Ephemeral Urbanism:

A Critical Study of Flexible, Resilient and Adaptable Projects

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Abstract

The study of the temporality of spatial utility is the new trend in urban settings with its growing need as 'pop-up' city or emergency settlements. This research aims to learn from existing scenarios that possess an aspect of ephemerality in their built spaces. This report begins with a discussion on resiliency and vulnerability and the role of temporary architecture and urbanism in building resiliency. 'Flexible architecture' is reviewed by building a synthesis in the progression of its general understanding by architects and scholars over the years. As the report advances, more pressing cases about different aspects of ephemerality are analysed through primary and secondary sources drawing on qualitative and factual analyses. A range of elements on site, from permanence to temporary, are determined under various parameters to know how they function as ephemeral projects and cities. The '*Ruelles Vertes*' project and the urban market of 'Jean Talon' are the two cases based on site observation in Montreal, Canada. While *Ruelles Vertes* is analysed for its perpetually growing and changing site components, the urban market reutilises outdoor spaces for commercial activities. The pivotal question that the report explores is how long a functional process takes and to what extent it is organised ahead of time to achieve its cyclical character. An extreme case of an urban setting of Allahabad's *Kumbh Mela* festival is an adaptive region that has accommodated changing functions on account of this cyclical event. Due to its large scale and complexity, this case is studied through a literature review which forms the crux of the report. The components of the site are sheared into layers as per their longevity with regards to their dynamism. The riverfront changes every six months, making it the least dynamic layer in nature. Every subsequent component is then categorised under various parameters through a modified version of Stewart Brand's (1995) diagram 'Shearing layers of Change'.

Key Words: ephemeral city, *Ruelles Vertes*, Jean Talon, polyvalence, spatial adaptability, physical rearrangements, *Kumbh Mela*, cyclical flexibility.

Résumé

L'étude de la temporalité de l'utilité spatiale est la nouvelle tendance en milieu urbain avec son besoin croissant de ville « pop-up » et d'installations d'urgence. Cette recherche a pour but de tirer les leçons de scénarios existants qui possèdent un aspect éphémère dans leurs espaces construits. Ce rapport débutera par une discussion sur la résilience et la vulnérabilité et le rôle de l'architecture temporaire et de l'urbanisme dans la résilience des bâtiments. « L'architecture flexible » est analysée en construisant une synthèse dans la progression de sa compréhension générale par les architectes et universitaires au fil des années. Au fur et à mesure que le rapport avance, des cas plus urgents concernant différents aspects de l'éphémère sont analysés à travers des références primaires et secondaires qui s'appuient sur des analyses qualitatives et factuelles. Pour savoir comment ils fonctionnent en tant que projets et villes éphémères, une gamme d'éléments sur site, certaines permanentes, d'autre temporaires, est déterminée sous différents paramètres. Le projet « Ruelles Vertes » et le marché urbain « Jean Talon » sont les deux cas basés sur l'observation directe sur site à Montréal au Canada. Alors que le projet « Ruelles Vertes » est analysé pour ses composants de site en croissance perpétuelle, le marché urbain « Jean Talon » réutilise les espaces extérieurs pour des activités commerciales. La question centrale que ce rapport tente d'explorer est de savoir combien de temps un processus fonctionnel peut prendre et dans quelles mesures il est organisé à l'avance pour atteindre son caractère cyclique. Un cas extrême de cadre urbain est le festival « Kumbh Mela » à Allahabad, qui montre une région adaptive en accueillent des fonctions changeantes en raison de cet événement cyclique. A cause de sa grande taille physique et de sa complexité, ce cas est étudié dans le cadre d'une revue de littérature que constituera le cœur de ce rapport. Les composants de ces sites sont organisés selon leur longévité au regard de leur dynamisme. Le bord de la rivière change tous les six mois, ce qui en fait l'aspect le moins dynamique de la nature. Chaque composant suivant est ensuite catégorisé selon divers paramètres dans une version modifiée du diagramme « Shearing Layers of Change» de Stewart Brand (1995).

Mots Clés : *Ville éphémère, Ruelles Vertes, Jean Talon, polyvalence, adaptabilités spatiales, réarrangements physiques, Kumbh Mela, flexibilité cyclique.*

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Introduction

- **Preface**

Striding towards an age of great unfamiliarity and uncertainty, we are preparing ourselves to secure our environment from new challenges. Humanity has continued to remain resilient in the face of adversity time and again. We strive to absorb and adapt to crises such as 'climate change', which is to a high degree self-induced, and other unprecedented events like the pandemic of COVID-19. As professionals of architecture and designs, resilience is an essential character of a city as it plays a significant role in the way we visualise our future urbanisations. Therefore, we must be able to strategise the forms of the built environment by learning from existing scenarios of ephemeral settlements that could potentially be microcosms of the cities of the future. These scenarios are discussed through various examples of temporary structures and settlements.

In principle, resilient architecture or flexible architecture is a system that can respond to unforeseen situations positively, withstanding and adapting to the volatility of the current times. Conventionally understood, flexible architecture affects the dwelling scenario in terms of reduced cost, time and effort in construction. Most importantly, it promotes sustainability and improved quality of life (Bharatkumar, 2013). There have been changes in the building industry recently due to changing economics, technology; and changing forms of ecological and climatic conditions. They are causing us to rethink how we conceive them to support life and work (Kronenburg, n.d.).

The extent of flexibility in design facilitates architects to project their ideologies into building for the future where a structure outlasts the period of its actual purpose (Essays, UK, 2018). Architect Rahul Mehrotra, suggests in his book 'Kinetic City' about the metropolitan city of Mumbai having extensive possibilities for adaptability on various fronts. He explains how adaptable spaces accommodate previously unimagined uses in dense urban conditions (*Kinetic-City_Essay-for-BSR.Pdf*, n.d.). For example, it is fascinating to witness 'pop-ups' of temporary shelters by agents of the building industry to function within a specific site. The practice of building temporary shelters widely known as 'pop-up architecture' repurposes vacant sites or buildings ranging from short-lived retail shops, charity workshops, bars and restaurants to galleries, studio spaces and short-term housing (Harris & Nowicki, 2015). While some pop-up

structures are constructed to adapt quickly, on a one-time basis, others are deployed, deconstructed and deployed again on a cyclical basis. The interaction of these ephemeral elements with the permanent elements of a site determines the flexibility of the overall space. **A site may be thought of as truly adaptable when it accommodates change time and again. This extent of adaptability depends on the physical scale and a required temporary utility to be gained out of it.**

- ### Problematique

Pre-existing global pressures such as the unequal distribution of wealth, high unemployment, underemployment, improper urban density and 'climate change' have been accelerated in recent times. There are specific urban and regional pressures such as political threats and discrimination, religious conflicts, violence, poor public sanitation, crime and insecurity that contribute to an individual's as well as a community's vulnerability (Malik, 2014). When these crises are coupled with the catastrophic effects of 'climate change' such as long periods of droughts and tropical storms, wildfires and flooding, communities are caught between despondent conditions like loss of shelter on the one hand and insufficient monetary capital on the other. Issues like these require resilience on a personal as well as social or community level. Therefore it is essential to learn from existing settlements that have empirically shown signs of resilience through its design and planning. Similar lessons may also be drawn from camps for refugees and post-disaster settlements.

- ### Scope of Study

This report discusses the significance and studies on resiliency in nature and what it means for our built environment. The evolving discourse on flexible architecture is elaborated, followed by examples that display an empirical approach to this form of urbanism. As the report advances, cases that display large scale ephemerality are discussed at length through their adaptive architectural elements and the extent of their flexibility. The objective of such an analysis is to understand them as possible prototypes of urban design and planning models that are relevant to the evolving conditions of the 21st century.

- Research Methodology I- A Qualitative Analysis

For qualitatively analysing a city's ephemeral nature, its site components need to be understood as elements of temporality. The report thus undertakes the 'case study method' on various scenarios of urban ephemerality. The cases of Jean Talon market and *Ruelles Vertes* are based on primary observations on site while the case of *Kumbh Mela* draws analysis from secondary sources.

The study of ephemerality at *Kumbh Mela* uses **'*Kumbh Mela*: Mapping the Ephemeral Megacity'**, a book published in 2015 by various faculties under the guidance of Rahul Mehrotra, architect and the chair of Urban Design and Planning at Harvard University (R. Mehrotra & Vera, 2015). This book is a pivotal secondary source in addition to scholarly journal articles and news reports.

- Research Methodology II- A Quantitative Analysis

For quantitatively analysing a resilient city for its ephemeral nature, its site parameters or components need to be measured for their longevity. The time a temporary element takes to be constructed, used and deconstructed defines its extent of flexibility, and therefore, this report is anchored on the following question:

"Depending on parameters of varying scales, how long does a functional process take? Furthermore, to what extent is it organised ahead of time to achieve its flexible character?"

A detailed analysis of the site and its components follows the concept of 'Shearing Layers of Change' by Stewart Brand (Brand, 1995). In the case of *Kumbh Mela*, rather than a single building, an urban setting is sheared into layers as per their longevity. These layers are the parameters that define an event's as well as the site's scope for 'cyclical' flexibility. Brand's 'Shearing Layers of Change' serves as a medium of measuring flexibility on site. If the site as per this analysis is adequately functional, it could serve as a planning module or a guide for the cities of the future where urban ephemerality might be second nature to our design models. Similarly, the cases of Jean Talon market and *Ruelles Vertes* also are sheared using Brand's methodology.

- **Intended Audience**

This report deals with flexible architecture with a perspective of global resiliency. It is based on various aspects of temporary architecture and is intended for students of architecture, urban design and urban planning. The aspect of adaptability and resiliency will be studied with regards to ephemeral events, including festivals, markets, hospitals and emergency shelters. It is also factually informative for its readers who intend to explore such cases in the context of 'pop-up' urbanism.

- **Research Report Outline**

The report is organised under the following chapters:

Chapter 1:

Chapter 1 discusses time as an element of architecture in the philosophy of temporality. The concept of flexibility in architecture is introduced, and a synthesis of its evolving interpretation by professionals and scholars is charted out.

Chapter 2:

Examples of some cities and events which take an empirical approach to the phenomenon of temporality are discussed. Smaller functions and sites around the world that include user and spatial transformation are also recognised followed by a brief description of the importance of building materials whose physical properties contribute to the flexible nature of a structure.

Chapter 3:

Three cases of ephemerality are explored based on the frequency of their occurrence-

- *Ruelles Vertes*, Montreal, Canada: Flexibility and endurance in a perpetually occurring green urban system- site analysis
- Jean Talon Market, Montreal, Canada: Ephemerality and flexibility in a seasonally altering market scenario- Site analysis
- *Kumbh Mela*, Allahabad, India: Temporality and Flexibility in a cyclically occurring religious event- Literature review on the extreme case of ephemerality

The third chapter dives into the crux of the research report. Site observations made for the cases of *Ruelles Vertes* and Jean Talon market are discussed in relevance to their adaptable and resilient natures. It is followed by a literature review on '*Kumbh Mela*: Mapping the Ephemeral Megacity'. It includes a brief discussion on how the *Mela* has 'polyvalent' flexibility. Streamlined logistics that simplify the activities on a large site are discussed, followed by the procedural steps of site planning and execution. The *Mela* being an ideal example of ephemerality, its architectural elements are studied for their temporal nature. Lastly, the order of supremacy and governance in planning and execution is described as a lesson in the administration of an ephemeral city.

Chapter 4:

'Ephemeral Urbanism' is introduced as an urban typology with the evolving change in the climate. This chapter mainly deals with the quantitative analysis of the case studies. It involves a 'timeframe' analysis of various on-site parameters of ephemerality based on Stewart Brand's 'Shearing Layers of Change'.

Chapter 5:

The report is concluded by pointing out some essential lessons in flexible architecture and urbanism. These lessons may be useful for the cities of the future that are challenged by the crises of the 21st century.

1. Chapter I: Resiliency in Architecture

1.1 Resiliency- What We Are

Human beings are dynamic, progressive and adaptive creatures. Our survival as a species is notable due to our resilient natures and the capacity for movement and adaptability. We can move about at will, manipulate objects, and manage to operate in a wide range of environments. As per Charles Darwin's 'Theory of Evolution by Natural Selection', the fittest species survive and move on into the future (Than, 2018). It is their power of adaptation and resilience that allows them to evolve with time. Many civilisations like our species have taken birth, evolved and destroyed along the timeline of our existence. To evolve, along with an organism's willingness and determination to change, its physical nature and scope are significant as well.

This physical quality of adaptability can be understood through a simple example of structural elasticity in a spring toy cylinder as against that of a regular cylindrical stand (Fig. 1).

Fig. 1: A spring toy as a pen-stand as against a regular pen-stand (Credit: Author).

As we know, in an architectural context, the physical nature of an object encompasses its form, structural elasticity, stability and materiality to ensure proper functionality. When a single lateral push is given, a regular pen stand which is rigid will topple. In contrast, the spring toy would mould as per the direction of the push. Although the spring toy misses other elements that enable functionality and ease of utility that a pen-stand has, the toy represents resiliency towards external forces. The possibility of using a flexible toy as a pen-stand is an example of resilience as the inherent elasticity of the toy allows it to accommodate more weight than usual and withstand lateral forces. Compared to the rigid stand, it does not carry the threat of toppling from an external force when multiple objects are added within it.

In theory, resilience is directly related to vulnerability, and it is based on various circumstances. All beings are vulnerable in one way or the other. However, some societies are more susceptible than others (Malik, 2014), and some circumstances cause more vulnerability than others. For example, financially weak members are more vulnerable to economic shocks. They are bound to their place of employment with inadequate resources to sustain their livelihoods if they choose to migrate (Petrescu et al., 2015). Differently-abled and older people find it harder to relocate under situations like natural disasters. However, unprecedented events like pandemics affect most of the population, and it paralyses the economies on a global level. In this case, every step taken is a risk towards an uncertain future. Human-induced climate change too has caused an increase in sea-levels that threaten to displace large parts of our built-up environment. Whether short-lived or long-lasting, circumstances like these test our ability to absorb the shock and test our resilience.

As per Canadian ecologist Crawford S. Holling, in ecology and the natural sciences resilience is accepted as a quality that allows a system to restore its original state after suffering a shock (Holling, 1973). Today it has come to be understood in multiple ways. True resilience can be realised depending on what the causes of distress are and who is the most vulnerable to them. When an event is related to climate change resilience can be defined as the ability to anticipate, absorb, accommodate and possibly recover from the effects of a disaster. In relevance, individual capability and social competence are tested when people achieve positive results under new circumstances and if necessary, by formulating new methods of securing themselves and society as a whole (Malik, 2014).

1.2 Resiliency- What We Build

"We should not forecast what will happen, but try to make provisions for the unforeseen"- J.N. Habraken

Our conventional understanding of sustainable structures is concurrent with the resiliency we expect in temporary structures. Our ability to absorb and adapt to every shift in the environment is challenged, and only resilient communities sustain. The need to add, adjust, replace and eliminate arises during situations that demand immediate action. However, while some global circumstances require intervention on an urgent basis, some that cannot be foreseen still require

us to make definite arrangements to address them in the future. When we compare flexibility in ephemeral structures with that in sustainable structures, we realise that such communities do exist in the form of what J.N. Habraken calls 'open buildings'(Bosma et al., 2000). In the book 'Housing for the Millions' he describes the importance of 'open buildings'. He elaborates that if we separate the finishing operations such as furniture, interior organisation, standard fittings, fixtures, surface finishing and mechanical systems from the shell and the exterior environment, we can build structures that sustain through changing times. The physical longevity of the structure is maintained when its interiors are reused and replaced. When a designated function of the building expires, it needs to take on a new role and modify itself to serve a different purpose. He proposes two distinct elements of the built environment with the urban fabric and base structures as **supports** and the interior fit-outs as **infill**. Our current decision-making can be based upon these two elements in order to act towards an unknown future (Cuperus, 2001). The support makes it possible for people to make subjective decisions within the broad socio-cultural context of society. Subjective decisions made by each individual make up the dynamic infill and their interaction with the existing supports, i.e. the static structural and urban fabric. As the report advances, further classifications are made within what is included in the infill and supports based on their level of dynamism or permanence.

1.3 Philosophy of Temporality in Architecture

The utility of space must change to accommodate evolving functions. How does the form follow function (Sullivan, n.d.), if the function is no more constant? In the contemporary conditions of rapid change and economic uncertainty, under which the future of an architectural or an urban development project is uncertain, designers are required to search for approaches where the role of time must be accounted for at the design stage of a project.

"For things to remain the same everything must change." This message taken from Tomasi Di Lampedusa's", 'Leopard' (Pierson, 2019) reminds us of a universal truth that can be applied in **What We Build- Cities**. Cities can only sustain if they are able to evolve, be resilient and update with time and the changing environment (Bellini & Macchi, 2016). The root cause of this is the ever-existent challenge in the building industry: 'the timetable of its functionality'. It can be assumed that our world is made up of two types of environments. One that is sensitive to human

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interventions- **the physical built environment,** and the other is intangible and beyond our control- **the natural climate and global economic conditions**. There is a push and pull within this duality of what can and cannot be controlled. In the pursuit of achieving this balance, designers and decision-makers must adapt to changing times while making interventions in the physical built environment. The control over design must shift from the traditional planning system of towns and cities to allowing its users and inhabitants to make personalised interventions within their surroundings. The everyday environment tells us that we must be able to deal with change and make provisions for an evolving design model; appropriately distribute design control and let each user alter their surroundings within the environmental hierarchy (Lifschutz, 2017). Each aspect of our everyday life, such as public transportation, waste management or social housing could be improved to achieve a reasonable level of social and environmental sustainability. True architectural resiliency lies not only in user transformation of a structure or space during the broad stretch of a day, but it must also manifest along with its surroundings resulting in the reconfiguration of the landscape's existing mass and void equation. As professionals, we could bring to life a visionary landscape that is flexible, fluid, open-ended and reversible.

1.4 Flexible Architecture

By definition, flexible architecture implies the impermanence of the structure, material, and program. It allows designers and planners to begin using a space with a limited initial capital quickly. Contemporary applications of new or recurring programs are becoming more and more common in urban settings. Such architecture is implemented even on large scales at social gatherings and public events. An infamous music festival called 'Coachella Valley Music and Arts Festival' includes tent structures for thousands of spectators for lodging (Fig. 3). Mass congregations at World's Expositions, Olympic villages, music festivals, and religious festivals too require the deliberate application of the time factor and adaptable spatial planning. Analysing such reoccurring events and their sites give us what can be thought of as a 'formula' on how to design a reoccurring urban settlement (Sutherland, 2018).

Fig. 2: The Olympic Village in Sapporo, Japan for the 1972 Winter Games. Photo: Rolls Press/Popperfoto/Getty (Carson, n.d.).

Fig. 3: 'Coachella Valley Music and Arts Festival, California, USA' (Coachella Camping Guide, Packing List & Tips| TravelGrom.Com, 2019)

Therefore, what does it mean for a city if its settlements were to change/ pop-up on a cyclical basis? What are these parameters used to 'measure' resiliency or the extent of flexibility of an urban development?

To answer that, one must recognise the needs and general practices of flexibility in various settlements. First, it is imperative to build a synthesis of **progression in the general interpretation** of flexible systems by referring to the works of professionals or researchers from the past. The basic concept of temporality in urban design and architecture has evolved through time, and it includes more than a single definition.

1.5 Interpretation of Flexible Systems

Frank Duffy, president of RIBA (1993-1995), believes that a building is always tearing itself apart. It can be conceived through several layers of longevity of built components (Brand, 1995). These components define the adjustment capacity of the building, hence determining how adaptable it is to the changing surroundings.

According to Rabeneck, Sheppard and Town (1974), flexibility is understood in terms of **physical** elements related to construction techniques with a fixed service core (Inani & Kumar, 2012). In contrast, flexibility in terms of **adaptability** relies on the designing of the architectural layout of the housing (Inani & Kumar, 2012). Adding to that, two decades later, Steven Groak (1992) defined them as two systems: **flexibility**- capable of "different physical arrangements" and **adaptability**- capable of adjustments and changes for "different social uses" (Groak, 1992) (Fig. 4). However, Gerard Maccreanor had a different view about flexibility where he believes that it does not involve "an endless change" in the physicality of space. However, he stresses that the buildings which are not initially designed with movable elements can indeed be the most adaptable (Fig. 4). N. J. Habraken leans towards the tangible aspect of practical transformations and describes elements that can be assembled and disassembled as per requirements with a single space through construction techniques and prefabrication (Schneider & Till, 2005).
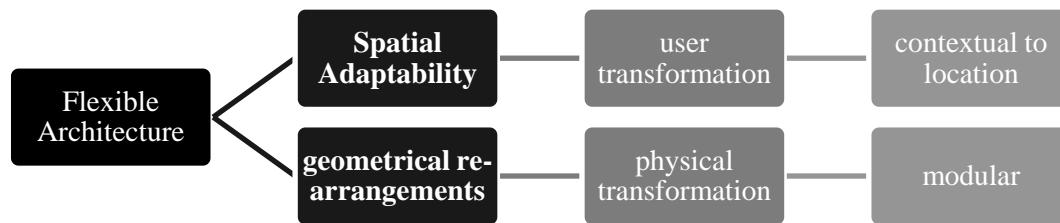
Fig. 4: Parallel approaches to flexible architecture (Credit: Author).

Fig. 4 interprets Steven Groak's approach to flexible systems. Here, adaptability refers to user transformation, and it is contextual to a location. Geometrical flexibility or rearrangements refer to the physical transformation which can be modular in its form.

Author	Book/ blog	year	Flexibility	Spatial Adaptability
Andrew Rabenek, David Sheppard, Peter Town	'Housing: Flexibility/Adaptability'	1974	The concept of Flexibility deals with the "constructional techniques and services distribution."	Adaptability is related to the "planning and layout" of the building
Herman Hertzberger	'Lessons for Students in Architecture'	1991	Polyvalence	
Steven Groak	'The Idea of Building: Thought and Action In The Design And Production Of Buildings'	1992	Flexibility points to the "capability of different physical arrangements."	Adaptability points to the "capability of different social uses."
Gerard Maccreanor	'Adaptability. A+T Magazine'	1998	"Flexibility does not imply the necessity of endless change and break-down of accepted formula."	"Most adaptable (buildings)were those not originally planned for flexibility."
Adrian forty	'Words And Buildings: A Vocabulary Of Modern Architecture'	2000	"It has served to extend functionalism and so make it viable" and "it has been employed to resist functionalism."	
Tatjana Schnieder, Jeremy Till	Words And Buildings: A Vocabulary Of Modern Architecture	2005	"Achieved by altering the physical fabric of the building." (or an object)	"Achieved through designing a room or units so that they can be used in a variety of ways. "

Fig. 5: Progression in the general interpretation of flexible systems of architecture by Siddharth Inani & Ashok Kumar in Flexibility Concept In Design And Construction For Domestic Transformation (Inani & Kumar, 2012).

As summarised in Fig. 5, it is eventually clear that flexibility as a system in urbanism is a homologous practice of 'planning layouts' and 'construction techniques'. **To function as a system, spatial adaptability and physical re-arrangements** exist in **co-dependence.** Habraken's 'supports and infills' explain the interdependence between the long-lasting physical built environment and the fleeting functions within. In Fig. 6, he explains the 'support' by comparing it with a permanent structure of a bridge and 'infill' as vehicles and other objects that move on and around it respectively (Fig. 6). He proposes that buildings must behave in a similar way where the everlasting 'skin' must house infills that come in different shapes and forms.
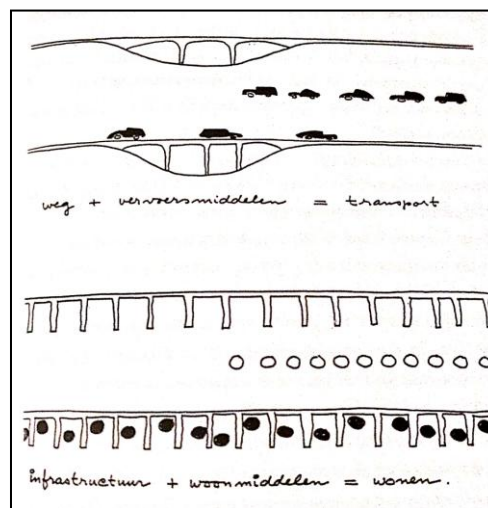
Fig. 6: Habraken's comparison between an infill package in a support structure and a car on a highway (Bosma et al., 2000)

In the 1960s, Dutch architect Herman Hertzberger introduced a concept: **'polyvalence'** which is the innate ability of an object to be reutilised for different uses over a period of time. However, he further explained that although a flexible set-up lets a space adjust according to changing functional needs, it may or may not be an accurate solution to every new function (Ring, 2017). 'Centraal Beheer', an office building designed in 1972 for an insurance company, is Hertzberger's most significant contribution to architecture (Fig. 7 and Fig. 8). It follows a modular matrix system of four quadrants of office cubicles and recreational areas. With time the office floors have been adapted for suitable interior purposes while the main structure remains unchanged; enclosing multiple transforming functions (*Office Building Centraal Beheer – Arch Journey*, n.d.).

Fig. 7: (right): The interiors of Centraal Beheer Office showing the 'modular matrix system' (Goss, n.d.)

Fig. 8 (left): Centraal Beheer Office, the Netherlands, designed by Hermann Hertzberger in 1972 includes adaptability of space (Arruti, 2015)

What we as architects require is a new polyvalent **design model** that extends beyond site-specific needs and devise solutions for the future. Merging the concepts of physical rearrangements and spatial adaptation (Fig. 9), the model is a fresh approach towards resolving the duality between the permanence of the built environment and the fluctuating natural environment. (Ring, 2017).
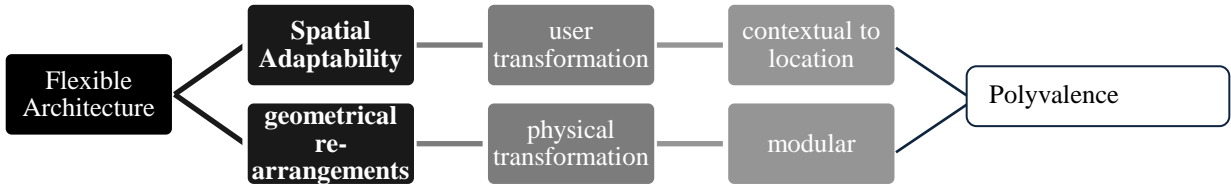
Fig. 9: Co-dependence in the two approaches of flexible systems (Credit: Author).

From Fig. 9, it can be inferred that spatial adaptability and geometrical re-arrangements work in co-dependence. Their polyvalence is what makes the site capable of flexible changes. Such sites are also generally thought to be highly dynamic by nature.

2. Chapter II: A literature review on ephemerality and generic examples

2.1 The Phenomenon of Ephemerality

Ephemeral settlements and the activities within are flexible by nature, i.e., adaptive to changing functional requirements, and manage and absorb the external pressures imposed by various factors. It is observed in various distinct scenarios- as a refined display in an art gallery or a quickly assembled roof as an emergency shelter. The most extreme kind of pressure would be to relocate to places that allow displaced populations to seek asylum in other nations due to transpiring political tensions in their homeland (Vera & Mehrotra, 2015). Another case would be of natural disasters coupled with the effects of 'climate change' where temporary shelters could provide an immediate solution. As described earlier temporality is not unique to a single geographical context. It also has a cultural aspect where its maximum potential can be observed. Pilgrimages like the *Hajj* in Saudi Arabia and *Kumbh Mela* in India or festivals like the Burning Man in Nevada are a few among other cyclically appearing ephemeral events. Marketplaces which are inserts within an existing urban fabric are one of the most common types of cyclical occurrences. Emergency rehabilitation due to political distress is carried out by building tent settlements in a way that they also sustain to form a new community. Many informal settlements are built on the edge of coastal cities like Mumbai in India. They are under a constant threat of flooding due to high tides in the monsoons. In recent years on account of climate change, they are the first ones to be hit by the rising sea levels, uprooting lives and settlements within seconds. Instant provisions for temporary shelters must be made to secure housing for these communities (Fig. 10).

Fig. 10: Temporary shelters, 2017 after houses are destroyed in flash floods in Chosica, Lima, Peru (McCabe, 2017).

2.2 'Open Buildings'- Flexible Spaces for Flexible Functions

An ephemeral settlement is the impermanent quality of a site. When a site as a whole accommodates temporary or recurring events, it is considered as truly adaptable. As previously mentioned, 'polyvalent' flexibility entails spatial adaptability and the physical transformability of a site. **Elements that define a site's ephemerality are its ability to transform along with housing various functions physically**. While some buildings are engineered to be physically transformable on site, others that remain static are also flexible. It is their nature rather than the actual structure that allows them to house **ephemeral events**. The spatial adaptability of what Habraken calls an 'open building' does not necessarily entail a tangible form of transformation. The distinction required between supports and infill in an 'open building' regards the 'space' as a more significant element of flexibility than the whole structure of a 'building'. Thus an 'open building' can be considered flexible due to the possibility of housing various fleeting events. The main characteristic that recognises them as having ephemeral spaces is when the structure or the envelope of the building is detached from the infill- the people and their changing activities.

Following are some of the examples that can be considered as 'open buildings' accommodating multiple activities.

2.2.1 *Jain Upashray*

In the religion of *Jainism*, the *Upashray* is a large open plan space for intellectual and spiritual contemplation. Practising an ephemeral lifestyle, the Jain Monks reside within the *Upashray* to rest, stay, meditate and worship. No cooking activities take place within these holy quarters. The ephemeral lifestyle includes a profound and ceremonial deed of accepting food by 'travelling' barefoot. The underlying idea is to let go of worldly attachments like the greed of 'wanting' food and promoting the act of 'accepting' what you are 'offered' (Fig. 11). The *Upashray* is an extension to the main Jain temple. It offers openness and tranquillity due to the unhindered open plan floor, where the cool marble floor emits a sense of calm. One such notable *Upashray,* designed by an Indian architect Suryakant Bhavsar, is in Manipur on the outskirts of the Ahmadabad city in India (*Jain Upashray*, n.d.) (Fig. 12). It is a good example of an open building where numerous meditative activities, community rituals and educational practices take place. Jainism also includes teachings of living an ephemeral lifestyle.

Fig. 11: Artistic depiction of a home dweller humbly offering food to God who arrives a monk (Jain, 2016)

Fig. 12: Upashray- an open plan space for Jain Monks to stay, rest, meditate and worship, Ahmedabad, India (Jain Upashray Manipur by Input-A | Homify, n.d.)

2.2.2 Bombay Gymkhana

Bombay *Gymkhana*, an Anglo-Indian expression for an assembly ground is a sports ground located in South Mumbai, India. It is the first sports arena in the city designed by English architect Claude Batley in 1875 (Fig. 13). It covers a variety of activities like archery, athletics, badminton, baseball, billiards, boxing, cricket, golf, soccer, tennis amongst others (Sarkar, 2016a). It is an example of user transformability which has an open-ended and an evolving

utility. In addition to hosting numerous sports, it also includes enclosed amenities like indoor games rooms, guest rooms, changing rooms amongst other activities.

Fig. 13: The main ground of Bombay Gymkhana, South Mumbai, India (Sarkar, 2016b)

2.2.3 The Centre Pompidou

In modern architectural practice, an **exoskeleton** structure is desirable because its structural elements and services are placed outside the skin of the building. Centre Pompidou designed by architects Renzo Piano and Richard Rogers, who are known for designing 'shed structures',- is one such example that boasts of large open plan floors that can be utilised in multiple ways (Fig. 14).

Fig. 14: The open plan floor of Centre George Pompidou, Paris (thealternativeatlas, 2015).

Tent structures are the ones whose most significant architectural element is the skin. The space within it is clear and flexible to use. Efficiently utilised as 'support' to various 'infills', state of the art tents are instantly provided on sites of disasters by dedicated disaster relief organisations. The skin of the tent is solely responsible for the accommodating capacity of a tent. Since all its

interiors are detached, a tent can occupy a flexible arrangement of cots, storage units for medical equipment, portable restrooms (Fig. 15).

Fig. 15: A tent can occupy a flexible arrangement of cots, storage units for medical equipment, portable restrooms (Shahani, n.d.)

2.3 Precedent Studies of Temporal Structures and Sites

Following are some of the examples of dynamic sites or cities that are temporary by nature and have morphed to house different situations such as festivals, sports events and exhibition fairs. Their frequency of occurrence varies from daily to seasonal to occasional as well as non-recurring. The purpose of presenting these examples is to understand the different aspects of temporary architecture and urbanism in various cultural and geographical contexts.

2.3.1 *Hajj*, Jeddah, Saudi Arabia

Site: Mecca, Saudi Arabia

Purpose: Hajj pilgrimage

Frequency: recurring every year

Duration: 5 days

Fig. 16: 'Mina' tents- temporary accommodation for the pilgrims. Photo: Amusing Planet (Hufaiza, 2014)

During the last month of the Islamic calendar, pilgrims from all over the world gather at the 'tent city' of *Mina* for *'Hajj'*, the holiest pilgrimage in Mecca or *Makkah* in Jeddah, Saudi Arabia. The hot and arid land of the region calls for the establishment of large tent settlements as lodges to house millions of pilgrims. Tents are an obvious architectural choice due to their ephemeral nature, and breathable envelope is built in clusters of thousands (Fig. 16). They encompass a 7.7km^2 vast land (Fig. 17), carefully master-planned with discrete blocks of modern tent modules. While the city continues to exist in a physical sense, it only comes alive during the pilgrimage (Berg, 2011).

Until 1997, when a fire incident took many lives, on the sandy plain stood a 'pop-up' city made with simple cotton tents (Fig. 18). As a durable and fireproof alternative, the envelope of the tent is made up of   PTFE (polytetrafluoroethylene) Teflon Coated Fiberglass further protected by an extensive network of permanent fire hydrants. There are about 100,000 tents erected every year where each module enclosing an area of 23km^2 to 80km^2 is equipped with ventilation, air-conditioning, electricity, water sewage infrastructure, public facilities and a network of transportation. Besides fire, the density of the population is also a risk to public safety. For this, there are tent hospitals erected with ambulances stationed at various locations (Pedersen, 2010). This ephemeral religious event is built repeatedly with careful infrastructural and logistical planning to manage and provide shelter to about 2.5 million pilgrims.

Fig. 17: They encompass a 7.7km^2 vast land, carefully master-planned with discrete blocks of modern tent modules. Photo: abc.net.au (Hufaiza, 2014).

Fig. 18: Until 1997, simple cotton tents were used, which were not fireproof (Hufaiza, 2014).

2.3.2 *Kumbh Mela*, Allahabad, India

Site: Allahabad or Prayagraj, Uttar Pradesh, India

Purpose: *Kumbh* pilgrimage

Frequency *Kumbh Mela*: recurring every 12 years

Frequency Magh *Mela*: recurring annualy

Duration: 2 months

Fig. 19: Tent accommodation at *Kumbh* Festival ('Accommodation in *Kumbh Mela* 2019 Prayag Raj', 2017)

Allahabad, officially known as Prayagraj, is a city in the Indian state of Uttar Pradesh. It hosts mass congregations for *Kumbh Mela* and is the largest temporary pop-up pilgrimage city in the world. The site is considered to be sacred owing to its proximity to the confluence of the three holy rivers- *Ganga*, *Yamuna* and *Saraswati*. The geographical elements of the site change when the water levels rise in the monsoons and recede after its end in September. This change is significant because it causes newer activities to morph with the landscape. Like *Hajj*, this city consists of various flexible elements to house a large population visiting for the purpose of their religious beliefs (Vera & Mehrotra, 2015).

An annual version of the twelve yearly *Purna* or full *Kumbh Mela* also takes place in Allahabad. Corresponding to January or February in the Gregorian calendar, '*Magh'* is the eleventh month

in the Hindu calendar. Historian Kama Maclean has said that while no mention of a twelve yearly *Mela* is found in the textual sources, *Magh Mela* has been mentioned and was celebrated for centuries. However, there is no difference in the rituals and traditions between *Kumbh* and *Magh Mela* (R. Mehrotra & Vera, 2015). As one part of a whole, the scale of the infrastructure at *Magh* is a smaller version of the twelve yearly *Purna Kumbh Mela* (Sutherland, 2018).

The example of these two versions of the festival is noteworthy because of the sheer size of the visitors it carries. Accommodating the largest public gathering for a religious event, it develops its roads, pontoon bridges, tents and other social infrastructure like any other urban development. The main purpose of the festival is for the pilgrims to take a dip in the holy water of the rivers to wash away their sins (Fig. 20). There are five such auspicious bathing days. Apart from continually lodging five to seven million people, the *Mela* sees an additional influx of ten to twenty million people on these five days. Once the fifty-five-day event is concluded, the city infrastructure is dissembled within the same amount of time it took for the construction. The site is deconstructed back to its basic elements, some of which are stored away until the next event or recycled for other functions within the central city (Vera & Mehrotra, 2015).

Fig. 20: Gathering of the pilgrims towards the edge of the river on one of the bathing days (Magh *Mela* 2020).

2.3.3 Burning Man, Black Rock City, USA

Site: Black Rock City, Nevada, USA

Purpose: Art festival

Frequency: recurring annually

Duration: one week

Fig. 21: An ephemeral landscape that disappears into the desert after the festival ends (*Pinterest*, n.d.).

Founded in 1986, a similar 'pop-up' tent city, the Burning Man comes to life annually in the desert of Nevada, USA. The built city called Black Rock City is made from scratch into an ephemeral landscape (Fig. 21). It is redesigned and dismantled every year, evolving with the changing list of events and activities and the number of people. It is a week-long festival, celebrated in dedication to anti-consumerism and self-expression. All commercial and monetary activities are prohibited, and exchange takes place in the form of barter system (*What Is Burning Man?*, n.d.).An art festival at its core, which hosted 78,820 participants in 2019, ends by burning its central sculpture made of wood (Fig. 22).

The ephemeral landscape is divided into distinct neighbourhoods. The street grid is designed to be bike and pedestrian-friendly, and smaller streets are made for public gatherings. The city includes tent structures (Fig. 23) for housing restaurants, bars, music venues, street lamps, and 1700 public toilets. The planning of the Burning Man presents utopian ideas for an ideal ephemeral self-sufficient city (Patton, 2019).

Fig. 22: 'Embrace' was a 72' tall wooden sculpture that displayed a celebration of all our relationships; an expression of ephemerality. The artwork was created by 'Pier Group' for The Burning Man 2014. Photo: Trey Ratcliff ('Picture of the Day', 2014).

Fig. 23: A tension tent (Ephemeral Architecture, n.d.)

2.3.4 German Pavilion, Montreal, Canada

Site: German Pavilion, 1967, Montreal. Canada

Purpose: World exposition

Frequency: once

Length: originally for three to six months

Fig. 24: Exhibition space in the pavilion. Photos: © Frei Otto (Langdon, 2015)

This project was executed, mindful of the site, and the impact of the human footprint. The German pavilion was made of tensile PVC- coated polyester fabric, which was easy to assemble and dismantle. It was a continuous tent structure with intermediate steel structural masts, making it flexible to morph on any terrain (Fig. 24). Unlike the tents at *Kumbh Mela* that are assembled on-site, the sheer size of the tent structure required it to be prefabricated offsite. The assembling process took six weeks, and it was dismantled at the same speed.

The structure was made for the Expo'67 World's fair in Montreal. Created by Frei Otto in collaboration with architect Rolf Gutbrod, the pavilion of the Federal Republic of Germany was an experimental lightweight structure in the form of a tensile canopy structure. It was the late-modern demonstration of the potential of technology, pre-fabrication as a new and sensible approach towards architecture. The design being a tent structure, it was a reflection of Otto's experience as a prisoner in 'Prisoners of War' (POW) camp in France. He was assigned to build tent-like structures for fellow prisoners using whatever limited material was available (Langdon, 2015). The intention of creating the lightweight, temporary pavilion was to underline resource conservation, the scope of structural engineering that was widely accepted as a new form of architecture in the 1950s and 1960s. Otto aimed to convey to the visitors of the exhibition that architectural solutions can be economical and adaptable (Langdon, 2015).

2.3.5 Maeklong market, Thailand

Site: Maeklong, Thailand

Purpose: Market

Frequency: recurring everyday

Fig. 25: A train approaches through the market while the vendors hold on to their awning posts (Bangkok Day Tour, n.d.).
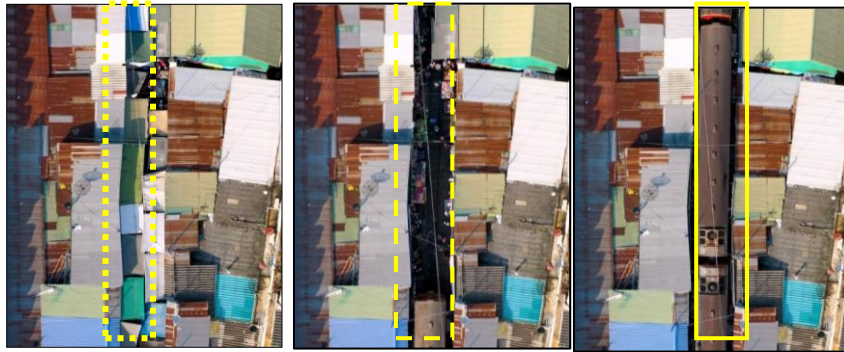
Fig. 26: The top view of the market, Thailand. The awnings are pulled back before the train approaches, causing the market to morph around it. (Demas, n.d.).

Maeklong Market in Thailand can be considered a clear example of an extreme case of temporality. The urban form is continually changing, making the market highly flexible and permeable in the process. It is an example that does not have sophisticated planning, and its temporary nature is built around the passing of the train from within the market. With its recurring frequency of deforming and rearranging daily, this example is the fastest and the smallest form of an ephemeral site. As the train approaches, the vendors and buyers are warned through a speaker, causing them to pull back the cotton awnings quickly, like clockwork, multiple times a day. Due to this, it came to be known as the 'umbrella pull-down market' (Fig. 25) (Kohlstedt, 2016).

The market was built in 1905 as the selling ground for the fishing community. Eventually, a railway track was laid to improve the conveyance of goods. However, the market stayed despite the track cutting through it (Iverson, 2018). Over a period of time, the form and function of the market morphed around the railway track and adapted with the train schedule (Fig. 26). Even though the feature of clockwork temporality is exceptional, it has caused accidents in the past. While the speed of physical arrangement is remarkable, more sophisticated administration may be required.

2.3.6 COVID-19 pandemic

COVID-19 is an indefinite event of crisis and emergency. It can be analysed as an example of temporality and resiliency on a global level. Possibly the best use of temporary architecture we have witnessed in recent times is the use of makeshift hospitals as a solution to provide medical assistance to the patients. The increasing numbers of cases surpassed the availability of beds in enclosed formal hospitals quite early during the pandemic, causing several public spaces to be converted to temporary hospitals. These public spaces are characteristically sizeable open-plan spaces which correlate to the 'open building' concept. They could be indoors as well as outdoors. Large indoor spaces like sports arenas are the enclosed version of 'open buildings' where the 'support' is the tangible component. The medical equipment, beds and the inflow and outflow of the patients and the staff is the 'infill'. Outdoor spaces like parks and open-air stadiums are the exposed versions of 'open buildings' where the permanent built environment is the 'support', losing any indication of its original utility.

Temporary shelters were most commonly designed for disaster management during natural calamities and refugee camps around the world in addition to its historical use in the war zones. The pandemic today is the renewed form of such a crisis and emergency, and it has extended and modified the use of temporary shelters as 'mobile hospitals'. The over-saturation of sophisticated formal hospitals has caused even the most developed nations to rely on semi-permanent and temporary forms of construction; arguably representing their growing inclination towards 'pop-up' urban architecture. The main difference between the tents used to shelter military officers and troops during wars and the COVID-19 field hospitals is that the latter has caused temporary shelters to find prominence within an urban environment. For example, Central Park in New

York, which is USA's coronavirus epicentre is transformed into a field hospital equipped with sixty-eight beds including ten I.C.U beds and ventilators (Fig. 27and Fig. 28). The outdoor medical facility is a part of the Mount Sinai Health System across its main hospital building. Tents and the trained staff are provided by a dedicated medical relief agency that has operated in war zones, and areas struck with natural disasters and disease outbreaks in the past (Fink, 2020).

Before opening the field hospital, a ditch was dug to lay the electrical system. As for the on-site plumbing, another tent was erected atop a hill where chlorinated water was stored. Pipes were run downhill to the hospital tents where the medical staff and volunteers could sanitise their hands and medical equipment (Fink, 2020). Here the concept of open buildings is applicable in the outdoor built environment where everything we build including the tents, medical products, instruments, storage items and the water tank is the infill within the existing site of open flat ground and the elevated terrain.

Fig. 27: A makeshift hospital in Central Park. Photo: Hilary Swift (Fink, 2020).

Fig. 28: Portable medical systems and equipment. Photo: Hilary Swift (Fink, 2020).

Another example that pertains to temporality in urbanism is how the city of Wuhan, the initial epicentre of the outbreak has displayed resilience. It had converted around eleven sports centres, exhibition halls and other local venues into makeshift shelter hospitals to add capacity and accommodate the growing number of case-patients (Pickrell, 2020). Thousands of beds were moved into large open plan venues where speed was of the essence, and risk alleviation was of utmost importance.

Every other large public venue of a city that is otherwise locked down for the general public has been converted into emergency medical relief centres. **What we can learn from this is how resiliency in *What We Build*- the cities, has managed to respond to an unprecedented crisis of the current times.**

2.4 Importance Of Materials

The practice of temporary architecture in any context would be to maximise the ease and efficiency of building structures and materials to deconstruct and reconstruct eventually (Armada, 2012). The physical nature of an object encompasses its form, structural elasticity, stability and materiality to ensure sustainability. One could think of an entire building as a clever juxtaposition of architectural elements or fragments such as the structure, its membrane and fenestrations. These elements give the building a quality which varies depending on it's location, functionality and a desired architectural style. This quality can be further explored in the context

of ephemerality through variations in form, materiality and the weight of their body. They are innate to all building objects and must work hand in hand for the building or a design project to function. For example, bamboo is flexible due to its ductile form, but a piece of fabric is flexible due to its light weight and foldability (Fig. 29). By recognising their true nature in terms of flexibility, we can decide the elements that are most suitable for a given scenario. Different kinds of flexible structures can be characterised by their length of utility and hence the choice of material that is appropriate taking into consideration privacy, reusability and permanence. For example, in a tent structure which is easier to deploy is an appropriate element for a short-term event like a festival. It's material is inexpensive, and the structures or tents are quicker to deploy as they are built with bamboo or wood (Armada, 2012).

For the construction of an ephemeral settlement, the discourse on the role of materials is essential. Recognising their properties and their suitable functions are the key to making any architectural object flexible. Along with ephemeral urban design and planning, evolution in the discovery of suitable flexible materials and architectural elements is also noteworthy.

Fig. 29: A hyperbolic pavilion where the bamboo's ductility allows the structure to bend and the fabric's foldability, lightness and tensile character allows it to act as a roof of the structure Photo: Building

3. Chapter III: Case Studies

A Qualitative Analysis
Introduction to case studies

The following three case studies are the existing cases of ephemerality. They are explored based on the frequency of their occurrence-

Ruelles Vertes, or Green Lanes in Montreal, Canada is an example of flexibility and endurance as a perpetually enduring and evolving urban system. It displays resilience and sustenance in an urban environment. Jean Talon Market, also in Montreal, displays ephemerality and flexibility in its seasonally altering market scenario. *Kumbh Mela* in India, which is the pivotal case of this report, displays temporality and flexibility as a cyclically occurring religious event. It is a good example of spatial adaptability and resilience on an urban level.

3.1 *Ruelles Vertes*, Montreal, Canada: Flexibility and endurance in a perpetually occurring green urban system- site analysis

As a part of the post-professional master's programme of Urban Design and Housing Studio, we, a group of five students pursuing the master's degree for the year 2019-2020 produced a report entitled 'Treasure in your Backyard'. It is based on the factual knowledge about the history of Montreal and the evolution of its 'back alleys'. All the data and figure illustrations within the text below were discussed and produced as a group. The focus of this studio was to study the development of some of these back alleys, recently converted into '*Ruelles Vertes'* or 'Green lanes' that, today, extends to about 444km in total distance. This project was initiated by *Regroupement Des Éco-Quartier*, a Montreal based non-profit organisation founded in 1999 (*Regroupement Des Éco-Quartiers*, n.d.). Various secondary sources in the form of previous researches and publications were referred. Our personal experiences and interpretations of the actual sites were carried out, recognising them as examples of green inserts within the urban fabric of Montreal. Held in October 2019, '*Eco-Quartier's* Green Lane Summit' was the main platform where development plans, design concepts and issues regarding the nineteen boroughs of Montreal Island were discussed. The summit acted as the direct source of information for the

studio in addition to site visits where general observations were made and further documented through the visual medium of photographs, sketches and drawings.

Ruelles Vertes or Green lanes are characterised by linear back alleys that are converted into a neighbourhood friendly zone shared amongst and maintained by a dedicated neighbourhood committee (*Pourquoi Une Ruelles Vertes?*, n.d.). As a visitor, when one enters a green lane, they feel the reduced effect of heat as the greenery within reverses the urban heat island effect. The atmosphere grows calmer and the air feels cleaner. Besides greening activities like planting vegetables, flowering plants, herbs and shrubs, critical measures are undertaken to maintain them regularly. Some lanes have added features that recreate the lost ecosystem for certain species of birds and insects. By building micro-habitats for them within the lane, the urbanised city's biodiversity finds an unusual way to thrive. Here, care is given on a personal level, and the habitat is maintained regularly. Such back alleys made up of different flora and fauna is shared by two rows of houses on either side within a typical neighbourhood block. It also happens to be a comfortable setting for the neighbours to interact and conduct various social activities. The lanes are often called 'children's lanes' as they are vibrantly cluttered with toys and book share stands. The children are always encouraged to help the community maintain the green lanes (Chaki et al., 2019).

A typical green lane is a complex urban system whose basic building blocks are houses, fences on the front and the backyards, pavements, green walls, vegetable planters, street art and the people that make it all function (Fig. 30 and Fig. 31). The lane is always evolving with the layering of each of these elements. Together they build a livable space for the dwellers within its surroundings (Chaki et al., 2019).
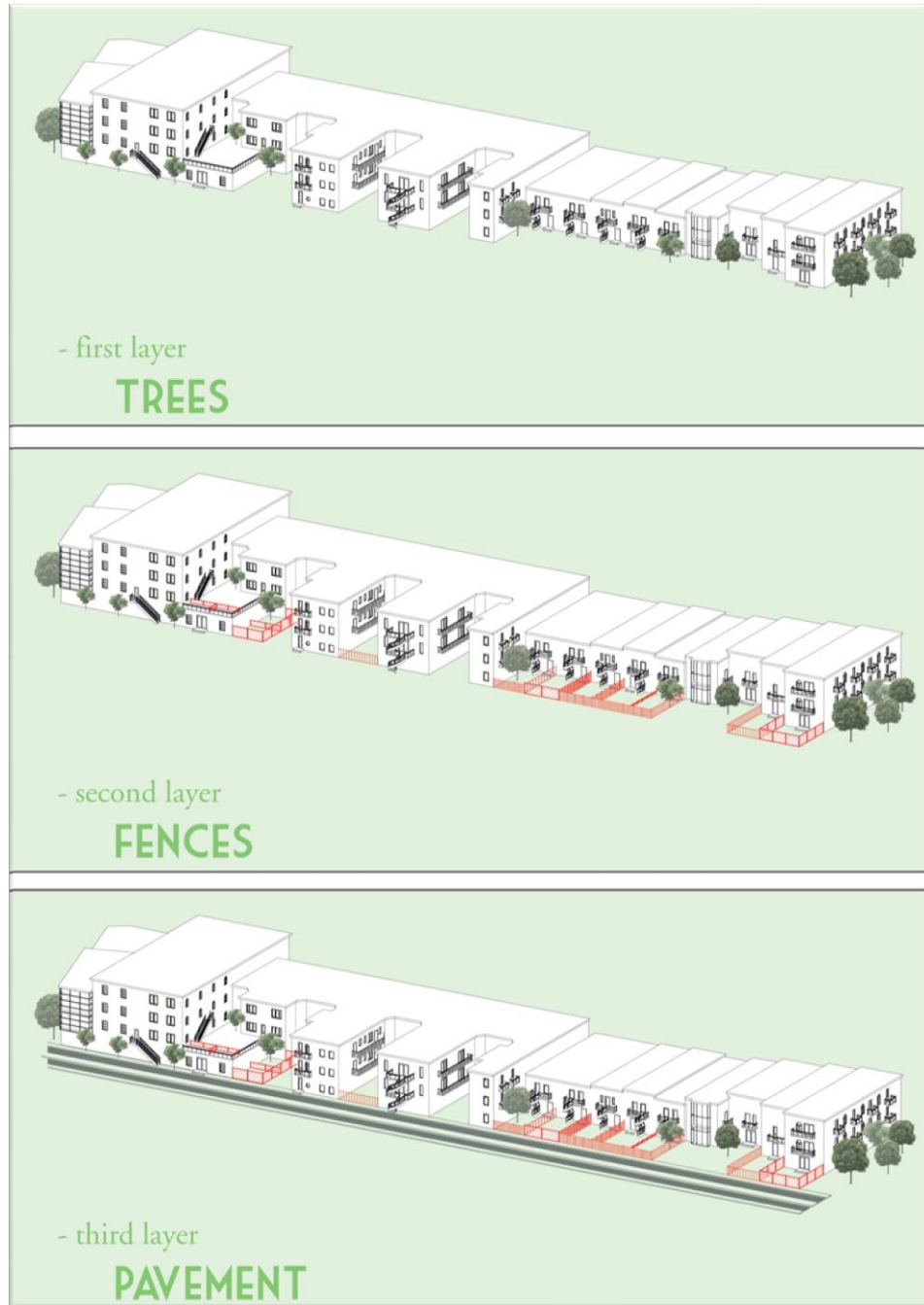
Fig. 30: An overlapping complex system of trees, fences, pavements, cultivation, art and social activities (Chaki et al., 2019).
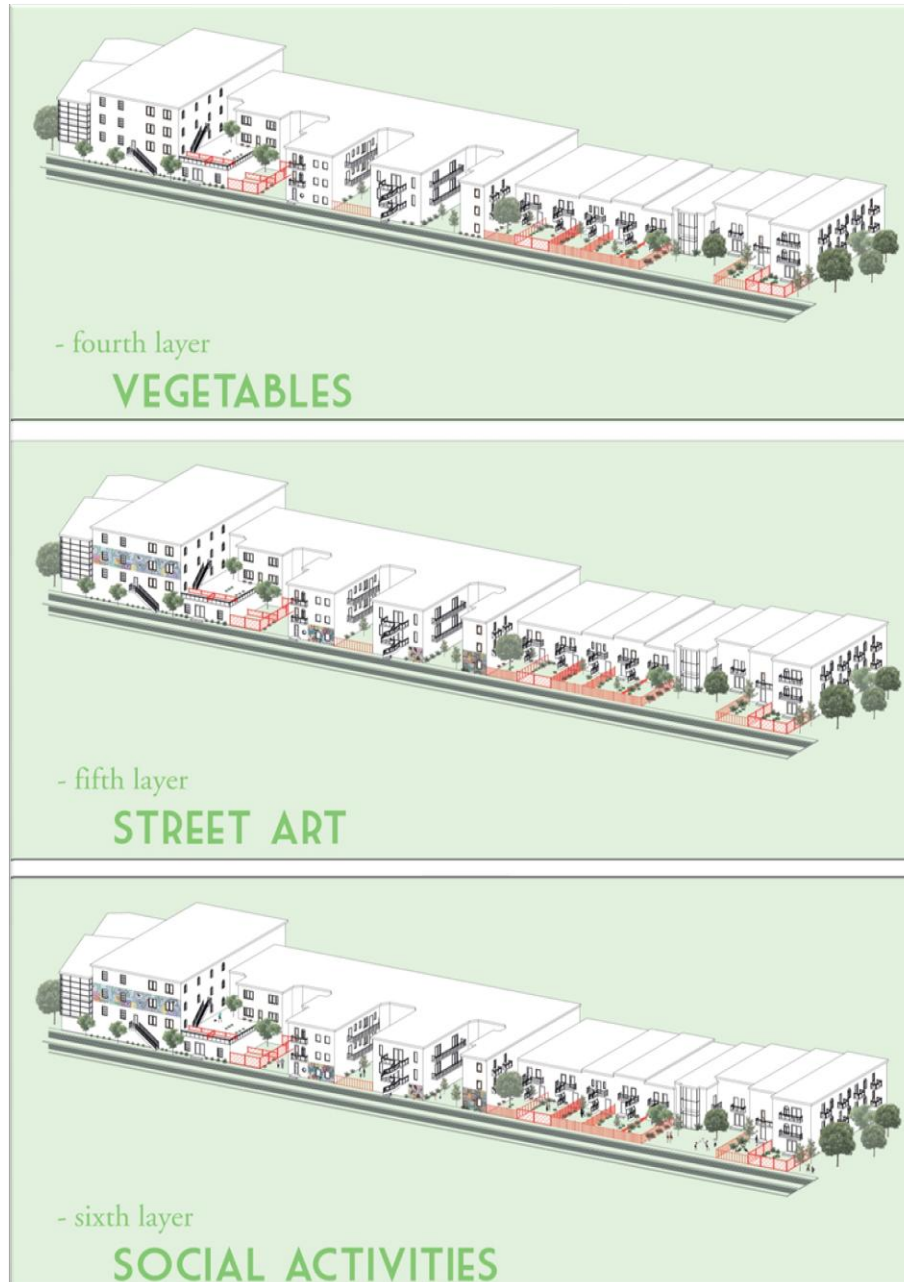
Fig. 31: An overlapping complex system of trees, fences, pavements, cultivation, art and social activities (Chaki et al., 2019).

Buildings and public infrastructure is the static urban setting to the green lanes. The layout of various neighbourhood blocks is different, which in turn affects the key factors of a lane. For example, a 'T' shaped lane provides a hierarchy in privacy and safety (Fig. 32). In contrast, a one-sided lane functions better as a beautiful promenade that is visibly attractive to the outside public as well (Fig. 33). The trees, the buildings, their fences and their colourful facades are

fixed in space. The planting and vegetation, the people and their way of using the space for social activities are always changing. Seasonally driven, these complex layers of the green lane are brought to life on account of intensive neighbourhood intervention with co-operation from other dedicated agencies.
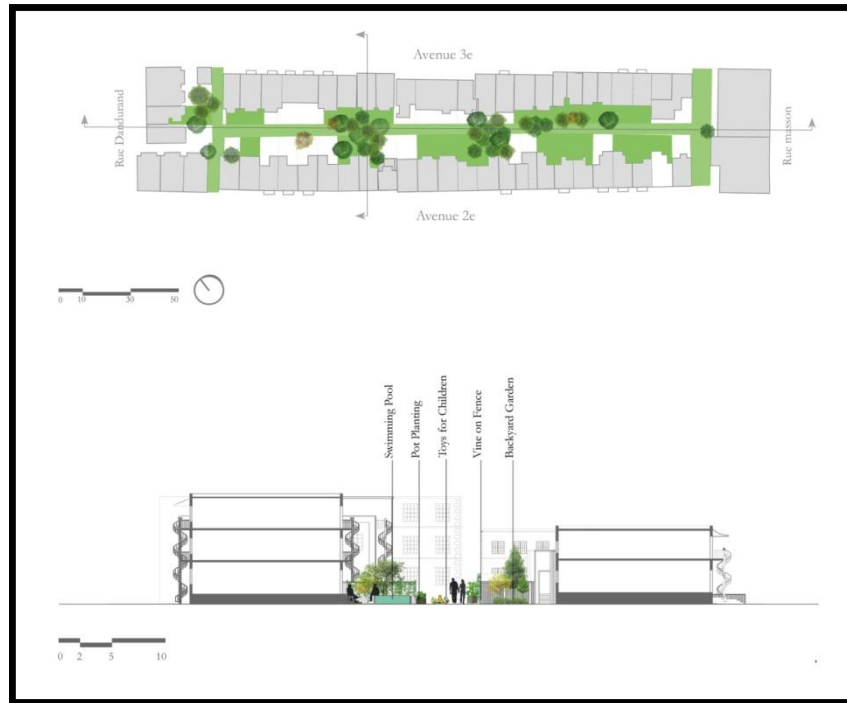
Fig. 32: A 'T' or an 'I' shaped lanes provides hierarchy in safety and privacy in the borough of Rosemont La Petite Patrie (Chaki et al., 2019).
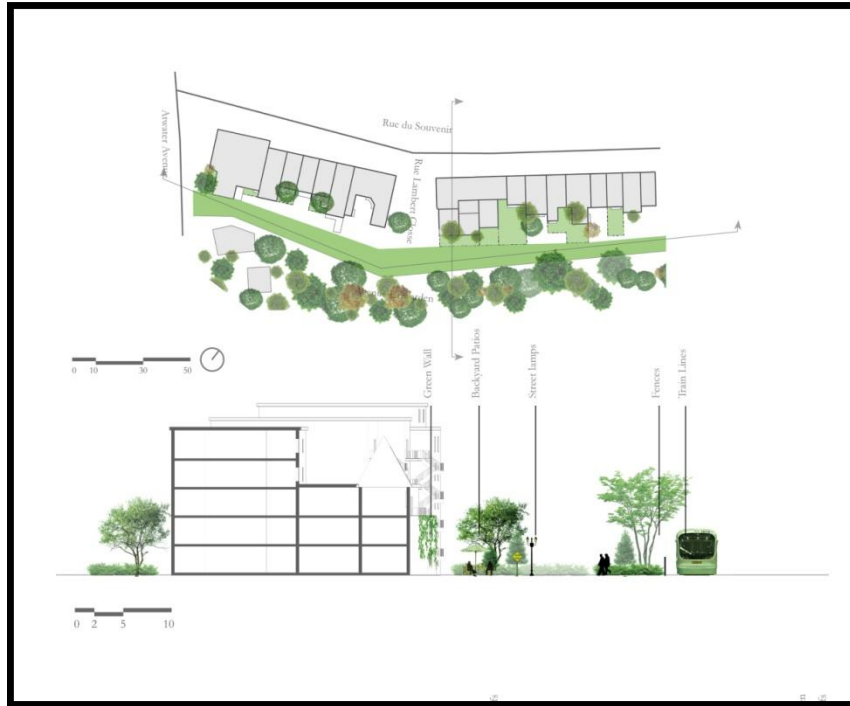
Fig. 33: A one-sided lane (in the borough of Ville Marie) functions better as a beautiful promenade that is visibly attractive to the outsiders (Chaki et al., 2019).

Truly flexible by nature, it can accommodate multiple functions as per changing seasons. During winter, the ground in the back alley is icy, and thus the otherwise 'green' lane is used for playing ice hockey or skating. In the summer months, urban agriculture and gardening become the primary function in addition to various social activities that involve play zones, neighbourhood gatherings and outdoor meals. Street art and floor markings are a few of the many attractive interventions that give a unique identity to each green lane. A typical green lane is surrounded by houses on both sides and lined by fences of varied patterns, along with birdhouses, flower pots, and hand-made wooden nameplates. Intensive gardening is practised during the summer months, which makes their surroundings, fences and building facades truly green and breathable (Chaki et al., 2019).

Elaborating on the building blocks of the green lane, the following are some of the key elements or layers that efficiently utilise the function of a back alley in different ways-

- **Urban Agriculture**

The practice of urban agriculture is a common approach to food sustenance in Canada. An edible landscape consisting of tomatoes, bush beans, cucumber, lettuce, radishes and more, are planted in spaces as unusual as the backside of a school parking lot, or the balcony of a small family home, or the back-lane, i.e., the green lane of the neighbourhood blocks (Fig. 34 and Fig. 35). Produce grown close to one's house in the green lane assures security and consistent monitoring on a personal level (Chaki et al., 2019).

Fig. 34: Vegetable plantation in the back lane/ green lane (Chaki et al., 2019).

Fig. 35: Tomatoes are grown as a part of urban agriculture (Chaki et al., 2019).

- **Social Activities**

The neighbours come together to carry out activities like gardening, floor painting, community meals, play games and sometimes also set up an open-air movie screening ("*Ruelles Vertes* et active," n.d.). Occasionally small semi-public events such as skits, block parties, birthday parties,

barbeques and musical nights also take place (Marotte, 2018). These activities are highly inclusive of all ages promoting good neighbourhood relations, a secure environment for the children and an active lifestyle for the elderly (Fig. 36). Book-share stands (Fig. 37) are installed in many lanes by their respective neighbourhood committees for children and adults. Play zones that include a mini-basketball court (Fig. 38), with floor markings for hopscotch games, basketball hoops, mini playhouses, swings and slides are set up for the children and neighbourhood friends. Here, brightly painted speed breakers alert vehicle drivers from entering the children-friendly green lanes (Chaki et al., 2019).

Fig. 36: A secure social environment for people of all ages (Regroupement des Éco-quartiers, 2016c).

Fig. 37: A book share stand (Regroupement des Éco-quartiers, 2016a) .

Fig. 38: A basketball stand for children in one of the safer green lane (Chaki et al., 2019).

- **Street Art**

Street art is one of the more creative initiatives breathing life into the neighbourhood blocks. The murals on the walls and floors add quality to the otherwise mundane facades. Their purpose is to make the life of the residents as well as of the passers-by more joyful (Fig. 39 and Fig. 40) (Chaki et al., 2019).
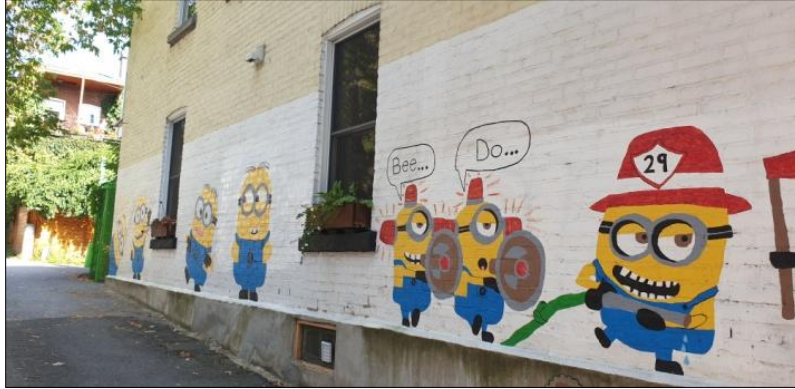
Fig. 39: Mural on a brick facade (Chaki et al., 2019).

Fig. 40: Adding real elements like planters on the two-dimensional wall and floor art
(Regroupement des Éco-quartiers, 2016b)

- **Fences**

More than a physical architectural element, the fences function as living walls (Fig. 41). They act as visual connectors despite being a separator of the private and public spaces (Fig. 42). Some residents make their fences identifiable by painting it in a different colour while some choose to hang planters on the face of the fence (Fig. 43). Fences are one such element that contribute to the spatial adaptability of the lane as every household could personalise the fenced area in the multi-usable back lane. Handmade wooden nameplates, specially made by the neighbourhood children, are also placed outside the fences. Some vine-covered fences also function as pollution filters and cool down the atmosphere (Chaki et al., 2019).
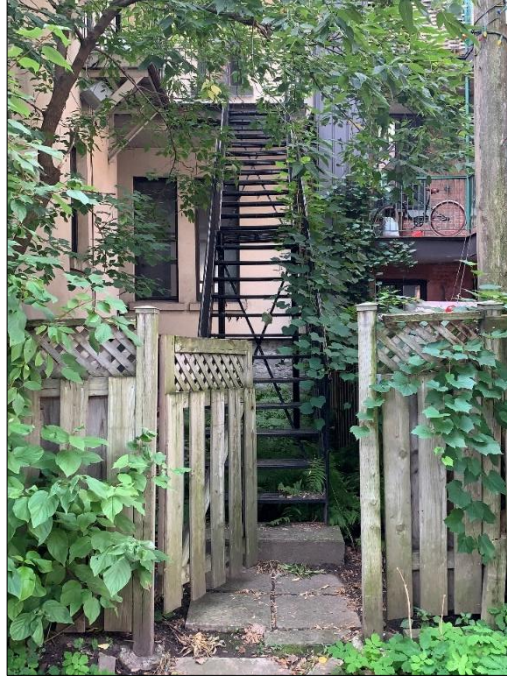
Fig. 41: A lively atmosphere around a house (Chaki et al., 2019).
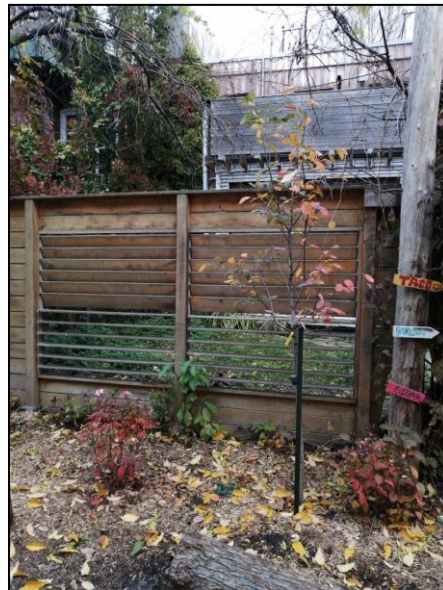
Fig. 42: A fence also functions as a visual connector (Chaki et al., 2019).

Fig. 43: A planter on the fence- gives identification to a particular house (Chaki et al., 2019).

Apart from the characteristics mentioned above, the lanes also function as the 'support' for housing the biodiversity, otherwise lost in the urbanised island (*'L'apiculture Urbaine'*, 2019). Taking advantage of the rejuvenated 'support' the neighbours take an extraordinary and rather friendly approach by having wood and mesh hotels constructed for housing bees. Apart from building bird feeders, insect and bee hotels, swatches of flowering plants are grown to promote bee pollination while also preventing the growth of wild plants (Chaki et al., 2019).

The purpose of this study was to recognise and appreciate the transformation and rejuvenation of the abandoned back ally that accentuates its flexible nature. The tertiary level of an urban movement system that is accessed when residents step out of their backdoors now gains an essential identity in terms of semi-public space of social sustenance and resilience. When every part of urban space as small as a back alley is utilised in multiple ways, then a larger space, as will be seen in the case of *Kumbh Mela*, can be reutilised in many different ways.

3.2 Jean Talon Market, Montreal, Canada: Ephemerality and flexibility in a seasonally altering market scenario- Site analysis

Jean Talon market is an example of flexible commercial architecture on an urban level. It is a farmer's market in Montreal, Canada. It is a retail platform for cultivators from the peri-urban zones and the farms in the other parts of the province of Quebec. The market is active throughout the year. Also known as *Marché du Nord*, it was built in 1933 with site coverage of 20,000m^2 (*Marché Jean-Talon*, n.d.) (Fig. 44). This partially open-air market was analysed as a case of ephemerality in an urban market scenario. This site documentation was conducted as a part of a course directly linked to this research report. The study helps in understanding what makes the market an adaptable urban setting that transforms as per time, on a daily basis, and the seasons, on a monthly basis.

The site observation and documentation was carried out in the winter of January 2020. Every year the Nordic winter temperatures and the snow cause the market to function indoors entirely. This case study thus makes inductive inferences based on first-hand site observations for the winter period. Data collection for the market scenario in the summer months relies on secondary sources on account of the COVID19 lockdown.
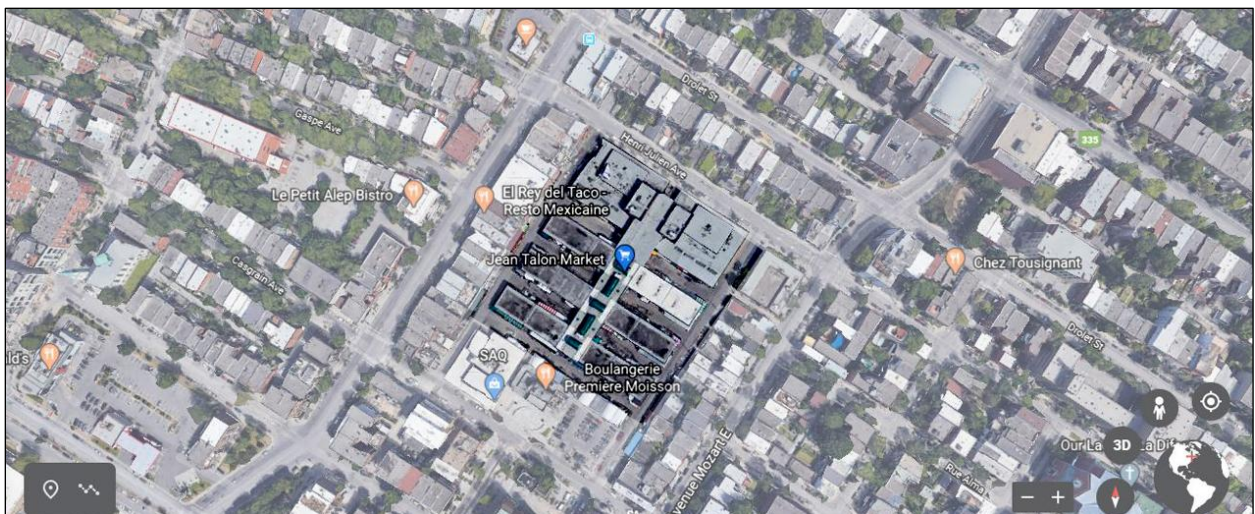
Fig. 44: A satellite view of the market (Source: Google Earth Pro).

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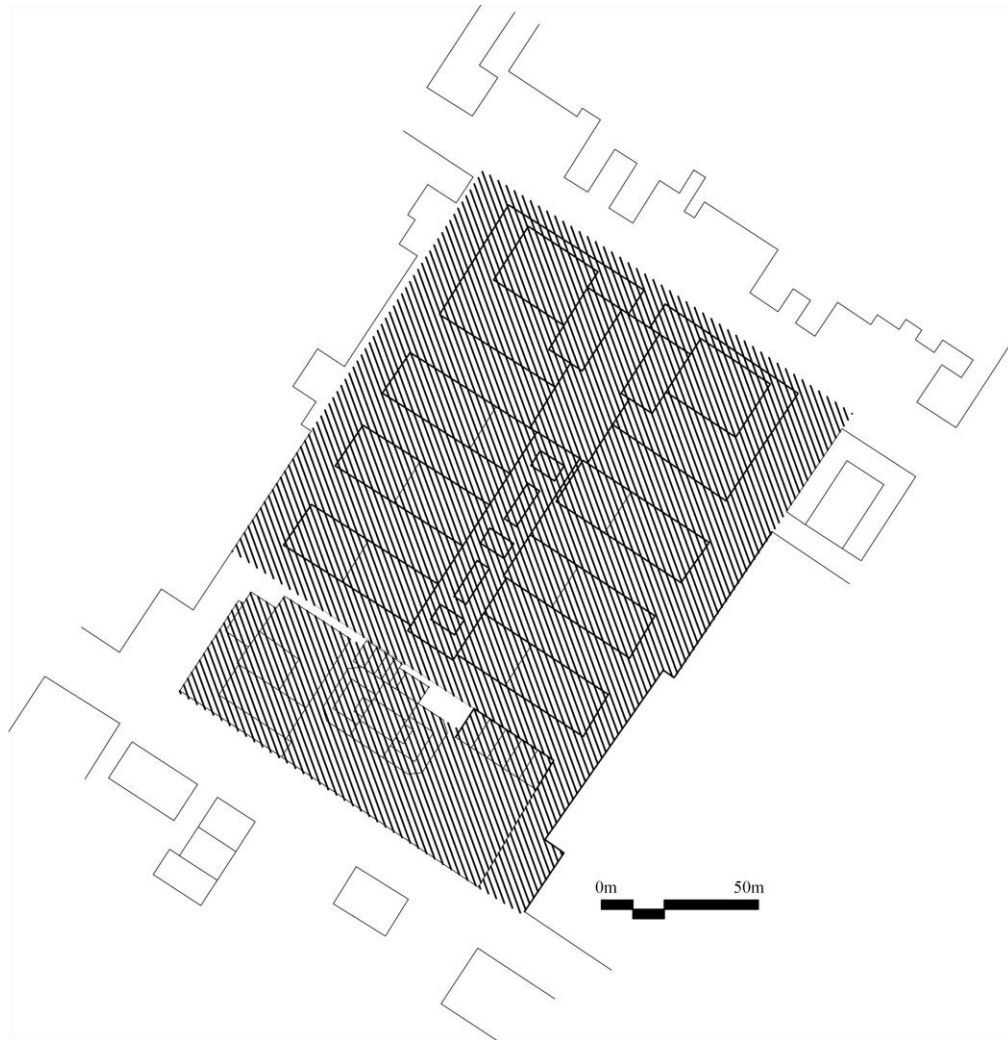
Fig. 45: The hatched region is the market area (Credit: Author).
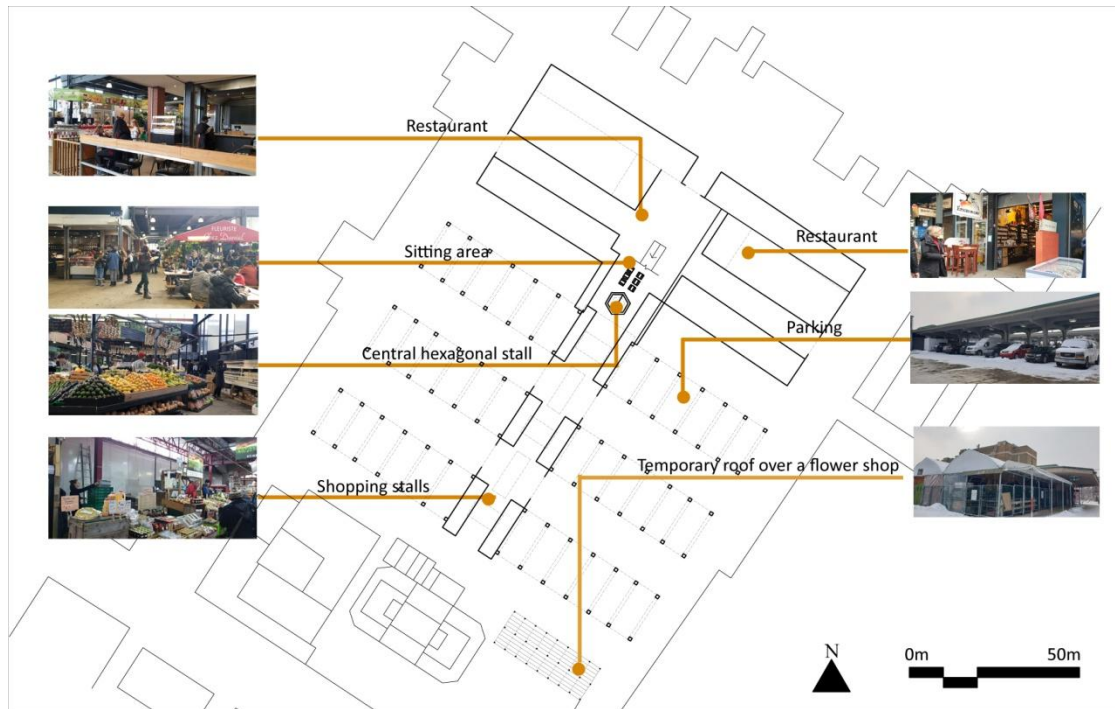
Fig. 46: Plan of the market with the programmatic distribution of that has the possibility for rearrangements (Credit: Author).

At a glance, Jean Talon market is a busy space with a blur of people walking in and out, like a swarm of micro-beings cohesively making the market function as one organism. Directly and indirectly, all buyers, sellers and passers-by of this market are a part of it. Gradation of flexibility owing to the permeable layout can also be observed here. As one approaches the site and into the market structure on a cold Sunday morning, the density of people increases from a minimum in the parking space to a maximum around the indoor market restaurants.

The market's structure is a shell (Fig. 47) on the outside but porous on the inside with exposed architectural elements (Fig. 48). The layout is an **open plan** allowing **maximum feasibility for re-arrangements**. It includes two aisles perpendicular to each other. Lined on their either sides are shops and restaurants. The central space has an open hexagon-shaped counter (Fig. 49) littered with picnic benches around it for relaxing and eating (Fig. 50).

Fig. 47: The market's structure is a shell (Credit: Author).

Fig. 48: The interiors are porous, horizontally a well as vertically (Credit: Author).

Fig. 49: A hexagonal selling stand acts as the axis for the planning of its surrounding spaces (Credit: Author).

Fig. 50: benches placed around the hexagon for relaxing and eating (Credit: Author).

It is not only the physical architecture that makes the market worth exploring; but it is the social, visual and physical elements and the interaction amongst its users that makes it a remarkable site. This interaction ranges from menial activities such as picking out ripe tomatoes to waiting for an ordered drink and from fleeting experiences such as hastily setting up shop before the morning crowd arrives, to battling the confusion of what to buy from the vast selection of the fresh produce (Fig. 51). They are all a final product of how the market was designed and planned- to be permeable and have a flexible space plan.
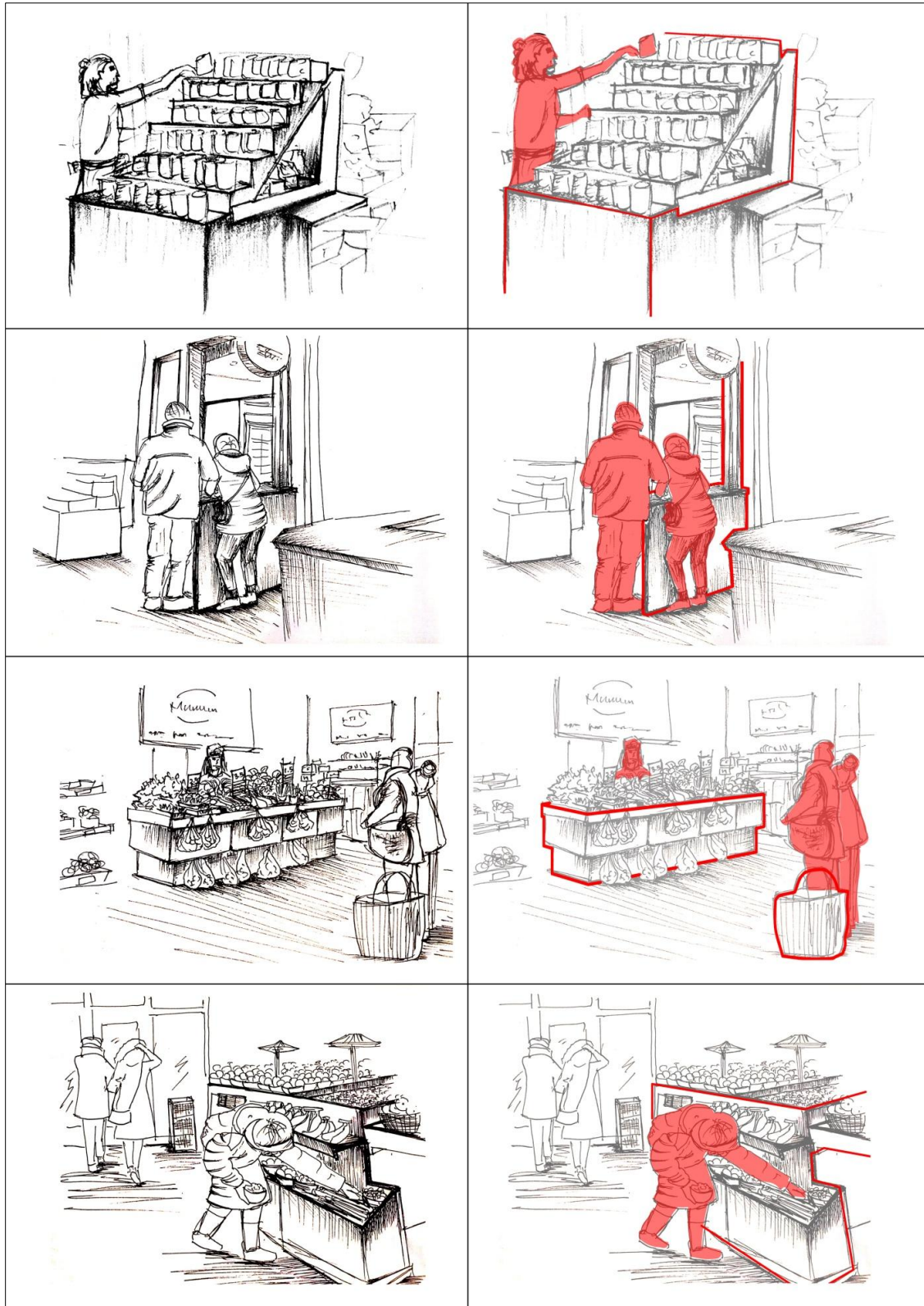
Fig. 51: All the activities in the dynamic market (Credit: Author).

The market can be deconstructed into **layers of rigidity and temporality**. The interaction between them makes it flexible and permeable. In the above sketches, some fleeting occurrences that caught the eye are illustrated in terms of **relatively rigid objects** (red lines) as against the temporary or movable objects, **the people** (red shade) (Fig. 51). This duality is what gives a functional quality to the open plan market.

Fig. 52: Colonnaded entrance during winters (Credit: Author).

Fig. 53: Colonnaded entrance during summer through the beginning of winters (Photo: Google Earth Pro).

Fig. 54: Flower shop out of use for the winter months (Credit: Author).
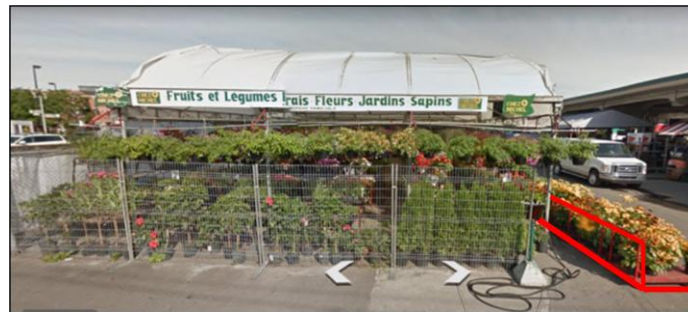
Fig. 55: Flower crates spill over as extension to the shop in the summer months (Photo: Google Earth Pro).

During the winters, the cold weather does not allow for the maximum utilisation of the market, causing it to shrink. However, the site and climate conditions in the summers and autumns generate a semi-permanent extension to the existing entity, re-programming the otherwise mundane parking lot (Fig. 52). The market shell lets in ample light through its large windows, and it starts opening up in various places to allow spillovers of stalls, goods and people into the collonaded parking areas (Fig. 53). Extensions to the existing structure are seen in the form of temporary elements such as fabric awnings, flower crates and umbrellas (Fig. 54, Fig. 55 and Fig. 56).

During the summer months, the market would break out of the 'duality' and have 'multiple' layers of ephemerality.
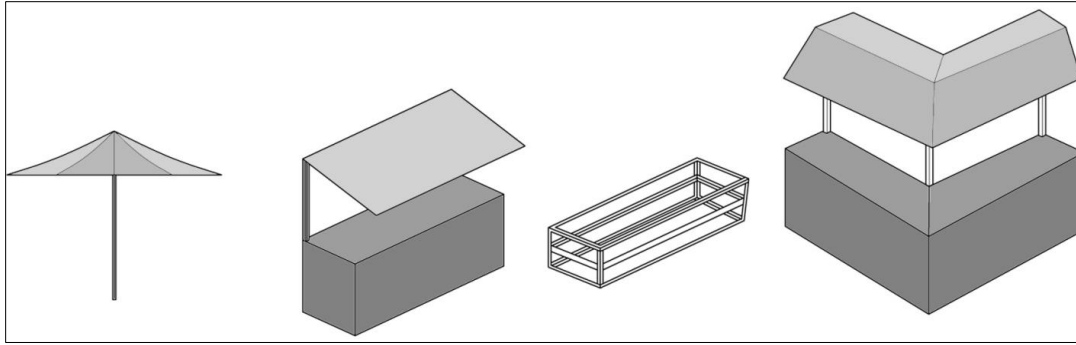
Fig. 56: Elements of flexibility built during the summer months (Credit: Author).

This range of fluidity from static site structures and the permanent market skin to temporary activities and the fleeting crowd provides an adaptable, functional footing to this highly permeable site. In the moderate climate, the market is very active, with the number of sellers and buyers increasing several-fold as compared to winters. Spaces expand as choices of local produce increases. the extent of its permeability and flexibility is thus evident when the market is deconstructed into layers- the existing site as the most **rigid** and the skin of the structure as **permanent** (Fig. 57). The display units and summer roof extensions are **temporary** (Fig. 58 and Fig. 59) and the activities and people are the extremely **flexible** (Fig. 60 and Fig. 61) components of the market. These components define the adjustment capacity of the building, hence determining how adaptable it is to changing surroundings.

Fig. 57: The skin of the structure is permanent (Credit: Author).
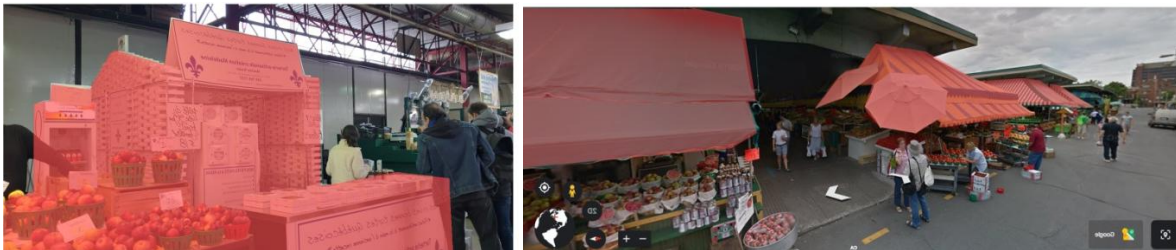
Fig. 58 (left) and Fig. 59 (right): Display units as temporary elements (Credit: Author).

Fig. 60 (left) and Fig. 61 (right): Activities and people as extremely flexible elements of the market (Credit: Author).

- **Deconstructing the site**

The range of temporality in the above components is not limited to three or four layers. As mentioned earlier, they are fluid, and they also overlap. **All the layers are polyvalent**, i.e. they are co-dependent and often overlap (Fig. 62) to create a combination of events similar to the first-hand observations analysed earlier (Fig. 51). These layers are not mutually exclusive in terms of function, and their utility can be re-interpreted when the environment changes. Some layers get re-programmed while some improve as elements of porosity giving rise to spillage and accommodate newer activities. While all urban markets are by nature, transitory, Jean Talon market would not have been so functional had it not been planned to transform for ephemeral situations.
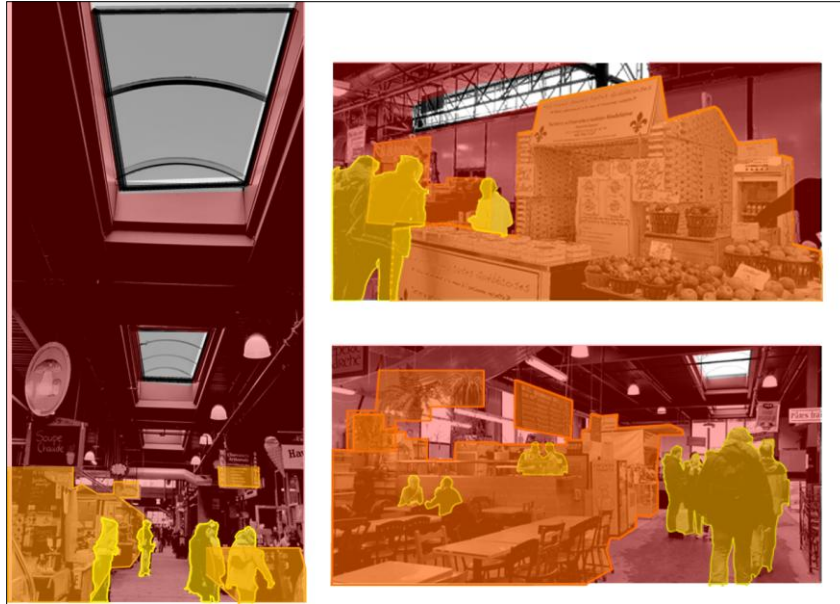
Fig. 62: All the components are what make this market a polyvalent flexible system (Credit: Author).

Such an urban market plays a vital role in the economy of the city. The bustle and vibrancy are reflected through the vendors, hard at work and locals purchasing their weekly fruits, vegetables and dairy products. What we as architects require is a similar polyvalent **design model** that extends beyond time-bound site-specific needs. **By combining the concepts of permeability and ephemerality seen in a market environment, it provides a new lens for resolving the inherent tensions between the permanence of a building and the changing conditions such as densities, functionality and climate.** From this perspective, residential, commercial or mixed-function projects can be designed and constructed to meet not only the current needs but also to provide capabilities of adaption to changing weather and to become supportive infrastructures for sustainable settlement patterns. The site analysis aimed to learn from its time-based transformability. The advantages of permeability and flexibility are achieved as a result of the polyvalent relationship between the layers. They give the market its ephemeral nature.

3.3 *Kumbh Mela*, Allahabad, India: Temporality and Flexibility in a cyclically occurring religious event- Literature review on the extreme case of ephemerality

3.3.1 Introduction

This case study is an example of spatial adaptability and resilience on an urban level. *Kumbh Mela* is a great bathing pilgrimage in India. This Hindu festival held every twelve years is an extreme example of a religious congregation that generates a temporary settlement. In 2017, the festival was added to the list of 'Intangible Cultural Heritage' by UNESCO (Quackenbush, 2019). The reason for its significance is due to the absolute achievement of erecting a temporary infrastructure whose functioning capacity is similar to a regular city. Remarkably the basic building blocks simply include cotton, plastic, plywood and other basic materials like jute and wire to organise the urban grid of roads, electricity, waste disposal and tent structures (R. Mehrotra & Vera, 2015).

As recited in the Hindu mythology, Lord Vishnu dropped the nectar of immortality in a pot (*Kumbh*) in four places called Allahabad/Prayagraj, Nashik, Haridwar and Ujjain. They came to be known as the sacred sites of the *Kumbh* festival. The main ritual, which is bathing in the rivers is said to wash away the past sins to move closer to '*Moksha'* or attain liberation from the cycle of birth and death- 'immortality'. At Prayagraj, the confluence of the three rivers Ganga, Yamuna and Saraswati is where the rituals take place.

The following discussion is based on the study of the full *Kumbh Mela* that takes place in Prayagraj every twelve years. For this report, the focal period is between the years 2012 to 2013 and the festival between 14th Jan to 22nd March 2013. The exact dates, however, fluctuate for every festival as they are determined by the Hindu Luni-solar calendar (Jacobsen, 2008). It is analysed for its cyclical characteristics that go beyond the two months of the festival. It is an example that thoroughly explains the importance of spatial multi-utility.

A version of the festival also takes place annually called *'Magh Mela'* at a relatively smaller scale. The report refers to the event of *'Purna Kumbh Mela'* or full *Kumbh Mela* as its empirical platform for research. *Ardh Kumbh Mela* or half *Kumbh Mela* takes place every six years, i.e.,

between two full *Kumbh Melas*. Another version takes place every three years, alternating between the four holy regions in India (Fig. 63).
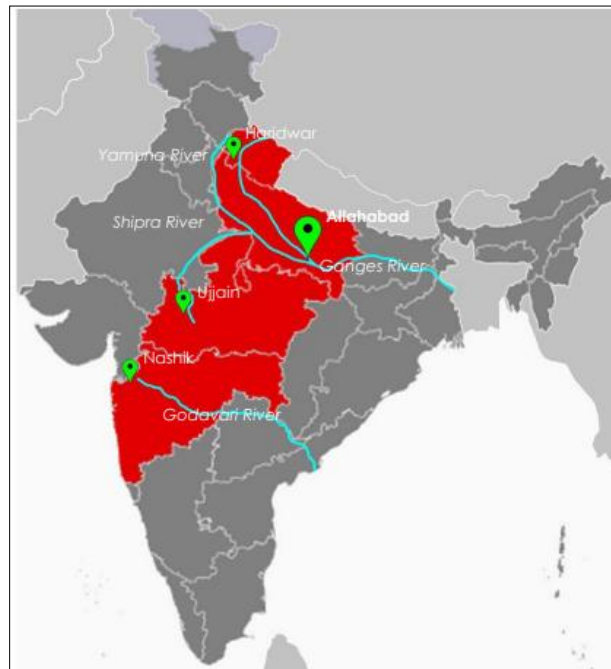
Fig. 63: The four holy cities of India, Allahabad, Nashik, Haridwar and Ujjain. (Sutherland, 2018)

The rivers in Allahabad morph the landscape in effect, directing the system of roads and regional infrastructure. This ever-changing configuration makes the site boundaries elastic. The edge of the river changes drastically with the expansion of its volume during the monsoon months. From June to October, the plain on which the ephemeral event takes shape is immersed. When the waters eventually begin to recede, there is a short window of eight weeks for the process of implementing the design plans for the temporary city. The short timeframe requires the conceptual design and planning decisions to be farsighted with alternative design solutions in case of uncertainties.

The temporal and fleeting events include gatherings, mass vaccinations, meal times and night-time social activities. They work in co-dependence with the makeshift infrastructure, sprawls of tent housing, public vehicles, transit routes, public toilets, drainage systems, electricity grids, bridges across rivers, and hospitals; making it a perfect urban setting of a flexible system (Johari, 2015). When the site is not being utilised for planning and erecting temporary structures, it is

used for performing agricultural activities. On the five auspicious bathing days during the fifty-five-day festival, the pilgrims or *Akharas* form pre-determined groups. Although the bathing ritual lasts about thirty-five seconds per person, the activity begins at 5 am and the final group finishes at 4 pm. During these days there is an influx of an additional ten million people. Through the course of the entire festival in 2013, about 100 million people had visited it making it the densest ephemeral settlement in the world (Fig. 64).
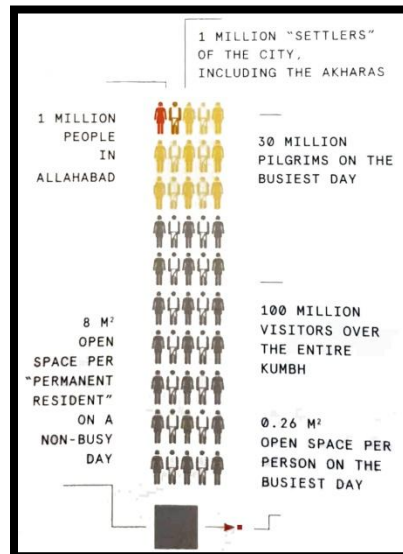
Fig. 64: On a regular day the population density of Allahabad is 8m^2. On the busiest day of the 2013 festival, it was 0.26m^2 per person (R. Mehrotra & Vera, 2015).

A literature review of the book '*Kumbh Mela*- Mapping the Ephemeral Megacity' is conducted as a secondary source case study. The book was a product of on-site analysis by the interdisciplinary departments of Harvard University. This chapter includes a detailed analysis of **the polyvalent relationship between spatial adaptability and physical rearrangements. It is followed by understanding the temporary elements that make the site ephemeral.** The complex management and planning of the festival are also discussed on account of the vastness of the site and the population it carries (R. Mehrotra & Vera, 2015).

3.3.2 Polyvalent Flexibility At *Kumbh Mela*

3.3.2a. Flexibility through 'Spatial Adaptability'

The infrastructural necessities of the city are vast and continuously evolving. It is a fine grid of infrastructure. Adaptability, in general, can be defined as the evolution of a being to adjust with the changing surroundings. It is the inherent quality of resiliency to adapt and reform, allowing various spatial configuration and disruptions (Nakib, 2010). A building can sustain through time even when the surroundings change. A city like Prayagraj, which is created within months to house millions, may cause smaller sections within it to lose their identity. On a social and collective level, spatial adaptability would serve more individualistic needs. It will support the occupants' interaction with their surroundings and amongst themselves. Individualistic needs like space personalisation call for alterations on the site and a rigid urban design project will fail if it does not adapt to their needs. *Kumbh Mela,* in this case, can be considered as spatially adaptable.

The planning of this city is different from other temporary shelters such as refugee and emergency shelters because spatial adaptability is a less relevant urban feature in those scenarios (R. Mehrotra & Vera, 2015).

The planning layout of *Kumbh* is done with a future possibility of personalisation and alterations without losing originality and spatial identity. Each community gets the authority of conceiving their own space and the social interactions that take place within. The urban grid over which the residential tents are organised has a 'neutralisation potential'. It involves maintaining the order of a grid while also facilitating self-expression. Tents are organised incrementally, following a hierarchy in form and size. Small gardens are also created during the period of the festival within the central courtyard space. It is an act of temporal personalisation as it would be erased when the ground is flooded after a few months (Rahul Mehrotra & Vera, 2015).

'The grid' is the main rationalisation element for infrastructural deployment. This grid is that neutralising mechanism that supports diversity within the regular patterns- the only constant in the evolving city. The layout of the grid for every version of the *Mela* is adapted to the site's changing morphology. This morphology is unknown until the water has receded. Therefore, most

of the design decisions during the planning phase are based on this hydrological context, with provisions made for the planners to allow a certain level of structural flexibility. The architectural elements that make this possible are further discussed in the next section. The way in which these architectural elements work together in interdependence with the pre-existing and the permanent elements of the city make it an excellent example of temporary architecture.

Before determining the exact location of the streets, the *Nagri* or the city is divided into sectors. In 2001 there were eleven and in 2013, fourteen (fig.62). From the context of urban planning and management, the divisions permit autonomous control over each sector, allowing focused management. The 'sector magistrate' is the principal authority figure that oversees the design process and the execution of the deployment of the infrastructure for each sector. In this way, every community in these sectors get the opportunity of self-expression and the expression of their internal structure within the community.

On the 'sector level' individuality comes in the form of the overall experience of the space. For example, sector eleven (Fig. 65) which happens to be situated along the periphery of the *Mela* serves as the logistical node or a transportation hub to receive the city's provisions, from where they are distributed across the *Mela*. The fourth sector (Fig. 65) is located near the confluence of the rivers due to which it gains an identity of being the most socially and culturally active. Within each sector, there are different kinds of grid clusters for tents, making the plan of the city customisable(Fig. 66).
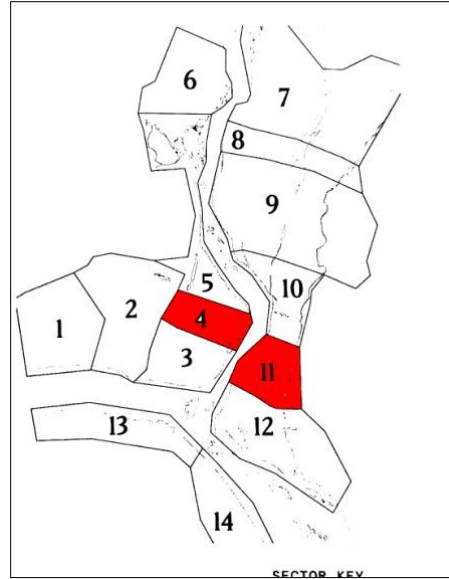
Fig. 65: The map of the 2013 *Kumbh Mela* divided into fourteen sectors (R. Mehrotra & Vera, 2015).

Fig. 66: Different tent clusters of the grid (Macomber, 2014)

3.3.2b. Flexibility through 'Physical Rearrangements'

The infrastructure and architecture are the tangible elements of the site. They define a sector or a grid's physical ability to rearrange as per the ever-changing hydrological context. Every planning cycle brings along new characteristics in the form of an altered terrain or a change in the number of pilgrims. The site components, in that case, must be reconfigured and rearranged as per the new conditions.

The tent is one of the most common forms of the temporary architectural unit. It is an enclosure system made out of simple generic elements. Some basic elements like plywood, bamboo, sticks and a surface material such as corrugated metal or tent fabric allow for recombinatory assemblies of tents. These assemblies range from small tents to large congregation halls and temples (Fig. 67, Fig. 68and Fig. 69).
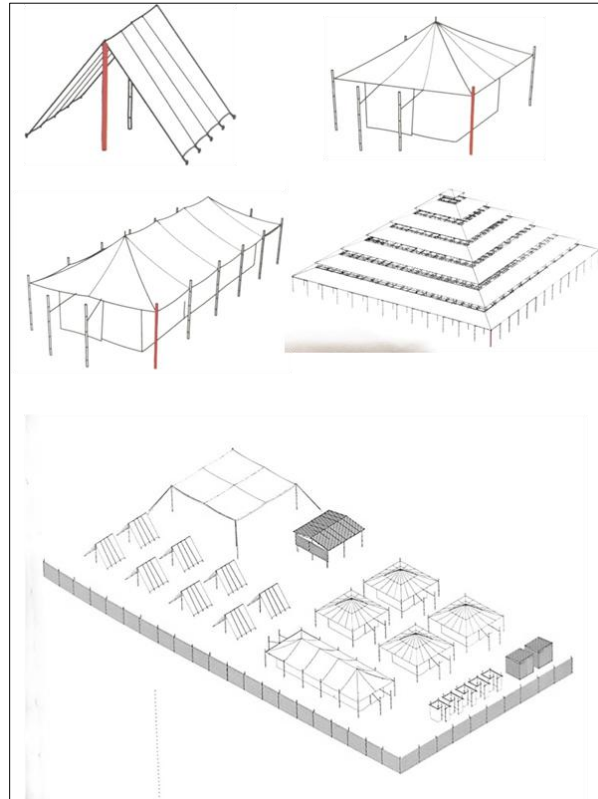
Fig. 67: Made up of basic elements, the recombinatory quality of a tent structure allows for various configurations (R. Mehrotra & Vera, 2015).
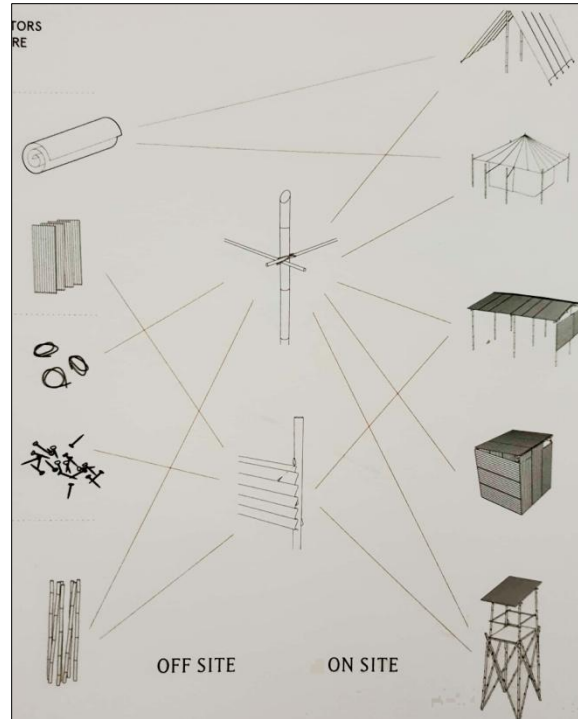
Fig. 68: The recombinatory quality of the basic building elements makes the structures flexible

(R. Mehrotra & Vera, 2015).

Fig. 69: The recombinatory quality of the basic building elements makes the structures flexible

(R. Mehrotra & Vera, 2015).

These elements are small and light enough for one or two workers to carry and assemble them on site (Fig. 70). The standard nature of the sticks and simple connections using ropes and nails ensure the possibility of recombining these elements in almost infinite ways. The advantages of this method of construction include cost-effectiveness in addition to providing labour opportunities to hundreds of workers of the region (R. Mehrotra & Vera, 2015).
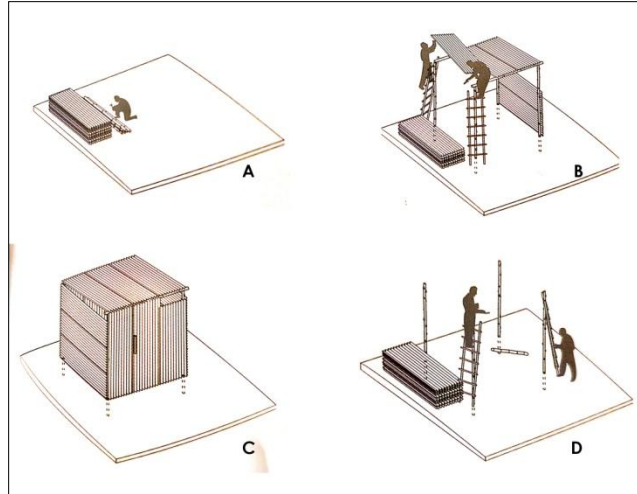
Fig. 70: The basic elements are light and easy to assemble and rearrange structures of different forms and sizes (R. Mehrotra & Vera, 2015).

3.3.3 Streamlined Planning And Logistics

In order to manage the density of people and make provisions for uncertainties in the site layout, the planning stage has to be ironed out to every foreseeable detail. When metropolitan regions like Mumbai or Delhi evolve with time, they grow stronger, and they can make provisions during crises based on their past experiences. However, a festival city as large as *Kumbh Mela* which is built from ground-up once in twelve years misses the factor of 'absolute continuous growth'. Every version of the *Mela* that has been celebrated in different cities teaches a new lesson in resilience to the planners and organisers.

At the *Mela*, scheduling charts, directing the movement of the bathing crowds, managing meal queues, repairing and maintaining tents and providing immediate medical attention are few of the many tasks that need seamless execution. Without relying on advanced data processors, the organisers manage to streamline these activities. They rely on the logistical decisions made during the planning stage and the feedback received from past visitors, that keeps on updating with every festival.

A centralised plan helps in streamlining the deployment of tents, pontoon bridges, electrical grid, health and sanitation facilities. Apart from the construction and material management, other complex issues that need rationalisation are the coordination between design and delivery. The planners and the organisers also have the task of allocating people and movement of goods,

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making provisions and plans of action in order to mitigate onsite risks, keeping a check on a continuous flow of resources like food and water.

The Harvard team conducted this analysis and made a note of the execution of some of the most complex construction decisions. For the 2013 festival, eighteen pontoon bridges were needed to complement the existing bridge on site. The number of pontoon bridges required was decided based on the expected inflow of visitors. About 156.2km of roads were constructed to facilitate the movement of 892 regular use buses and 3,608 special buses. Transportation decisions that were made in advance included making ninety-nine parking lots and five temporary bus stations. 750 trains operating in seven train stations in and around Allahabad were dedicated to carrying pilgrims from different locations. For controlling fires, crimes and the influx of the crowd, thirty fire stations and thirty police stations were placed at regular intervals. Eighty-five security cameras and fifty-six temporary watch towers along with fourteen hospitals ensured the safety of people. A total of 43,500 sanitation facilities were constructed including 35,000 individual toilets, 7,500 trench toilets and 1,000 crude or makeshift toilets (R. Mehrotra & Vera, 2015).

Despite having executed every planning decision to a final number of required facilities, organisers had to allow a window of flexibility in the numbers while the festival was in progress. **Analysing the streamlined planning and logistics of *Kumbh* on how a complex system works would be especially useful for planning similar heavily crowded ephemeral settlements.**

3.3.4 An Ephemeral Site- Planning And Execution

As explained above, the model of *Kumbh* needs to be flexible as a temporary and a cyclical event that is ready to adjust with the continually altering terrain. Based on lessons from the past versions, the planning phase includes intangible elements like provision for uncertainties, safety factors and preconceiving the movement of large crowds. This task has to be carried out while making sure that spaces are adaptable for individual personalisation as well (Vera & Mehrotra, 2015).

The site of Prayagraj, otherwise an agricultural land during summers and monsoons lights up during the winter months. Michael Lee and Juan Pablo from the Harvard interdisciplinary team carried out their research using time-based deployment and analysis of high-resolution satellite

images of the site. The changing morphology of the site was evident with the change in the topography after the monsoons. Steadily the built environment took shape in the form of roads, pontoon bridges, land divisions, electric poles, water supply lines, sanitation facilities, securing river edges, and erecting tents in the form of various clusters.

The following timeline descriptions explain in brief the planning and execution during the 2013 festival.

March 2012: From March 2012, maps of the existing site were drawn and sent to the army. After a layout was finalised, material transportation began. However, this planning layout may have evolved with the changing terrain until the end of monsoons in 2013. The management and administration meetings took place towards the end of May between the respective authorities of the city like the chief secretary and the *Mela Adhikari* / officer-in-charge of the festival (Fig. 71). However large parcels of the land connected with dirt road tracks were utilised for agricultural purposes before the actual festival preparations began (R. Mehrotra & Vera, 2015).
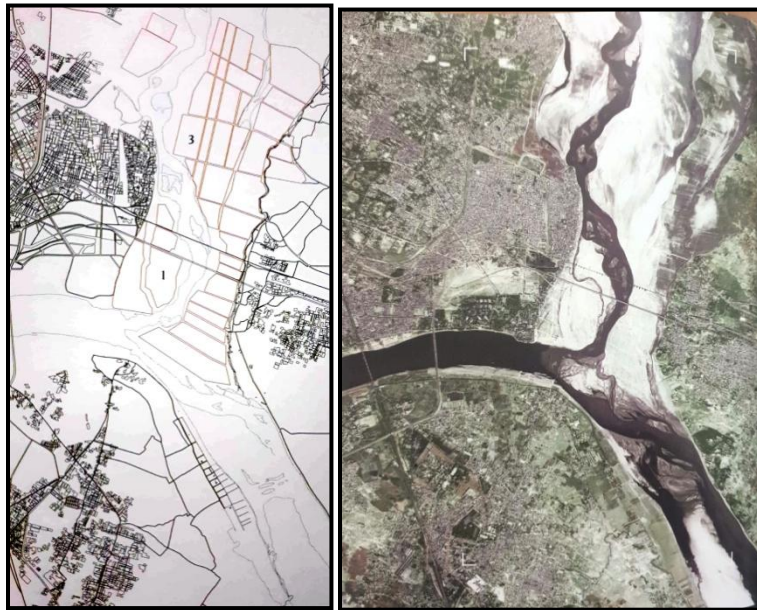
Fig. 71: Finalisation of a layout to begin material transport (R. Mehrotra et al., 2015).

October 2012: As the waters receded and evaporated in the October heat, the land below became accessible for the groundwork of levelling and road demarcation. Sector boundaries were

identified and electrical poles installed. Elements of the metal pontoon bridges were brought to the site (Fig. 72) (R. Mehrotra & Vera, 2015).

Fig. 72: Roads are demarcated, sectors identified, and materials for pontoon bridges brought to the site (R. Mehrotra et al., 2015).

December 2012: By mid-December, all main metal roads were laid, and interconnecting roads were marked. Three-fourth of the pontoon bridge construction was completed. A bund wall of sandbags was systematically arranged along 25% of the river's edge. The main infrastructure that includes water lines, electricity, and telecommunications was deployed. Bamboos poles for tent and metal enclosures were erected (Fig. 73) (R. Mehrotra & Vera, 2015).

Fig. 73: Infrastructure for water supply and drainage, electricity, and telecommunications is erected; tent and metal enclosures are built (R. Mehrotra et al., 2015).

December 2012 to January 2013: All the access routes were constructed, and maximum work for securing the river edge was completed. Pontoon bridges were ready for use by the end of January (Fig. 74) (R. Mehrotra & Vera, 2015).
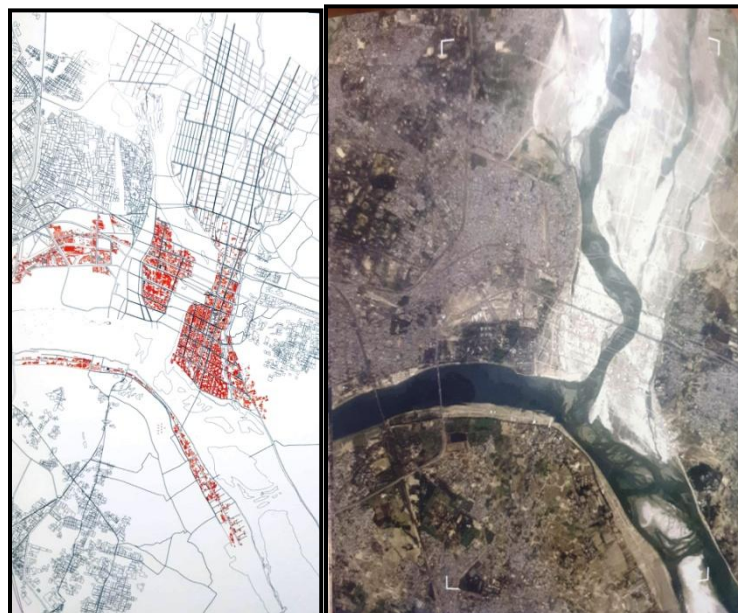
Fig. 74: Road and pontoon bridges construction completed (R. Mehrotra et al., 2015).

January 14th to March 22nd: The *Mela* was functioning during this sacred time of the *Magh* (January/ February) with a total of 100 million people having visited or lodged at the festival. As per the satellite images referred and maps generated by the research team, February 7th saw *Kumbh Mela* occupied to its maximum capacity (Fig. 75) (R. Mehrotra & Vera, 2015).
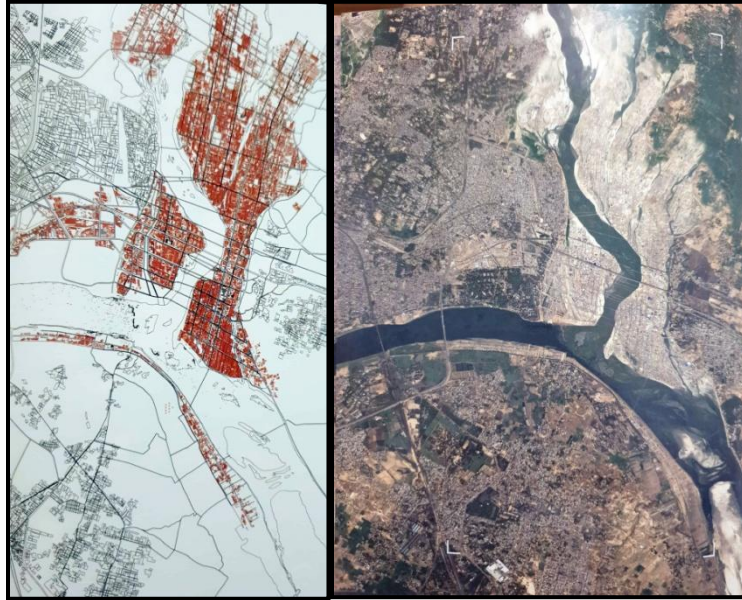
Fig. 75: The city of Prayagraj fully functional during the festival (R. Mehrotra et al., 2015).

March 2013 to April 2013: Just as it had come to life within a few months, it began to dissipate into smaller parts until no trace of its existence was left. The tents were dismantled, and most of the infrastructure was deconstructed and sorted as per reusable and non-reusable materials. The residents of the city reused the sandbags. Once the entire infrastructure was taken down all connector routes like metal roads and pontoon bridges were dissembled, erasing the trace of a city having been there (Fig. 76). The agriculture activities resumed, and while the rituals continued at the confluence of the rivers, they were organised in small private groups (R. Mehrotra & Vera, 2015).

Fig. 76: The presence of the vibrant city starts fading with the dismantling of the infrastructure and segregation between reusable and non-reusable materials (R. Mehrotra et al., 2015).
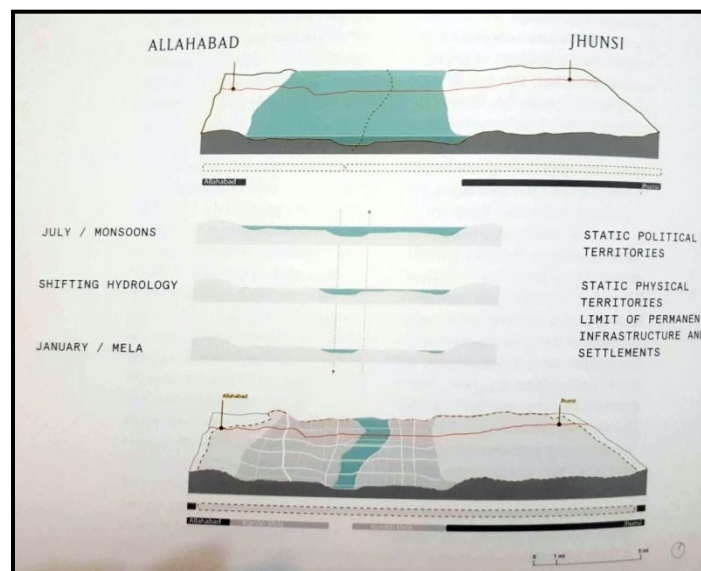
Fig. 77: The annual cycle of the shifting hydrology that shapes the layout plan of every *Mela* (Sutherland, 2018)

When a site functions around a hydrological context (Fig. 77), it is essential to understand how preparations are made for erecting an ephemeral city. *Kumbh's* planning is fairy organised to

every last detail keeping in mind that the cycle of construction and deconstruction is carried out efficiently.

3.3.5 Architectural Elements Of An Ephemeral City

While the execution and on-site construction and deconstruction carry out for at least twelve months, the planning discussions begin much more in advance. Urban designers, planners, architects and other relevant disciplines are attentive towards developing and executing a master plan where logistics of a heavily clustered ephemeral city need to be streamlined. In this case, sector magistrate and the *Adhikari* as discussed earlier oversee the sector and grid planning in addition to the road laying work, constructing makeshift bridges and building efficient sanitation facilities while keeping in mind crowd control and sector-wise movement scheduling.

However, in terms of architecture, this means selecting the right materials, construction techniques and its timeline of execution. **These architectural elements are what give an ideal ephemeral city its flexible quality of spatial adaptation and physical rearrangements.**

3.3.5a. Tents

Tents, a universal element for temporary settlements, house the residents of the pilgrimage. An exclusive manufacturer and distributor were approached during the 2013 *Mela* who brought the tent parts and furniture to the site. Same distributors were given the contract for the tents for the *Mela* in the other three holy cities. There are different uses for the tents on the site, due to which its elements need to be **rearranged.** Functions that are housed by tent structures are all enclosed spaces like kitchens, bathrooms and different typologies of residential tents. While bamboos are used as structural elements for the upright framework, the roof is made of bamboo, pipes and trusses that also support the overhead tube-lights and bulbs. The tents are used in a modular hierarchical order from square layouts to large rectangular units depending on different levels of desired luxury. All tents, small or large, are arranged within a typical urban grid. Corrugated metal sheets are bound together with upright bamboos to act as a compound wall following this urban grid (Fig. 78)
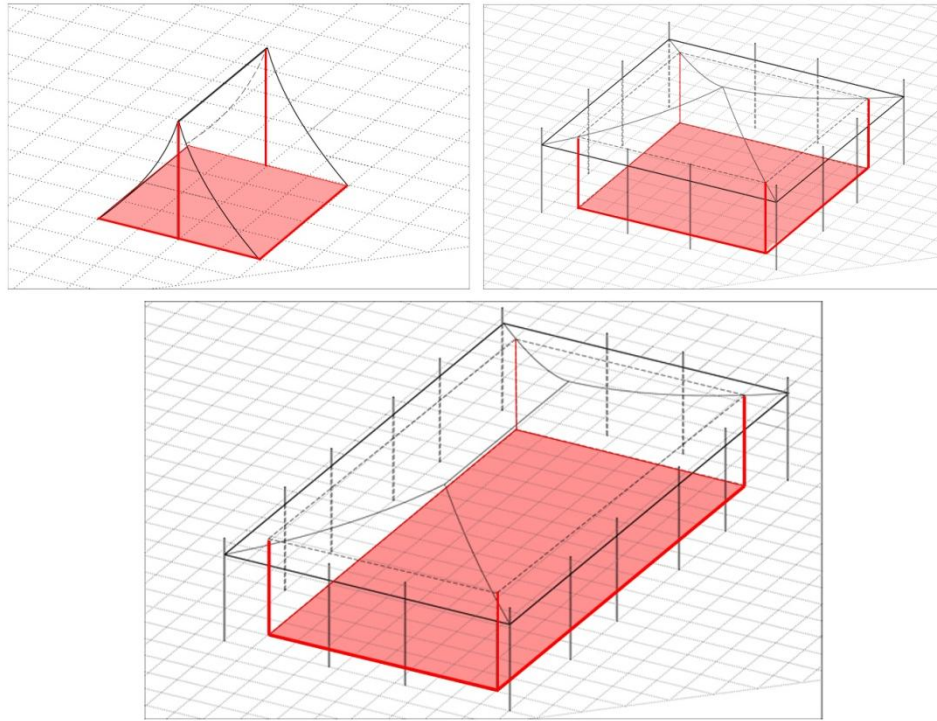
Fig. 78: A typical grid gave shape to tents of different sizes. (Credit: Author. Adapted from Fig. 67)

The tents also offer social adaptability. They can be used as gathering spaces for religious purposes, socialisation, and entertainment. Healthcare facilities that are of the utmost importance in a highly dense city such as this are also housed within larger modules of tents.

3.3.5b Pontoon Bridges- Fabrication And Assembly

During the 2013 festival, seventeen floating bridges were built to stitch the two long river edges together. They are the key components that streamline the movement of the crowd during peak events of the festival, such as bathing times, prayer meets, and mealtimes. '*Pipa'* is the hollow and cylindrical steel pipe that is the main floating element of the bridge (Fig. 79 and Fig. 80).

There were a total of 4,479 such pipes that were used. Out of these 1,510 were reused from the previous versions of the *Mela* from the four sacred cities. Each hollow pipe is a gigantic thirty-two feet long, eight feet in diameter, and weighed about 4,950 kg. Steel cables connect the pipas above water and coir ropes below water. Bamboo tripods are made to function as anchors on both sides of each *pipa*. Once the tripods are erected in the water, the entire floating system or pontoons are connected to it with screwed-in beams. Like any other wood-metal bridge or any

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indoor wooden flooring, the top surface is levelled with wooden plates. The wooden surface is then layered with metal plates (Fig. 81 and Fig. 82).

Fig. 79: A reusable pipa or cylindrical steel pipe being transported to the site (R. Mehrotra & Vera, 2015)
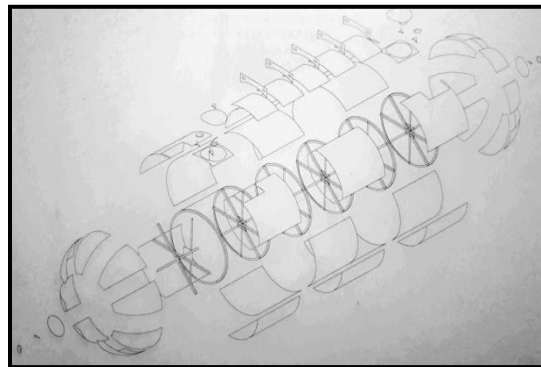
Fig. 80: The exploded view of a typical pontoon (R. Mehrotra & Vera, 2015).
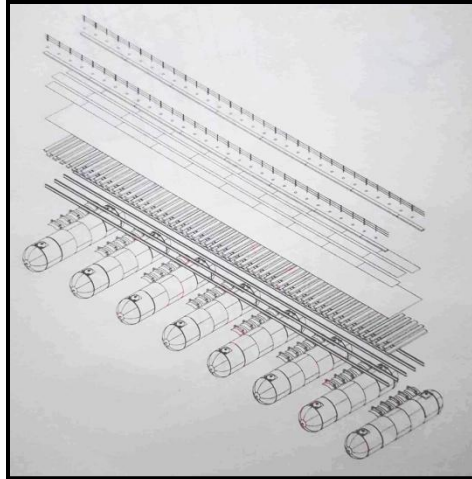
Fig. 81: The exploded view of the material layers of the pontoon bridge (R. Mehrotra & Vera, 2015).

Fig. 82: All pontoon bridges completed and in use (R. Mehrotra & Vera, 2015).

The pontoon system is equipped with the security system to oversee the slow-moving crowd at all times. During the festival about thirty-five people are appointed to watch the bridge and manage the discipline of the crowd movement. These bridges are one of the most remarkable elements of this ephemeral city, as they are reused at other sites and for emergency and disaster relief (R. Mehrotra & Vera, 2015).

3.3.5c. Securing The River Edge

The course of the rivers structures the morphology of the terrain. The holy days are the days of high risk when large groups of people gather along the edge of the river for bathing. It involves repeatedly dipping oneself in the water where each person is allotted about thirty-five seconds.

Therefore bamboo fences with layered sandbags are built along the edges of the river to subdue the force of the river current and ensure safety. It also extends the land boundaries of the city (Fig. 83 and Fig. 84). They extend one to three meters beyond the edge preventing other elements like metal roads from getting eroded. The clashing currents harden the sand, making it structurally more stable (Poole, 2013).

The exact edge along the river is never finalised until the end of the monsoons. Additionally, the confluence of the rivers is what makes Allahabad the prime location for the largest version of the *Kumbh*. Hence, being able to reform the natural edge and iterate it as per changing situations is what gives the *Mela* its quality of physical flexibility.

Fig. 83 (left): The beginning of the process by lining the sandbags to form the edge (R. Mehrotra & Vera, 2015).

Fig. 84 (right): Bamboo fence and layered sandbags (R. Mehrotra & Vera, 2015).

3.3.5d. Modular Road System

Along with bridges, the state of Uttar Pradesh is primarily responsible for the construction of streets in terms of construction and maintenance. The roads need to be widened and increased in number and network with every new version of the *Mela*.

Three kinds of streets form the grid of the *Mela.* The main streets that run through the *Mela* are permanent, and they are never erased. The secondary streets connecting them are called *Gattas*. A *Gatta* is centrally positioned, elevated to about twenty-four inches sloping in the direction of the river edges. Square metal plates are laid on two sides to provide the required friction for the vehicle tires on the sandy terrain. Each plate is 6mm thick. For the 2013 *Mela,* a total of 116 km

of plates were used. Finally, intermediate streets or *Pucca* made of bitumen are the temporary elements in this modular road system (R. Mehrotra & Vera, 2015).

The reusable metal plates are bolted with each other to make cross-connections. The metal plate being the modular component of the road system, allows for maximum flexibility through road extensions, or for rearranging the existing ones by removing the redundant road networks and re-deploying them as and when required on the vast open land (R. Mehrotra & Vera, 2015).

The above mentioned adaptive architectural components have a typical quality of rearrangements. The infrastructural elements like the bamboo piles, steel beams and sandbags can form multiple iterations of a required structure. They make design decision making more straightforward and open to changes like additions or reversals. They essentially define an adaptive and dynamic city that we aspire to see in other urban areas. One can treat the architectural elements and layout of this pop-up city as a conceptual model for future ephemeral cities.

3.3.6 Governance In An Ephemeral City

If one had to analyse a pop-up city as an extreme case of ephemerality, the cyclical event of *Kumbh Mela* would stand out for its leadership and organisational success. The scale of the event and its riverside location makes it a breeding ground for confusion and casualties. To realise the multi-faceted approach of planning the *Kumbh Mela* undertakes, Harvard's multi-disciplinary team extrapolated not only the elements of flexible architecture but also other defining features such as the organisation of religious ceremonies, public health and sanitation. Both private and government sector worked in collaboration; took leadership where appropriate and stepped back when required (R. Mehrotra & Vera, 2015).

Recognising the government's role is important because even though a pop-up city is created, it takes an equal amount of commitment and decision making to keep running it smoothly. Unlike the physicality of the site, what remains the same is the central purpose of this gathering–religion and faith. Therefore it is essential to let the city function in the interest of all its devotees without constraining it. Therefore religious leaders step in as the primary content makers of the festival. In light of promoting spatial adaptability, the government allowed each community to

take over the functioning inside their subunits or tent clusters. An adequate amount of security personnel was stationed in every sector, on bridges and along the riverside to ensure safety while maintaining general decorum and avoiding brute force. Facilities like water supply and electricity supply were abundant. As per the researchers, electricity was heavily subsidised due to which it was taken for granted. There were hospitals and clinics dispersed at equal distances. While the state provided 44,000 toilets, regular maintenance daily cleanliness had to be outsourced. Retail and wholesale markets, in addition to private food stalls, were situated in and around the periphery. However, while planning tent clusters, it maintained the delicate sense of status hierarchy amongst the visitors that has existed throughout the festival's history. The land allocation was done based on the status of seniority amongst the devotees (R. Mehrotra & Vera, 2015). However, such practices may not be appropriate in a regular urban scenario.

A takeaway from the above observations made on site in terms of planning and governance would be— following an urban grid and convenient routes for pedestrians. Their safety should be prioritised. Various measures to ensure the safety of residents from pathogens and water-borne diseases must be taken. Finally, private communities; in this case, the community leaders must be given an equal stake in the decision-making.

4. Chapter IV: Critical Analysis by Shearing Layers of Ephemerality

4.1 Introduction

The approaches highlighted in the case of *Kumbh Mela* can be utilised as guidelines like 'Do's and Don'ts' for the functioning of a new ephemeral city in the future. The disastrous effects of climate change, for example, cyclical submergence of coastal regions are yet to be seen. As per UN environmental chief Erik Solheim, rising sea-levels is one of the biggest threats to cities around the world (Fig. 85). Since the past few years, the annual average temperature has gone up and is projected to follow a perpetual uphill trend. The rising temperatures will cause water in the oceans to expand and ice caps to melt leading to frequent flooding or even submergence during monsoons in tropical coastal regions (Holder et al., 2017).
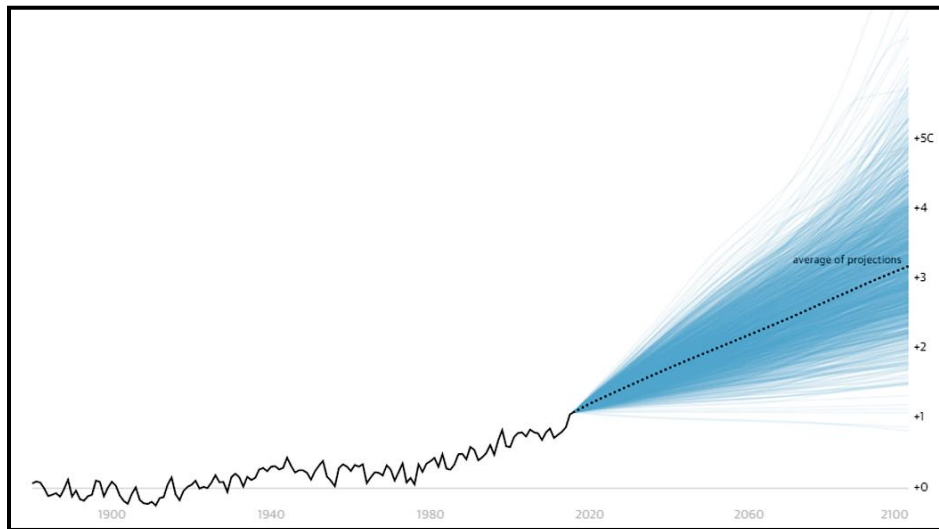
Fig. 85: The projected increase in global temperatures (Holder et al., 2017)

During times like these, when millions of lives are under threat, evacuating cities is simply impossible. To prepare for such a future, researchers and city planners need to study the existing ephemeral events to 'build', 'maintain' and 'wrap up' new cities when the monsoons approach. The regulatory approach of *Kumbh Mela* provides us with guidelines required to be implemented in the pre-design and a pre-construction phase of a temporary city.

4.2 Ephemeral Urbanism

As quoted in the section 1.3 Philosophy of Temporality in Architecture, "For things to remain the same everything must change". The factor of time is essential for the planning and design of anything we build. Our built environment can only sustain itself if it can evolve, be resilient and update with time, and respond to the changing conditions (Bellini & Macchi, 2016). The timetable of a building's functionality is fixed – either due to its structural character or more commonly – due to its functional character. Therefore, we need to devise a new form of urbanism that is time-based and resilient towards fluctuating natural events and evolving conditions. In dense metropolitan cities **'Ephemeral Urbanism'** could be the progressive and the most relevant form of urbanism in the near future. It advocates temporal architecture and adaptable use of spaces with the aim to be resilient and adaptable.

In the case of coastal regions that are under the threat of frequent flooding, resilience should be maintained in order to combat the effects of sea-level rise. It would require an inter-disciplinary collaboration between the city planning committee, urban planners, urban designers and architects. Collaboration with adjoining unaffected dry zones is integral as this region would function as a complementary settlement to the wet zones during monsoons. While the practice of ephemeral urbanism is yet to be seen as a formal urban typology, for coastal regions, ephemeral urbanism is applicable as a possible measure for handling effects of 'climate change'.

4.3 Assessment of case studies

There is more than one singular approach to building flexible systems. An entirely ephemeral settlement entails a fluctuating **Environment**: geographical conditions and physical terrain; **Space**: the holy riverside where the rituals take place; **Activity**: the act of performing the rituals and the activities related to residing in that settlement; and finally **People**: all the fleeting interpersonal interactions that are momentary and time-based.

The flexible system of the *Ruelles Vertes* is an example of resilience and sustenance through greening and cultivating food in the back alleys. A back alley here is the flexible ground like an 'open building' albeit, outdoors. The multi-utility of the alley is *Ruelles Vertes'* fundamental function as a flexible system.

Jean Talon market is another example of an open building whose flexible character is amplified when the season permits outdoor commercial activities. It is an open building, the layout of which makes the space permeable. As the seasons change, its capability of physical rearrangements is evident when the market stalls pour out. Similar to the tent structure, these stalls can be considered as truly flexible architectural objects.

From the above approaches, it is evident that planning for a temporary scenario is concurrent to having a foresight integrated into the planning and design process. This foresight also affects the consequent actions carried out by other participants in the process. At the end of qualitative analysis in chapter three, it was discussed that the pre-architectural or a pre-construction phase is crucial to the decision-making process of the temporary city. This chapter makes a concise numerical analysis on the plan of action that includes concrete decision-making, execution/ construction and deconstruction timeframes. The aim is to address the research question- **"Depending on parameters of varying scales, how long does a functional process take? Furthermore, to what extent is it organised ahead of time to achieve its flexible character?"**

4.4 A Quantitative Analysis

- A timeframe analysis of the extreme case of ephemerality: *Kumbh Mela*

This research method begins with recognising said 'parameters' that are time-based. Here, what will be considered as 'parameters' helps us 'measure' the amount of **time** any festival-related or seasonal component takes. It must have an approximate numeric or measurable value. In the case of *Kumbh*, the '**time**' it takes to assemble, and dismantle is the central part of the analysis. It is also a crucial lesson in the discourse of ephemeral urbanism for future cities, assuming that they are similar to *Kumbh* on various fronts like the socio-economical conditions and geographical and climatic conditions.

4.4.1 Parameters of Ephemerality

The purpose of numerically analysing this festival is to extract a 'formula' for the urban design and planning of a new or an existing city, which in the future may primarily be driven by geographical conditions like sea-level rise or land-submerging monsoons. While such a

technique is admittedly more inclined towards a theoretical approach, the 'formula' is meant to lay guidelines for a city that may need to wrap up before the monsoons and re-assemble cyclically.

These parameters define the site conditions that alter at regular intervals. The parameters of the *Kumbh* site are noted by applying the concept of 'Shearing Layers of Change' by Stewart Brand, which is based on the Frank Duffy's study of 'building layers' (Fig. 86). As per Duffy, a building is always tearing itself apart. A building can be conceived through several layers of longevity by their built components (Brand, 1995). Brand compelled architects, constructors, other professionals and habitants to reconsider their approach towards design decisions that affect the building's performance over time, essentially asking them to review the factor of time in their buildings projects (Koenig, 2019). The shearing layers are based on a scale from the most dynamic and fleeting layer to the least dynamic or static one. These layers or parameters define the adjustment capacity of the building, hence determining how adaptable it is to the changing surroundings.
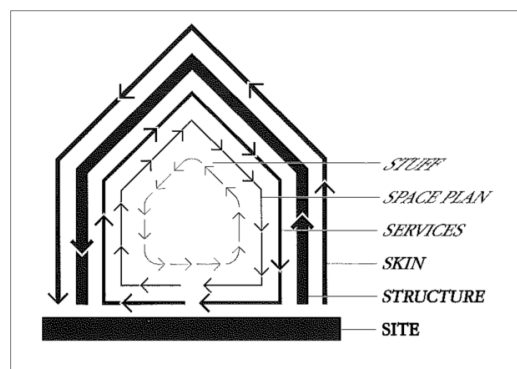
Fig. 86: Brand's shearing layers of change in a building (Brand, 1995).

Layer	Span	Elements and character
Site	Eternal	A geographical setting
Structure	30-300 years	The structural quality, which can be called as the backbone of the physical built environment.

Skin	20 years	Every element that defines a boundary of interiors and exteriors is the skin of the building. It changes as per trends or for better insulation.
Services	7 to 15 years	The service core of the building where functions and movements are directed by it.
Space Plan	3 years	Building's interior layout, including partitions, walls, false ceilings and doors, change faster with changing functions. This is common in commercial structures.
Stuff	Weekly or monthly	People, furniture, appliances, clothes, books, and so on, are the most dynamic by nature

Fig. 87: The time spans of the 'Shearing Layers' of a building (Brand, 1995).

From Fig. 87, as per Brand's Shearing Layers of Change, the **Site** is assumed to be a natural setting. It is the most static part of the built environment, almost eternal if there are no natural or human-made disasters. It could be a defined plot which lasts forever, while the existence of the buildings on it is ephemeral. The **structure** is the man-made built architecture. Typically the life of a modern reinforced concrete frame structure lasts forty to sixty years. The **skin**, or the building envelope is what distinguishes interiors and the exteriors of the structure. After about twenty years, the skin is altered in terms of architecture. It is upgraded through insulation, painting or cladding. As for **services**, they are the solid core within a building around which other dwelling spaces and circulation is planned. It includes communications wiring, electrical wiring, plumbing and fire fighting system that need regular maintenance. They need to be replaced every seven to fifteen years. Elevators and staircase are the primary hinges that direct the circulation within a building. The **space** plan is the interiors that need not be fixed during the architectural construction of the building. It includes non-load bearing elements that can be constructed and demolished as and when desired. It includes partitions like drywalls, panelling walls, false ceilings, doors and fenestrations. In the case of commercial buildings, these are found to be modified or replaced every three to five years. In residential buildings, the span could be longer depending on the dweller's choice of interior renovations. **Stuff** is the most ephemeral parameter of a site. It includes everything movable and momentary. It includes furniture, books, utensils that may be moved daily (Bosma et al., 2000). People are the dynamic 'infill' that caps the overall purpose and functionality of the building.

In this way, Brand bifurcated the layers of a building as per their longevity. A similar analysis is applied in the case of *Kumbh* in the further sections.

4.4.2 Shearing Layers of Change at *Kumbh*

In this scenario, rather than one singular building, an urban setting is sheared into layers as per their longevity. These layers are the 'parameters' that define the event's and the site's scope for cyclical flexibility. While 'eternal' or thirty to three hundred years relates to perpetuity, the most extended layer in the case of *Kumbh Mela* is as short as approximately six months. Every parameter after that is crunched to a lifespan of six or less than six months. The timeframe analysis by the Harvard team is used as the main source of information for on-site observations (Fig. 88).
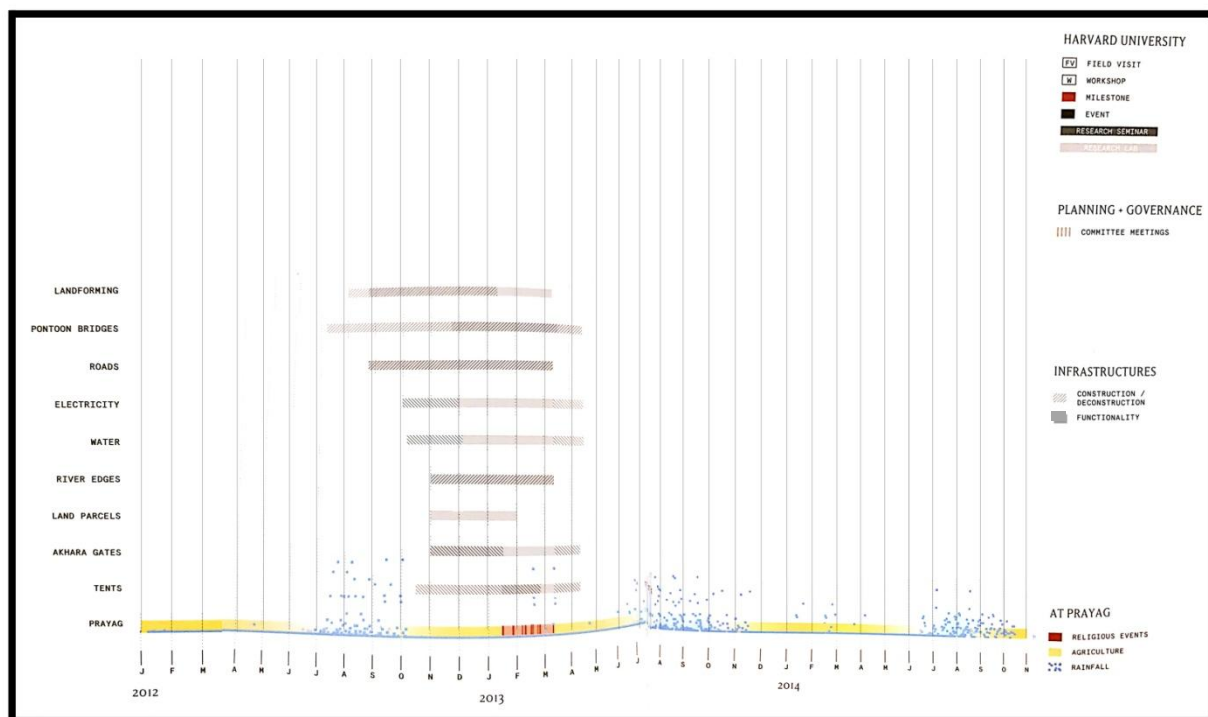
Fig. 88: A timeline analysis of parameters/components of site (R. Mehrotra & Vera, 2015).

Adapted from Fig. 88, the extent of assembly and disassembly or in other words, the longevity of the ephemeral city is deduced. It describes the site components or parameters when they are in the 'construction', 'in use' and 'deconstruction' phases. These parameters are 1. Land forming, 2. Pontoon bridges, 3. Roads, 4. Electricity, 5. Water, 6. Securing river edges, 7. Land parcels,

8. *Akhara* gates (urban grid clusters demarcated with metal sheets), 9. Tents, and 10. Festival (R. Mehrotra & Vera, 2015). It defines the project's capability for spatial adaptability and physical rearrangements, hence, a good example of an ephemeral event/city. **Fig. 90** describes the timeframe analysis of construction, in use and deconstruction of various site parameters at *Kumbh* between the years 2012 and 2013.
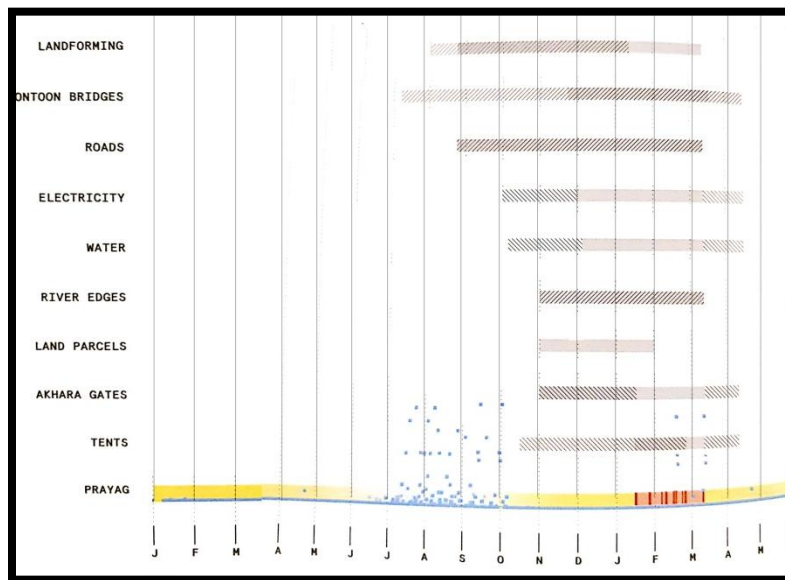
Fig. 89: Graphical representation of the construction, in use and deconstruction of these parameters (R. Mehrotra & Vera, 2015).

				ELEMENTS & CHARACTER	
Layer	**Parameters**	**Span (including construction, in use and deconstruction) time**	**Timeframe**	**Description**	**Construction, in use and deconstruction phases**
Site: Land and water	The plotted boundary of *Kumbh Mela* used for land forming	≈6 months	Aug-Mar	A fluctuating geographical setting where the ground surface takes form after the river water	

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	-Land(existing)			recedes	
	-Water(receded)	≈7 months	Oct-Apr	A fluctuating geographical setting where the river edges take form after the water recedes	
Infrastructure	-Pontoon bridges	≈9.5 months	Jul-Apr		Construction and deconstruction: ≈ 9.5 months In use: ≈4 months
	-Roads	≈7 months	Sep-Mar		Construction and deconstruction: ≈ 7 months In use: ≈7 months
	-Electricity	≈6.5 months	Oct-Apr		Construction and deconstruction: ≈ 3 months In use: ≈3.5 months
	-Securing river edges	≈4.5 months	Nov-Mar	A combination of sandbags as and bamboo is used	Construction and deconstruction: ≈ 4.5 months In use: ≈4.5 months

	-Demarcating land parcels	3 months	Nov-Jan		Marking process and in use: 3 months
	-Grid metal compound walls	≈7 months	Nov-Apr		Construction and deconstruction: ≈ 4 months In use: ≈4.5 months
Skin	Tents	≈6 months	Oct-Apr	Tent fabric, corrugated metal sheets and jute are the primary construction materials	Construction and deconstruction: ≈ 5 months In use: ≥ 2 months
Services	Sanitation stalls	≈6 months (same as the skin in this case)	Oct-Apr	Unlike a central service core, planning around the toiletS and bathing stalls is not rigid. However, they are installed at regular intervals. In case of individual restrooms within tents- much like an open building- the planning of the interior will not be dependent on the stalls as they are detachable.	Construction and deconstruction: ≈ 5 months In use: 2-5 months

Space Plan (within an enclosed tent)	Tent interiors	≤6 months (same as the skin in this case)	Oct-Apr	An open plan layout within the tent.	Construction and deconstruction: ≈ 5 months In use: ≥ 2 months
Stuff	People	Fleeting	Jul-Apr	The people and their activities are fleeting and momentary from the inception of the construction process until the settlement is cleared	All activities related to *Kumbh*: ≈10 months

Fig. 90: A detailed numerical analyses of the time frames for construction, in use and deconstruction- to be used as a guideline for other coastal ephemeral cities assuming they are geographically and socio-economically similar to Prayagraj (Credit:Author. Adapted from Fig. 88).

Fig. 90 shows the organisation of the site parameters or components under the shearing layers. The longevity period is the 'span', and the 'timeframe' is in terms of months. The longevity period is then bifurcated as per construction time, in use or the functionality time and deconstruction time. There is a possibility of overlap amongst these phases as occupancy begins in one part of the site while the construction is still in progress in another part.

In a regular building, the stretch of time is longer. The building site is the longest and the most rigid layer while people and furniture, the most dynamic. However, when the complete built environment lasts from thirty to three hundred years, the settlement is far from ephemeral. When we indeed attempt to design ephemeral settlements as a new form of urbanism, Fig. 90 may be used as a prototype. The actual festival analysed lasted from 14th January 2013 through 22nd March 2013. It can be seen that a considerable amount of time is required in the conceptual design, planning, organisation and on-site execution before the festival begins. For example, from the 'timeframe' column of the above chart pontoon bridge execution begins six months

before its public utilisation. However, based on what the geographical location of the coastal region is, the number would change. The economic, professional, administration and management bodies of the region would also play a role in altering the guideline numbers (months).

The design stage precedes back to January 2012. It is similar in case of other components of the site that make it a lesson towards urban resilience and sustainable living. Once its residents are adept with an ephemeral lifestyle, the decision-making phase would become shorter. In this way, the new settlement would achieve its cyclical character. A succinct and cyclically occurring built environment may be a wiser solution for the climatically challenged regions in the future.

4.4.3 Shearing Layers of Change in *Ruelles Vertes* and Jean Talon

A similar analysis is conducted based on the site observations of the urban market scenario of Jean Talon and the evolving urban system of *Ruelles Vertes.* The analyses of these two studies also correlate with Brand's observations of the shearing layer of a regular site. In **Fig. 91** the evolving 'green' urban system of Ruelles Vertes adds a factor of sustenance and endurance to Brand's shearing of a typical residential site. The lanes are not just subject to the wear and tear associated with a regular site; they are governed by the central aim of greening the urbanised island of Montreal.

In **Fig. 92**, the aspect of months come into play when the indoor market of Jean Talon spills out with temporary elements like stalls of fruits, vegetables and nursery plants. This quantitative analysis can serve as a guide for an urban market scenario whose functioning is governed by the changing seasons. These two analyses may also serve as prototypes of ephemeral landscapes with similar functions.

Layer	Components	Span	Description
Trees	All young and old trees that are a part of the back alley before it is converted to a green lane	40-100 years	A natural and a common element of greenery in the lanes last the longest. They seldom need attention and they are the mos static layer.

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Houses	All the residential and public structures, (residents are caretakers and benefactors of the green lane with the help of the NGO Eco Quartier)	15-40 years	Multi-story structures last as long as 40 years, while a single-family home may require renovations and redevelopment earlier than 40 years
Fences	The architectural element that demarcates the boundary of each house.	3-5 years	While functional maintenance is regular, some fences may be redecorated or redesigned after every few years to restore the uniqueness of the green lane
Pavements	The pathway of the lane itself. Maybe lined with absorbent paver blocks or have a regular sidewalk	1-5 years	They are laid once, but required maintenance that may also involve laying some block again as they are under constant wear and tear from the rain, snow and heat.
Street art/ murals	Building facades painted and decorated with abstract art or a literal depiction of stories and folklore	1 ≤ years	While the neighbours of some lanes choose to re-decorate their building facades with new forms art regularly, some might choose invest the funds on other components of the lane
Urban Agriculture	This layer includes all the fruits and vegetables, shrubs and herbal plants grown within the lane by the neighbours	Fleeting to Seasonal	A noteworthy aspect of the green lane is the cultivation of food done in the urban environment. Along with the community gardens, the Ruelles Vertes initiative has proved itself to be an evolving and enduring urban system. Pruning and mainting is regular and intensive. Some vegetables are seasonal and require half-yearly maintenance.

Layer	Components	Span	Description
Activities and people	The act of daily maintenance and upkeep of the lane by the neighbours. Social gatherings and play areas are included in this layer.	Fleeting	The more active neighbourhoods host a number of events like outdoor meals and performances. Every fleting interaction taking place is gives the lane its dynamic quality

Fig. 91: Layers of Ruelles Vertes sheared as per their longevity which can serve a noteworthy example for a constantly enduring and evolving urban system (Credit: Author. Adapted from 3.1 Ruelles Vertes, Montreal, Canada: Flexibility and endurance in a perpetually occurring green urban system- site analysis)

Layer	Components	Span	Description
Site	The site includes the market structure, public and private spaces surrounding it in addition to the city infrastructure like the road network	40-100 years	The largely static layer is the site whose changing frequency is the slowest.
Skin	The building envelope or the skin of the market including the facade, fenestrations and the roof structure.	15-20 years	the facade of the structure gets repaired from time to time but fully renovated after longer intervals
Space: restaurants and enclosed shops	The relatively permanent components within the internal space of the market building are occupied by restaurants and enclosed shops	3-5 years	The restaurants and shop units go through a change of occupancy by different food brands every few years.
Space: stalls and benches	The interior space is also cluttered with temporary market elements like stalls and benches which are rearranged from time to time	Seasonal or monthly	The layout of the space changes as the warmer climate allows the spillage of the outdoor stall of fruits, vegetables and nursery plants

Activities and people	The act of setting up shop, buying, selling, interacting between people and general passers-by account for this layer	fleeting	They are momentary occurrences that give the market its dynamism.

Fig. 92: Layers of Jean Talon sheared as per their longevity which can serve as a guide for an urban market scenario whose functioning is governed by the changing seasons (Credit: Author. Adapted from 3.2 Jean Talon Market, Montreal, Canada: Ephemerality and flexibility in a seasonally altering market scenario- Site analysis)

5. Chapter V: Conclusions-Lessons in Architecture and Urbanism

The objective of the report was to analyse the working of the Ephemeral Megacity using the literature as the main source of data and information. A possible futuristic scenario was considered where the city is assumed to be under a cyclical threat of flooding from the increased sea levels. All the precedent studies in addition to the two case studies – *Ruelles Vertes* and Jean Talon Market, and the extreme case of ephemerality, *Kumbh Mela*, were described to push the discourse of flexible architecture into 'ephemeral urbanism'. As examples of adaptability and resiliency, they were studied to give the readers an idea of the existing practices in temporary architecture and urban design.

The site of *Kumbh* is an ideal example of a temporary settlement that practises cost-effective cyclical construction with a meticulously streamlined planning phase that manages a large population. It has shown an adequate amount of success while still requiring some work in terms of fire safety and density (R. Mehrotra & Vera, 2015). The flexibility of the *Mela* is indeed a polyvalent relationship between spatial adaptability and the ability to rearrange the components of the site physically.

By organising the temporal elements on the site under Stewart Brand's shearing layers of change, we can see that every element from our built environment that helps us sustain can be efficiently compacted. These qualitative and quantitative analyses allow the readers to further the research on ephemeral urbanism by deducting time spans not just for the construction and deconstruction of infrastructure, but subdivide its intermediate phases crucial to upgrading the guidelines for the future city. The case of *Kumbh Mela* causes us to rethink and strategise the forms of urban settlements as it could potentially be a microcosm or a precedent model for the cities of a challenging future.

All the case studies in the report are analysed with an intention to tell its readers a story on their achievement and difficulties as models of resiliency and adaptability in what we build. They impart lessons in architecture, urban design and urban planning that could contribute to a visionary ephemeral landscape for the future.

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