FARU FACULTY OF ARCHITECTURE RESEARCH UNIT UNIVERSITY OF MORATUWA, SRI LANKA
FARU 2022 – 15TH INTERNATIONAL RESEARCH CONFERENCE
www.faru.uom.lk
Independence and Interdependence of Sustainable Spaces

CITY AS A SYSTEM OF SYSTEMS; AND EVALUATION OF "URBANITY" IN POST-PANDEMIC SPACE

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Abstract: The rapid spread of the COVID-19 pandemic and the subsequent compartmentalization of cities have questioned the existing norms of urban living. In such context, it is important to explore a form of 'urbanism' that fluctuates between the pre-COVID 19 requirements of social interdependence and the post-COVID-19 expectation of physical independence. In the form of qualitative research, "urbanity" is proposed as a critical point of departure for the theoretical investigation, while "system thinking" is employed as its key philosophical framework. Subsequently, a border normative definition for "city" is established by interrogating the notions of "urbanity" and "city as a system". The reciprocal connection thus established between "urbanity" and "city as a system" defines an analytical framework to evaluate the behavior and challenges of urban settings underpinned by the expectations of the post-COVID-19 life. In applying this theoretical framework to the case study investigation, the "form syntax" method is used as the main analytical tool. Reviewing the results against the expectations of post COVID-19 urban space, a case is made on the criteria that facilitate post-pandemic urban life with special reference to the city of Colombo.

Keywords: *COVID-19; Urbanity; System Theory; From Syntax*

1. Introduction

From the early 2020, the Sri Lankan urban realm has been impacted by the globally contagious socio-cultural crisis that is commonly known as the COVID 19 coronavirus pandemic. All over the world, the rapid spread of the pandemic and its subsequent impact on the use of physical space in cities have initiated a discourse on urban design and social wellbeing; Sri Lankan is no exception. As expected, a densified and compacted city like Colombo has struggled to accommodate the 'new normal' of social distancing and physical isolation imposed by the pandemic; on the other hand, the subsequent compartmentalization of the city for health benefits has questioned the existing norms and living patterns of the urban dwellers.

This unforeseen health situation unfolds the perception of an urban crisis in two ways. Firstly, the expectations of physical independence via social distancing, urban compartmentalization and isolation contradict with the established norms of good city design, which generally champion the notions such as interdependency, sociality, permeability and the strengthening of the public realm. Secondly, a new urban-human dynamic has supervened from the crisis due to changed lifestyles and emotional conditions such as working from home, passive interaction, encapsulation, remoteness, and denial (Salama, 2020).

In the academia, however, the dominant impact of this urban crisis on urban ethnography is largely ignored; at best, an emphasis on physical environment is proposed to correct this intellectual failing. Chan (2019) draws out limitations of this discourse in terms of both understanding cities and acknowledging the challenges posed towards socio-cultural landscape. He further points out that, in the backdrop of the crisis, there is a need to have an outlook for city as a possible solution for restructuring the inter-relationship among its people, in addition to merely organizing the physical environment to inhabit them.

Underscoring the above-discussed practical and theoretical observations, and using Colombo as the investigative background, this study frames its analysis on two critical – and seemingly conflicting - challenges.

- The need for an alternative approach on urban studies to understand the post-pandemic space In the view of scrutinizing the knowledge gap raised by Chan (2019) on the requirement to redirect the urban discourse

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DOI: https://doi.org/10.31705/FARU.2022.3

to recognize and strengthen the inter-relationship among city dwellers, there is a need to reinvigorate an approach that would constitute an alternative way of studying a city through a critical juxta-positioning of the built environment and human settlement.

- The expectations of post-COVID-19 urbanism particular to Colombo.
  The pandemic, on the other hand, has generated a public health crisis exhibiting – and exposing - multiple "pre-existing" issues on urban environment as well as the ethnography it belongs to; emerging new urban living and working patterns have led to rethink the urban socio-spatial needs.

2. Contextual Background

Sri Lanka is an urbanizing economy in par with many emerging economies around the globe, where the increasing population and the local migration trends have resulted in a radical – and periodic - transformation of the urban space. As Ranjith Dayaratne (2016) points out, the Sri Lankan cities are spatially crowded compared to the rural hinterland and that their economies are based on services / commerce rather than agriculture, but there is still a predominant influence of rural culture in the urban settings due to the migrants' strong cultural values. Comparing to other cities in the global landscape, this significant existence underpinned by urban-rural dichotomy creates unique urban spaces within the Sri Lankan city. Subsequently, a synergy of formally- and informally organized microeconomics and a way of life convoluted by various socio-cultural landscapes generate complex connections among the city's social, physical and economic elements

3. Research Methodology.

Undertaking the challenges mentioned above (in the introduction) in two stages, the study frames its main objective as delineating an analytical framework to understand the behavior of the post-pandemic urban space. In the first stage, the study explores the need to reinterpret the standard notion of the city through an experiential and functional paradigm. Such framing of an intellectual position is required because, it is through understanding people's functional experience and perception of the city that a framework for socio-physical separation and/or connection – as determined by the concerns of post-pandemic life - can be devised. As a means of achieving this objective, the notions of "urbanity" and "system thinking" are evaluated as a critical point of departure for the theoretical investigation. In doing so, a reciprocal connection is established between "urbanity" and "city as a system" which in turn helped defining an analytical framework to counteract Chan's (2019) claim mentioned above.

The second stage draws the attention to the expectations of the post-pandemic cities by framing their function on four main experiential and cultural attributes: (1) the need for density; (2) the need for mixed-use development; (3) the need for a connected city; (4) the need for a separated city. These four expectations are evaluated against the theoretical framework identified in the first stage as they impact the post-pandemic urban life in Colombo. To that end, the "Form syntax" method is used as the analytical tool to measure the urban morphologies – in particular, street-network configuration, building density, and functional mix – to verify how the theories of "urbanity" and "system thinking" relate to the afore-mentioned four expectations of the post-pandemic city.

4. City as System of systems

To respond to the need for an intellectual reinterpretation of cities through an experiential and functional paradigm, "system thinking" is proposed as the key philosophical framework for the theoretical investigation. System thinking is a mode of inquiry that allows to describe a complex phenomenon in an analytical and rhetorical perspectives (Batty, 2017). Examining the seminal work by Hugget (1980), Hughes (2017) and Buchanan (2019), this study derives a normative definition on the idea of a "system" based on 3 key attributes:

1. A system exists within a physical or virtual environment, where it functions for a specific goal such as human needs, social benefits, spiritual insight, economic restructuring and so on;
2. A system is a synergic condition of three components (structure, behavior/function, and its connectors) which works in an interrelated behavior.
3. A system, when exposed to expected/unexpected changes, will modify its function in different ways.

This notion of "system', in turn, informs a broader understanding of the idea of "city as a system". Underscoring seminal literature (table 1) on both urban and system thinking, an intellectual case of "city as a system" is summarized into three key points. Firstly, city as a system exists in a geographical area that encompasses physical form, human need, social well-being, economic opportunity, and visual delight that in turn allow for social, cultural, and economic opportunities. Secondly, the system of city is an entity of physical, functional and cultural components, which function in a synergic way. Thirdly, the system of city is dependent on its external factors which can affect its urban dilemmas. Thus, cities are systems artificially constructed by humans to fulfill their need for planetary livelihood.

Table 1: Literature review on cities. (Source: Authors)

Attributes	Author	Summary Points
City as a System and its Existence Within a Physical and /or Virtual Environment Where it Functions for a Specific Goal.	Léon Krier (1998),	composition of **built form** in an ecological boundary.
	Alexander (1965),	**Socio-economic network** within a **physical space**.
	Lynch (1960)	city as "natural animation"- **the physical form** and the amalgamation of **spatial cognition**.
	Henri Lefebvre (1968)	**Projection of society** over the **land**.
	Frey and Zimmer (2000)	Space that is not only **for economic exchanges**, but also for **social and ecological opportunities**.
City as a System and, thereby as a Synergic Condition of Three Independent Components Which Works in an Interdependent and Interrelated Behavior.	Bastié and Dezert (1980). Pumain (2006)	City as juxtaposition of **physical space** (biotic and abiotic), **economic space** (function) and the **social space** (people and culture)
	Marcel Roncayolo (1990)	Territory or a combination of territories made from **morphology, function, and culture** (social cultural alliance).
	Fox (2000)	city is a by-product of **biological re-production, mechanical process of organisms** (people and their activity) and **mechanism** (urban morphology and function).
City as a System and, thereby its Exposure to Alterations Where Expected/Unexpected Changes Will Modify the Systems to Function in Different Ways.	Fox (2000)	Cities are **dependent** on **external supplies** which articulate its **standard**.
	Dalby (2017) West (2017)	**cities and human conditions** have become utmost **crucial** to Anthropocene.
	Chang (2019)	**Reciprocal connections** between precarious spaces and precarious subjects.

However, Modern cities are large and complex in their form and function. This, in turn, makes the city a large complex system, which is impractical to evaluate within the generic system thinking, especially with reference to analytical and design endeavors. Hence, to apply it within physical reality, this phenomenon should be simplified. Looking into semantic relationships, Léon Krier (1998), Kurt (2013), etc., have explored the city as a collective of micro-urban components. The rationale for this deeper segmentation is to look at the city as a composition of smaller cities – i.e., smaller urban attributes. In turn, a system of city is understood as a collective of smaller systems of cities; in other words, the city is a system of systems.

Within the aforementioned definitions of (1) a system as a synergy of components – i.e., structure, behavior/function, and its connectors, and (2) the city as a system of systems, three further observations can be derived concerning the spatial and behavioral form of a city.

- The structure of the "city as a system of systems" is about its morphological and spatial parameters (Tonkiss(2013), Berghauser Pont, et al., (2019))
- The behavioral pattern of a city can deem as its spatial-programmatical distribution, in other words, its functional integrations. (Van Den Hoek ,2009)
- The streets and street network are the connecting elements of the system of city; they are the interface between the functional entities and urban context. (Hillier, (1996), Alexander (1995))

This then brings us to the question of what entails the function of "being urban"; in other words, what do we mean by "urbanity".

5. Urbanity

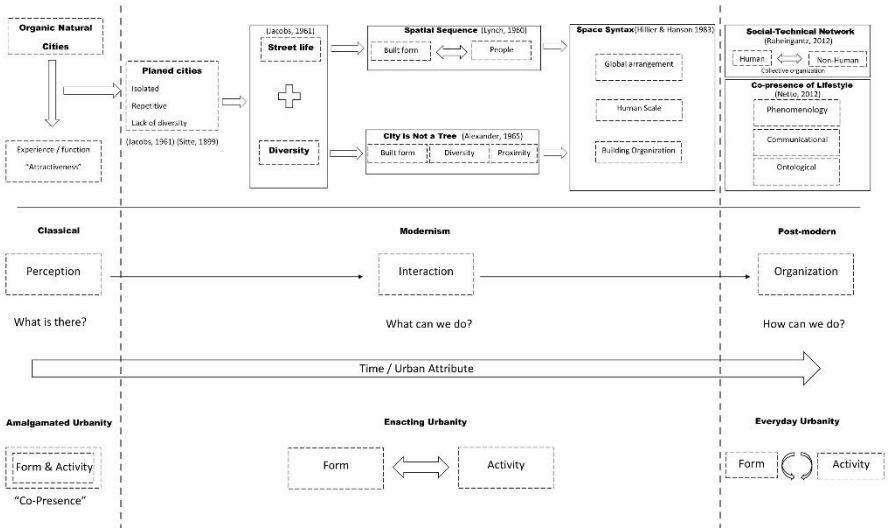


Figure 1: Critical cross evaluation on the notion of urbanity. (Source: Authors)

In the rich literature on cities, urbanity is considered as a social production of space based on its cultural and economic dimension (Fischer, 1972). City is a product of growth; in parallel, the notion urbanity has also evolved inquiring the spatial pattern and its attributes towards socio-cultural and socio-economical practices (Dymnicka et al., 2017). When underscoring the characteristics of urbanity (Figure 02), a double argument– spatiality and vitality -have always been accentuated.

- Urbanity and Spatiality: Spatiality is all about how the urban space is physically articulated. On the one hand, Spatiality is referred as enunciation of spaces in the urban fabric via street network (Hillier, 1996); on the other hand, it evaluates how these spaces are related with buildings that constitute themselves. This syntactic dimension plays a major role in the degree of urbanity. In such line of thinking, urbanity can be defined and understood as a consequence of spatial and physical arrangement in urban spaces, which mediates all human actions.

- Urbanity and Vitality: Urban Vitality, also known as the "condition of urban animation" (De Aguiar, 2013), can be assessed by the co-presence of people in urban spaces. Accordingly, more people using/experiencing urban spaces is naturally followed by distribution of diverse urban activities. Scholarly, vitality can also be defined as the way urban activity that acknowledges its spatial integrations. But urban spaces with commercial success - along with a higher degree of attractiveness and activities - can attract people. Such situations will have a low degree of urbanity because it only relays on attractors to flourish its vitality.

By adopting the above double argument - and relating to the idea that the spatial integration in a physical urban space is the achievement of spatial connection via street network (Gehl, 2010; Le Corbusier, 1927) - Urbanity can be summarized as a synergic condition resulted by its spatial connection, building placement, and functional distributions. To achieve a higher degree of urbanity, all these three components should be at their optimum level.

6. Defining a Critical yet Operative viewpoint: Urbanity and System of Cities.

Now let us try to put together these critical interpretations on the ideas of "urbanity" and "city as a system of systems" into an operative argument. Elaborating system thinking, Hughes (2017) refutes "system" as a mere composition of technology; rather, he considers each system to have a technical, economic, cultural, and political aspect. On the other hand, Mackenzie, et al., (1985) argue that the pre-condition of the system is the active force that shapes its course of transformation. To that end, the technical, economic, social and political context that underpins the system defines the environment upon which it operates and organizes itself. Summing up the above ideas, there is a reciprocal connection between a system and its context. Consequently, if a system is a synergic condition of structure, behavior /function, and its connectors, then there is a mutual connection between a system's context and its three components. Coming back to city, which is a system that evolves and organizes itself, Dymnicka , et al., (2017), De Aguiar (2013), among others, define urbanity as an inheritance of urban space, influenced by the underlying urban form/spatiality, urban quality/vitality and the nature/activity of urban space. In other words, urbanity is informed by the city's structure (form/spatiality), behavior/function (activity), and its connectors (quality/vitality), which in turn are the three factors identified as components of a "system'. Henceforth a reciprocal connection between the ideas of "urbanity" and the "city as a system of systems" exists, which can be further elaborated as follows:

- Urbanity and "structure" of system of city : Articulation of urban physical form – i.e., the structure of solids and voids - within the urban fabric of a city is an important aspect of urbanity. Berghauser Pont, et al. (2019) developed a framework called "typo-morphology" to read urban form in the perspective of solids and voids as a combination of various building types, which coherently encompass its influence with the socio-economical attributes of a city. Typo-morphology, in other words, evaluates the building placement of urbanity as it reciprocates with the "structure" of the system of city.

- Urbanity and "behavior" of system of city : Looking into the notion of functional diversity of an urban space also is a crucial factor in constituting urbanity. The argument here is that the spatial-programmatical distribution – i.e., function - reciprocates with the "behavior" of the system of city.

- Urbanity and "connectors" of system of city -A large body of research by (Hillier, et al., 2007) has revealed that the pedestrian movement via street network acts as an intermediary for social connection and economical affiliation in an urban space. Specifically, Bill Hillier (1996) projects street network as an active background that allows integration of human activity, in particular spatial-ethnographical integration. Accordingly, the street network and the subsequent spatial integration reciprocates with the "connecters" of system of city.

6.1. DEVELOPMENT OF AN ANALYTICAL FRAMEWORK.

Above theoretical investigation concludes that a higher degree of urbanity is a synergic condition of a higher degree of spatial connection, building placement and functional distributions. Graphically, we can represent the above theoretical position as shown in figure 02. Therefore, to achieve a higher degree of urbanity, (1) spatial connection, (2) building placement and (3) functional distributions should be in their highest levels comparing to its lower counterparts. This argument is important to the study as these three parameters are quantitatively analyzable thus degree of urbanity can be also analyzed in terms of its incremental property (high, medium, low). What is then required is an analytical tool to gather and evaluate the relevant data concerning the aforementioned three parameters and their collective reflection on the notion of urbanity. For this, the study relies on the Form syntax.

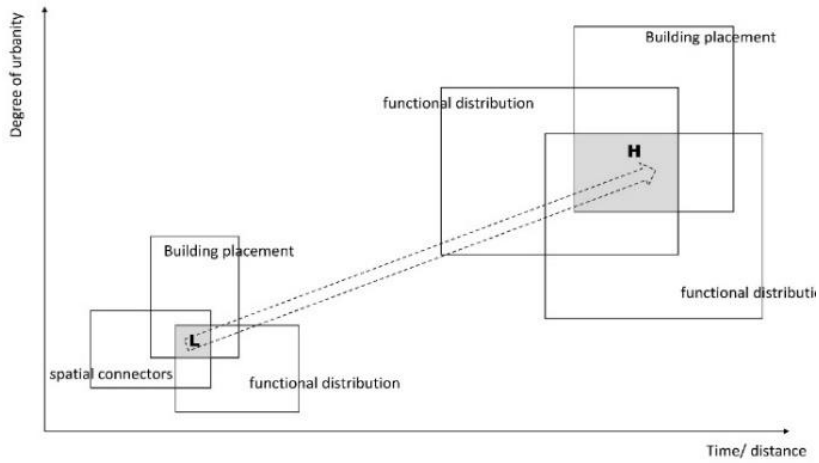


Figure 2: Comparison of various degree of urbanity with respect to its system components.
(Source: Authors)

Adopting the Conzenian (Conzen ,1960) theory on urban form and its elements – i.e., streets, buildings, and land use distribution - Ye, et al., (2017) created a morphological studying tool known as Form syntax. Here, the term "form" demonstrates the morphological focus of the tool while "syntax" represents the links created by the morphological elements on its social and economic performance. In essence, the Form syntax model integrates various other similar models – i.e., space syntax, space matrix and mixed-use study – into a singular index. From a practical stance, the Form syntax looks urban space as a combination of urban blocks evaluated through area-based or point-based data. Based on a larger body of literature, Ye and van Nes has defined high, low and medium values of the morphological elements that forms the Form syntax model (Trancik, 1986; Joosten, et al., 2005). Furthermore, these classifications have been validated empirically by applying them in various countries with GIS based observations.

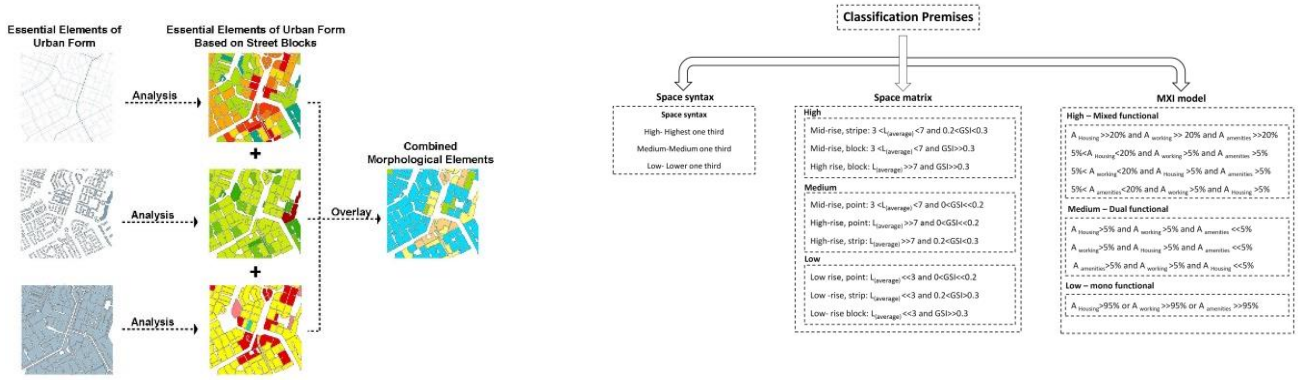


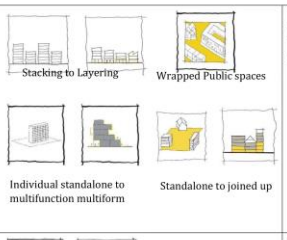
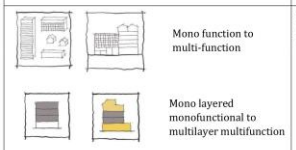
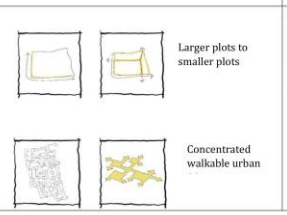
Figure 3: Form syntax as an accumulation of three layers of morphological analytical tools,
Classification premises of analytical tools. (Source: Ye, et al., (2017))

To summarize the process of building up of the analytical framework, the city is first understood as a "system of systems". The three components of system thinking – i.e., (1) structure, (2) behavior/function, and (3) connections - were then related to the idea of Urbanity. Urbanity is, in turn, reinterpreted within three quantitatively analyzable parameters: (1) spatial connection, (2) building placement and (3) functional distributions. Finally, and appropriate analytical tool – i.e., Form syntax – was chosen to explore the behavior of the above three parameters in the post-pandemic Colombo to verify the functions of "separation' and "connection" with respect to the urban ways of life.

7. Post-Pandemic City and Departure Towards a Viewpoint on "City as a System of System"

The point of departure of the study is the ongoing academic discussion on how architecture and urban design contribute towards the post COVID-19 urbanism. The vulnerability of cities towards COVID-19-related crisis - coupled with the rapid urbanization - has led to set out a critical (re)thinking on the function of cities in the developing world. COVID-19 has, in fact, generated a socio-cultural and economic condition generally labelled as the "New normal" (Forsyth, 2020), which exemplifies social distancing measures, human detachment and intense engagement with the virtual world. In such context, Attention is drawn on four main expectations on urban design – i.e., morphology, function (or activity), cultural interaction and public health - that must be considered as paramount when defining the broader expectations of a post-pandemic city. By means of a detailed literature survey, the aforementioned four socio urban expectations have been further qualified into the following four situations (cases): (1) the case of density (morphology), (2) the case of mixed-use development (function/activity), (3) The case of connected city (cultural interaction), and the case of separated city (public health) (presented in Table 2).

Table 2: Expectations on Post Pandemic Cities. (Source: Authors)

Case	Author	Argument	System Component			Morphological intervention and classifications	
			Structure	Behavior	Connector		
Case of Density	Hang (2020	Increasing density allows proliferation of diseases from (/to) urban centers to(/from) peripheries	Compact buildings with various breathing spaces Different typologies, building front to allow various activities in general and specific. Layard urban space to allow packing Urban spaces to allow both permanent and temporary functions	Multiple and hybrid functions Provide amenities that respond to various activities in general and specific. Capacity to accommodate temporary functions.	Accessible Street network towards amenity in neighborhood scale Walkability		Typo-morphology – High / Medium
	Badger (2020), Wong, Hassel (2020),	High density management with high amenities					
Case of Mixed-use Development	Rinde(2020)	Mixed use function in various layers among neighborhood					Function – High / Medium
Case of Connected City	Abdel-Hadi, Elnachar & Safieldin(2011)	Proximity to amenity Reduction of travelling Tolerance not to allow mass gathering					
Case of Separated City	Salama	'Physical Separation' while expanding people ability to connect with the amenities. Urban commons					Street Network-- High / Medium
	Ricci (2020)	Functional Distribution which is flexible enough to accommodate the need in both ordinary and extraordinary conditions.					

Consequently, the next challenge falls into two tasks concerning the logics of verifying the data collected. Firstly, a rationale had to be derived to classify the outcome of the above four combinations with respect to how they behave in a particular city. For this, the works of Salama (2020), Dayaratne (2016), Sim (2019), etc., have been referred to in identifying a hierarchy of attributes as listed below.

- Mixed use / Dual functional property is important in a sense of providing inhabitant's opportunities to access work and habitable-related amenities within a walking distance. A self-sufficient neighborhood of such caliber can be locked down for a longer period.
- Allowing space for informal activity to passively interact with the urban neighborhood without compromising health.
- Allowing space to accommodate opportunities for emergency shelters and health benefits.
- Highly integrated street network to provide walkable condition.

Secondly the above classification was needed to be translated it into the framework of urbanity proposed by Ye , et al., (2014), in order to conclude a particular urban space's performance towards the post-pandemic expectations. This was achieved by the criteria depicted in the table 3.

Table 3 : Analytical framework for the performance towards pandemic. (Source: Authors)

The value distribution of the functional mixture degree, building density and type, and street-network configuration,	Degree of classification
H-H-H	Balanced with high value – high resilience to pandemic. (medium in functional mixture degree – only residential and amenities.)
H-H-M	
H-M-H	
M-H-H	
M-H-M	
M-M-H	Unbalanced with mix value – tolerable resilience in pandemic
M-M-M	

8. Case Study Simulation.

Colombo was selected for the study based on its socio- economic condition that resulted in its urbanizing paradigm. Three socio-physical agglomerations in Colombo have been subjected to the comparative analysis: Bambalapitiya (Colombo 04), Cinnamon Gardens and Nugegoda. As mentioned above, the case study analysis has been conducted by employing Form syntax as an analytical tool. The subsequent Form syntax analysis is presented in a common form that describes the process of analysis as per simulation protocol (figure 04).

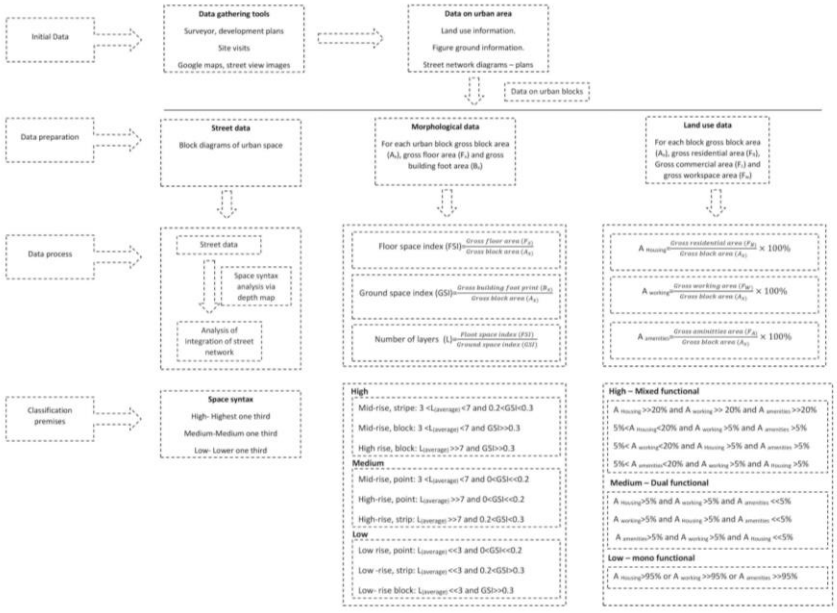


Figure 4: Simulation Protocol (Source: Authors)

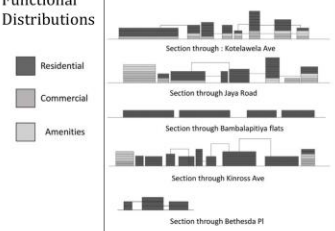
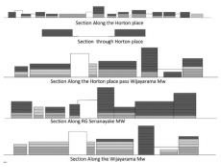
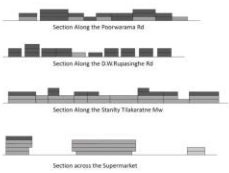
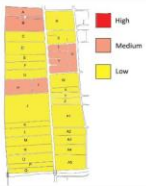
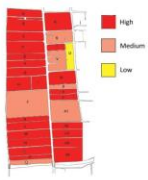
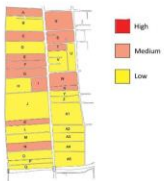
Urban Form			
Case study	Rigid: Colombo 04	In-between: Cinnamon Gardens	Organic: Nugegoda
Empirical Data			
Urban Form			
Functional Distributions			
Simulation Results			
Space Syntax			
Space Mate			
MXI model			

Table 4: Case Study Analysis. (Source: Authors

9. Discussion.

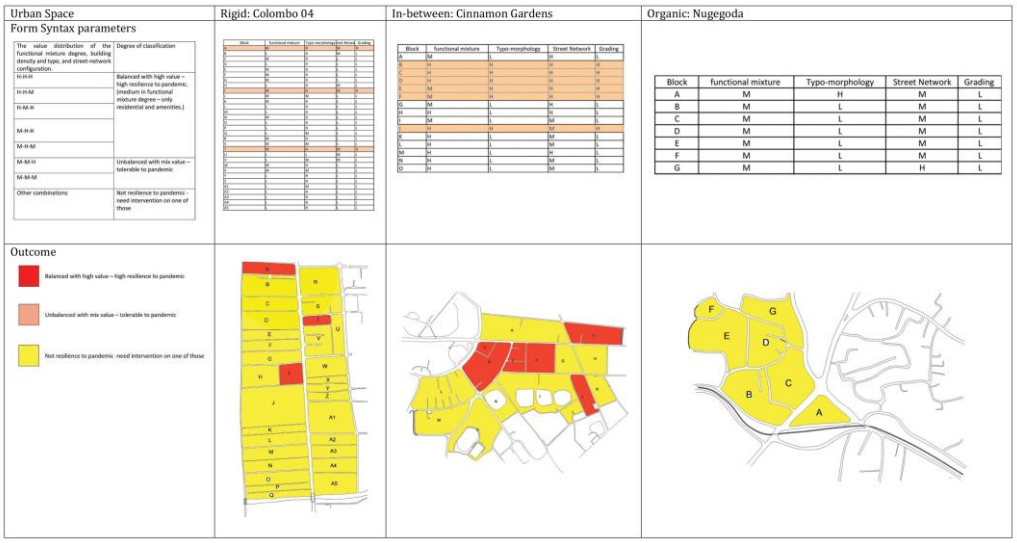
The case study analysis has brought to light a few critical observations with respect to the function of urbanity and social life in the selected, post-pandemic urban settings of Colombo.

Firstly, Bambalapitiya and Cinnamon gardens have the potential to reconfigure themselves to create an inner-city micro economic fabric that can limit people from traveling to fulfil their needs as opposed to a more organically evolved place like Nugegoda. On the other hand, high-density places like Nugegoda, with proper open spaces such as street and building fronts, can have more access to resources from the informal economic spheres. Accordingly, low dense neighborhoods can pool public amenities to a network of walkable, central locations; high dense areas, on the other hand, may require a more dispersed and informal economic system to facilitate the diversity of their cultural needs.

Investigating the cultural landscape, built forms and the functional distributions in Sri Lanka, it is noted that a large number of populations in the metropolitan area depend on supermarket and markets to fulfil their daily grocery needs. The introduction of strategic commercial islands with walkable distances would reduce the need for people to travel for marketing purposes. These hubs should be located strategically at key public nodes with the possibility for spatial and functional expansion so that the need for both social separation and connection can be achieved depending on the broader requirements of a specific time and space.

Secondly, the proliferation of residential buildings in urban areas should have an outlook towards self-sufficiency through a diverse economic structure. Yet, contrasting to Cinnamon gardens, Bambalapitiya and Nugegoda are vulnerable towards economic disparities. Specifically, in Nugegoda, economic structure – along the polarized spending capacities at community levels - have created inequalities towards addressing the needs of the inhabitants. In such locality, an economic support mechanism is also needed, so is a paradigm shift towards embracing mix-use development in lieu of mono-centric functional zones.

Table 5: Case Study Analysis. (Source: Authors)



Thirdly, and in addition to creating self-sufficient neighborhoods, there should be an outlook towards integrated inter-urban transportation modes. Urban spaces like Nugegoda and Cinnamon gardens, with their roomy and flexible street network pattern, indeed have a good potential to create such strategic transport links, thereby reducing the time people would be spending on the road exposing to social contact. In the case of Bambalapitiya, however, this entity is restricted due to its rigid, "grid" structured urban form. Especially when people shift from using public transportation to other private modes of transportation - such as walking, cycling and private vehicles - urban conditions should be favorable towards such transition. The congested, tight streets of Bambalapitiya do not offer space to integrate transitional programs to facilitate this type of urban movement. Vertical, multi-mode transportation hubs may be the answer for such cases, though moving public mobility away from the street level will be challenging to make work in Sri Lankan cities.

Fourthly, the investment on public open spaces is felt badly during the pandemic times. Cinnamon gardens offers multiple opportunities for people of all ages to convene at outdoors while keeping the necessary distance against each other; the overall morphology depicts a great balance of solids and voids while the connectivity between public recreational pockets and the residential squares is at a favorable level. Nugegoda, on the other hand, faired very poorly in this aspect according to the Form syntax modelling. The capacity of an urban fabric to accommodate

fluctuations in population numbers and cultural activities is useful to inhabit a good sense of urbanity in general, but specifically during the times of social crisis.

Fifthly, having urban buildings with a capacity to adapt and change their internal programs would be useful to isolate and separate people as and when needed. For example, if designed with the necessary diose of flexibility and adaptability, libraries can be converted into community centers, sports pavilions can be temporary markets, and school buildings could be makeshift hospitals. What is more important though is to have a legible street network to connect such urban programs, and to that end, Cinnamon gardens and Bambalapitiya offered better opportunity than the organically proliferated Nugegoda.

Sixthly and finally, all the above planning measures should be complemented by a form of urban governance that provides adequate economic and social support during times of social strife. More specifically, in cities of compartmentalized urban space and life, it is important to have an administration system that provides integrated support for mitigation, adaptation, and recovery.

Reflecting on the above results the following attributes can be highlighted as specific to post-COVID Sri Lankan city.

- Ability to sustain variation in supply and demand in urban economics and lifestyle.
  A self-sufficient neighborhood can be locked down for a longer period without compromising the inhabitant's opportunities to access work- and recreation-related amenities.
- Allow adaptability to withstand unexpected social and economic conditions.
  Providing an integrated city governance plan and mechanism should be established to take required measured in a timely manner without creating social-economic inequalities.
- Ability to create relations between the micro urban economics.
  The urban fabric should have a capacity to accommodate and respond to micro urban economics - which can be both formally and informally organized – and allow opportunities for people to use them.

10. Conclusion

Developed through a focused theoretical investigation and by taking Sri Lanka (particularly Colombo) as a case study, and drawing attention to its urban rural dichotomy, and addressing the need for an internally efficient (and optimized) post pandemic urban environment, this work concludes two outcomes.

Firstly, at an academic level, it is possible to analyze cities in a trans-disciplinary framework through system thinking, which can be utilized to identify design and planning implications from both ethnographical and urban built environment perspective thereby overcoming Chan's (2019) call on the inability to investigate cities on such a dialectic platform.

Secondly, at a more pragmatic level, and with reference to the city of Colombo, it is possible to achieve a self-sufficient neighborhood that can allow the expected social-cultural dynamics without compromising the public health expectations of the COVID-19 situation. To achieve this, however, the city's spatial connections, building placements and functional distributions should be organized in an optimum condition simultaneously. Such spatial, formal and functional synergy should also take advantage of the informal conditions of a typical developing-world city, allowing the latter to reconfigure (or reorganize) itself to the changing needs of people in both ordinary and extraordinary conditions.

11. References

Abdel-Hadi, A., Elnachar, E., & Safieldin, H. (2011). Residents perception of home range in Cairo. *Open House International, 36*(II), 59-69. doi:10.1016/j.buildenv.2009.10.019

Alexander, C. (1965). A city is Not a tree. *Architectural Forum*, 45-63.

Batty, M. (2013). *The new science of cities.* Cambridge: MIT Press.

Berghauser Pont, M., Stavroulaki, G., & Marcus, L. (2019). Development of urban types based on network centrality, built density and their impact on pedestrian movement. *Urban Analytics and City Science, 46*(VIII), 1549-1564. doi:10.1177/2399808319852632

Chan, J. (2019). *Urban ethics in the anthropocene.* Singapore: Singapore University of Technology.

Conzen, M. (2010). The elusive common denominator in understanding urban form. *Urban Morphology, 14*(I), 55-58.

Dayaratne, R. (1999). *Urban rural dichotomy and attachment to place in Sri Lanka in architexts.* Colombo: Vishvaleka.

De Aguiar, D. (2013). What is urbanity about? *International Space Syntax.* doi:9788986177213

Fischer, C. (1972). "Urbanism as a Way of Life": A review and an agenda. *Sociological Methods & Research, I*(II), 187-242.

Fox, W. (2000). *Ethics and the built environment.* London: Routledge.

Frey, W., & Ziimmer, Z. (2000). *Handbook of Urban Studies: Defining the city.* London: Sage Publications.

Gehl, J. (2010). *Cities for People.* Washington: Island Press.

Hillier, B. (1996). Cities as movement economies. *Urban Design International*, 49-60.

Hillier, B., Turner , A., Yang , T., & Park, H. (2007). Metric and topo-geometric properties of urban street networks. *6th International Space Syntax Symposium,.* Istanbul.

Huggett , R. (1980). *Systems analysis in geography.* Oxford: Clarendon Press.

Hughes, T. (2012). The Evolution of large technological systems. In *The Social Construction of Technological Systems : New Directions in the Sociology and History of Technology* (pp. 45-76). Cambridge: MIT Press.

Krier, L. (1988). *The Architecture of community.* London: Papadakis.

LI, Y., Ye, Y., Xjao, W., Law, A., & Wang, D. (2017). Classifying community space at a historic site through cognitive mapping and GPS tracking : The case of Gulangyu , China. *Urban design International*, 112-125.

Pumain, D. (2006). *Dictionary of city and urban.* Paris: Anthropos.

Salama, A. (2020). Coronavirus questions that will not go away: interrogating urban and socio-spatial implications of COVID-19 measures. *Emerald Open Research, 2*(IV).

Van den Hoek, j. (2009). Towards a Mixed-Use Index (Mxi) as a tool for urban planning and analysis. *Urbanism*, 64-84.

Ye, Y., Yeh, Y., Van Nes, A., & Liu , J. (2017). "Form Syntax" as contribution to geodesign: A morphological tool for urbanity-making in urban design. *Urban Design International, 22*(1), 73-90. doi:10.1057/s41289-016-0035-3