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Essay

Accessing the Sustainable Potential of Urban Projects Towards Smart Cities in Japan and the Middle East

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Abstract: Today's new perspectives on 'smart' cities are becoming increasingly different from the past when people thought about the idea of urbanism which was the central terminology for studying the changing urban environment. With the rapid development of cities, the definitions and functions of urbanization are shifting towards green-urban development and sustainable 'smart' innovations. These changes are because of globalization, goals of a green future, and inter-cooperation locally and globally. This paper examines the sustainable potential of urban projects towards 'smart' cities in Fukuoka, Japan, and Dubai, the Middle East, with the two different cases and follows discussion on the aspects of 'smart' and 'greening'. This article incorporates a fourfold methodology. First, the conceptualization of 'urbanism' is explored by examining the previously researched accomplishments and terminologies about urban studies and smart cities. Secondly, the Japanese case study on the city of Fukuoka is analyzed by considering Fukuoka is a great example since it innovates and practices on the built environment with the thinking of sustainability and the geographic feature of Japan where it has been reported that Japan is in a high threat level of natural disasters. Thirdly, the Dubai case study is argued by criticizing how the urban projects serve and improve the city in the 'smart' and 'greening' way and paying attention to the real estate and man-made environment. Fourth, this paper is concluded with a discussion to extract the points of smart cities and sustainable development from the two cases. In summary, the applicability of the sustainable potential of urban projects in Fukuoka and Dubai may provide real-life examples for reviewing and studying. The future operations in urban development and the innovative constructions in smart cities would be case by case based on the individual circumstances of different cities worldwide to react and manage the influences and changes caused by an unpredictable climate.

Keywords: Urbanism, Sustainability, Smart Cities, Green Buildings, Climate Changes

The term "smart city" defines the new urban environment, one that is designed for performance through information and communication technologies and other innovations that provide a better service to people's day. Given that the majority of people across the world will live in urban environments within the next few decades, it is not surprising that massive effort and investment is being placed into efforts to develop strategies and plans for achieving "smart" urban growth. As time goes by, the growth of smart cities has become a global phenomenon. Thousands of urban constructions have been planned and mushroomed all over the place. Rationally, the developments of smart cities link to urbanism, theories and many famous urban theorists. Such as Shannon Mattern and Mannel Castells. The focus of this paper is how Fukuoka and Dubai develop their urban projects to adapt to ongoing climate change and implement urban development in a 'sustainable' way by evaluating the examples of The ACROS Fukuoka Prefectural International Hall in the city of Fukuoka and man-made creations in Dubai. One important example is The Palm Jumeirah. The paper concludes with a discussion of reconstructing and reconsidering urban projects built and under construction as a good approach to suggest environmental protection and sustainable urban development. After viewing the two case studies from Japan and the Middle East, I argue that the everyday operations in Dubai's lie to their visitors who used to believe that Dubai was a good place for 'green' and luxury travel. Whereas, Fukuoka showcases a better promotion for public education on sustainability and raising a social awareness by creating a built OR illusional (man-made) urban world.

1. Urbanism

At present, urbanism seems to be the central component to study urban development and planning. Before diving into the individual case study, it would be better to make a connection and generate a common knowledge to form an 'urban thinking'. As mentioned in the introduction, the two major urban theorists who inspired and encouraged the younger generation to think about 'smart cities' published their research in the field of urban studies. At first, Manuel Castells as a postmodern theorist provided a great emphasis on urbanism in the Information Age with his observation of social and spatial trends in the world at large. In terms of the Information Age, he was focusing on the concept of space as the basic and fundamental dimension that "expresses" urban society. In other words, his idea was about the relationship between spatial and social transformation. Both

transformations took place faster and faster within the twenty-first-century world since the majority of the world's population was already living in urban areas and the change of spatial patterns and urban processes was mostly found in metropolitan regions. Similarly, Shannon Mattern (2017) approached the mediation and transition between past and present in cities. Its concentrations on surveying 5,000 years of urban media in a vision that synchronizes planetary and geological thinking of the Anthropocene moment. She introduced her books by starting from 'our current-day obsession with urban intelligence' and what we fancied to understand and develop on - 'smart cities'. She talked through a comfortable narrative of digital newness and demonstrated that cities had to have always been 'smart'. Both urban key thinkers argued how 'stuff' made cities both durable and livable, which we called 'smart' technology, innovation, digitalization and so on. Essentially, the discussion of sustainable urban operations is a potential evaluation and analysis for future urban planning and two cities' profiles will provide a different view of what is a 'sustainable' way of life.

2. Japanese Case Study

In September 2013, Tokyo was awarded to host the 2020 summer Olympic games (Figure 1) by the 125th International Olympic Committee (IOC) session. This was Japan's fourth Olympic event, besides the Summer Games in 1964 and Winter Games in 1972 and 1998. As one of the largest international events, the 2020 Olympics sought to showcase an example of the top world-class city: "hosting the Games will be a great opportunity to demonstrate to the world how, across the entire community, a city can use new technologies and architectural innovations to ensure such access" (Tokyo Bid Committee, 2013). Thus, the Tokyo Metropolitan Government (TMG) established Tokyo's Vision 2020 to prioritize Tokyo's rejuvenation on the principles of sustainable development working on green urbanization and economic growth. In 2020, Japanese tourism would enter a new era to support Japan's GDP because of some well-known international events taking place. Based on Kassens-Noor and Fukushige (2018), the 2020 Olympic Games in Tokyo brought a tremendous impact to host cities and encourage a technological revolution that would make a more convenient and sufficient urban transformation between rural and urban area in order to serve the increase of number of tourists in this big metropolis in the world. A mega-event like the Olympic Games would attract a massive range of tourists to visit and explore the Japanese landscapes and local cultural development. In fact, from Essex and Chalkley (2004), their study gave a brief review of the role of the Olympic Games in urban development. Taking a message from their discussion, a 'Mega-event', such as the Olympic Games, had emerged as an important tool of urban and regional renewal through their ability to justify redevelopment and enhancement, attract inward investment, promote tourism and create new images for host cities. The construction progress of infrastructures raised concerns of environmental influence. For example, on a small scale, some Olympic-related development proposed for early Winter Games could still raise environmental protests. Given these changing circumstances, smaller hosts now faced problems justifying investment in permanent, purpose-built Olympic Villages, hotels, and stadiums. Such an environmental concern had been a major issue in developing venues in each host country. On an increasing scale also necessitated more formal recognition of environmental issues and replacement for the residential problems.

Figure 1. The sign of Tokyo 2020. (Patterson, 2021).

Meanwhile, Japan is also working on innovation and building the environment to propagate an urban 'suitability' thinking since the geographic feature has been reported that Japan is in a high threat level of natural disasters. To inspire and spread the ideology of sustainable urban growth, it would be better to learn from developed urban projects. Fukuoka City in Kyushu, Japan has a good built environment which allows people to study and focus on the city's local climate change adaptation and in particular the role of urban and greenspace planning in facilitating adaptation actions within Fukuoka. Fukuoka is a humid subtropical city that experiences rapid urbanization and economic growth. Fukuoka currently works on adaptation and mitigation, in particular heat risk. Its green terraced ACROS building has come to symbolize adaptation via the built environment and emergence of green roofs. In Mabon et al. (2019), they found the concept of greenery creation to contribute to alleviation of the heat island phenomenon in the city center, which directed the sea breeze to enter the city center through wind corridors and upper air. This idea concluded from the fact that Fukuoka City produced its ACROS Fukuoka prefectural international hall (Figure 2). This was a location where greening had delivered a local cooling system with biodiversity benefits. The feature of this building was a woodland that had a stepped façade of 15 stories height and directly connected to the adjacent Tenjin Central Park. While this building provided public good, it contained sustainable thinking and aesthetic outlooking. Evidently, the ACROS building could become an icon of vertical greening with a method of using green roofs and heat island mitigation. Mabon et al. (2019) stated the example of a built environment in

Figure 2. The ACROS Building (Velazquez, 2011).

Fukuoka was a successful example of climate adaptation in urban environments. As noted above, Fukuoka's "success" may have come from the early adoption of climate change and adaptation-related policies, especially in specific cities that considered these in green space and urban planning. In Japan, existing urban policies for areas such as disaster risk reduction and environmental management may mean that cities are relatively well prepared to adapt to climate change and may not need new policies or planning areas to address weather and climate risks (Hijioka et al., 2016). Thus, Fukuoka is unique in its explicit focus on green space and climate change in urban planning measures. In contrast to other Japanese urban environments, green space planning in Fukuoka has also made rigorous attempts to consider climate change, urban thermal environment, and efforts to understand the city's green space from a citywide green network perspective, supported by internal government studies and local institutions. Interestingly, another aspect of Fukuoka's progress in adapting to climate through the built environment is the community and citizen involvement in greening. It encourages community involvement in greening strategies to maximize the climate benefits of greening in dense cities where green space may be at a premium and available space may lie outside formal green space plans (Mabon & Shih, 2019). Participation in greening at the community level can also help build social relationships (Tidball & Atkipis, 2018), which may improve resilience to future climate events.

To sum up, urban development in Japan would be studied and designed case by case. The example of Fukuoka shows greenspace planning and designing appear particularly well-adapted to the effects of local climate change as the 'heat island effect'. Whilst Fukuoka is indeed promoting sustainability and mitigating climate adaptation, its context makes it distinctive. This case shows a different level of interaction between the government and citizens. The orderly cooperation and the participation from the non-governmental organizations collectively contribute to the 'green' action which is necessary to create a 'livable environment' for everyone.

3. Dubai Case Study

While Dubai starts on its economic development, it also needs to pay attention to its environmental change. Let's talk about 'Dubai's sustainable development'. Mostly, when people talk about 'Dubai' as a geographic term, they might think about its location in the Middle East region or its tourism development as a high-quality service to tens of thousands of visitors. However, this would lead to the topic of 'consumption' of tourism and question about whether Dubai is a sustainable city. By looking at the relatively unusual topic to tie environmental perspective with economic and social perspectives, you as readers will be able to be open-minded to take a chance to think about 'is Dubai a sustainable city?'. At the beginning, Dubai's city development would be based on its advantaged natural resource -petroleum and incomes from tourism. These would be seen as an action of consumption. Consumption has been mainly concerned with the differential purchase, use and consumption of certain material objects. At the same time, consumption patterns of tourist-related services draw my attention since there seems to be a correlation between economic development and environmental degradation. In the end, urbanization in Dubai causes environmental change which encourages people to reconsider urban development and what is a sustainable way of life. According to the Environmental Kuznets Curve (Figure 3), it suggests that economic development initially leads to a deterioration in the environment, but after a certain level of economic growth, a society begins to improve its relationship with the environment and levels of environmental degradation reduces. The EKC is well-adapted to Dubai's case, which studies the country's urban constructing past and present. Yet, the EKC may not be able to apply to every city in the world. Particularly, the following analysis in this paper refers to and guides by the EKC Cave to study Dubai's urban development.

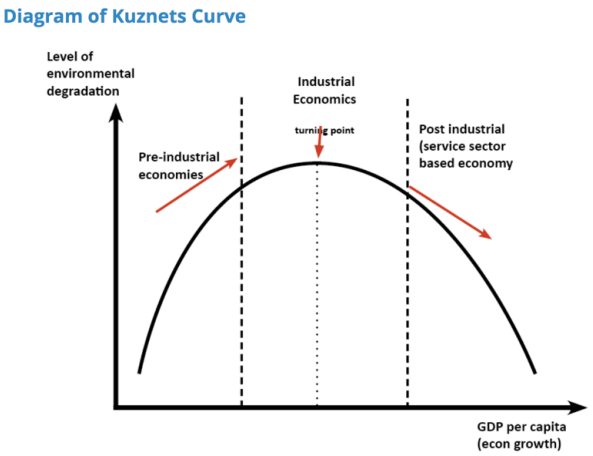

Figure 3. The Diagram of EKC (Pettinger, 2019).

Dubai's urbanization generates a lot of tourist-related services surplus which has been researched. The tourism sector brings money into the city with harmful environmental degradation. Nassar et al. (2014) found that while developing the desert, Dubai was a rapidly developing urban area which had grown to support a large human population within a drought environment. Their results indicated a dramatic increase in urban areas, with a compound annual growth rate of 10.03% over their study period. With a peak of 13.03% during 2003-2005, it showed Dubai was one of the fastest growing cities in the world. While the population growth rate was high, this had outpaced the rate of increase in urban areas and the categorizations also included temporary labor forces and visitors from other countries. As well as the spatiotemporal dynamics of urban growth were closely associated with globalization and local economic development and the ambitious development strategies of the government. Nassar et al. (2014) researched the form of the coastline of Dubai (Figure 4) had been changed since 1972 due to both offshore and onshore construction. They pointed "a significant increase in the pace and scale of offshore development took place during 2000-2003, with the construction of Jumeirah Palm Island (Figure 5). Even more extensive changes in the coastline appeared

between 2003 and 2011 where 68 km^2 was added to the total terrestrial area of Dubai Emirate by offshore reclamation projects in the Arabian Gulf (Nassar et al., 2014, p.55)." From this quote we could interpret that the creation of artificial islands was stimulated by the population shifts leading by Dubai's urbanization and tourism booming. On the other hand, Dubai's artificial islands are a transformation of the form of the coastal landscape which is likely to have implications for the aquatic environment, with potential changes in the dynamics of currents, sediments, biogeochemicals and ecosystem functions regionally or even broadly. Based on an urban thought from Lehtovuori (2016), these coastal destructions were a group of the production of urban space. Even though the constructions were exploring new ways of imaging the city, the influence of the outcome of planning and architecture practice ruined the surrounding environment. Similarly, Poole (2009) acclaimed the impressive creation that the Palm Jumeirah was so large. It can be seen from space, but this reclamation project of this size could easily have a negative effect on the environment. Upon researching the project, he cleared that the UAE was in such a rush to build the islands that lacked planning and environmental studies. Poole's saying claimed the destruction of the Persian Gulf's eco-system was not only the direct impact on marine life but also humans themselves. In addition to damaging the existing coastline, the Palm Jumeirah had proved deadly to most of the marine species in the area. Due to its extreme temperatures, salinity, and other factors, the Persian Gulf was already a high stress ecosystem with the marine life that exists there held in a delicate balance. In order to build these artificial islands, the majority marine life including coral reefs were either removed, permanently dislodged, or completely buried under the new island itself. Seriously, the direct impact of the construction site ruined the marine population located in or close to the construction site.

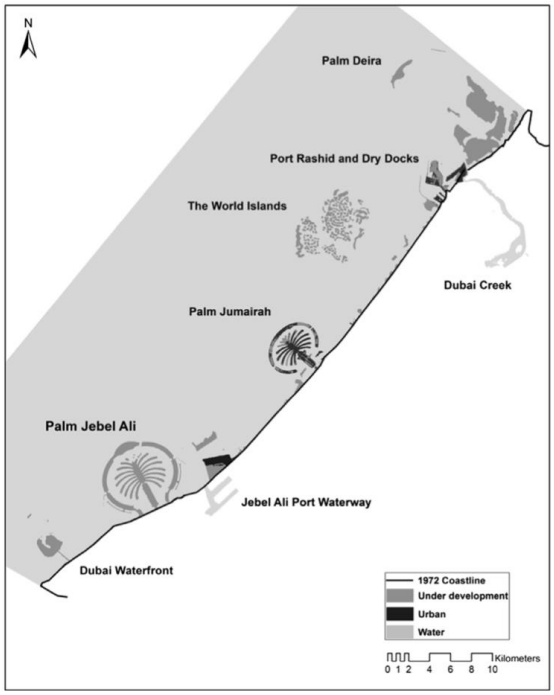

Figure 4. The Offshore Construction (Nassar et al., 2014).

Figure 5. The Palm Jumeriah (Lovecchio, 2014).

Relating back to the EKC, after a period of city development and environmental degradation, the state starts to revalue the impact of existing and ongoing constructions and reconsider to work out the environmental change caused by urbanization and anthropogenic activities. However, there is a spatial mismatch in the EKC, in which people usually take a flight to travel around world metropolitans. So, the tourism consumption in Dubai is evidently identified as a huge carbon footprint that the tourists visiting and transferring generate tens of waste which is an ugliness of building urban landscapes. In some degree, the carbon emission caused by international transition and movement can be valued as an ironic showcase to the modern cities' urban, economic and social development. For instance, quoting from Kunzig (2017) in the *National Geographic*, Dubai, which was on the scorched sands of Arabia, was a fishing village and trading port, small and poor. Then oil and a wild real estate boom transformed it into a city that sported the world's tallest building, one of its densest collections of skyscrapers, and its third busiest airport. As we all know, it has the most recognized luxury shopping mall which the slope looks like a silver spaceship impaled on the ground floor of the Mall of the Emirates. Inside, you can window-shop at Prada, Dior, and Alexander McQueen. According to the Airports Council International, Mouaward (2014) noted Dubai received 67.3 million passengers in the 12 months through February, jumping for the first time ahead of Heathrow's 66.9 million international travelers, and Hong Kong's 59.9 million. Therefore, the tourism consumption is an invisible stimulus to the economy and urban construction but its loss of an idea of sustainability. This like Harvey (2019) suggested we may think capitalism kept producing too much capital, which the new urban investments developed and expanded so fast. Building new cities became a "spatial fix" that created investment opportunities to capitalists' benefits. These developments were seen to ensure that capital would remain and be able to continue to grow but the city turned out to be dominated by the capital accumulation. Next, urbanization easily collapses with environmental degradation.

Normally, sustainable development refers to a socio-ecological process characterized by the fulfilment of human needs while maintaining the quality of the natural environment. Green architectures and parks are two approaches that emphasize the

place of buildings within both local ecosystems and the global environment. Green building is the practice of increasing energy efficiency, while reducing building impact on human health and the environment. Whereas, green parks reduce the heat islands effect, which is negatively affecting the ecology system and human bodies. In order to take a step on sustainable urbanization, Dubai operated several green projects to help its environmental change. First of all, the use of greens is a cooling strategy in a sustainable urban context. Haggag (2012) referred to shading, insulation and vegetation as good strategies to block the heat and reduce indoor temperature. Particularly, "vegetation provides a reliable heat buffer and can save up to 20% on energy use (Haggag, 2012, p.265)." For instance, Madinat Jumeirah (Figure 6), the largest resort established in 2004, was designed and built in an ecological and sustainable way. It used wind-towers, shading devices, vegetations, pools and canals to integrate and create a pleasant outdoor environment, improving indoor comfort by achieving desirable thermal conditions. These strategies minimized the need for mechanical cooling systems and then reduced energy consumption. Likely, in Bolleter's landscape research (2015), he mentioned the Zabeel Park (Figure 7) was another green project dealing with climate. This park was designed for cooling down the temperature and reducing the effect from 'urban heat island'. His research also brought an idea that this pastoral and highly artificial landscape seemed to become a good place for public space and supporting biodiversity in Dubai.

Figure 6. A sight of the Plantation in the Resort.
from https://www.visitdubai.com/en/places-to-visit/madinat-jumeirah. Retrieved October 27, 2022.

Moreover, the use of green walls is another approach to achieve a 'sustainable' goal. Haggag (2012) talked about "green walls, also known as vertical gardens, have been successfully implemented in different climatic conditions (p. 266)." These living walls were made up of climbing plants that grew directly on a wall or supporting structure. Then, they provided a wide range of positive effects for buildings, inhabitants, and the environment, including balancing the temperature, lowering sound insulation, improving visual sights and air quality. For example, the Green Planet Dubai (Figure 8) was built and located at one of Dubai's most popular lifestyle districts. It was defined as the world's "largest indoor man-made and life-sustaining tree" with its tropical rainforest system. It used the 'sustainable' method to create an educational and entertainment space for visitors.

Figure 7. A Bird Eye-view of the Zabbeel Park (Bolleter, 2015).

Figure 8. The Green Planet Dubai.
from https://www.thegreenplanetdubai.com/en, Retrieved October 26, 2022.

To conclude, Dubai gradually realizes the environment change and takes action on operating green projects during its urbanization. In order to implement a 'sustainable' way of life, Dubai would be better to study different aspects including economic, social, etc. Hopefully, Dubai will become more concerned with environmentalism in its urban development.

4. Discussion

Evidentially, the two selected cases make proof for the present and future ideas of 'smart' cities working on innovating and creating a sustainable living sphere, and the operated urban projects drive the issues of climate change, unexpected natural disasters and dangerous hazards.

In sum, to study the case of Dubai emphasized an interdisciplinary perspective to learn from its urban operations. The special lance of taking from this example was the traditional perception and social media propaganda that Dubai was a good place for traveling with tags that were modern, fashionable, friendly, 'green', and sustainable. The misunderstanding of the sustainable way of life in Dubai had been testified as the carbon waste of air pollution. One of the busiest airports in the U.A.E. had transferred and served a huge proportion of visitors from worldwide. Historically, the international airline was considered to be spending for the upper-class range of people. In the 21st centuries, more and more people would like to spend money on enjoying life. Indeed, the more visitors could afford the ticket for travel, the more greenhouse gas emissions would be generated. Although Dubai was criticized for its reception and tourism, it also built and planned lots of green buildings with the method of using green roofs and walls to cool down the temperature and alter the carbon emission. In fact, there were difficulties to popularize green strategies because the usage of water in a drought place was such an expensive experience. Dubai was one of the richest countries in the world, but it would be better if they could find a backup plan for the future urban and sustainable division.

To review Fukuoka's built example indicated that government control and intervention had made progress in climate adaptation through the built environment as a community and citizen engagement. The engagement encouraged urban constructions using greening strategies and maximizing sustainable bio-benefits from the built creations where greenspace plans in dense cities. Eventually, the propagation of urban development in a sustainable way was established by a series of improved urban operations such as green buildings and parks. On the one hand, the result of applying green and sustainable strategies was to adapt and mitigate the influence that comes out of the unpredictable natural hazards from climate change regionally. On the other hand, its alternative planning and designing were well-adapted to the locality and geographic characteristics of Fukuoka. Thus, this case study of 'integrated adaptation strategy' may or may not suit individual city planning and urban construction. The potential tension between economic development and environmental protection may become more and more significant. Granting an increase in a sustainable way of life, people should consider it more carefully.

Essentially, the 'smart' cities in Fukuoka and Dubai attached importance to making the 'green' urban development and protecting the urban environment and living sphere. These were the real cases of 'green' cities that concentrated on urban constructions that emphasized ecological balance and nature protection, as well as human health and cultural development.

In a broad sense, it was a new cultural view based on a deeper understanding of the relationship between man and nature, a new social relationship with coordinated development of society, economy, and nature established in accordance with the principles of ecology, and new production and lifestyle that effectively utilized environmental resources to achieve sustainable development. In a narrow sense, urban design should be carried out in accordance with ecological principles to establish an efficient, harmonious, healthy, and sustainable human settlement environment.

Nonetheless, there were limitations to the evaluation of Dubai's everyday operations and a booming of tourism visiting and tourist-related services. As well as the applicability of Fukuoka's experience with climate adaptation to other international cities and metropolitan areas. Urban development and scientifically technical innovation competencies with green and sustainable strategies would provide a less polluted, friendly, and well-suitable living space for both human beings and other creatures. Accessing and encouraging developed and developing urban projects with that kind of methodology, such an action would be possible to overcome the rapidly changing situation and unexpected problems caused by anthropogenic impacts and activities.

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