9- Green commercial design in Tunjungan

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The 2nd International Conference Planning in the Era of Uncertainty: Sustainable Development Green Commercial Design in Tunjungan Surabaya Gunawan Tanuwidjaja1*, Tiffany Tommy1, Halim Adi Kusuma1, Marvin Edwar Lesmana1 1Petra Christian University, Architecture Study Program, Jl. Siwalankerto 121-131, Surabaya, Indonesia Abstract The Tunjungan Street was destination shopping street in 1920 – 1970, because of several famous building such as Majapahit Hotel (previously Sarkies Hotel and Orange Hotel, built in 1902), Hoen Kwee Huis, Hellendorn Restaurant and Maconieke Lodge (built in 1875). Unfortunately, because of limited parking space and modern shopping facilities nearby, the Tunjungan Street was slowly abandoned in 1970. On the other hand, lack of green open space in the area was detected causing urban heat island. Therefore, Tunjungan City-Walk, an integrated green open space and and mixed use development was proposed. It was equipped with Entertainment Centre, Office and Bank, Apartment, Trade and Tourism Centre, Gallery and Shopping Information Centre, and Convention Centre. It was proposed for reducing the greenhouse gases (GHG) emissions. It was created within the walking distance, with environmental friendly, as well as energy efficient design features. Keywords: The Tunjungan Street, Majapahit Hotel, green open space, mixed use development, reducing greenhouse gases (GHG) emission 1.

Introduction Surabaya is **the second - largest** - populated - **city of Indonesia** 3

(2,765,487 persons) and the largest Port City of Eastern Indonesian [1]. The

Port city was very **strategic for the regional** and international **trading** 3

[2]. And Tunjungan Street is the most famous commercial streets in Surabaya, with 1.3 km length and 20 m road width. The street actually connects North-Western and Southern part of Surabaya (residential area of Gubeng, Darmo, Ketabang and Sawahan). The Tunjungan Street has evolved historically from linkage road in the early 20th century, destination street in 1920 – 1970, and again to linkage road after 1970 [3]. The Tunjungan Street is historical because of several famous building such as Majapahit Hotel (previously Sarkies Hotel and Orange Hotel, built in 1902 with Classic Style), Hoen Kwee Huis, Hellendorn Restaurant and Maconieke Lodge (built in 1875 with Empire Style) [4]. In 1945, Hotel Majapahit is related with the Dutch flag tearing incident during the struggle the Indonesian and Dutch colonies. The historical event was later celebrated as Heroes Day, every 10th of November. The event actually increased the historical importance of the street. The Tunjungan Street was converted from linkage road to destination shopping street in 1920, because of development of shops, residentials, amusement centres with no set-back. The Street became a very busy commercial street. Unfortunately, because of limited parking space, the Tunjungan Street was slowly abandoned in 1970. It caused the Street was converted again to linkage road again. The * Corresponding author. Tel.: +62 81 221 220 842 E-mail address: gunte@petra.ac.id, gunteitb@yahoo.com unsustainable development of Tunjungan Street was further caused by development of modern shopping facilities, such as Tunjungan Plaza [5]. The Tunjungan Street needs to be revitalised with a new green commercial concept which relevant to the climate change context. The climate change was caused by greenhouse gases emission from vehicles. Therefore, Green Commercial Development integrated with green open space is needed to reduce the air pollution and urban heat island. 2. Literature Review Boediningsih, W., [6] stated that the greenhouse gases (GHG) emission were caused by traffic jams. The traffic jams were caused by weak traffic control, irregular parkings, poor road surfaces, and floodings. All these eventually would create more pollution (emission, particulate, and noise) and reduced the health condition of the urban residents (respiratory tract inflammation, headache, noxia, etc). Kusminingrum, N., & Gunawan, G., [7] higlighted that

70% of air pollution was **generated from vehicle** emission. **Air** 2

qualitly monitoring

in urban roads such as Surakarta, Yogyakarta, Semarang, Surabaya, Denpasar (Bali), and Serang 2

showed poor

air quality especially Nitrogen oxide (NOx), suspended particulate matter (SPM10) **and hydrocarbon (HC). The air quality ambient** 2

was found, such as CH4 : 1,0 – 1,97 ppm, NonCH4: 1

,5 – 3,78 ppm, NOx: 0,06 – 0,490 ppm, SOx: 0,001 – 0,276 ppm, CO : 0,01 -11,53 ppm 2

andparticulate (SPM10): 6,0 – 260 ug/m3. And it was recommended to implemented

air pollution reduction technology such as landscape arrangement by *restoration of vegetation.* 2

Kusminingrum, N., [8] also found that from observation in the laboratory, some species were found most effective to reduce CO, such as Ganitri tree (Elaeocarpus sphaericus) by 81.53% (0.587 ppm); b) Iriansis bush (Impatien sp) by 88.61% (0.638 ppm); Philodendron shrubs (Philodendron sp) by 92.22% (0.664 ppm). Furthermore, combination of trees Galinggem + Kriminil Merah (2 : 1) by: 79.22% (0. 244 ppm). Therefore, greeneries in green open space were critical for fighting the global warming. Furthermore, Jane Jacobs [9] suggested

element of the city especially parks and neighbourhoods was **needed in** integration with **the** "mixed-use" **urban development (the integration of different building types and uses) and the diversity of functions, as well as residents using areas at different times of day, producing community vitality.** 3

And it also supported the green commercial design in Tunjungan Street. In order to create a green innovative building, an integrated design team must be formed. And the integrated process must be conducted throughout the process. The commitment of all stakeholders, such as: client, project managers, design team, contractors, should be maintained towards the green innovations and cost saving [10]. One example of Green Building standard is the Leadership in Energy and Environmental Design (LEED) [11]. LEED prescribed green building principles to be followed as described below: 1.

Sustainable Sites, • Erosion & Sedimentation Control, • Site Selection, • Development Density, • Brownfield Redevelopment, • Alternative Transportation: Public Transportation Access, Bicycle Storage & Changing Rooms, Alternative Fuel Vehicles, Parking Capacity and Carpooling, • 1

Reduced Site Disturbance: Protect or Restore Open Space, and **Development Footprint, • Stormwater Management: Rate and Quantity,** and **Treatment, • Landscape & Exterior Design to Reduce Heat Islands: Non-Roof**

and Roof Application •

Light Pollution Reduction, 2. ***Water Efficiency, • Water Efficient*** **Landscaping: Reduce by 50%** or **No Potable Use or No Irrigation, • Innovative Wastewater Technologies, • Water Use Reduction: 20%** | 1

to

30% Reduction, 3. Energy & Atmosphere, • Fundamental Building Systems Commissioning, • Minimum Energy Performance, • CFC Reduction in HVAC&R Equipment, • Optimize Energy Performance, • Renewable Energy: 5% to 20%, • Additional Commissioning, • Ozone Depletion, • Measurement & Verification, • Green Power, 4. Materials & Resources, • Storage & Collection of Recyclables, • Building Reuse: Maintain 75% of Existing Shell, or Maintain 100% Shell | 5

&

50% Non-Shell, • Construction Waste Management: Divert 50% to 75%, • Resource Reuse: 5% **to 10%, • Recycled Content:** 5% **to** | 6

10% (post-consumer + ½ post-industrial), • Local/Regional Materials: 20% Manufactured Locally or **of 20% Above, 50% Harvested Locally, • Rapidly Renewable Materials, • Certified Wood,** 5. **Indoor Environmental Quality, • Minimum IAQ Performance, • Environmental Tobacco Smoke (ETS) Control, • Carbon Dioxide (CO2) Monitoring, • Ventilation Effectiveness,** | 1

•

Construction IAQ Management Plan: During Constructio or **Before Occupancy, • Low-Emitting Materials: Adhesives & Sealants, Paints,** | 4

Carpet, Composite Wood & Agrifiber, • Indoor Chemical & Pollutant Source Control, • Controllability of Systems: Perimeter and **Non-Perimeter, • Thermal Comfort: Comply with ASHRAE 55-1992** or **Permanent Monitoring System, • Daylight & Views: Daylight 75% of Spaces,** or **Views for 90% of Spaces,** 6. **Innovation & Design Process, • Innovation in Design**

(to be specified), • LEED™ Accredited Professional. 3. *Results and Analysis* 3.1. *The Proposed Urban* Design of Tunjungan City-Walk The Tunjungan Street faced massive urban development. The lack of green open space in the area was detected causing urban heat island. Therefore, a two hectares integrated commercial – green space was proposed for reducing the GHG emissions. It was created within the walking distance, with environmental friendly as well as and energy efficient design features. The project was named as Tunjungan City-Walk. It was defined as a mixed use development with six facilities, such as: Entertainment Centre, Office and Bank, Apartment, Trade and Tourism Centre, Gallery and Shopping Information Centre, and Convention Centre. The Brownfield Redevelopment criterion of LEED is also fulfiled because of using abandoned space of Surabaya inner-city. Three Pathways connecting surrounding buildings were redrawn, causing intersection and green nodes in the center of the Tunjungan City-walk. Further, smaller open spaces are proposed to facilitate interaction and emission reductions. Pedestrian bridges are also proposed connecting the buildings in Tunjungan City-Walk. Public transportation (tram) station was also proposed in the reused Kundadas Shop to reduce the traffic loads entering Tunjungan Street. This strategy fulfils the Alternative Transportation - Public Transportation criterion. Landscape & Exterior Design to Reduce Heat Islands (as LEED criterion) is also applied in the green open space. The plants are proposed to improve thermal comfort of exterior plazas, used for reading, playing, as well as social interaction. The species selected are locally available trees, bushes and grasses. The communal parking is also proposed in the basement. The pedestrian of Tunjungan Street was bent looping into the central open space of the Tunjungan City-walk, attracting pedestrians to enter the central plaza. Meanwhile, the vehicle entrance to the complex and dropping zone was relocated to the basement to encourage walking in the precinct. Furthermore, the building heights are designed with gradual increase based on sight line of the persons on Tunjungan Street and surrounding buildings. And, it create more dramatic skyline in the Tunjungan Street. Figure 1. Figure Ground of Tunjungan Street that were Figure 2. Proposed Green Open Space Provision in Tunjungan cramped by commercial buildings Street Figure 3. Existing Buildings in Tunjungan Street Figure 4. Existing Buildings in Tunjungan Street Figure 5. Existing Block in Tunjungan Citywalk Figure 6. Connected Green Open Space Provision in Tunjungan Citywalk Figure 7. Early Mass Composition Tunjungan Citywalk Figure 8. Final Mass Composition Tunjungan Citywalk Figure 9. Site Plan of The Commercial Legend: G. Entertainment Centre A. Tunjungan Plaza H. Office and Bank B. Tunjungan Hotel I. Apartment C. Swiss Bell-in Hotel J. Trade and Tourism Centre D. Majapahit Hotel K. Gallery and Shopping Information E. Journalistic Struggle Monument Centre F. Restaurang and Tram Station L. Convention Centre (Utilising the Kundadas Shop) Figure 10. Perspective of Tunjungan City-Walk integrating with Green Open Space Figure 11. Perspective of Tunjungan City-Walk integrating with Green Open Space Figure 12. Perspective of Tunjungan City-Walk integrating Figure 13. Perspective of *Tunjungan City-Walk integrating with Green Open Space with Green Open Space Figure 14. Perspective of* Tunjungan City-Walk integrating \ with Green Open Space Figure 15. Perspective of Tunjungan City-Walk integrating with Green Open Space Stormwater Management is also proposed with collecting rain-water in some pool and swales designated. This fulfils the LEED Stormwater criterion. To further describe the concept of Tunjungan City-Walk, the Entertainment Centre is presented in the following sub-chapter. 3.2.

The Proposed Entertainment Centre in the Tunjungan City-Walk An Entertainment Centre is proposed in the area because analysing the youths' and young adults' needs. The building The Entertainment Centre consists of Retail on the 1st Floor. The retail would provide entertainment related products. The retail would be designed with modern concept. Further, 2nd Floor of the Entertainment Centre will be proposed for Foodcourt and Restaurants. These facilities would attract youths to enjoy lunch, dinner as well as snackis during recreating in the building. The third floor of Entertainment Centre is allocated for Multimedia Library. The library would provide popular and Tunjungan's historical multimedia contents. The library also would also promote the green building and green open spaces in Tunjungan City-walk. The 4th Floor and 5th floor of the Entertainment Centre are allocated for Wax Museum and Trick Eye Museum. These museums would cater the historical figures of Surabaya, as well as folklores. Lastly the 6th Floor of the Entertainment Centre is allocated for Theatre and Green Screen Studio. The Green Screen Studio would allow youths and young adults to create short movie with creative animations. Figure 16. Zoning and Imagerial Illustration of Entertainment Centre of Tunjungan City-walk. The Entertainment Centre consists of : 1st Floor - Retail, 2nd Floor – Foodcourt and Restaurants, 3rd Floor – Multimedia Library, 4th Floor - Wax Museum, 5th Floor - Trick Eye Museum, 6th Floor - Theatre and Green Screen Studio Figure 17. 1st Floor Plan of Entertainment Centre of Tunjungan City-walk Figure 18. 2nd Floor Plan of the Entertainment Centre of Tunjungan City-walk *Figure 19. 3rd Floor Plan of Entertainment Centre of Tunjungan Figure 20. 5th Floor Plan of* Entertainment Centre of Tunjungan City-walk City-walk \ Figure 21. 6th Floor Plan of Entertainment Centre of Tunjungan City-walk \ Figure 22. Structural System of Entertainment Centre of Tunjungan City-walk Figure 23. Section of Entertainment Centre of Tunjungan City-walk Figure 24. Perspective of Entertainment Centre of Tunjungan City-walk connected with sky-walk to surrounding mass Figure 25. Elevation of Entertainment Centre of Tunjungan City-walk LEED's Water Use Reduction criterion is also proposed. The strategy is implemented with rainwater usage for flushing, and dry urinoir. The building adopts the photovoltaic panel (PV panel) on the façade and roofs. The PV panel would generate partial electrical supply for the building and it fulfils Renewable Energy criterion designated by the LEED. Seventy five percent (75%) of entertainment spaces (except library and theater) are daylighted. It is fulfilled with slimmer building design and structural application, which are 10-m rigid frame and diagrid envelope system. It actually fulfils the Daylight & Views, Daylight for 75% of Spaces LEED criterion. 4. Conclusion In conclusion, integrated green commercial and open space could answer the need of GHG reduction in the Tunjungan Surabaya. Further study and simulation should be conducted to perfect the preliminary concept. Green spaces in the inner-city could be produced in the balanced proportion with other land use. The green also could enhance the economic and environmental sustainability of the area. References [1] Badan Pusat Statistik Kota Surabaya (BPS Kota Surabaya), 2011, Kota Surabaya dalam Angka 2011, Surabaya [translated in English: Statistics Bureau of Surabaya City, (2011), Surabaya City in Figures 2011, Surabaya]. [2] Handinoto, (1996), Perkembangan Kota dan Arsitektur Kolonial Belanda di Surabaya 1870-1940 [translated in English: Development of Urban and Dutch Colonial Architecture in Surabaya from 1870-1940], Andi, Yogyakarta. [3] Ibid. [4] Ibid. [5] Ibid. [6] Boediningsih, W., (2011), Dampak Kepadatan Lalu Lintas terhadap Polusi Udara Kota Surabaya, Jurnal Fakultas Hukum, Volume XX, No. 20, April 2011, Fakultas Hukum Universitas Narotama, Surabaya, [translated in English: The Impact of Traffic to Air Pollution of Surabaya City, Journal Law Faculty, Volume XX, No. 20, April 2011, Law Faculty Narotama University, Surabaya] accessed in http://ejournal.narotama.ac.id/files/8 Widyawati.pdf [7] Kusminingrum, N., Gunawan, G.,(2008), *Polusi Udara akibat Aktivitas Kendaraan Bermotor di Jalan Perkotaan Pulau Jawa* dan Bali, Pusat Litbang Jalan dan Jembatan, [translated in English: Air Pollution because of Motorised Vehicle in Urban Roads in Java and Bali Island, Research Institute of Road and Bridge, Bandung] accessed in: http://www1.pu.go.id/uploads/services/infopublik20130926120104.pdf [8] Kusminingrum, N., (2008), Potensi Tanaman dalam Menyerap CO2 dan CO untuk Mengurangi Dampak Pemanasan Global, Pusat

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