org/blog/2019/08/3-things-consider-moving-indonesias-capital-jakarta>.
31. M.P. Rosalina and Y. Budianto, "Will Indonesia's New Capital City Have Enough Clean Water to Support Its Growth?" *Kompas Indonesia*, March 16, 2020, available at <https://earthjournalism.net/stories/will-indonesias-new-capital-have-enough-clean-water-to-support-its-growth>.
32. M.I. Gorbiano, "Indonesia's New Capital City Will Be Very Special, Tony Blair Says," *Jakarta Post*, February 29, 2020, available at <https://www.thejakartapost.com/news/2020/02/29/indonesias-new-capital-city-will-be-very-special-tony-blair-says.html>.
33. Global Construction Review (GCR), "Aecom, McKinsey, and Nikken Sekkei Hired to Design New Indonesian Capital," March 2, 2020, available at <https://www.globalconstructionreview.com/news/aecom-mckinsey-and-nikken-sekkei-hired-design-new-/>.
34. "Indonesia Picks Area on Borneo for New Capital with Relocation Estimated to Cost US\$33 Billion," *South China Morning Post*, August 26, 2019, from Bloomberg News, available at <https://www.scmp.com/news/asia/southeast-asia/article/3024352/indonesia-announces-site-new-capital-city-reduce-jakartas>.
35. E. Pisani, "Opinion: Indonesia Is Moving Its Capital to . . . Where, Exactly?" *New York Times*, August 30, 2019, available at <https://www.nytimes.com/2019/08/30/opinion/indonesia-capital-jakarta.html>.
36. *Ibid.*
37. McBeth, "Why Widodo Really Wants out of Jakarta."
38. Greenpeace Southeast Asia, "Greenpeace Indonesia's Response to the Planned Move of the Indonesian Capital to East Kalimantan," August 27, 2019, available at <https://www.greenpeace.org/southeastasia/press/2933/2933/>
39. World Cities Culture Forum, Percentage of Green Space (Parks and Gardens), in World Cities Culture Forum, 2020, available at <http://www.worldcitiescultureforum.com/data/of-public-green-space-parks-and-gardens>.
40. GeoTab, "Urban Footprint: The Allocation of Space in U.S. Cities," April, 2019, available at <https://www.geotab.com/urban-footprint/>.
41. Lefebvre, *The Urban Revolution*, p.113.
42. E.M. Forster, "The Machine Stops," *Oxford and Cambridge Review*, November 1909, available at <https://www.ele.uri.edu/faculty/vetter/Other-stuff/The-Machine-Stops.pdf>.
43. Wikipedia, "The Machine Stops," available at https://en.wikipedia.org/wiki/The_Machine_Stops.
44. I. Carvalho, "Ecological Epistemology," in H.P.P. Goren, ed., *Encyclopedia of Latin American Religions* (Springer International Publishing, 2016), p.1, available at https://www.researchgate.net/publication/308036036_Ecological_Epistemology_EE.
45. D. Moran, K. Kanemoto, M. Jiborn, R. Wood, J. Tobben, and K.C. Seto, "Carbon Footprints of 13,000 cities," *Environmental Research Letters*, 2018, available at DOI: 10.1088/1748-9326/aac72a and <http://citycarbonfootprints.info/>.
46. A. Voiland, "Sizing Up the Carbon Footprint of Cities," NASA, Earth Observatory, April 10, 2019, available at <https://earthobservatory.nasa.gov/images/144807/sizing-up-the-carbon-footprint-of-cities>.
47. Fox TV Digital Team, "Before-and-After Images Show How Air Pollution Levels Have Dropped around the World Amid Covid-19 Lockdowns," April 22, 2020, available at <https://q13fox.com/2020/04/22/before-and-after-images-show-how-air-pollution-levels-have-dropped-around-the-world-amid-covid-19-lockdowns/>.
48. H. Constable, "How Do You Build a City for a Pandemic?" *BBC Future: Health*, April 26, 2020, available at <https://www.bbc.com/future/article/20200424-how-do-you-build-a-city-for-a-pandemic>.
49. Brenner and Schmid, "Towards a New Epistemology of the Urban," thesis 2, p.165.
50. T. Diela and G. Suroyo, "Indonesia Puts US\$33 Billion Move of Capital City on Hold to Tackle Pandemic," *Reuters*, August 19, 2020, available at <https://www.reuters.com/article/us-indonesia-capital/indonesia-puts-33-billion-move-of-capital-city-on-hold-to-tackle-pandemic-idUSKCN25F13W>.