RETHINKING THE URBAN CEMETERY: INNOVATIVE AND SUSTAINABLE DESIGN FOR MEMORIALIZING OUR DECEASED LOVED ONES

By

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To my family, friends, and teammates

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LIST OF DEFINITIONS

Below is a list of terms developed by the Government and Legal Affairs Task Force of the International Cemetery and Funeral Association. (International Cemetery and Funeral Association, 1998)

BELOW-GROUND CRYPT: A pre-placed enclosed chamber, which is usually constructed of reinforced concrete, poured in place or pre-cast unit installed in quantity, side by side or multiple depth, and covered by earth or sod and known as a lawn crypt, turf-top crypt, etc.

BURIAL: The placement of human remains in a grave space.

BURIAL PERMIT: A legal document issued by a local regulatory authority authorizing final disposition of human remains.

BURIAL PLOT: A piece of property within a cemetery purchased for a burial or burials, especially for a family.

CASKET: A rigid container which is designed for the encasement of human remains and which is usually constructed of wood, metal, or like material, and ornamented and lined with fabric.

CEMETERY: A place that is established, maintained, managed, operated, or improved; and, which is dedicated to and used or intended to be used for the final disposition of human remains and their memorialization.

CEMETERY PURPOSES: Any and all business and activities requisite to, necessary for, or incident to establishing, maintaining, operating, or improving a cemetery, interring human remains, and the care, preservation, and embellishment of a cemetery.

COLUMBARIUM: A structure or room or space in a building or structure used or intended to be used for the inurnment of cremated remains.

COMMINGLING: The mixing of cremated remains of more than one decedent.

CREMATED REMAINS: The bone fragments remaining after the cremation process, which may include the residue of any foreign materials that were cremated with the human remains.

CREMATION: The irreversible process of reducing human remains to bone fragments through intense heat and evaporation, in a specifically designed furnace or retort, which may include any other mechanical or thermal process whereby the bone fragments are pulverized, or otherwise further reduced in size or quantity. Cremation is a process and is not a method of final disposition.

CREMATION CHAMBER: The enclosed space in which the cremation of human remains is performed.

CREMATION CONTAINER: An enclosed receptacle, which is combustible, rigid, and leak-resistant, that is designed for the encasement of human remains prior to and during cremation.

CREMATORIUM: A facility that houses a cremator having a cremation chamber or retort.

CREMATORY: A structure containing a furnace or retort used or intended to be used for the cremation of human remains.

CRYONIC:	The practice of freezing a person who has died of a disease in hopes of restoring life at some future time when a cure for the disease has been developed.
DEATH CERTIFICATE:	A legal document containing vital statistics pertaining to the life and death of the deceased.
DECEASED	One who is no longer living.
DISINTERMENT:	The act of removing human remains that have been interred.
EMBALMER:	One authorized by law to engage in embalming.
EMBALMING:	A procedure whereby human remains are chemically treated by injection for temporary preservation including, but not limited to, the act of disinfecting, preserving, and restoring the human remains to a natural life-like appearance.
ENCASEMENT:	The placement of the human remains in a rigid container, including but not limited to, a casket or urn.
ENTOMBMENT:	The act of placing human remains in a mausoleum crypt.
FINAL DISPOSITION:	The lawful disposal of human remains whether by interment, burial at sea, scattering, etc.
FORMALDEHYDE:	A colorless, toxic, potentially carcinogenic, water-soluble gas, CH_2O, having a suffocating odor, usually derived from methyl alcohol by oxidation; used chiefly in aqueous solution, as a disinfectant and preservative, and in the manufacture of various resins and plastics.
FUNERAL:	The rites held commemorating the deceased with the human remains present.

GRAVE SPACE:	A space of ground in a cemetery that is used or intended to be used for in ground burial.
GREEN BUILDING:	Built structures that are more environmentally friendly than standard buildings consume less energy and resources and are also associated with improved health and productivity.
HUMAN REMAINS:	The body of a decedent and includes the body in any stage of decomposition and cremated remains.
INTERMENT:	The final disposition of human remains by burial, entombment, or inurnment.
INTERMENT SPACE:	A space intended for the final disposition of human remains including, but not limited to, a grave space, mausoleum crypt, niche, and below-ground crypt.
INURNMENT:	The act of placing cremated remains in a receptacle including, but not limited to, an urn and depositing it in a niche.
LEGALLY DEAD:	A human being whose heart and lungs have irreversibly ceased to function.
MAUSOLEUM:	A chamber or structure used or intended to be used for entombment.
MAUSOLEUM CRYPT:	A chamber of a mausoleum of sufficient size for entombment of human remains.

MEMORIAL:	Any product, other than a mausoleum or columbarium, used for identifying an interment space or for commemoration of the life, deeds, or career of some decedent including, but not limited to, a monument, marker, niche plate, urn garden plaque, crypt plate, cenotaph, marker bench, and vase.
MEMORIAL SERVICE:	A ceremony commemorating the deceased without the human remains present.
MEMORIALIZATION:	Any permanent system designed to mark or record the names and other data pertaining to a decedent.
MOURNING:	An outward sign of grief for a person's death.
NICHE:	A space usually within a columbarium used or intended to be used for inurnment of cremated remains.
REINTERMENT:	The act of interring human remains that have been disinterred.
SCATTERING:	The final disposition of cremated remains by lawful dispersion.
SUSTAINABILITY:	The principle of living in accordance with nature's boundaries, to not deplete the planet's resources and to allow future generations to have access to these same resources.
TOTALLY DEAD:	A human being whose entire brain function has irreversibly ceased to function.
UNCLAIMED REMAINS:	Cremated remains which are unclaimed for a prescribed period of time from the cemetery authority, crematory authority, direct disposer, or funeral establishment.

URN:	A receptacle for the encasement of cremated remains.
WAKE:	A watch held over the body of a dead person prior to burial and sometimes accompanied by festivity.

ABSTRACT

Abstract of the Master's Research Project Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Master of Science in Architectural Studies with a Concentration in Sustainable Design.

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By

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Chair: Dr. Nawari Nawari, Ph.D., P.E., M.ASCE
Co-chair: William Tilson
Major: Master of Science in Architectural Studies with a Concentration in Sustainable Design

Our world is currently undergoing the largest wave of urban growth in its history. More than half of the world's 7.5 billion human inhabitants now live in urbanizing towns and cities, as opposed to rural areas, and by 2030, this number is projected to swell to about 5 billion. Therefore, there simply is not enough land available in many of these rapidly densifying urban centers to continue the tradition of underground burial rituals, nor are many of today's numerous rituals for body disposition socially and environmentally sustainable. While death may not be such a taboo topic of conversation in today's rapidly evolving world, it is still largely neglected and seen as an afterthought in the community planning and design profession; many cities either play catchup or ignore the question of planning for final resting spaces altogether.

The purpose of this research was to determine what impacts of today's funeral

and burial rituals pose on the natural environment, to determine if they are sustainable with a rapidly urbanizing population. Research was conducted in an effort to make a case for implementing a radical change in the way we physically, mentally, and emotionally process the bodies of the deceased.

Methods of research included data collection from journals, websites, videos, books, case studies of existing projects related to this thesis, and site visits to several memorial gardens and urban resting centers. Ten urban resting centers were selected for site visits and analyzed. These sites were chosen for various reasons, including their religious affiliation, unique qualities, geography, history, size, and/or their relationship with the surrounding context and community. To guide the analysis of each site, a checklist was created to determine the presence (or lack of) ten key attributes.

Based on this research, several innovative and sustainable alternatives have been presented that could revolutionize the ways in which we memorialize our deceased loved ones, design and plan for urban resting centers, and quite possibly reduce death's adverse impacts on the natural environment. While, of course, not the only solutions to addressing this silent crisis, they can create a dialogue, which would inspire the public, the funeral industry, and local and state officials all over the world to begin taking action.

CHAPTER 1
INTRODUCTION

When one see's or hears the word *death*, what typically comes to mind? Depending on their religious and cultural beliefs, past experiences, and overall personal points-of-view, some thoughts might be that death is sad and scary, unavoidable, necessary, cruel, unforgiving, natural, joyous, symbolic, and mandatory. All organic matter "life" on earth eventually dies, yet mourning and performing death rituals appear to be reserved for more complex and social creatures in the animal kingdom, such as homo sapiens "humans", chimpanzees, elephants, dolphins, and dogs. (Joslyn, 2014)

Death rituals can be traced back to the Neanderthals, an ancient species of early humans that lived more than 160,000 years ago. (Than, 2013) "*Since prehistory, societies have developed rituals to attempt to understand and explain the presence of death. For society, death rituals, death myths, and religion have all been created to explain and understand the great unknown factor of death."* (The Many Faces of Death, n.d.)

While we are all 99.9% the same, DNA-wise (Genome Variations, 2003), the ways we mourn, honor, and dispose of our dead vary greatly from culture to culture, and is truly unique throughout the animal kingdom. For instance, the ancient Egyptians believed in life after death, and so they mummified their dead before burying them in tombs (Torgovnick, 2013); Buddhist Mongolians and Tibetans believe in the transmigration of spirits, and so, after death, the body, now believed to be an empty vessel, is cut into pieces and fed to vultures, who are viewed as angels, carrying the spirits up to heaven, following an elaborate ceremony (Torgovnick, 2013). Today, many cultures throughout the western world use practices that are similar to each other to dispose of the dead, including underground burial, above ground burial in mausoleums,

and cremation, often with little or no thought of the consequences to the natural environment.

While death may not be such a taboo topic of conversation in today's rapidly evolving world, it is still largely neglected and seen as an afterthought in the community planning and design profession; many cities either play catchup or ignore the question of planning for final resting spaces altogether. Today, the global population is estimated to be 7.5 billion people, and by 2050, the world's population is estimated to be at 9.77 billion people; an additional 2 billion people are anticipated to inhabit the earth by 2100 (Worldometers.info, 2017).

Furthermore, according to the United Nations Population Fund, "*The world is undergoing the largest wave of urban growth in history. More than half of the world's population now lives in towns and cities, and by 2030, this number will swell to about 5 billion. Much of this urbanization will unfold in Africa and Asia, bringing huge social, economic, and environmental transformations.*" (Urbanization, 2016)

Therefore, there simply isn't enough land available in many of the rapidly densifying urban centers around the world to continue the tradition of underground burial rituals, nor are many of today's practices, embalming, for example, environmentally responsible. In fact, the current way many of our societies plan (or lack thereof) for dealing with the deceased is unsustainable in every sense of the word.

Statement of Purpose

This research paper aims to answer the following question: How can the use of innovative and sustainable design change the ways in which we memorialize our deceased loved ones, in urban communities around the world? This research also aims to explore how cities and various cultures around the world currently plan and design urban resting places with the purpose of understanding the harsh effects our current rituals of death have on the environment, as well as to address ways in which climate change will adversely affect these resting places.

The question brings to light a very real and severely understudied subject that affects us all. While we may not be able to stop death from coming for us tomorrow, we can start changing the ways we design and plan our urban resting centers today. The current way many cultures around the world handle their dead is unsustainable (socially and environmentally). Additionally, urban planners do not typically account for this need while advocating for density centers. Therefore, this question helps to bring forward the topic of planning and designing for (and with) death, in a healthier and more sustainable manner, that will not only enhance our communities for generations to come, but will also ease the strains on our only planet's finite resources.

CHAPTER 2
LITERATURE REVIEW

According to Merriam-Webster's dictionary, the definition of a funeral is as follows: "*The ceremonies connected with burial or cremation of the dead.*" (Hungry Minds, Inc., 1996) while the definition of a burial is as follows "*The burying of a body in a*

grave, tomb, etc." (Hungry Minds, Inc., 1996). This research's purpose is to dig beneath the surface of a topic that has historically been very taboo in many cultures, investigating how cities and various cultures around the world plan, and design urban resting places. Ultimately, the goal of this research is to answer the question "How can the uses of innovative and sustainable architectural design and better urban planning create viable alternatives to traditional, non-sustainable, burial sites?"

Analyzed in this chapter will be the various options for body disposition after death; traditional funeral and burial rituals observed in the five major religions practiced around the world; the environmental impacts of funerals and burials; and the role architectural design has played in the afterlife.

Traditional Funeral and Burial Customs by Religion

As of the time this thesis was written, the current population of the world was 7,516,004 persons (Worldometers.info, 2017). While not everyone around the world identifies as religious, approximately 2.2 billion of those who do are followers of Christianity; 1.605 billion are followers of Islam; 1.05 billion are followers of Hinduism; 488 million are followers of Buddhism; and 13.9 million are followers of Judaism (Illsley, 2017). **Table 2-1**: Funeral Burial Rituals in Various Religions compares and contrasts the various traditional funeral and burial customs between the above-mentioned religions.

Christianity

In the early years of Christianity, death was seen as a private affair, except in instances where one was struck down on the battlefield or by accident. Therefore, only

close family and friends paid their respects to the deceased. Generally, physicians and priests removed themselves when cases became “hopeless” and death was imminent. Believing that contact with the body of the recently deceased caused impurities, ritual activity around the deathbed was kept to a minimum (History of Christian Death Rites, 2016). Often, the deceased person’s spouse or parent would place a coin atop the departed person’s eyes or tongue, as a token for the underworld ferryman; while all bodies were bathed posthumously, the deceased would be dressed into clothing befitting their own social class, sometimes just in a shroud. Bodies were often cremated or laid to rest in family plots outside of the city walls (History of Christian Death Rites, 2016).

Christian views and responses to death and dying further developed during the Medieval Latin Church, when the rise of the saints changed the relationship between the living and the dead. Remains of those honored as “saints” were housed on church properties within the city walls (History of Christian Death Rites, 2016). Since then, Christianity has used the transition from living to dead as a reminder of one’s limited time on earth, and funerals and burials became more inclusive community affairs.

Embalming is an acceptable practice within the Christian religion. While cremation is also acceptable, this process typically does not occur until after a funeral mass, and the ashes generally are only be buried in the ground, within a tomb, or placed at sea, but never scattered (Everplans, n.d.). Vigils and wakes are widely practiced and accepted; those closest to the deceased often present eulogies and tributes. There is no law or rule that requires a memorial period or a memorial event, within the Christian religion.

Islam

Islamic law (“shariah”) states that the body of the deceased should be buried at the earliest opportunity from the time of passing (Everplans, 2015). Autopsies, embalming (unless required by local laws), and cosmetology are generally not accepted nor are they routine rituals when preparing the body for burial; cremation is forbidden in Islamic law. To prepare for burial, close same-sex family members will wash the body three times, in a specific order: upper right side, upper left side, lower right side, lower left side. Once clean and prepared, the body is then shrouded, secured with three ropes (one tied above the head, two tied around the body), and then covered in a white sheet (Everplans, 2015).

Because the body must be buried at the earliest opportunity from the time of death, viewings, wakes, or visitations do not traditionally occur. However, the funeral (“janazah”) is a public affair where prayers are performed by many members of the deceased’s community, typically occurring within the mosque’s courtyard, not within the interior spaces themselves (Everplans, 2015). After prayers and blessings have been said, the body is then transported to the cemetery for burial, with only men traditionally allowed to attend the burial.

The grave must be dug perpendicular to the direction of Mecca (“qiblah”), and the body placed on its right side, facing Mecca. After the body has been placed in the grave, a layer of stones or wood is placed atop of the body, preventing the body from coming into direct contact with the soil that will fill the grave. It is traditionally forbidden to erect large monuments or decorate the grave in an elaborate manner. However, in order for loved ones to recognize the grave, a small marker, typically a stone is allowed

to be placed at the gravesite (Everplans, 2015). Under Islamic law, following the burial service, a period of mourning will last for 40 days (FuneralWise, 2017). Although lamentation is generally tolerated during mourning, loud crying or wailing is strongly discouraged.

Hinduism

Conventionally, Hindus believe that life and death are part of the concept of rebirth ("samsara"). If possible, once death seems imminent, the body should be transferred to a grass mat on the floor, where a small amount of water from the Ganges River is poured into their mouth; if this isn't possible before death, then it should take place as close to the time of death as possible (Everplans, 2017). Following the passing, those loved ones surrounding the deceased should avoid unnecessarily touching the body, as it is viewed as tainted.

Embalming is an acceptable practice within Hinduism, and family members and close friends traditionally wash the body. When washing the body, the deceased's head must face southward, and a lighted oil lamp and picture of the deceased are placed next to their head. Traditionally, the body is washed in a blend of yogurt, milk, honey, and ghee (clarified butter), and those washing the body generally chant prayers and blessings (Everplans, 2017). Following the holy bath, the big toes are tied together, hands are placed palm to palm, and the body is shrouded in a plain white sheet.

A viewing or wake is typical among the Hindu, where family and friends gather around the casket to recite mantras. Traditionally, all Hindus are cremated, with the exception of saints, babies, and children (Everplans, 2017). The cremations usually take

place on the Ganges River in India, where the family builds a pyre for the casket to rest upon. The karta (“priest”) will set the pyre ablaze and walk around the structure in a counter clockwise motion while sprinkling holy water on the pyre. Those gathered to pay their respects to the deceased will stay until the body is entirely burned. Following the cremation, a period of mourning will last for 13 days (Everplans, 2017). Traditionally, on the first anniversary after the death, family members observe a memorial event (“sraddha”), which pays respect to the deceased. The karta will return, bringing along members of the highest caste, and provide the family with an elaborate meal.

Buddhism

Originating in northwest India approximately 2,500 years ago (The Buddhist Society, 2017), Buddhism has always viewed death as an inherent part of life itself, and so believes that the act of dying is simply another stage of life that one takes; it is also a reminder of one’s own mortality. Ideally, death and dying should take place in a calm, tranquil, and sensitive location, and the body of a deceased person should remain at the spot of death for a minimum of four hours. Further, the Buddhists believe that, if an autopsy is required, then the body should not undergo one for at least three and a half days, nor should the body be embalmed at all, if possible (The Buddhist Society, 2017).

While there is not a singular funeral service practiced for all of Buddhism, the vast majority of practicing Buddhists choose to be cremated, as was the case of the Buddha (The Buddhist Society, 2017). Tibetan Buddhists believe that death and dying are an important subject because dying reveals which karma will lead the deceased person to the next rebirth. Further, since firewood was scarce throughout Tibet, and the ground was often unsuitable for burial, the practice of cremation was reserved mainly

for the Great Masters, whose ashes were stored in stupas. Therefore, the majority of Tibetan Buddhists practiced sky burials. The practice requires the body to be chopped up and fed to the vultures; this is seen as an extreme type of Buddhist's "self-sacrifice." (MailOnline Reporter, 2015) These Buddhists view the vultures as Dakinis (Tibetan's equivalent of angels) that take the souls of the deceased into the heavens, where they await to be reincarnated in their next lives (MailOnline Reporter, 2015).

Table 2-1: Funeral Burial Rituals in Various Religions

	Christianity	Islam	Hinduism	Buddhism	Judaism
Underground burial allowed (yes/no)?	Yes	Yes	No	Yes	Yes
Cremation allowed (yes/no)?	Yes	No	Yes	Yes	No
Sky burial performed (yes/no)?	No	No	No	Yes	No
Embalming allowed (yes/no)?	Yes	No	Yes	Yes	No
Cryonics allowed (yes/no)?	Yes	No	Neutral	Neutral	Yes
Public/private affair?	Private	Public	Public	Public	Private
Official period of mourning?	None	40 days	13 days	49 days	7 days

Do wakes traditionally take place (yes/no)?	Yes	No	Yes	Yes	Yes
Timeframe burial must occur by?	None	Within 24 hours	None	None	Within 2 days
Grave markers allowed (yes/no)?	Yes	Yes	Yes	Yes	Yes
Traditions dictated by religious law (yes/no)?	No	Yes	Yes	No	Yes
Internment amongst other religions allowed (yes/no)?	Yes	No	Yes	Yes	No
Deceased body treated with respect before burial (yes/no)?	Yes	Yes	Yes	Yes	Yes

Source: (Benmoshé, 2017)

Figure 2–1: A typical wood casket and flower arrangement used for Christian burials (Retrieved from http://request.org.uk/teachers/teaching-resources/life-resources/funeral-life/2013/10/15/thinking-through-a-christian-funeral/)

Figure 2–2: Mourners attending a wake before the funeral and burial (Retrieved from https://www.gannett-cdn.com/-mm-/5e592a40464b1a80825a272ab2b0bc119684c9ea/c=82-0-2318-1680&r=x513&c=680x510/local/-/media/Indianapolis/Indianapolis/2014/03/07//1394226880000-inidc5-

6ebhnnoanq118zck61ry-original.jpg)

Figure 2–3: Muslim women practicing how to prepare a body for burial
(Retrieved from https://cdn.evbuc.com/eventlogos/88262/2013060922.12.05.jpg)

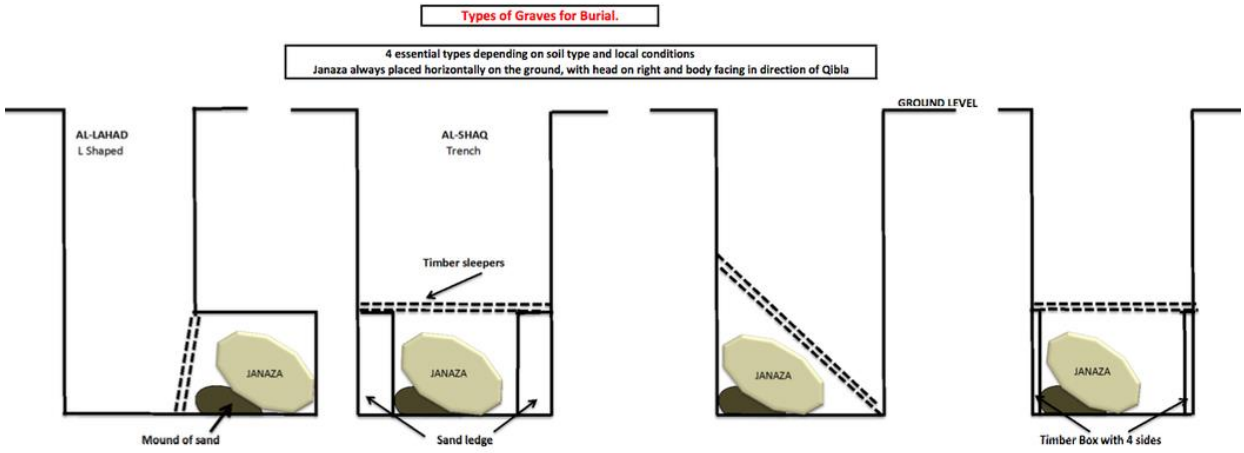


Figure 2–4: The four essential types of graves for burial of a deceased Muslim
(Retrieved from http://www.mfs.asn.au/uploads/1/3/7/8/13783065/2451783_orig.png)

Figure 2–5: Buddhist mourners watching the vultures during a sky burial
(Retrieved from Image China/Rex Features)

Options for Body Disposition After Death

Casket Burial

One of the oldest options for body disposition after death in human history, dating back to the ancient Egyptians, is casket burial. Today, to ready the body for burial, it is bathed and disinfected, and, unless specifically requested not to, is typically pumped with embalming fluids that help to temporarily preserve the body; this practice is more for vanity and convenience than for sanitary or decomposition purposes. The body is then placed into an airtight and oversized box, typically designed and manufactured to remain intact for a very long time, and buried 5-7 feet below ground and adorned with a large granite or bronze marker.

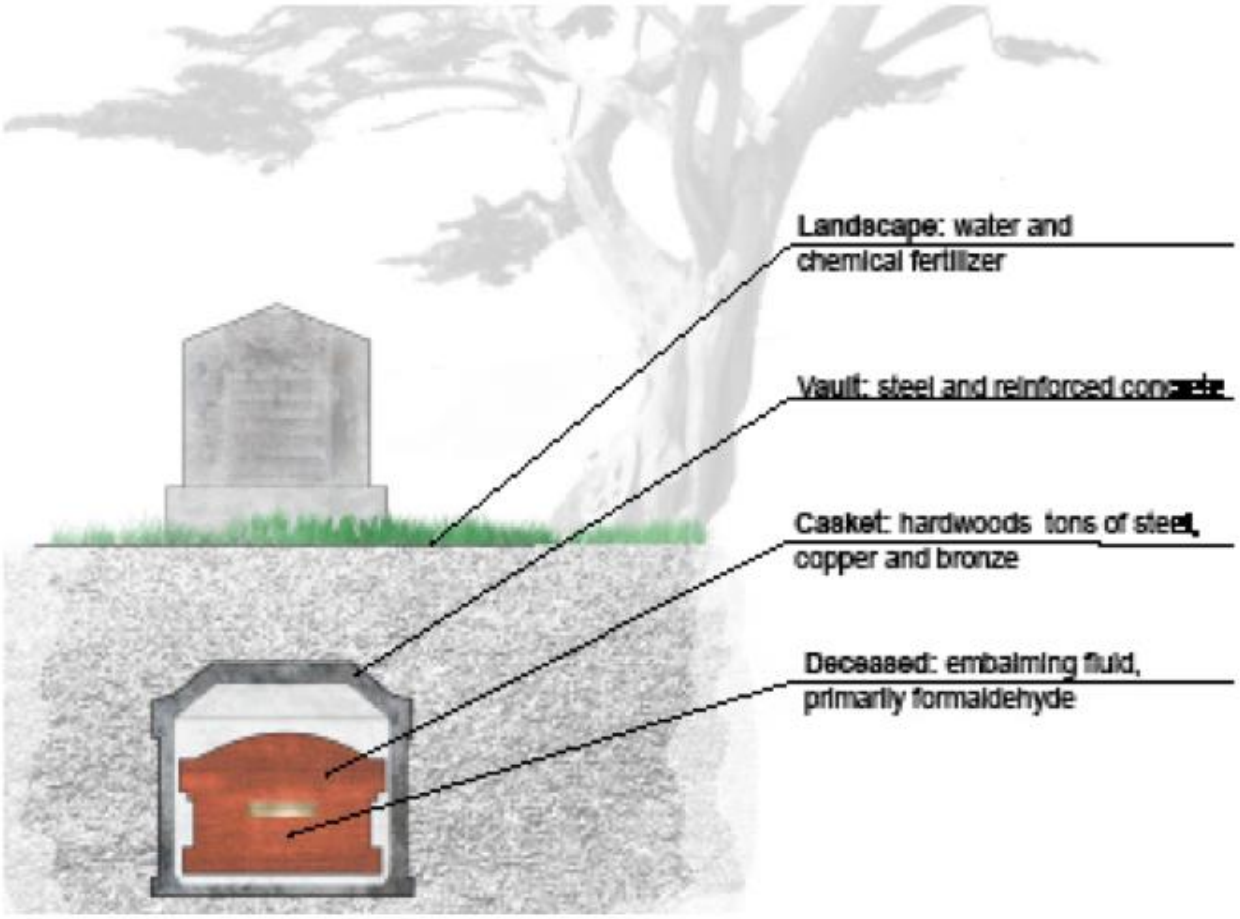


Figure 2–6: An illustration of the various materials involved in a typical casket burial (Retrieved from http://4.bp.blogspot.com/-lRcXdNcSBmw/Uu1m-MmmlxI/AAAAAAAABA4/cJue6YJHRSE/s1600/Screen-shot-2012-09-20-at-3.13.58-PM.png)

Cremation

Cremation, first practiced by the ancient Greeks, and recently surpassed traditional casket burial as the preferred option for body disposition in the U.S.A., is the process of burning a dead body at very high temperatures until there are only brittle, calcified bones left, which are then pulverized into “ashes.” These ashes can be kept in an urn, buried, scattered, or even incorporated into objects as part of the last rites of death. Several factors which affect the duration of the cremation process include the bone structure of the body; percentage of body fat to lean muscle mass; the cremation

machine and support equipment's performance; operating temperature of the cremation chamber; and the type of casket or urn in which the body is placed (How Is A Body Cremated?, 2017).

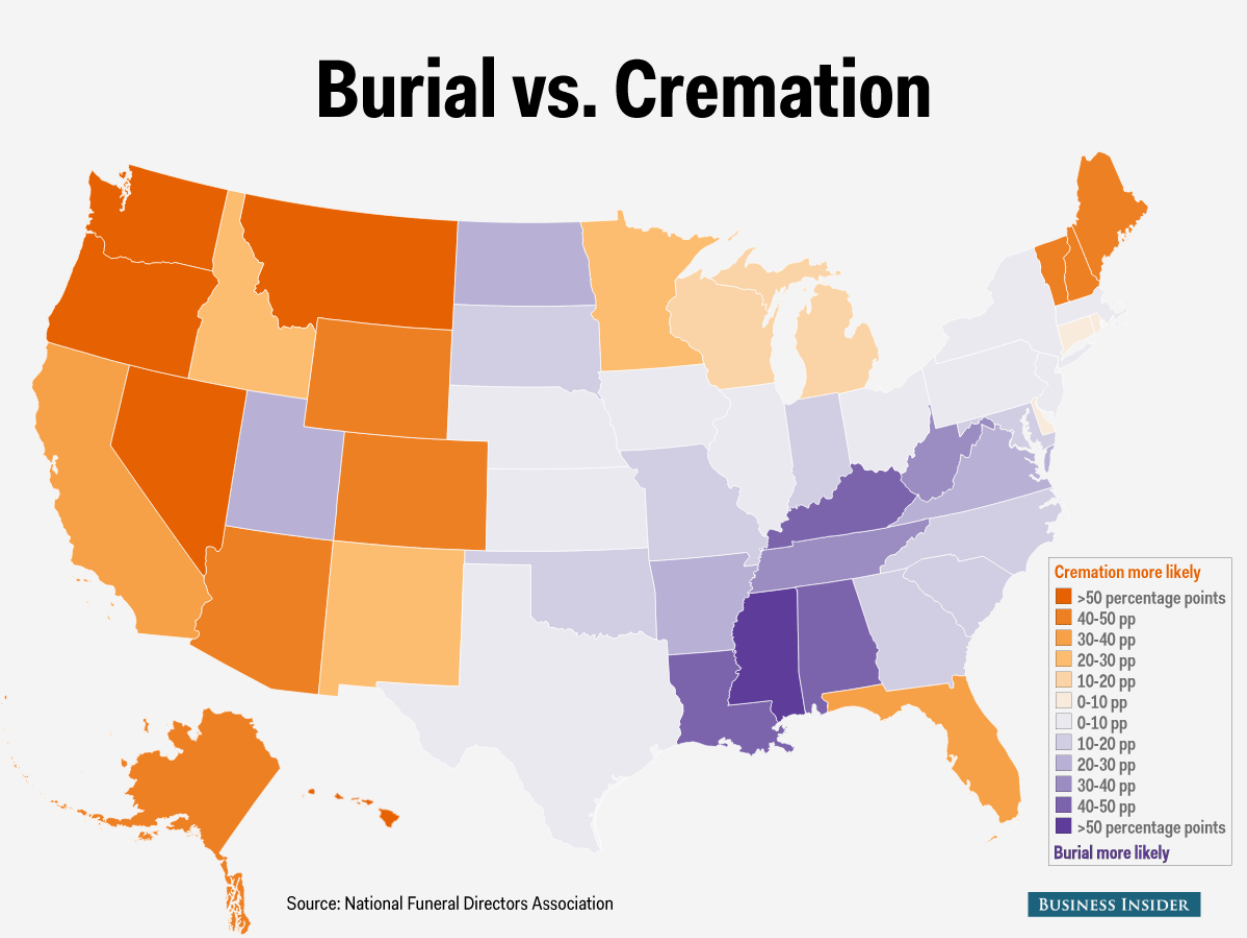


Figure 2–7: Cremation is now the preferred method of body disposition in the U.S.A. (Source: National Funeral Directors Association)

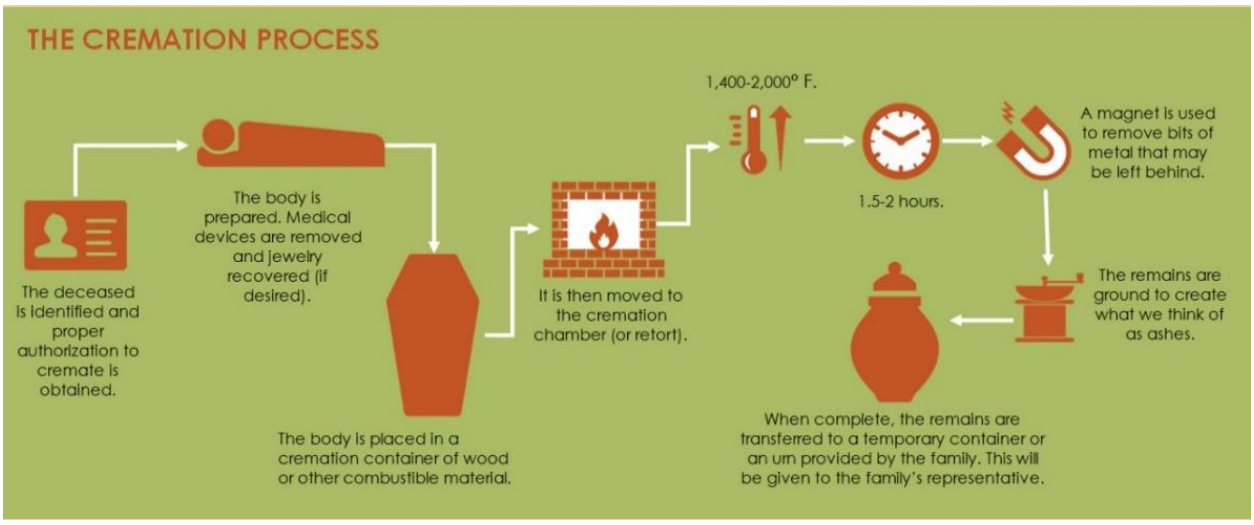


Figure 2–8: The cremation process illustrated
(Retrieved from https://www.funeralwise.com/wp-content/uploads/2017/01/101-cremation-process.jpg)

As illustrated in **Figure 2–8**, the cremation of human remains goes through a series of steps that include the following (Kim, 2009):

- Firstly, to avoid any mix-ups, each body and urn are properly identified and tagged. These identification papers accompany the body through its cremation processing;
- The body is then prepared for cremation, a step that typically includes the removal of medical devices and jewelry before it is placed in a cremation container made from a combustible material (usually wood);
- The container is placed into a retort, where temperatures between 1,400-2,000° Fahrenheit break down the body's tissues and dry out the body, typically between 1.5-3 hours;
- Once the body is completely burned and has cooled down, the remains, which are often still recognizable as human skeletal fragments, are removed from the retort and placed under a powerful magnet; this process removes

pieces of metal, such as dental fillings, medical devices, and plates that were not incinerated;

- The fragments are placed into a cremulator, which pulverizes and grinds the skeletal remains, creating the recognizable “ash;”
- Finally, the ashes are placed in an urn and delivered to the deceased’s family representative.

Metamorphosis (ashes to soil)

Another option for body disposition after death is metamorphosis -- mixing cremation ashes with planting soil, to create new life. By taking the proper steps needed, cremation ashes can help provide many nutrients and qualities needed for sustaining plant life. However, on their own, cremation ashes can be quite harmful to the environment, largely due to their high levels of PH and toxic levels of sodium (Planting Cremation Ashes, 2015). Metamorphosis is a unique way to not only create a living memorial, but it directly aids in returning nutrients back to the earth. Traditional burial and cremation rituals prevent this crucial phase from occurring, largely because of the airtight containers in which the interned are placed.

Figure 2–9: Cremation ashes being poured into a biodegradable urn
(Source: The Spiritree Forest Co.)

Figure 2–10: Life grows from the nutrients of the cremation ashes
(Source: The Spiritree Forest Co.)

Cryonics

Not to be confused with *cryogenics* -- the study of what happens to materials at low temperatures, *cryonics* is the technique used to store human bodies at extremely low temperatures with the hope of one day reviving them. A Physics teacher, Robert Ettinger is credited with first proposing the idea of cryonics in 1931, however, the first person to be frozen “cryonic suspension” using cryonics, Dr. James Bedford, did not occur until January 1967. (Cryonics Institute Resource Library, n.d.) Today, only a hand full of cryonics labs around the world practice cryonic suspension. Additionally, because it is illegal to perform cryonic suspension on a living person, the person undergoing cryonic suspension must first be declared “legally dead” -- their heart must have

stopped beating (not to be confused with “totally dead” -- the point at which all brain function ceases).

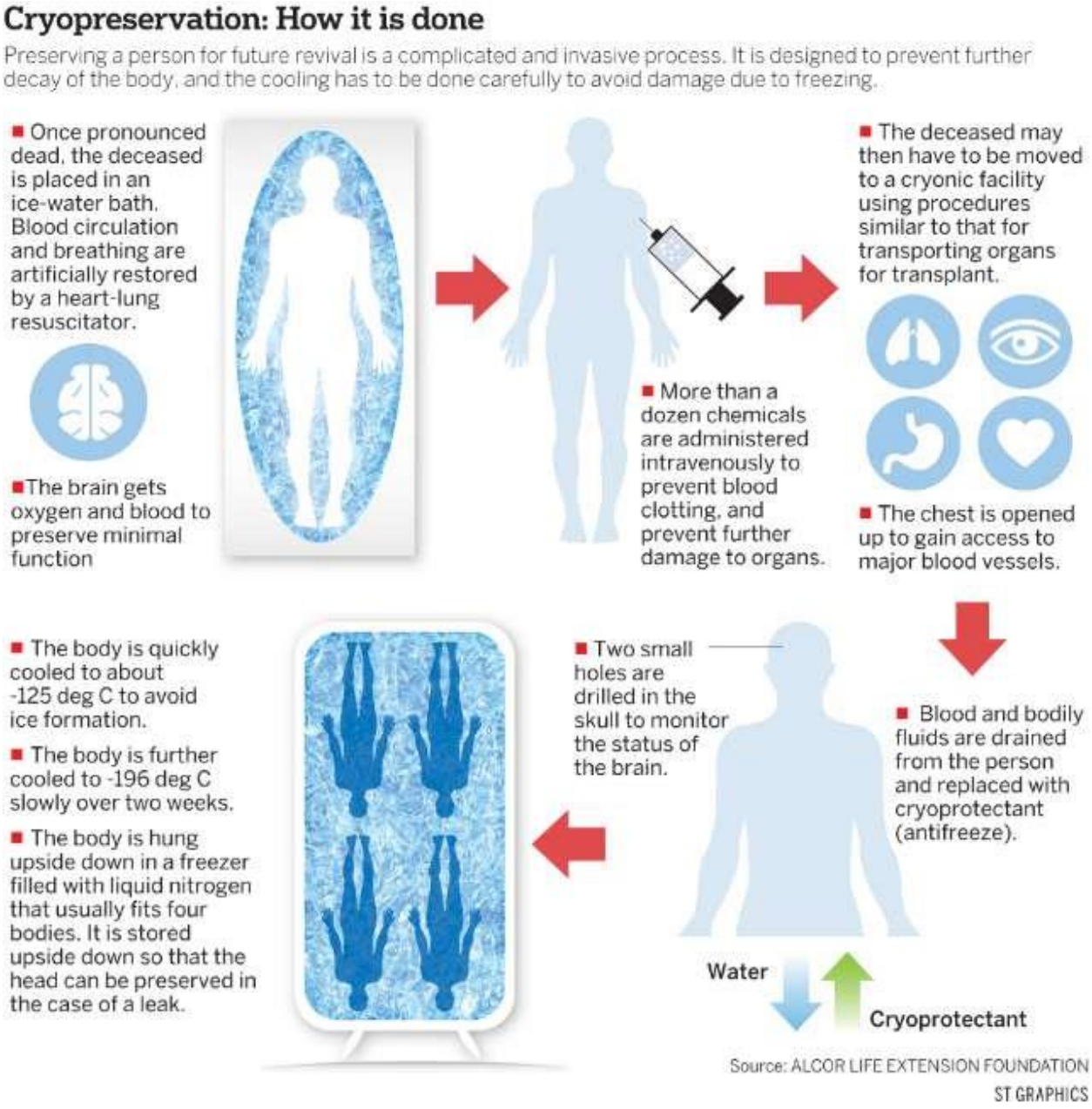


Figure 2–11: The cryopreservation process illustrated
(Source: ALCOR Life Extension Foundation)

As illustrated in **Figure 2–11**, in order to achieve cryonic suspension, the body goes through a series of complicated and invasive steps that include the following (Watson, 2005):

- Firstly, the deceased body is placed in an ice-water bath where the core body temperature is lowered significantly; a heart-lung resuscitator is then used to artificially restore breathing and blood circulation;
- Next, the body is injected with more than a dozen chemicals that prevent the blood from clotting, as well as any further damage to the organs;
- The chest is then opened up to gain access to major blood vessels, where the blood and bodily fluids are drained before being replaced with antifreeze; to avoid the formation of ice on the body, it is quickly cooled to about -125° Celsius;
- Over the next two weeks, the body is further cooled to -196° Celsius, before being placed in a freezer “chamber” filled with liquid nitrogen. The body is stored upside down, so if there ever a leak in the tank, the brain would stall immersed in the freezing liquid.

Figure 2–12: Cryonics Chambers from the Cryonics Institute, Great Britain (Retrieved from http://i2.cdn.cnn.com/cnnnext/dam/assets/161118054927-02-uk-teenager-cryonics-body-preservation-full-169.jpg)

Resomation

An alternative to traditional burial and flame cremation, resomation practices that mimic a faster, natural decomposition process. This process involves placing the cadaver in a special wool coffin into a Resomation chamber, and instead of fire, uses an alkali hydrolysis chemical and water to quickly reduce the body to ash (Sullivan, 2016). Typically, this process takes 3-4 hours to complete; it also uses less energy, relies on fewer fossil fuels, and emits fewer particles and pollutants into the air than fire cremation (Bay Area Funeral Consumers Association (BA-FCA)). Currently, the only location in the United States where patrons can choose this option is at the Anderson-McQueen funeral home in St. Petersburg, Florida (Pappas, 2011).

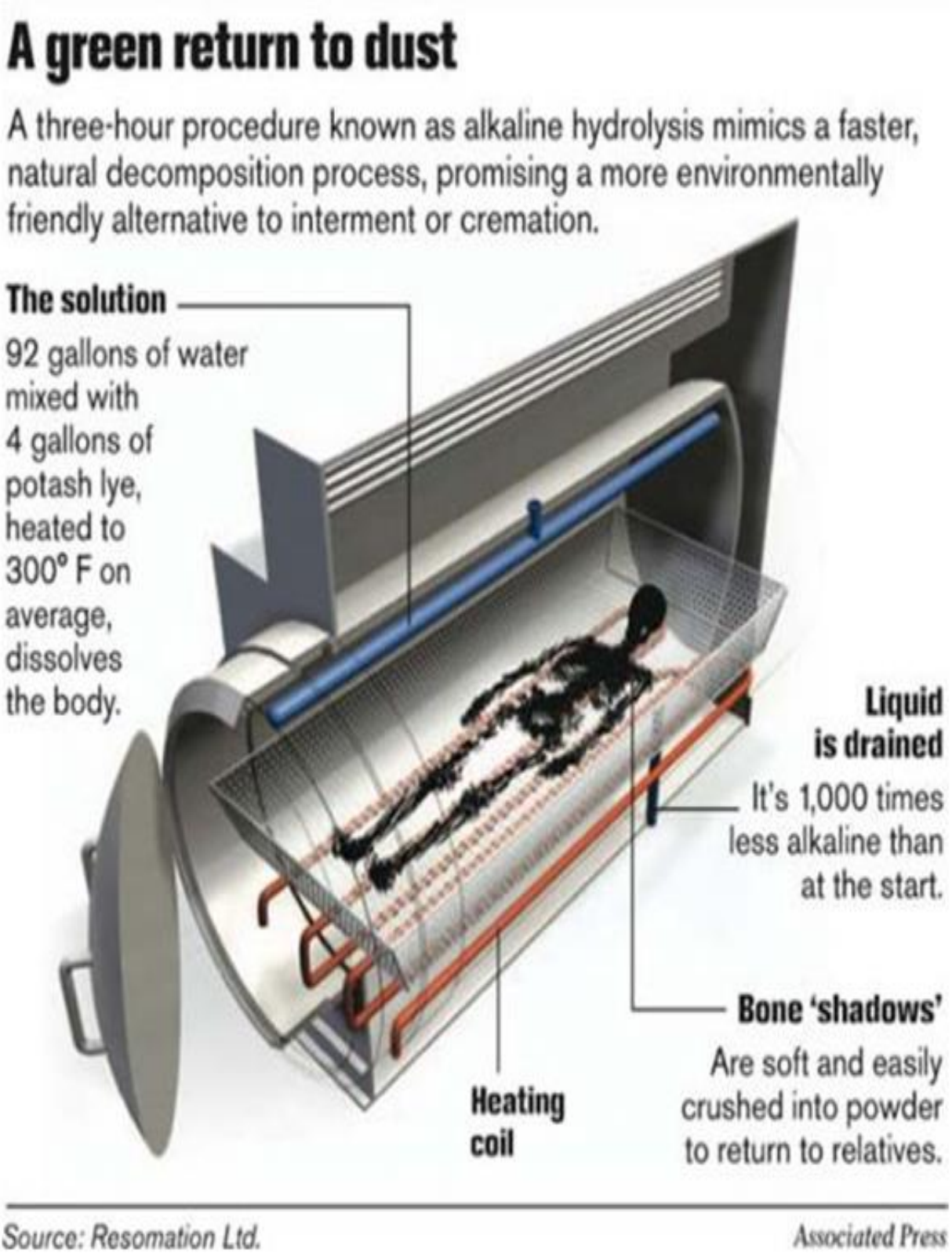


Figure 2–13: Resomation illustrated
(Source: Resomation Ltd.)

Natural "Green" Burial

Today, more and more people are concerned about, and aware of their impact on the environment. As such, many are opting for a green burial versus a traditional burial practice. Simply stated, green burial is a way of caring for the deceased with as little impact to the natural environment as possible, especially compared to traditional and more common burial practices. In order to be considered a "natural burial" several focus areas must be met. These include the conservation of natural resources; the preservation of the environment; and the protection of the health of the industry workers (EverPlans, 2017).

Figure 2–14: A natural burial being performed in Seoul, South Korea
(Source: Dideier Ruef, 2002)

Figure 2–15: A natural burial
(Retrieved from https://c2.staticflickr.com/8/7144/6506358125_ab4c17f94a_b.jpg)

Green burial is a great way for many religious persons, specifically those practicing the Jewish and Muslim faith, to meet the requirements of the religious law regarding burial rituals and customs. This burial option conserves natural resources because the caskets are made from sustainably produced materials created from renewable sources; conventional caskets are often constructed using wood or metal not typically produced in a sustainable manner. Green burial caskets are created from sustainable sources; they do not use chemical-based paints or finishes; and they are biodegradable. Therefore, they do not add harsh toxins into the earth as they decompose, thus aiding in the preservation of the environment.

Eternal Reefs

Another alternative to the traditional practice of burial is to mix the cremated remains (“cremains”) of the deceased with concrete, to create artificial reef material (Eternal Reefs, 2014). This material is used to form large orbs and structures that are then placed in areas of the ocean where reefs need restoration. The organic material from the cremains attracts fish and other organisms that aid in turning the artificial reef into a thriving underwater habitat (Pappas, 2011).

Figure 2–16: The thriving eternal reef
Source: (Eternal Reefs, 2014)

Figure 2-17: Pre and post-placement of a cremain structure
Source: (Eternal Reefs, 2014)

Environmental Impacts of Body Disposition Practices

According to *National Geographic, American funerals are responsible each year for the felling of 30 million board feet of casket wood (some of which comes from tropical hardwoods), 90,000 tons of steel, 1.6 million tons of concrete for burial vaults, and 800,000 gallons of embalming fluid. Even cremation is an environmental horror story, with the incineration process emitting many a noxious substance, including dioxin, hydrochloric acid, sulfur dioxide, and climate-changing carbon dioxide*.

Table 2-2 illustrates the various resources used in each type of major burial practice, thus helping to determine which is the most harmful to the environment and which is least detrimental to the environment.

Table 2-2: Resources Used in Various Types of Burial Practices

	Traditional Burial	Cremation	Resomation	Natural/ Green Burial	Sky Burials
Animals	X				X
Biodegradable casket				X	
Biodegradable urn			X	X	
Concrete	X				
Electricity		X	X		
Embalming fluids	X				
Fire		X	X		
Flowers	X			X	
Plot of Land	X	X		X	
Renewable resources			X	X	X
Shroud/cloth				X	X
Steel	X				
Water			X		
Wood	X				X
Any harmful chemicals released?	Yes	Yes	No	No	No
Spatial requirements	2.5'W x 8'L x 6'D (burial plot)	4'W x 8'L (cremation chamber)	3'W x 7'L (resomation chamber)	4.5'W x 9'L (burial plot)	None

Source: (Benmoshé, 2017)

Casket Burial

Traditional “full-service” burials (casket, flowers, burial plot or tomb, grave marker, etc.) have an enormous impact on the natural environment. For instance, 10 acres of burial ground contains nearly 1,000 tons of casket steel, 20,000 tons of concrete for vaults, and enough wood from buried coffins to build more than 40 single-family homes (Brackett, 2017). Moreover, to accommodate a large number of bodies, whether being buried in a grave or a mausoleum, cemeteries typically require many acres of land; causing much destruction to the natural environment and habitats that initially occupied the land.

Furthermore, the typical measurement of an average human adult is just under 1.5 feet wide by 6 feet long by 1 foot deep (Griggs, 2011). Per the *International Cemetery, Cremation, and Funeral Association*, a standard burial plot is recommended to be 2.5 feet wide by 8 feet long (including space for a marker or headstone). Atypical burial plots, used to accommodate individuals requiring additional space, are recommended to be 3 feet wide by 9 feet long and 4 feet wide by 10 feet long.

Cremation

Contrary to popular belief, the practice of cremating bodies of the deceased is not an eco-friendly alternative to underground burial. As a whole, while it may not be as damaging to the environment as full-service burials, large amounts of energy (typically natural gas) are needed, to power the furnaces. In order to reduce the body to bone-ash fragments, the furnace must reach temperatures ranging from 1,400^{o}F to 2,000^{o}F; a typical incineration session lasts for 2 to 2.5 hours. Following the incineration, any remaining bone-ash fragments are pulverized and stored in an urn.

By using nonrenewable sources of energy, greenhouse gasses and chemicals that have been vaporized during the cremation process are released into the atmosphere. One of these, released from silver amalgam dental fillings, is mercury. Once released, mercury cycles through the environment, especially in water; small organisms, making its way up the food chain, and inadvertently consumed by humans, absorb the chemical. Described by the United States Environmental Protection Agency (EPA), mercury is a “naturally occurring element that can be found throughout the environment.” Although a naturally occurring element, too much exposure to mercury is neither good for people nor the environment (Rahill, 2016).

Since 1963, the practice of cremation has been on the rise, and is quickly becoming the preferred choice for many within the United States of America. In 2011, the cremation rate in the U.S.A. was 42.2%, while the cremation rate was projected to be 49.4% in 2016; the average growth rate for cremation per year was 1.64% (National Funeral Directors Association, 2011).

Metamorphosis

A common misconception among many mourners is that the cremated remains of a deceased loved one can simply be placed into the ground or around plants, with the intent that the ashes will be beneficial to plant life. However, because “raw” ashes contain very high levels of PH and sodium, scattering these ashes around the plants has an adverse effect on the plants and surrounding soil, making the plants and soil toxic and unstable. Therefore, in order for the ashes to provide the desired outcome of sustaining living organisms from the remains of deceased organisms, the toxic PH and

sodium in the raw ashes needs to be lowered before the ashes are scattered on the ground.

Embalming

Among the most destructive burial rituals to the environment is the use of embalming fluids - a replacement of bodily fluids with a preservative solution. (Elemental Cremation & Burial, 2017). Although government law or regulation in many parts of the world does not require the process of using embalming fluids, it remains a common practice throughout the funeral industry. Alternatives to using embalming fluid include refrigerating the body and opting for a closed casket service.

The Design and Planning of Death

Types of Cemeteries

Regardless of religion, all cemeteries can be divided into fifteen categories, which include:

1. **The Church Cemetery:** Between the Middle ages and the Victorian era, the dead were often buried on the properties of churches – however, with limited space; graves were often used multiple times. But as plagues and disease rose through the soils infecting those who attended mass, new regulations were formed in regards to burials and burial plots, which included making it illegal to bury bodies less than six feet under the soil. These days, churchyards are still used to house the dead, and while a church cemetery is often found in the churchyard, it can often be separate from the church. These churchyards are owned by the church and are

considered private property; however, churchyards are generally open for all to visit. One such famous churchyard is the Trinity Church Cemetery located in Manhattan, New York, USA, which is the home to many founding US representatives and Revolutionary War soldiers. (Gillies, 2017)

2. **The Public Cemetery:** Public Cemeteries are plots of land owned by a governmental unit within a town, city, or county and are by law, public cemeteries that must remain open to the public. (Gillies, 2017)

3. **The Customary Cemetery:** With no formal or legal status no sexton or sexton's records, customary cemeteries are simply plots used by neighbors as burying places, which are further cared for by survivors of those buried within. While they are not generally legal, these types of cemeteries are tolerated and can often be found in rural areas. (Gillies, 2017)

4. **The Private Cemetery:** Often owned and operated by a corporation, lodge, community organization, military or specific family, these cemeteries are restrictive to the public and will list the owners and/or caretakers at the cemetery entrance. (Gillies, 2017)

5. **The Lodge Cemetery:** Similar to the private cemetery, a lodge cemetery is owned and operated by lodges or other fraternal organizations, such as the *Bohemian Grove Club*, *Freemasons,* or *Oddfellows*. In many cases,

these cemeteries are strictly restricted to members of the organization, but often, others can purchase plots – and because many of these organizations were founded as a means to provide burial or death insurance, costs were generally inexpensive for members. (Gillies, 2017)

6. **The Ethnic Cemetery:** These type of cemeteries can be either private or public, but are owned, operated and maintained to support one religious group, such as Russians and the Russian Orthodox Church. (Gillies, 2017)

7. **The Family Cemetery:** In most states, these types of cemeteries are still legal, but while there are fewer family cemeteries, at one time there were thousands of them. Consisting of a plot of land, owned by a family, a family cemetery would see the occasional close friend buried on the property along with family members, due to many families owning large amounts of rural land, they could afford to allocate portions of land for this purpose to keep burial costs down. (Gillies, 2017)

8. **The Veterans' Cemetery:** As part of their service in the military, veterans who were honorably discharged from service are given the opportunity to be buried in a military cemetery. Currently there are 119 national veterans' cemeteries in the United States, the most famous of all being the Arlington National Cemetery. (Gillies, 2017)

9. **The Monumental Cemetery:** monumental cemeteries are cemeteries in which headstones, other monuments made of marble, granite, or similar materials rise vertically above the ground. However, because maintenance of monuments is the responsibility to the family, and further because of the number of graves inside the cemetery, monumental cemeteries have been considered unsightly. (Gillies, 2017)

10. **The Memorial Park:** With no gravestones or grave mounds, memorial parks and lawn park cemeteries are more commemorative memorials in honor of the deaths of many lives. (Gillies, 2017)

11. **The Lawn Park Cemetery:** With commemorative plaques placed horizontally at the head of the grave at ground level, a lawn cemetery is a cemetery that is void of grave mounds, but covered entirely with flat grassy lawns which barely shows any evidence that people have been buried there. However, because the plaques are in the ground, many families are restricted from leaving objects on grave markers, due to lawn maintenance and the use of mowers. (Gillies, 2017)

12. **The Lawn Beam Cemetery:** Much like a lawn park cemetery, a lawn beam cemetery is a recent addition to the cemetery that addresses the problems a lawn park cemetery may impose on maintenance workers. Using a low raised concrete slab placed across the cemetery which allows for commemorative plaques be mounted to, this feature allows space between the slabs where grass can grow, giving cemetery maintenance

workers ease to work mowers without the risk of blades damaging plaques and objects left behind by families. (Gillies, 2017)

13. **The Garden Cemetery:** It was in 1831 when the first American garden cemetery was created. Known as Mount Auburn Cemetery, it combines a mixture of trees, flowers, and benches to give it a park-like atmosphere, but still uses the traditional grave markers and monuments to identify the locations of final resting places. (Gillies, 2017)

14. **The Natural Cemetery:** Instead of headstones and monuments lined along a neatly manicured lawn, the natural cemetery is planted with trees to create a botanical park. It is the type of environmentally friendly cemetery that would appeal to people who prefer not to be preserved in caskets and injected with chemical preservatives but would rather let Mother Nature recycle the nutrients of a body to assist plant life to grow. (Gillies, 2017)

15. **The Pet Cemetery:** For many people a pet can be more than just a pet. In their eyes, a pet is a member of the family and as a member of the family, a certain of dignity is required which is why pet cemeteries have been increasing in popularity over the years. However, while a person cannot be buried with their pets in pet cemeteries, their cremains can. Meanwhile, since 1896, the Hartsdale Pet Cemetery & Crematory has been catering to pet interment with nearly seventy-thousand pets having been buried on the land. (Gillies, 2017)

Figure 2–17: A church cemetery in Iceland
Source: (Benmoshé, 2017)

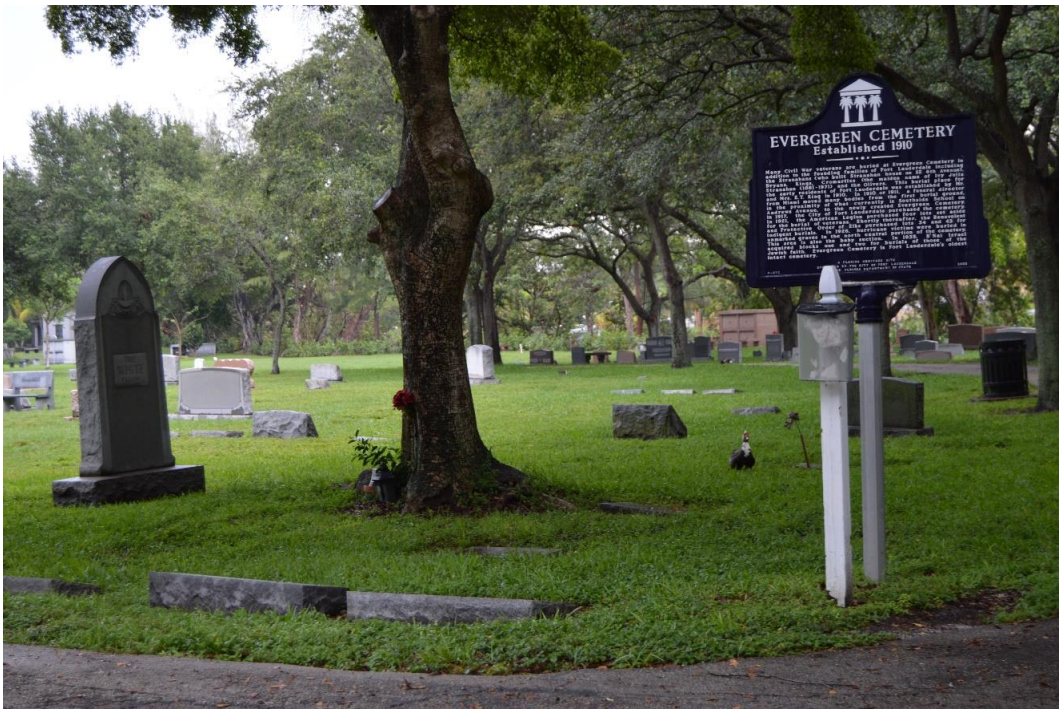


Figure 2–18: A public cemetery owned and operated by the City of Fort Lauderdale
Source: (Benmoshé, 2017)

Figure 2–19: A customary cemetery in New Orleans, Louisiana
(Retrieved from http://static.panoramio.com/photos/large/32362632.jpg)

Figure 2–20: A private cemetery
(Retrieved from http://lazarusfuneralhome.com/wp-content/uploads/2014/02/WP_20140704_0011.jpg)

Figure 2–21: A lodge cemetery in Chicago, Illinois
(Retrieved from https://gravelyspeaking.files.wordpress.com/2014/11/img_5037.jpg)

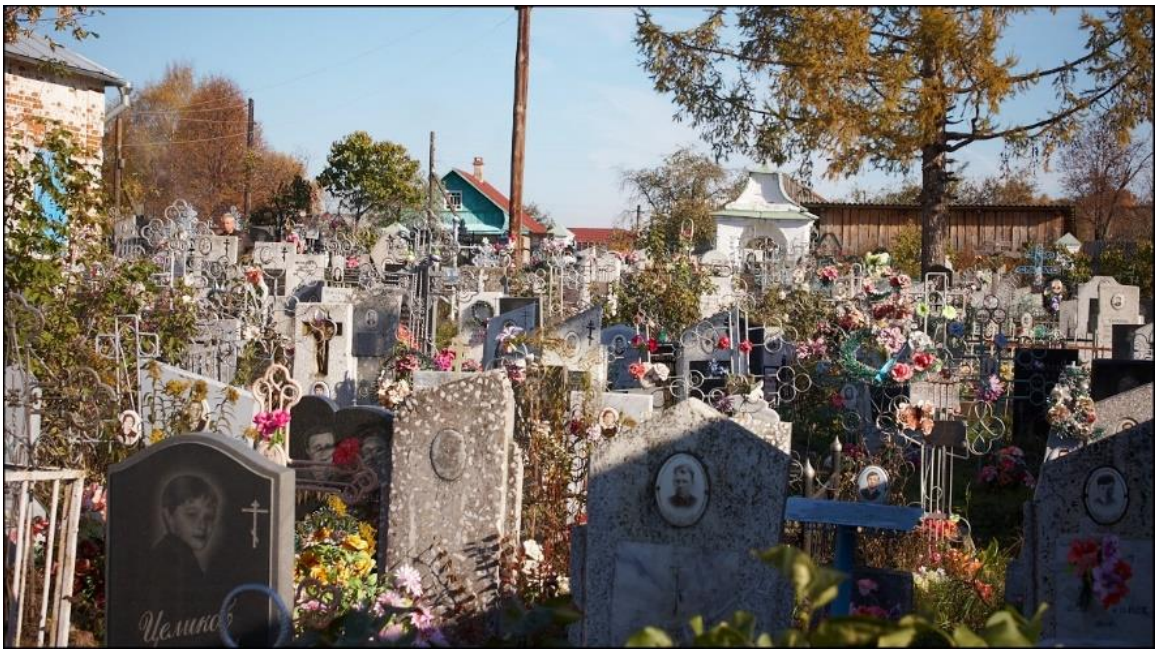


Figure 2–22: An ethnic cemetery in Yarolalvl, Russia
(Retrieved from https://upload.wikimedia.org/wikipedia/commons/6/61/Cemetery_in_Norskoye%2C_Yaroslavl%2C_Russia.jpg)

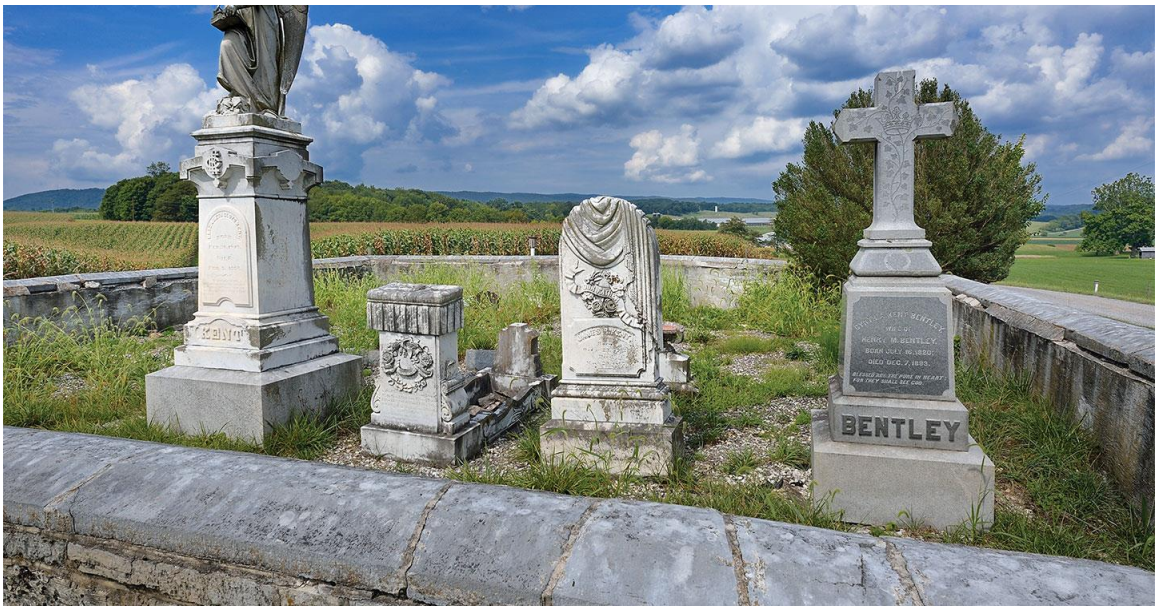


Figure 2–23: A family cemetery in Virginia
(Retrieved from http://www.vtmag.vt.edu/fall15/img/family-tree-cemetery-1.jpg)

Figure 2–24: A veteran's cemetery in Virginia
(Retrieved from https://c1.staticflickr.com/6/5094/5593854660_769a8b6329_b.jpg)

Figure 2–25: A monumental cemetery in Spain
(Retrieved from https://simplyspain.files.wordpress.com/2011/11/dscn4019.jpg)

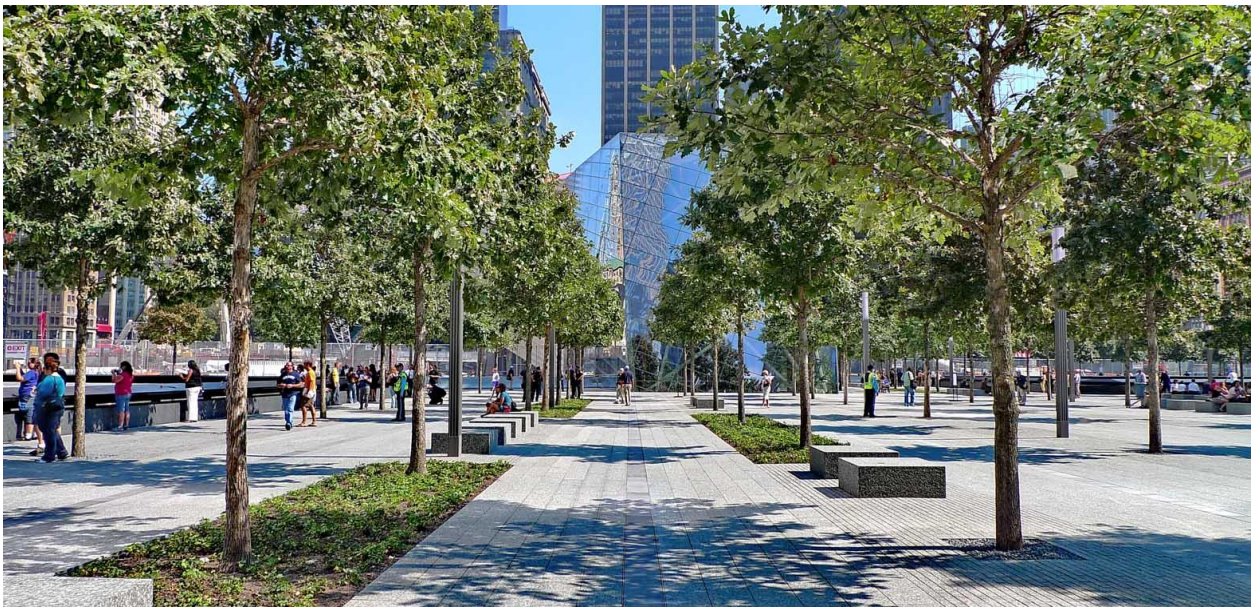


Figure 2–26: A memorial park in Manhattan
Source: (PWP Landscape Architecture, 2017)

Figure 2–27: A lawn park cemetery in Los Angeles
(Retrieved from http://www.bestourism.com/img/items/big/6781/Forest-Lawn-Memorial-Park-in-Los-Angeles-USA_Cemetery-view_7636.jpg)

Figure 2–28: A lawn beam cemetery in Australia
(Retrieved from
http://ezifunerals.com.au/admin/cemetery/uploads/14568433831736337 03CAN-Woden%20Cemetery.jpg)

Figure 2–29: A garden cemetery in Cambridge, Massachusetts
(Retrieved from http://www.cambridgeusa.org/images/made/a16a7418a9821c33/Stroll_Mount_Auburn_590_300_s_c1_smart_scale.jpg)

Figure 2–30: A natural cemetery in Stratford, U.K.
(Retrieved from http://www.natural-burials.co.uk/wp-content/uploads/2013/12/slide-3.jpg)

Figure 2–31: A pet cemetery in Hartsdale, New York
(Retrieved from http://assets.nydailynews.com/polopoly_fs/1.1459070.1379460991!/img/httpImage/image.jpg_gen/derivatives/article_750/hartsdale-pet-cemetery.jpg)

Forecasting Need

Table 2-3 illustrates the ranking of the world's top twenty most populous urban areas (as of April 2017), and includes each urban area's land area and population density. Of those listed, Tokyo is the most populated urban area with an estimated population of about 38 million people; with a total land area of 8,547 square kilometers, its population density is 4,400 people per square kilometer. While Dharka is ranked as the fifteenth most populated urban area in the world, of the twenty urban areas listed below, it is by far the most densely populated urban center with nearly 46,000 people per square kilometer.

Table 2-3: Top Twenty Largest Urban Areas In The World: 2017

Rank	City and Country	Population Estimate	Land Area (in sq. km.)	Population Density (in sq. km.)
1	Tokyo, Japan	37,900,000	8,547	4,400
2	Jakarta, Indonesia	31,760,000	3,302	9,600
3	Delhi, India	26,495,000	2,202	12,000
4	Manila, Philippines	24,245,000	1,787	13,600
5	Seoul, South Korea	24,105,000	2,745	8,800
6	Karachi, Pakistan	23,545,000	1,010	23,300
7	Shanghai, China	23,390,000	3,885	6,000
8	Mumbai, India	22,885,000	88	26,000
9	New York, U.S.A.	21,445,000	11,875	1,700
10	Sao Paulo, Brazil	20,850,000	3,043	6,900
11	Beijing, China	20,415,000	4,144	4,900
12	México City, México	20,400,000	2,370	8,600
13	Guangzhou, China	19,075,000	3,820	5,000
14	Osaka, Japan	17,075,000	3,212	5,300
15	Dharka, Bangladesh	16,820,000	368	45,700
16	Moscow, Russia	16,710,000	5,698	2,900
17	Cairo, Egypt	16,225,000	1,917	8,500
18	Bangkok, Thailand	15,645,000	3,043	5,100
19	Los Angeles, U.S.A.	15,500,000	6,299	2,300
20	Buenos Aires, Argentina	15,355,000	3,212	4,800

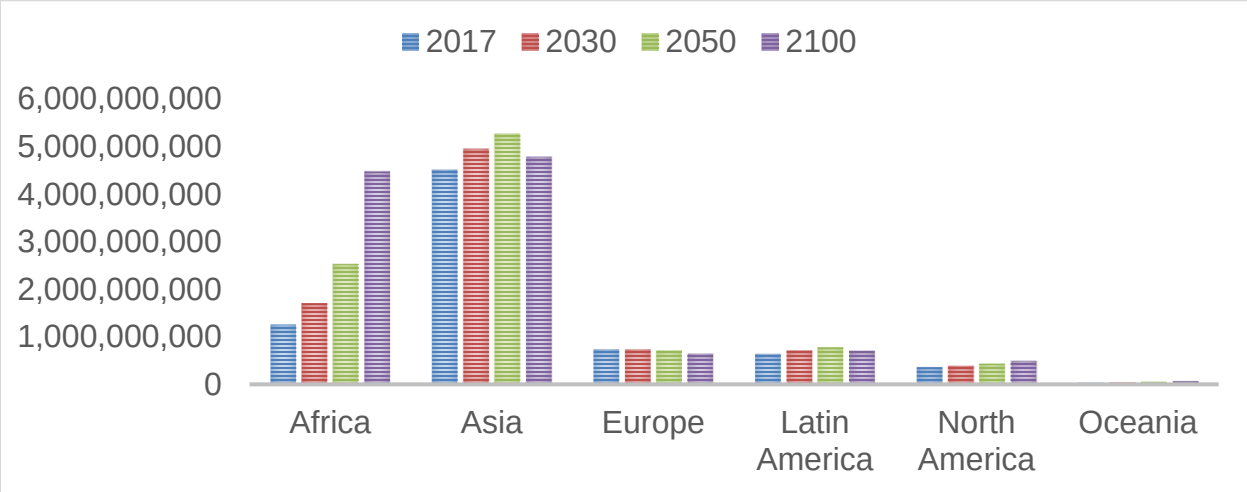
Source: (Demographia, 2017)

Table 2-4: Current and Projected Population of the World and Regions

Region	Population			
	2017	2030	2050	2100
Africa	1,256,000,000	1,704,000,000	2,528,000,000	4,468,000,000
Asia	4,504,000,000	4,947,000,000	5,257,000,000	4,780,000,000
Europe	742,000,000	739,000,000	716,000,000	653,000,000
Latin America	646,000,000	718,000,000	780,000,000	712,000,000
North America	361,000,000	395,000,000	435,000,000	499,000,000
Oceania	41,000,000	48,000,000	57,000,000	72,000,000
World	**7,550,000,000**	**8,551,000,000**	**9,772,000,000**	**11,184,000,000**

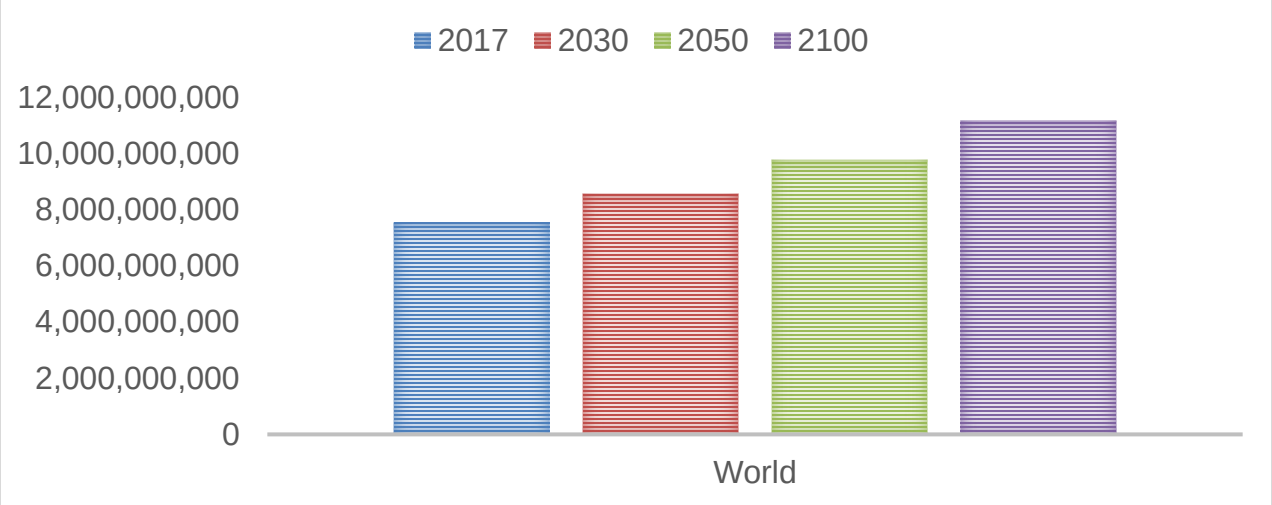
Source: (Demographia, 2017)

Table 2-5: Current and Projected Populations of the World Regions



Source: (Benmoshé, 2017)

Table 2-6: Current and Projected Population of the World



Source: (Benmoshé, 2017)

As of July 2016, the world's population was made up of 7,323,187,457 persons (The World Factbook, 2016). During this time, the crude birth rate for the whole world was 18.5 births per 1,000 people -- this rate results in about 258 worldwide births per minute (The World Factbook, 2016). Also during this time, the crude death rate for the whole world was 7.8 deaths per 1,000 people -- this rate results in about 108 worldwide deaths per minute (The World Factbook, 2016).

Based on the rates above, we can calculate the estimated total amount of land needed to bury every person estimated to die in 2016:

Table 2.7: Estimated Total Amount of Land Needed

	Minute (60 seconds)	Hour (60 minutes)	Day (24 hours)	Year (365 days)
Deaths	**108**	**6,480**	**155,520**	**56,764,800**

20 ft^2 (recommended burial plot size)
X
56,764,800 (deceased persons)
=
1,135,296,000 ft^2 of land

1,135,296,000 ft^2 of land
/
43,560 ft^2 (1 acre)
=
26,063 acres of land

Using the recommended standard burial plot size of 2.5 feet wide by 8 feet long (20 square feet), multiplied by the estimated number of deceased persons in 2016, equates to approximately 1,135,296,000 ft^2 (26,063 acres) of land needed to bury all of those who passed away in 2016. Based on these figures, the amount of land equivalent to 1/3 the size of Dhaka, Bangladesh would be needed each year, in order to bury the dead underground.

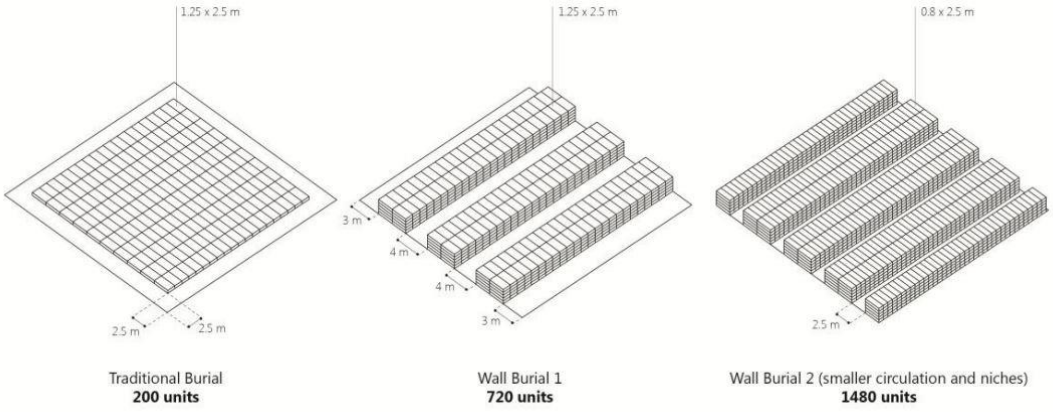


Figure 2–32: Space Calculation Comparison
Source: (Hariyono, 2015)

As illustrated in **Figure 2–32**, space calculations were conducted, in order to identify the maximum number of units (tombs) that will fit on each floor. Using the same

amount of floor space (99 ft. wide x 99 ft. long) and room height of 10 ft., as well as the standard recommended burial plot size of 2.5 ft. wide x 8 ft. long x 2.6 ft. deep, the results are thus: a traditional burial can only accommodate 200 units. However, once the units are stacked, even with the inclusion of 9 ft. and 12 ft. wide walkways, this number nearly quadruples to 720 units. If the walkways were reduced to a standard width of 8.25 ft. throughout the floor, and additional 760 units can be added.

CHAPTER 3
METHODOLOGY

Purpose of Research

The purpose of this research was to determine the impacts of today's funeral and burial rituals on the natural environment, to determine if they are sustainable with a rapidly urbanizing population. Research was conducted in an effort to make a case for implementing a radical change in the way we physically, mentally, and emotionally process the bodies of the deceased, essentially making the funeral and burial process more sustainable. The process of research included collecting information from journals, websites, videos, books, case studies of existing projects related to this thesis, and site visits to several memorial gardens and urban resting centers.

Study Design

The study design used a cross-sectional design because it proved to be the most appropriate and fitting one based on the research topic, approach, and execution. This study design also used a retrospective-prospective study, a quasi-experimental research design, and included case studies, a trend study of traditional burial practices among several major religions, and field visits to cemeteries. This study design allows

for some flexibility as well as obtaining an overall “picture” of the funeral industry’s practice.

Site Audit

A total of ten memorial gardens and cemeteries were selected for site visits and analyzed. The selected sites include:

- National Memorial Cemetery of the Pacific, Honolulu, Hawaii;
- Reynir í Mýrdal Cemetery, Vík, Iceland;
- Hólavallagarður, Reykjavík, Iceland;
- Raleigh Memorial Park, Raleigh, North Carolina, U.S.A;
- Dean-Lopez Memorial Garden Cemetery, Big Pine Key, Florida, U.S.A;
- Fort Myers Memorial Gardens, Fort Myers, Florida, U.S.A;
- Mount Sinai Memorial Park Cemetery, North Miami, Florida, U.S.A;
- Evergreen Cemetery, Fort Lauderdale, Florida, U.S.A; and
- National September 11 Memorial Plaza, Manhattan, New York, U.S.A.

These sites were selected for various reasons, including their religious affiliation, unique qualities, geography, history, size, and their relationship with the surrounding context and community. To guide the analysis of each site, a checklist was created to determine the presence (or lack of) ten key attributes, including:

1. General site information, including the total number of years in operation, site acreage, whether or not the grounds are religion-based, maintained, and their current capacity;

2. Streetscape features such as shade trees, native plants, street furniture, landscape maintenance, and whether or not any placemaking assets and amenities are present;
3. Community characteristics, including uses of surrounding properties;
4. On-site building characteristics, including the use(s) of the main building(s), whether or not any there is any ground floor retail, service, and/or entertainment venues present;
5. Pedestrian circulation, such as the presence of adequate pedestrian pathways, bike lanes, streetlights, and whether or not they connect to the adjacent neighborhoods;
6. Signage, such as wayfinding and general site information;
7. Sustainability features, such as being built on any environmental lands and/or environmental issues, and whether or not any green energy technologies present;
8. Culture of grounds, such the presence of any other visitors, including their general activities and attitude while on-site;
9. Site specific challenges/issues that might interfere with the design of the grounds, including future expansion, burial plot placement, and any issues related to geology and weather;
10. Overall impression of the site.

The *Site Audit Criteria* is in the Appendices, as **Exhibit A**.

CHAPTER 4
CASE STUDIES

As a part of the research project, five types of cemeteries established in different cities around the world were analyzed, to understand how they performed and to verify their design goals. These projects were selected for various reasons, including their use of innovative design, techniques, and practices; unique features and qualities; geography; history; size; and their relationship with the surrounding context and community. The cemeteries studied include:

- Memorial Necrópole Ecumênica, Santos, Brazil;
- Burial plot rentals throughout the Netherlands;
- Yarkon Cemetery, Tel Aviv, Israel; and
- National September 11 Memorial Plaza, Manhattan, New York.

Memorial Necrópole Ecumênica, Santos, Sao Paulo, Brazil

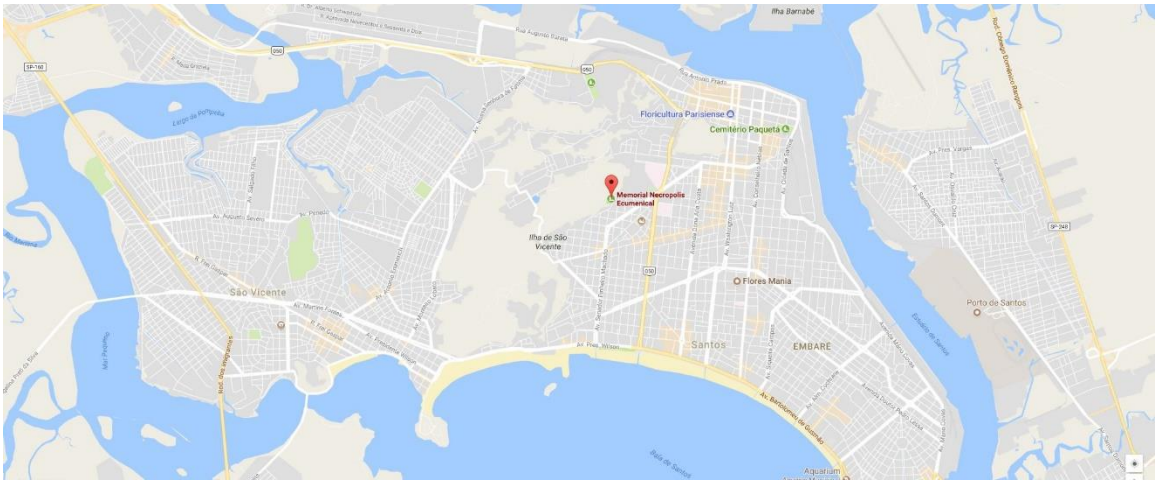


Figure 4–1: Site map from 2,000 feet above ground
Source: (Google Maps, 2017)

Figure 4–2: Site map from 500 feet above ground
Source: (Google Maps, 2017)

Located in one of Brazil's most populous cities, situated on the side of a mountain, and adjacent to a residential neighborhood, the Memorial Necrópole Ecumênica cemetery has a capacity to house 25,000 burial spaces spread across 35 floors. In additional to the non-denomination cemetery, the complex also includes a concert hall, retail shops, a first class restaurant, a rooftop chapel, and a conservation garden with many exotic species, making the Memorial Necrópole Ecumênica one of the most visited landmarks in all of Santos.[1]

When it was inaugurated in 1983, the Memorial Necrópole Ecumênica was only a small building. However, due to increased demand for burial spaces, the small building has had to expand; today, it stands at an impressive 151 feet tall, making this mixed-use building complex the world's tallest vertical cemetery. With an increase in demand comes an increase in price: the higher up a tomb is in the building, the higher the premium will be to rent the space. Families can rent a tomb on one of the higher levels

[1] http://www.odditycentral.com/architecture/tombs-with-a-view-at-the-worlds-tallest-vertical-cemetery.html

for three years (the typical time it takes for a human body to decompose), at the end of which they have an option to have the body exhumed and moved to a different part of the necropolis.[2] A three-year rental of a burial plot within the Memorial Necrópole Ecumênica costs 10,000 to 35,000 Brazilian reals (between $5,900 and $21,000 USD, 2016), depending on which part of the complex it is located in. Options to extend the three-year rental are available, and can become quite costly over time.

The Memorial Necrópole Ecumênica was selected because it is a radical shift in the way we house and memorialize the bodies of deceased loved ones, and is helping to change the way people think about burial customs and cemeteries. This project sets a precedence that cemeteries can be just as functional, stately, successful, and attractive to many people while only taking up a fraction of the space a horizontal cemetery needs.

[2] http://www.odditycentral.com/architecture/tombs-with-a-view-at-the-worlds-tallest-vertical-cemetery.html

Figure 4–3: Memorial Necrópole Ecumênica Memorial rising high above Santos
Source:

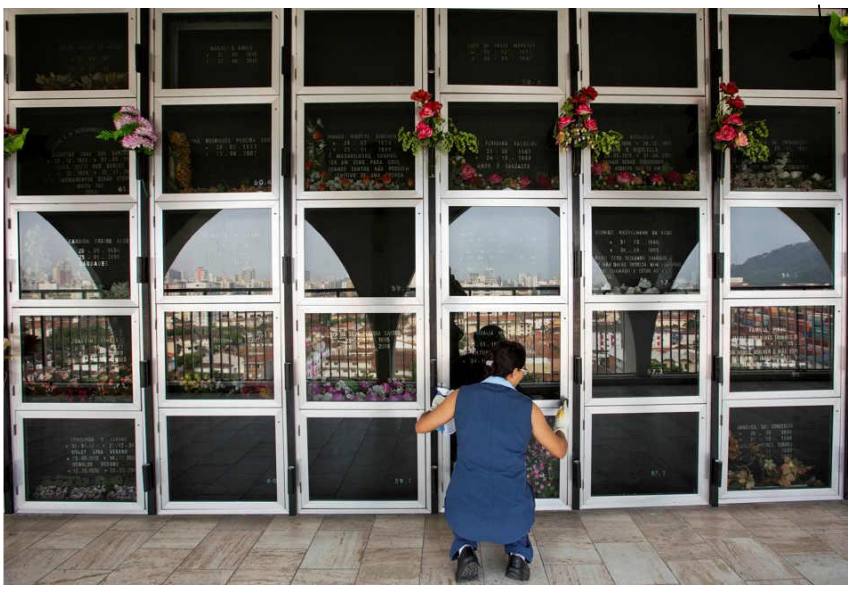


Figure 4–4: An employee cleaning the surface of the crypts
Source: (Penner, 2014)

Figure 4–5: A view of the 14-story cemetery as seen from the central courtyard
Source: (Penner, 2014)

Burial Plot Rentals, Netherlands

In much the same way the Dutch have had to be innovative with the growth and engineering of their cities, largely because a quarter of the country is below sea level, so too have they have to be creative about the ways in which they handle their dead. With the constant threat of flooding, poor soil conditions, and being the most densely populated country in the European Union (493 persons per square kilometer)[3], land devoted to underground burial is at a premium and has traditionally been reserved for the wealthy; therefore, the Dutch have come up with a system of leasing burial plots in 10 to twenty-year increments. With burial space at such a premium, it was not

[3] http://www.expatica.com/nl/about/Dutch-culture-Facts-about-the-Netherlands_102998.html

uncommon that, underneath the church floors, up to five layers of bodies were buried as churches were running out of space to store the deceased underground. Unfortunately, this caused the floors of the church to become unstable (Steen, 2005).

A law passed in 1829 required cemeteries to be established outside of the city boundaries, in built up areas. However, this proved changing for many cities as the poor soil conditions that surrounded these cities was unsuitable for burial sites. In addition to the poor soil conditions, the high ground water table throughout many areas of the country affected the skeletonization process of the bodies; only a handful of locations in the Netherlands have an average ground water table of 0.8 meters, the level specified by the law on “death delivery.” (Steen, 2005) Furthermore, a law passed in 1869 required deceased bodies to be buried within five days; until 1 April 1914, cremation was considered an illegal act in the Netherlands.

Figure 4–6: A church and surrounding burial grounds
Source: (Benmoshé, 2016)

Figure 4–7: A Residential neighborhood surrounds the church and cemetery
Source: (Benmoshé, 2016)

Yarkon Cemetery, Tel Aviv, Israel

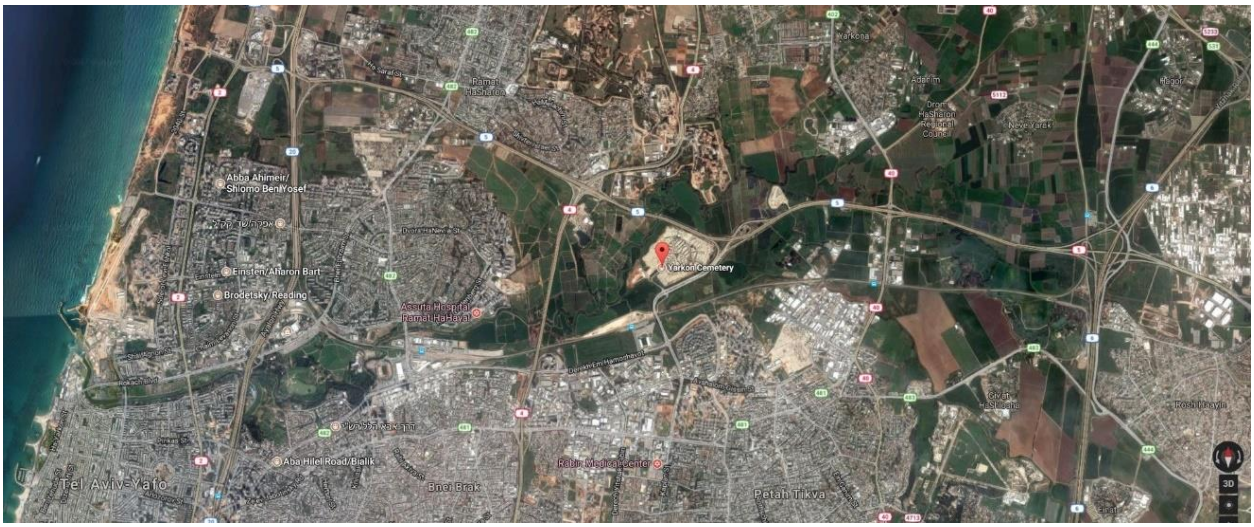


Figure 4–8: Site map from 2,000 feet above ground
Source: (Google Maps, 2017)

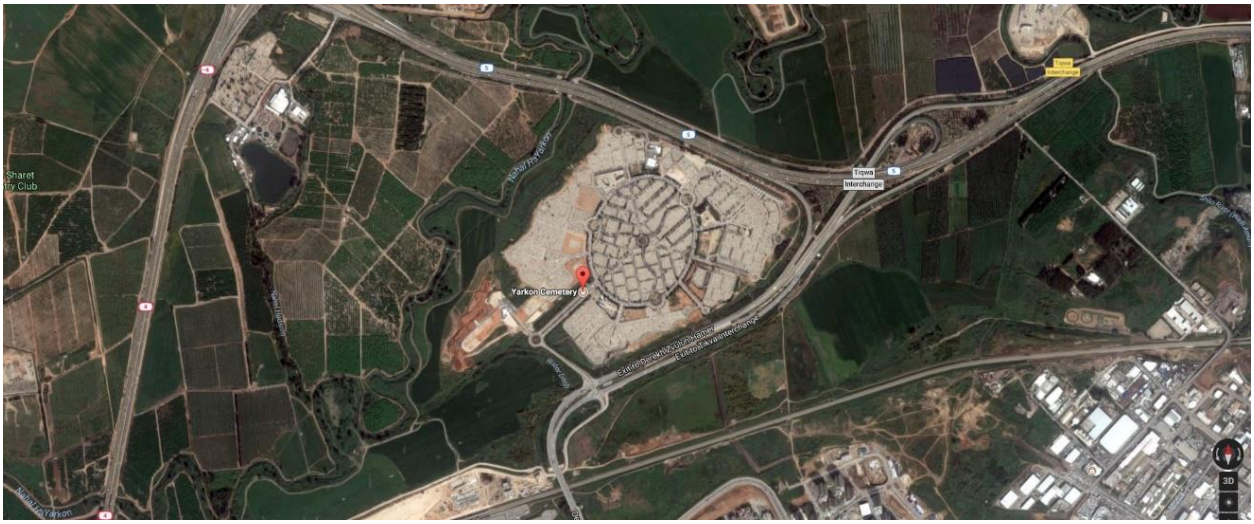


Figure 4–9: Site map from 500 feet above ground
Source: (Google Maps, 2017)

Established in 1991, Yarkon Cemetery is a sprawling 230 acre (93 hectares) site that, when first built, was located outside of the city limits; due to urban sprawl, the cemetery is now located within the city limits. Because of this, along with combatting floods during the rainy season, the cemetery has since run out of space to grow

horizontally; its solution: going vertical. The cemetery's new, vertical expansion consists of four fourteen-story buildings located at the heart of the grounds, and bring the total burial capacity to 60,000 persons. This innovative approach to cemetery design in Israel allows for Yarkon Cemetery to remain the only burial site located within Tel Aviv to remain open and active.

Figure 4–10: The nearly completed vertical cemetery looms over its predecessor
Source: (Balilty, 2014)

Figure 4–11: Aerial view of Petah Tikva's crowded Yarkon Cemetery
Source: (Times of Israel, 2017)

Figure 4–12: The interior of Israel's vertical cemetery
Source: (Times of Israel, 2017)

National September 11 Memorial Plaza, Manhattan, New York, U.S.A

On the morning of Tuesday, September 11, 2001, two hijacked airplanes deliberately crashed into the Twin Towers of New York's World Trade Center Complex, which caused a series of failures that ultimately weakened each tower's structural integrity. The failure of the towers' structural systems caused them to collapse soon afterwards. The terrorist attacks on the nation's financial center took the lives of nearly 3,000 people, and left a nearly 80 feet deep void in the heart of downtown Manhattan. After years of deliberation, one design was selected from 5,201 design submissions from 63 nations, and in 2006, the construction of the plaza began.

The following is an excerpt from the memorial's architects, Michael Arad and Peter Walker:

> *"This memorial proposes a space that resonates with the feelings of loss and absence that were generated by the destruction of the World Trade Center and the taking of thousands of lives on September 11, 2001 and February 26, 1993. It is located in a field of trees that is interrupted by two large voids containing recessed pools. The pools are set within the footprints of the Twin Towers. A cascade of water that describes the perimeter of each square feeds the pools with a continuous stream. They are large voids, open and visible reminders of the absence.*
>
> *Surrounding the pools on bronze parapets are the names. The enormity of this space and the multitude of names underscore the vast scope of the destruction. Standing there at the water's edge, looking at a pool of water that is flowing away into an abyss, a visitor to the site can sense that what is beyond this parapet edge is inaccessible.*
>
> *The memorial plaza is designed to be a mediating space; it belongs both to the city and to the memorial. Located at street level to allow for its integration into the fabric of the city, the plaza encourages the use of this space by New Yorkers on a daily basis. The memorial grounds are not be isolated from the rest of the city; they will be a living part of it."*

The 9/11 Memorial Plaza is an 8-acre park that not only serves as a sanctuary to honor and remember the 2,973 lives lost, but also as a final resting place of the remains of 1,113 unidentified victims. Additionally, the plaza has been constructed as one of the most sustainable green plazas ever created -- the 400 swamp white oak trees planted throughout the Memorial Plaza serve as a green roof for the 9/11 museum and train station 70 feet below street level. Furthermore, these trees, which can grow to reach heights as tall as 60 feet, sit on a series of concrete tables that suspend over the plaza on troughs of nutrient-rich soil for the planted trees.

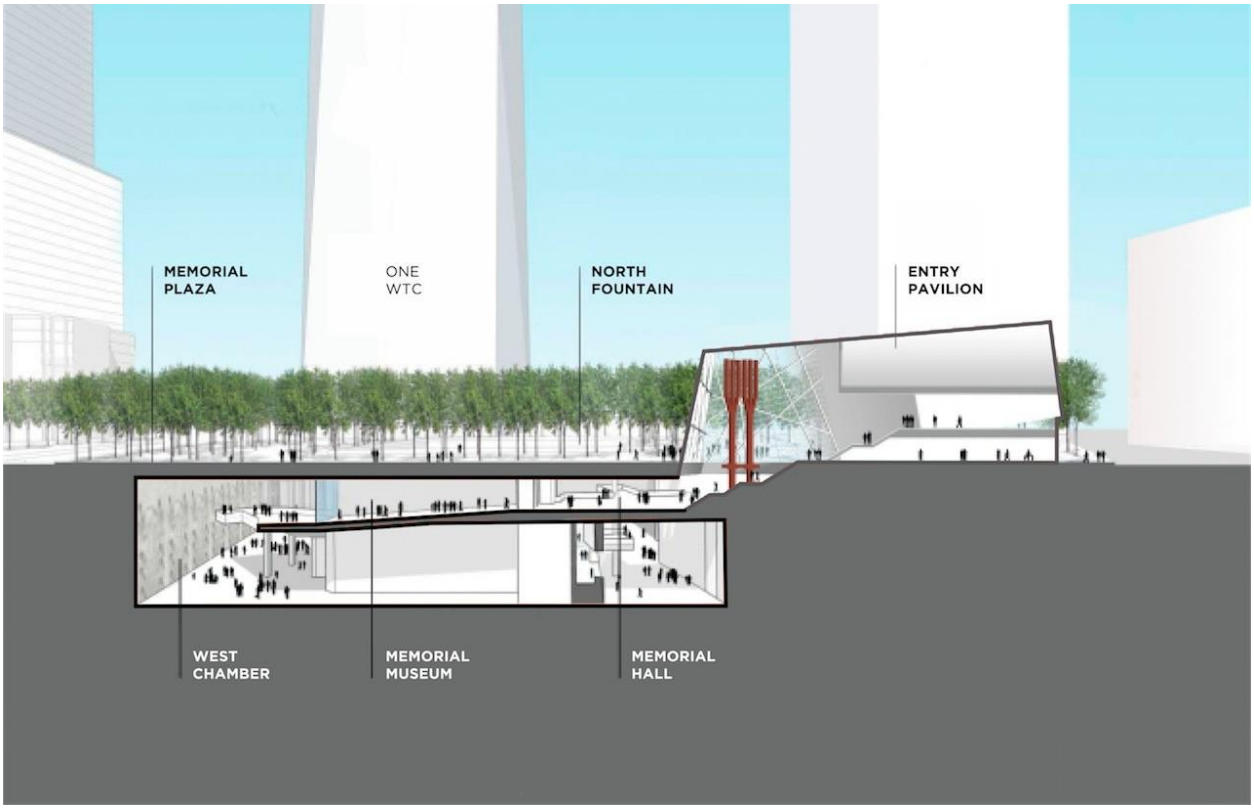


Figure 4–13: A section drawing illustrating the green roof
Source: (Davis Brody Bond, 2014)

Figure 4–14: Reflecting Absence
Source: (Benmoshé, 2012)

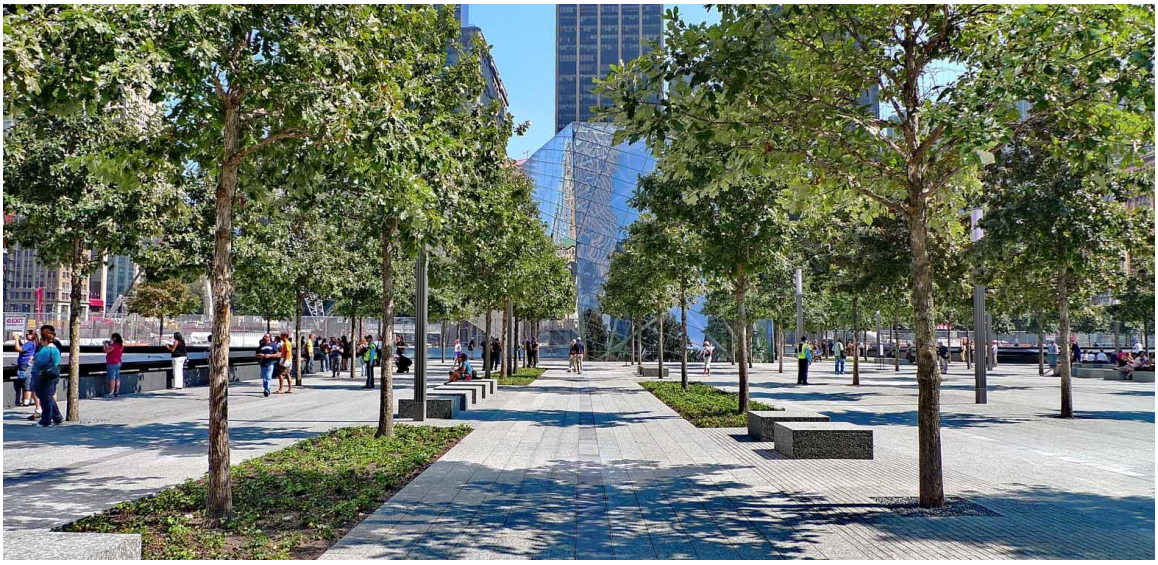


Figure 4–15: The swamp white oak trees are a reminder of the beauty of life
Source: (PWP Landscape Architecture, 2017)

Lessons Learned

Each of the selected projects and practices have pushed the boundaries of what we think of cemeteries and final resting places, while retaining the essence of their respective culture and traditional funeral and burial rituals and customs.

The Memorial Necropole Ecumenica has set a precedence for cemeteries to not only be designed vertically, but that they can also become tourist attractions that offer a variety of uses and amenities, and they can even be built in overcrowded cities with steep topography.

The Netherlands' approach to leasing out burial plots has greatly helped alleviate the country's lack of available space, while also reminding us that even though death may be permanent, our "final resting space" isn't.

Yarkon Cemetery is a great example of the side effects of urban sprawl – while urban planners may want to push cemeteries to the outskirts of town today, eventually cities will have to plan for and fold this land use into the very fabric of the community. Furthermore, by going vertical, Yarkon Cemetery remains the only open and active cemetery in Tel Aviv.

The National September 11 Memorial Plaza has provided millions of people around the world the space to grieve for the thousands of lives lost, and to reflect on their own lives while looking ahead to the future. With its approach to sustainable design and conveyance of what happened on the site, the memorial plaza has helped to redefine what we think a cemetery is, and how it can be incorporated into the heart of the community.

CHAPTER 5
RECOMMENDATIONS

As many urban centers around the world are becoming more and more dense, land is becoming increasingly harder to find; what little land that may remain available can sell at a premium. Therefore, several innovative and sustainable alternatives have emerged that could revolutionize the ways in which we memorialize our deceased loved ones, design cemeteries, and could reduce death's impact on the natural environment. While, of course, not the only solutions to addressing this unspoken challenge, they can create a dialogue which would inspire the public, the funeral industry, and local and state officials all over the world to begin taking actions to addressing this silent crisis that we can no longer ignore.

The following recommendations aimed to preserve traditional instructions of body disposition, from the five religions reviewed, as outlined in this thesis. Moreover, it is important to note that both recommended options described below would follow the leading green building standards and ratings and certification systems, used in that country. Examples include the United States' LEED (Leadership in Energy Efficiency Design); Canada and Europe's BREEAM (Building Research Establishment Environmental Assessment Method); Australia's Green Star; and Singapore's Greenmark.

Vertical Cemeteries

One such alternative to addressing the multitude of issues related to the ways in which we treat our deceased could be to expand upon the Memorial Necrópole Ecumênica's approach of designing cemeteries vertically, not horizontally. Not only

would vertical cemeteries require a small fraction of land, as compared to traditional cemeteries, but would also provide urban areas with geological challenges, such as steep terrain or flood-prone areas, with better options for body disposition. Furthermore, while the placement, size, density, and use of any structure must typically adhere to the local and/or state minimum building design standards and zoning code, each vertical cemetery can be unique assets and amenities to their community.

Mixed-uses

Unlike a traditional cemetery, which typically only uses the space for funeral and burial services, vertical cemeteries can be designed to have ancillary uses such as theatres, parks and green spaces, civic and cultural, recreation, retail, office, and even residential units. Creating mixed-use cemeteries means the cemeteries are not simply occupying much needed space rather that they also fold into the urban fabric and community much better. Additionally, these mixed-use cemeteries would be better suited to financially support themselves in the long term.

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. As illustrated in **Table 2-0**, 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.

Taking the idea of designing highly customizable and adaptive spaces a step further, vertical cemeteries could even “grow,” based on demand for space. By utilizing prefabricated components, the building can quickly expand; reduce construction-related impacts to the environment; increase worker safety and production; reduce material waste; and allow greater flexibility and adaptability. Furthermore, having greater control over the “grounds” could potentially reduce contamination and pollutions from leaking out of the tombs.

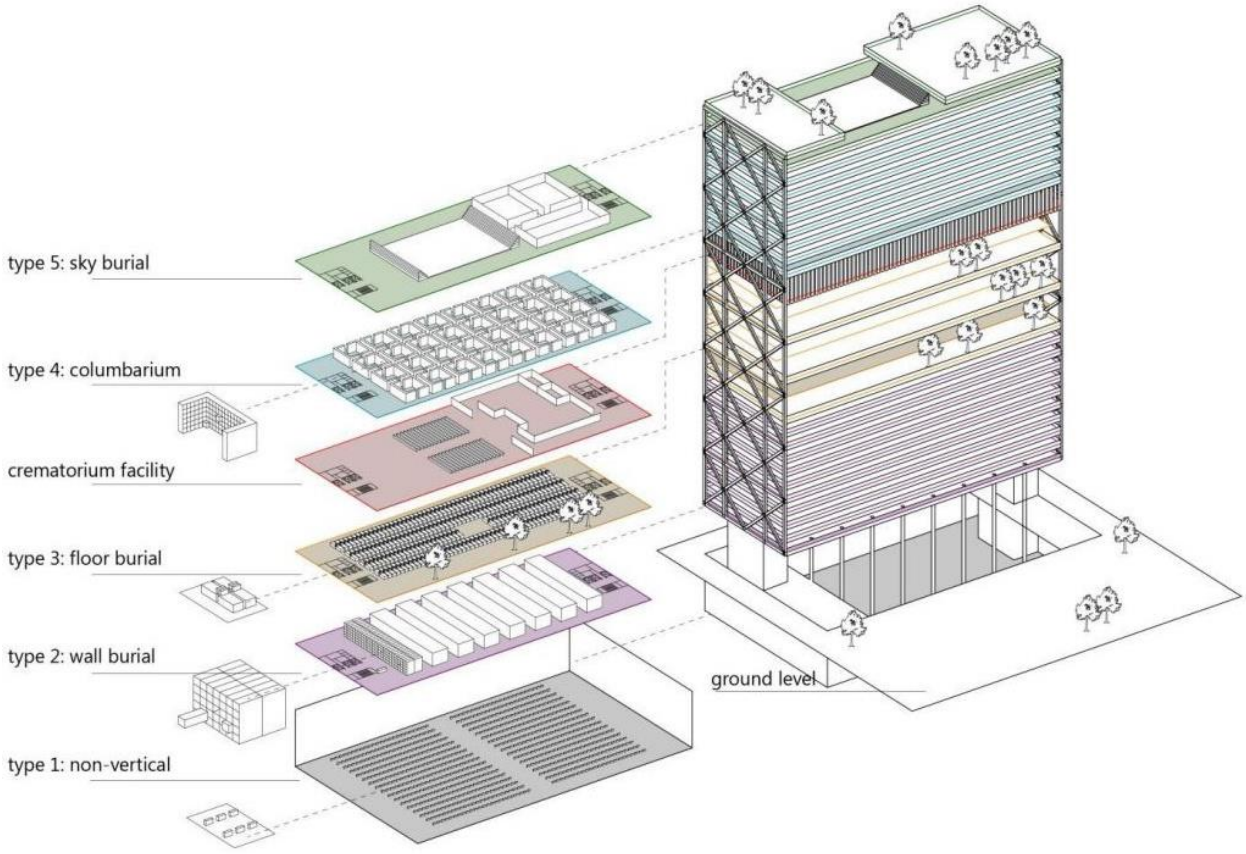


Figure 5–1: Simulation of Strategic Design Plan of Vertical Cemetery
Source: (Hariyono, 2015)

Celebratory Parks

Another innovative alternative to the traditional cemetery is to create celebratory parks and plazas, for those seeking non-traditional places of body disposition. These parks would be hybrids between memorial, natural, and garden cemeteries, combining many of the great qualities and benefits of each to create a new type of cemetery that serves the needs of the living and the dead, in both natural and built environments. Celebratory parks would be designed to provide unique and sustainable spaces for those wishing to mourn the loss of loved ones, as well as providing areas for recreation, revitalization, and reflection. The ultimate goal of these celebration parks is to change the ways in which we view and approach the topic of death, intern and memorialize deceased loved ones, and rethinking what cemeteries are and have to be.

Benefits

Designing this type of cemetery to include amenities such as playgrounds, lakes, pedestrian pathways, open greenspaces, street furniture, and even year-round events helps to maximize the use of the land; these amenities contribute to place making and community enhancements. Moreover, these sacred greenspaces can be established all over the city, providing a multitude of benefits to the community, and play an important role in ecology, in many ways, in that they:

- Filter air, water, and sunlight;
- provide shelter to animals;
- aid in restoring ecosystems and habitats;
- provide recreational areas for people;
- potentially help with urban revitalize;

- moderate local climate;
- mitigate stormwater runoff;
- provide shade to surrounding buildings thus conserving energy; and
- greatly contribute to a city's tree canopy cover, which is critical in reducing the urban heat island effect.

Metamorphosis

The cremated or resomated ash remains of a person would be placed inside of a biodegradable urn, along with seeds of a tree, planted in the remembrance park, grown and cared for by staff, and enjoyed by many. An inscribed concrete, metal, or ceramic ring about the size of the tree species' average width, placed over the planted urn, would be used as a memorial marker. Taking this idea a step further, the ashes from multiple generations of family members can be commingled and used to continuously provide the same "parent" tree with nutrients; this option would allow generations of the same family to remain together posthumously.

Figure 5–2: Visitors to the National 9/11 Memorial Plaza engaged in various activities (Retrieved from https://static.seattletimes.com/wp-content/uploads/2016/04/e9042c53411e4028b9793cdc55de1ec0-780x524.jpg)

Figure 5–3: An inscribed tree ring could be reimagined as a grave marker (Retrieved from https://s-media-cache-ak0.pinimg.com/originals/33/c2/86/33c286ebbf8043fce47f833834e991b1.jpg)

CHAPTER 6
CONCLUSIONS

While death may not be such a taboo topic of conversation in today's rapidly evolving world, it is still largely neglected and seen as an afterthought in the community planning and design profession; many cities either play catchup or ignore the question of planning for final resting spaces altogether. Gone are the days of placing cemeteries on the outskirts of town, where they are left out of sight, out of mind until absolutely needed. This research project aimed to answer the following question: How can the use of innovative and sustainable architectural design change the ways in which we memorialize our deceased loved ones, in urban communities around the world?

This research project also explored and compared the traditional and contemporary funeral customs and rituals, of the five major religions practiced around the world. Also analyzed were the various options for body disposition after death, the types of cemeteries, and the forecasted demand of land needed to continue with these traditional burial rituals. The purpose of this was to gain a greater understanding of the harsh effects these practices have on the environment.

Based on this research, vertical cemeteries and celebratory parks are just several innovative and sustainable alternatives that could revolutionize the ways in which we memorialize our deceased loved ones, design and plan for cemeteries , integrate cemeteries into the fabric of our communities, and potentially reduce death's adverse impacts on the natural environment. While, of course, not the only solutions to addressing this silent crisis, they can create a dialogue, which would inspire the public, the funeral industry, and local and state officials all over the world to begin taking action.

For thousands of years humans have built ever taller structures, in order to be closer to God and the heavens, to celebrate their wealth and prosperity, or simply due to a lack of viable land. Therefore, does the idea of a vertical cemetery truly seem so farfetched?

Future Research

For future research, it is recommended that organizations such as LEED, BREEAM, Green Star, Greenmark, etc. establish a program and criteria that compares and rates the green practices and standards for cemeteries, in order to raise the sustainability practices of cemeteries and the funeral industry. It would also be recommended that interviews and surveys be conducted to determine if neighborhoods in close proximity to cemeteries were more or less popular than other areas of the community. The aim of this would be to make an argument that cemeteries truly have a place within the urban fabric as well as actually enhancing neighborhoods. However, due to time constraints, this research was not able to be conducted.

CHAPTER 7
APPENDICES

Exhibit A: Site Audit Criteria

1. National Memorial Cemetery of the Pacific, Honolulu, Hawaii, 7 April 2015
2. Reynir í Mýrdal Cemetery, Vík, Iceland - 28 April 2017
3. Hólavallagarður, Reykjavík, Iceland - 1 May 2017
4. Raleigh Memorial Park, Raleigh, North Carolina - 14 May 2017
5. Dean-Lopez Memorial Gardens Cemetery, Big Pine Key, Florida - 22 May 2017
6. Fort Myers Memorial Gardens, Fort Myers, Florida - 29 May 2017
7. Mount Sinai Memorial Park Cemetery, North Miami, Florida - 5 June 2017
8. Evergreen Cemetery, Fort Lauderdale, Florida - 5 June 2017

Site Visit and Analysis Conducted on (Date & Time): 7 April 2015 / 11:30 -13:00
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: 2177 Puowaina Drive, Honolulu, HI 96813

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
National Memorial Cemetery of the Pacific "Punchbowl Cemetery"	**1. General Site Information**			
	What year did the grounds open?	N/A	1949	
	Total site acreage?	N/A	112	
	Open 24 hours a day?	No	Typically from 0800 to 1730.	
	Religion-based burial site?	No	Site serves as a memorial to honor those who served in the United States Armed Forces, and those who gave their lives doing so.	
	Total number of graves?	N/A	34,000	
	Are any place(s) of worship present?	Yes		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	No	Due to current capacity, only cremation services remain	
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Underground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	A comfortable distance from one another	
	2. Streetscape Features			
	Open space and landscaping present?	Yes		
	Shade trees present?	Yes		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	No		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	Yes		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	Yes		
	Is the site adjacent to offices?	Yes		
	Is the site adjacent to any areas recreation?	Yes		
	What are the building heights on the other sides of the road?	N/A	Residential, retail, recreation, civic, environmental	
	4. Buildings			
	Main building use(s)?	N/A	Memorial and exhibit space	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1-2 stories	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	N/A	The steep cliffs of the crater create a natural barrier; no security gate present on entry road.	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	No	Sidewalks are only available in the areas surrounding the buildings and parking lot.	
	Estimated sidewalk width, if applicable?	N/A	3'	
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A	12' per lane	
	Streetlights present?	No		
	Streets connect to adjacent neighborhood?	Yes		
	Sidewalks connect to adjacent neighborhood?	No		
	Bike lanes/bikeways connect to adjacent neighborhood?	No		
	6. Signage			
	Wayfinding signs present?	Yes		
	7. Sustainability			
	Environmental lands?	Yes	Grounds are situated within the Punchbowl volcanic crater	
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	Yes		
	If applicable, did visitors appear to be enjoyinig themselves?	Yes		
	If applicable, were visitors observed strolling through the grounds?	Yes		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	No		
	If applicable, did visitors appear to spend a lot of time on the grounds?	Yes		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The memorial grounds are beautifully landscaped and provide a breathtaking view of the island. The site is currently at capacity and is unable to expand, due to it being located within Punchbowl Crater.	

Figure 7–1: National Memorial Cemetery of the Pacific Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 28 April 2017 / 1400 -1415
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Vík, Iceland

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Reynir í Mýrdal Cemetery	**1. General Site Information**			
	What year did the grounds open?	N/A	1897	
	Total site acreage?	N/A	0.25	
	Open 24 hours a day?	No	Yes	
	Religion-based burial site?	Yes		
	Total number of graves?	N/A	Nearly 100	609
	Are any place(s) of worship present?	Yes		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Elevated underground burial	594
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	Tight	597
	2. Streetscape Features			
	Open space and landscaping present?	Yes		615
	Shade trees present?	No		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	No		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	No		
	3. Community			
	Is the site adjacent to a neighborhood?	No		
	Is the site adjacent to retail/commercial shops?	No		
	Is the site adjacent to offices?	No		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	The site does not surround any other buildings.	
	4. Buildings			
	Main building use(s)?	N/A	Church	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	2 stories	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	Yes	A small stone wall and a small wooden fence surround the grounds.	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	No		
	Estimated sidewalk width, if applicable?	N/A		
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	No		
	Streets connect to adjacent neighborhood?	Yes		
	Sidewalks connect to adjacent neighborhood?	No		
	Bike lanes/bikeways connect to adjacent neighborhood?	No		
	6. Signage			
	Wayfinding signs present?	Yes		608
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	No		
	If applicable, did visitors appear to be enjoyinig themselves?	Yes		
	If applicable, were visitors observed strolling through the grounds?	Yes		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	No		
	If applicable, did visitors appear to spend a lot of time on the grounds?	No		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The grounds were full of history and were well maintained; aside from visiting a deceased loved on, or quickly snapping a picture of the surrounding landscape, nothing entices me to stay and enjoy myself at this site.	

Figure 7–2: Reynir í Mýrdal Cemetery Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 1 May 2017 / 1300 -1400
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Reykjavik, Iceland

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Hólavallagarður "Hillocks Valla Garden	**1. General Site Information**			
	What year did the grounds open?	N/A	1838	
	Total site acreage?	N/A	0.25	
	Open 24 hours a day?	Yes		
	Religion-based burial site?	No	Interfaith burial grounds	
	Total number of graves?	N/A	Nearly 100	
	Are any place(s) of worship present?	No		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	No		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Underground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	Tightly spaced	
	2. Streetscape Features			
	Open space and landscaping present?	No		
	Shade trees present?	Yes		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	Yes		
	Street furniture present?	Yes		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	No		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	Yes		
	Is the site adjacent to offices?	Yes		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	1-3 stories	
	4. Buildings			
	Main building use(s)?	N/A		
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	Yes	A small stone wall surrounds the grounds.	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	Yes		
	Estimated sidewalk width, if applicable?	N/A	4 feet	
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	Yes		
	Streets connect to adjacent neighborhood?	Yes		
	Sidewalks connect to adjacent neighborhood?	Yes		
	Bike lanes/bikeways connect to adjacent neighborhood?	N/A		
	6. Signage			
	Wayfinding signs present?	Yes		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	No		
	If applicable, did visitors appear to be enjoyinig themselves?	Yes		
	If applicable, were visitors observed strolling through the grounds?	Yes		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	Yes	Picnicing	
	If applicable, did visitors appear to spend a lot of time on the grounds?	Yes		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The grounds were full of history, were well maintained. And inviting for visitors to stay and enjoy themselves.	

Figure 7–3: Hólavallagarður Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 14 May 2017 / 1130 -1200
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Raleigh, North Carolina

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Raleigh Memorial Park	**1. General Site Information**			
	What year did the grounds open?	N/A		
	Total site acreage?	N/A		
	Open 24 hours a day?	No		
	Religion-based burial site?	Yes	Christian	
	Total number of graves?	N/A		
	Are any place(s) of worship present?	Yes		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Underground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	A comfortable distance	
	2. Streetscape Features			
	Open space and landscaping present?	Yes		
	Shade trees present?	Yes		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	No		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	No		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	Yes		
	Is the site adjacent to offices?	Yes		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	1-3 stories	
	4. Buildings			
	Main building use(s)?	N/A	Memorial services	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	Yes	A metal fence surrounds the grounds	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	No		
	Estimated sidewalk width, if applicable?	N/A		
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	No		
	Streets connect to adjacent neighborhood?	No		
	Sidewalks connect to adjacent neighborhood?	No		
	Bike lanes/bikeways connect to adjacent neighborhood?	N/A		
	6. Signage			
	Wayfinding signs present?	Yes		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	Yes		
	If applicable, did visitors appear to be enjoyinig themselves?	No		
	If applicable, were visitors observed strolling through the grounds?	No		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	No		
	If applicable, did visitors appear to spend a lot of time on the grounds?	No		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The grounds were well maintained and inviting, yet those who were visiting were there solely to pay their respects to deceased loved ones and nothing more The grounds have great potential for further growth and for multiple uses.	

Figure 7–4: Raleigh Memorial Park Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 22 May 2017 / 1030 -1045
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Big Pine Key, Florida

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Dean-Lopez Memorial Gardens Cemetery	**1. General Site Information**			
	What year did the grounds open?	N/A		
	Total site acreage?	N/A		
	Open 24 hours a day?	No		
	Religion-based burial site?	No	Interfaith burial grounds	
	Total number of graves?	N/A	50	
	Are any place(s) of worship present?	No		
	Do the grounds appear to be well-maintained?	No		
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Above ground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A		
	2. Streetscape Features			
	Open space and landscaping present?	No		
	Shade trees present?	No		
	Landscape maintained?	No		
	Adequate pedestrian pathways throughout?	No		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	No		
	3. Community			
	Is the site adjacent to a neighborhood?	No		
	Is the site adjacent to retail/commercial shops?	No		
	Is the site adjacent to offices?	No		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	1 story	
	4. Buildings			
	Main building use(s)?	N/A	Memorial services, office	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	No		
	Security wall or gate present on property?	Yes	A tall, stone wall	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	No		
	Estimated sidewalk width, if applicable?	N/A		
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	No		
	Streets connect to adjacent neighborhood?	No		
	Sidewalks connect to adjacent neighborhood?	No		
	Bike lanes/bikeways connect to adjacent neighborhood?	N/A		
	6. Signage			
	Wayfinding signs present?	No		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	Yes	Grounds sit just above sea level, area is prone to flooding.	
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	No		
	If applicable, did visitors appear to be solemn?	N/A		
	If applicable, did visitors appear to be enjoyinig themselves?	N/A		
	If applicable, were visitors observed strolling through the grounds?	N/A		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	N/A		
	If applicable, did visitors appear to spend a lot of time on the grounds?	N/A		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The grounds were poorly maintained and not inviting; tombs cannot be buried underground due to the low elevation and the island is prone to flooding; tall, overgrown vegetation helped to block out a lot of the noise from the busy road.	

Figure 7–5: Dean-Lopez Memorial Gardens Cemetery Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 29 May 2017 / 1000 -1030
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Fort Myers, Florida

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Fort Myers Memorial Gardens	**1. General Site Information**			
	What year did the grounds open?	N/A		
	Total site acreage?	N/A		
	Open 24 hours a day?	No		
	Religion-based burial site?	No	Interfaith burial grounds	
	Total number of graves?	N/A		
	Are any place(s) of worship present?	Yes		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Below ground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	A comfortable distance apart	
	2. Streetscape Features			
	Open space and landscaping present?	Yes		
	Shade trees present?	Yes		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	Yes		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	Yes		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	Yes		
	Is the site adjacent to offices?	No		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	1-3 stories	
	4. Buildings			
	Main building use(s)?	N/A	Memorial services, office	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	Yes	A tall, stone wall	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	Yes		
	Estimated sidewalk width, if applicable?	N/A	3 feet	
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	Yes		
	Streets connect to adjacent neighborhood?	Yes		
	Sidewalks connect to adjacent neighborhood?	Yes		
	Bike lanes/bikeways connect to adjacent neighborhood?	N/A		
	6. Signage			
	Wayfinding signs present?	No		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	Yes		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	Yes		
	If applicable, did visitors appear to be enjoyinig themselves?	Yes		
	If applicable, were visitors observed strolling through the grounds?	Yes		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	No		
	If applicable, did visitors appear to spend a lot of time on the grounds?	Yes		
	9. Site Specific Challenges/Issues			
	10. Overall impression			
			The grounds were well maintained and inviting; lots of shade trees and well-connected sidewalks enticed visitors to stay and enjoy themselves.	

Figure 7–6: Fort Myers Memorial Gardens Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 05 June 2017 / 1315 -1400
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: North Miami, Florida

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Mount Sinai Memorial Park Cemetery	**1. General Site Information**			
	What year did the grounds open?	N/A		
	Total site acreage?	N/A		
	Open 24 hours a day?	No		
	Religion-based burial site?	Yes	Jewish	
	Total number of graves?	N/A		
	Are any place(s) of worship present?	Yes		
	Do the grounds appear to be well-maintained?	Yes	Moderately maintained	
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Below ground burial; all burial plots faced east	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	Tightly spaced	
	2. Streetscape Features			
	Open space and landscaping present?	Yes		
	Shade trees present?	Yes		
	Landscape maintained?	No		
	Adequate pedestrian pathways throughout?	No		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	No		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	No		
	Is the site adjacent to offices?	No		
	Is the site adjacent to any areas recreation?	No		
	What are the building heights on the other sides of the road?	N/A	1 story	
	4. Buildings			
	Main building use(s)?	N/A	Memorial services, office	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	No		
	Security wall or gate present on property?	Yes	A tall, stone wall	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	No		
	Estimated sidewalk width, if applicable?	N/A		
	Bike lanes present?	No		
	Bike facilities present?	No		
	Estimated street width?	N/A		
	Streetlights present?	No		
	Streets connect to adjacent neighborhood?	No		
	Sidewalks connect to adjacent neighborhood?	No		
	Bike lanes/bikeways connect to adjacent neighborhood?	N/A		
	6. Signage			
	Wayfinding signs present?	No		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	Yes		
	8. Culture of Grounds			
	Any visitors present?	Yes		
	If applicable, did visitors appear to be solemn?	Yes		
	If applicable, did visitors appear to be enjoyinig themselves?	No		
	If applicable, were visitors observed strolling through the grounds?	Yes		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	No		
	If applicable, did visitors appear to spend a lot of time on the grounds?	No		
	9. Site Specific Challenges/Issues			
			Site is surrounded by several residential neighborhoods, making horizontal expansive unlikely.	
	10. Overall impression			
			The grounds were modertately maintained but uninviting; too few shade trees, wayfinding signage, amenities, and sidewalks discouraged visitors from wanting to stay and enjoy themselves.	

Figure 7–7: Mount Sinai Memorial Park Cemetery Site Audit Checklist
Source: (Benmoshé, 2017)

Site Visit and Analysis Conducted on (Date & Time): 05 June 2017 / 1430 -1500
Person Conducting Site Visit: Bradley Benmoshé
Location of Site Visit: Fort Lauderdale, Florida

SITE NAME	KEY AREAS OF FOCUS	YES/NO	COMMENTS	PHOTO NUMBER(S)
Evergreen Cemetery	**1. General Site Information**			
	What year did the grounds open?	N/A		
	Total site acreage?	N/A		
	Open 24 hours a day?	No		
	Religion-based burial site?	No	Interfaith burial grounds	
	Total number of graves?	N/A		
	Are any place(s) of worship present?	No		
	Do the grounds appear to be well-maintained?	Yes		
	Are the grounds able to create additional plots?	Yes		
	What appears to be the favored burial custom (under ground burial, or mausoleum)?	N/A	Below ground burial	
	If underground burial, are the plots a tight or comfortable distance from one another?	N/A	Spaced a comfortable distance from one another	
	2. Streetscape Features			
	Open space and landscaping present?	Yes		
	Shade trees present?	Yes		
	Landscape maintained?	Yes		
	Adequate pedestrian pathways throughout?	Yes		
	Street furniture present?	No		
	Place making assets (plazas, pedestrian access, civic and cultural amenities, monuments, etc.) present?	Yes		
	3. Community			
	Is the site adjacent to a neighborhood?	Yes		
	Is the site adjacent to retail/commercial shops?	No		
	Is the site adjacent to offices?	No		
	Is the site adjacent to any areas recreation?	Yes		
	What are the building heights on the other sides of the road?	N/A	1 story	
	4. Buildings			
	Main building use(s)?	N/A	Memorial services, office	
	Ground floor retail, service, or entertainment present?	No		
	Estimated building height?	N/A	1 story	
	Scenic or functional space present?	Yes		
	Security wall or gate present on property?	Yes	A small, stone wall and gate surround the site	
	5. Pedestrian Circulation			
	Sidewalks present throughout?	Yes		
	Estimated sidewalk width, if applicable?	N/A	4 feet	
	Bike lanes present?	Yes		
	Bike facilities present?	No		
	Estimated street width?	N/A	12 feet	
	Streetlights present?	Yes		
	Streets connect to adjacent neighborhood?	Yes		
	Sidewalks connect to adjacent neighborhood?	Yes		
	Bike lanes/bikeways connect to adjacent neighborhood?	Yes		
	6. Signage			
	Wayfinding signs present?	No		
	7. Sustainability			
	Environmental lands?	No		
	Environmental issues?	No		
	Green energy technology present?	No		
	Electric vehicle charging stations present?	No		
	8. Culture of Grounds			
	Any visitors present?	No		
	If applicable, did visitors appear to be solemn?	N/A		
	If applicable, did visitors appear to be enjoyinig themselves?	N/A		
	If applicable, were visitors observed strolling through the grounds?	N/A		
	If applicable, did visitors appear to be using the space for any purpose other than for mourning?	N/A		
	If applicable, did visitors appear to spend a lot of time on the grounds?	N/A		
	9. Site Specific Challenges/Issues			
			Site is surrounded by a residential units on three sides and a large canal on the fourth; horizontal expansive would be unlikely.	
	10. Overall impression			
			The grounds were well maintained and inviting; lots of shade trees, sidewalks, and bike paths encouraged visitors to stay and enjoy themselves; the grounds and surrounding neighborhood were quiet during the time of the visit.	

Figure 7–8: Evergreen Cemetery Site Audit Checklist
Source: (Benmoshé, 2017)

Exhibit B: The Evolution of Death

The timeline below shows the evolution of death, including rituals and practices surrounding funerals, as well as indicates the origins of many modern day funeral traditions. The timeline was created by *www.mysendoff.com*.

- (60,000 BC - Iraq): Neanderthal men buried with flowers. Earliest evidence of "first funeral." (Emery, 2001)
- (8,560 BC - Tibet): Sky-burial tradition still in practice today in some countries where the body is left in an elevated area and consumed by wild vultures. (Lamb, 2011)
- (3,400 BC - Egypt): Mummification: Organs removed and placed in jars. Body is preserved with chemicals, a practice known as embalming still used today. (O'Brien, 1999)
- (800 BC - Greece): Cremation becomes the most common method to dispose of ancient Greeks, using an open fire called a funeral pyre. (Johnson, Cremation Through the Ages, 2011)
- (500 BC - Peru): Chavin culture: Body was dried and organs removed, then buried in ground wrapped in cloth embroidered with gods, demons or animals. (Placeholder5)
- (100 BC - China): People are buried with figurines that depicted dancers, mythical beasts, everyday objects, or scenes such as farms or houses. (Rawson, 2002)

- (7 AD - America): Native burial grounds: Buried with jewelry, tools, food, and in different body positions depending on their age, sex, or social status. (Josephy, 1991)
- (300 AD - Italy): Underground catacombs: Placed in the graves were paintings, statues, and ornaments. Inscriptions indicated brief overview of their life. (Ancient Roman Catacombs, 2016)
- (500 AD - Mexico): Mayans cached objects and buried relatives within their residences. The house and content were burned down and a new one built in place. (Thompson, 2010)
- *(700 AD - England): The rock-cut graves of Heysham are one of the earliest examples of Christian burial.* (Johnson, Rock-Cut Graves of Heysham, 2011)
- *(950 AD - Scandinavia): Vikings believed that the way to the after-life was by boat. Sendoffs for Viking warriors were on burning ships, and some were buried in a ring of stones laid out in the shape of a boat.* (Waidson, 2007)
- *(1532 AD - Peru): Although most deceased Incas were mummified and entombed, some were sewn inside a llama hide. A face was shaped on the outside, and the body was kept this way inside the family home.*
- *(1800 AD - United Kingdom): To prevent body snatching, graves were bricked over. The fear of a loved one being buried alive inspired bells to be placed on the graves connected to a chain inside of the coffin.*
- *(1862 AD - America): Modern embalming practices using Arsenic began during the Civil War with bodies being shipped back to families; Formaldehyde became the standard embalming chemical.*

- *(1882 AD - America): First meeting of the National Funeral Directors Association starting the movement to professionalize funerals. Before this, most funerals were the responsibility of the family with caskets made by the local furniture maker.*
- *(1930 AD - United Kingdom): Open-air funeral pyres are made illegal following the Cremation Act of 1930. It is also made illegal for remains to be cremated if the deceased noted their wishes otherwise.*
- *(1950 AD - America): There are more than 700 casket manufacturing companies employing more than 20,000 workers. Most caskets are cloth covered, with metal and hardwood comprising less than 20%.*
- *(1963 AD - Vatican): A law is passed that by the Catholic Church that no longer forbids cremation . Cremation rates begin to rise.*
- *(1979 AD - Germany): The plastination process preserves bodies or body parts with a clear hardening resin for purposes of anatomical education.*
- *(1993 AD - United Kingdom): The first natural burial cemetery is created. The body is returned to the earth free of preservatives or disinfectants. The body is enclosed in a biodegradable coffin or shroud.*
- *(1997 AD - America): Space launch burials aboard rockets bring one's cremated remains into the earth's orbit or the moon, for a never-ending journey.*
- *(2006 AD - America): As traditional casketed funerals decline, personalized casket options such as KISS-themed, motorcycle-themed, and biodegradable pod style become available.*

- *(2007 AD - Scotland): Resomation, also known as Aquamation, is a new process for disposal of remains, similar to cremation but using an alkali solution heated to 350 degrees for 3 hours leaving only skeletal remains.*
- *(2016 AD - America): Recomposition is a new process that transforms bodies into the soil so that new life can grow from the nutrients of the dead.*

CHAPTER 8
LIST OF REFERENCES

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