Amphibious Islands: Decay, Ecology, and the Future of the Venetian Lagoon

by

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Dalhousie University is located in Mi'kmaq'i,
the ancestral and unceded territory of the Mi'kmaq.
We are all Treaty people.

Contents

Abstract

Venice, Italy is a city of constant fluctuations, existing amphibiously between fixed states, of past and present, fact and fiction, restored and ruin. For centuries, Venice, its peoples, and its lagoon have formed a symbiosis of mutual respect, able to adapt to their changing needs throughout time. Currently, Venice is in a state of crisis, no longer able to support its human and non-human residents due to its commodification, ecological degradation, flooding, and vanished inter-island network.

Through focusing on its rich history and unique ecological systems, this thesis will reclaim spaces for Venice's various inhabitants by transforming four abandoned islands, embracing the eventuality that they will become flooded within the next century. This facilitates the inhabitation of these islands by the Venetian people now, and in 100 years, the inhabitation by Venice's plant and animal species once the islands flood and we must let go.

Acknowledgements

I would like to thank Catherine Venart and Michael Faciejew for their insight and guidance throughout this project. I am so grateful for the time you have given me and the things you have taught me.

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Thank you to my friends who made moving to a new province and a new school such an amazing experience. I am so grateful for my girls, Julia, Christina, Courtney, and Emily, for my partner, Paul, and for everyone else for all the laughs, support, and trips to Pizza Corner over these past four years. It would not have been the same without you.

Chapter 1: Introduction

The story of Venice begins and ends with her lagoon. Throughout its history, regimes and cultures have come and gone through Venice, leaving their mark on its resilient landscape through urban development, architecture, and art. This has formed Venice into a combination of the tectonic and imaginative, marrying together the practical and the magical. The success of each of these occupations depended heavily on their relationship with the lagoon environment and the care of Venice's intricate salt marsh ecosystems. As these eras have come and gone, patterns have formed, revealing that the success of any community existing within Venice must balance their constructive and economic interests with the needs of the lagoon. Unless such a symbiotic relationship is formed, the inhabitants of Venice will be doomed to fail.

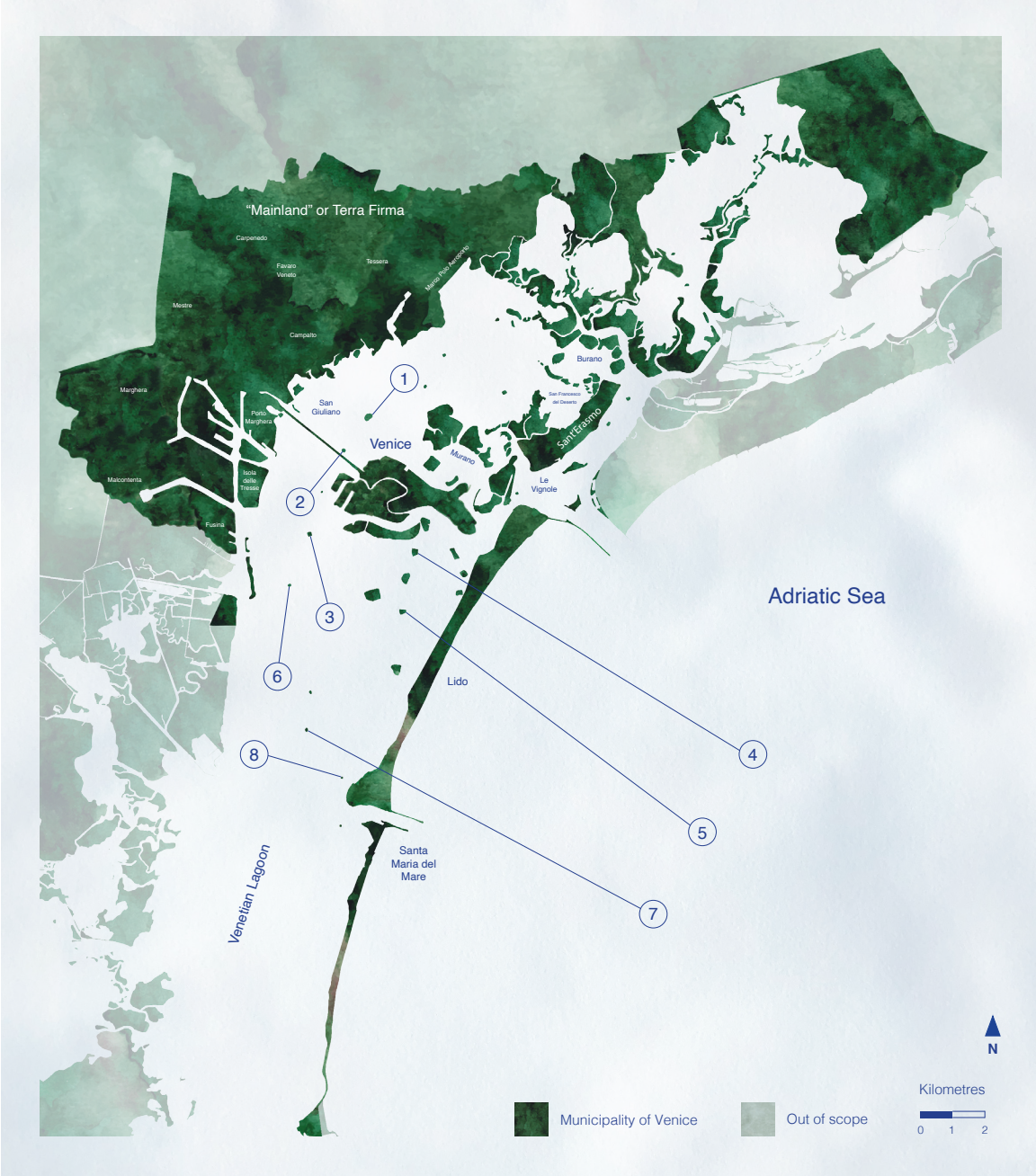
This thesis will begin by describing three areas in which the architecture, culture, and environment of Venice are experiencing decay. Chapter 2 will address the museum city, which is the current state of Venice's urban and architectural system wherein historic buildings are preserved by UNESCO, despite no longer functioning to serve their community. This results in only preserving the faces of buildings and not the foundations or culture of the city, while also not permitting new architecture to take hold, thus driving away the local Venetians who make the city function. This leaves us with just the myth of Venice, ignoring the pragmatic and imaginative elements that make it so special. Chapter 3 will address ecological degradation that is being experienced by Venice's lagoon environments, and the resulting impacts on its intricate salt marsh ecosystems. This chapter will also

introduce the abandoned islands of Venice as unutilized spaces that were once crucial pieces of this lost island network, and will become integrated as spaces for Venetians once more within this thesis's proposed design framework. Chapter 4 will address the anti-city, which is the plight of local Venetians who are living in a city that is no longer designed for them, catering exclusively towards tourists. As a result, the once intricate economic network between the islands within the lagoon has become one-sided, serving only tourism on the main island of Venice, losing its other crafts and industries that made Venice a good place to live. Currently, Venice is experiencing a decay of architecture, a decay of its ecology and networks, and a decay of its culture.

This thesis will focus on four currently abandoned islands situated within the Venetian lagoon. The word "amphibious" is being used to describe these islands, as they are situated in a unique position of being land upon which they can be inhabited by humans, but they are also of the lagoon environment and are in the process of being reclaimed by the lagoon. They are amphibious because they are situated on the boundary between land and sea, between the human and the natural, and between the temporary and permanent.

These currently abandoned islands will each be tied to an era of Venetian history, based on the existing structures and past inhabitations of each island. This era of history and the past uses of each island will inform the design. The first iteration of the design will plan for new habitation of the island by Venetian locals, and will reignite a form of lost craft or industry, thus facilitating integration of the island back into the currently absent network of the Venetian lagoon. The second iteration of the design will occur 100 years from now when the island becomes flooded and humans retreat

from the island occupation, letting it go. At this point, the islands will be taken over and transformed into a habitat for non-human residents of Venice, reviving the lagoon's lost ecology.



The abandoned islands of the Venetian Lagoon that are currently owned by the municipal, state, or national government (data from Carrera et al. 2011).

The beautiful, romanticized city of Venice (Baschiera 2018).

Chapter 2: The Museum City

Monument

While Venice has always been adaptable to its ever-changing lagoon environment, it has also adapted to changing socio-cultural times, acting as a chameleon, taking on the forms of the new regimes and influences that passed through its waters. In modern times this has ceased to be the case. As the city became a Mecca for tourists in the late 20th and early 21st centuries, the vernacular language of Venice has become frozen in time, no longer able to adapt to suit the needs of its people. What was once a bustling city, alive with people, music, food, and interaction, has now become a museum city, packaged and sold to tourists at the expense of its locals, both human and non-human.

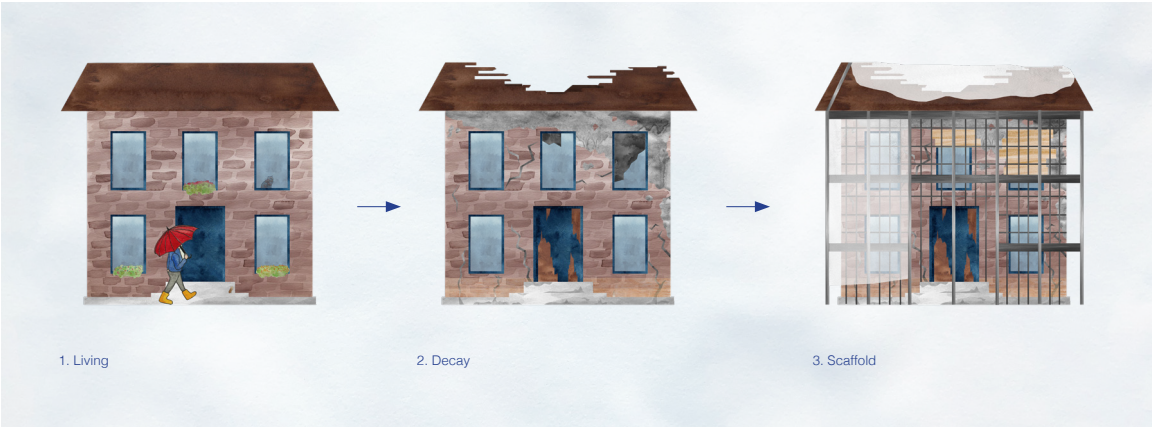
The Venice that we see today is largely a reflection of a particular past, with the preservation of historic buildings from bygone centuries taking precedence over the construction of new buildings for modern uses and populations. The current renovation and maintenance of architecture in Venice by bodies such as UNESCO are selective about what they preserve, thus changing the historical narrative. Historically, Venice absorbed the architecture and cultures of its inhabitant civilizations into its own, creating an intricate mosaic of them, expanding and developing as needed (Foscari 2014, 25). The Venice of today is suited only to showcase its history, and not to adequately sustain the people currently living within it.

Apart from a few isolated incidents, attempts to introduce modern architecture into Venice's fabric have been largely rejected (Salvadori 1980, 18). The myth and history of

Perpetual scaffolding (Allan 2021).

Venice are currently associated with architecture of Gothic, Renaissance, and other bygone eras, so no changes can be made to it, lest we shatter the façade that is it still an ancient, mystical, mysterious city. Any proposed changes to what Venice looks like today or any attempts at innovation and adaptation are seen as an affront to its past (Foscari 2014, 153). Even world-renowned architects struggle to succeed in designing small projects in Venice (Foscari 2014, 153). Already in the 1800s there was need for scaffolding buildings from centuries past; the city has gone through ages of building, decay, and preservation (Foscari 2014, 39).

With buildings as old as the ones in Venice, it is almost inevitable that their functions have changed in the centuries since, and how they have surely been mutated from their original programs in countless ways through renovations. These functions likely do not fit the form of the buildings as they currently stand, but the forms impress us so that we must keep them. It creates an auspicious sense to maintain buildings of that age (Rossi 1982, 28). With the same constant revolution of architecture, it is as if buildings



The stages of monument.

A city in decay (Spratt 2018).

are never fully completed, thus are never left open for interpretation and intervention by the modern world. This is what Aldo Rossi refers to as “interrupted work”, where a building that was full of potential and opportunity was never able to fully materialize within our realm, and has since been forgotten by time (Rossi 1982, 18).

In some historic cities, their layout expands, and the old architecture must be integrated into that change. In some such cases, the architecture maintains its vitality, and old architecture is reincorporated into the new urban fabric. In other cases they become a ruin, unused, where only their lifeless form remains, failing to be integrated into the modern era (Rossi 1982, 59). A successful city should see architecture from different points of formation and inception, and Venice once showcased that successfully. However, with its failure to adapt its architecture to any degree, it has fallen behind, and lacks the urban unity it needs to survive (Rossi 1982, 64).

Preservation of Monument

Venice and her lagoon were designated as a UNESCO World Heritage Site in 1987, and is recognized as not only a cultural hub of art and history, but for its unique urban formation on over 100 small islands (Horvath 2018, 19). When World Heritage organizations search for qualities that make a city or monument unique, they also look for universal values with which to relate that uniqueness to (Al-Harithy 2005, 8). This results in the homogenization of a site’s specific cultural relevance in terms of time and place, and erases the significance of its local identity. This acts to suspend the interpretation of a monument into a singular reference of a historical era, to be marketed to

Tourism in St. Mark's Square (Buratynski 2022).

an international tourist audience (Al-Harithy 2005, 9). Any nuance or dual identity to a monument is eviscerated with this act. Conservation bodies such as UNESCO see this process not as museumification, but as a method of preserving cultural artifacts of built heritage. However, this only serves to conform the varied cultural facets of Venice's long and storied history, and removes locals from the conversation about how their history is to be preserved and remembered (Al-Harithy 2005, 9). Instead, these monuments should be viewed as open texts, where Venetians are invited to interpret, change, and regenerate them as their communities require. By not only allowing, but encouraging the people of Venice to participate in this process, they could form a novel dialogue between past and future, enriching these spaces for new generations of Venetians to come.

The museumification of Venice is such a large issue as we are not dealing with a single artifact or statue or building; Venice is a rich, interconnected urban fabric that contains multitudes of physical and social layers. The monuments of Venice are still functioning as dynamic social spaces, and to rehabilitate one of these monuments would mean rehabilitating each of those layers (Al-Harithy 2005, 9). This would involve addressing global wicked problems such as capitalism and climate change, from which these issues of isolation, disconnection, commodification, and ecological death stem.

In the past, Venice was focused on an ideology of progress, and in this modern era is the first time we have seen the city focused on an ideology of self-conservation. In order to create a habitable, sustainable environment within the city, the old and the new eras of Venice should not be viewed as opposing, but as a continuum (Lamprakos 2005, 17). Venice

was once interconnected in terms of people, ecologies, urban fabric, and foundations; these are not being protected or maintained by UNESCO. To lose these is to lose Venice.

Tourismification

A Touristic Economy

Venice has been a major centre for global tourism, dating back to the 16th century, with its tourism industry steadily increasing since the 1950s (Horvath 2018, 19). As of 2016, Venice was the 3rd most important city in Italy and 38th most important city globally in terms of international tourist arrivals, bringing in an average of 25 million tourists every year (Horvath 2018, 20). On any given day there are approximately 150,000 people in Venice, which is the same as in the 15th and 18th centuries (Foscari 2014, 146). Around 67,000 of those are residents, 23,000 commute to the city for work, 3,500 are students, and 40,000 – 50,000 are tourists (Foscari 2014, 146). That number of tourists can double and triple in the high seasons.

Tourism makes up the majority of Venice's economy and is its main industry, bringing in over 2 billion euros of gross revenue every year (Horvath 2018, 20). Unfortunately, this results in the loss of local craftspeople and artisans, with other industries previously operating in the city being forced to downsize or close.

A city of Venice's scale was simply not designed to host so many people at one time, and its capacity to do so is being overwhelmed. Venice is characterized by narrow, winding alleyways and transportation primarily by boat, so the effects of increased tourism and overcrowding within the city often feel exacerbated as the infrastructure simply

Souvenir masks for sale (Zhyvchik 2019).

cannot keep up. Many tourists to Venice are brought there on cruise ships, which in addition to causing environmental issues within the lagoon, those tourists return to their ship at night and are thusly not contributing to the local economy by paying to stay in a hotel (Horvath 2018, 22). These day-trippers do not take the time to immerse themselves in Venice's rich culture, and therefore tend to lean towards purchasing cheap souvenirs instead of something hand-crafted by a local artisan. They also do not visit museums or galleries to learn about the city and its history, instead just walking by monuments and checking them off their lists (Horvath 2018, 22).

A phenomenon has developed around highly touristic cities, where some tourists are no longer satisfied with just the classic experience of the main monuments. Tourists now want "off the beaten track" experiences, adding more layers to this economy of tourism, resulting in the expansion and extension of these touristic areas (Horvath 2018, 15). However, this has not been the case within Venice, as tourists tend to stay concentrated in the historic centre of the city, on the main island, resulting in intense overcrowding of that area (Horvath 2018, 21). For many of those visiting Venice, the experience of a city with no cars, connected only by bridges and boats is enough of a change from their daily life that they may not need these extra excursions. This is an interesting trend though, as it implies that if other, less tourist-oriented parts of the city were reclaimed for local Venetians, tourists would be less likely to try and colonize those areas as well. If tourism must occur on these sites, it should be on the condition that tourists engage in the full cultural identity and traditions of Venice and its people (Al-Harithy 2005, 17).

Nordic Pavilion for the Venice Biennale (Abreu 2022).

Pieces of Venice

The image of Venice today has become so ubiquitous with tourism that it has become an icon city that everyone wants to visit at least once (Horvath 2018, 25). The symbols of Venice – masks, lions, architecture, gondolas – have been commodified and mass-produced for the tourist market on a global scale. Everyone wants a piece of Venice, whether that be a souvenir to take home, or a theme for their casino or shopping mall. They want the fairy tale of the city on the water without actually engaging with it on any meaningful level, or sustaining it in any way (Foscari 2014, 131).

The first Venice Biennale International Art Exhibition was held in 1895. This inspired every internationally politically active country at the time to build their own pavilion on the site at the start of the 20th century (Foscari 2014, 140). Everyone wants to claim a piece of Venice; it is viewed as an attraction, not as a living city. The internationalization of heritage creates frozen monuments, designed to be easily digestible and marketable to the global public (Al-Harithy 2005, 8). Instead of its internationalization or nationalization, heritage should directly reference its own cultural context, and should be maintained within the local community with which it has its roots (Al-Harithy 2005, 8). The keeping of Venice should be left to the Venetians who call the islands home.

A Disappeared Network

Due to tourism in Venice driving commercial markets, the economy has become undiversified. This results in local traders and craftsmen operating less in the area, foreign brands flooding the market, reliance on seasonal and

unstable hospitality employment as opposed to full-time work, and a deterioration of the community experience that a city needs to thrive (Horvath 2018, 16). Local businesses that serve the people who live in Venice have been forced to close or to adjust their offerings to cater to tourists if they wish to stay open. Grocery stores have been converted to restaurants and bars, and craft makers have been forced to pivot to selling cheap tourist souvenirs in order to survive (Horvath 2018, 20).

All of this serves to sever the intricate network that had been formed across Venice's lagoon throughout its long history, with the tourism industry of the main island dominating every other sector and making every other island into an appendage to serve that singular purpose.

Reinterpretation of Monument

When considering monument, we often get pigeon-holed into focusing on specific architectural eras or elements. A helpful way to dismantle this way of thinking is to focus on the site itself. In architecture, the site is typically thought of as a physical location, usually one that requires intervention and must be "completed" by an architectural project (Hogue 2004, 54). However, this is not valuing the site as a distinct, complete element as it already exists. Architecture should complement a site, rather than just intervening in it. Venice has qualities, layers, and a rich ecological history to it that stands alone without architectural intervention. A site is never just found; it is a constructed piece, already made by millennia of natural forces shaping it and characterizing it. A focus on site will be important in the years to come, as flooding and the effects of climate change will create drastic impacts on Venice's lagoon landscape. What we see empirically is

Kolumba Museum as a meeting of the past and present (Goffi 2016, 32).

not a complete site, nor are our ideas about what a site is or should be; the site is the dialectic of both our ideas and concrete experiences (Hogue 2004, 55). Architects tend to view a finished building, and not the site upon which it is built, as a site. When these buildings become conceptually neglected, and in Venice's case, monumentified, they can become rich sites for future projects that encompass the "margins" of these sites that were ignored and underutilized previously (Hogue 2004, 57).

The traces of history that are scattered in a ruin can never again be assembled to create history as it once was, but to get a glimpse, we can weave these traces in a certain way, leaving a trail of breadcrumbs to the past (Goffi 2016, 26). In the context of an ancient urban fabric like Venice, while they will never meet one another, there should be a dialogue between past and future (Goffi 2016, 27).

Kolumba Museum detail of Zumthor choosing to accentuate differences with the new brick rather than mimic the old (Goffi 2016, 32).

The Kolumba Museum by Peter Zumthor is a beautiful example of marrying together old and new forms of architecture, in order to both conserve the old and create a new type of space for modern dwelling. Zumthor encased the museum within perforated brick walls, used to facilitate ventilation to the ruins, aiding in their conservation (Goffi 2016, 32). When re-assembling walls, Zumthor joined old and new brick types together, purposely using a distinctly different type as to not imitate; he wanted the difference to be stark (Goffi 2016, 32). Conservational architecture becomes so much more interesting when the goal is not just to imitate a historical style. It is much more stimulating and playful to acknowledge those differences and to celebrate them when fusing the old with the new.

Carlo Scarpa detail showing the modern enclosure overlaid onto the historic wall (Goffi 2016, 28).

Carlo Scarpa, one of the few great modern Venetian architects, believed that the current imitation of historical architecture is just copying with no substance or deeper thought (Goffi 2016, 29). In his work, Scarpa aimed to reinhabit the past in order to connect the past and present, bringing it forth into a new context in the present fabric of time. Scarpa believed that a work of architecture can hold multiple temporalities at the same time (Goffi 2016, 29).

Traditionally, site is thought of as a transitory placeholder that exists until a permanent form is erected onto it (Hogue 2004, 59). With Venice's temporal environment, we should consider that the land itself, while shifting, is a permanent fixture, and the architecture should be what transits in and out of place to adapt to these changing needs and conditions. The urbanism of Venice has disrupted the natural processes enough. New architecture should intervene with the site minimally, and reference what is already occurring there naturally. When we react to these existing conditions, we can generate new identities and histories that serve more purpose for the times we live in (Hogue 2004, 59). When we are able to separate Venice as a city and as an ecological habitat from this idea of "monument," we are more willing to change it to adapt to our needs, and are more willing to let it go when it is time.

The cyclical patterns of monument and flooding over time in Venice, Italy (data from Ferrarin et al. 2022, Figure 1).

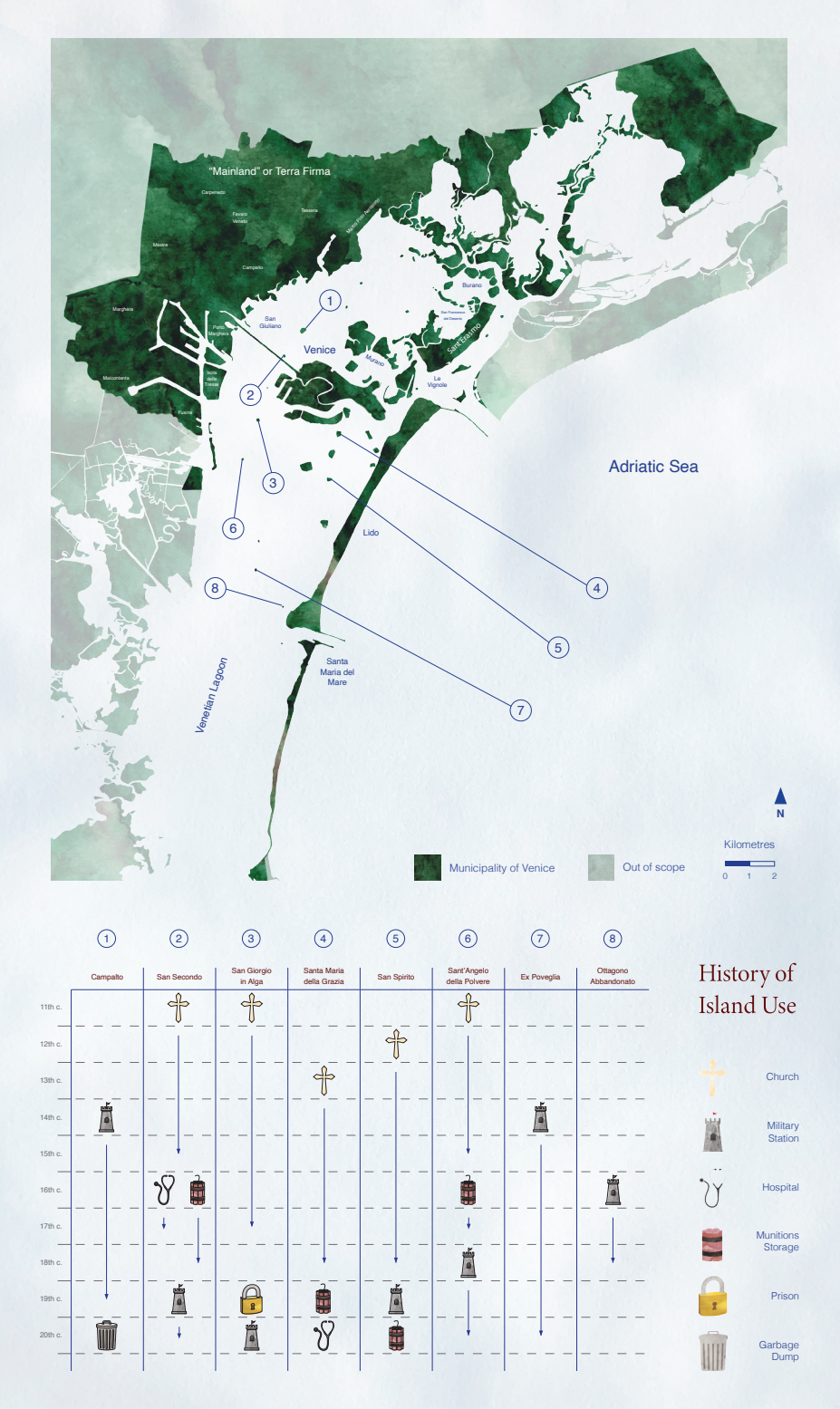
Chapter 3: A Fractured Landscape

The Lost Islands

While Venice's main islands of Venice, Murano, Burano, Torcello, Sant'Erasmo, and Lido are bustling with tourism, Venice also has many small, peripheral islands that have remained abandoned for years. Some of these islands have become stigmatized for their uses in the past such as military stations, hospitals, and prisons, and many contain the ruins of these former structures. It is on these lost islands that design responses will be focused.

These islands did not always exist on the peripheral consciousness of Venice, and were once intricate players in Venice's intra-lagoon network. These were sites of agriculture and fishing, religious orders and monasteries, quarantining and healthcare, and of military training and defence (Cavallo & Visentin 2021, 208). Many of these islands were mixed-use, and changed uses over their centuries of inhabitation. In recent centuries when Venice shifted its economic structure from trade and commerce towards tourism, and especially when the main island of Venice was connected to the mainland via bridge in 1846, these islands lost much of their former purpose (Cavallo & Visentin 2021, 208). As the island network of Venice shrunk and formed a monoculture around tourism, these islands were perceived as being too remote and irrelevant to the new ways of life forming on the main islands (Cavallo & Visentin 2021, 208).

However, just because these islands did not provide a destination for tourists does not mean they were disregarded by everyone. Local Venetians have visited and used these amphibious islands as multi-use public space for years.



The abandoned islands within the Venetian lagoon and their changing uses historically (data from Poloni 2014, 36-64; Carrera 2011).

Viewed as an informal commons, Venetians have frequented these islands, particularly in the summer as a site for camping, swimming, and fishing (Cavallo & Visentin 2021, 217). This has provided them with not only an escape from the tourists, but allowed them to reform deeper connections with Venice at a time when much of their city has been taken away from them and commodified.

The Municipality of Venice, unfortunately, does not view these abandoned islands in the same light as many local people do, instead regarding them as spaces of decay which are unfit for use or worth rehabilitating. As a result, the Municipality has found a financial opportunity in the sale of these islands to private buyers, with the purpose of turning them into luxury homes, hotels, or other commercial enterprises (Cavallo & Visentin 2021, 211). Some such cases include the island of San Clemente, which was previously the site of a women's asylum, being turned into a luxury hotel, and the island of Sacca Sessola, previously a public sanatorium, into a hotel as well (Cavallo & Visentin 2021, 211). Local residents have fought against this "land grabbing", arguing that these islands must remain a public good for the free use of its citizens, instead of transforming them into just another cog in the tourism industry of Venice.

A group formed in resistance to the city's intent to lease the island of Poveglia for a 99-year duration in 2014, which was previously the site of a plague quarantine station, a sanatorium, and a nursing home (Cavallo & Visentin 2021, 209). The group, called "Poveglia Per Tutti" (or "Poveglia for Everyone") believed that the island and its rich history needed to be maintained as a public commons for use by its citizens, and attempted to purchase the island themselves (Cavallo & Visentin 2021, 213). Grassroots movements

The abandoned island of Poveglia (Cavallo & Visentin 2021, 210).

such as this have successfully aided in the rehabilitation of other islands, such as San Servolo's renovation into a university study camp and convention centre, Lazaretto Nuovo's refurbishment and use for archaeological camps, and Certosa Island's transformation into a park with a marina used for sailing sports (Cavallo & Visentin 2021, 210).

It is clear that local Venetians have a vested interest in the continued maintenance of and access to these islands, and are willing to put in work to retain that relationship. These islands have been a part of Venice's collective memory for so long that it would be a disservice to allow that heritage to be bulldozed into yet another luxury hotel. These spaces could instead serve as "open islands", a site reserved for public use and enjoyment, such as the CPH-Ø1 floating island project in Copenhagen, Denmark (Cavallo & Visentin 2021, 213). This "parkipelago" provides spaces for wildlife development and the growth of endemic plant species, and are used for community events, swimming, sailing, fishing, gardening, picnics, and other urban events (Cavallo & Visentin 2021, 213). I believe that the abandoned islands of the Venetian lagoon could be used in a similar way, providing new public spaces for Venetians as their previous ones have disappeared, and providing habitats for native plant and animal species to flourish.

The CPH-Ø1 floating island project (Emdal n.d.).

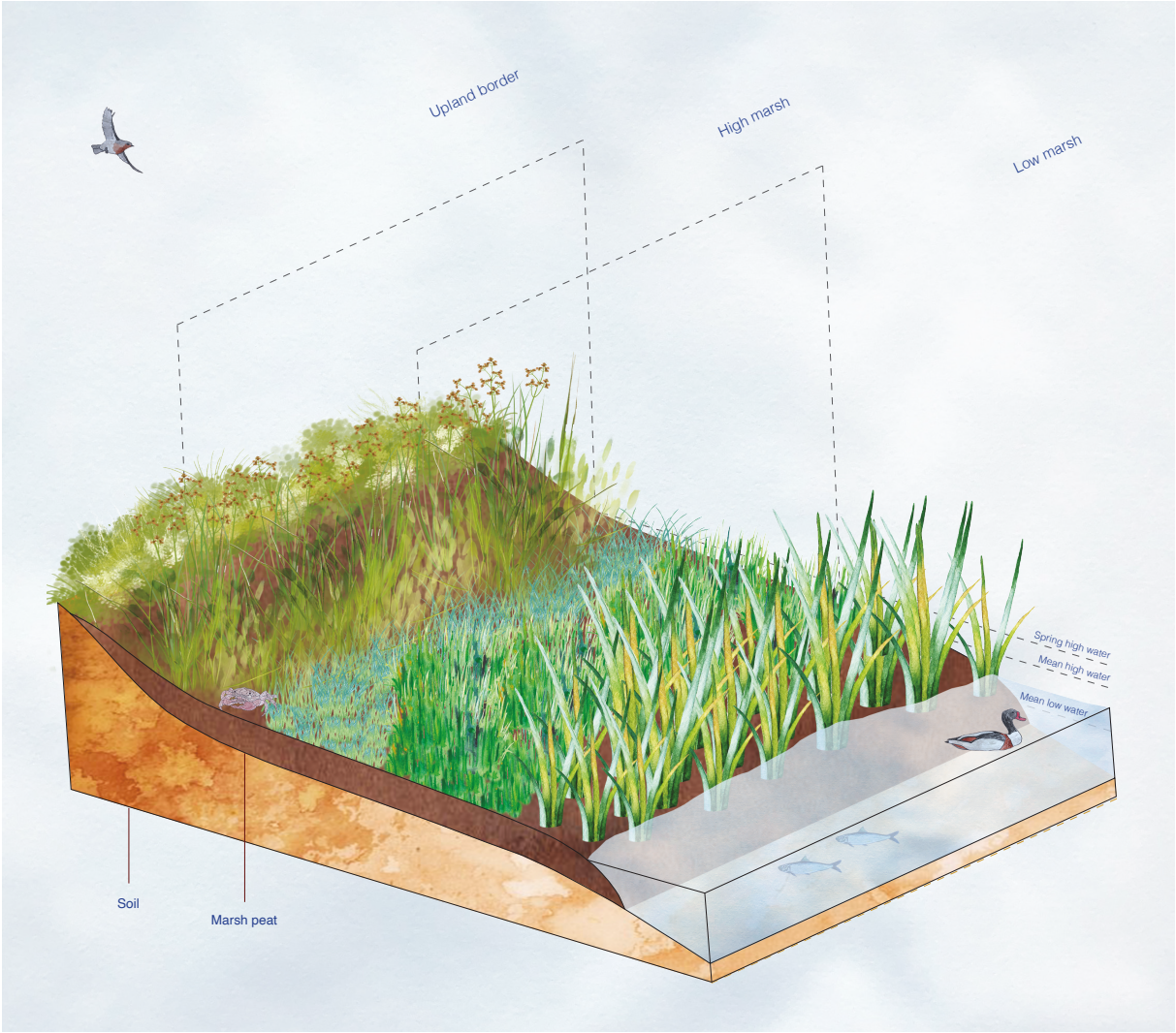
Lagoon Degradation

As public commons for the human residents of Venice have been disappearing, the environments of Venice's non-human habitants have been greatly diminished as well. Venice's coastal ecosystem is what has allowed it to prosper economically, culturally, and socially for centuries, but this edge condition facilitates direct contact between

Venetians and their lagoon environment, which when not properly regulated, can have devastating ecological effects.

A lagoon is a coastal, inland body of water that receives both saltwater and freshwater inputs, treading the line between marine and freshwater ecosystems (Deheyn & Shaffer 2007, 206). These unique qualities allow lagoon ecosystems to host a variety of different species, as they are often nutrient-rich, shallow, and associated with high productivity (Deheyn & Shaffer 2007, 206). As the lagoon environment is so variable it provides many different niches for various organisms to reside and interact, making these ecosystems extremely biologically important. Factors such as sediment flow and dispersal, water input and circulation, geochemistry, and inhabitant species are all very relevant in terms of lagoon health (Deheyn & Shaffer 2007, 206). As human settlements are often formed around lagoons, the lagoon environment is often degraded as a result of dumping and pollution in the lagoon and its surrounding bodies of water, as the lagoon acts as a reservoir and contaminants become absorbed into its sediments (Deheyn & Shaffer 2007, 206). When these contaminants become released back into the ecosystem, they can be extremely harmful to animal and plant species in that environment (Deheyn & Shaffer 2007, 206).

The Venetian lagoon is one such area in crisis due to intense anthropogenic operations within and around it over the past century. Erosion, pollution, over-fishing, subsidence, sea-level rise, and increased wave motion have all contributed to the degradation of Venice's lagoon ecosystems (Deheyn & Shaffer 2007, 207). Venice's delicate salt marsh ecosystems have been reduced in area, dredging of the lagoon floor has

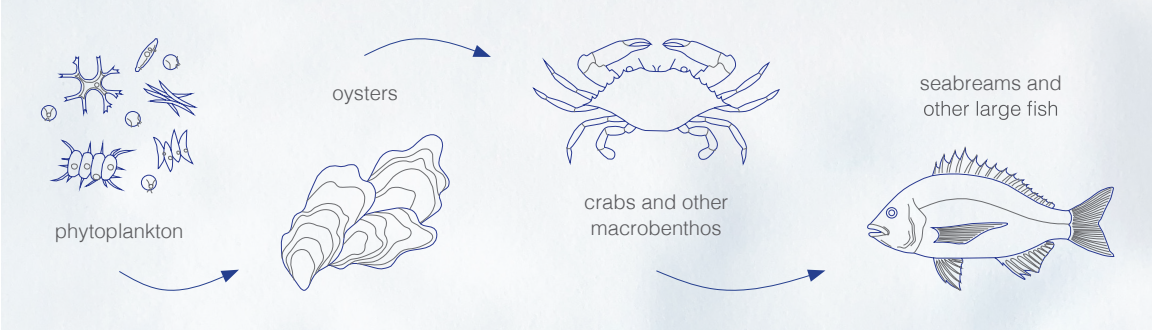


Salt marsh ecosystem structure (data from RI Coastal Resources Management Council n.d.).

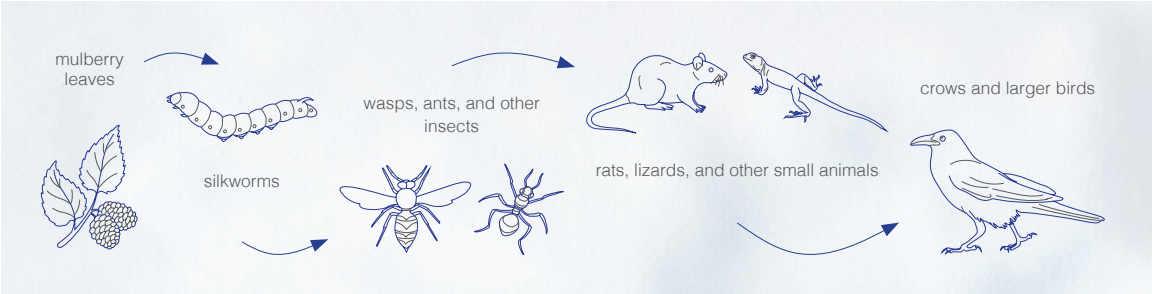
resulted in habitat loss, and the quality of the water and sediments have decreased (Deheyn & Shaffer 2007, 207).

Salt marshes are a type of coastal wetland within the Venetian lagoon that become flooded and drained when the tides cycle salt water into them (NOAA 2023). They are composed of peat, which is a spongey, waterlogged material made up of decomposing organic matter, and of deep mud (NOAA 2023). Due to the presence of the decomposing material, peat has a very low oxygen level, creating a condition called hypoxia (NOAA 2023). These habitats, when allowed to remain naturalized, can host a wealth of biodiversity and perform important ecosystem services. Their coastal position helps to protect shorelines from erosion by acting as a buffer from wave impacts, and they absorb rainwater, thus reducing flooding (NOAA 2023). The preservation and restoration of these essential ecosystems must be a key driver of any design response within the lagoon.

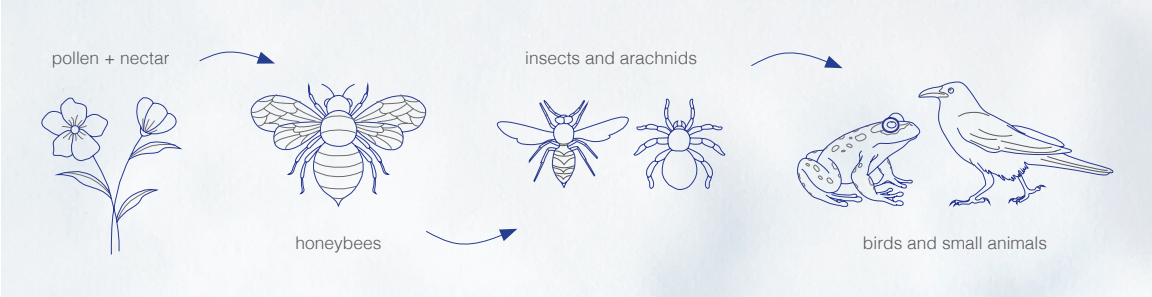
Work is being done on the ground in Venice to address the ecological degradation of the Venetian lagoon environment and its salt marsh ecosystems. Jane da Mosto is an environmental scientist and activist, advocating for the environmental issues in Venice to be viewed from an ecosystem services perspective, where the intricate ecological matrices of the lagoon can be valued in the same way as other economic generators within the city (da Mosto et al. 2020). This relates back to the history of the lagoon in Venice that will be discussed in Chapter 5, as the past inhabitants of Venice have always recognized that the lagoon environment needs to be maintained and cared for in order for the city to benefit economically from its ecosystem services. A healthy lagoon means tides for pulling ships,



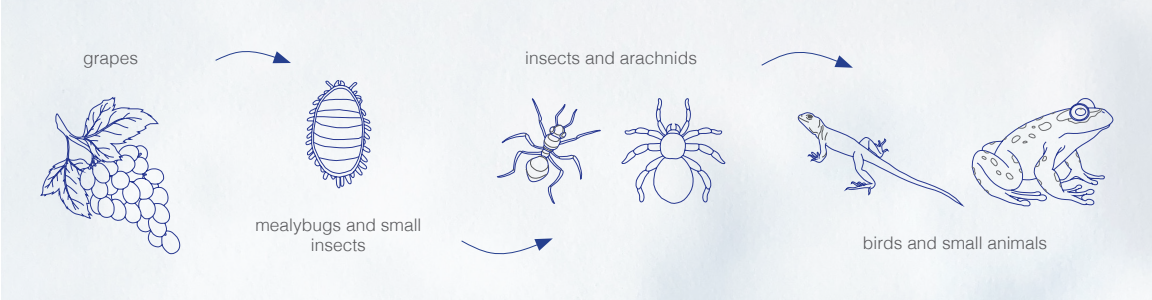
Oyster food system (data from Geraldi et al. 2021, 2).



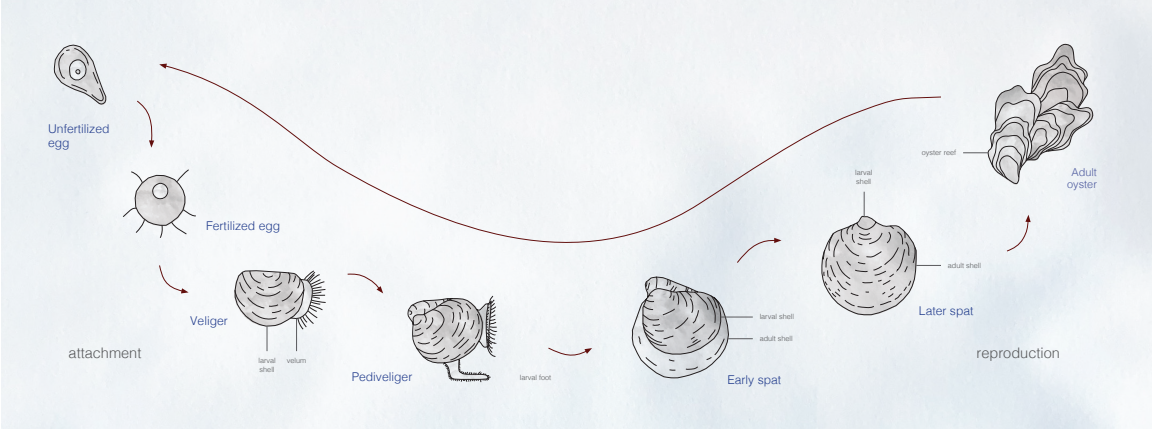
Silkworm food system (data from Gathalkar and Barsagade 2016).



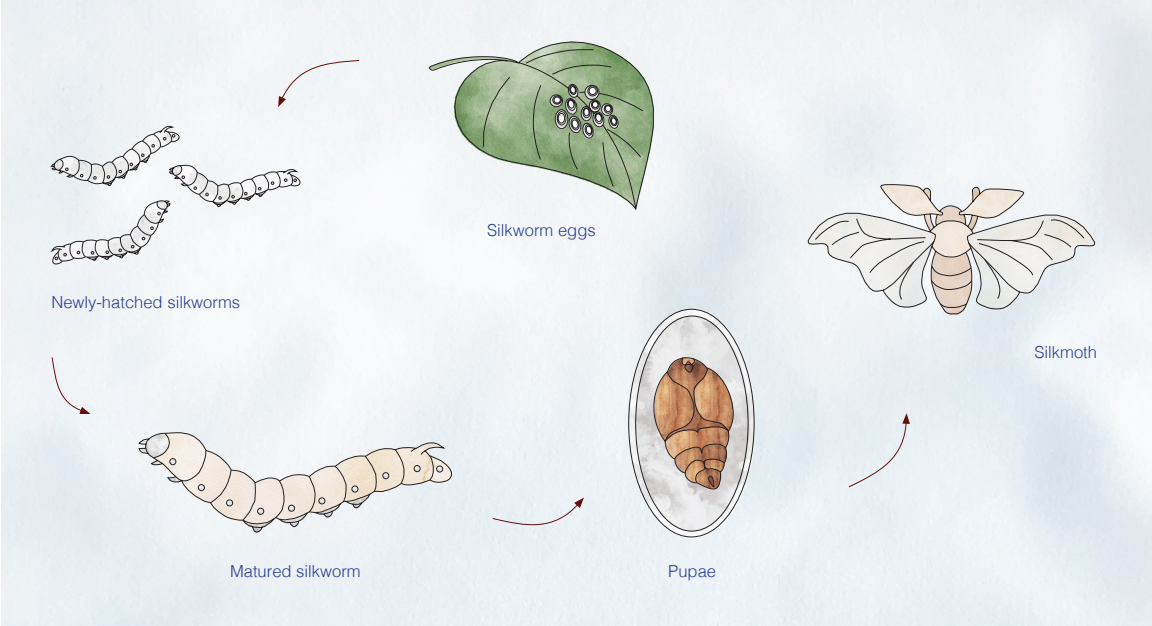
Honeybee food system (data from Albrecht et al. 2007).



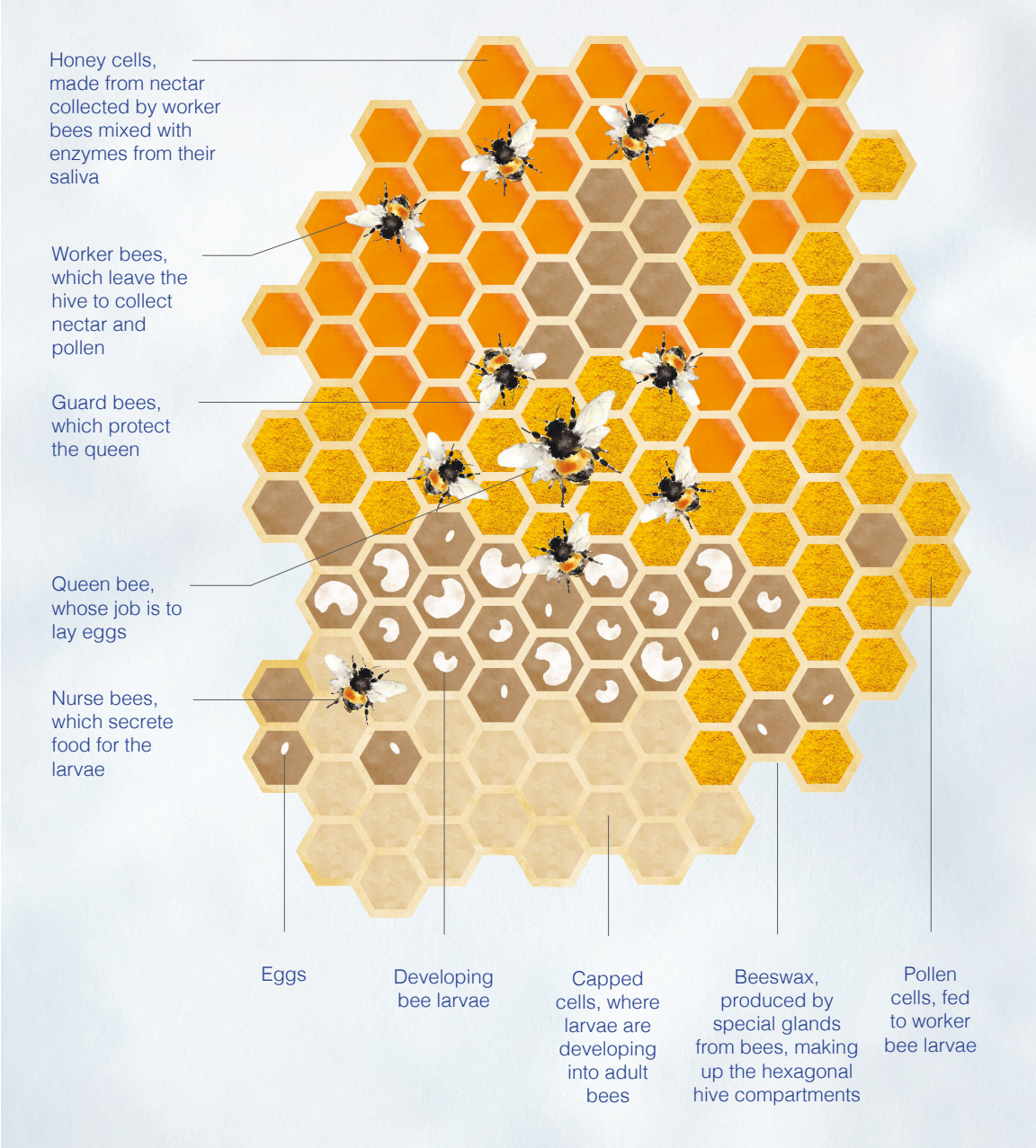
Grapevine food system (data from Gutierrez et al. 2008, S173).



Oyster life cycle (data from Kennedy et al. 2001, 66-67).



Silkworm life cycle (data from Zhou 2012, 2).



Beehive interior structure (data from Honey Bee Research Centre n.d.).

Acqua alta flood waters (Gottardi 2017).

fish and agricultural production for nourishment, and islands that will not be eroded away.

Acqua Alta

While Venice's lagoon ecosystem has been environmentally degraded on the local and regional scale, the global threat of climate change has manifested in Venice in the form of extreme flooding events.

Venice has long felt the impacts of rising sea levels, being inherently vulnerable to it as a low-lying, very coastal city (Cavaleri et al. 2020, 42). The city is positioned within a long, semi-protected lagoon, meaning that when it is hit with a storm, the waves continue to oscillate within the lagoon for days, even after the storm has passed, resulting in more damaging flooding effects (Cavaleri et al. 2020, 42). In November of 1966, Venice was hit with an intense storm surge, which caused flooding at its highest ever recorded water height of 194cm, remaining at 110cm for 22 hours after the surge (Lionello et al. 2021, 2634). This resulted in the city searching for solutions to better detect such storms and prevent future flooding events. In recent years, the frequency of these intense storms have increased, with massive flooding events in October of 2018 and November of 2019, showing that these events are not singular, isolated occurrences (Cavaleri et al. 2020, 42). In addition to these storm events, the relative sea level (RSL) has been rising since the 1930s, which was previously rising in Venice at a rate of 2.5mm per year, but has now grown to 5mm per year due to natural and anthropogenic sinking of the city's foundations (Lionello et al. 2021, 2634). Floods have become a common factor of everyday life for Venetians, known colloquially as the *acqua alta* or "high water."

Flooding in St. Mark's Square (Zarkovic 2021).

The MoSE flood prevention system (Harlan & Pitrelli 2022).

The city has made attempts to mitigate this flooding, the most notable of which being the Modulo Sperimentale Elettromeccanico (MoSE) system. MoSE is made up of large flood barriers located at the three inlets of the lagoon, to be raised during extreme storm events to prevent flooding. This system is still under development but is currently being used sparingly, due to its high operational costs and its prevention of traffic in and out of the lagoon (Harlan & Pitrelli 2022). Unfortunately, this system will likely not provide a permanent solution to flooding as once sea level rises hit 30cm, the system will be overwhelmed and not able to operate sustainably, as it would need to be used every few days at a minimum (Harlan & Pitrelli 2022). Additionally, the MoSE system adds to the environmental stresses of the lagoon, as it does not allow the lagoon to naturally cycle water, sediment, and organisms in and out of it.

Unless drastic changes are made to mitigate the effects of global warming and the projected rises in sea level are controlled, it is inevitable that the flooding of Venice will continue and will become more severe. It is important to acknowledge this eventuality and design in tandem with it.

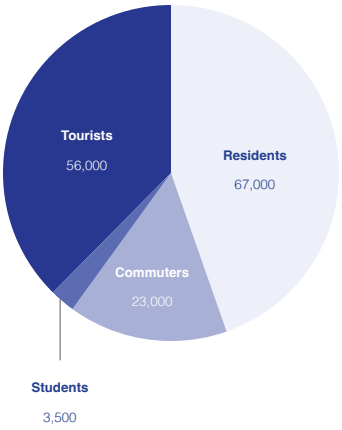
Chapter 4: The Anti-City

As Venice has become overrun with tourists, local Venetians have been pushed out of their homes, of their islands, and out of the lagoon itself. As a consequence of this displacement, a system of urban inhabitation has formed: an anti-city. This anti-city is composed of marginalized groups such as students living in isolation and working families, resulting in social adaptations such as squatters in abandoned housing. All of these residents require year-round access to scarce community cornerstones such as grocery stores, markets, parks, and areas of community interaction, whether access is legal or not.

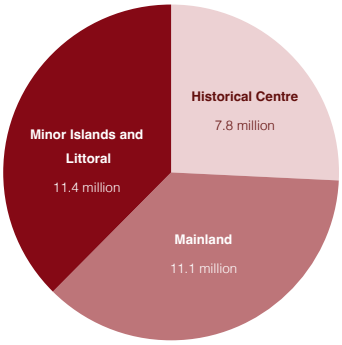
Displacement of the Locals

For hundreds of years Venice was one of the most populous cities in the world (Foscari 2014, 70). As Venice grew in commercial success in the 16th century, its population grew rapidly. To meet this vast population growth, unprecedented building works were undertaken to expand Venice's housing stock on its limited available land (Foscari 2014, 71). The city bought land from religious orders and developed it into housing, and nearly all the existing buildings were somehow enlarged, with some doubling in size as new floors were added (Foscari 2014, 71). Despite dealing with a very finite amount of space, throughout history Venetians have always been able to find ways to adapt their city to suit their changing needs.

The need for change has once again arisen as the increased tourist population is displacing local Venetians from their homes. Locals cannot compete with these increasing land prices, especially as land in Venice is so scarce already,



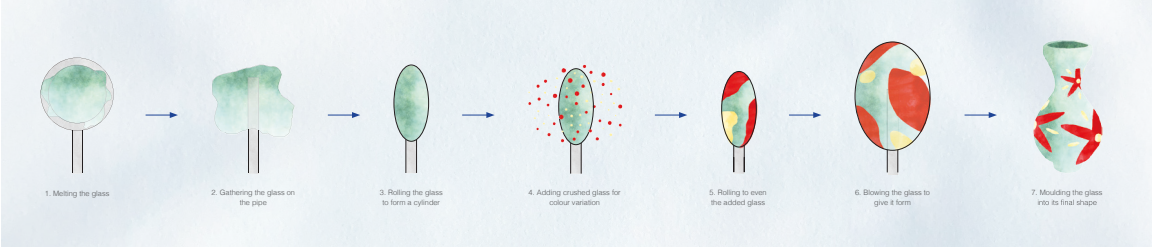
Average daily composition of Venice's population (data from Foscari 2014, 146).



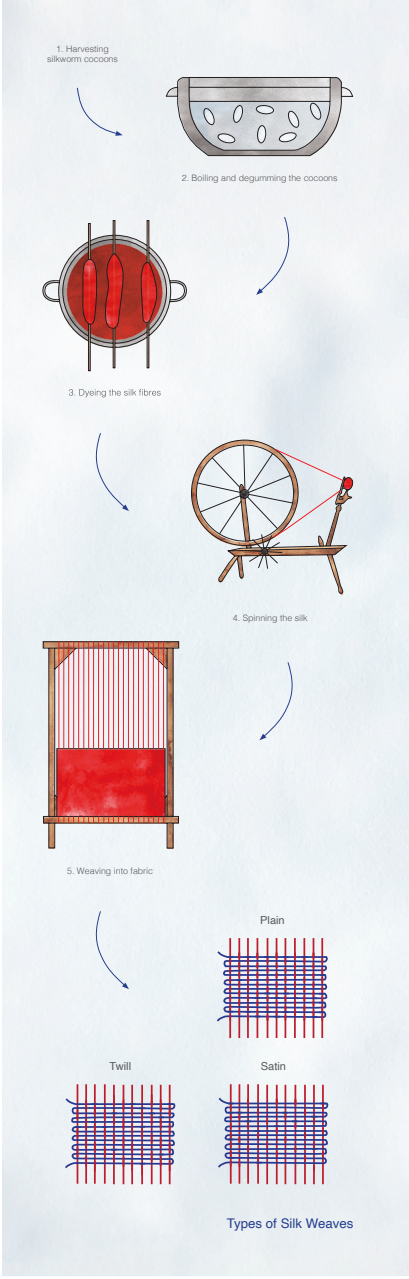
Overnight stays per zone in Venice (data from Salerno 2020, Figure 1).

and are therefore forced to leave to the mainland (Horvath 2018, 20). Due to increased demand in Venice as a tourist destination, house holiday rentals and Airbnbs have become incredibly popular, making the housing market more expensive for locals looking to buy a home (Horvath 2018, 20). These are often unregulated and are therefore not properly accounted for when evaluating Venice's rental markets. Businesses that regular inhabitants of the city need, such as bookstores, grocery stores, and children's clothing stores are disappearing. Local businesses are having foreign investors buy their buildings and raise rents to extremely unaffordable amounts, pricing them out of the area (Horvath 2018, 20). With these high rents and things such as basic food prices costing triple what they do on the mainland, many Venetians are opting to rent out their homes to tourists during the high season, living in lower cost of living mainland areas instead to recoup some of these losses (Horvath 2018, 23). This exacerbates the issue by removing residents and flooding the city with even more tourists.

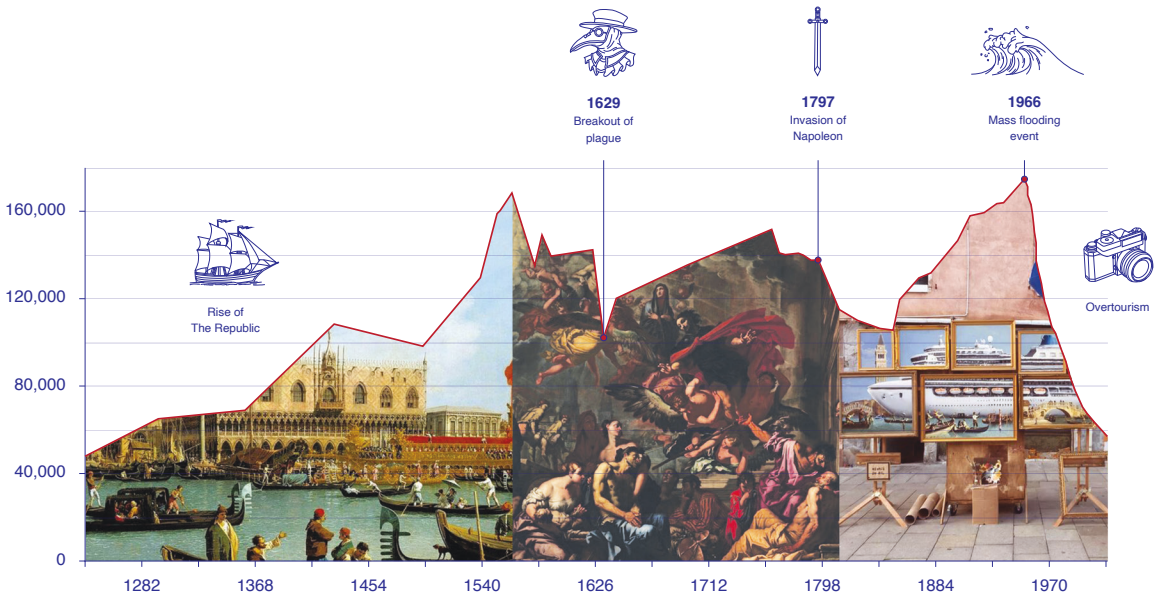
The overcrowding that Venice now experiences causes stress for local people simply trying to live in that environment, is a strain on the old, often fragile urban context, and disturbs pre-existing economic activities through the added environmental issues of litter and air, water, and noise pollution (Horvath 2018, 17). Tourists and residents inhabit spaces differently; tourists walk slowly, stop to look at things frequently, and can be unsure of their directionality. This is generally fine in a larger city, but since Venice has such a small land mass and disproportionately large tourist make-up, it can be quite tedious for the locals to contend with. This increased urban development and tourismification also



Glassblowing process (data from Beckett 2022).



Silk production process (data from May Silk 2021; Topalbekiroglu et al. 2008, 283).



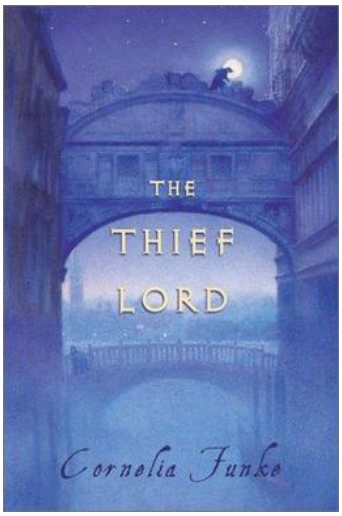
The population of Venice over time (data from Statista Research Department 2006; Swingle n.d.; Foscari 2014, 71)

brings with it unsavoury, often illicit subeconomies such as unruly behaviour and alcohol abuse by tourists, narcotics dealing, gambling, and prostitution (Horvath 2018, 18).

The Commodification of Public Space

The imposition of rules for conservation within the city are lauded as being for the benefit of the locals, as this preserves their built heritage. However, these rules are often enforced in opposition to the social and economic goals of the public, with the monumentification of the city resulting in gentrification and displacement of locals, their city serving only as a stage set for the tourist trade (Lamprakos 2005, 18). In addition to locals having to compete with tourists for access to their public spaces, local customs and traditions that were initially special to Venetians are now being packaged and sold as a commodity to tourists, resulting in a loss of their authenticity (Horvath 2018, 17).

Don't Look Now film poster (Woodward 2019).



The Thief Lord book cover (Chicken House Publishing Ltd. 2002).

The municipal government of Venice earns some of its revenue by selling licences to businesses who occupy public space (Foscari 2014, 338). These licenses often go to restaurants who want to extend their patios into walkways or public squares, or to those with mobile shops selling art and souvenirs from stalls and carts. Some residents of Venice have picked up on this commercial opportunity, and are choosing to forgo the licensing expense by selling goods to tourists placed on large white sheets in high-traffic public areas (Foscari 2014, 338). The use of the cloths enable these illegal vendors to scoop up their cloths with their remaining goods and run if a police officer were to come by. This is an interesting case study as it is clear that the municipality will only allow the use of public space for commercial enterprises if they can directly benefit from it, even if their locals desperately need opportunities like this. Like those squatting in abandoned houses, these street vendors are taking public space back for the use of local Venetians, whether this is legal to do so or not. The design of this thesis acts in a similar manner by taking over Venice's abandoned islands and ruins and adapting them to imagine something new that could be used once more for the locals.

Representation in Media

While Venice has served as the stage for many works of literature, film, and media over the years, many such stories focus on an outsider coming to Venice and experiencing it as a romantic or tragic site. While these can provide insight to the attitudes and perceptions of local Venetians, telling stories from their perspective is important too.

The film *The Thief Lord* invokes this notion of an anti-city, involving a band of child orphan thieves who pick the pockets

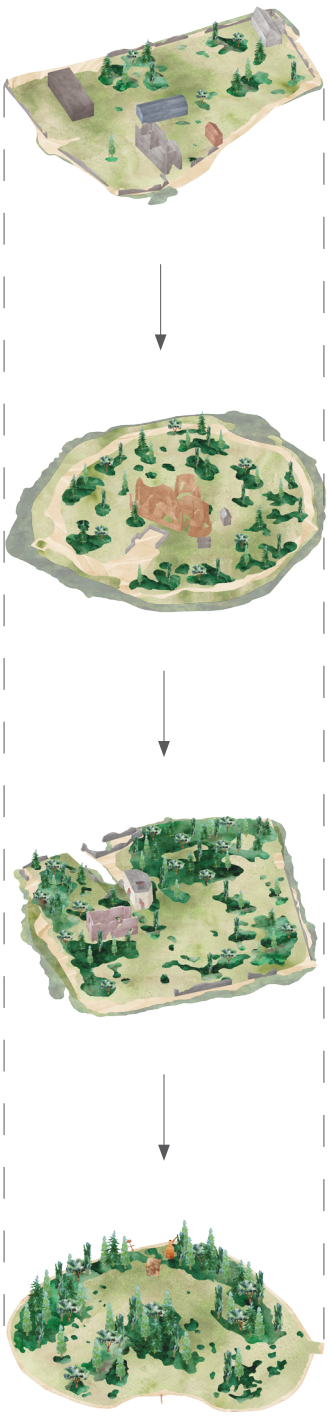
Characters of the anti-city as represented in media.

Mushrooms in the City.

The Garden of Stubborn Cats.

of tourists and burgle houses in order to survive (Claus 2006). This film takes a light-hearted approach to the supernatural presence of the city, with a magical carousel on one of the "haunted" islands capable of accelerating or reversing one's age. It also focuses heavily on the theme of found family, which is very important for many residents of Venice who are students or immigrants who do not have strong pre-existing community networks. Film centred around Venice has also shown the locals as guides to visitors of the city. In *Don't Look Now*, this is taken to a more sinister spiritual level (Roeg 1973). The main characters are a couple, John and Laura, who are visiting Venice for work following the death of their young daughter. The local bishop working with John has an intuition that he needs to leave Venice or else something terrible may happen to them, which it inevitably does. Throughout the film they are surveilled by the locals, all the time implying that the locals know something that John and Laura do not. The film gives the sense that Venice has an inherent darkness or supernatural presence to it, and you would have to be of the city to truly understand it and belong in it.

In Italo Calvino's *Marcovaldo*, a series of short stories, the titular character of Marcovaldo is a working-class Italian man who grew up in the countryside and is now adapting to city life with his young family. In one such story, *The Garden of Stubborn Cats*, Calvino details the secret underside of the city in which cats dwell, through a system of alleys, rooftops, and other overlooked spaces that are uninhabited by humans (Calvino 2001). This is until, of course, Marcovaldo stumbles upon and attempts to infiltrate their world, with comedic results. These stories provide a valuable insight into the attitudes of local Venetians, who are



The history of the four islands is compiled on top of the ones before it, with Campalto and the Era of Salt as the oldest being the base, ending with Santo Spirito and the Era of Decay as the most recent on top.

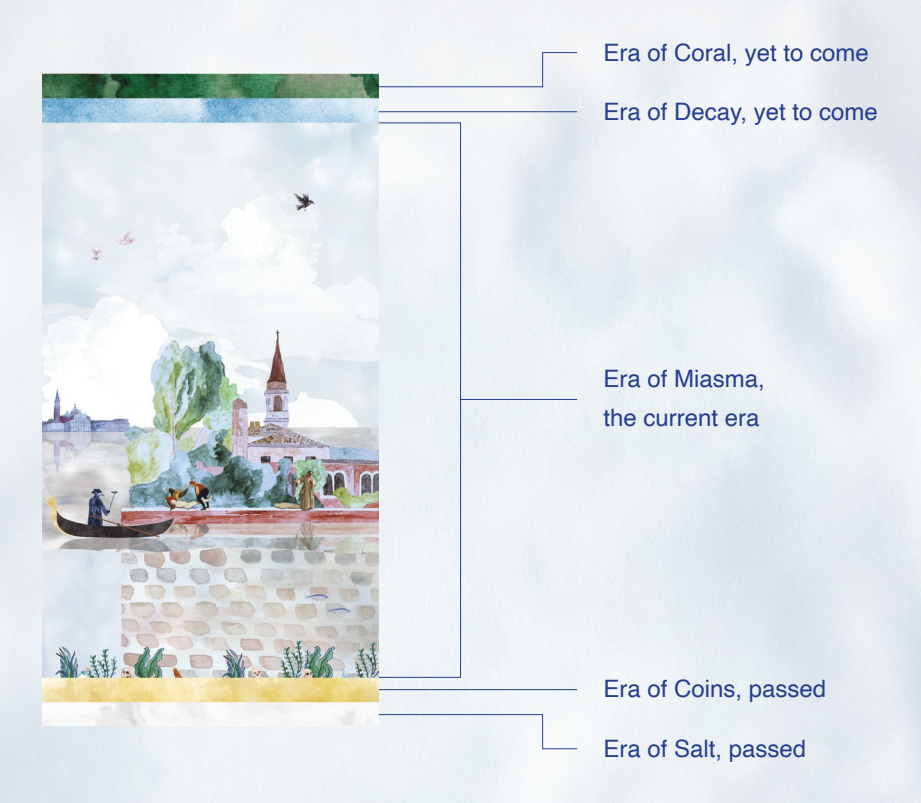
constantly balancing their very urban environment with the natural, mysterious lagoon landscape beneath it. Another story, *Mushrooms in the City,* involves Marcovaldo finding wild mushrooms growing by his bus stop, which he plans to cook for his family to eat (Calvino 2001). The delight of serendipitously finding natural elements in the urban realm is a common theme in these stories.

Methodology

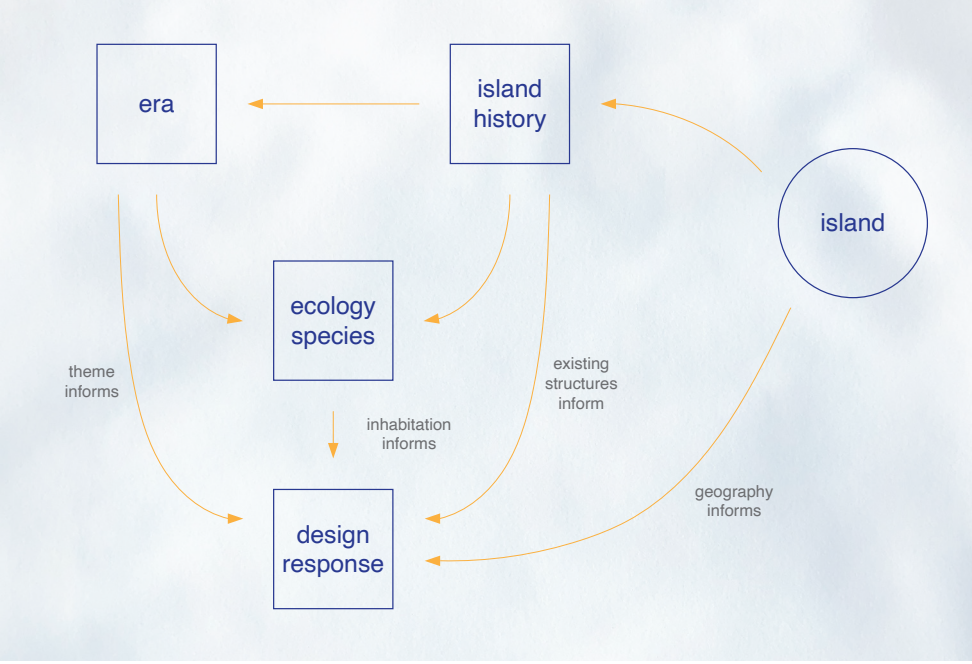
The methodology for this thesis involves translating the ecological and the historical to create a design response for each island. These responses are based on a narrative structure that builds on both real and imaginary elements, influenced by both the city and lagoon as a whole and by small facets of daily life. The island and its past uses dictate the historical era it falls under, and those histories and the remaining ruins on the island inform what ecological species will be designed for to inhabit the island. All of these factors, in addition to the geography and scale of the island, inform the design response. Each of these islands was selected as they are owned by the municipal, state, or national government and are not privately owned, and therefore have the potential to be more easily operated upon as spaces for Venetians (Carrera 2011).

As the eras are progressed through, the history of the islands become stacked on top of one another, and the history of the previous era and island is buried. Through this process, it is changed, reinterpreted, and reincorporated into the architecture of the following era, forming a new layer that echoes those of the past. These designs are intended to not be fixed in space or time, but act temporally, like the water of the lagoon, together forming a network.

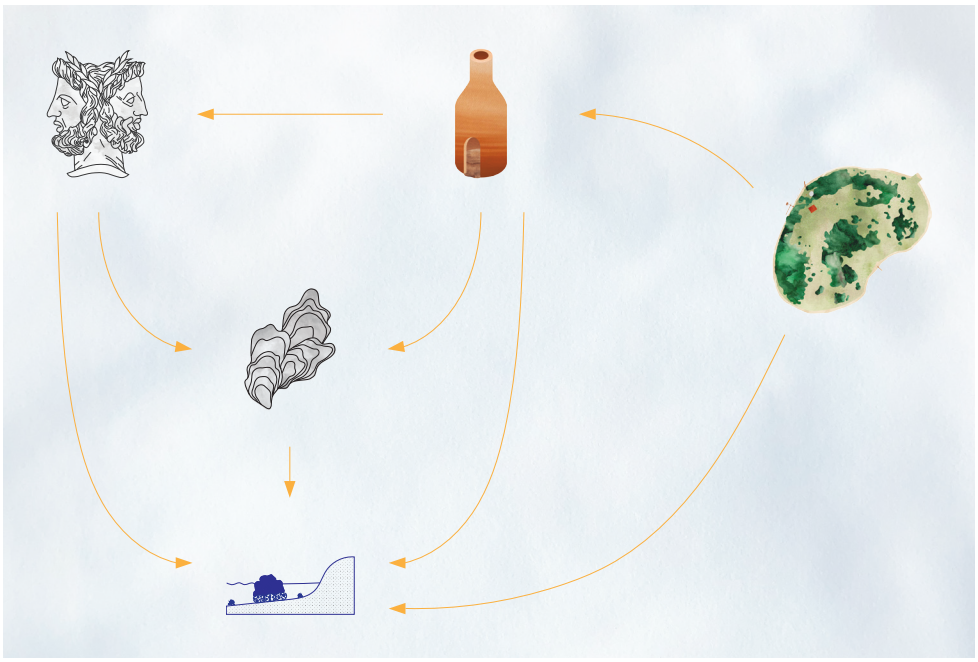
The designs for these islands and eras exist in a place between myth and reality. A figurehead has been given to each era to help define its place in history and the impact it had on the development of Venice, as well as its impact on its designated island and resulting design. These figures have anthropomorphic qualities, representing the close connections between the human and non-human inhabitants of the lagoon. Janus, the Roman god of doors, transitions, and beginnings represents the Era of Salt, as this is where we begin our story and is a time of many changes and uncertainties. The Lion of St. Mark represents the Era of Coins, as St. Mark is the patron saint of Venice and was believed to bring the Venetians good fortune in their commercial and mercantile endeavours. The Venetian plague doctor represents the Era of Miasma as they were prominent and almost mythic figures of the time, travelling across the lagoon to the various quarantine islands to heal the sick. A masquerader represents the Era of Decay, as they are a reflection of Venice's bygone history that is being commodified for tourists today, masking the systemic issues that the inhabitants of Venice are facing. Lastly, the Era of Coral is represented by a figure overcome with the growth of a reef, reflecting a hope for the future involving the coexistence of natural and human elements, as well as the expansion of ecological systems and habitats.



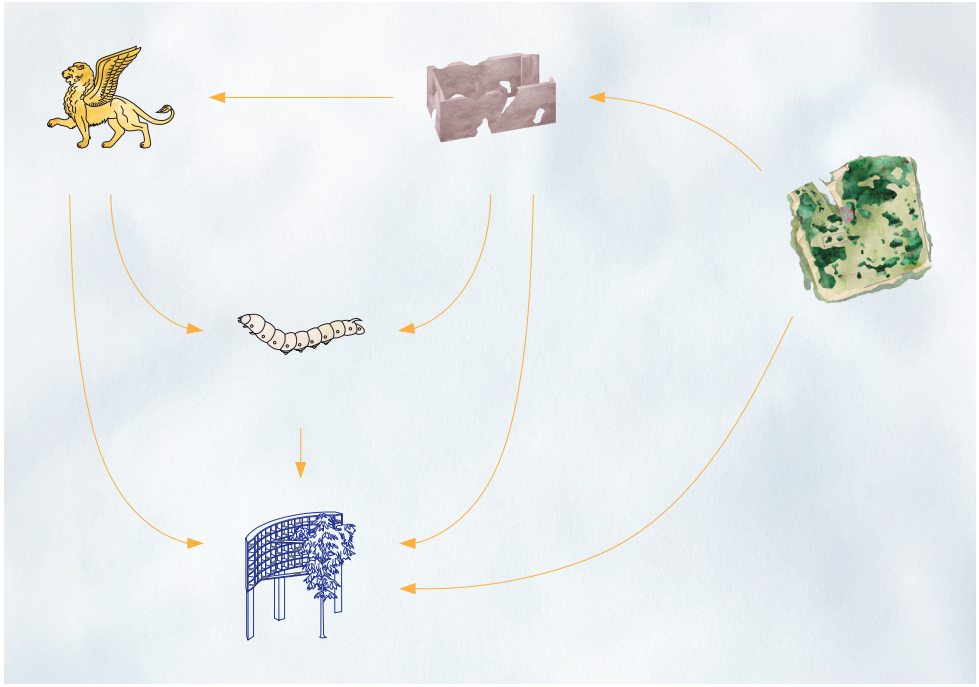
The framework of snapshot diagrams for each era that will appear in Chapter 5, with that of the Era of Miasma as an example.



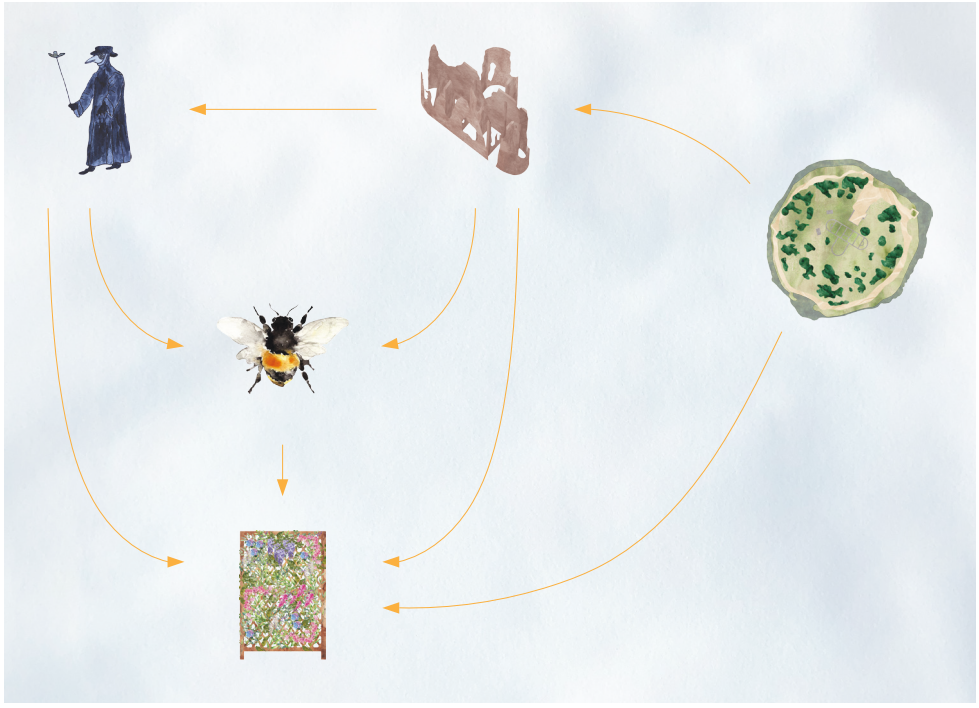
Diagramming the methodological framework for the design work of this thesis.



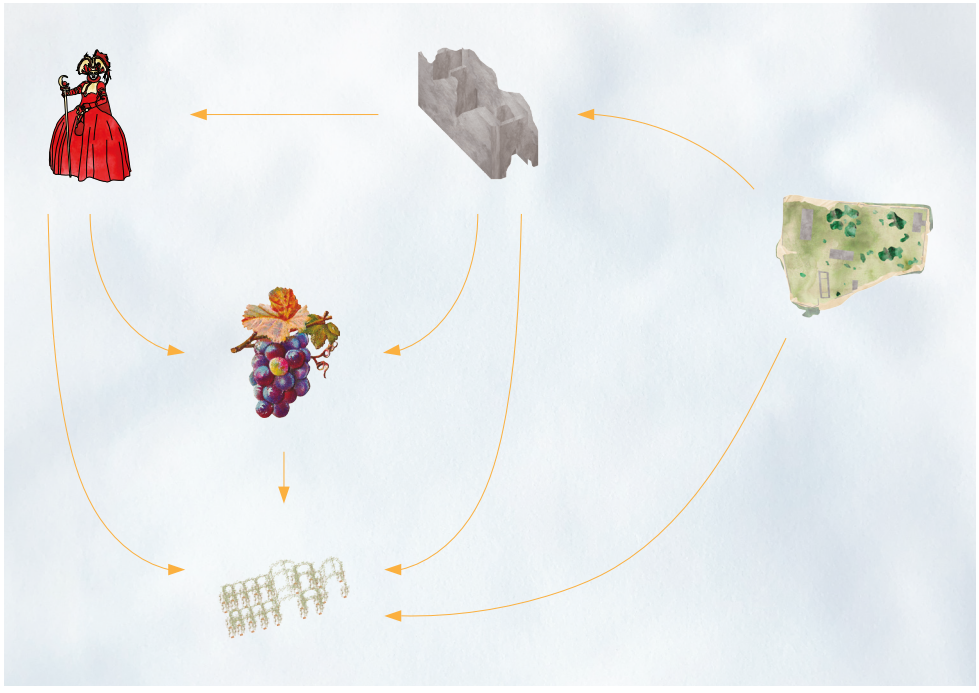
Methodology for the island of Campalto.



Methodology for the island of San Giorgio in Alga.



Methodology for the island of San Secondo.



Methodology for the island of Santo Spirito.

Four abandoned islands within the Venetian Lagoon that will be design sites for this thesis.

Janus: Roman god of doors and transitions.

Chapter 5: Designing for Submersion

The design responses for this thesis will take place over four abandoned islands within the Venetian lagoon that are still under government ownership, and thus have the potential to be taken over and operated upon. The design for each island will correspond to an era of Venice's history, integrating existing ruins on the island and their past principal uses, while creating habitats for key species. As the islands move through the eras, echoes from the past eras will be included with each new design, marrying together the myth and reality of the islands. These strategies will create new ecosystems for native Venetian plant and animal life, and will provide spaces and resources to be enjoyed by local Venetians, giving them purpose again within the island network of the lagoon, while regenerating that lost network. These designs will take place over two phases: one which could occur now and could be used by the human residents of Venice, and one which could occur 100 years from now, when the islands experience flooding and will be taken over by animal and plant ecosystems.

Snapshot of Venice during the Era of Salt.

Campalto

The Era of Salt, c. 700

The origins of the city of Venice lay in the 6th century, when refugees from northern Italy fled invasion from Lombard tribes and settled around the Venetian Lagoon (Ferraro 2012, 2). These refugees were an Indo-European group who made their livelihood off of fishing, and thus were familiar with building in a marine environment. They assembled their huts on top of the treacherous mud flats, raised up on

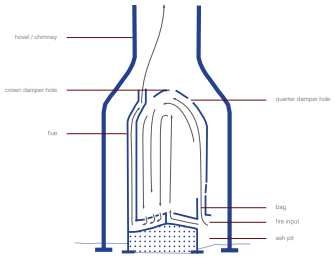
stilts, placing them above the water, silt, and reeds of the lagoon (Ferraro 2012, 3). These structures needed to be very adaptable to meet the varied conditions of the lagoon's temporal environment. When the lagoon inevitably flooded their land, they had to be quick on their feet to consolidate surrounding reeds and dried soil into mats to maintain a base for their structures (Ferraro 2012, 3). The lagoon environment had no consistency and was constantly subject to change, making these settlements extremely precarious places to live.

Their first settlements were constructed in Malamocco (on the island today known as Lido) and in Rivo Alto (now known as Rialto on the main island of Venice) (Ferraro 2012, 3). These early Venetians learned to harvest salt and fish from the lagoon, and traded these goods with the mainland in exchange for timber with which they could construct further boats and buildings (Ferraro 2012, 3). They were also craftspeople with carpenters, glassmakers, and ironworkers among them, creating markets for glass, metalwork, and jewelry trade. The Venetians had cultural and political links to the Byzantine Empire, and Veneto-Byzantine churches were founded on the Venetian islands of Torcello and Murano, where glassmaking and agriculture were taking place (Ferraro 2012, 4).

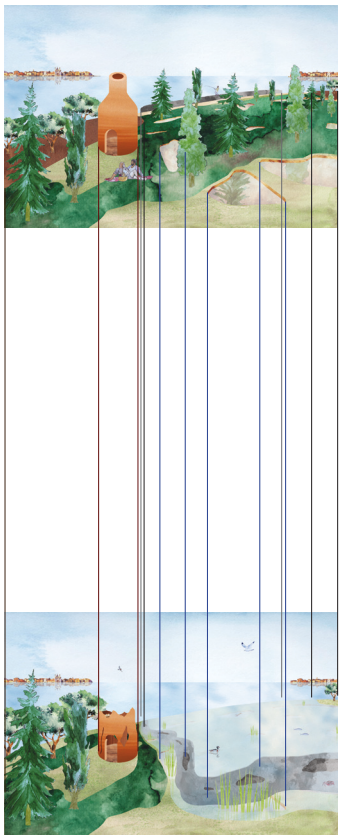
The crucial role of the Venetians at this time was to learn to work within the restrictions and conditions of their lagoon environment, and to create dry land masses within it on which they could build and develop their settlements (Ferraro 2012, 3). They elected their first Doge in 730 (Doge meaning "Duke" in the Venetian dialect), which allowed them to retain their relationship with Roman Byzantium and awarded them protection, trading privileges, and tax exemptions, thus

Map of the Venetian Lagoon during the Era of Salt, showing land formations, settlements, and trade routes (data from Ferraro 2012; Foscari 2014, 292).

Axonometric view of existing structures on the island of Campalto.



Bottle kiln section (data from Wooliscroft 2015).



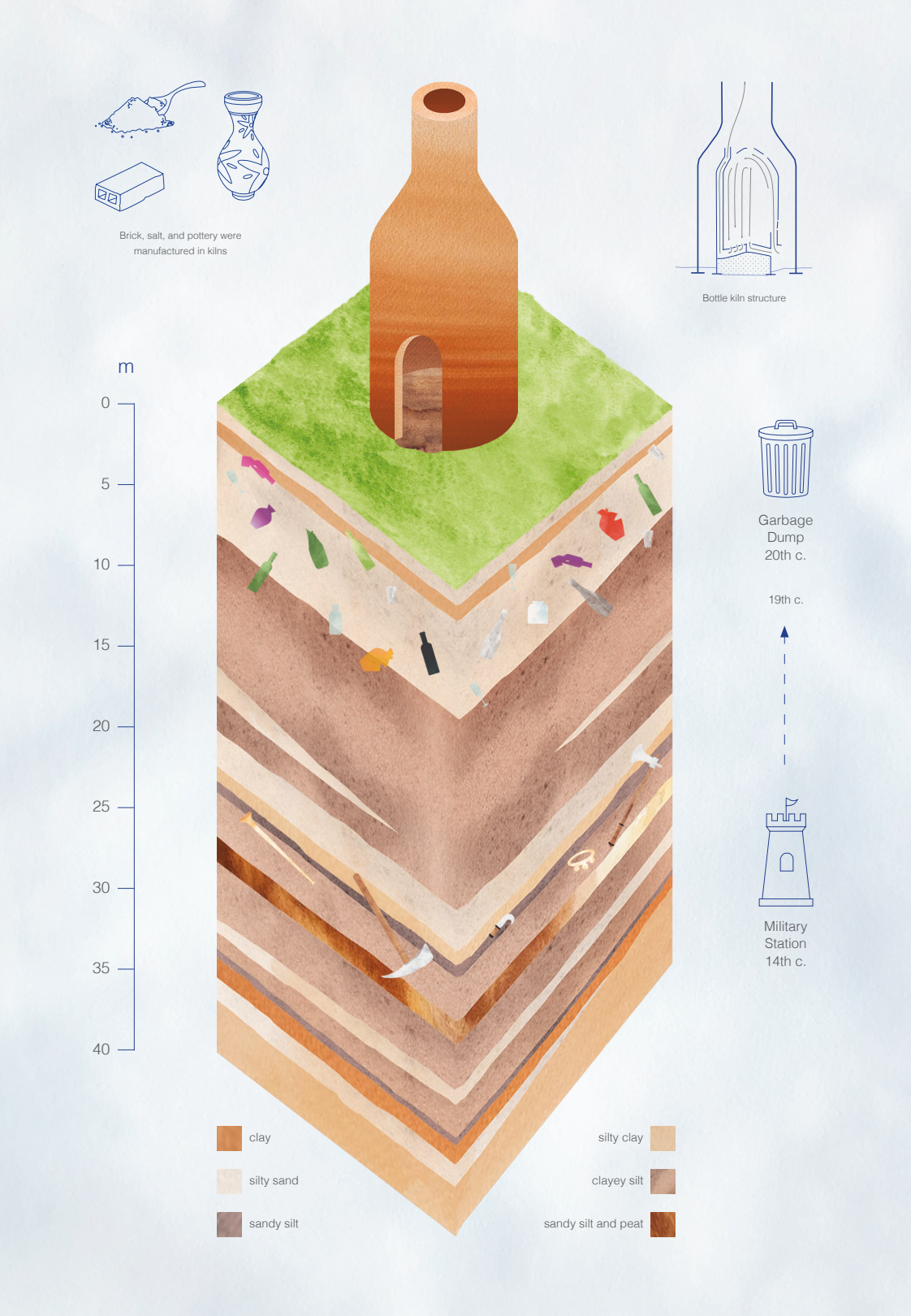
Campalto visualization.

beginning Venice's role as a hub for mercantile commerce (Ferraro 2012, 4).

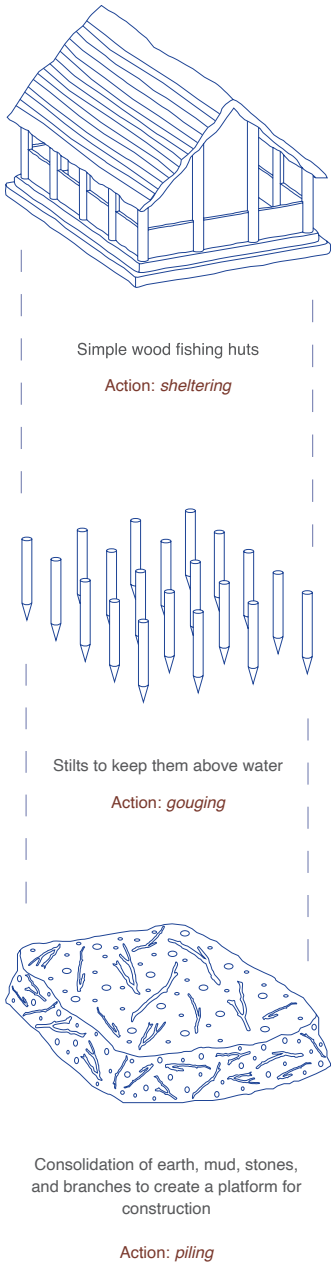
Tidal Blooms

The Era of Salt will manifest on the island of Campalto. This island was used as a military station from the 14th – 19th c., and as a garbage dump in the 20th c. (Poloni 2014, 43). Campalto has been designated as a "making" island type, due to the ruins of what was likely a bottle kiln on the island, which could have been used for the manufacture of brick, salt, or pottery. It is linked to the Era of Salt due to its history of artisanal making, and the potential production of salt that occurred on the island.

Its past use as a garbage dump provides opportunities for excavation and reuse of these materials. Glass found on the island can be recycled and taken to the island of Murano for use in its famous glassblowing industry, and plastics can be converted into geotextile materials for use in construction of artificial oyster reefs. Oysters have long been important ecosystem builders in marine systems around the world. Healthy oyster populations produce reefs which provide habitats for a variety of other lifeforms (Beck et al. 2011, 110). However, oyster populations within the Venetian lagoon have been suffering due to pollution, overharvest and trawling, and sediment disturbance (Beck et al. 2011, 107). This has consequences for the larger lagoon environment, as oyster reefs also form a natural buffer on shorelines that help to prevent erosion and flooding from wave action (Beck et al. 2011, 110). The oysters building these reefs correlates with the "making" characteristic of the Campalto.



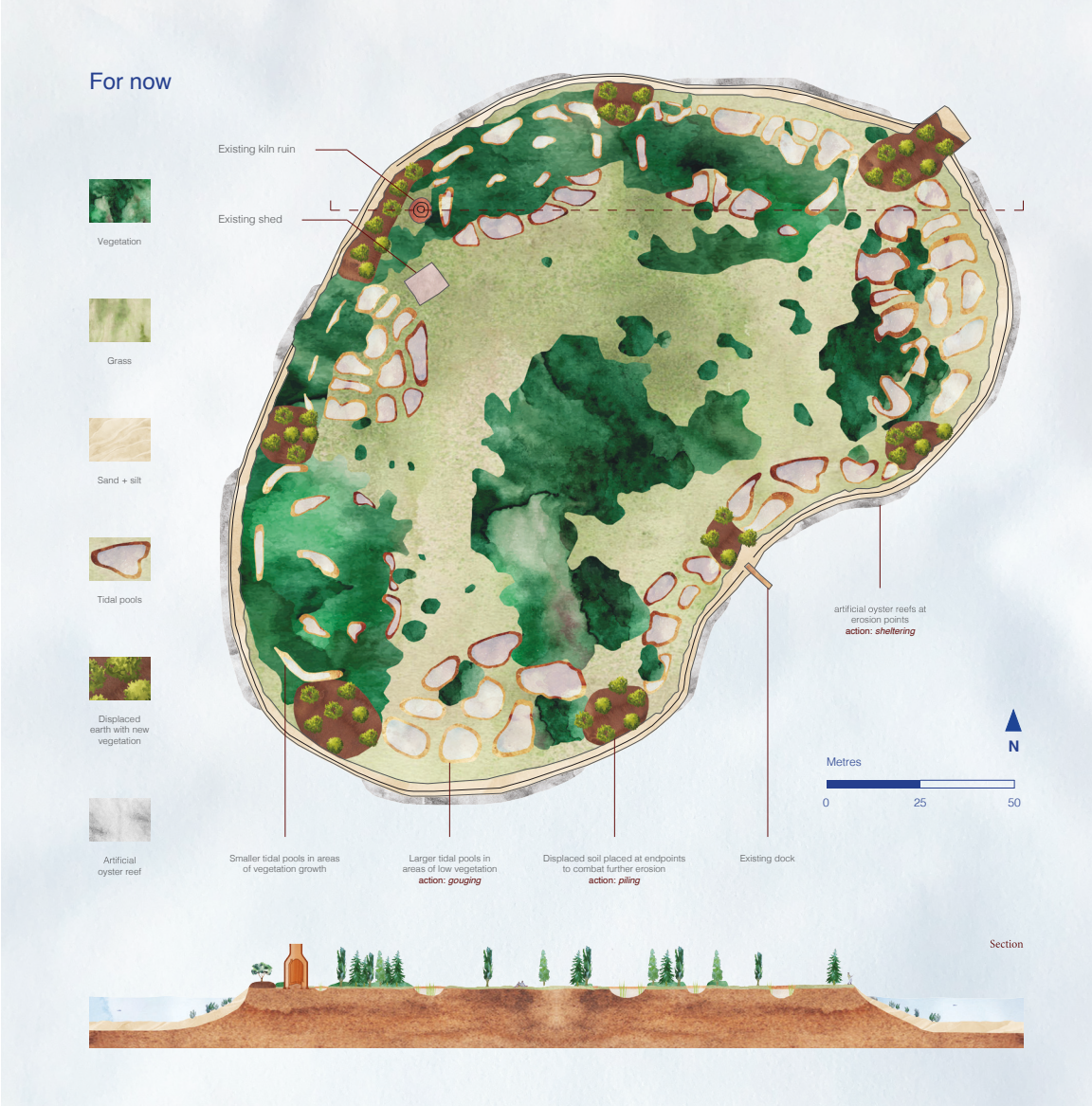
A core sample showing the past histories of Campalto, as well as the bottle kiln ruins that remain on the island (data from Monaco et al. 2014, Section N-S; Poloni 2014, 43).



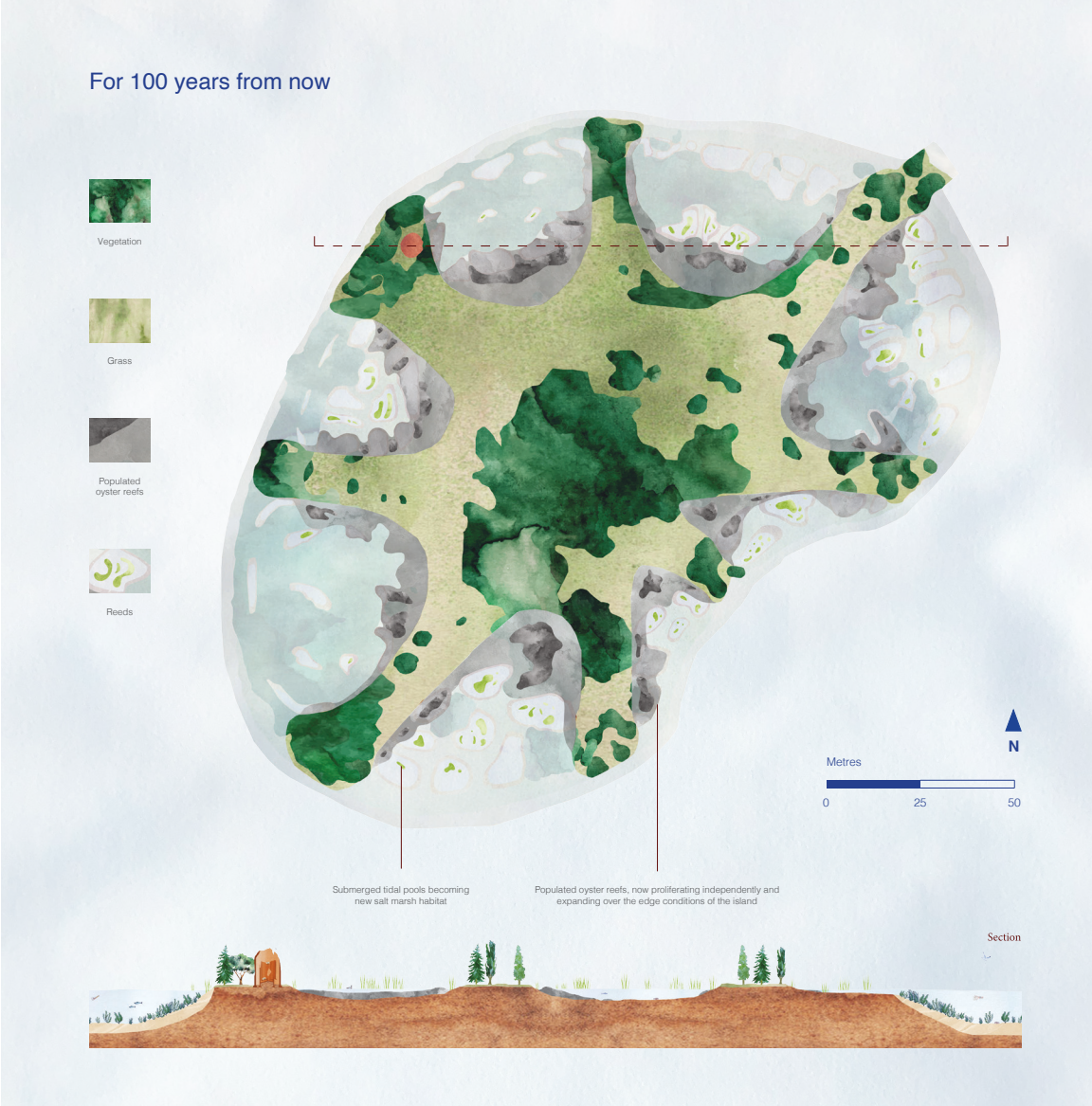
Traditional fishing hut construction during the Era of Salt (data from Ferraro 2012, 3).

This design response involves establishing a connection between the kiln ruins and the existing dock, thus establishing preservation points and resulting flood areas. By allowing certain areas to flood, this maximizes the edge condition, which is key for oyster reef development, and creates niche tidal pool habitats, which will eventually and become crucial salt marshes. The excavation of tidal pools allows uncovered glass refuse to be repurposed for glass blowing industries, and uncovered plastic can be used to help form the artificial oyster reefs, also composed of oyster shells and lagoon sediment. Specialized marine bacteria that break down plastic polymers can be integrated in order to prevent microplastics from entering the environment after the reefs have formed (Syranidou et al. 2019, 33). Remaining sediment excavated can be used to fortify the remaining landscape. New vegetation can be grown in these areas to help consolidate this new soil. This serves to create a star-shaped shoreline with a long perimeter, creating a larger edge condition for oyster reefs and subsequent ecosystems to cultivate. In approximately a century when the island begins to become flooded, the oyster reefs will act as a buffer, helping to preserve the remaining island landscape, and these tidal pools will become flooded and allowed to transform into new salt marsh habitats.

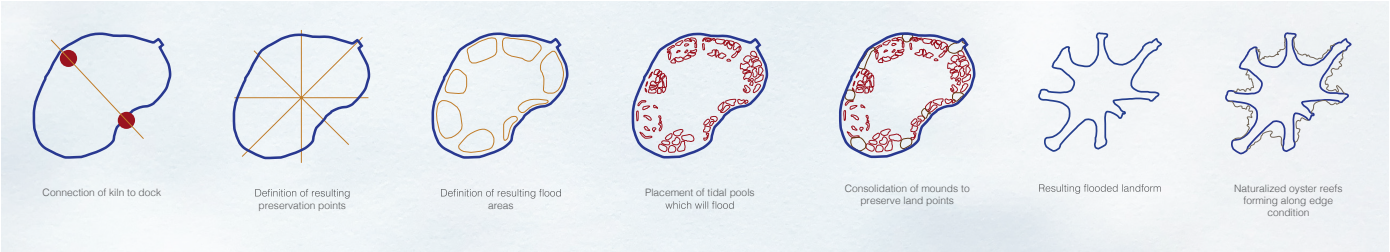
The design of this response draws from the construction of traditional fishing huts seen in early Venice during the Era of Salt. These huts were constructed through the act of **piling** to consolidate earth, mud, stones, and branches to create a platform for construction, through the act of **gouging** stilts into the earth to keep the structures above water, and through the act of **sheltering** by constructing a wooden hut on the stilts for protection from the elements. This design is



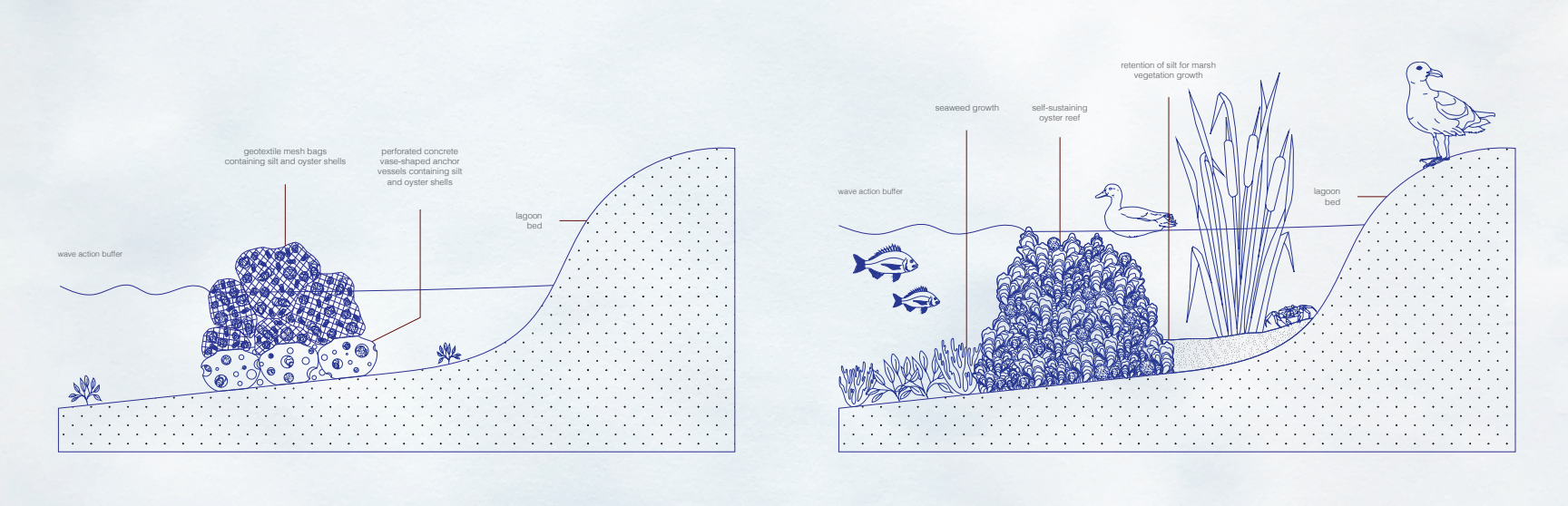
Campalto site plan and section - for now.



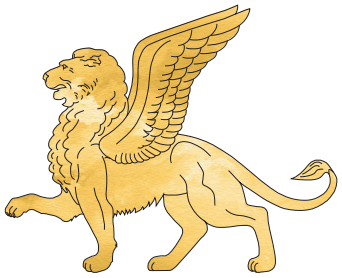
Campalto site plan and section - for 100 years from now.



Campalto parti diagrams.



Artificial oyster reef for now (left), and inhabited oyster reef 100 years from now (right).



St. Mark: Patron saint of Venice.

constructed through the act of **piling** displaced soil at island endpoints to combat erosion, through **gouging** tidal pools into the ground for excavation of materials, and through **sheltering** the remaining land of the islands through the use of the oyster reefs to prevent erosion and maintain the shoreline.

San Giorgio in Alga

The Era of Coins, c. 1100

As Venetians became more attuned to life within their littoral landscape, their builders learned how to better drain and consolidate soil, and add external gravel, dirt, and other materials to form land masses within the lagoon (Ferraro 2012, 5). They excavated canals to allow larger ships to pass through and raised the level of the land, allowing the city to expand, and added landfills around the edges of the city (Ferraro 2012, 5).

Snapshot of Venice during the Era of Coins.

Christianity became the dominant religion in Venice and San Marco became the principal church of the city at this time. A church was built upon each inhabited island, and more than 70 island parishes were established by 1100 (Ferraro 2012, 6). The Venetians were very careful to be mindful of the lagoon when developing these islands, observing where the tides naturally deposited silt and allowing that to inform where they built (Ferraro 2012, 6). They ensured that the natural flow of the tidal waters were not obstructed by their urban development, as they knew they needed these currents to pull their ships and clear sewage from the city (Ferraro 2012, 6). Permanent structures were built by driving long wooden piles deep into the mud, upon which wooden

Map of the Venetian Lagoon during the Era of Coins, showing land formations, settlements, and trade routes (data from Ferraro 2012).

platforms were built and covered with stone (Salvadori 1980, 13).

The flow of ships and goods within and around the lagoon was extremely important at this point in time, as all transportation and their trading economy depended on it. The city built early gondolas called “traghettos”, that served as public transportation, moving citizens across the Grand Canal and brought merchants to and from the mainland (Ferraro 2012, 8). Districts in the city were formed for craftspeople and farmers to sell their goods. Such vendors included bakers, milk vendors, silk weavers, fruit vendors, arrow smiths, sword smiths, cloth sellers, and glass makers (Ferraro 2012, 9). Venice was unique from other Italian cities at the time as their economy was not formed around agriculture, as they had limited access to natural land, and they instead had to important food, raw materials, and timber from the mainland in exchange for salt (Ferraro 2012, 9-10). Though their diet included plenty of fish from the lagoon, and there were small gardens in some areas where produce was grown, this was not enough to feed everyone and so they needed to supplement their food sources through trade (Ferraro 2012, 10).

The positioning of Venice on the lagoon provided a natural barrier from invaders, allowing the Venetians to cultivate their trading economy. They did invest in a navy, and they patrolled the Mediterranean with a small fleet by 1000, and additionally developed a burgeoning commercial trade fleet between 1190 – 1220 (Ferraro 2012, 10). With this newfound empire of Venice forming, they conquered and formed colonies around the Adriatic coast, and gained wealth through the European Christian Crusades (Ferraro 2012). At this point, Venice was positioned as a crucial

Axonometric view of existing structures on the island of San Giorgio in Alga.

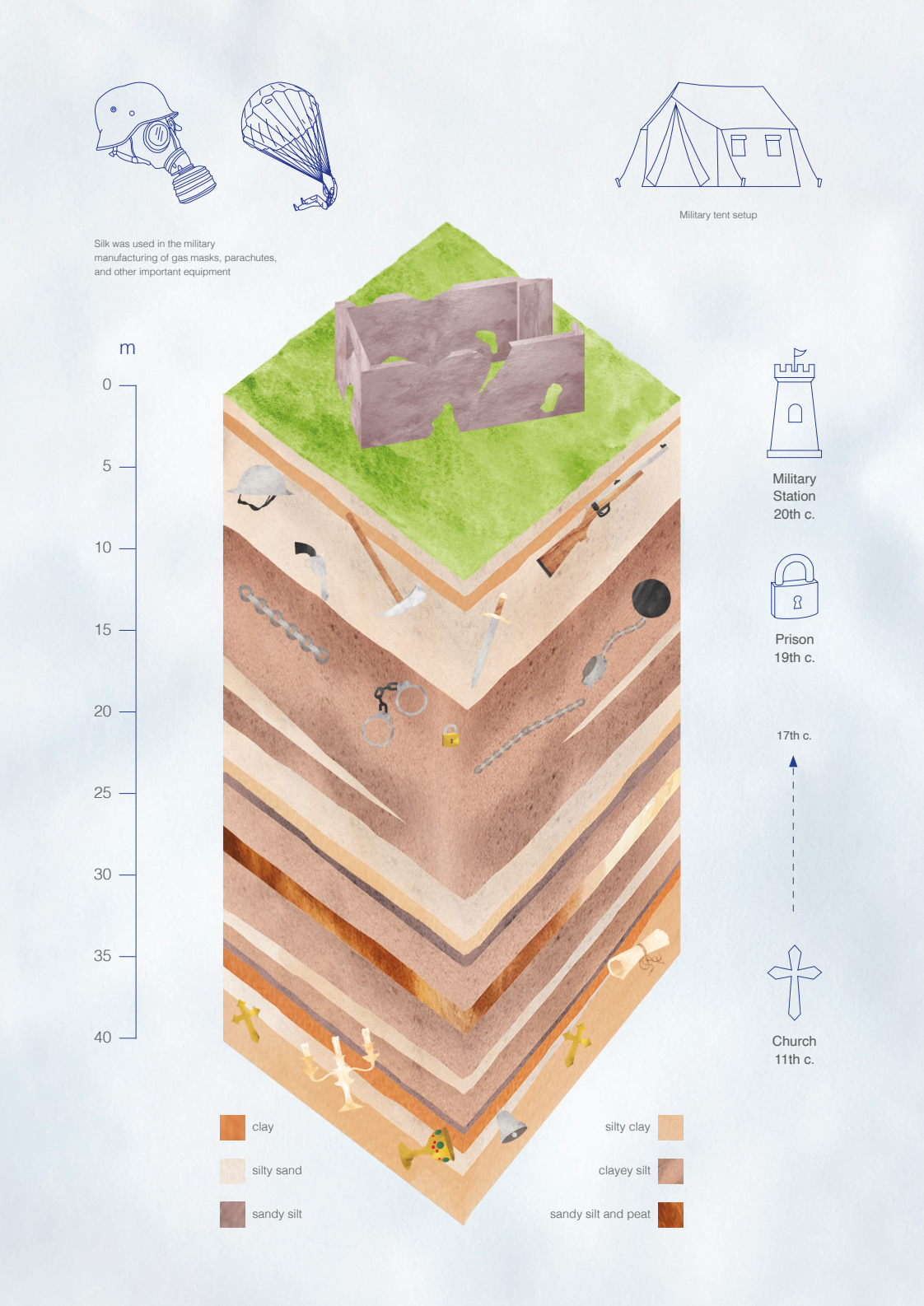
link, connecting the Adriatic coast, Constantinople, Egypt, Greece, the Black Sea, the Holy Land, and northern Europe, functioning primarily as a commercial rather than a military power (Ferraro 2012, 11). Their largest industries were shipbuilding, supplying timber, and glassmaking (Ferraro 2012, 11).

Silk Sheath

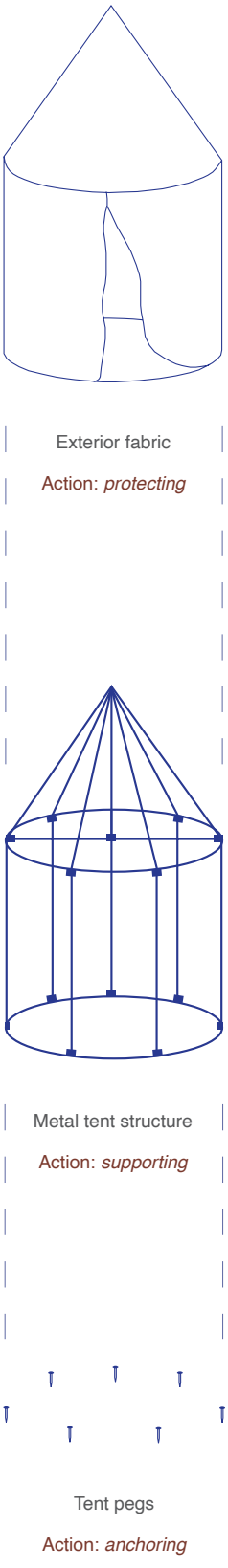
The Era of Coins will manifest on the island of San Giorgio in Alga. This island was used for religious purposes from the 14th – 19th c., as a military prison in the 19th c., and as a military station in the 20th c. (Poloni 2014, 48). San Giorgio in Alga has been designated as a “military” island type, due to its history as a military site and its existing military ruins, though it also contains the ruins of a former monastery. It is linked to the Era of Coins due to its military history, which reflects the conquering naval superpower Venice had become during the Era of Coins.

The design response for San Giorgio in Alga involves silk and silkworms. Silk has a long history of use within the military, with it being used in the manufacturing of parachutes and as lining for gas masks, among other uses (Koos n.d.; Smart 1999, 8). Venice has strong historic ties to silk as well, with the island of Burano serving as a historic centre for silk weaving that is still alive today.

Silk is produced during the metamorphic stage of silkworms into silk moths, when they weave their protective cocoons from a single strand of silk, which generally takes around 2 days (Bhalla et al. 2020, 284). In sericulture, which is the process of farming silkworms for silk production, the cocoon is then harvested at this stage and boiled, thus killing the



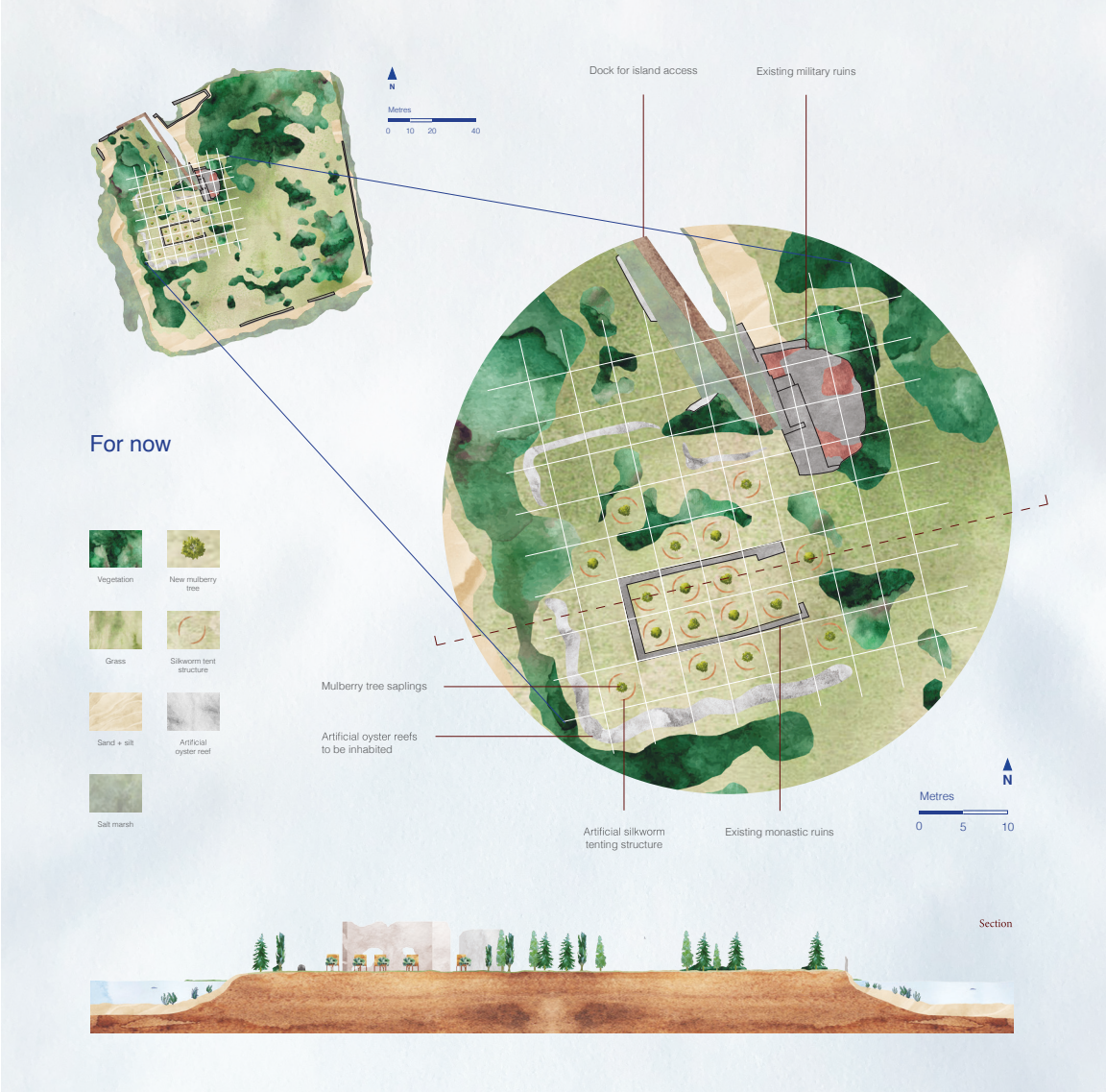
A core sample showing the past histories of San Giorgio in Alga, as well as the monastery ruins that remain on the island (data from Monaco et al. 2014, Section N-S; Poloni 2014, 48).



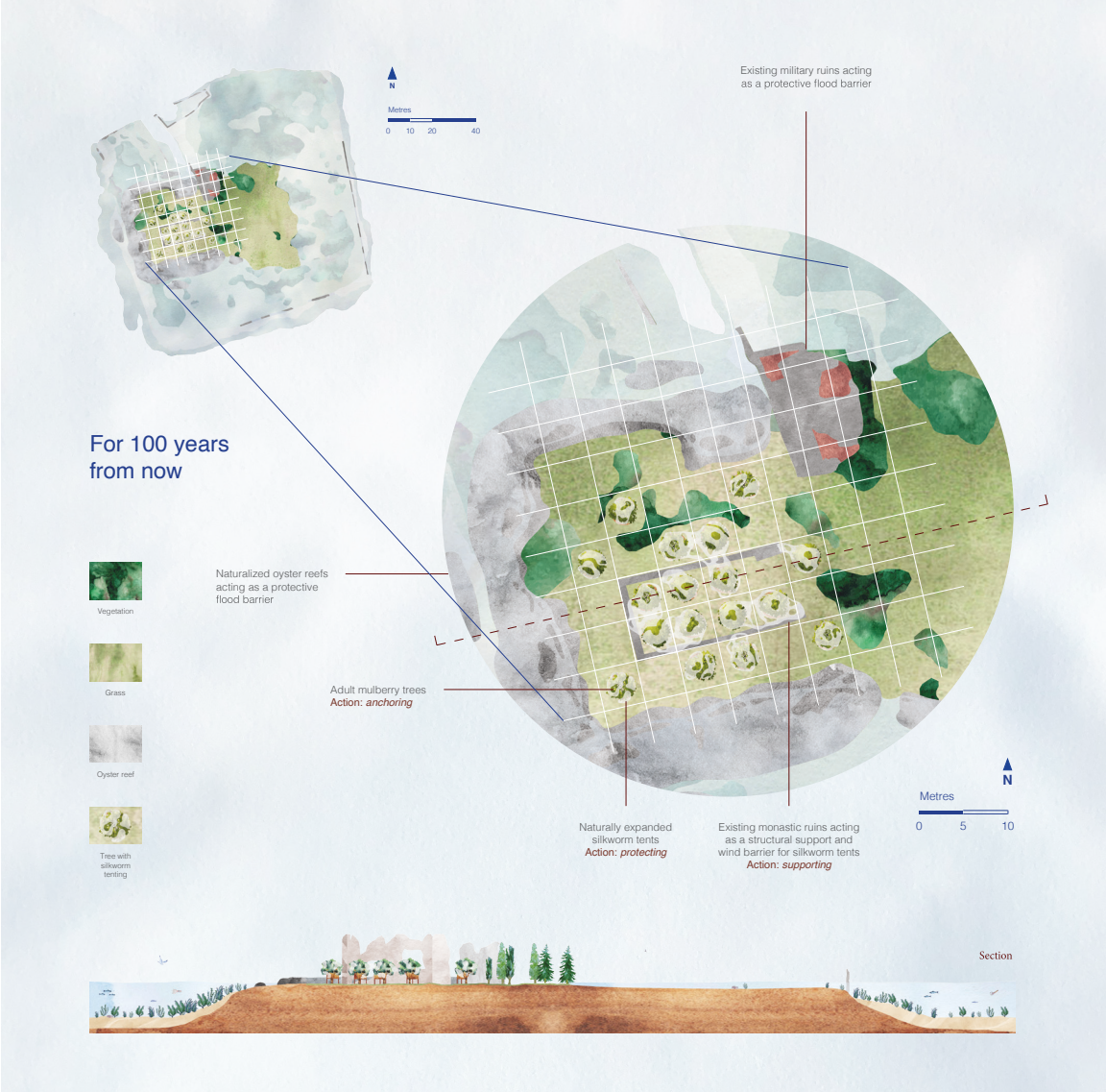
Traditional military tent structure.

developing caterpillar inside and loosening the cocoon strands (Bhalla et al. 2020, 284). This is done as if the moth were allowed to form and break free of the cocoon, it would sever the valuable silk strands. However, there are more ethical methods of silk harvesting that exist which do not involve killing the silkworm. This ethical silk production, known as “peace silk”, allows the moth to emerge from the cocoon and complete its natural life cycle, and fibres from the discarded cocoon are extracted and spun into silk fabric (Adanir et al. 2022, 7).

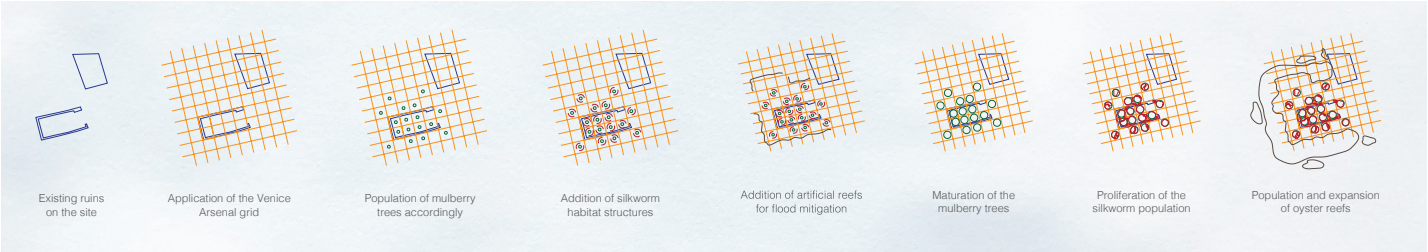
Due to this militaristic relationship, the grid of the Venice Arsenal has been applied to the existing ruins on the site to inform the design. Mulberry trees, which are the primary source of food for silkworms, take the place of water in this grid as they are the lifeblood of this design, which water is for the Arsenal. This grid is also reminiscent of the patterns of silk weaving, as shown in Chapter 4. Around these trees, “silk sheaths” are constructed. These silk sheaths, designed off of traditional sericultural models, provide small niche shelf spaces for silkworms to live and develop. These shelves contain a woven wicker interior to facilitate easy climbing for the silkworms. These shelves are connected to the mulberry trees via small bridges, thus allowing freedom of movement for the silkworms between the trees and their protective shelves. The whole sheath structure is only open on the tree-facing side, and is closed on the outside with a protective exterior timber shell, creating the sheath. As the mulberry tree sapling grows, the worms are able to further inhabit the tree, as the tree becomes part of the architecture itself. Eventually, the tree will grow beyond the sheath structure and the silkworms will be able to inhabit the tree naturally.



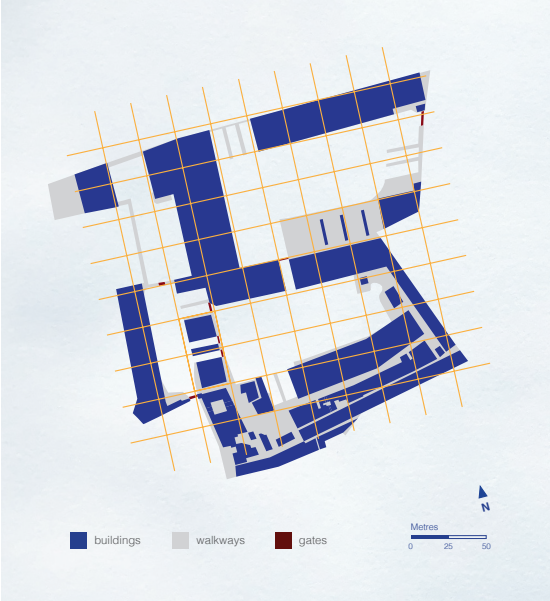
San Giorgio in Alga site plan and section - for now.



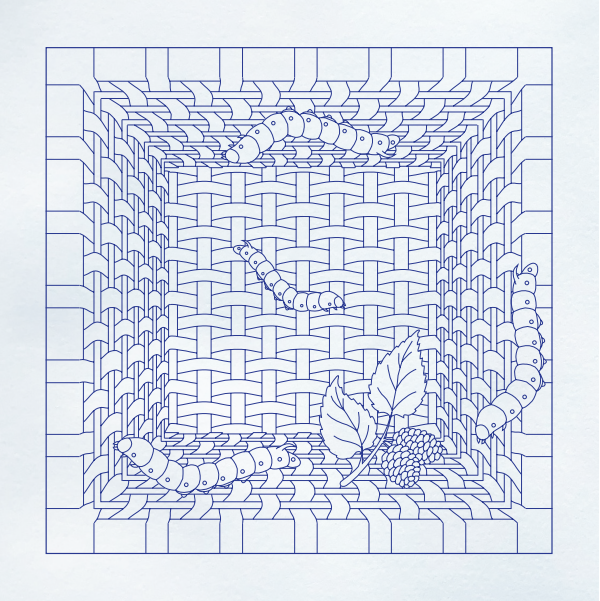
San Giorgio in Alga site plan and section - for 100 years from now.



San Giorgio in Alga parti diagrams.



Venice Arsenal plan (data from Combatti 1811-14).



Silkworm shelf wicker interior detail.

Silk sheath structure for now (left), and inhabited mulberry tree 100 years from now (right).

Plague Doctor: Healer of the sick.

This design response explores the links between protective silkworm cocoons and traditional military tent structures. These tents were constructed through the act of **anchoring** to the ground with the use of tent pegs, through the act of **supporting** with the use of a metal interior structure, and through the act of **protecting** the interior of the tent with the use of exterior fabric. This design is constructed through the act of **anchoring** to the site with the roots of the mulberry trees, through the act of **supporting** the structures with the use of existing ruins, and through the act of **protecting** silkworms with the use of the silk sheaths.

As the Era of Coins follows the Era of Salt, we see echoes of the past era within this design. The oyster tidal blooms are present as well, acting as protective barriers to prevent the design site from flooding.

San Secondo

The Era of Miasma, c. 1500

Snapshot of Venice during the Era of Miasma.

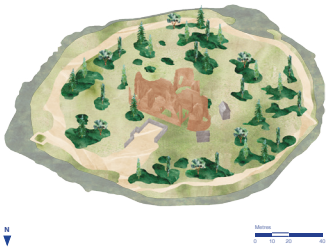
Though Venice was flourishing as a Republic and had achieved immense financial success, that wealth could not protect them from the waves of sickness that ravaged Europe during this time. The bubonic plague, known then as the “Black Death”, struck Europe in the mid 14th century, bringing Venice’s economy to a grinding halt (Ferraro 2012, 27). Venice’s position as a massive seaport made it particularly vulnerable to the plague, and across Europe the Black Death killed an estimated 60% of its population, approximately 100 – 200 million people (Mussap 2019, 672).

The bubonic plague was transmitted via the bite of an infected flea, and approximately 80% of those with the illness who went untreated died within 2 – 7 days of infection

Map of the Venetian Lagoon during the Era of Miasma, showing land formations, quarantine islands, settlements, and trade routes (data from Ferraro 2012; “Satellite of the Lazaretti” n.d.).

(Mussap 2019, 672). The medieval plague doctor has become a famous figure today, identified by their long black cloak, beaked mask, hat, gloves, and goggles, concealing the entirety of their human appearance. Though this figure appeared fearsome, the plague doctors were putting themselves at great personal risk treating the infected, and many of them later died as a result (Mussap 2019, 673). The miasma theory of infection that was widely believed at the time stated that disease was transmitted through inhaling decomposing organic matter (Mussap 2019, 673). Therefore, the long beaked nose of the plague doctor mask was stuffed with a special combination of aromatic herbs to prevent the miasma fumes from infecting the doctors (Mussap 2019, 673).

In an attempt to minimize the impacts of plague on its local population, Venice instituted one of the first ever quarantine policies in 1408, requiring incoming cargoes, sailors, and infected residents to isolate for 40 days on Lazaretto Vecchio, a remote island of the lagoon (Mussap 2019, 673). Subsequent quarantine stations were later developed, known as Lazarets (Mussap 2019, 673). The Venetian *quarantia*, meaning “forty” gives us the word “quarantine” today (Mussap 2019, 673). Prior to the plagues, Venice had grown wealthy from the Crusades, textile manufacturing, and agricultural production, in addition to providing financial mercantile services such as banking, insurance, exchanges, and accounting, making it one of the richest cities in Europe (Ferraro 2012, 19). The glassmaking industry was relegated to Murano and other industries such as the manufacture of dyes, metal, soap, tiles, salt, and brick were transferred off of the main island due to fear of fires (Ferraro 2012, 20). Timber continued to be imported from the mainland to



Axonometric view of existing structures on the island of San Secondo.

Trellis wall design.

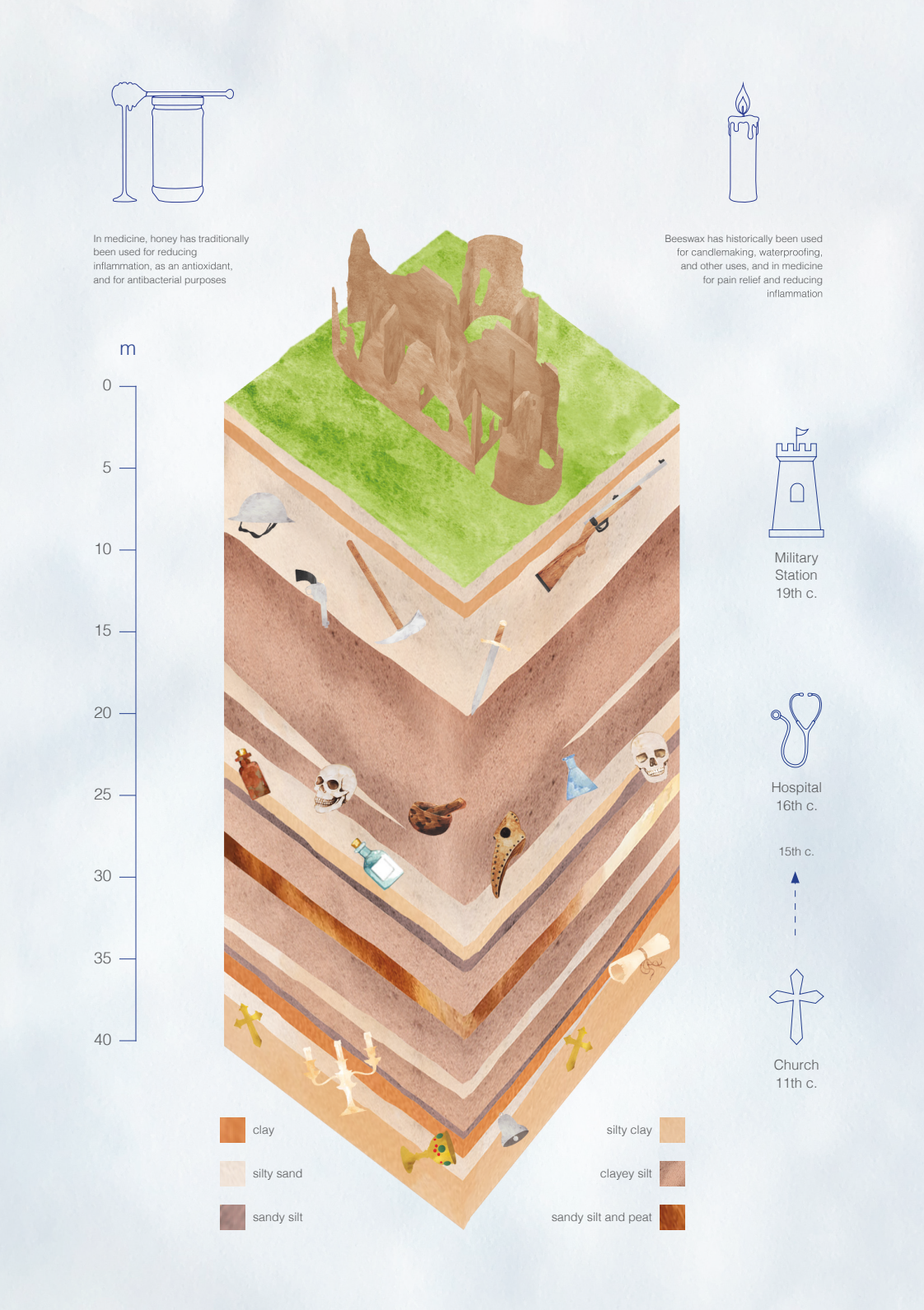
construct churches, and due to increased immigration and building trade, the districts of Giudecca Nova, Cannaregio, and Santa Croce were created (Ferraro 2012, 27). Though the plague temporarily stopped and slowed these industries, they were quick to resume after the plague had passed.

During this time of sickness, the health of the lagoon and canals were neglected, with residents dumping waste, spoiled meat, cloth dyes, and other pollutants into the canals (Ferraro 2012, 28). It became difficult to access clean drinking water, and the fresh and salt water needed for sanitation was scarce. To protect their water supply from pollution, ordinances were issued that prohibited dumping in canals, and some canals had to be dredged to remove the stagnant, fetid water that had accumulated (Ferraro 2012, 28).

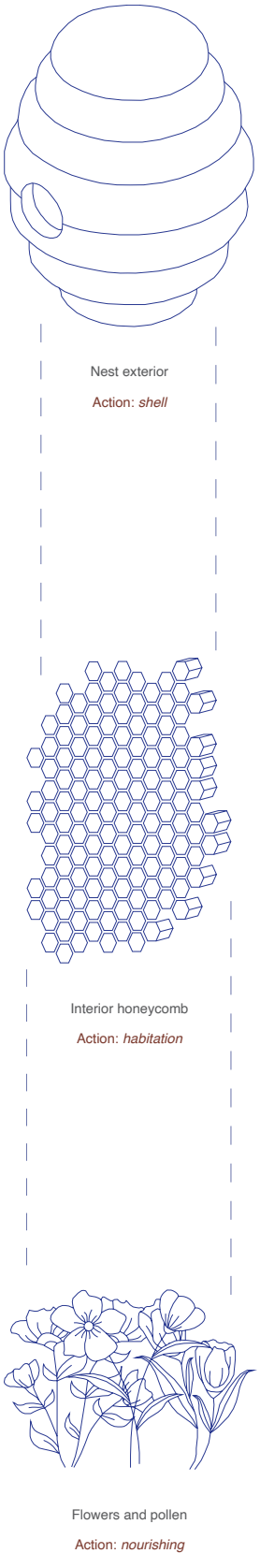
Subsequent waves of plague hit Venice between 1456 – 1528, and large plague epidemics between 1575 – 1630 decimated Venice's population, killing 25 – 30% of its population each time (Ferraro 2012, 145). These epidemics were often joined by outbreaks of typhus, then called the "spotted sickness", and French and Spanish armies in the Adriatic often brought syphilis to Venice (Ferraro 2012, 154). Despite these illnesses and setbacks, the Venetian Republic continued to survive and dominate the Adriatic for centuries, until it was finally conquered by Napoleon's army in 1797 (Ferraro 2012, 202).

Suspended Labyrinth

The Era of Miasma will manifest on the island of San Secondo. This island was used for religious purposes from the 11th – 15th c., as a hospital in the 16th c., and as a military station in the 19th c. (Poloni 2014, 45). San



A core sample showing the past histories of San Secondo, as well as the hospital ruins that remain on the island (data from Monaco et al. 2014, Section N-S; Poloni 2014, 45).



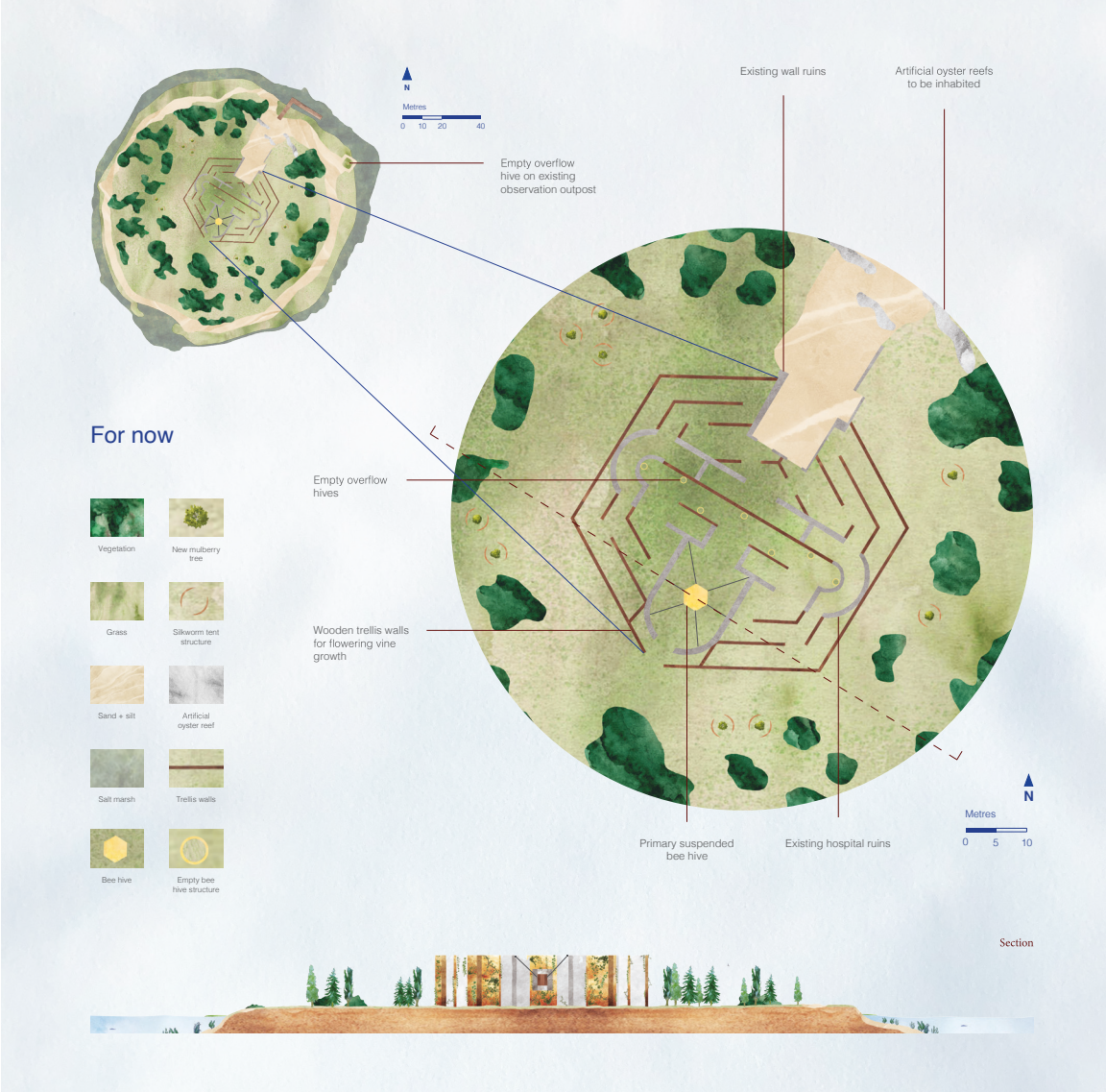
Beehive exterior structure.

Secondo has been designated as a “hospital” island type, and is linked to the Era of Miasma due to its history as a quarantine overflow island and its existing hospital ruins.

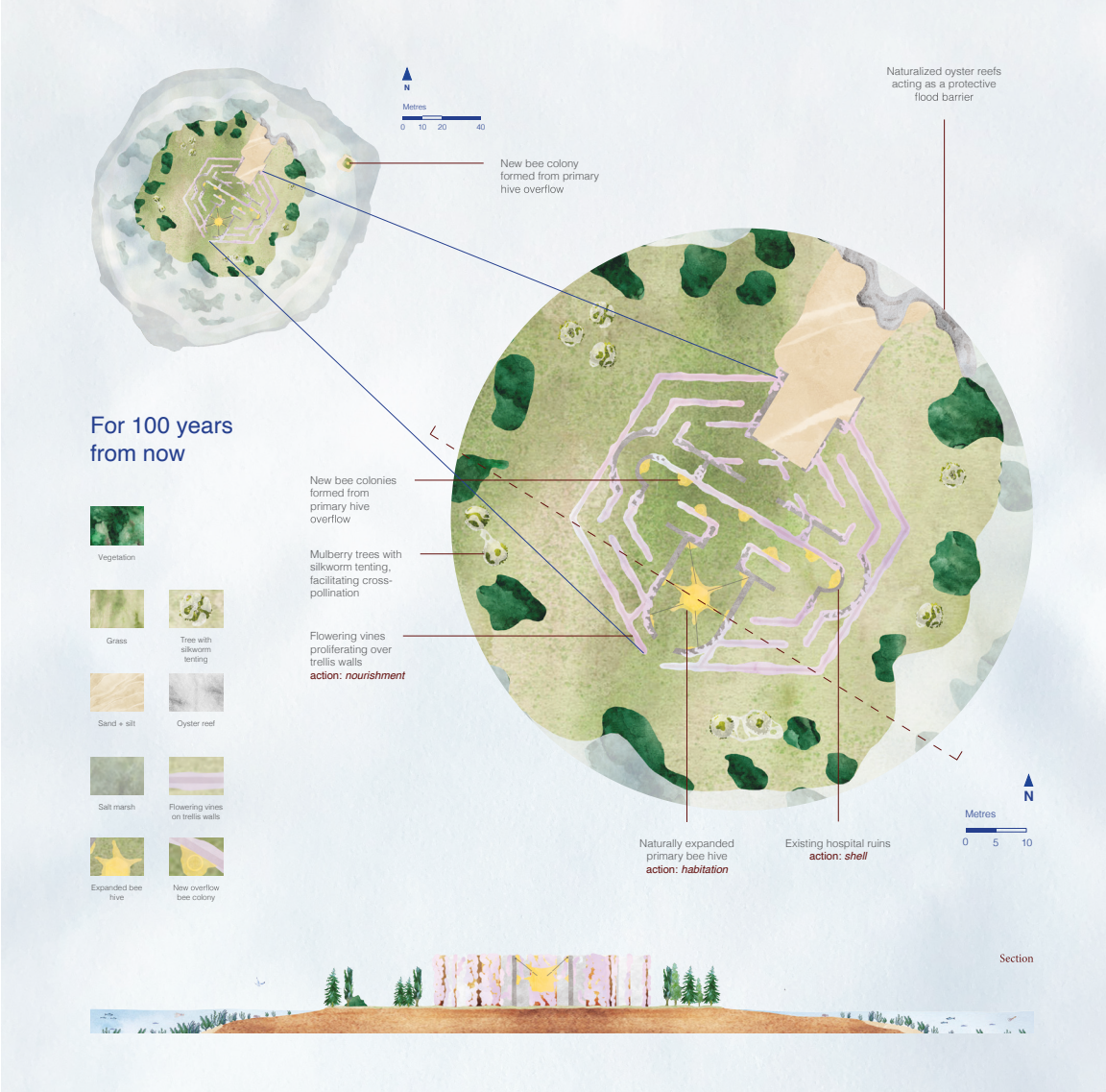
The design response for San Secondo involves honey and honeybees. In medicine, honey has traditionally been used for reducing inflammation, as an antioxidant, and for antibacterial purposes (Saranraj 2016, 271). Beeswax has also historically been used in medicine for pain relief and reducing inflammation. Beekeeping has been used in tandem with agricultural practices in Italy for centuries, which still occurs today on the island of Sant’Erasmo (Hughes 2020).

Beehives are made up of many small hexagonal cells, made of beeswax, which can then be filled as needed with honey, pollen, or bee larvae at various stages of development (Honey Bee Research Centre n.d.). To mimic this hexagonal form and use of small compartments, a maze has been integrated to the existing hospital ruins on the island, the decaying walls of which have been removed. The walls of the maze are constructed from timber trellises for the growth of flowering vines such as wisteria and bougainvillea, which will fill in the gaps as they grow. The prize of the maze is a large, suspended beehive, placed within a protective aluminum shell, where the bees can come and go to pollinate and collect nectar from the surrounding flowering vines. Central compartments of the hive can slide in and out to allow for the collection of honey. The hive is suspended to allow for the natural swinging movement and airflow that bee nests have in the wild.

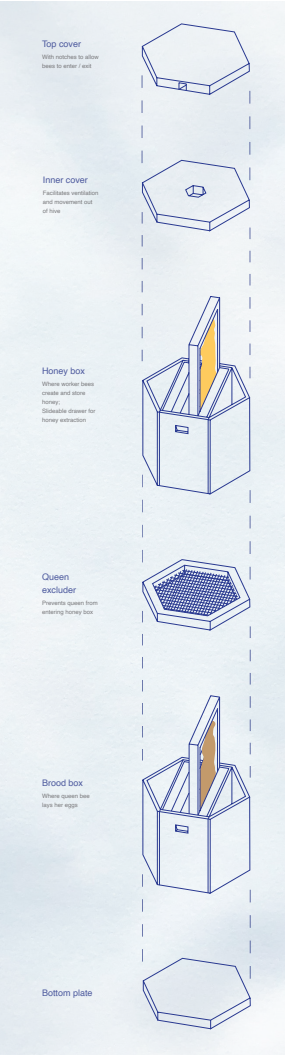
This design of the maze also relates back to the plan of a traditional Venetian hospital, such as that of the Incurabili



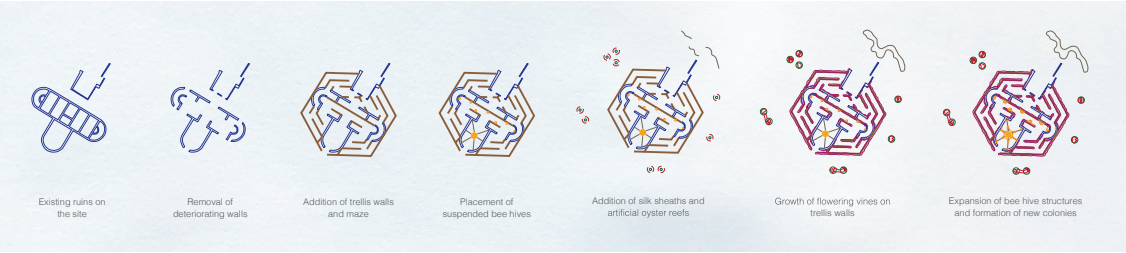
San Secondo site plan and section - for now.



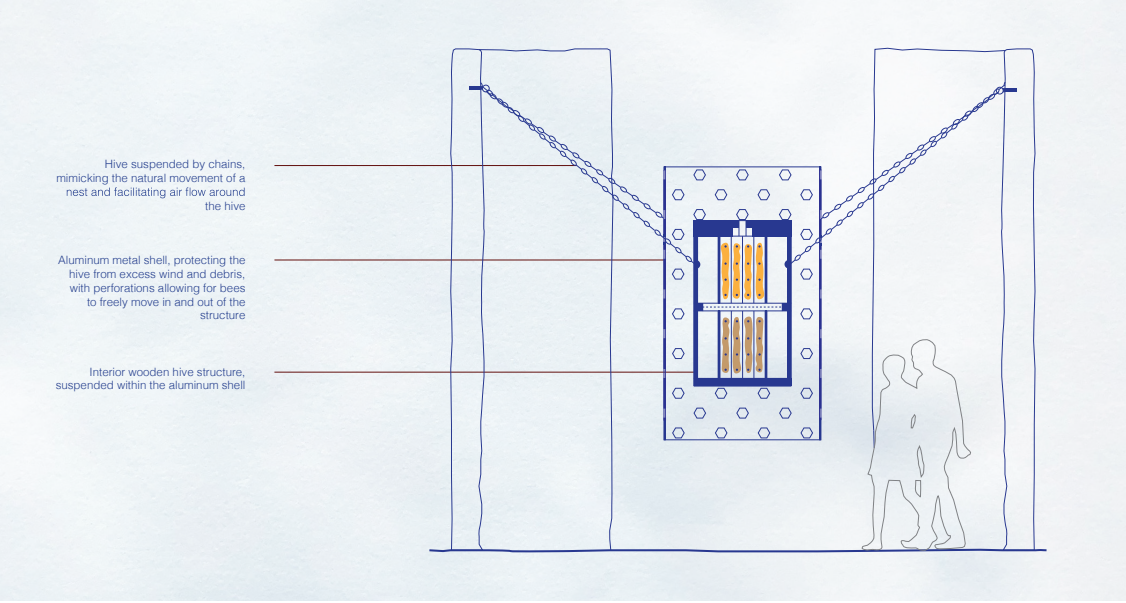
San Secondo site plan and section - for 100 years from now.



Suspended hive interior layout.

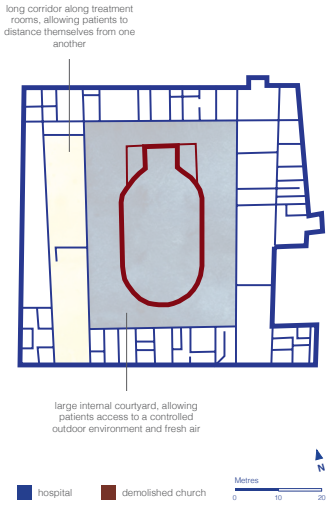


San Secondo parti diagrams.



Suspended beehive section.

Vision of the maze through the compound eyes of a bee.



Incurabili Hospital plan, Venice (data from Foscari 2014, 270).

Hospital. This traditional hospital plan contains a large internal courtyard, allowing patients access to a controlled outdoor environment and fresh air. The individual hospital rooms are connected by a long, wide corridor, allowing patients to distance themselves from one another. In the maze design, the courtyard houses the suspended hive, the compartments of the maze represent the small individual patient rooms, and they are connected via a wide-open corridor at the centre of the maze. Within this corridor, and on an existing observation outpost at the northeast corner of the island are overflow hives, within which the bees can form new colonies once their population has become too large for their suspended hive. This is a similar pattern to the establishment of plague overflow islands for when the designated quarantine islands within the lagoon exceeded their patient limits.

This design response explores the links between the form of the maze and suspended hive and natural beehive structures. Natural hives are constructed through the act of **nourishing** the bees within due to proximity to flowers for pollen and nectar collection, through the act of **habitation** by many different types of bees with different roles within the hive, and through the formation of a **shell** to protect the interior honeycomb from external elements. This design is constructed through the act of **nourishing** the bees in the hive through the presence of many flowering vines, through the act of **habitation** of the suspended hive by a local bee colony, and through the formation of a **shell** with the integration of the existing hospital ruins into the maze design.

As the Era of Miasma follows the Era of Coins, we see echoes of the past two eras within this design. The oyster

Masqueraders: Facade masking a dead city.

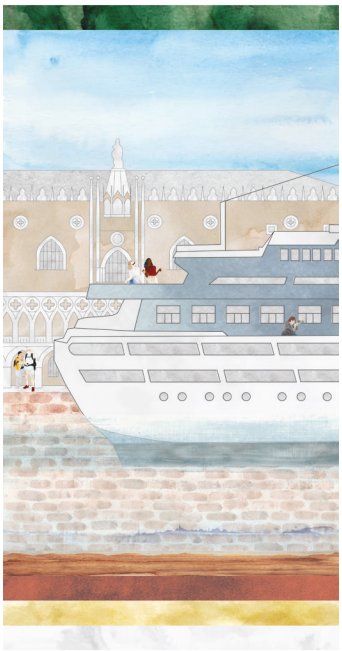
tidal blooms are present, acting as protective barriers to prevent the design site from flooding, as are the silk sheaths and mulberry trees, facilitating cross-pollination.

Santo Spirito

The Era of Decay, c. 2000

With the sweeping historical changes and eras that Venice has transitioned through in the past, one may be surprised by how little the architecture has changed in Venice's modern era today. While much of the historic architecture has been preserved, the way that the canals and lagoon are viewed and the admiration for its unique ecosystems have been lost.

In the previous three eras, the Venetians maintained a respect for their littoral environment, with the acknowledgement that they needed to care for it in order to maintain a healthy, productive city for them and to continue to benefit from the lagoon's ecosystem services. Today, the lagoon environment has been degraded to the point that its ecosystems are no longer able to properly function, and the inhabitants of Venice are experiencing the consequences. The global effects of climate change are causing sea levels to rise, and Venice is experiencing unprecedented flooding events (Lionello et al. 2021). On a local scale, increased tourism in the city and excess boat traffic in the lagoon, particularly the use of cruise ships, and subsequent canal dredging has resulted in the edges of the islands eroding, and increased pollution in the air and water (Horvath 2018, 17).



Snapshot of Venice during the Era of Decay.

Venice's economy has become dominated by tourism, resulting in it becoming homogenized, thus alienating local craftworkers, artisans, and other businesses, and flattening

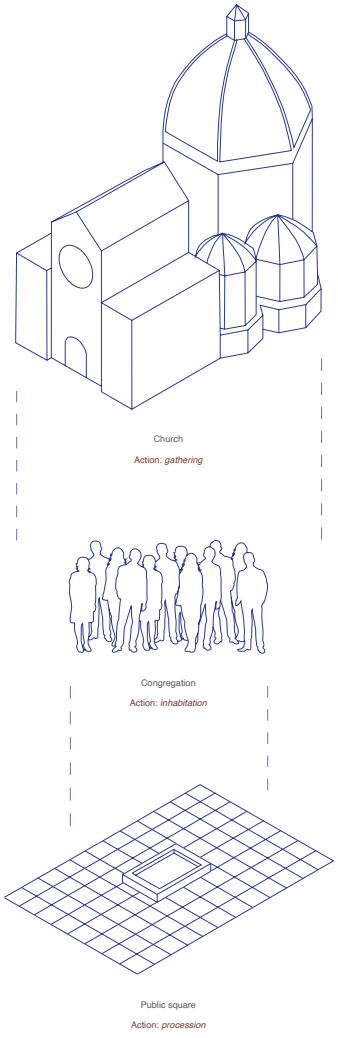
Map of the Venetian Lagoon during the Era of Decay, showing land formations, key islands, and how tourism has taken over as the main industry.

Axonometric view of existing structures on the island of Santo Spirito.

the rich lagoon network that Venice cultivated for centuries (Horvath 2018, 20). The first goal of this thesis is to design sites that reignite Venice's history of craft and trade, based on the involvement of local Venetians that have otherwise been excluded from their economy, resulting in the revival of this important network.

Aromatic Procession

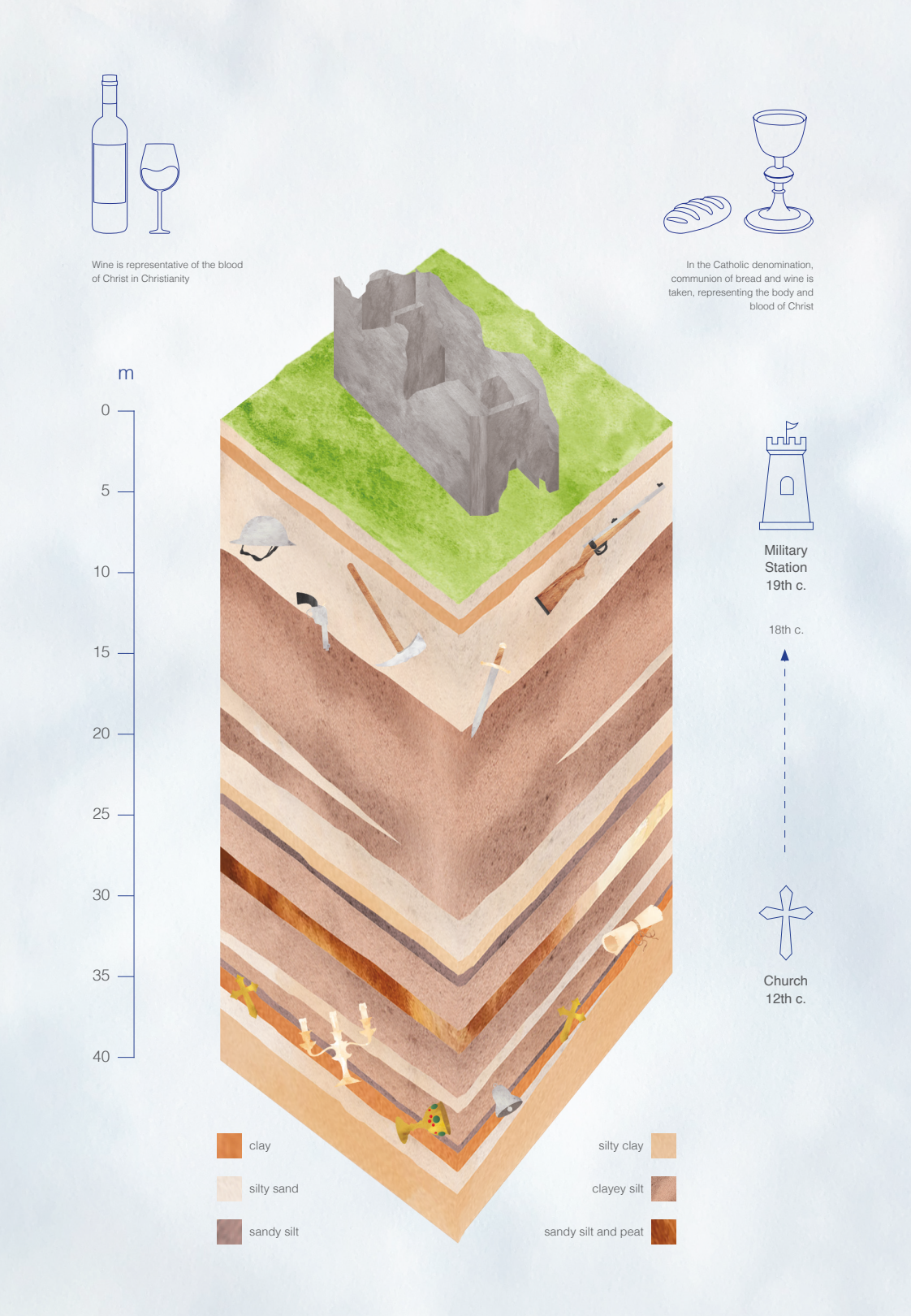
The Era of Decay will manifest on the island of Santo Spirito. This island was used for religious purposes from the 12th – 18th c., and as a military station in the 19th c. (Poloni 2014, 56). Santo Spirito has been designated as a "church" island type, due to its long history of religious and monastic use. The Era of Decay fits into the "church" type as the vast majority of the small islands within the lagoon began as church islands, and slowly lost that purpose as they were taken over and transitioned into something else, with those decaying ruins being reincorporated into the new use (Poloni 2014).



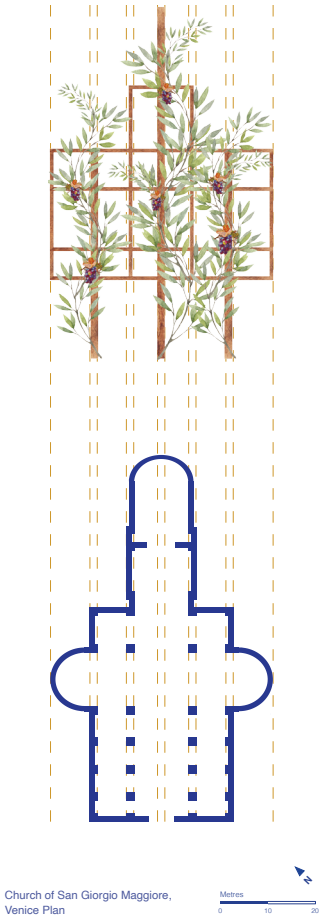
Components of the Venetian church.

The design response for Santo Spirito involves grapevines and wine. In Christianity, wine is representative of the blood of Christ. In the Catholic denomination, communion of bread and wine is taken during mass, representing the body and blood of Christ. The growth of rare Dorona grapes is unique to the islands of Venice, as they thrive in the high salt content of the Venetian soil and the humid lagoon environment, which is atypical for other grape species (Hughes 2020).

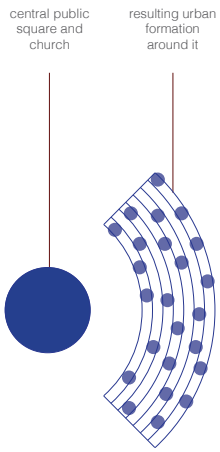
Grapevines are trained by structured trellises to grow in certain patterns for ease of harvest and growth optimization. The design response for Santo Spirito involves training the vines on a trellis modelled off of the plan of a traditional



A core sample showing the past histories of Santo Spirito, as well as the church ruins that remain on the island (data from Monaco et al. 2014, Section N-S; Poloni 2014, 56).



Vine training pattern based on traditional Venetian church plan (data from Palladio 1565).

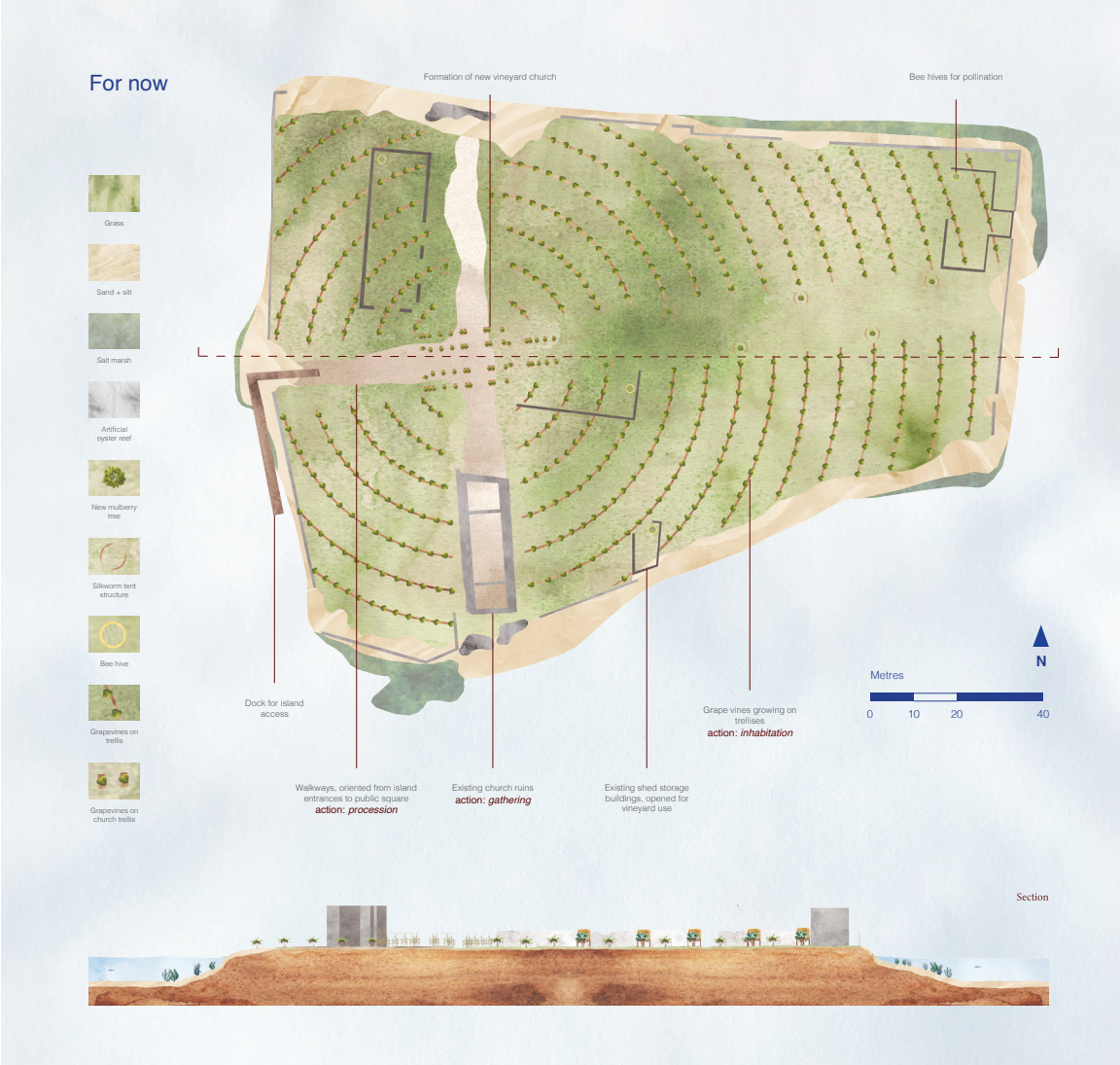


Venetian neighbourhood formation.

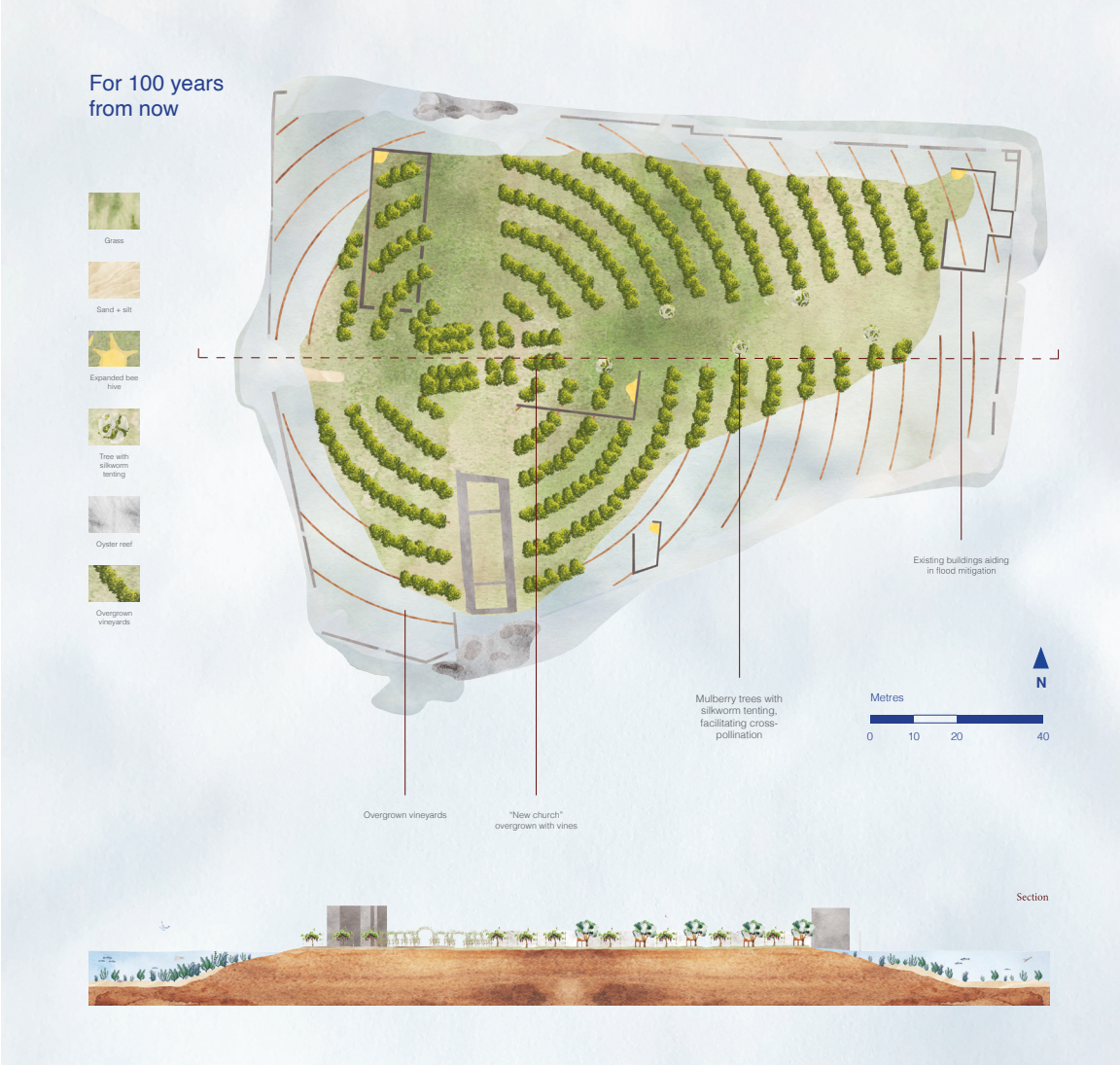
Venetian church, with that of San Giorgio Maggiore used in this design. The trellis takes on the grid organization of the church plan, with the vines inhabiting the spaces within, as a church congregation would.

In the traditional Venetian urban organization, neighbourhoods were formed with the construction of a church and an adjacent public square, and the rest of the buildings were organized around it, as seen in spaces such as St. Mark's Square with the neighbouring St. Mark's Basilica. For this island a similar approach is taken by creating a central square in front of the ruins of the church, at the crossroads of three of the island's entrance points. Vineyards are then planted stemming outwards from this area, echoing the traditional urban formation and that of a church congregation. The footprint of a new church will be formed in this square, using the organization of the Church of San Giorgio Maggiore informing the placement of a trellis system. As time goes on, the vines will take over the trellis structures, forming an open outdoor church structure with vines overhead, creating walls.

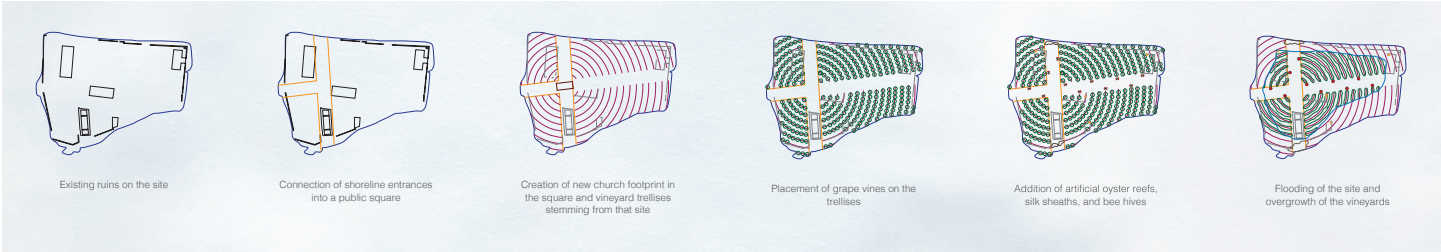
This design response explores the links between the form of the church and public square and the formation of this new vineyard church. The courtyard is constructed in conjunction with the church for the purpose of **procession** to this holy space from the secular city, through the act of **inhabitation** by the congregation of the church attending a service, and for the purpose of **gathering** as a community under one roof. This design is constructed through the act of **procession** from the various island entrance points to the central space, through the act of **inhabitation** by the vineyards stemming outwards from the central space of the island, and for the purpose of **gathering** visitors to the



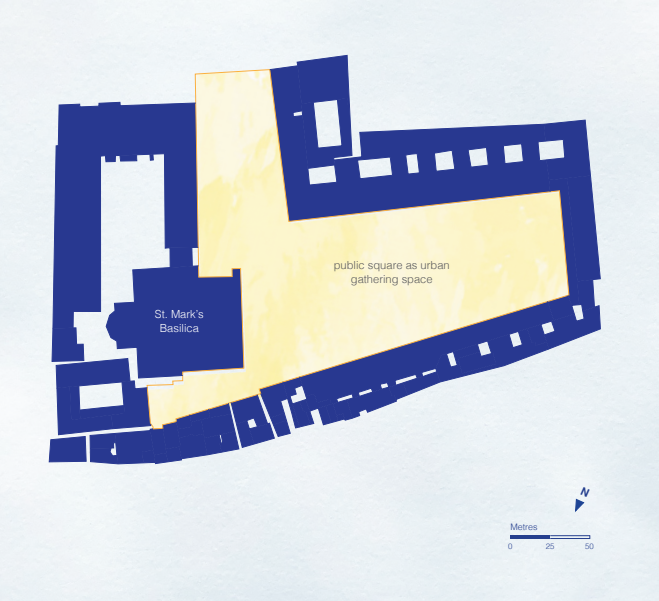
Santo Spirito site plan and section - for now.



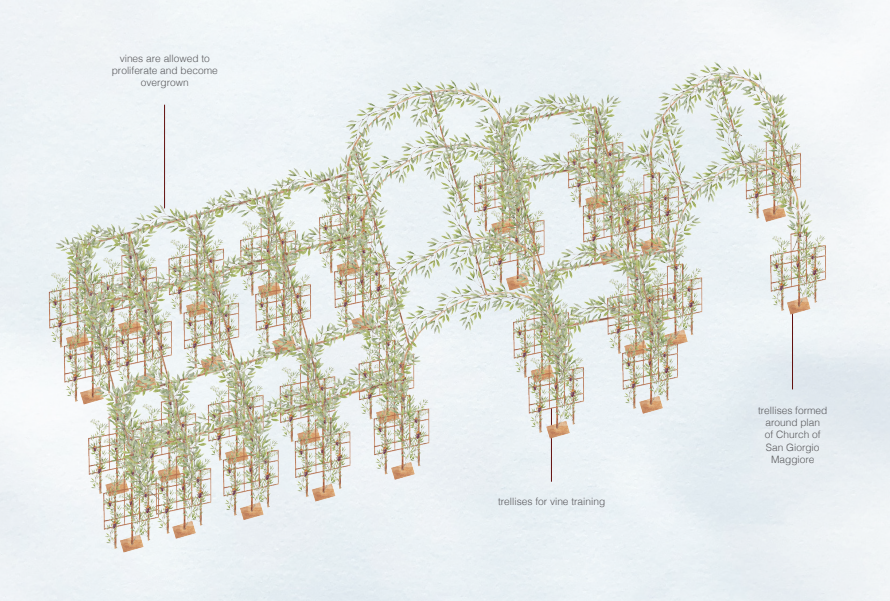
Santo Spirito site plan and section - for 100 years from now.



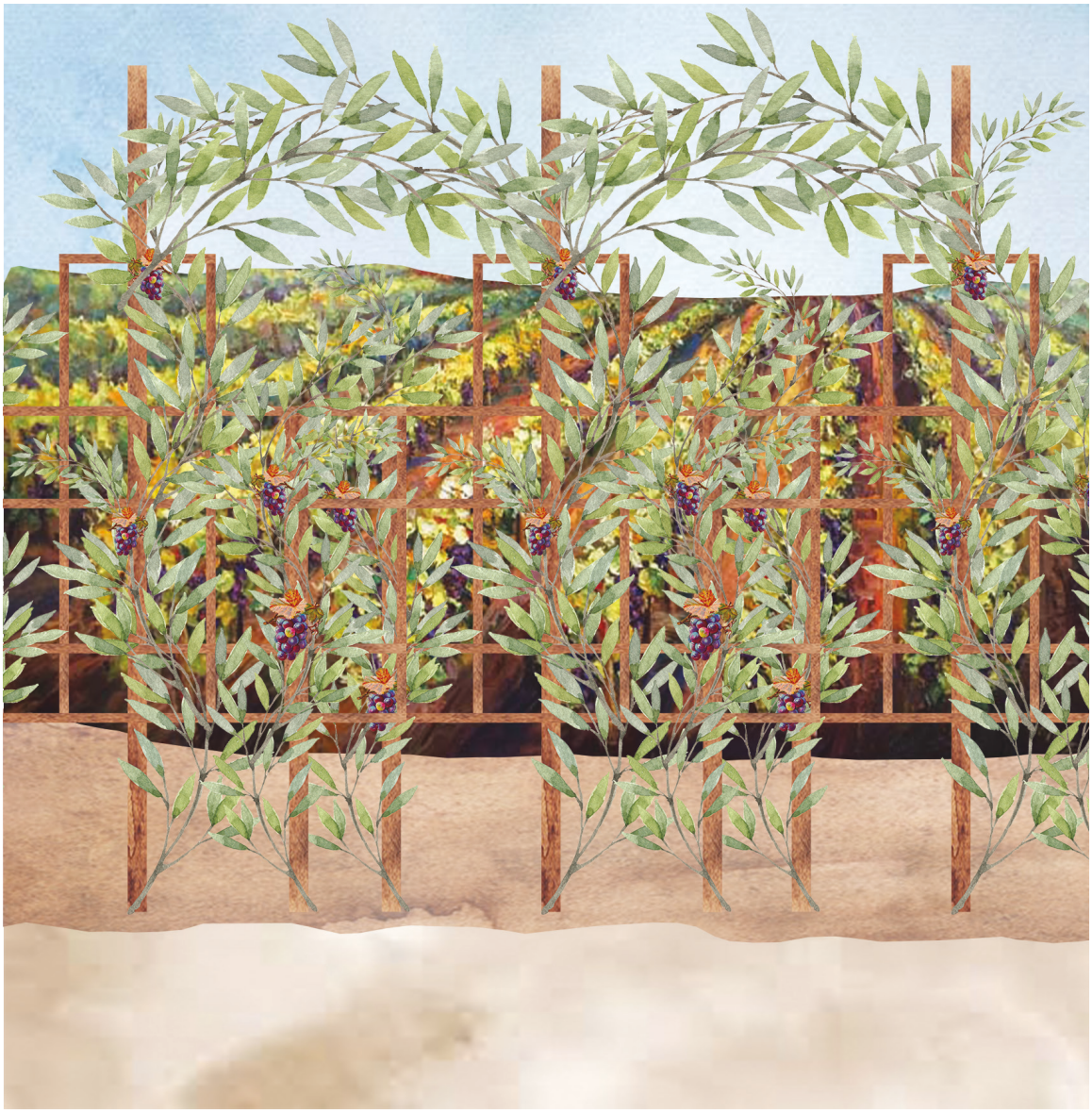
Santo Spirito parti diagrams.



St. Mark's Square plan (data from Google Maps n.d.).



New vineyard church formation.



Inside the vineyard church.

island within this new vineyard church that has been formed by the island processes themselves.

As the Era of Decay follows the Era of Miasma, we see echoes of the past three eras within this design. The oyster tidal blooms are acting as protective barriers to prevent the design site from flooding, the silk sheaths and mulberry trees are facilitating cross-pollination, and the beehives are providing the vineyards with pollinators for growth.

A Renewed Network

With these design responses, this thesis seeks to reinvigorate the Venetian inter-island network to resemble the one it once had, with these abandoned islands reincorporated and allowed to come alive once again. Things are brought to these islands where they are reinterpreted and reformed by the landscape and ecologies, thus renewing the network and communities that operate within and around the lagoon.

On Campalto, this process could involve concrete from the mainland and uncovered plastic from Campalto being brought to the industrial hub of Giudecca. On Giudecca, artificial oyster reefs are constructed and are then brought to Campalto. Disused oyster shells are collected from restaurants from the main island of Venice and are brought to Campalto to fill the artificial reefs. Uncovered glass from Campalto could then be brought to Murano for it to be repurposed for blown glass creations. This glass artwork could then be exported to the mainland.

On San Giorgio in Alga, this process could involve timber from the mainland being brought to the western port of Venice, known for its history of timber processing and shipbuilding. It is here that the silk sheaths could be

assembled. Silkworms and mulberry tree saplings could then be brought from the mainland to San Giorgio in Alga, as well as the silk sheaths, where they can be set up. Upon development of the silkworm population, discarded cocoons can be collected and brought to Burano for processing into silk fabric and lace. These textiles could then be exported to the mainland.

On San Secondo, this process could involve timber from the mainland being brought to the western port of Venice for assembly into trellis walls, which could then be brought to San Secondo and set up. Flowering vines and bees could then be brought from the mainland to San Secondo to inhabit the maze system. Upon development of the honeybee population, honey could be collected from the hive and brought to Sant'Erasmo for processing. This honey could then be exported to the mainland and to the markets of Venice.

On Santo Spirito, this process could involve timber from the mainland being brought to the western port of Venice for assembly into vine training trellises, which could then be brought to Santo Spirito and set up. Grapevines could then be brought from the mainland to Santo Spirito to begin to grow in the vineyards. Upon development of the vines, grapes could then be harvested and brought to the main island of Venice for processing into wine. This wine could then be sold to restaurants on Venice and on the resort islands of Lido and Pellestrina, and exported to the mainland.

All of these processes would serve as opportunities for local Venetians to be able to engage with their networks once more, through the resurgence of these lost crafts and industries, helping to reform this inter-lagoon network.

New island network formed for now within the Venetian Lagoon.

Cessation of network activity altogether within the Venetian Lagoon 100 years from now, allowing natural processes to take over once more.

Coexistence: Reclamation of human elements by the lagoon.

The Era of Coral, c. 2100

Current projections of future flooding and sea level rise show that globally, the sea level is expected to rise approximately two metres by 2100 (Mulhern 2020). On a local scale, due to Venice's highly exposed maritime environment, this will result in much of the city and its many islands being flooded (Mulhern 2020). The second goal of this thesis is to design with this eventuality in mind, and acknowledge that Venice's lagoon ecosystem will eventually reclaim its islands, and to have designs that can transition to aid in this renaturalization process to the benefit of Venice's non-human inhabitants. This era has been designated the Era of Coral because coral is an ecosystem builder, which provides many different habitats and niches for a variety of inhabitants, which is a quality that inspired this thesis.

Snapshot of Venice during the Era of Coral.

Map of the Venetian Lagoon during the Era of Coral, showing predicted flood patterns (data from Mulhern 2020).

Chapter 6: Conclusion

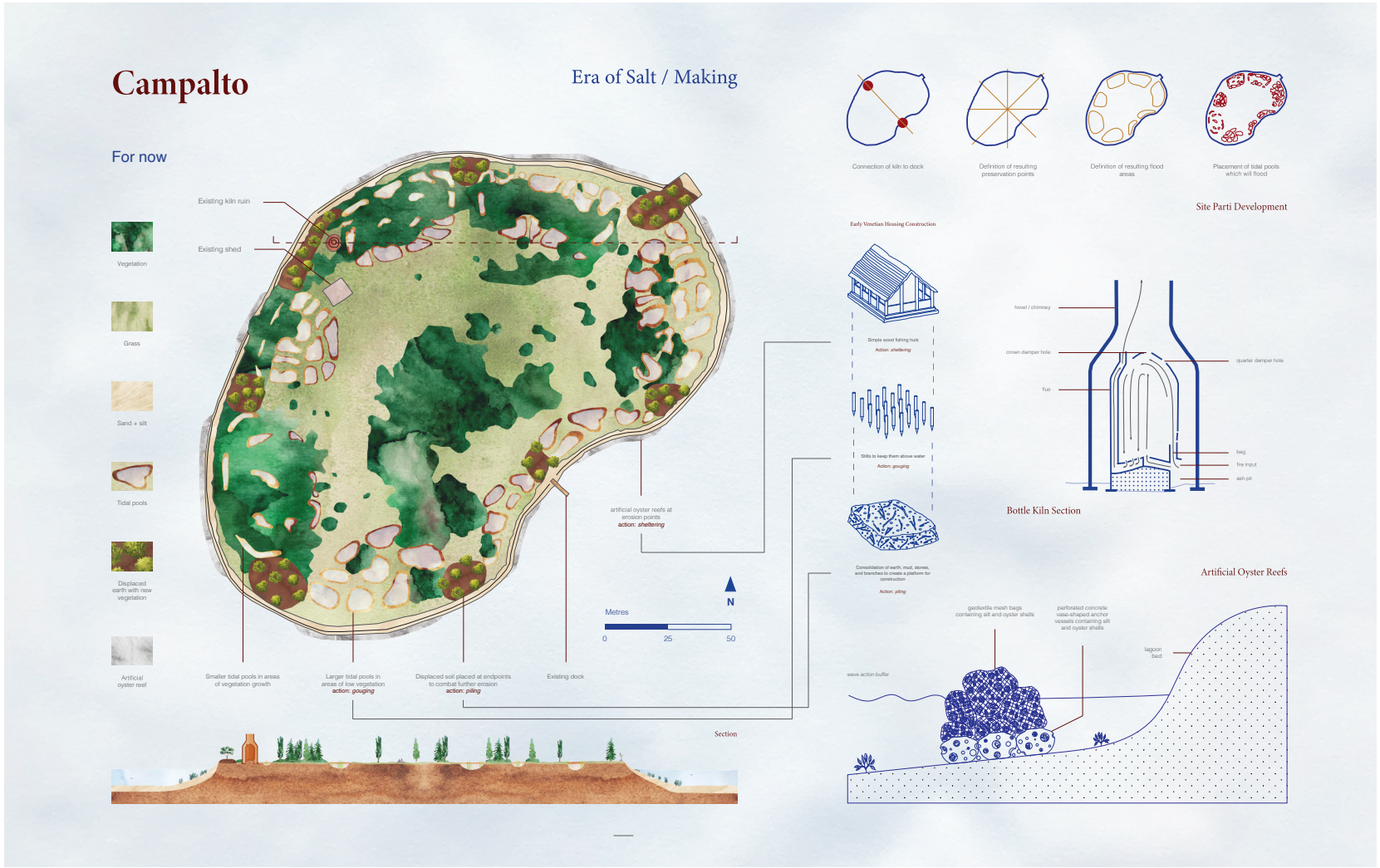
Upon reflection, it is unlikely that these design responses will be taken by the Venetian government and put into action on these abandoned islands. It may be the case that these islands, too, will be auctioned and sold to luxury hotel developers, or will remain as ruins. This thesis, though based on reality, asks if we can look beyond that to solutions that may be based in part in imagination or fictions. It is clear that the ideas expressed by the local people of Venice, by historians, and by environmental advocates seeking to adapt and innovate within Venice are deeply important to the future of the lagoon. Venetians have already shown that they are determined to take back public space and housing within the lagoon, valuing it above what it means for tourists.

If the history of Venice as summarized in this thesis reveals anything, it is that this complex, interconnected lagoon network will not operate effectively under conditions of duress, especially to the degree of abandonment it is currently faced with. In order to maintain use of the city and to continue receiving the economic benefits that come with it, the lagoon must be given equal value to the economies of Venice, with its delicate ecologies considered and maintained to the absolute best of our abilities.

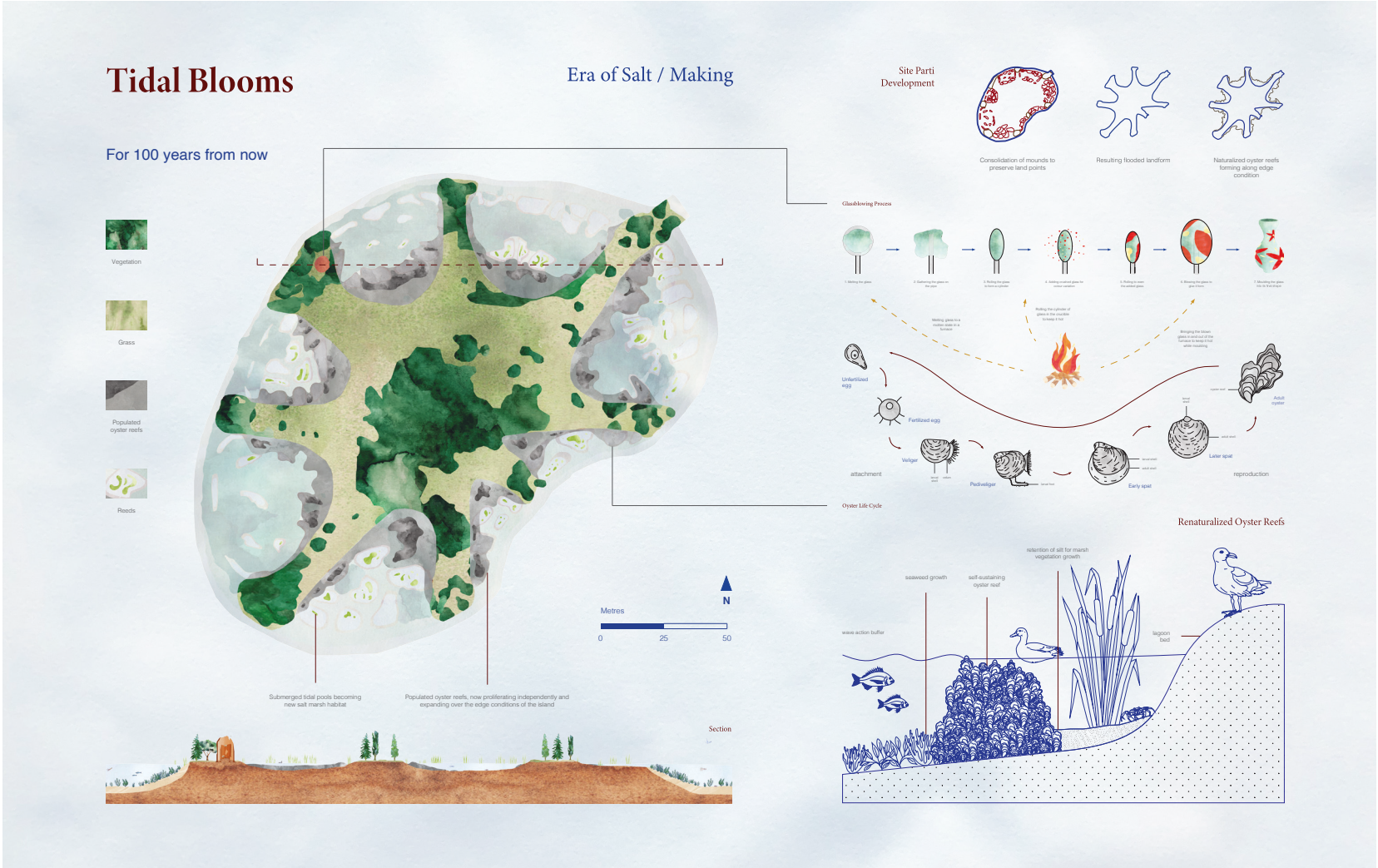
The story of Venice begins and ends with her lagoon. It is almost certain that flooding levels will render much of Venice uninhabitable by the year 2100. That is, if the urban formation and attitudes around the museum city of Venice remain on their current trajectory. Another option to consider, and the one that this thesis proposes, is to design with this in mind and welcome this challenge, allowing architecture to transform with the landscape as it floods. It is inevitable

that Venice will be returned to her lagoon. Whether we allow what Venice represents to all of her inhabitants to sink with it is our choice to make.

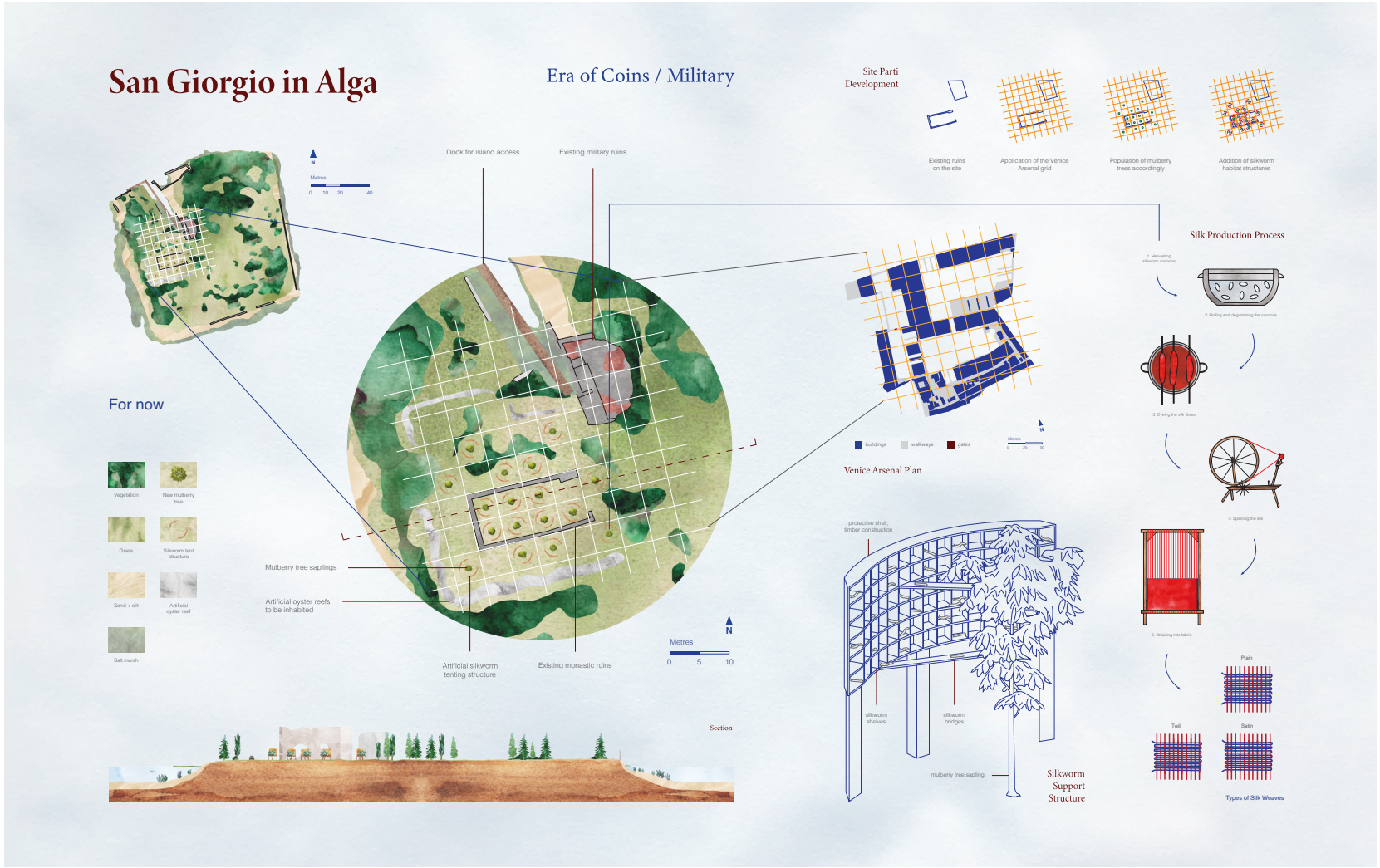
Appendix 1: Campalto - For Now



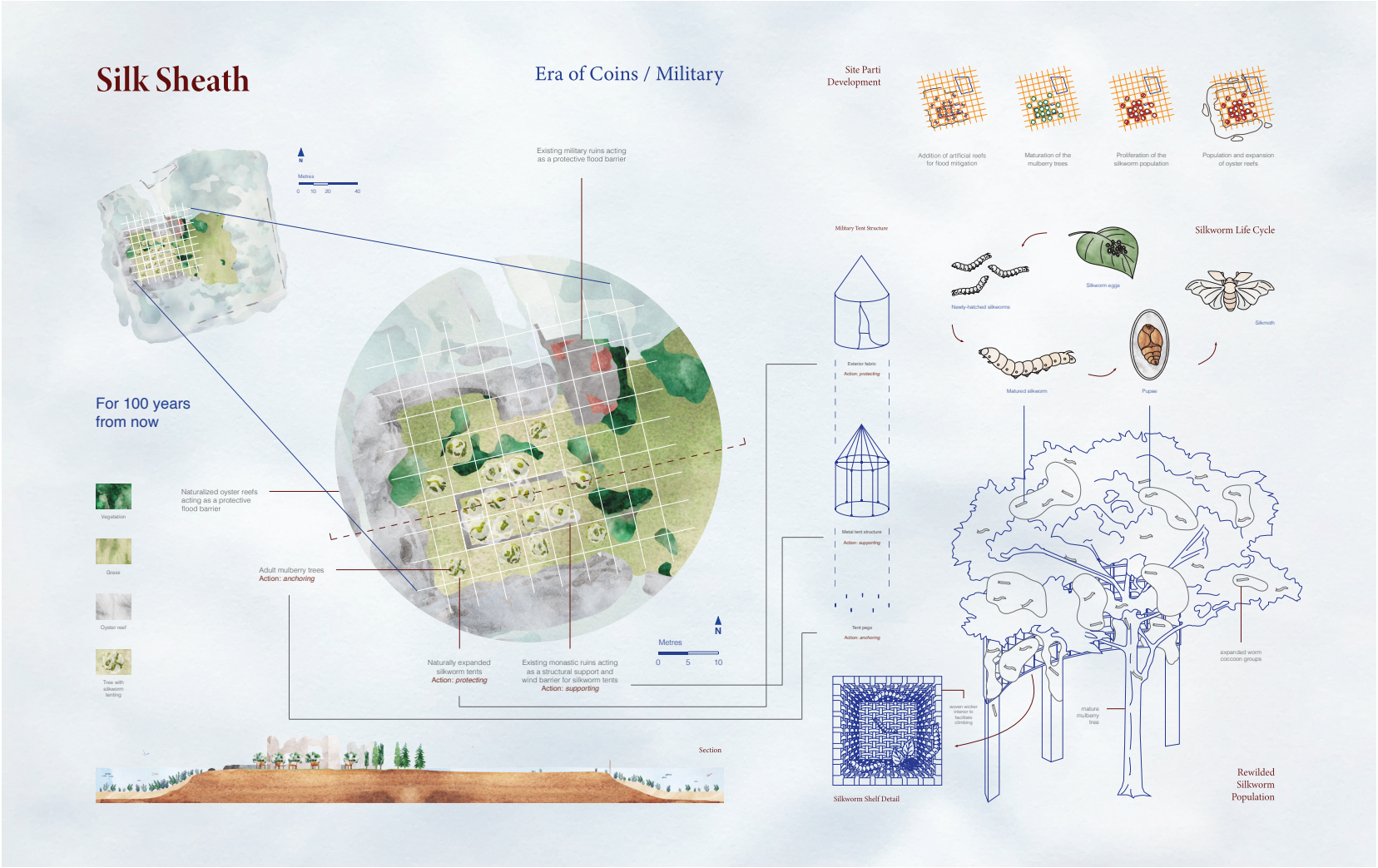
Appendix 2: Campalto - For 100 Years From Now



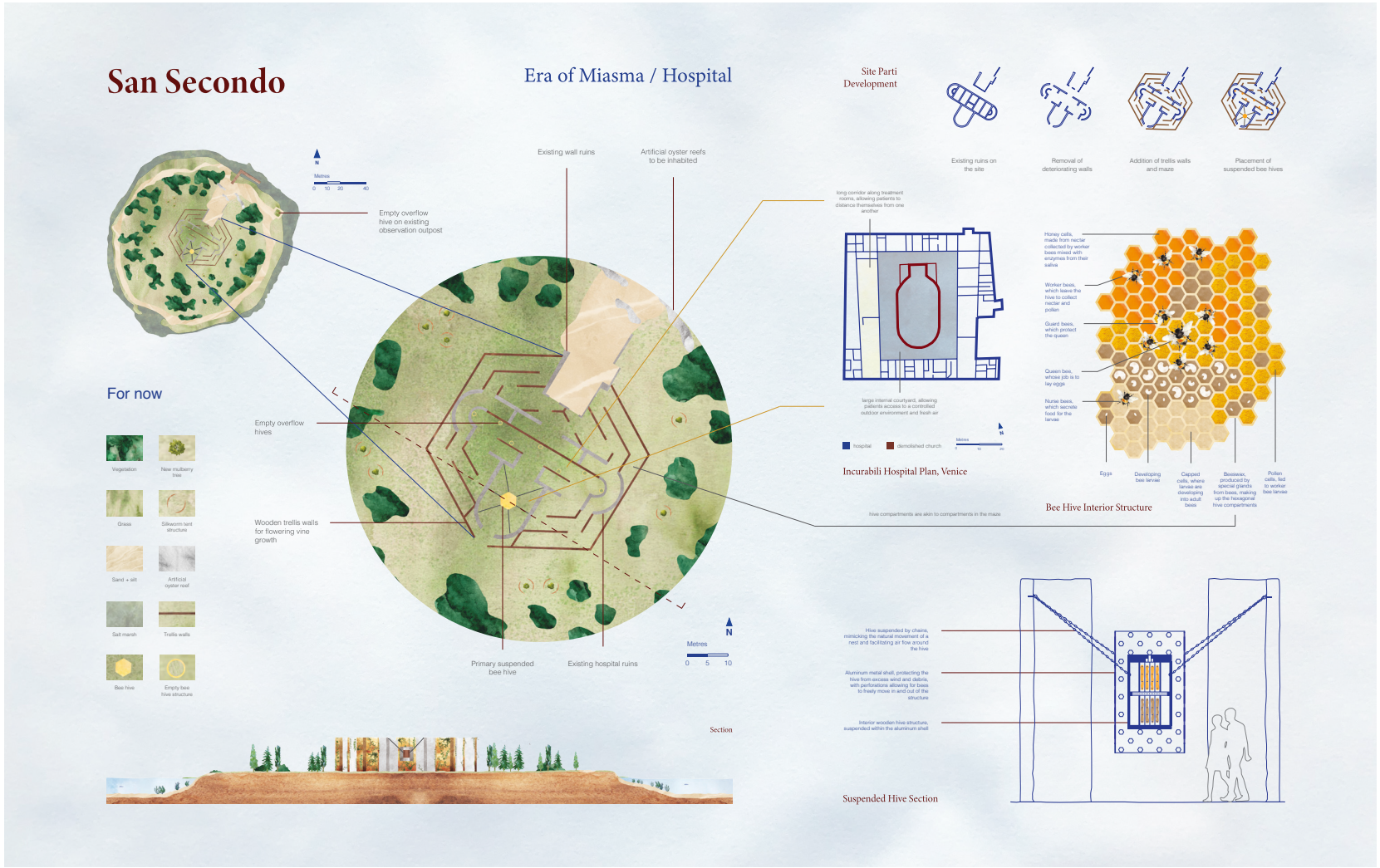
Appendix 3: San Giorgio in Alga - For Now



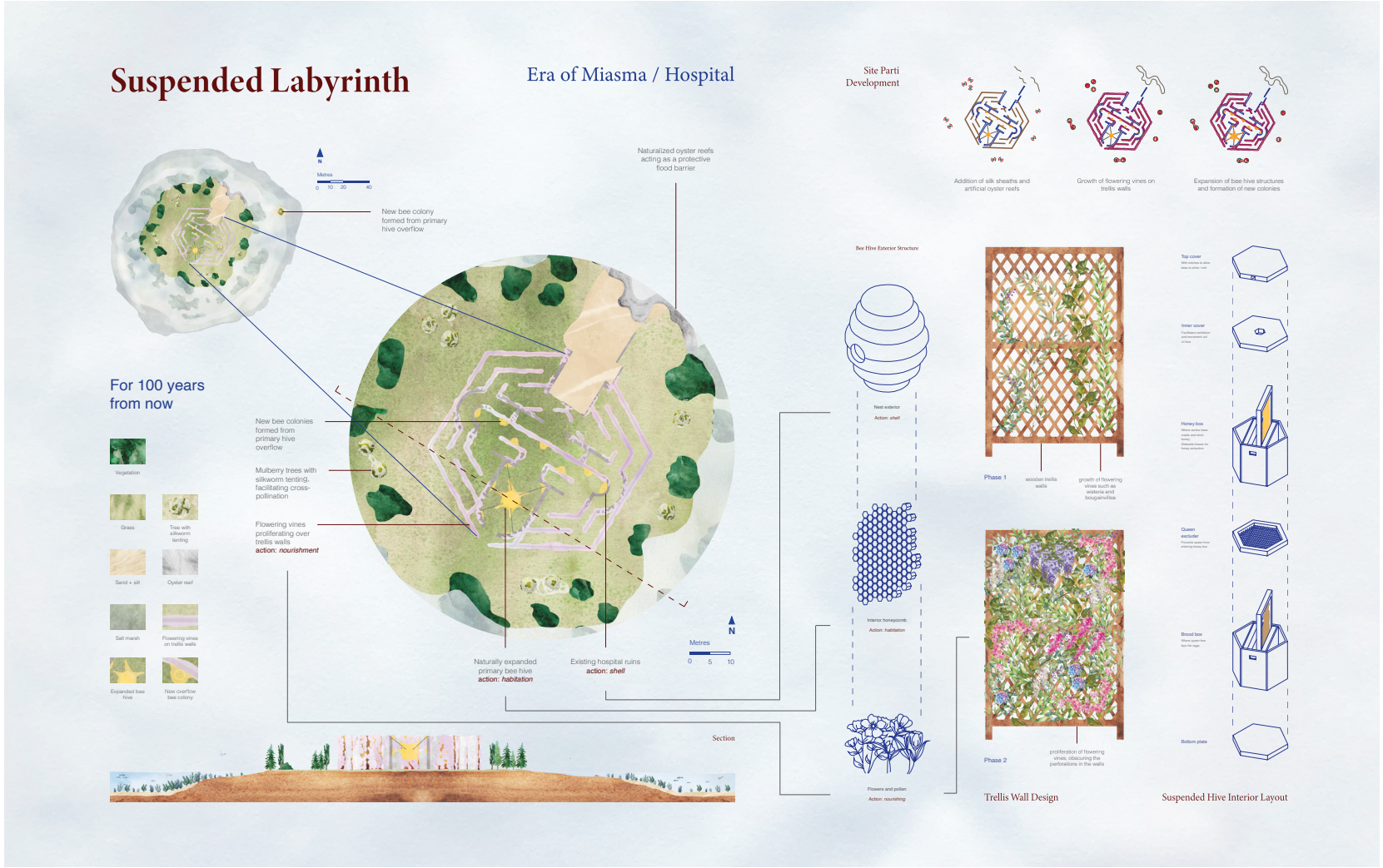
Appendix 4: San Giorgio in Alga - For 100 Years From Now



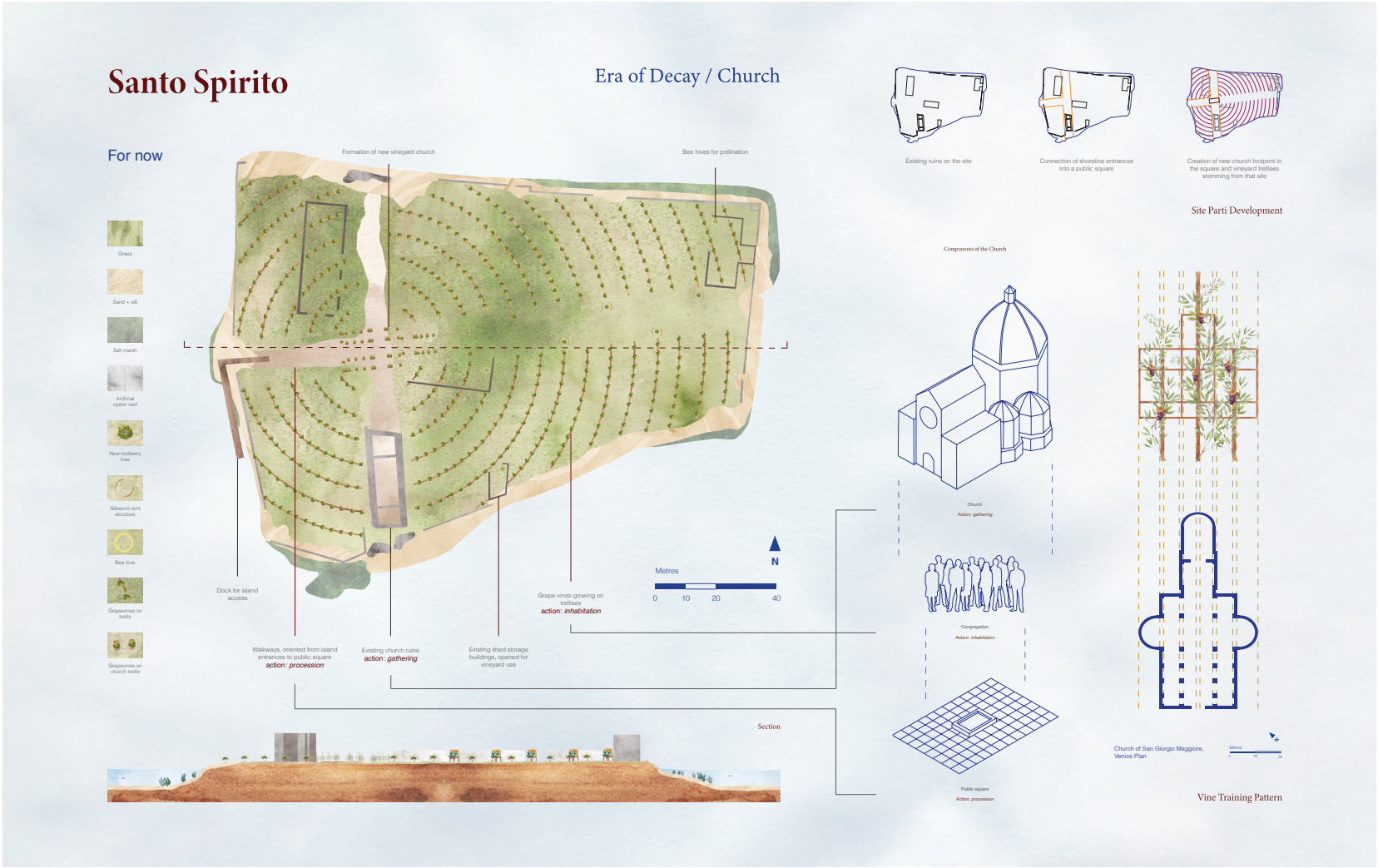
Appendix 5: San Secondo - For Now



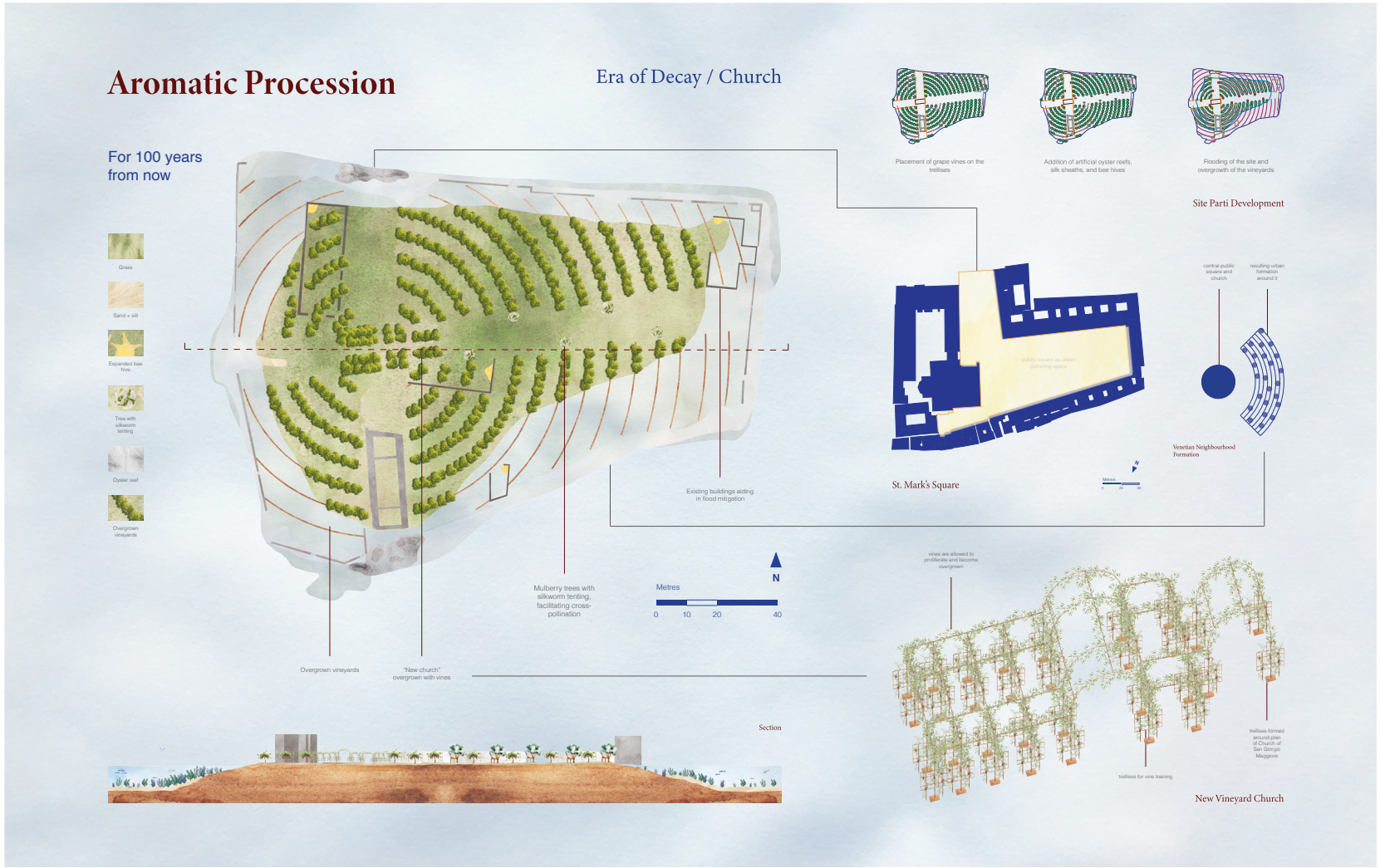
Appendix 6: San Secondo - For 100 Years From Now



Appendix 7: Santo Spirito - For Now



Appendix 8: Santo Spirito - For 100 Years From Now



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