



Rethinking the Urban Cemetery amidst Land Scarcity in Port-Harcourt: A Study of Vertical Cemetery Designs

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Abstract: *Our planet is presently seeing the greatest wave of urbanization in its history. More than half of the world's 7.5 billion people already live in urbanizing towns and cities rather than rural regions, and by 2030, this figure is expected to rise to almost 5 billion. As a result, there simply isn't enough land available in many of these fast densifying metropolitan places to maintain the practice of underground burial ceremonies, and many of today's myriad rituals for corpse disposal aren't socially or environmentally viable. While death may no longer be such a taboo topic of conversation in today's fast-paced world, it is still largely ignored and regarded as an afterthought in the community planning and design profession; many cities either play catch-up or ignore the issue of planning for final resting places entirely. The goal of this study aims to identify what effects today's funeral and burial customs have on the natural environment and if they are sustainable in the face of a rapidly urbanizing population. The study was carried out in order to create a case for enacting a fundamental shift in how we physically, psychologically, and emotionally treat the remains of the departed. By the end of the research, a general urban design plan for densified funeral complexes will be provided as the concept conclusion of religious studies and verticality. This study and inventive method, I believe, will provide a long-term answer for urban expansion in cities with limited land.*

Keywords: urban Area, Cemetery, Vertical architecture, Land use, Port-Harcourt.

Key words: Hadejia-Nguru Wetlands; Environmental Change; Resource Decline; Livelihoods; Adaptation.

1.0 Introduction

Society is always evolving, but the architecture that serves it might take a while to catch up. Multiculturalism, shifts in faith and family, and a growing emphasis on uniqueness have meant that the one-size-fits-all alternatives of a church funeral or a conveyor belt service at a gloomy 1970s concrete cremation are no longer adequate. Thankfully, architects are responding with a diverse spectrum of settings for funeral rites, ranging from designs that focus on a very austere simplicity, invoking a spirituality that is suitable for all religion groups, to curvy, human-scaled buildings that attempt to soothe in a time of mourning. There are structures that can accommodate huge gatherings of 500 or more mourners, as is

usual during Hindu funerals, while others have chapels only a couple of metres wide, reflecting the growing desire to offer a location where parents may grieve a stillborn child in private. The aim to create an environment of quiet and tranquility is at the core of practically every design, however this may be handled in a variety of ways.

2.0 Relevant Literature review

2.1.1 Urban Funeral Facility Demands

Cemeteries are frequently given a lower priority when it comes to design. It's easy to forget that this place is becoming larger by the day. Houses can be squeezed, offices can be shared, and stores can be piled, but not cemeteries. The number of deaths can be reduced, but what has been buried cannot be restored. Cemetery had no other option than to "expand." For this type, land will always be in high demand. This will not be a major issue in the suburbs, but it will be a whole different scenario in metropolitan areas. Nigeria's high population and economic expansion has resulted in fierce rivalry for land usage between the living and the "dead." With the expanding population and paucity of residential space in most Nigerian towns, the departed have begun to compete for land, since burial sites and plots have become increasingly scarce. The situation is the same from Lagos to Kaduna: burial ground places are in short supply. In places such as Lagos, prices for plots for the deceased and flats for the living are at an all-time high, and it is getting increasingly expensive to rest in peace. Some building developers must construct large towers in order to maximize space. This transition will soon be applied to typology, which has generated quantity concerns.

2.1.2 Burial Customs in the World's Four Major Religions

Both Catholics and Protestants believe that the body will be resurrected. Even while cemetery burial is still preferred as a translation of their ideology, cremation (high-temperature burning of the dead corpse) has been an alternate technique since 1963. Catholics must have a church funeral. Following the three steps of funeral ceremonies, the grave burial or cremation is performed (prayers, funeral Mass and absolution). If the body is buried, the site should be designated as sacred and blessed (usually Catholics churchyard). Otherwise, the cemetery will be blessed by the priest. If the body is cremated, the ashes must be placed in an urn. The urn is then buried or stored in a mausoleum rather than being kept at home or scattered (Gray, H., 2013).

In Protestant burials, the body is customarily dressed before the service. The body will then be put in a casket for the final visitation by family or friends before being buried or cremated. According to the Rev. J. Lowell Harrup of Northland Cathedral in Kansas City, the conditions for Protestant Christian funerals are minimal in general. Cremation is becoming increasingly popular these days. In contrast to Catholics, the Protestant Church does not have a set of rules for dealing with ashes. Despite the fact that numerous columbaria (houses of cinerary urns) are erected or added to churches or chapels to accommodate the ashes that are maintained in urns, burying the ashes at a cemetery or

spreading them at the sea or garden is also an acceptable practice. The Eastern Orthodox Church, on the other hand, forbids cremation. After being bathed, the body is put in a casket and carried to the church for the funeral service. After the final visitation, the casket is taken to the cemetery and buried in the ground.

In New York State, the Division of Cemetery (Department of State) mandates that the top of the coffin or casket be at least 3 feet below ground level for burial. Cremation is "haram" or banned in Islam, according to one interpretation of the meaning of the verse: "And Indeed We Have Honored the Children of Adam" [Al-Israa' 17:70]. Muslims believe that the dead should be treated with the same dignity as the living (Anne Hunter, 2007). As a result, cremation is forbidden. Instead, the deceased corpse is bathed, purified, wrapped in a white shroud, prayed over, and buried as quickly as possible. The body is buried on the right side of the excavated earth, towards the qibla, or direction of Mecca (Huda Dodge, 2009).

In Hinduism, there is relatively little earth burial practice. The deceased are usually cremated. Depending on the area, there are several funeral pyre rites. The deceased body is burnt in a specific ritual in Bali and India. The body is positioned with the head to the south, the direction of the deceased (Neighbors 2011). The corpse is bathed with holy water and clothed in new garments before being placed on a stretcher, brought to the cremation location, and flamed. In certain circumstances, they bury the deceased first and then wait for a mass service. Later, the ashes are collected and scattered in holy water or the sea.

2.1.3 Burial Culture in Port-Harcourt

Originally the indigenous people of Port Harcourt buried dead relatives within their compounds but with the arrival of Christianity and the Anglican Church there was the establishment of church cemeteries. (Gbule, 2021) The deceased were then buried in these cemeteries, with the exception of royals and core traditionalists whose burial rites were non-negotiable. These cemeteries were sited either within the church premises or within a short distance from the church. This evoked the increased need for land respective to increasing interment needs leading to requests for land donations. Families presented their ancestral lands in large quantities in support but the scenario resulted in land grabbing and coveting by church leaders, administrators and the traditional leadership. As rapid development and urbanization crept in, land prices began to soar thus increasing value and leading to frequent conflicts.

Additionally, the governments' forceful seizure and dispossession of ancestral lands based on the enactment of the land use act towards its own purposes further complicated situations (Onuoha, 2020). In order to establish cultural ownership of land people thus resorted to burying their dead in their ancestral lands/premises generally. This was done to secure land assets against conflict or poachers. Gradually, this eliminated the existence of the church cemeteries as land values continued to soar. The dead were then buried even inside bedrooms where they lived just to secure ownership of houses for their children or immediate families as it was believed that a man owns any portion of land on which he is buried and thus it is an inheritance for his children.

However, this poorly orchestrated approach to defining ownership mostly resulted in the devaluation of a larger portion of the ancestral lands. This is because the positioning of graves and interment spaces largely restricted meaningful use of such land for infrastructural development, especially as determination of grave spots in some cases were determined under supernatural direction by the priests of the local deity, *Ali*, (Olumati, 2020). Where there was a deep intent to acquire and use such land, it involved traditionally relocating the remains of the demised which was an expensive and tedious process. This pushed more focus from the incoming industrialists towards the acquisition and development of the farmland areas which were mostly shared, resulting in widespread communal clashes. The impacts remain currently visible as there is a gross differential in streetscapes, architecture, land asset prices and values, access networks and infrastructural progression between the ancestral residential areas where indigenes are typically buried, and the farmland areas far off. Indigenous interment practices have exerted some negativity on land value in such areas.

2.1.4 Land Use and Mortality

In certain nations, mortality and population are calculated using death rate (Porta, 2014) to determine how much space we need for burial now and in the future. In Qatar, the nation with the lowest mortality rate, 1.54 (CIA, 2013), the average number of deaths per year is 3,319, roughly double the number of Titanic fatalities. If we suppose they are all buried on the ground and the burial size is 1.25 x 2.5 meters, 373,392 square meters of land would be required in 2050. Meanwhile, with a mortality rate of 17.23 (CIA, 2013), South Africa must deal with 930,454 deaths, which is about the same as the population of Austin (Texas) in 2013. If we apply the same figure to the country with the greatest mortality rate, the quantity of land required for burial in 2020 is 17.4 square kilometers, which is more than five times the size of New York's Central Park.

Furthermore, assuming the pace and technology remain constant, necessary land will be enlarged to 104.7 square kilometers, almost the size of Paris, by 2050. As of 2014, the global crude mortality rate is 7.89 (CIA, 2013) per 1,000, and out of 7,197 billion (United Nations, 2004) world population, 56,784,330 (about the same as Italy's population in 2011) are anticipated to die in a single year. If the same size graveyard (1.25 x 2.5 m) is used and the ratio remains constant over the next six years, we will require 1076.4 square kilometers of land solely for burial sites by the end of 2020, which is nearly the size of Seoul. This suggests that 6,458 square kilometers will be needed in 2050. It is larger than New York City, omitting the footpath, road, and tree. This circumstance prompts the thought of considering the area as a burial allocation. Despite the fact that anti-high-rise arguments have evolved during the twentieth century, the notion of emerging this shape as a tool of urban land-use planning and a critical component in achieving the Ideal City is quite common (Meyer, H. and Zandbelt, D., 2012).

The current upward tendency will be considered as one approach to diminish the ground as the only choice to burying a dead corpse. This application has been used in several traditional cultures/beliefs in the past, and some of them still do. The true instances of this

method include the Pyramid in Egypt, Toraja Burial in Indonesia, and Cave Burial in Hawaii. But, before we jump to conclusions, we need consider how the inclusion of religious norms impacts this concept. As a result, the planning or design strategy does not imply the opposite.

3.0 Innovative and Sustainable Solutions to Funeral Complex Buildings

Property is becoming increasingly difficult to locate as many metropolitan areas across the world become more crowded; what little land that may remain available might sell at a premium. As a result, various creative and ecological solutions have evolved that have the potential to transform how we mourn our departed loved ones, build cemeteries, and decrease the impact of death on the natural environment. While they are not the only answers to this unsaid problem, they can start a conversation that will motivate the public, the funeral industry, and local and state governments all around the world to start taking action to solve this quiet disaster that we can no longer ignore. As detailed in this thesis, the following proposals seek to retain traditional guidelines on bodily disposition from the five faiths studied. Furthermore, it is vital to highlight that both of the proposed choices listed below would adhere to the country's top green construction standards, ratings, and certification systems. Examples include LEED (Leadership in Energy Efficiency Design) in the United States, BREEAM (Building Research Establishment Environmental Assessment Method) in Canada and Europe, Green Star in Australia, and Greenmark in Singapore.

3.1 Vertical Cemetery Designs

One method to tackling the plethora of concerns relating to how we treat our departed may be to build on the Memorial Necrópole Ecumênica's idea of building cemeteries vertically rather than horizontally. Vertical cemeteries would not only need a less amount of space than typical cemeteries, but they would also afford better possibilities for corpse disposition in metropolitan locations with geological constraints, such as steep terrain or flood-prone places. Furthermore, while the location, size, density, and purpose of any structure must normally follow to local and/or state minimum building design requirements and zoning regulation, each vertical cemetery may be distinct assets and attractions to their community.

3.2 Mixed Uses

Vertical cemeteries, unlike regular cemeteries, can be constructed to include auxiliary uses such as theaters, parks and green spaces, civic and cultural, leisure, retail, office, and even residential

units. Creating mixed-use cemeteries implies that the cemeteries do more than just take up much-needed land; they also better integrate into the urban fabric and neighborhood. Furthermore, these mixed-use cemeteries would be better adapted to self-sufficiency in the long run.

3.3 Adaptability

Perhaps the biggest challenge vertical cemeteries would face is ensuring they adhere to the specific religious-based burial requirements of each of the five religions, when applicable. It is against both the Islamic and Judaic laws to be interned amongst other religions; being buried alongside members of other faiths would clearly violate this rule. Like many of today's high-rise office buildings, the interior of a vertical cemetery could have a multitude of configurations, allowing for better accommodation of individual preferences as well as adhering to any religious-based restrictions on body disposition. Vertical cemeteries may even "grow" based on demand for space, taking the notion of constructing highly adjustable and adaptable environments a step further. The use of prefabricated components allows the structure to swiftly expand, reduces construction-related environmental impacts, increases worker safety and productivity, reduces material waste, and allows for more flexibility and adaptability. Furthermore, improved control over the "grounds" may prevent contamination and pollutants from flowing out of the tombs.

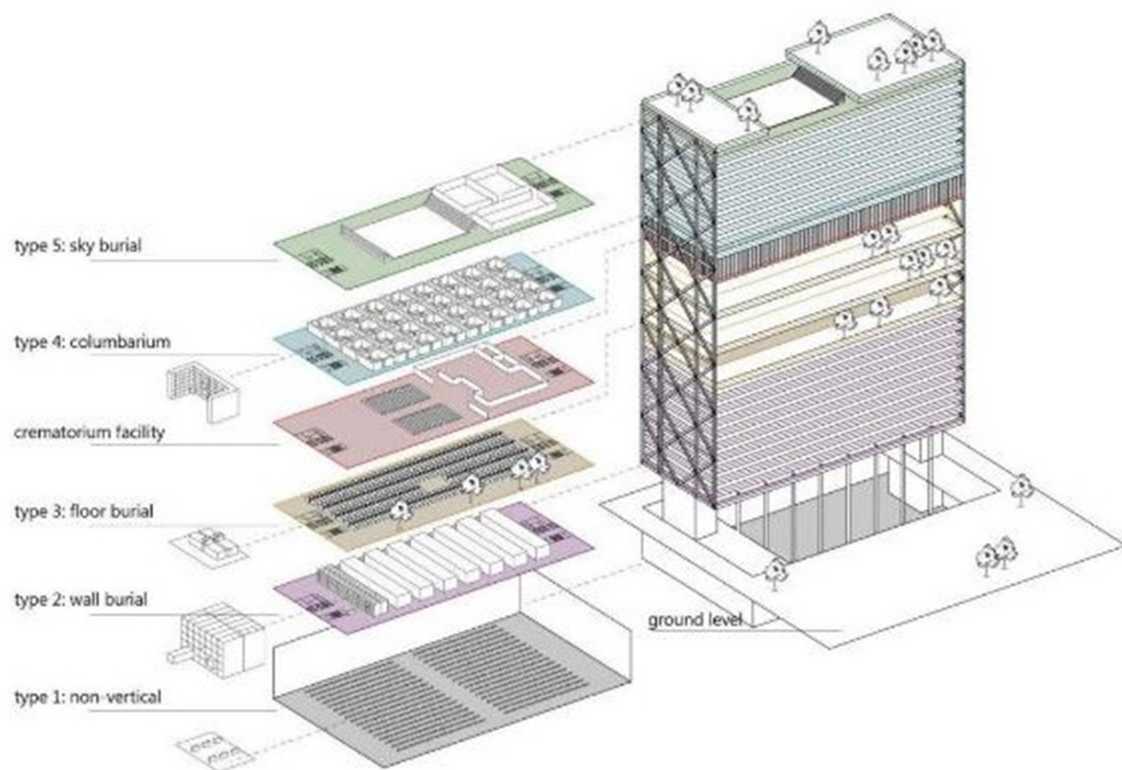


Figure 1: Vertical Cemetery Conceptual Design Plan Model Inventive+ paraphrase: (Hariyono, 2015)

3.4 Celebratory Parks

For individuals wanting non-traditional venues of corpse disposal, another unique option to the typical cemetery is the creation of celebration parks and plazas. These parks would be hybrids of memorial, natural, and garden cemeteries, incorporating many of the best aspects and advantages of each to produce a new sort of cemetery that serves both the living and the dead in both natural and constructed settings. Celebratory parks would be created to give one-of-a-kind and long-lasting locations for individuals who want to grieve the death of a loved one, as well as areas for leisure, renewal, and introspection. The ultimate purpose of such celebration parks is to transform how we perceive and handle the subject of death, to honor and commemorate dead loved ones, and to reconsider what cemeteries are and must be.

3.4.1 Benefits of Celebratory Parks

The inclusion of facilities like as playgrounds, lakes, pedestrian paths, open green spaces, pedestrian areas, and even year-round activities in this sort of cemetery helps to maximize the use of the site; these amenities contribute to place making and community improvements. Furthermore, these holy green spaces may be constructed throughout the city, delivering a plethora of advantages to the community and playing a vital part in ecology in a variety of ways, including: Filtering air, water, and sunlight and improving environmental balance. Green spaces identifiable with celebratory parks proffer many benefits to overall health and well-being. World Health Organization in Europe suggests that access to green spaces improves our mental health invaluablely as it reduces stress and anxiety, improves mood, and helps one relax. Lack of accessibility and destitute quality of green spaces may contribute to poor mental health. However, it is evident that green spaces are beneficial for the environment, particularly in regards to its impact on air quality and high temperatures. Trees naturally function to absorb Carbon Dioxide (CO₂) to produce Oxygen (O₂) thus trees on their own act like air filters. By planting many trees, man-made pollutants can be filtered out consequently increasing air quality. Green spaces combat “Urban Heat” produced from grey infrastructure through creating processes of shading. This Shading refers to how tall plants like trees serve as a shed that decreases surface heat. This is typically the systematic moderation of the local climate. This is especially important during summer days or heat waves. Mitigation storm water runoff and provision of shade to surrounding buildings, thereby conserving energy thus significantly contributes to a city's dense forest cover, which is vital to reducing the urban heat island adverse impact. The shade becomes a shield for the ground from the sun using its branches and leaves, leading to the dissipation of heat. Restoration of ecosystems and habitats is also a crucial benefit of celebratory parks as it provides shelter for some animal life. Sustainability determines the drive for greener, more sustainable, and more eco-memorial green spaces. Celebratory Parks provide

recreational areas for people and encouraging socially constructive behaviour and promotion of culture through social historic practices and identity preservation. It also presents for expression of religious freedom and community cohesion. Urban revitalization is potentially aid and there is improved economic perception of cities.

3.4.2 Metamorphosis

A person's ashes or resomated ash remains would be placed into a biodegradable urn, together with tree seeds, and planted in the memorial park, where they would be grown and cared for by personnel and enjoyed by many. As a memorial marker, an engraved concrete, metal, or ceramic ring the size of the typical width of the tree species would be set above the planted urn. Taking this concept a step further, the ashes of numerous generations of family members can be mixed and utilized to constantly supply nutrients to the same "parent" tree; this option would enable descendants of the same kin to remain together postmortem.



Figure 2: Guests to the National 9/11 Memorial Plaza participated in different of activities (Retrieved from Seattle Times, 2022)

3.5Wall Mausoleum

In this arrangement, deceased remains are put in a shelf/drawer similar to a morgue before being transported to the burial ritual. Vertical features (such as a wall or a wardrobe) alter

the role of the land. Placing dead bodies on top of one other becomes possible in this manner. Wall burial is probably the closest anticipation that fits the demand for Protestants, Catholics, Buddhists, or those who favor burial over cremation or at least having their relatives body remain exists. The decomposition of a dead corpse can be accomplished by the modification or installation of organic metabolism. In addition, the figure below shows a computation to compare the distance necessary between a wall and a land burial.

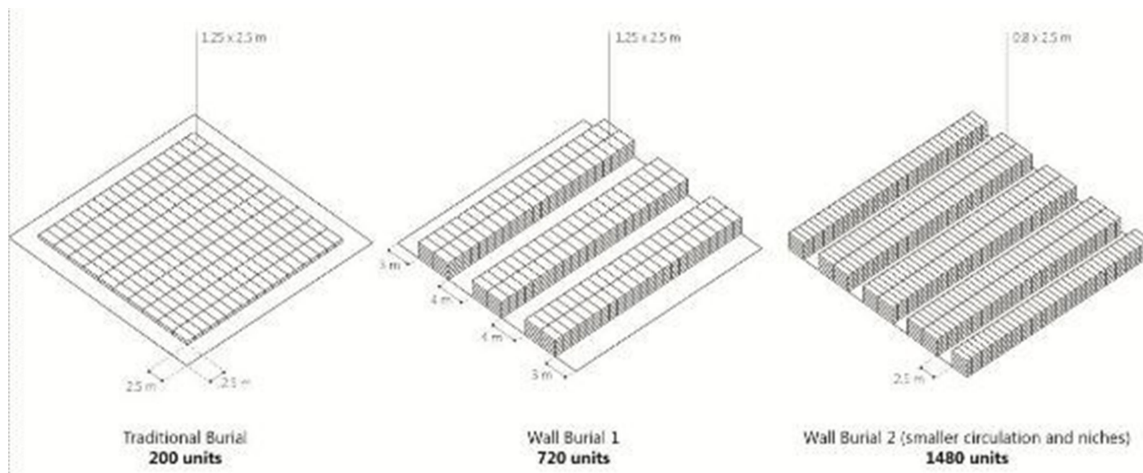


Figure 3: Comparison of Space Calculation between Wall Burial and Traditional Ground Burial

The space needed is calculated using the same burial size (1.25 x 2.5 m) and the same floor area size (30m x 30m). The first choice, ground burial, takes up the whole area in this instance. Later, a 2.5-meter-wide circulation corridor is constructed to the periphery. This 90 square meter space can accommodate 200 deceased bodies with this configuration. The second arrangement consists of a linear wall with 3.5 and 4 meter-wide circulation in between the rows. If the clearance height of the space is assumed to be 2.5 meters, this alternative may accommodate up to 720 burial units, with more circulation and direct access to the units. It is about four times more efficient than the first setup.

4.0 Case Studies: Built Urban Cemeteries

1. Ecumenical Memorial Necropole, Brazil

According to the article "Raising the Dead: Lack of Land Forces Cemetery Skywards" (2014), Monument Necropole Ecumenica is the world's highest cemetery, with 32 storeys and a capacity of 180,000 dead. A restaurant, church, performance hall, furnished rooms, and a park with waterfalls and animals are also incorporated into the structure. This facilitates the possibility of activity and function switching. Burial places are available 24 hours a day, seven days a week, with both annual rental and

privately owned graves. Within the same structure, other niches are already being planned.



Image showing the Memorial Necropole Ecumenica, Santo, Brazil
Source: Umer Sohail, Wonderful Engineering, 2016

2. Israel's Yarkon Cemetery

Every year, over 35,000 Israelis are killed. The new facility, which was built within the old cemetery complex, provides three alternative burial options. The first option is to stack "sandwich" graves on top of one another (minimum 2 layers). This type of burial is typically selected by a family member or a couple who wish to be buried together. The second method is wall burial, in which the deceased corpse is placed on a shelf, much like a mortuary. Headstones are placed on the surface of the walls to identify the deceased. The final choice is to be buried on the ground. As a result, each floor slab in the structure is viewed as a ground burial place.



Image showing The Yarkon cemetery at Petah Tikva, Israel
Source: Haaretz, Associated Press 2014

3. Bolivian cemetery in La Paz

Verticality has effectively addressed the issue of a shortage of land cemeteries in Bolivia. The only distinction is that it is not a skyscraper. Buildings with stacked crypts might be observed in the La Paz cemetery. These crypts serve as a temporary resting place for departed bodies until they are incinerated within ten years. Cremation ashes are eventually relocated to "outdoor" compartments that remain in the cemetery complex. One Bolivian tradition is to visit and deliver flowers to their deceased relatives' graves. As a result, glass doors are built on the front of ash



dwelling to ensure their living stay.

*Image showing the Cementerio General, La Paz, Bolivia
Source: Atlas Obscura, 2022*

5.0 Conclusions

While death may no longer be such a taboo topic of discussion in today's fast-paced world, it is still largely ignored and regarded as an optional extra in the society engineering and policy profession; many urban areas either play catch-up or ignore the issue of planning for final resting places entirely. Cemeteries are no longer placed on the outskirts of towns, where they are out of sight and out of concern until absolutely necessary. The goal of this study effort was to find an answer to the following question: How might the use of creative and sustainable building design affect how we mourn our lost loved ones in metropolitan areas all over the world?

This method which maintains religious burial rules while also presenting a strategy for maximizing space through verticality is as follows:

- To create methods for stacking the deceased inside the structure and utilizing as little land area as feasible in order to respect population and economic growth
- To create a broad acceptable framework (design approach) in vertical cemetery typology without taking into account site context.

- To embrace as well as provide burial space for different communities/cultures represented in the city or site area, x to provide complete freedom in shape, plan, building enclosure, material, and construction method design by architect to develop further, x to embrace and provide burial space for different communities/cultures represented in the city or site area,
- To replace current ground burial approach with verticality as a sustainable cemetery design option for cities deficient in land, x to provide substantial public green areas as part of the contemplation, and x to bring back the earth element to new high-rise building typology

This study effort also investigated and analyzed the historic and modern funeral practices and rituals of the world's five major faiths. The different alternatives for corpse disposition after death, the sorts of cemeteries, and the predicted need for land required to continue with these ancient burial practices were also examined. The goal was to obtain a better understanding of the negative consequences these behaviors have on the ecosystem.

Conclusions

According to this study, vertical cemeteries and celebration parks are just two of the innovative alternatives that could revolutionize how we memorialize our lost loved ones, design and plan for cemeteries, incorporate cemeteries into the fabric of our communities, and help decrease death's negative effects on the natural environment. While they are not the sole answers to this silent problem, they may start a conversation that will motivate the public, the funeral industry, and local and state governments all around the world to start taking action. For thousands of years, mankind has erected ever-higher structures in order to be closer to God and the skies, to celebrate their wealth, or simply to make up for a lack of available land. That, does the concept of a vertical mausoleum sound so far-fetched?

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