

Pulsing Territories, Perpetual Frontiers

by
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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

ABSTRACT

The construction of the Ngurah Rai International Airport in Bali in 1969 facilitated the birth of mass tourism on the island, as well as an increasing concentration of tourist-centered developments. As the tourism industry now constitutes 70% of the island's GDP, tourist-dominant developments are highly economically profitable, but often culturally and environmentally unsustainable. Developments are continuously pushing boundaries into an increasing number of neighboring towns as tourists persistently search for "untouched" territories offering "authentic" cultural experiences. In the context of an island, with a finite amount of land, these sprawling developments are confronted with both physical and environmental constraints.

The thesis seeks to propose an alternate form of tourism development that works cyclically, leveraging seasonal activities over time, rather than one that sprawls

outward. Departing from traditional notions of static developments, the thesis questions the possibilities of designing infrastructures that work in synchrony with contextual cycles. The design of a networked infrastructure investigates how tourist developments and local economies can cycle between periods of high activity, periods of dormancy, and periods of regeneration. The proposal also seeks to question how an infrastructure could facilitate a symbiotic relationship between tourism and agriculture, effectively managing resources between the two industries through these cyclical periods. In addition how can these strategies generate new spatial experiences for tourists? How can spaces facilitate the possibilities of enhanced translatability in terms of the different stakeholders involved and their unique aspirations and often competing desires?

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i. INTRODUCTION

TOURISM AND PLACELESSNESS

During a trip to Bali in August 2014, I observed a landscape I had not returned to in five years, and was struck by the transformation of the island's urban fabric. Bali, a small island in the archipelago of Indonesia (Figure 1), has been the country's primary destination marketed for tourism as early as the 1900s, when Indonesia was still under Dutch colonial rule. Under the national development agenda, Bali continues to be a key focus in the government's desire to propel the tourist industry throughout the country, and today tourism contributes to 70% of the island's GDP¹. While highly economically desirable, development within the tourist industry not only leads to a series of environmental problems, but also manifests in a way that often deteriorates the unique characteristics of Bali's urban fabric. In a particular town that five years ago was only beginning to attract tourists, by 2014 I could no longer see any semblance of local life. Towns that

once housed cultural community centers dominated by local islanders, were populated entirely with bars and restaurants filled with tourists. These landscapes accurately described the notion of "other directed places", where one had no semblance of the unique relationships of nature and culture in the place.

J.B Jackson defines the term 'other directed architecture' as "architecture directed towards outsiders, spectators, passers-by, and above all consumers" resulting in the "creation of other-directed places which suggest almost nothing of the people living and working in them"². The term describes the common effects of tourism where generic landscapes replace the uniquely regional landscapes that attracted tourists in the first place. The concept is used by Edward Relph to describe the phenomena of placelessness, which he describes as "a weakening of the identity of places to the point where they not only look alike but feel alike and offer the same bland possibilities for experience"³.



Figure 1: Location of Bali in Indonesia

As Bali attracts an increasing number of tourists each year, landscapes of tourist shops, shopping malls, restaurants, and above all hotels, keep pushing out into surrounding towns, ultimately cloaking entire districts with a sense of placelessness (Figure 2). Within these landscapes, the notion of tourist enclaves is especially evident. Whether manifest as exclusive resorts designed to be enclaves in themselves, or entire towns that operate as enclaves by displacing local activities and events, they seem to erase any understanding of place. As the physical urban fabric of these towns transform, and as cultural relationships to the land shift, changing approaches to development often amounts to scenarios of heavy resource extraction, high levels of waste and pollution, and the deterioration of ecosystems and ecologies. The transforming urban fabric is not only a manifestation of the physical displacement of local communities and a change in attitude towards local ecologies, but is also descriptive of the shifts in power towards capital intensive developments,

which are usually fueled by foreign investors. The disparity of power often results in situations of inequitable distribution of resources and access to territories between a foreign elite class and the local population. In Bali the political economy has created a climate where deregulation gradually paves the way for hotels to be constructed in areas zoned for protection, fresh water is diverted away from farms into hotels and water-intensive golf courses, productive land is often forcefully converted to tourism developments, privatization of beaches increasingly denies local access to the island's landscapes, and despite protests from local governing bodies, the central government of Indonesia continually readjusts the hand of the law to facilitate a growing number of resource-intensive tourism developments.

Perhaps most disturbing to me during my visit, was that I noticed this phenomenon was not unique to Balinese towns, as patterns of sprawling tourist enclaves were also evident on the nearby islands of Gili and Lombok. (Upon



Figure 2: Transformation of Bali's urban fabric. Tourist developments cloaking towns with a sense of placelessness

further investigation, this is a common phenomenon across South-East Asian islands, especially in contexts where the tourist industry contributes to a significant portion of the economy). Despite its often negative ecological ramifications, and the stresses it often causes to local agricultural economies however, the tourist industry continues to expand in Bali because of its power to significantly relieve other economic stresses on a population living in a developing country. This thesis stems from these observations, where, understanding the dichotomic effects of the tourist industry, and especially considering a context with a high income disparity between foreigners and islanders, I began to question if architecture, as the creation of these spaces, could have a role in mitigating the effects of enclaves that often displace local communities, ecologies, economies and events.

TOURISM DEVELOPMENT IN BALI

A further investigation into the characteristics of tourism development in Bali reveal that they can be classified

as spontaneous or induced developments, as illustrated in Figure 3. Induced developments are typically master planned at a large scale, while spontaneous developments are unplanned and occur as a response to moving tourist populations. Larger bodies such as the government, international organizations, and institutions are responsible for induced developments that typically manifest as resort enclaves geared towards luxury tourists. Spontaneous development is a cycle that inevitably occurs in nearby towns as active tourists, or backpackers seek new territories to explore. In this cycle, local entrepreneurs respond to growing tourist demands, gradually trading in agricultural assets for more immediately profitable tourist related businesses. As these towns gain increasing popularity, rising land prices begin to displace locals and attract a growing number of foreign investors. An unregulated growth of tourist facilities completely transforms the urban fabric and natural landscapes of these towns, eventually causing tourists and investors to move away in search of other 'untouched' territories. This repetitive cycle has manifested in a condition

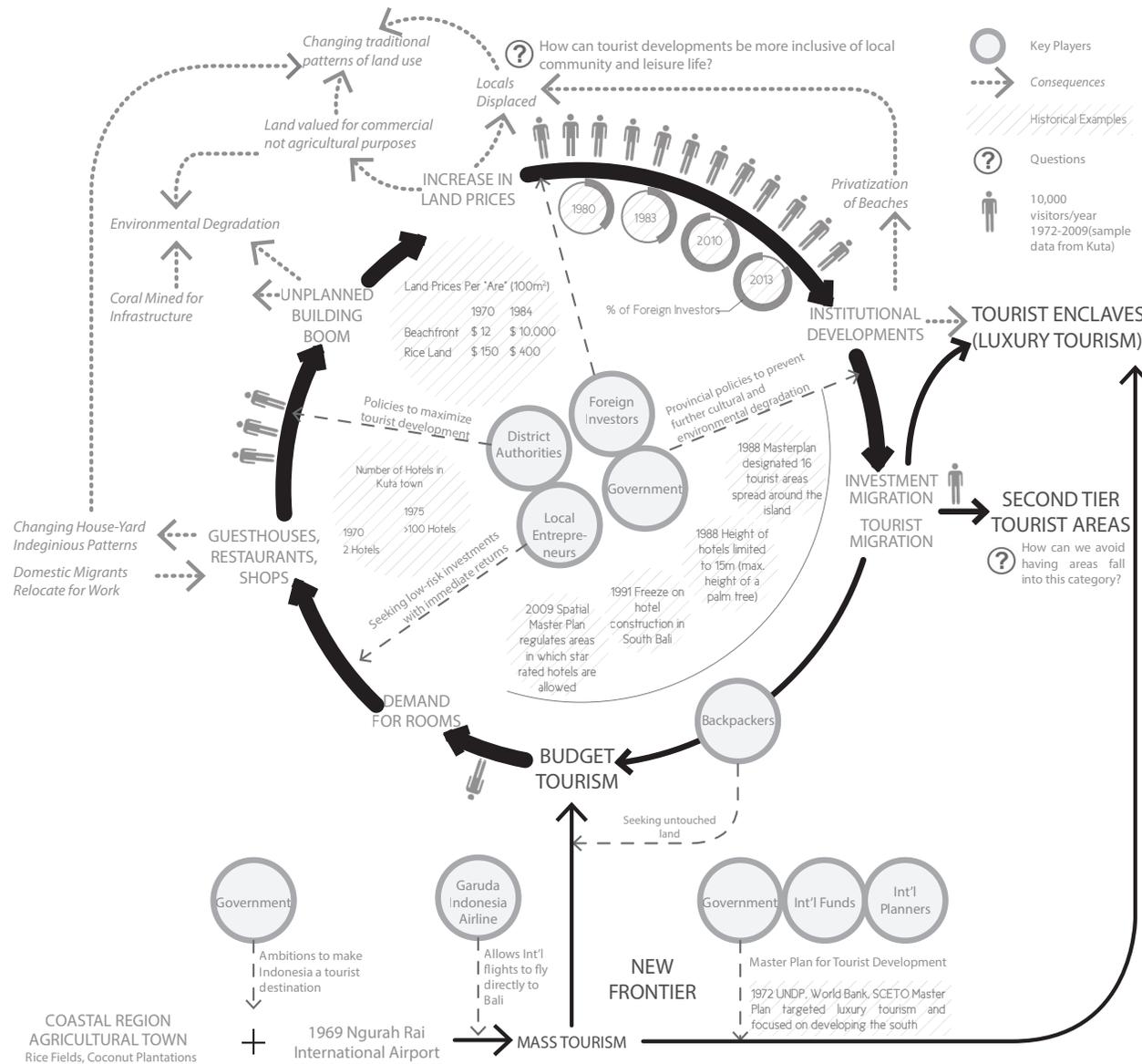
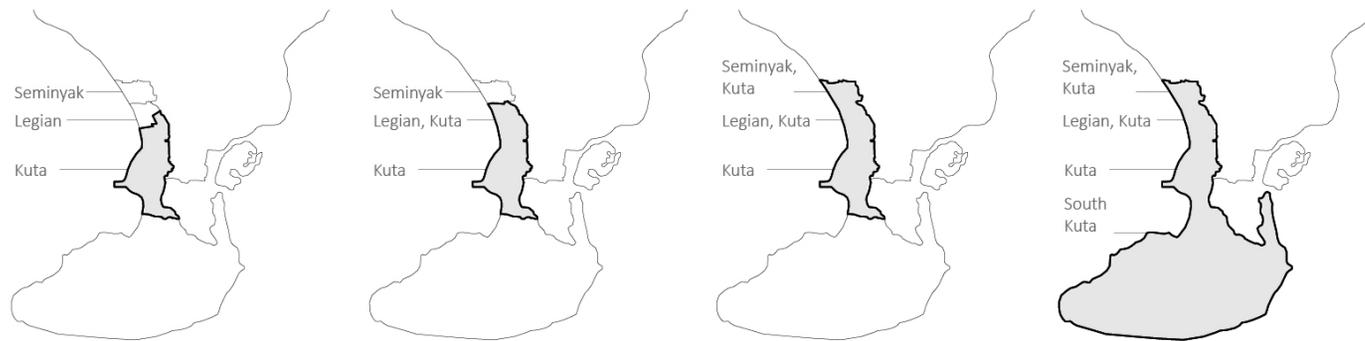


Figure 3: Patterns of Induced and Spontaneous Development in Bali



of continuous sprawl in Bali, most notably along the towns of Kuta, Sanur, Seminyak, and Legian (Figure 4). This cycle is descriptive of the landscapes I observed during my visit in 2014.

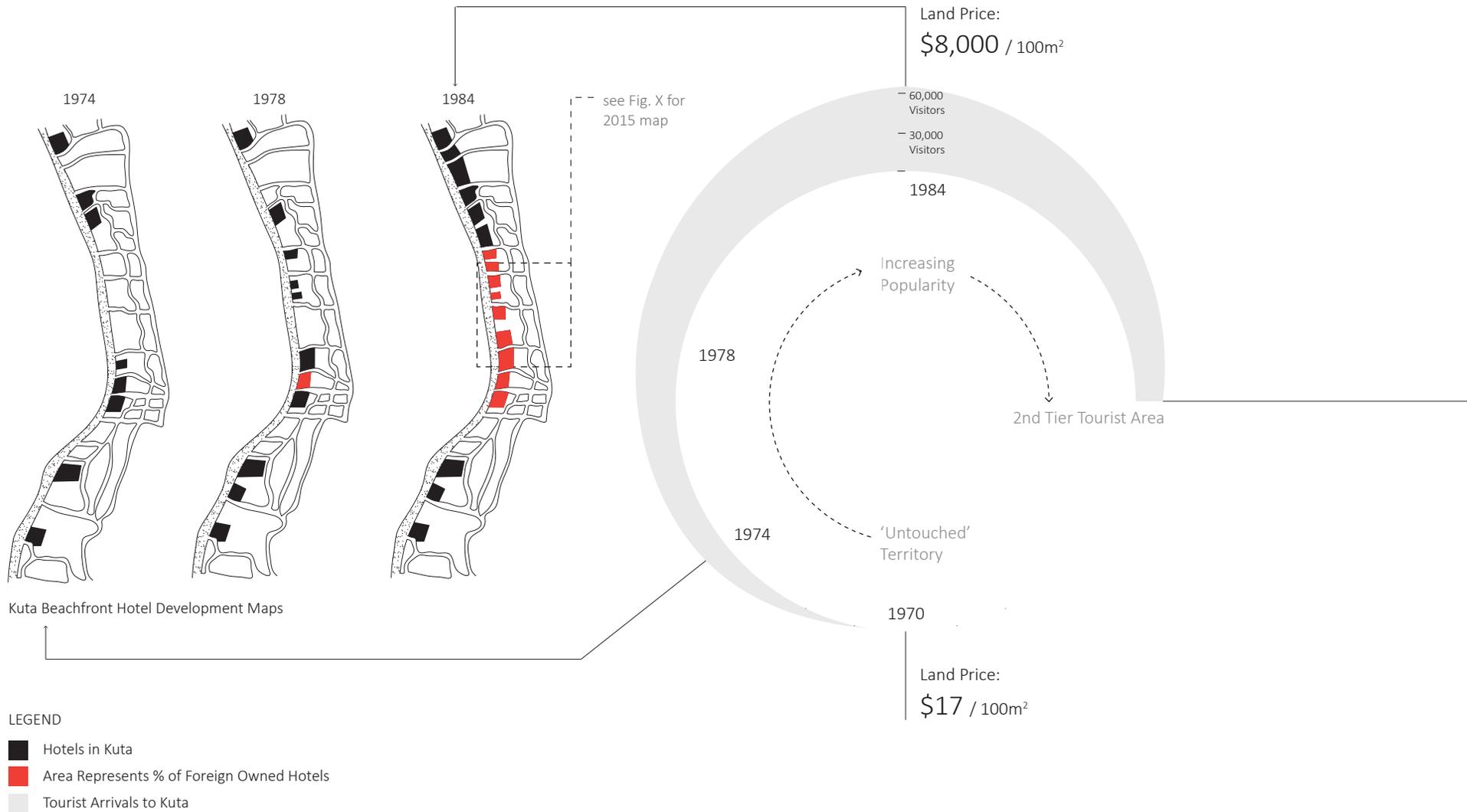
Especially in the process of spontaneous developments, key infrastructural services, such as sewers, roads, and power lines, become after thoughts⁴. Ron Nomura, marketing director at the Bali Hotels Association, expresses his reaction towards the lack of adequate water infrastructures and reservoirs in these situations, asking, “Can you believe there is this much rain and we don’t have enough water?”⁵. As tourist accommodations hastily concentrate themselves in towns that have gained accelerated popularity, infrastructural services are unable to keep up at the same pace. As these towns fall into the category of ‘second tier tourist areas’, the decline of ecological landscapes and local economies becomes increasingly accentuated. The effects of unregulated planning, coupled with a deteriorating

tourist quality, results in large amounts of trash and pollution, blackouts, overflowing sewage, water shortages, and increasing amounts of traffic⁶. In Bali, these effects are especially evident in the town of Kuta, a town that has become infamous for most greatly suffering the impacts of the unregulated growth of tourist developments (Figure 5).

The thesis seeks to primarily address the cycle of spontaneous development, which currently manifests as a very parasitic relationship with the island. By taking into account and establishing relationships with the political, economic, cultural, and ecological ecosystems at play, the thesis seeks to investigate how a model for development can have a more symbiotic relationship with the island that could simultaneously enrich the tourist experience by reestablishing and enhancing the sense of place.

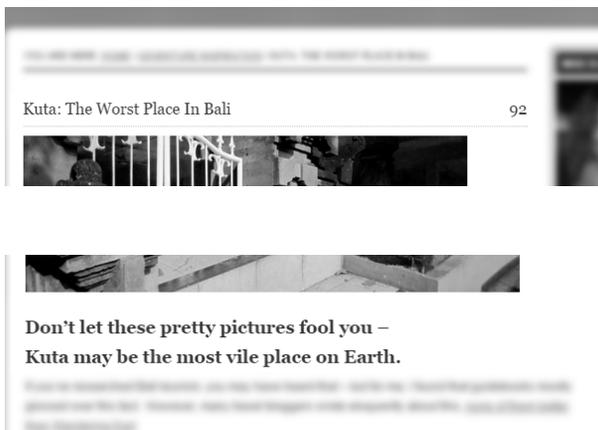
Figure 4: Continuous sprawl as a result of spontaneous development in Kuta, Legian, and Seminyak. Hatch indicates major concentration of tourist developments

CASE STUDY: SPONTANEOUS DEVELOPMENT IN KUTA



Kuta Today - a second tier tourist town:

The effects of unregulated and accelerated spontaneous development, coupled with a deteriorating tourist quality, results in large amounts of trash and pollution, blackouts, overflowing sewage, and increasing amounts of traffic.





1 'THE LAST PARADISE' TO A 'LOST PARADISE'? Tourism in Bali

*"Bali, by its isolation and lack of accommodation for the casual tourist, and because of the wise policy of the Dutch which has left Bali for the Balinese, has retained its individuality and primitive character. The people seem more like unspoiled children of Eden than any other race I have yet had the opportunity of studying. Surrounded as they are by gardens as beautiful as an earthly paradise can be, creatures of sunlight and music exude a mellow satisfaction of life that seems too good to be true."*¹ – Melvina Hoffman, sculptor

1.1 THE LAST PARADISE: A BRIEF HISTORY OF EARLY TOURISM IN BALI (1908-1969)

During the Dutch colonization of Indonesia, where Bali was violently occupied in 1908, tourism and tradition became increasingly important factors in politically reshaping the image of the Dutch colony while creating an added source of revenue for the colonials². In order to ameliorate their public reputation, and present their colonization as an enlightened one, Dutch policies relied on the museumification of Balinese culture and promotion of the island as a paradise, unspoiled by modernization³. Bali was presented as an Arcadian landscape, potent with arts, dance, and theatre, where spiritual villagers, descendants of a unique Hindu civilization, lived in modest towns in harmony with nature and the gods⁴. However, while the Dutch intended to present the island as an untouched paradise, they had little understanding of the existing traditions, and their own preconceived notions of what a pure civilization looked like.

A cultural policy termed "Balinization"⁵ aimed to 'restore' the culture to its 'original' state, based on these preconceptions, and preserve it that way. Here lies the basis for 'other-directed architecture', where places are designed for on-looking spectators based on preconceived notions of exotic locations.

Across Europe and America, as Bali gained a reputation as the true unspoiled tropical paradise, advertised as purer still than Hawaii and Fiji, affluent travelers sought to become associated with the island⁶. Bali became a popular destination for artists, scholars, anthropologists, and elite Western travellers.

In the early days of tourism, Bali was accessible by boat from the neighboring Indonesian islands of Surabaya and Java⁷. It was not until 1924 however, when a weekly steamship service was established between Singapore and several cities in Java, to Bali, that tourism gained a more prominent presence on the island⁸. Hotels did not begin to develop on the island up until 1928, prior to which tourists

Figure 6 (previous page): A Lost Paradise? Unregulated rapid tourist developments are the cause of many environmental problems the island is facing

resided at resthouses that were originally intended to house Dutch officials⁹. In 1928, the Bali Hotel, which was geared towards the “rich and famous”¹⁰ paved the way for a new type of development on the island. Now that Bali had already acquired its identity as an unspoiled paradise, modernization could begin to impose a visual presence on the island, but only to accommodate the wealthy.

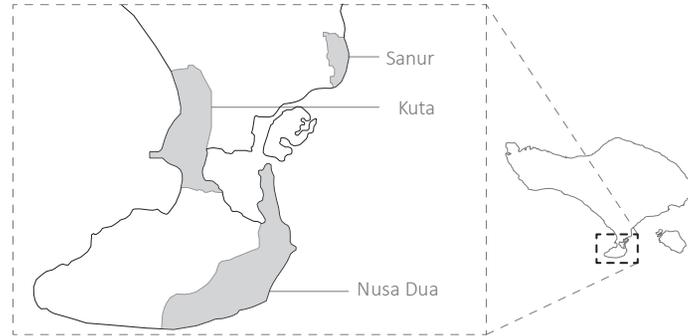
Disappointed by the Bali Hotel, which he described as “something out of Miami Beach”¹¹, Robert Koke, a tennis professional and film editor from Hollywood, built the Kuta Beach Hotel in 1938. Separating itself from the foreign concrete construction of the Bali Hotel, the Kuta Beach hotel was built with regional materials, bamboo and thatched roofs, and was targeted towards a different kind of tourist than the elite guests of the Bali Hotel¹². The hotel quickly gained popularity as a Pacific paradise, and by 1941 was already having to turn away guests due to full occupancies¹³.

As Bali gained increasing popularity, attracting not only more tourists, but a growing number of writers, film-makers, and artists, romantic depictions of the island provided it with an increasingly exotic and sensational reputation. Afraid of the modernizing impacts of increasing numbers of foreigners on the island, these artists began to market Bali as the “Last Paradise”, and the island was presented as possessing a unique culture that had to be experienced before it was lost¹⁴. While Balinese landscapes were marketed to a degree, most heavily advertised in tourist brochures were aspects of the culture that were unique and cinematically provocative such as photographs of burning cremation towers, tranced dancers, and performers wearing monstrous masks¹⁵. The stereotype that all Balinese were artists was continuously perpetuated, further attracting wealthy foreign artists seeking inspiration¹⁶.

1.2 A BRIEF HISTORY OF MASS TOURISM IN BALI (1969-PRESENT)

While the Dutch occupation in Indonesia ended in 1945, tourism in Bali continued to be employed as a means to ameliorate political reputations. The New Order Regime, marked by the induction of Soeharto as the second president of Indonesia, was heavily focused on economic development to revive the country from the political, social, and economic crises it faced in the 1960s¹⁷. Tourism was a key focus on the national development agenda, intended not only to bring in large amounts of foreign investment but also to rebrand the country with an international image and a modernizing identity¹⁸. The arrival of international visitors was intended to ameliorate Suharto’s global reputation (who had developed the reputation of a military dictator operating in the guise of a democratic government). The New Order significantly invested in development plans to strategize for tourism that would greatly accelerate the economy. Bali’s already prestigious reputation, built up by the Dutch Tourist Bureau during the pre-war years, enabled it to become a focus in the country’s tourism development agenda.

In the first 5-year development plan for Bali (1969-1974), policies focused on drastically increasing foreign arrivals to the island¹⁹. In 1969, the construction of the Ngurah Rai International Airport paved the way for the arrival of mass tourism on the island. The plan specifically targeted higher end tourists coming from Australia, Western Europe, North America, and Japan²⁰. It focused on creating luxury tourist enclaves concentrated in a town on the southern portion of island, Nusa Dua (Figure 7), in efforts to contain the effects of tourism on the local culture and environment²¹. However, Bali inevitably also drew in growing numbers of



young backpackers and less affluent tourists, resulting in the development of unregulated hotels outside the designated areas, as local entrepreneurs responded to tourist patterns²². Development in Nusa Dua progressed slower than expected, while unplanned and unexpected development in the towns of Kuta and Sanur progressed at an accelerated rate. Today, the fabric of Nusa Dua still reflects the ideas of the first development plan, as it manifests as a planned luxury enclave composed of large-scale coastal hotels (Figures 12-13). Kuta on the other hand, which became extremely popular for budget tourism during the early 1970s, developed at an unprecedented scale that was completely unforeseen in the master plans. While the master plan did not regard Kuta as a valuable location, local responses to tourist patterns, followed by foreign investors, resulted in an accelerated unregulated growth of multiple scales of tourist facilities. By 1980, a third of all tourists coming into Bali stayed in Kuta²³. However, a growing popularity of the town meant that locals were increasingly displaced as land prices continued to increase. In the 1970s a hundred square meters in Kuta cost US \$17, while by 1984 the figure rose to US\$8,000²⁴. By 1991, the

percentage of land for tourist accommodations represented more than twice the area of residential property²⁵. Mapping a sample area of Kuta (Figure 10), the effects of unregulated and rapid development have resulted in a disproportionately congested concentration of tourist facilities. Simply observing the degree to which tourist accommodations make up the streetscape, and the percentage of land area that they occupy, it is understandable why tourists continually move away in search of more authentic experiences. The effects of spontaneous development as a town becomes a second tier tourist area is particularly evident in Kuta, where a rapid concentration of developments, followed by a decline in the town's popularity and a decline in the quality of tourism, has amounted to a situation where there is a high degree of environmental degradation and waste, along with a loss of cultural activity (Figure 5).

In search of more authentic experiences and less polluted landscapes than areas like Kuta are able to offer, in recent years tourists have begun to increasingly move away from the overdeveloped areas on the south of the island (Figure 9). However, as tourists move, investments

Figure 7: Reference Map Indicating Nusa Dua (which was a planned tourist enclave) and Kuta & Sanur (which experienced unplanned and unexpected developments)

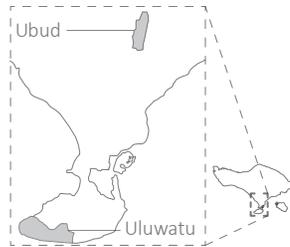


Figure 8: Reference Map Indicating Ubud and Uluwatu (towns that are beginning to gain increasing popularity today)

inevitably follow, and the cycle of spontaneous development inevitably begins in another town. In present day, towns that are beginning to gain popularity include Ubud (Figures 14-15) and Uluwatu (Figures 16-17). As Ubud gains popularity as the artistic and cultural hub of Bali, resorts, seeking to set themselves apart from the congestion of Kuta, insert themselves amongst the picturesque landscape of rice fields, and attract a new generation of wealthy travellers who are looking to gain inspiration and indulge in the illusion of cultural immersion. Uluwatu is gaining increasingly popularity for its dramatic cliffs and ideal surfing conditions. While it is not currently heavily populated by tourists, plans for several resorts in the area are underway. Kuta, Nusa Dua, Ubud, and Uluwatu represent the four major typical types of tourist landscapes present in Bali today (Figures 10-17).

Each of these landscapes accommodate unique sets of tourist activities as outlined in Figures 10-17. While more active programs, such as hiking and biking, occur in the inner parts of the island, and water sports are popular throughout Bali's coast, more conventional mass tourist activities such as amusement parks, zoos, museums, resorts, and clubs are focused on the southern part of the island. Bali thus hosts a wide variety of tourists, each with their own agendas and interests. Figure 18 illustrates typical routes of the seven most common types of tourists in Bali, While the highest concentration of movement occurs along the south-east coast,

central areas are starting to gain increasing popularity in more recent years.

Tourism continues to be employed as a political strategy in Indonesia today. With leaders keen to secure electoral votes, unrealistic projections for foreign arrivals are often announced to promote economic optimism. Shortly before the 2014 presidential elections, current President Joko Widodo, projected that Indonesia had the potential to receive 20 million tourists by 2019²⁶. Based on these projections, the Minister of Tourism predicted a 27% increase in tourist arrivals between 2014 and 2015 alone²⁷. While Indonesia is not experiencing a growth in tourist arrivals at this accelerated rate, investors, who often rely on the predictions made by leaders, hastily develop projects that ultimately create conditions of oversupply and cause significant environmental damages²⁸. In 2010, while there were 55,000 registered hotel rooms in Bali, tourist arrivals and demand only called for 24,000 rooms²⁹. Today, Bali is host to over 90,000 registered hotel rooms³⁰. Despite the fact that developments far exceed tourist demands in Bali, the creation of tourist facilities continues to expand. As designers of these spaces, what is the role of architects in mitigating the negative impacts of these developments? How might we gain access to the opportunities for ameliorating the effects of these developments by optimizing the political and economic power they hold?

FIGURE 9: MOST VISITED TOURIST DESTINATIONS IN 2013 VS. CONCENTRATION OF HOTEL DEVELOPMENTS

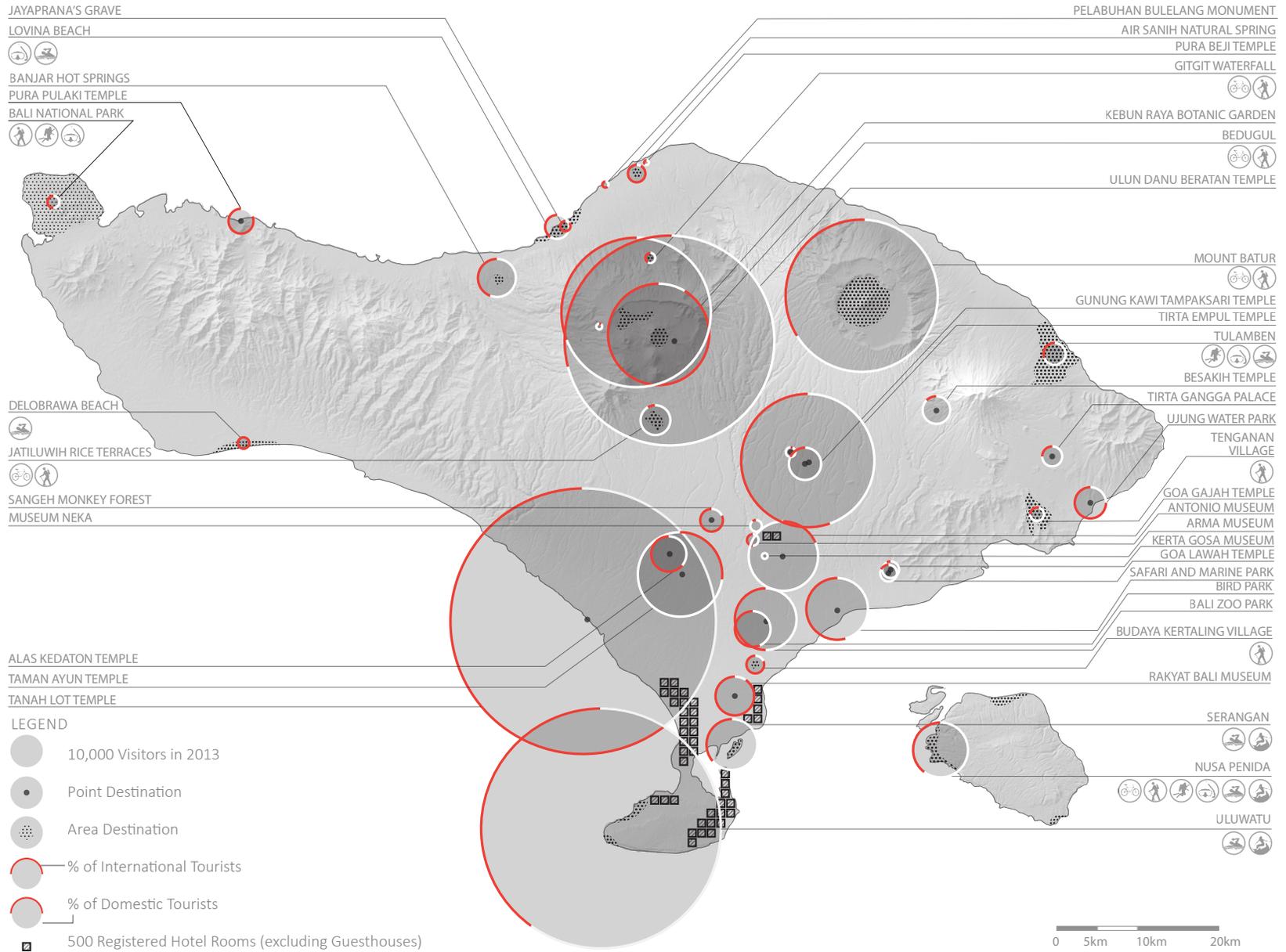
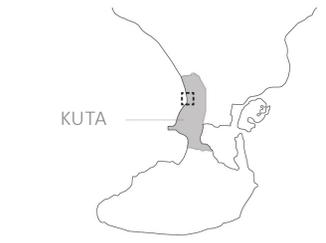
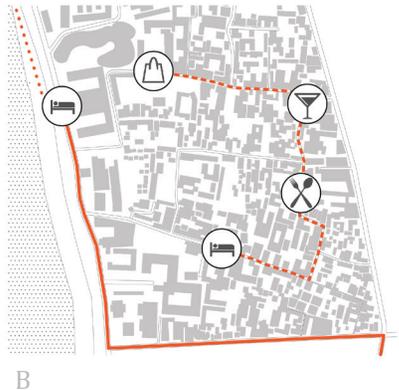


FIGURE 10: A) MAP OF SAMPLE AREA IN KUTA B) TYPICAL TOURIST ROUTE IN SAMPLE AREA, C) KEY MAP



47% of the building footprint is tourist accommodations

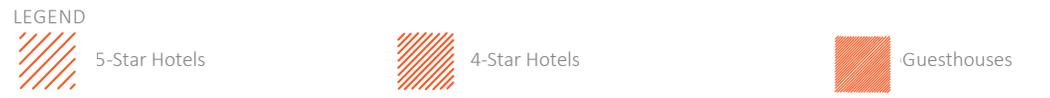
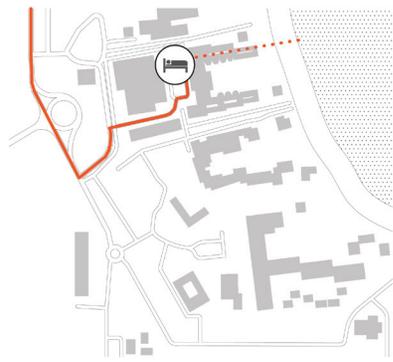


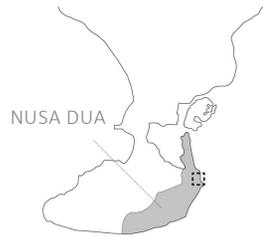


Figure 11: Aerial View of Hotel Developments Along Kuta Beach. Kuta hosts a continuous string of large-scale beach-facing hotels, behind which are heavy concentrations of smaller scale tourist accommodations. The unplanned and unregulated building in this town has created a dense tourist neighborhood, heavily unbalanced with hotels.

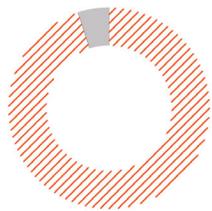
FIGURE 12: A) MAP OF SAMPLE AREA IN NUSA DUA B) TYPICAL TOURIST ROUTE IN SAMPLE AREA, C) KEY MAP



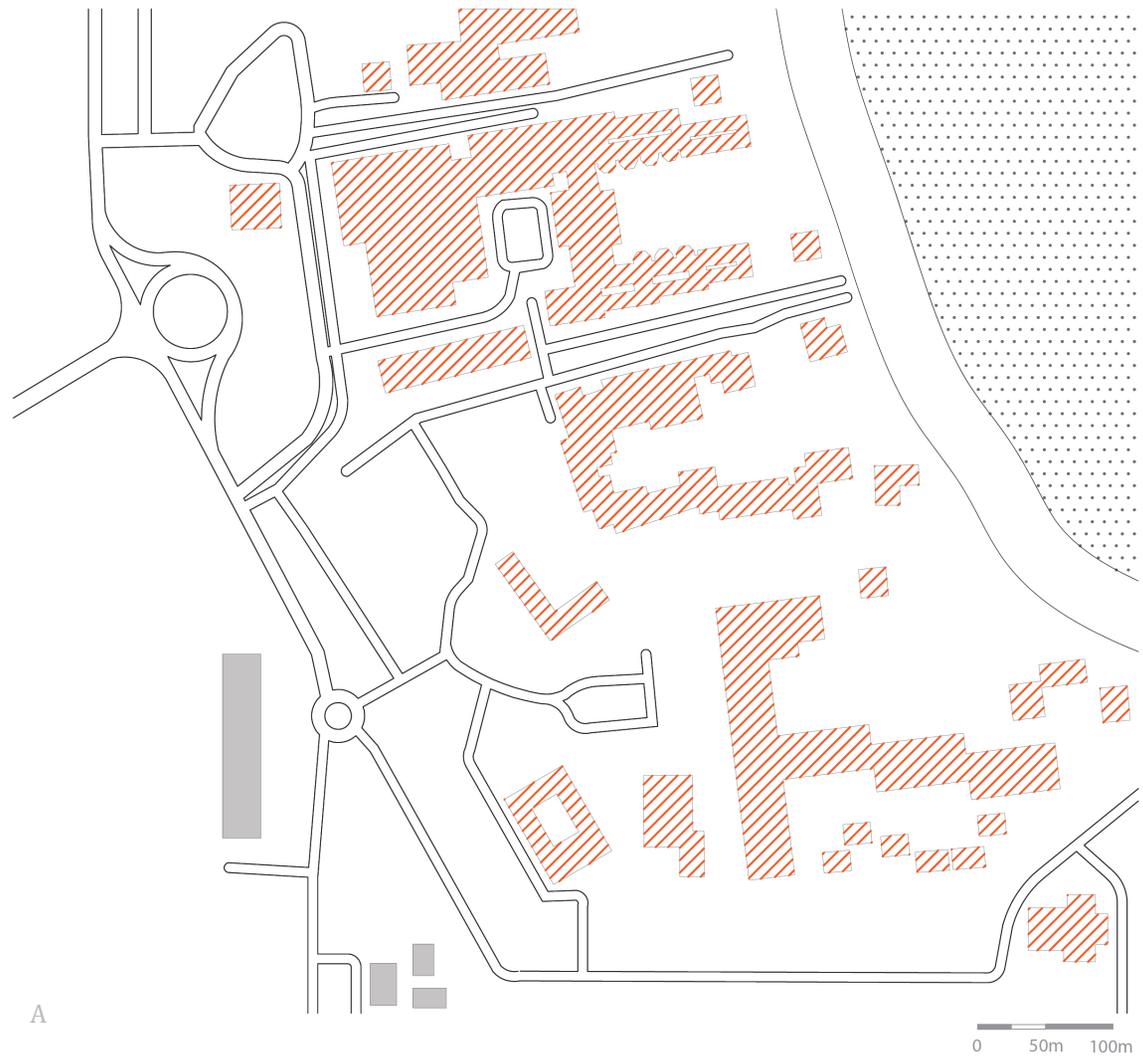
B



C



95% of the building footprint is tourist accommodations



A

LEGEND

 5-Star Hotels

 4-Star Hotels

 Guesthouses



Figure 13: Aerial View of Hotel Developments in Nusa Dua. Nusa Dua is composed almost entirely of large-scale luxury beach-facing hotels. The town's regulated development has largely followed a master plan created in 1970, which delineated the area as a luxury tourist enclave.

FIGURE 14: A) MAP OF SAMPLE AREA IN UBUD B) TYPICAL TOURIST ROUTE IN SAMPLE AREA, C) KEY MAP

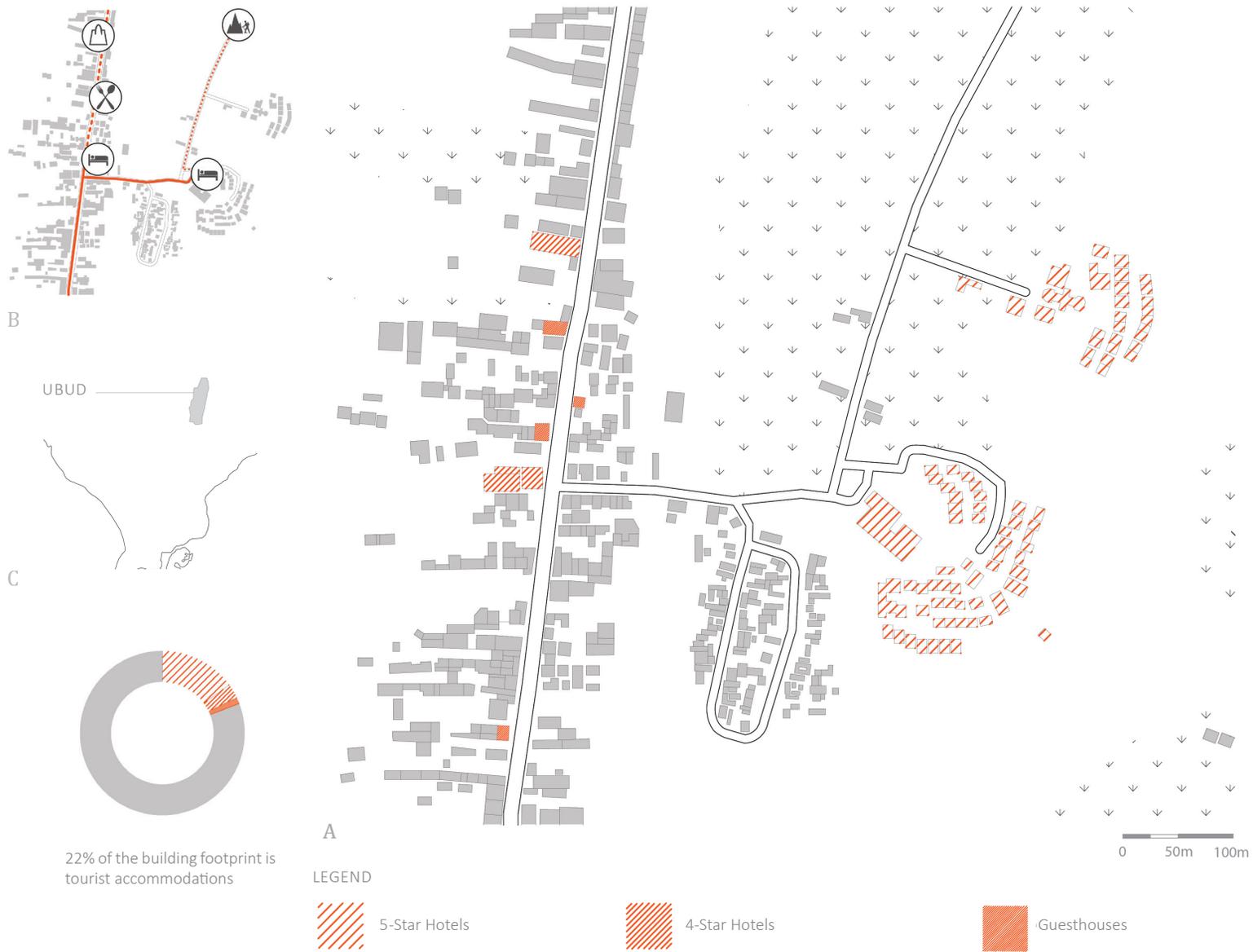
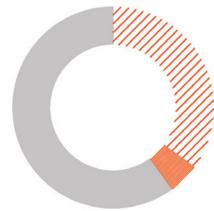
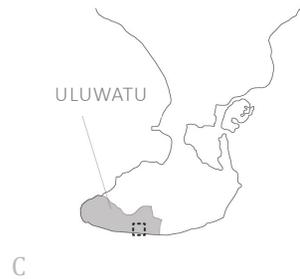
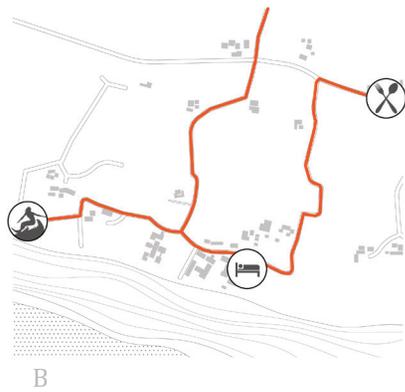




Figure 15: Aerial View of Typical Resort Developments in Ubud. In Ubud, which has gained popularity as the arts and cultural center of Bali, luxury resorts will embed themselves amongst the picturesque landscape of the rice fields to market an 'authentic' Balinese experience. While not densely populated with resorts, Ubud hosts some of the most up-scale resorts in Bali.

FIGURE 16: A) MAP OF SAMPLE AREA IN ULUWATU B) TYPICAL TOURIST ROUTE IN SAMPLE AREA, C) KEY MAP



40% of the building footprint is tourist accommodations



LEGEND



5-Star Hotels



4-Star Hotels

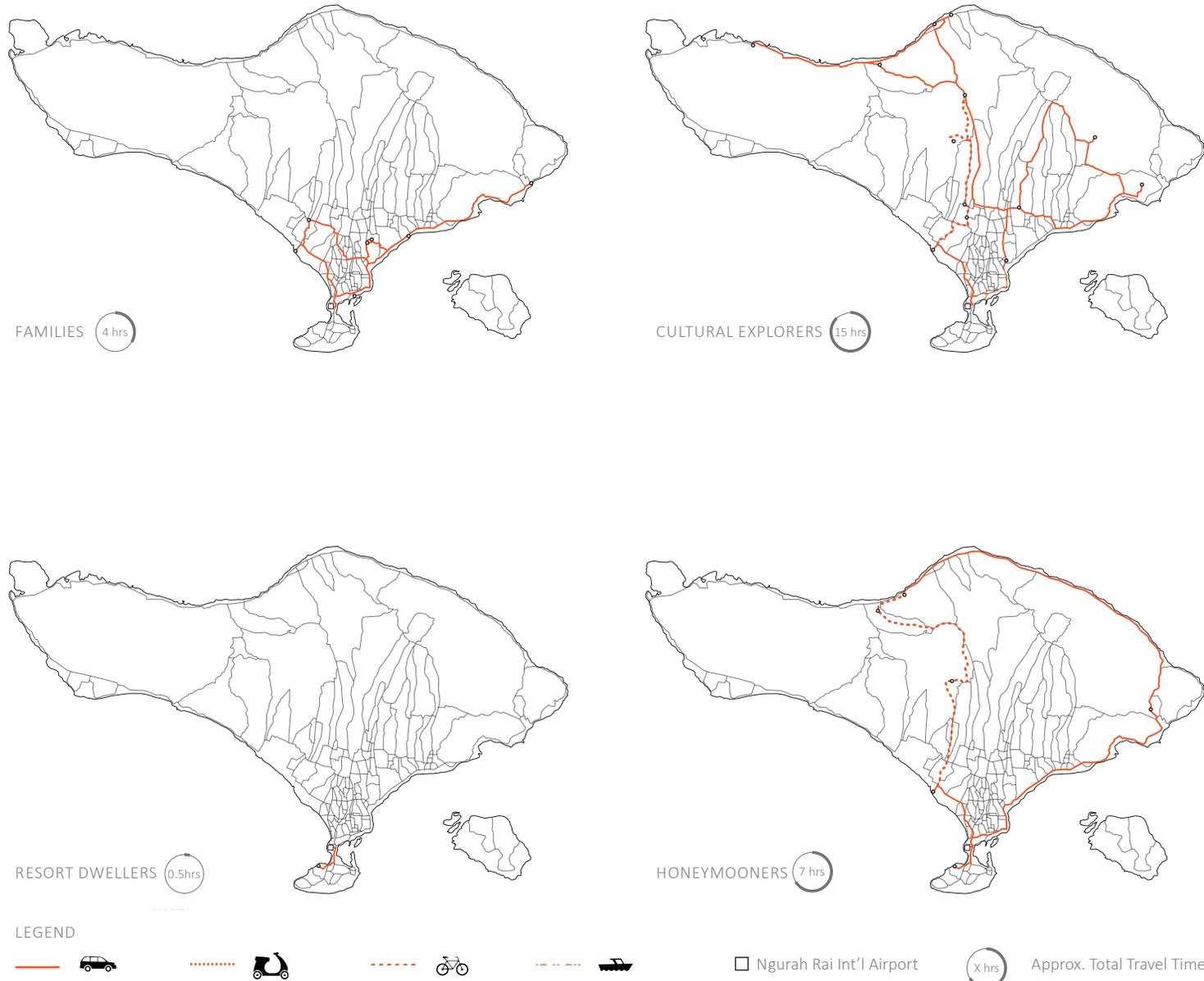


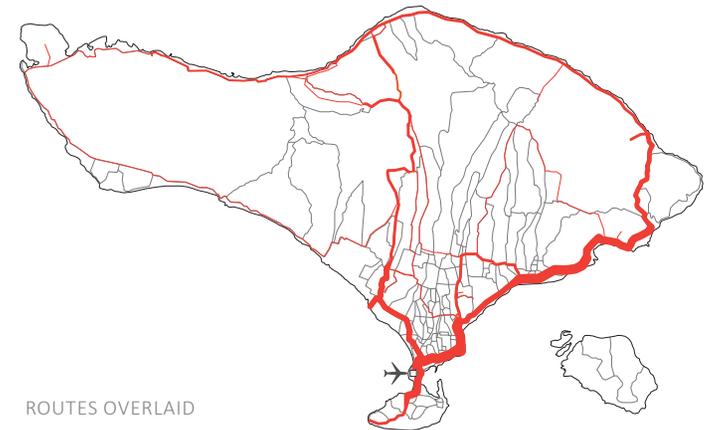
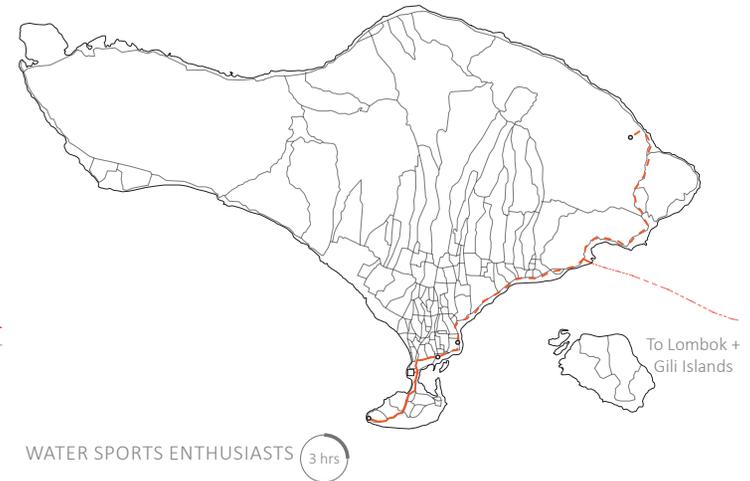
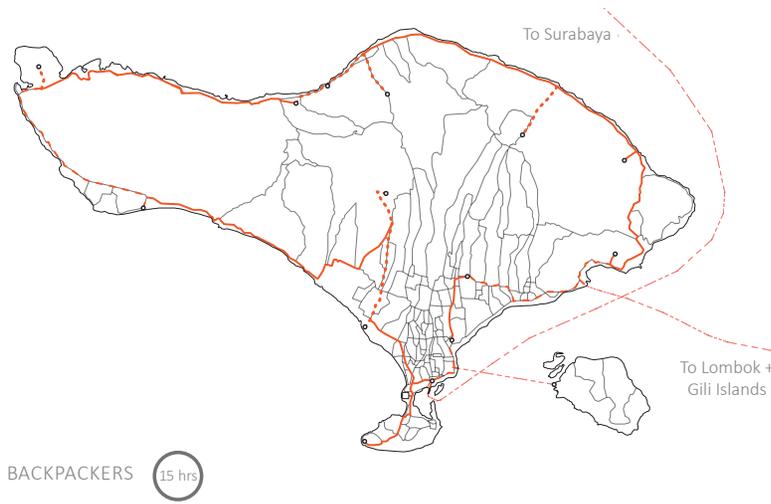
Guesthouses



Figure 17: Aerial View of Hotel Developments Along the Cliffs in Uluwatu. Uluwatu, which is presently gaining presence as a surfer's paradise, is becoming a new host to luxury resort developments. The town is currently not heavily populated, although plans for several luxury tourist accommodations are underway.

FIGURE 18: TYPICAL TOURIST ROUTES FOR SEVEN MOST COMMON TYPES OF TOURISTS TO BALI







2 AUTHENTIC ILLUSIONS: RESORTS IN SOUTH-EAST ASIA

“Guests stay at resorts because they find a resort property better reflects the local flavour and ambience than a city hotel; resorts are, if you like, more authentic. There is a growing trend for properties to better reflect the culture of the host country while maintaining higher standards of customer service”¹ – Joannee Watkins, group public relations manager of Shangri-La International

To respond to an increasing population of tourists who are searching for more ‘authentic’ experiences than large scale hotels or areas like Kuta are able to provide, there have been a growing number of resorts in Southeast Asia that are aesthetically more contextually attuned. While these resorts display an increased sensitivity towards maintaining material aspects of the urban fabric, they are also sometimes reminiscent of the Dutch policies of ‘Balinization’, and embodiments of ‘other-directed architecture’, as historic architectural features are selectively included in order to meet preconceived notions of an ‘exotic’ location.

DRAWING FROM BALINESE VERNACULAR ARCHITECTURE

While the use of regional materials and building techniques to construct modest hotel accommodations for backpackers was employed by Robert Koke in the late 1930s, the tradition of planning luxury hotels in the model of Balinese housing compounds was introduced by an Australian architect, Peter Mueller². In 1970, in response to his observations of the large scale Hotel Bali Beach, which he felt stood alienated and unresponsive to its contextual landscape, Mueller proposed an alternate typology for the Balinese hotel that drew its spatial and material configurations from traditional Balinese villages (Figure 21), but were highly refined and catered to Western standards of luxury³. This model introduced the idea of housing guests in walled in private villas, rather than the conventional hotel

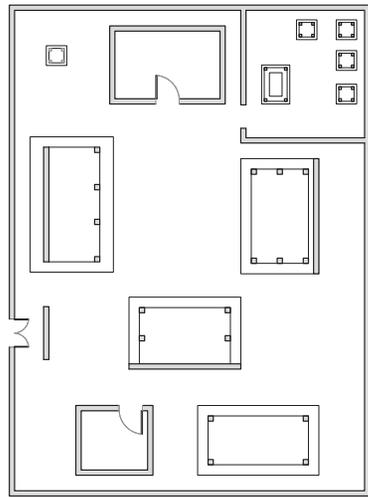
room. The typology departs from traditional large scale hotel developments, which house several hundred rooms, and is deliberately small, typically accommodating around fifty villas (Figure 23). The villas themselves are very large though, and this along with the degree of craftsmanship, sets new standards for luxury and exclusivity. This shift in typology is increasingly evident in Bali today as newly popular areas such as Ubud and Uluwatu, seek to set themselves apart from the congested experience of the tightly-packed conventional hotels of Kuta.

In his book “Architecture Bali: Birth of the Tropical Boutique Resort”, Philip Goad writes: “To experience the epitome of interpretive modern architecture in Bali and to see the best in Balinese arts and crafts, one had to be Western and wealthy. But this is contemporary Bali where the continuity of local artistic traditions is served by the highly refined and arguably exacting demands of a sophisticated touristic culture. Such a phenomenon reveals the Western tradition of looking at the purest aspects of an exotic culture and attempting to capture its essence”⁴. Again, remnants of the Dutch policy of “Balinization” are still very much evident in the culture of resort architecture today as the ‘purest aspects’, or more accurately, the most marketable aspects, of a culture are appropriated to cater to tourist expectations that have developed based on images that they have been fed of the island. However, these developments do reflect attempts to maintain some of the material qualities of the urban fabric, even if on just a purely aesthetic level.

Figure 19 (previous page): Resorts adapt spatial principles and material qualities of the Balinese vernacular architecture to more convincingly market an ‘authentic’ Balinese experience



Figure 20: South-East Asian resorts (bottom) rely heavily on the formal mimicry of vernacular architecture (top) to market an (authentic) cultural experience.




 0 2m
 165m² typ.

- 1 **SANGGAH**: HOUSE TEMPLE (MOST IMPORTANT SHRINES PLACED CLOSEST TO *KAJA-KANGIN*)
- 2 **BALE DANGIN**: OPEN CEREMONIAL PAVILION FOR RITES OF PASSAGE
- 3 **METEN**: ENCLOSED PAVILION FOR HOUSEHOLD HEAD
- 4 **BALE DAUH**: LIVING QUARTERS FOR GUESTS
- 5 **ALING ALING**: SHORT WALL INSIDE GATE TO KEEP OUT BAD SPIRITS
- 6 **BALE GEDE**: PAVILION FOR WEAVING AND WORK
- 7 **NATAH**: COURTYARD
- 8 **LUMBUNG**: GRANARY
- 9 **TEBA**: PRODUCTIVE GARDEN
- 10 **PAON**: KITCHEN

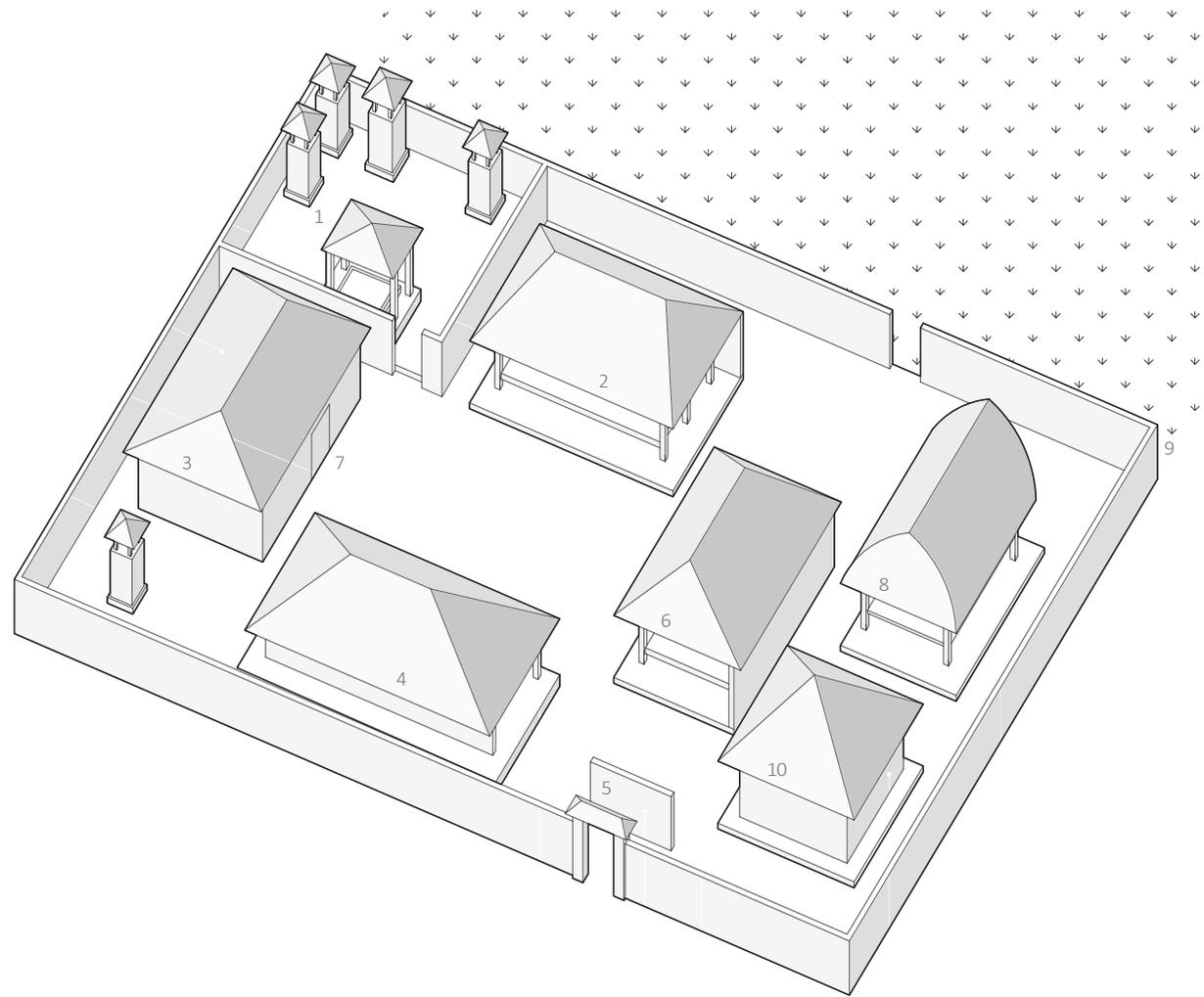
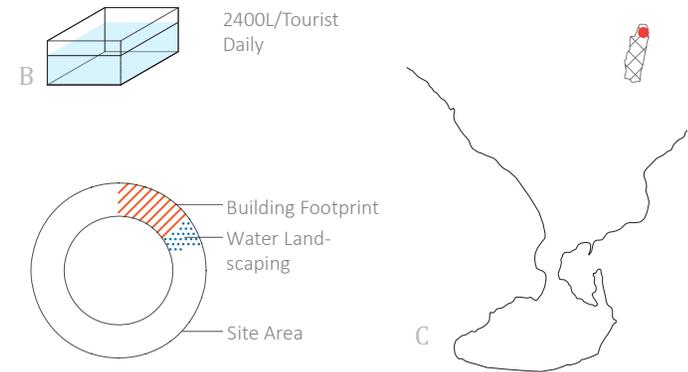
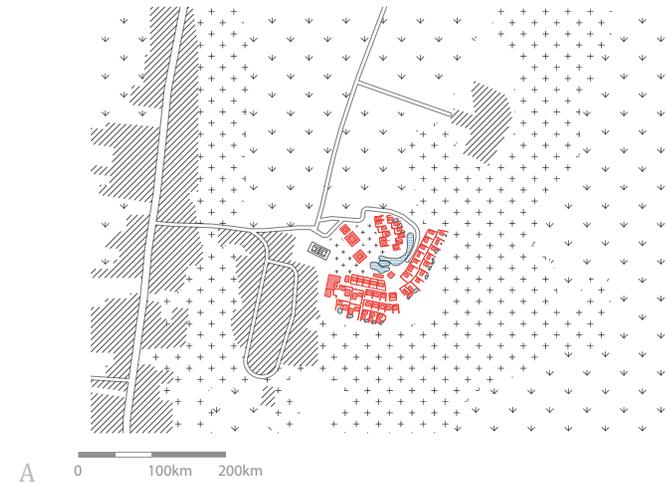


Figure 21: Traditional Housing Compound Typical Plan and Axo



Figure 22: Luxury resorts, such as the Kamandalu Resort, draw their spatial and material configurations from traditional Balinese villages



LEGEND

- ⊠ Dominant Areas with this Typology
- ⊠ Surrounding Building Mass
- ++ Trees
- Water
- ↓ Rice Fields

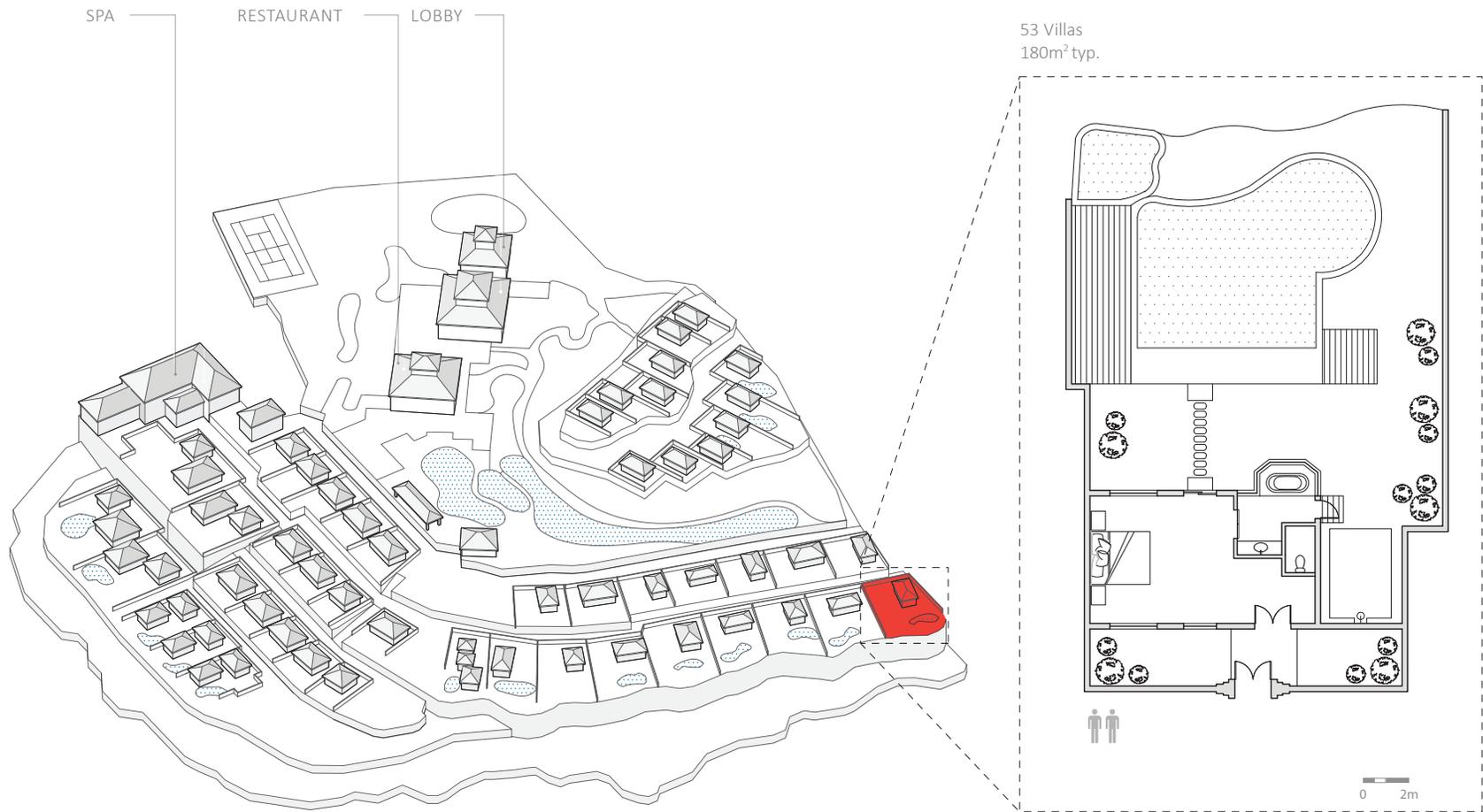


Figure 23: Axonometric of a luxury resort in Bali, the Kamandalu resort and a typical villa plan. The typology departs from traditional large scale hotel developments, which typically house several hundred rooms, and is deliberately small, typically accommodating around fifty villas, modeled around similar principles as the Balinese housing compound. A) Site Plan B) Average Daily Water Consumption C) Project and Typology Location

LANDSCAPING AND WATER FEATURES

Mueller was responsible for the design of some of the most upscale resorts in Bali, and landscaping was always an extensive physical and experiential feature. The tradition of landscaping as one of the most important aspects of the hotel experience is still very much prevalent, and is used as a means by which to enhance and deliver the tropical experience.

Hotel architects also drew from the structure of terracing rice fields and traditional Balinese water palaces, including water as a crucial experiential aspect of the designed landscape⁵. Inspired by water palaces, such as those at Taman Ujung, where pavilions appear to float amongst a complex of pools, hotels increasingly began to include extensive ponds and floating pavilions, especially in public areas such as the lobby, restaurant, and bar (Figure 24). Iconographically, hotel designers were recollecting an analogy to the water palaces which were places associated with both luxury and sanctity, as these were the spaces where kings went to meditate and connect with the gods.

While alluding to spaces of cultural and historical significance in order to deliver a uniquely Balinese experience, these extensive water landscapes however, consume excessive amounts of water. The typical consumption of water in luxury resorts in Bali equates to approximately 2400L/tourist/day, while the average local consumption of water is 150L/day⁶. In large scale hotels, where rooms are architecturally more generic and the experience is delivered through more elaborate landscaping and water features in public areas, water consumption typically amounts to 3200 L/tourist/day⁷. (In comparison, the average residential consumption of water in Canada is 251L/

person/day⁸.) The Intercontinental Hotel in Bali, is one such example, and represents the typical development of large scale star rated hotels along the coasts in the south of Bali (Figure 26). The implementation of a series of courtyards, originally influenced by traditional Balinese water temples⁹, allows the generic rooms to have a view out to a less generic, extensive landscape. Amongst the garden landscape, pavilions are dressed up in vernacular materials to deliver an image of the 'authentic cultural experience'.

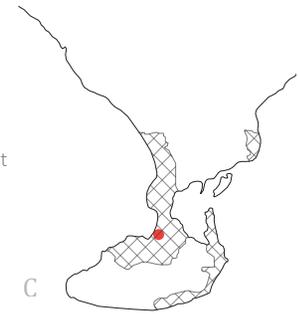
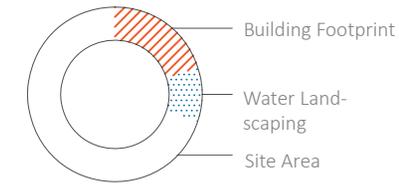
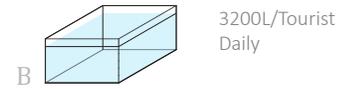
Although many Balinese hotels and resorts adapt regional materials and traditional spatial organizations in order to maintain and market a Balinese aesthetic, extensive water and garden landscapes often create an unequal distribution of resources on the island. A resort that markets itself as the 'leading green resort' in Bali, and whose website is populated with images of tranquil villas situated amongst a lush landscape of terracing rice fields, has a private pool for each of its 58 individual villas. There is no public evidence or documentation of sustainable strategies besides the marketing of scenic views of tropical vegetation in the rice fields. In reality, by situating themselves in these landscapes in order to market environmental integrity and cultural sensitivity, these resorts are causing a multitude of negative ramifications for the rice farmers, who consequently face increasing land taxes and water shortages. While resorts in Bali have become visually more responsive to the local context, as a physical representation of the cultural, climatic, social, political, economical, and temporal locales of a place, perhaps an architecture that claims 'authenticity' should be responsive to all these contextual layers as well.



Figure 24: The extensive water landscapes of hotels (TOP) recall traditional Balinese water palaces (BOTTOM)



Figure 25: Spatial and material qualities in large-scale hotel designs, such as the Intercontinental Hotel, are borrowed from the traditional vernacular architecture



LEGEND

- ⊗ Dominant Areas with this Typology
- ⊘ Surrounding Building Mass
- ++ Trees
- Water

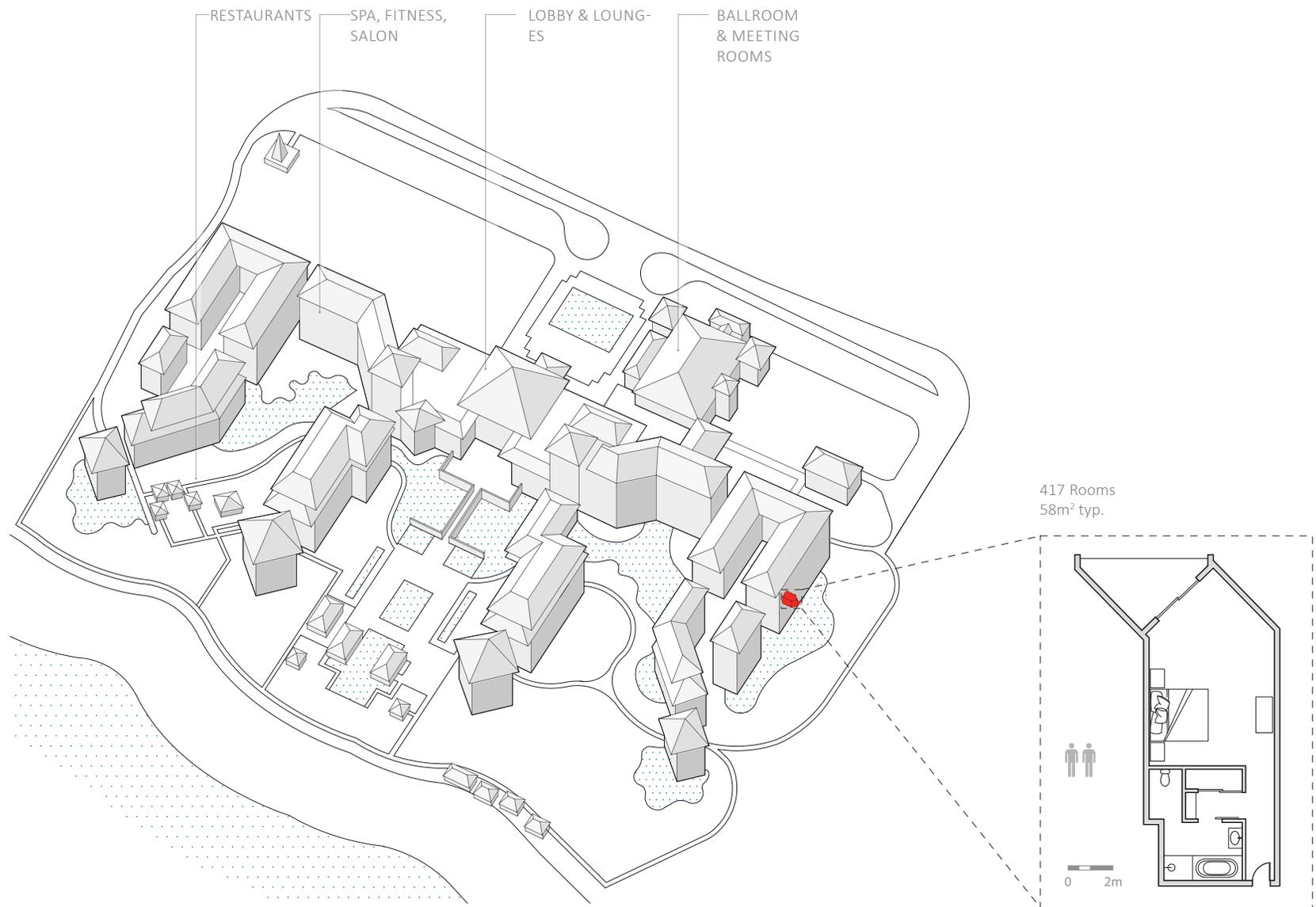


Figure 26: Axonometric of a large-scale hotel in Bali, the Intercontinental Hotel and a typical room plan. Large-scale hotels are typically arranged around courtyards with lush vegetation and extensive water features to allow the generic rooms a view out to a less generic landscape. A) Site Plan B) Average Daily Water Consumption C) Project and Typology Location



3 POLITICAL ECONOMY AND THE SWAYING HAND OF THE LAW

In 1987, deregulation in Bali paved the way for an investment boom, leading to a high concentration of tourism developments funded largely by foreign investments¹. By 1990, environmental damages were of significant concern to the public and highly publicized by the local media². Concerns included the development of hotels in areas zoned for protection, the unregulated mining of coral and limestone for construction, increasing levels of pollution and garbage, increasing rates of salt water intrusion into the groundwater, the unequal diversion of fresh water away from farms into hotels and water-intensive golf courses, the often forceful conversion of productive land to tourism developments, and the role of the government and army in facilitating growing numbers of tourism developments despite their negative ramifications and protests from the local population³. Growing tensions among the local public, as well as increasingly visible environmental damages, drove the Minister of Tourism to issue a one year freeze on large tourism developments until a study conducted by the UNDP could evaluate the situation and set the groundwork for future planning⁴. However, the freeze was lifted before the study was even completed⁵. Instead policies were issued around the aim of maximizing the number of tourists and their spending on the island. While in 1987 there were 5,000 rooms in star classified hotels, by 1992 (two years after the freeze was issued) there were 13,000 rooms and 20,000 more under construction⁶. While the 1971 Master Plan zoned three areas for tourism development, this expanded to 15 zones in 1988, and 21 zones in 1993, effectively opening up a quarter of the island and one in five Balinese villages as hosts to tourism developments⁷. Zones that were originally delineated as protected areas were deregulated, as part of agreements between the Ministries of Forestry, Agriculture and Tourism, in order to supposedly provide sites for agro and eco tourism developments⁸.

Despite announcements of concern, deregulation has continually paved the way for the often unregulated growth of large

scale, highly capitalized tourist facilities in Bali. Political tensions are driven by the significant contributions of foreign investment to the economy, the majority of which fund tourist facilities. In 1990, Indonesia received US\$8.8 billion in foreign investment, half of which was for hotel projects⁹. During the first three months of 2015, Bali alone approved US\$1 billion worth of investments for upcoming projects, the majority of which were from foreign investment companies¹⁰.

In a conflict of interest between central and local authorities, between those aiming to maximize profit and those hoping to conserve cultural sites that draw tourists to the island in the first place, gradual deregulation progressively paves the way for capital intensive developments to expand their territory. A significant historical example was the Bali Nirwana Resort project, which began construction in December 1993, prior to any public announcement¹¹. The project includes a five star hotel with 401 rooms, 450 residential units each with their own private pools, an 18 hole golf course, and recreational facilities¹². Once the project was underway, there was a large public outcry as the project not only took over 120 hectares of some of the most fertile rice-land in the region, but it is also located on a site that faces the ancient sacred temple of Tanah Lot¹³ (Figure 27, previous page). Although zoning measures were not always followed in Bali, and policies could be swayed for economic gain, the Bali Nirwana Project heightened the tensions between a foreign elite class and the local population and paved the way for an entirely different level of development. Little has changed as recently the site has been taken over by Trump International properties and is expected to undergo a complete rebranding and expansion starting 2018. Taking into account the continued political and economic power of tourism developments however, how can architects, as creators of these spaces, optimize this power to begin to leverage other human and non-human stakeholders?



4 ALTERNATE TOURISM

While the 1960s marked a rapid growth of world-wide mass tourism, by the early 1990s, increasing concerns grew over its negative impacts and gave rise to discussions about alternate, more sustainable forms of tourism¹. The World Summit on Sustainable Development in 2002 referred to sustainable tourism development as the “increase [of] benefits from tourism resources for the population in host communities while maintaining the cultural and environmental integrity of the host communities and enhancing the protection of ecologically sensitive areas and natural heritage”². Alternative tourism, as an alternative to mass tourism, thus aims to be more sensitive to the social, economic, environmental, and cultural layers of a destination.

Comprising a variety of subcategories such as eco-tourism, agri-tourism, and special interest tourism, as alternates to mass tourism these models are all concerned with minimizing the footprint of tourism developments, and operate on smaller scales and intensities. Contrary to creating enclaves where tourists have little or superficial interaction with the local population, alternative tourism typically

promotes activities that encourage a high level of interaction between tourist and local networks. Culture Xplorers is an example of a non-profit organization specifically focused on the engagement between travelers and locals. Tourists can choose from a range of week-long itineraries in small towns across South America, Mexico, and Europe, where they partner with host families and engage in a variety of activities relating to the cultivation of local crafts and cultural activities. Figure 29 illustrates a sample itinerary that the program offers. While Culture Xplorers creates more intimate interactions between tourists and host families in this manner, agri-tourism completely integrates tourism into the labor-force of the industry. Engaging visitors in agricultural activities, some forms of agri-tourism also pay wages to visitors in exchange for labour. In France for example, French farmers yearly seek help to harvest all their grapes in the fall (Figure 30). While promising as more engaged and sensitive models of tourism, these examples are completely reliant on a specific type of tourist, a more responsible tourist.

Figure 28 (previous page): Alternative Tourism typically promotes activities that encourage a high level of interaction between tourist and local networks, and a sampling of local daily life

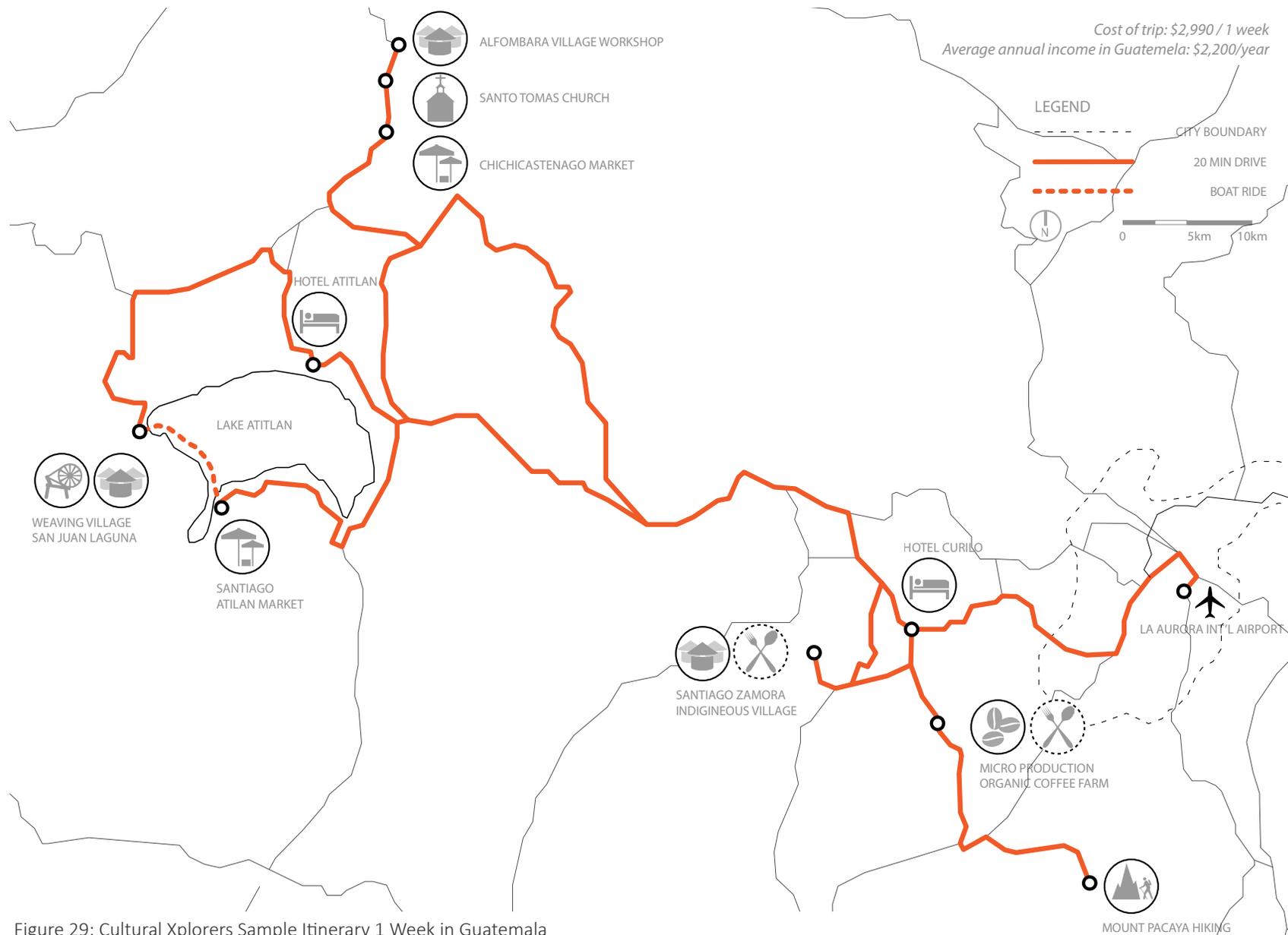


Figure 29: Cultural Xplorers Sample Itinerary 1 Week in Guatemala

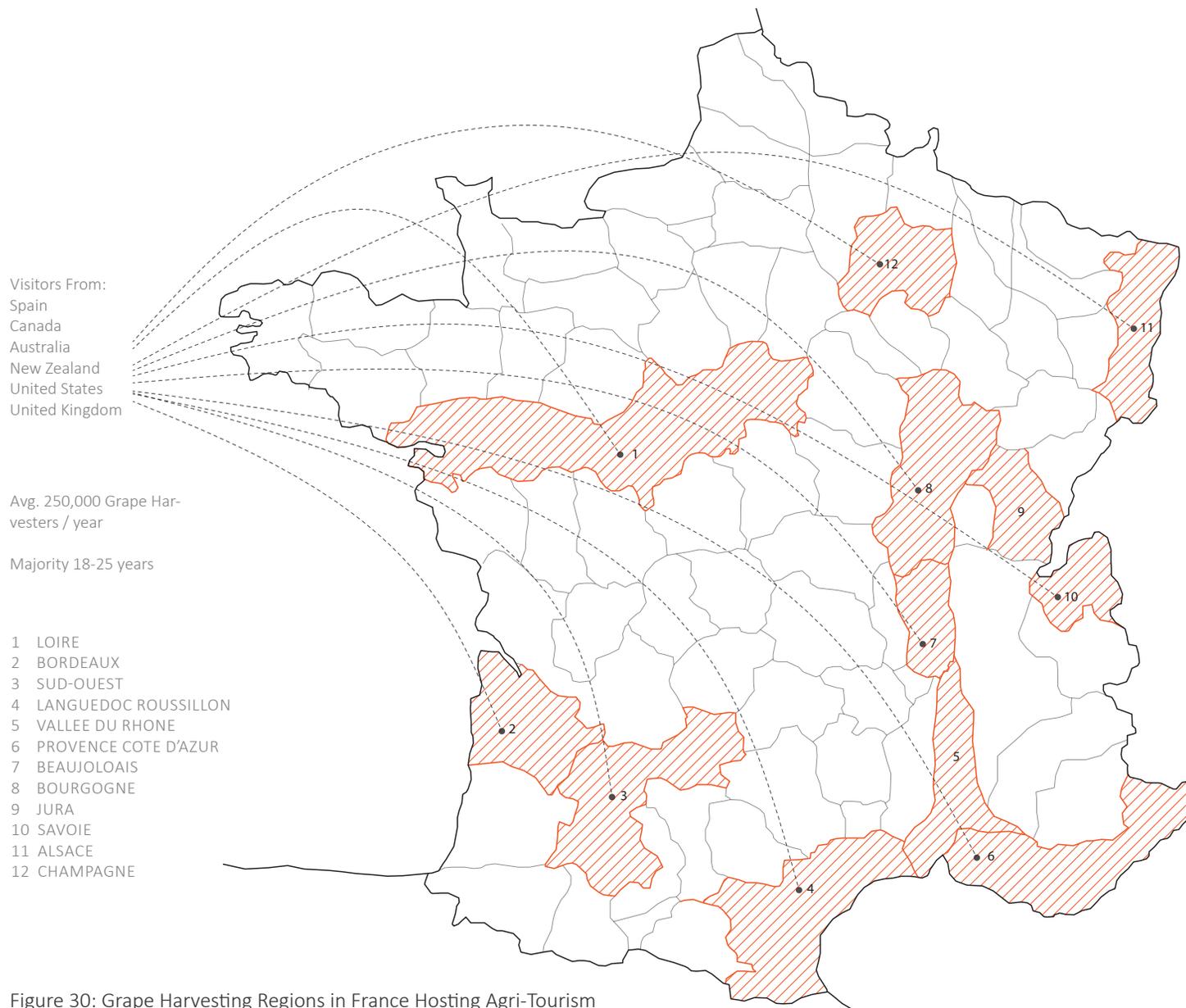


Figure 30: Grape Harvesting Regions in France Hosting Agri-Tourism



Fig 31: The Mangrove Information Center in Bali, an eco-tourism facility, lacks popularity and is only able to survive economically through financial aid.

Expressing the concern that these types of tourists represent a very small portion of the population, Richard Butler, a professor of geography who actively studies tourist patterns, explains that the rejection of mass tourism and promotion of alternative tourism is problematic precisely because “many people seem to enjoy being a mass tourist”³. McKercher outlined a similar argument in the first issue of the *Journal of Sustainable Tourism*, stating that “tourists are consumers, not anthropologists”⁴. While the models of agritourism in France and the agenda of Culture Xplorers display a sensitivity to socio-economic, cultural, and environmental contexts, they are small scale operations that are not only absorbing a minor percentage of tourists, but also cater to those tourists who are already inherently concerned with their impact and not typically associated with the negative ramifications of the industry. In Bali, although models of alternate tourism exist sparsely, they attract a very small portion of the tourist population, and for this reason are often not economically successful or able to

have a significant impact on the island. One such example is the Mangrove Information Center, which attempts to propose a more localized and contextually sensitive tourist experience, offering activities such as kayaking, walking, and birdwatching through mangrove trails, but is only able to survive economically through financial aid. The center receives 6,000 visitors annually, less than 1% of the island’s tourist arrivals, and does not earn more than \$42,000 per year⁵. As annual maintenance costs of the trails are almost twice as much as the center earns, approximately \$80,000 per year, the facility has only been able to survive because it is supported by a major aid agency, JICA, which has a strong financial base⁶. Considering that the majority of foreign arrivals to Bali are mass tourists, perhaps it may be more relevant to ask how architecture might begin to facilitate a more responsible framework for tourism and tourists to operate on, instead of depending on inherently responsible tourists.

Besides the limited percentage of tourists that

alternative tourism absorbs, perhaps the largest criticism against the success of alternative tourism is the 'development against capitalism' argument. Brian Wheeler's argument, from the 1990s, is still very much valid as the professor of tourism writes: "we have, on the one hand, a problem of mass tourism growing globally, out of control, at an alarming rate. And what is our answer? Small scale, slow, steady controlled development"⁷. While the lack of popularity of the Mangrove Information Center in Bali is often attributed to lack of access, ecologically sensitive sites such as these, which are often the sites for alternative forms of tourism, must also be careful in balancing economic profits and tourist arrivals, because of their sensitive carrying capacity. The ideal ratio for the MIC mangrove forest, is for less than five tourists to be led by one guide⁸. The center can only provide a fixed number of tours a day, and a fixed number of tours at a time, so if tourist numbers were to greatly increase in order to generate more income, the site would encounter other management difficulties in relation to carrying capacity. The balance between economic growth and managing a sustainable carrying capacity is a challenge eco-tourism projects have to consider significantly. The difficulty in achieving this balance suggests that it does not seem viable for them to exist in isolation from mass tourism, especially considering the growing volume of tourists world-wide (as Wheller points out).

In developing countries, where the tourist industry is employed as a means to increase economic growth, unique tensions arise between economic and equitable development. Typically, it is the larger scale corporations and foreign-owned companies, such as metropolitan airlines and hotel chain companies that have the most influence on tourist flows, because their funds and connections extend their ability to extensively advertise to tourist-source countries⁹.

Advertisement of selective experiences shape tourist expectations, and are typically only quenched by large scale, resource intensive hotel resorts¹⁰. The political economy at play significantly reduces the ability of small scale, local operators to remain economically viable because of limited resources, connections, experience, and funds.

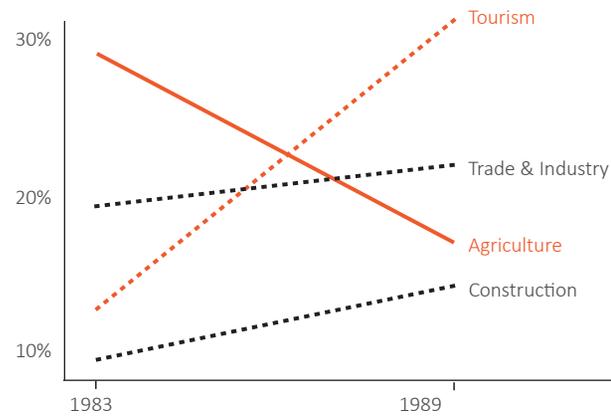
Butler thus argues for a movement away from the dichotomy of mass versus alternate tourism, and instead advocates a condition of balance: "balance between ecosystems, balancing economic and social goals, balancing the responsibility of the state with the rights of individuals and groups"¹¹. Especially in a context which inevitably attracts increasing numbers of mass tourists each year, and one in which the government relies on the tourist industry to propel the economy, perhaps it would be more viable to question the relationships that could be established between the highly profitable mass tourist industry and more ecologically sensitive alternative forms of tourism, rather than completely trading the former for the latter. Acknowledging that the operators of mass tourist facilities often have more political and economic power to impact change at a faster pace on the island, how can architects optimize their role in the creation of these facilities to begin to develop more inherently sustainable tourist infrastructures?

Accepting that tourism is a capitalistic endeavor, with the primary concern of economic gain, instead of barring mass tourism, perhaps it might be relevant to question how it would be possible to hijack the system, allowing mass tourism to continue operating for economic gain, but in a way that might begin to leverage local stakeholders. What is the role of architecture in intervening in a context charged with questions regarding rights to territory and resources, and in navigating economic and equitable development?



5 ECONOMIES AND CULTURES OF BALI

An underlying premise of alternative tourism is the idea of building to accommodate the specific activities and events of a place, such as the agriculture industry, rather than building for hospitality itself. In Bali, agriculture, and especially wet rice agriculture, holds significant cultural importance as it associates itself with social, religious, and spiritual dimensions. Although it was once the dominant industry on the island, the growth of mass tourism that began in the 1970s progressively reduced its role in the economy (Figure 33). However, an increasing population and demand coupled with a decrease in agricultural production, amounts to a scenario of unsustainability and threatens food security. The Bali bombs of 2002 and 2005 were a wakeup call to the government however, who realized that the dependence of 70% of Bali's economy on tourism was not economically sustainable (Figure 34). The government recognized that the neglect of farming was a "deep wound"¹ to the economy that could only be resolved when the industry worked "in parallel"² with tourism.



TOURISM, WATER, & AGRICULTURE

A closer study into the agriculture industry reveals that it is not only in threat by competing land developments in the tourism industry, but also because of the fresh water shortages the island is experiencing. The government has issued a statement that Bali will face a water crisis in 2015 with an estimate deficit of 27,000 gegaliters³. The tourist industry currently consumes 65% of Bali's fresh water supply, with tourists in resorts consuming approximately 2400 L/day/tourist compared to an average local who would typically consume 150L/day⁴. Golf courses consume an average of 3 million liters of water a day⁵. More than half of the water from a new reservoir built in Tabanan, that was meant to be utilized for wet rice farming, is being diverted to the south of the island to supplement hotels⁶. The vast difference in the consumption of a scarce natural resource in a developing country, and the politics surrounding the diversion of water away from rice fields to luxury resorts, raises questions regarding rights to territory and resources.

Fig. 32 (previous page): Wet Rice Agriculture, which was historically the dominant industry, carries much cultural and spiritual significance for the Balinese
Fig. 33 (above): Percentage of Workforce Deriving Primary Livelihood from Mentioned Sectors

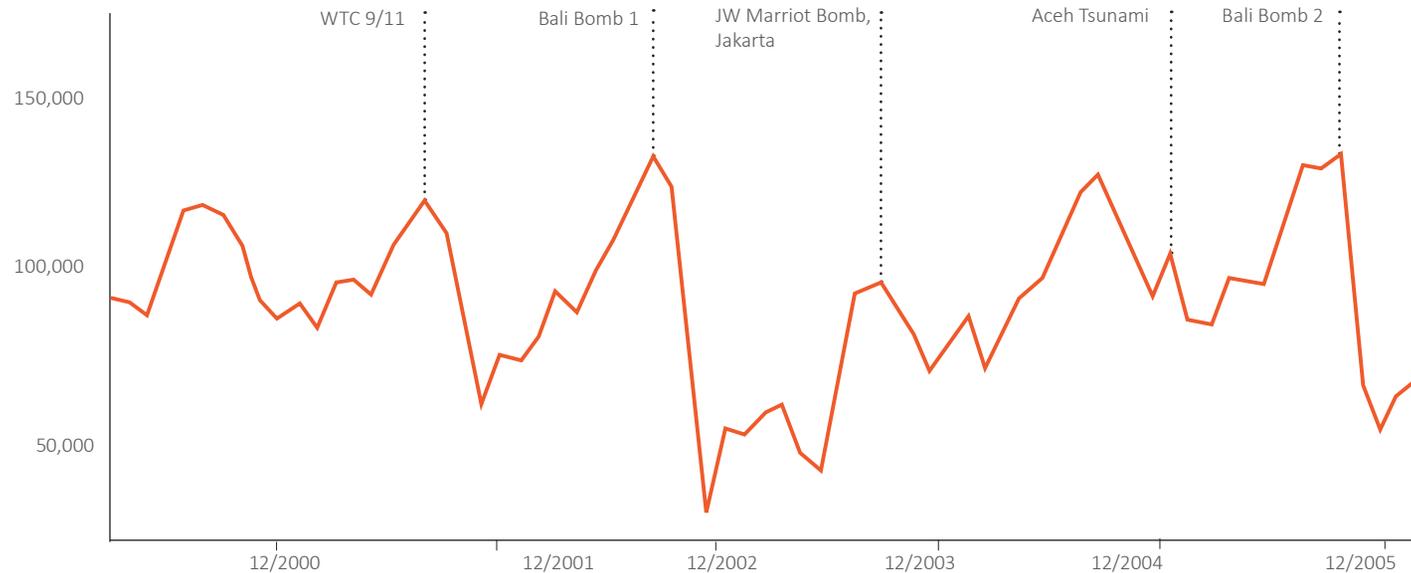
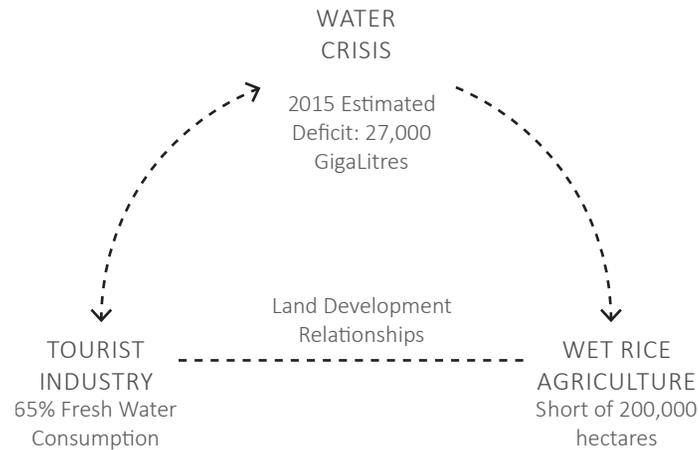


Figure 34:
Foreign Arrivals
Through
Nugrah Rai Int'l
Airport Bali

While tourism has given rise to many water-related issues, the provision, storage, and distribution of water on the island also generally lacks efficiency. The two most pressing issues in Bali regarding water are water quality, and access to water⁷. While most households and businesses are connected to piped water, the infrastructure is unreliable as there is a collective complaint regarding the flow of water down these pipes⁸. Consequently, almost all businesses and households obtain their freshwater from wells that range from 10-12m deep for households, to approximately 60m deep for large hotels⁹. Especially in areas with heavy concentrations of tourist developments, over pumping of groundwater is amounting to a scenario of a falling water table, salt water intrusion into groundwater, and an overall deteriorating water quality¹⁰. 260 of the 400 rivers in Bali have run dry¹¹ and the largest natural reserve of water, Lake Buyan, dropped 3.5m between 2004 and 2007¹². Most of the wells are not

metered and there is no system in place that measures how much water is being extracted¹³.

Taking into account the general lack of water infrastructure on the island, and given the economic power of the tourist industry, as well as their increased likelihood of contributing to the creation of an infrastructure over the government's own ability to do so, is there an opportunity for tourist facilities to alleviate some of their own future water stresses while leveraging local stakeholders as a result? What are the possibilities in optimizing such an infrastructure to simultaneously enhance the tourist experience?



WATER MANAGEMENT IN THE RICE FIELDS

Among the rice fields, water is managed through an active historical irrigation system organized around a hierarchy of water temples and social units called ‘subaks’ (Figure 36). Subaks are a primary unit of water management and consist of a group of farmers and rice fields sharing the same set of irrigation infrastructure. Technologically, subaks consist of dams and a system of collectively owned irrigation canals¹⁴. Physically, a subak includes all rice fields sharing the same set of irrigation infrastructure¹⁵. Socially, a subak includes all farmers cultivating those rice fields¹⁶. Religiously, subaks are linked to a hierarchy of water temples that manage the distribution of irrigation water¹⁷. There are an estimated 1200 subaks in Bali, of varying sizes, with an average subak consisting of 200 farmers and 125 hectares of agricultural land¹⁸. (Another unit of management, that organizes labour,

is the ‘banjar’. Rice farmers are members of both subaks and banjars, while hired labour and harvesting teams belong only to the Banjar unit¹⁹.)

Within this water management system, water is delivered through a system of collectively owned irrigation channels (Figure 36). The flow of river water is divided by small simple weirs, which divert water into tunnels, and subsequently a series of canals and aqueducts that eventually deliver water to the highest point of a terraced rice field²⁰. Irrigation systems that originate at different weirs are interconnected in order to enable unused water to be transferred across groups of rice terraces, depending on necessity²¹. Since the traditional irrigation system does not rely on irrigation dams or storage tanks, the irrigation flow is completely dependent on seasonal flows of rivers and springs²².

Figure 35: Networks of Water Flows Through 3 Key Irrigation Networks and Major Hotel Areas

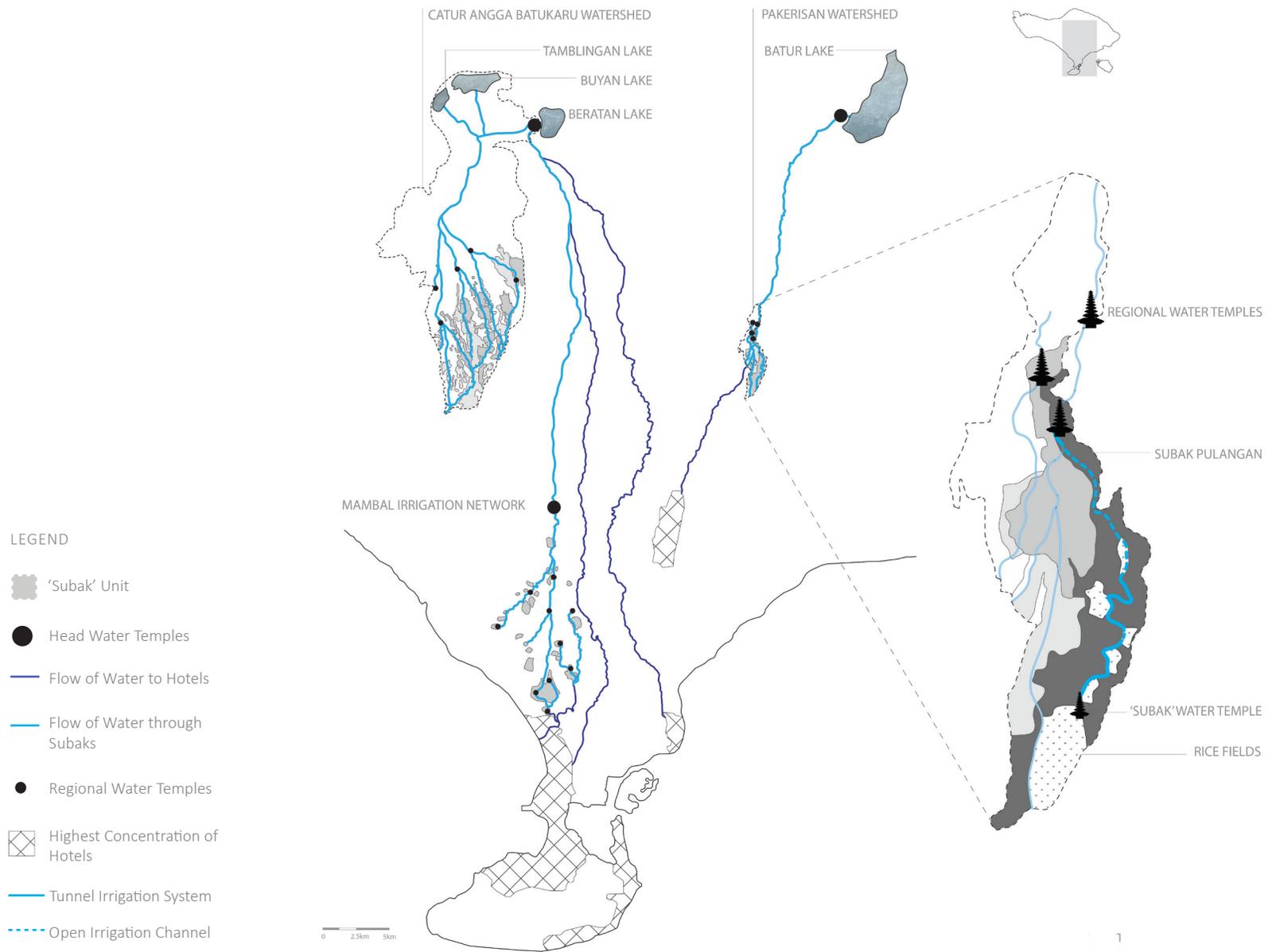


Figure 36: Subak Water Management Diagram & the Influence of Neighboring Hotel Developments

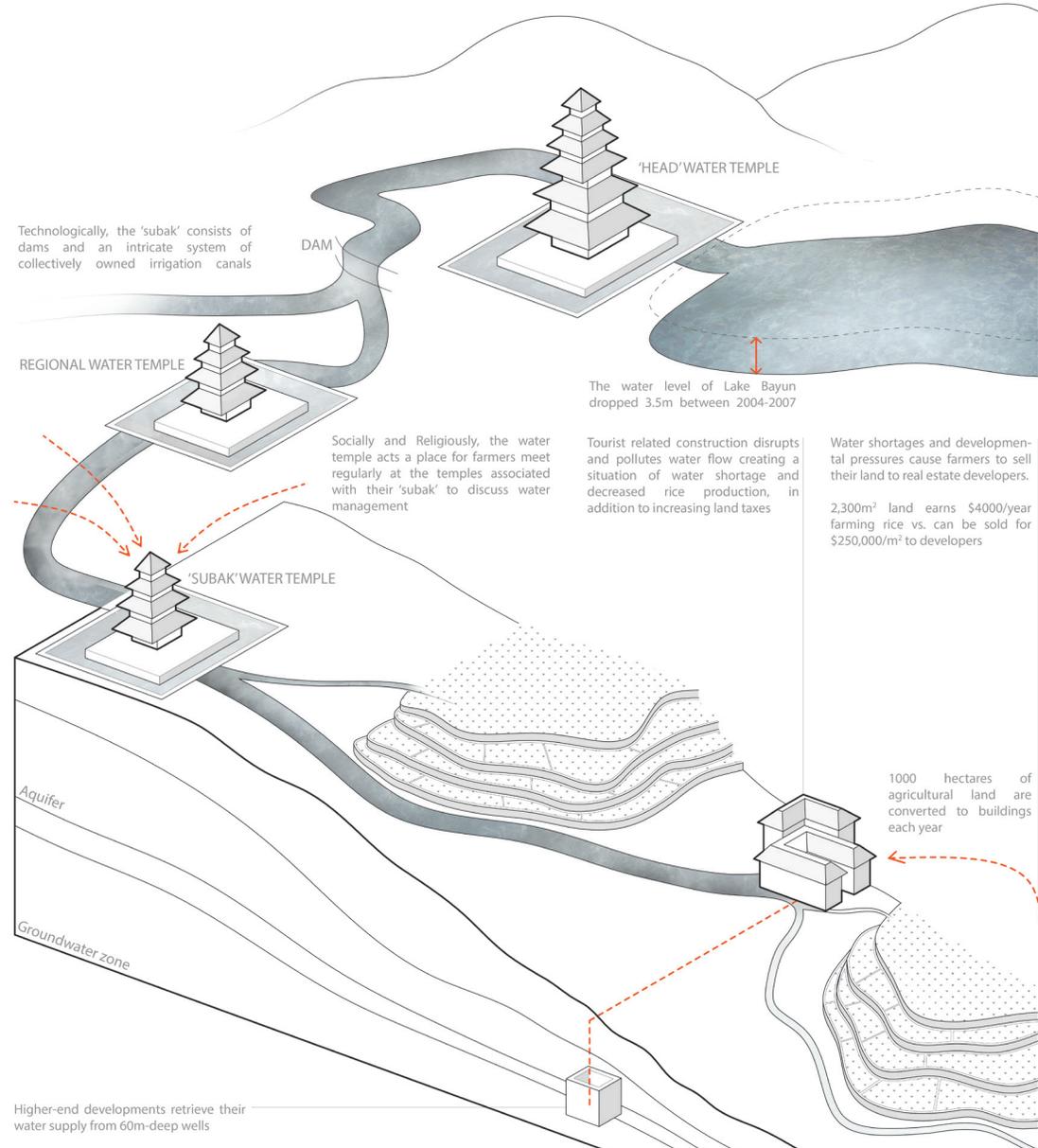




Figure 37:
The rice fields
create an
artificial pond
ecosystem that
cycle between
wet and dry
phases

Pulsing and seasonal flooding in the rice fields:

The coordination of seasonal water flows and growing cycles of rice are optimized to seasonally flood and drain the terraced rice fields. The controlled pulsing and coordination of wet and dry cycles enables a long term productivity of the artificial pond ecosystem (Figure 37). “A general theory in ecology holds that ecosystems which are characterized by steady, unchanging nutrient flows tend to be less productive than systems with nutrient cycles or pulses”²³. In the paddy fields, the pulsing of seasonal wet and dry phases creates a series of advantageous biochemical processes that contribute to long-term high yields. Some of these processes include the stabilization of soil temperature, and the management of nutrient absorption into the subsoil²⁴.

Interconnected networks of water sharing:

Unlike conditions of smooth rivers running through

flat plains where farmers can tap into the main irrigation canals without needing to coordinate much with their neighbors, the rugged topography of Bali creates a condition where every farmer is dependent on the irrigation system that begins much further upstream and passes through several other fields before reaching their own²⁵. Cropping schedules of upstream neighbors directly influence the amount of water that downstream neighbors receive. Due to the interconnectedness of the irrigation system, and an understanding of much larger ecological contexts, the Balinese have developed a coordination system that optimizes water sharing. Upstream neighbours are not reluctant to release water to the downstream fields because by synchronizing planting and fallow periods, pest populations are controlled²⁶. If the cycles were not synchronized, then pests from downstream fields could migrate to upstream fields²⁷. (Stephen Lansing, an anthropologist who studied

the Balinese irrigation systems extensively, conducted a survey in ten subaks to investigate whether farmers were more concerned about pests or water shortage²⁸. His results revealed that upstream subaks were worried about pests while downstream subaks were more concerned about receiving an adequate supply of water²⁹. By engaging in a relationship through the subak units however, farmers are able to minimize the effects of these constraints and maximize yield.) This relationship is established between dozens of subaks in a highly interdependent, interconnected irrigation system. In a study he conducted to understand how the subaks could manage to achieve such accurate coordination in a large complex system, Stephen Lansing's results revealed that the water temple networks were responsible for optimizing a balance between the two opposing constraints³⁰. The water temples are not only a space of religious and social significance for the communities they serve, but also act as



reservoirs and provide a space for farmers to meet biannually to discuss water sharing within the subak unit³¹.

WATER TEMPLES

General relationships of temples to society:

In Bali, all social units (markets, households, villages) have their own altars or temples dedicated to a specific deity so that “each social unit forms the congregation of a specific temple or shrine, which symbolically defines its place in the Balinese social universe”³². The temples are highly contextualized architectural symbols that spatially demarcate functional and social units. This tradition has continued to present day construction where banks, offices, and hotels will include small shrines, dedicated to no particular deity, to “superficially establish their identity”³³ (Figure 38).

Figure 38:
Shops often include small shrines, dedicated to no deity, to superficially establish their identity

Water Temples

The location of water temples, and their relation to upstream and downstream flow, are directly related to water bodies and local ecosystems. In this established hierarchy (Figure 39), each of the temples are not only physical demarcations of a hierarchy of water sources, but also establish a spatial relationship to specific components of the irrigated landscape³⁴. In spatially demarcating the conjunction of physical features of the landscape to social units, following logics of production, the water temples not only create a greater bioregional awareness but also make comprehensible, on a human level, through architecture, the large ecological networks at play. Besides serving a larger infrastructure, water temples are also significant religious and social spaces. These temples contain multiple pools of water, typically organized around three courtyards, that serve different functional purposes (Figures 40-41). The outer courtyard usually contains a storage pond, acting as a reservoir for lake water, the middle courtyard contains purifying bathing pools, and the inner courtyard contains temple shrines and relics.

THE IMPACT OF HOTELS ON THE HISTORIC IRRIGATION SYSTEM

As hotel developments encroach on agricultural land, the flow of water in this irrigation system is sometimes interrupted and often polluted. (The disruption of these

irrigation networks is exaggerated further by Bali's waste disposal problem, where there is inadequate infrastructure to manage waste on the island and consequently most hotels dispose their waste into rivers.) As the channels of water are supporting a string of rice fields, and as the system is so interconnected, the interruption of water negatively affects not one, but a whole series of downstream rice fields.

As water shortages amount to decreased rice production, and consequently decreased earnings for local farmers, productive land is being converted to vacation homes and hotels at a rate of 1000 hectares annually³⁵. Bali is currently short of 200,000 hectares of land to sustain the demands of rice for its tourist and local population³⁶. As resorts insert themselves among the rice fields (in order to deliver an image of an environmentally sensitive, authentic cultural experience), land values and consequently land taxes drastically increase for nearby farmers. Decreasing rice yields coupled with increasing land taxes amounts to a scenario where farming continues to decrease in economic viability. A 2,300m² area of land for example, earns approximately \$4000 / year farming rice, but instead could be sold to developers for \$250,000/m²³⁷.

In this politically charged context, what is the role of architecture, as the hosts of the tourist industry and as nodes in an infrastructural system, to mitigate the water stresses on the historic irrigation system?

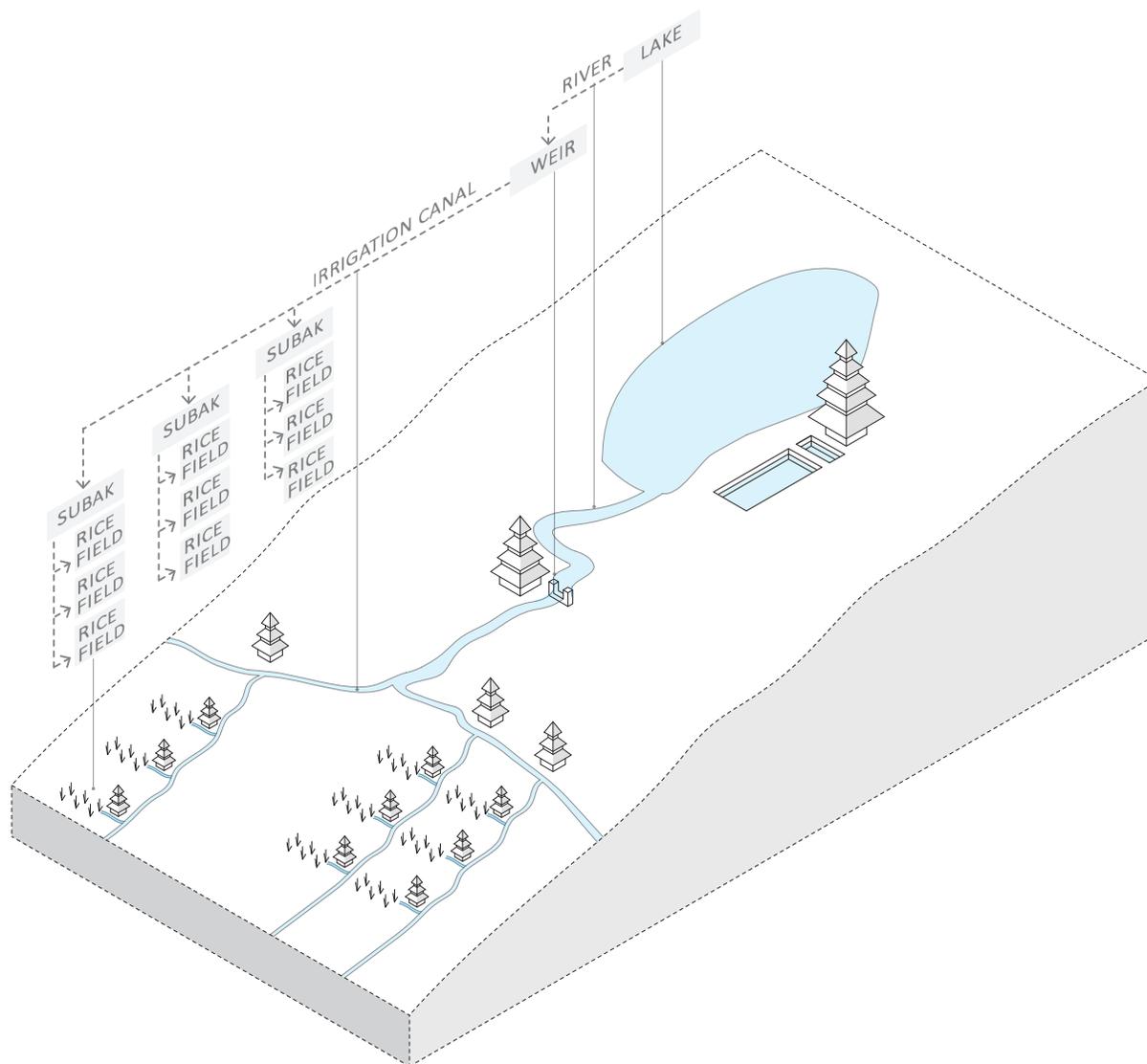


Figure 39: The location and hierarchy of water temples demarcate the conjunction of physical features of the landscape to social units, following logics of production

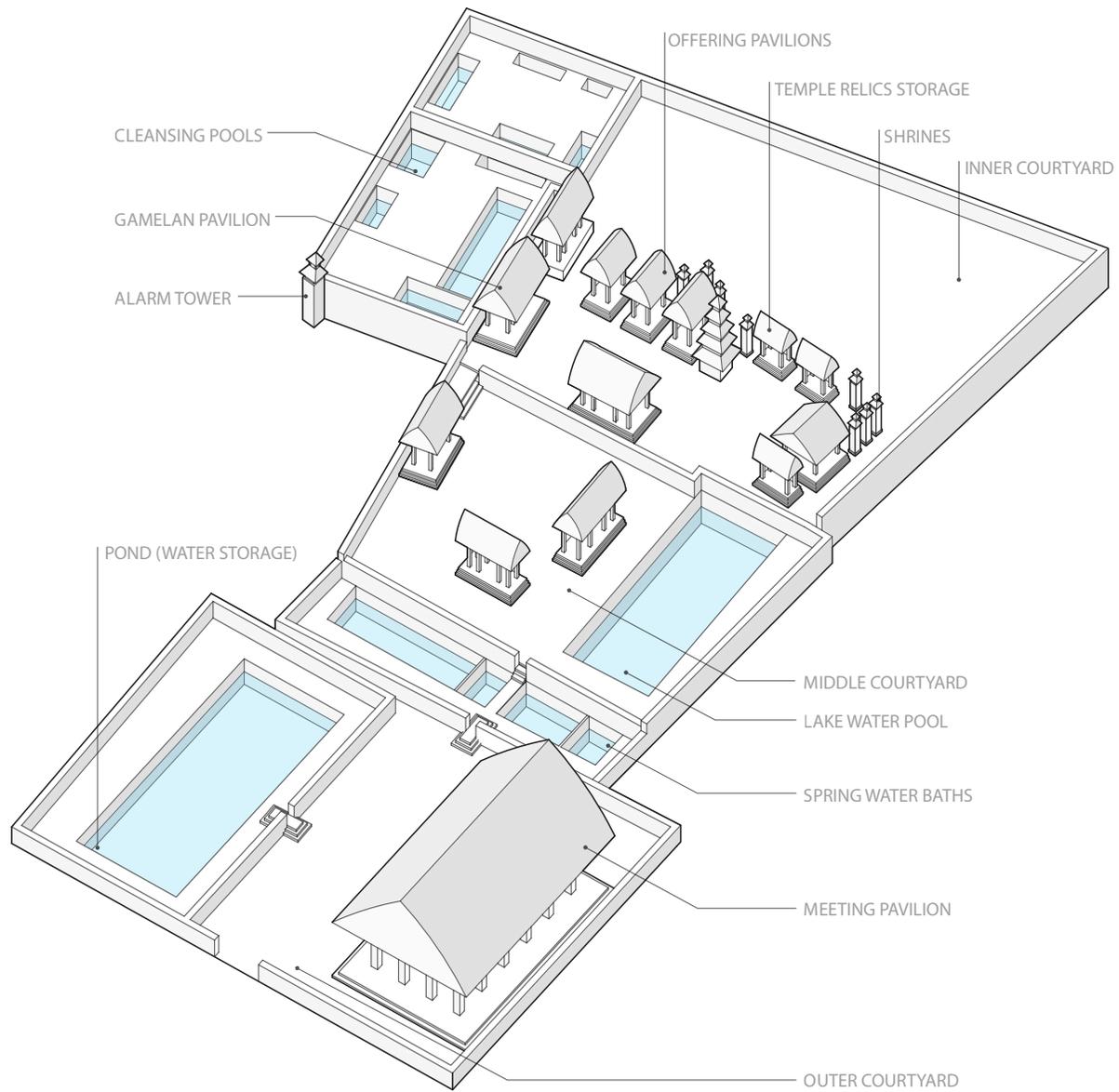


Figure 40: Axonometric of Tirta Empul Water Temple. Water Temples are typically organized around three courtyards.



Figure 41: Water temples contain multiple pools of water that serve different functional purposes, from storage pools to purifying bathing pools.

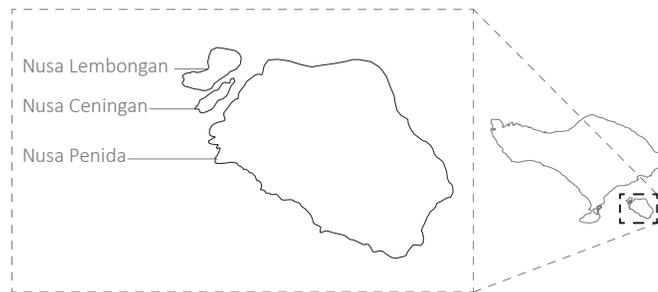


Figure 42:
Reference
Map indicating
location
of Nusa
Lembongan,
Nusa Ceningan,
Nusa Penida
(presently
emerging as
new frontiers
and host to the
largest area
of seaweed
farming in Bali)

SEAWEED FARMS

Another industry facing decline in the face of tourist developments, but one whose landscapes have also attracted tourists and have the potential to host more sustainable tourist facilities, is seaweed farming. Seaweed farms were historically a significant source of income for coastal villages in Bali, and contributed to a sizeable portion of the economy. Prior to the arrival of the tourist industry, the dominant industry on the islands of Nusa Lembongan, Nusa Penida, and Nusa Ceningan, (three islands separate from the main island but still classified as part of Bali (Figure 42)), was seaweed farming. According to a 2009 survey by the Native Conservatory, there is a cumulative total of 3 acres of seaweed farms across the three islands³⁸. As the islands are presently emerging as new frontiers, and gaining increasing popularity among tourists, organizations such as the Indonesian Association of Seaweed (ARU) are encouraging seaweed farming villages to play host to eco-tourism³⁹. Resorts are already beginning to quickly sprout along the coastlines of Nusa Lembongan, but as they territorialize the coastal land

and privatize beaches, seaweed farmers have diminished access to the shallow waters used to grow seaweed and have to travel further in search for vacant land to dry their seaweed under the sun⁴⁰. The increased labour associated with this is imposing greater pressure on the seaweed industry, resulting in a gradual decrease in farmers as farmers trade in agricultural assets to work in the more immediately profitable tourist industry⁴¹. The significant decrease in seaweed production over the past few years among these islands, from 40 tons/month to 25 tons/month⁴², illustrates the extent of tourism's impact on the industry. Ironically but not surprisingly, the arrival of a steadily increasing number of tourists, is threatening the very industry that attracted active tourists here initially. The decrease in seaweed farming not only has social implications but environmental ones as well. The growth of seaweed promotes bio diversity by creating added niches for local species of fish, shellfish, and invertebrates⁴³. The decrease in seaweed farming will threaten the bio diversity of these areas, which in turn has negative implications for the tourist industry as these are popular snorkeling locations.



Figure 43:
Seaweed
Farming
in Nusa
Lembongan.
Seaweed is
grown on
submerged
strings
stretched
between
bamboo poles
or mangrove
posts

Nusa Lembongan, Nusa Penida, and Nusa Ceningan are interesting sites to engage in the conversation because they are presently emerging as ‘new frontiers’. How can a development scheme for these islands address the growing number of tourists, but ensure that they don’t fall into the state of ‘second-tier tourist areas’ as Kuta did? How can a model for development facilitate the possibilities of enhanced translatability so the two industries can exist symbiotically without having to trade off one for the other?

SEAWEED FARMING PROCESS

The seaweed is grown on submerged strings stretched between bamboo poles or mangrove posts spread approximately ten meters apart⁴⁴ (Figure 43). It is grown in areas of fairly shallow waters; at low tide the water level may be around 10 centimeters high (but the seaweed is always submerged), while at high tide the water level may reach two meters in height⁴⁵ (Figures 44-45). The base farming unit is a ten meter by ten meter plot, worth around CAD\$30, and typically a family owns three to five of these plots⁴⁶. The

most commonly grown species is spinosum, which sells for CAD\$0.26-\$0.29 per dried kilogram⁴⁷. (*Euchema Cottonii* is also farmed, and sells for CAD \$0.48-0.53 per dried kilogram, although their seedlings cost more too⁴⁸).

Farmers go out daily on their boats, or on foot during low tide, to harvest mature seaweed and tend to the growing plants. Once harvested, the seaweed is brought to land and spread on tarps to dry under the sun. The drying process lasts typically two to three days in the dry season, but can extend up to a week in the wet season. Once dry, the seaweed is bundled and stored in large storage warehouses, before it is sold to be exported. While the seaweed grown is of high quality, the raw product sells for a very minimal value. Processing the seaweed would greatly increase the potential earnings for the industry, but processing facilities do not exist in Bali.

*“While we often talk of environmental conservation, we often fail to consider the impact of the loss of the fabric of the communities that draw in tourism in the first place”*⁴⁹

– Liza Dwn, Chief Operations Manager for the Role Foundation

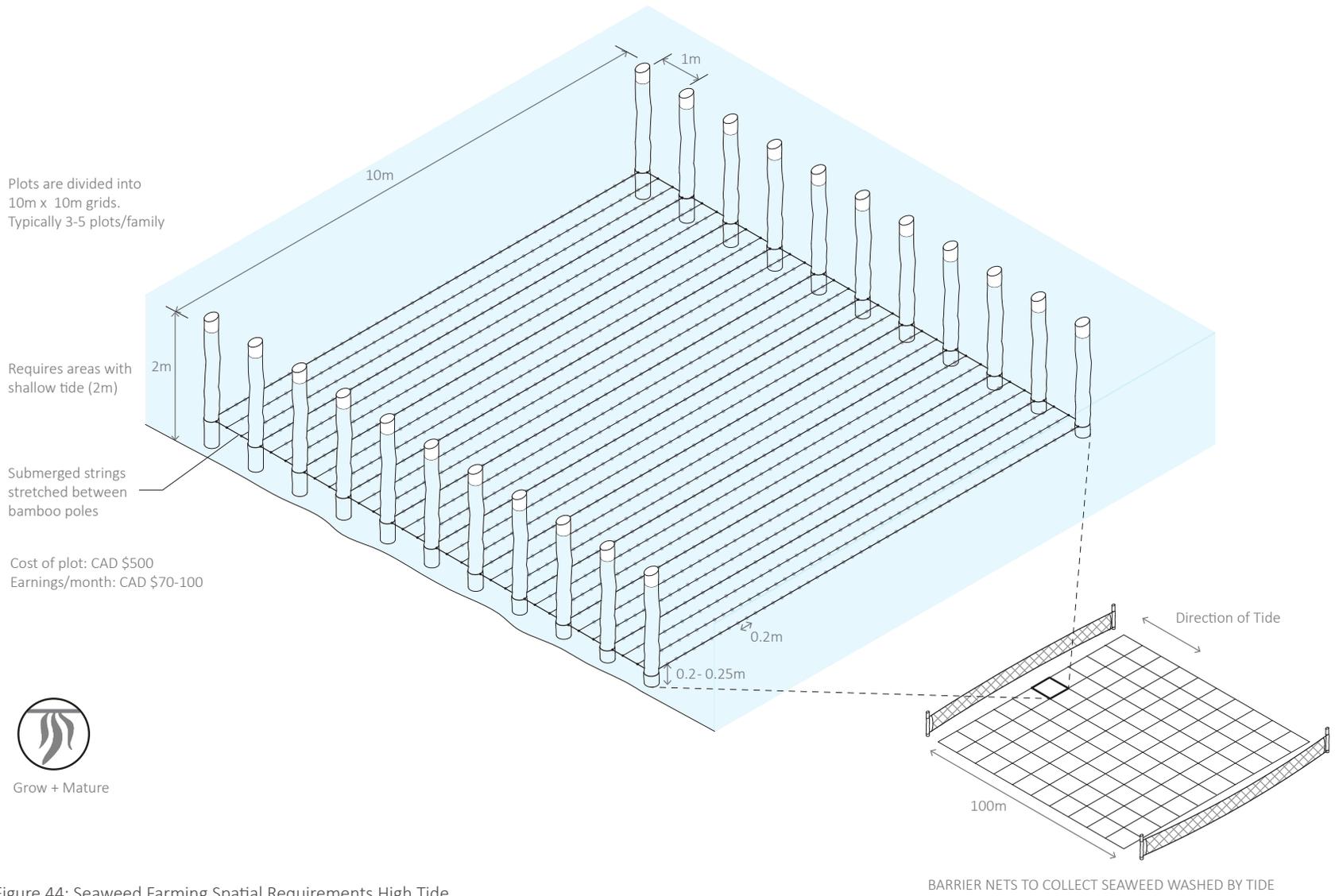


Figure 44: Seaweed Farming Spatial Requirements High Tide

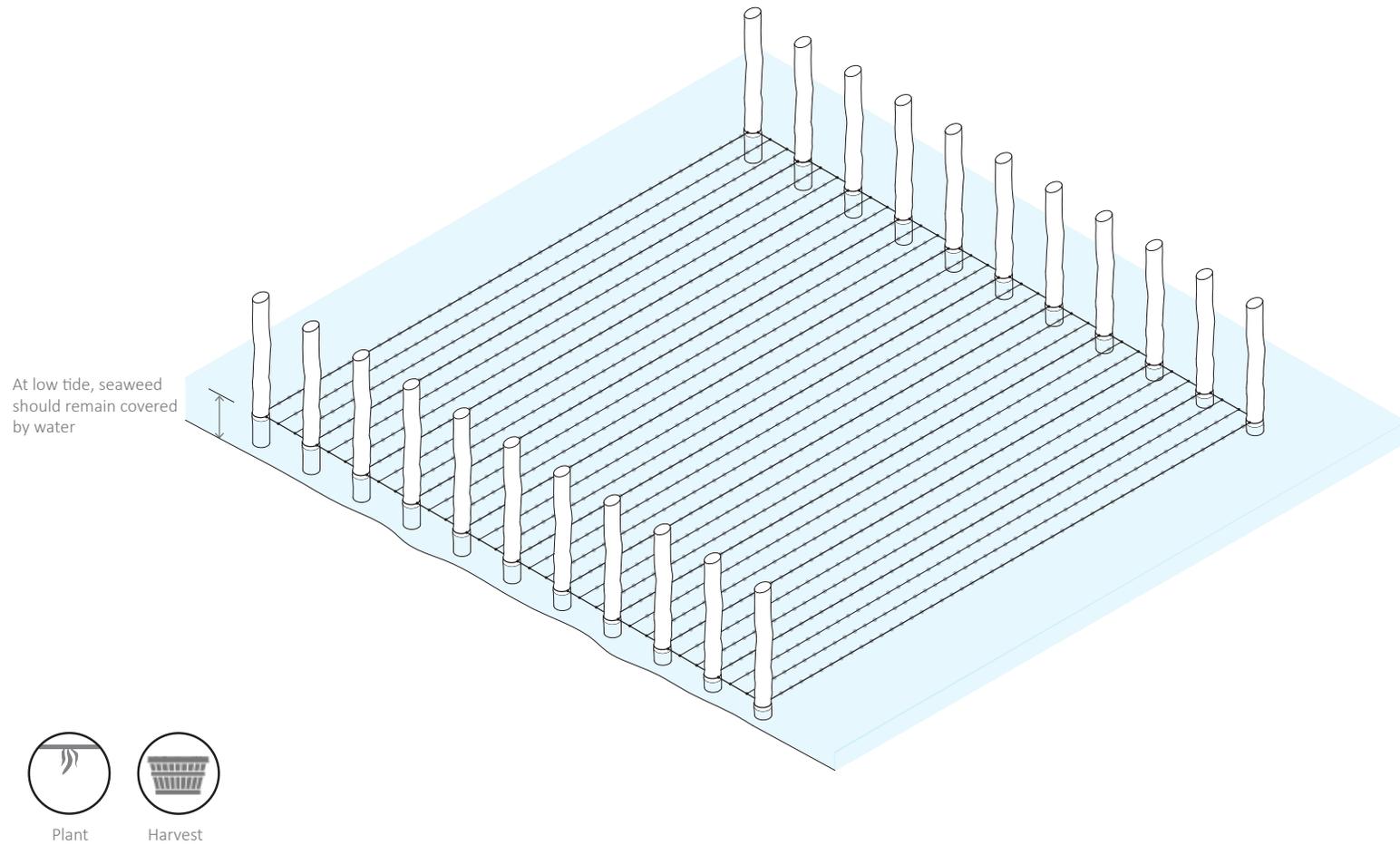


Figure 45: Seaweed Farming Spatial Requirements Low Tide

SYNTHESIS + DESIGN INTENT

While tourism has imposed some burdens on Bali, there are reasons that the industry continues to expand and that the government continues to pursue it as a key aspect of the national development agenda. While most of these benefits are monetary, their impacts can sometimes trickle down to improving social conditions. Although the direct profits of luxury resorts often stay in the hands of foreign investors and hotel operators, these facilities do generate a significant amount of employment within the industry as well as in related industries, such as construction. Based on data from Bali's Minister for Culture and Tourism, the tourist industry employs 65%¹ of the workforce. While the majority of the types of jobs created in these facilities do raise political questions about rights to territory, access and power, following the construction of the Ngurah Rai International Airport, Bali has emerged as one of the richest provinces in Indonesia². At 4.5%³, the percentage of the population that lives under the poverty line is much below the national poverty percentage, which sits at 13.3%⁴. Neighboring islands such as North Lombok and West Nusa Tenggara, islands that have not developed active tourist industries yet, have poverty rates of 43.1%⁵ and 22%⁶ respectively. An active tourist industry also generates the construction of services such as hospitals and infrastructure, all of which ameliorate the conditions for the population as a whole. With the promotion of cultural tourism, the positive ramifications of the tourist industry expand to include preservation. While there have been many debates about the impact of tourism on culture, and the exploitation of sacred cultural activities for tourism, certain benefits are also evident such as the provision of funds to maintain and restore historic sites and temples⁷. Without the economic generation of the tourist industry, these sites might not otherwise have direct access to funds to maintain the spaces hosting cultural activities.

The presence of tourism on the island thus has an interesting dichotomy: while it often leads to negative environmental ramifications, its economic power greatly facilitates the possibility for it to impact positive change on the island. While this balance currently appears skewed, it seems that there are opportunities for architecture to intervene and begin to shift the balance. Considering that it is the capital-intensive developments of the tourist industry that have a significant amount of power in massaging policies and implementing change at a much quicker pace than any other force on the island, perhaps architecture can employ these agents as economic levers to ameliorate some of the environmental conditions in Bali. How can architecture begin to play with politics to leverage change? How can architecture employ the structure of these organizations, which often mix with political and economic agendas, to gain access to political platforms? The project is interested in finding traction in the tensions that arise in the mediated space between the often opposing groups of a foreign elite class and local farmers.

By employing the capital powers of the tourist industry as agents of change, the thesis seeks to question how tourist developments can have a more symbiotic relationship with the island. How might architecture intervene in a politically charged context to begin the shift the balance on the island? Based on the conducted research, it appears that a large portion of the negative impacts that result from tourism, arise from the notion of static places. Developments impose relatively permanent impacts on the towns they concentrate themselves in, and even as tourists and investments move away, the ramifications of these developments are still heavily felt. On the other hand, farmers living in agricultural landscapes that have been deemed UNESCO Cultural Heritage sites feel constrained in their restriction to tend landscapes that

are no longer economically viable. In both conditions, these places exist as 'static' sites – one in a state of overdevelopment, and one in a state of museumification. The thesis seeks to investigate what would happen if we were to pulse these sites? Could this be a more sustainable form of tourism development?

DESIGN INTENT

Based on the research and documentation of tourism on the island, the proposal seeks to primarily address three fundamental issues:

a) Sprawl and the cyclical quest for 'untouched territories'

In the context of an island, which is a finite land form, how can the proposal mitigate the tendency of continually sprawling development as tourists search for 'authenticity'?

b) Moving towards resource equity.

How can the use of valuable resources, such as fresh water and land, be managed more effectively in the system, in a context where there is a high income disparity between a foreign elite class and the general population?

c) Spatial land use and economies

In a dominantly binary economy where there is a continuous trade off between Bali's two main industries, tourism and agriculture, how can the proposal create a more balanced condition for the two industries to co-exist as mutually beneficial agents? This may also involve attempts to begin to diversify the economy.

The design project seeks to propose an alternate model for tourism development that could be regenerative in order to create sites that pulse in time rather than sprawl outwards. The proposal intends to create conditions that will allow sites to pulse in their carrying capacities

of tourism and agriculture, in order to relieve them from the stresses of long periods of resource extraction. The thesis aims to develop a more symbiotic relationship between tourism and the island by working with the existing environmental, agricultural, and economic cycles at play. The intent is to create a network of sites that work in reciprocity within a larger system. Effectively, when one site is dormant or decreases in its tourist capacity because of agricultural demands, then the other sites in the system will become more active in their tourist capacity in order to still manage the high number of tourists that will inevitably keep visiting the island (Figure 46).

SITES

To test the proposal, three landscapes were selected to operate as a network of sites: rice fields, seaweed farms, and mangroves (Figure 47). Each of these landscapes have a degree of tourist draw to them, but are threatened by tourist developments in different ways. Within these landscapes, sample test sites were selected to develop a design proposal. The intention is that the approach towards developing the projects in each of these specific sites could transfer across the respective landscapes, and eventually the whole system could work as a network of pulsing sites in relationship with each other.

The test sites are unique and interesting to engage in a conversation because they are all at different stages of development. The areas surrounding the mangrove bay in the south of Bali, are heavily developed. The site selected in the rice field, in the district of Ubud, is representative of the approach to development among this landscape – spread out to create the feeling of immersion in the landscape, but still manifest as luxury developments with very deep impacts on their surroundings. The islands of Nusa Ceningan and Nusa Penida are currently emerging as new frontiers in Bali. By engaging these sites in a conversation, the proposal aims to ensure a more sustainable growth of tourism in Nusa Ceningan and Nusa Penida, and restore some sense of balance to the heavily developed areas surrounding the mangrove bay.

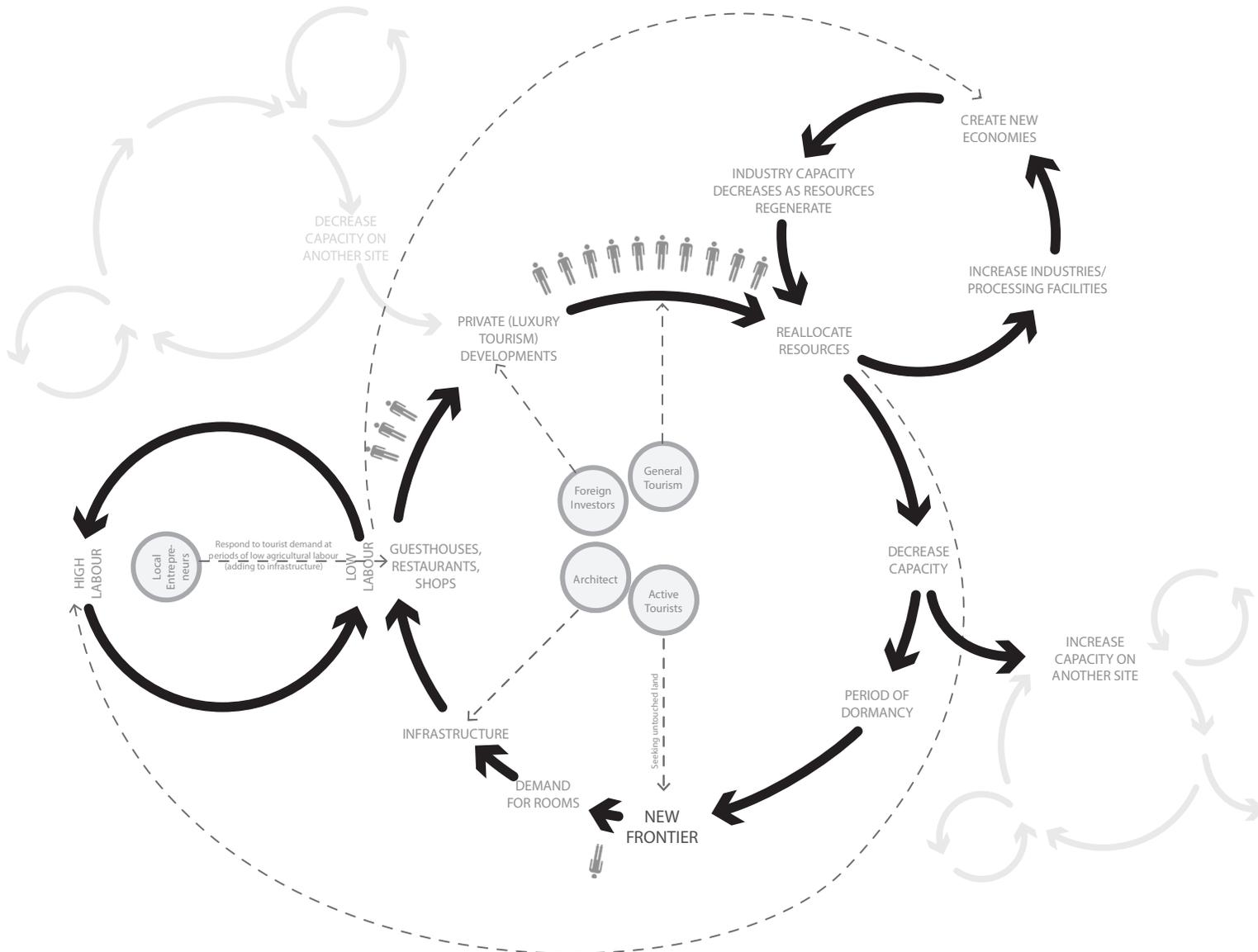


Figure 46: The project pairs tourist activities with existing cycles on the site, in order to create sites that pulse in their carrying capacities of tourism and agriculture

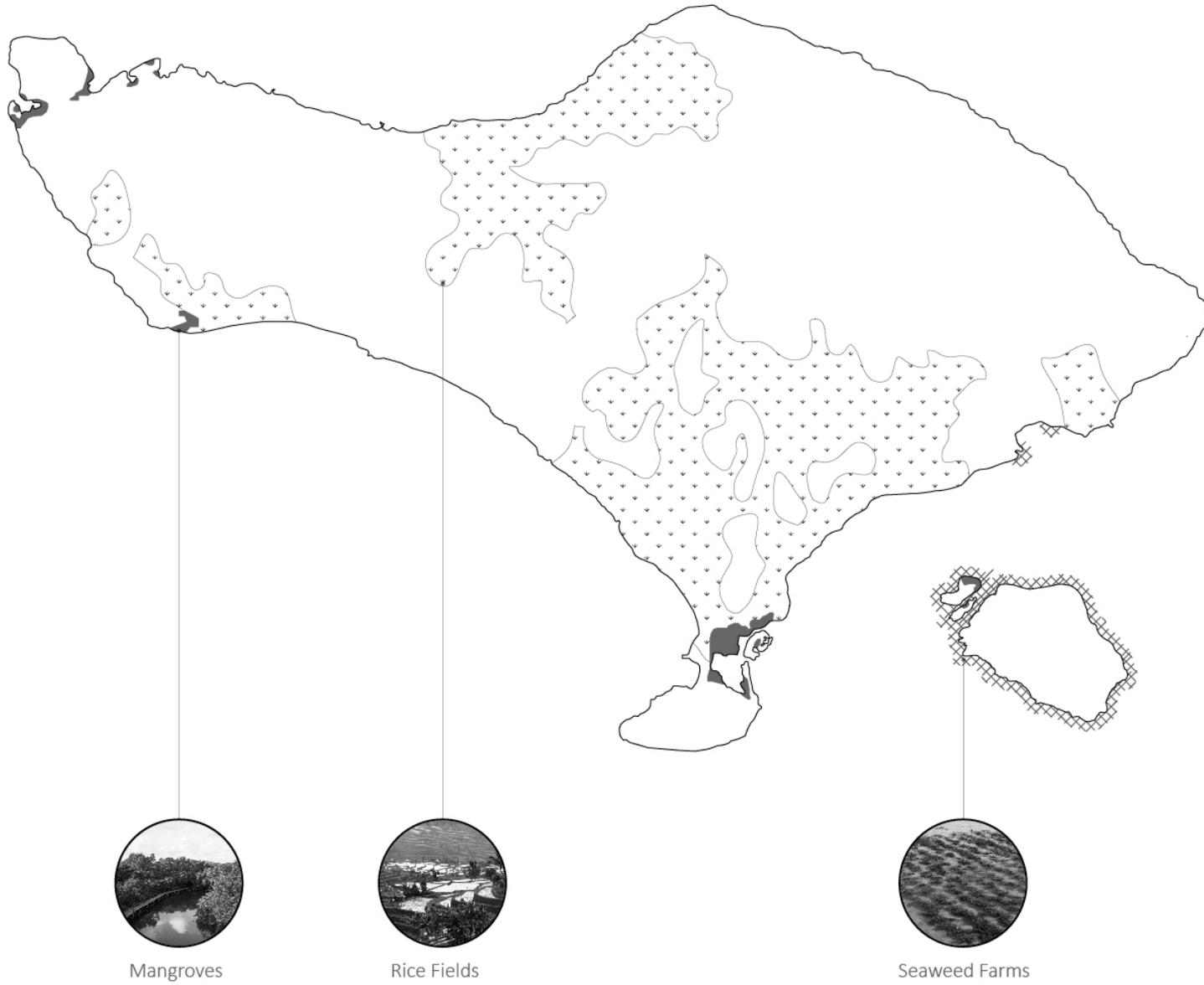


Figure 47: Three landscapes are selected to test the proposal

DESIGN PROPOSAL

Mapping the monthly tourist arrivals in Bali (based on the Bali Tourism Board's data on arrivals through the Ngurah Rai International Airport in 2014) it is evident that the island receives a fairly consistent influx of visitors, with minor peaks around August and December (Figure 48). This thesis seeks to question the possibility of redistributing tourist numbers across multiple sites, in order to respond to the demands and requirements of agricultural cycles. Instead of having a consistent competition over land, water, and labour resources, the thesis proposes creating a system that encourages periods of high and low tourist activity to enable different stakeholders to be leveraged at different times of the year.

Figures 49-50 document annual cycles of rainfall in agricultural zones, Figure 51 documents annual cycles pertaining to the rice fields, and Figure 52 documents annual cycles pertaining to the seaweed farms.

While Bali is a tropical island, receiving plenty of rainfall in the wet season, this water source is very rarely

captured or stored for use. Examining Figure 51, which plots the water requirements for the rice fields against the amount of rain the island receives, there are clearly periods of high and low excess water, if one were to assume on the dependence on rain as a water source. Based on these patterns, four conditions were identified, illustrated in Figure 53, ranging from periods of high excess water in the wet season to periods of low excess water in the dry season. The thesis proposes that each site is designed to respond to these four conditions, so that it is constantly evolving states in response to the annual cycles. Figure 55 illustrates that the benefit of working with a network of landscapes is that a reciprocity can be developed between them. While the high and low tourist seasons on each site vary in time, as a system they work together to absorb the total number of tourist arrivals. In order to illustrate the pulsing of these sites, the project will illustrate each landscape at its peak and lowest seasons.

FIGURE 48: TOURIST ARRIVALS THROUGH NGURAH RAI INT'L AIRPORT

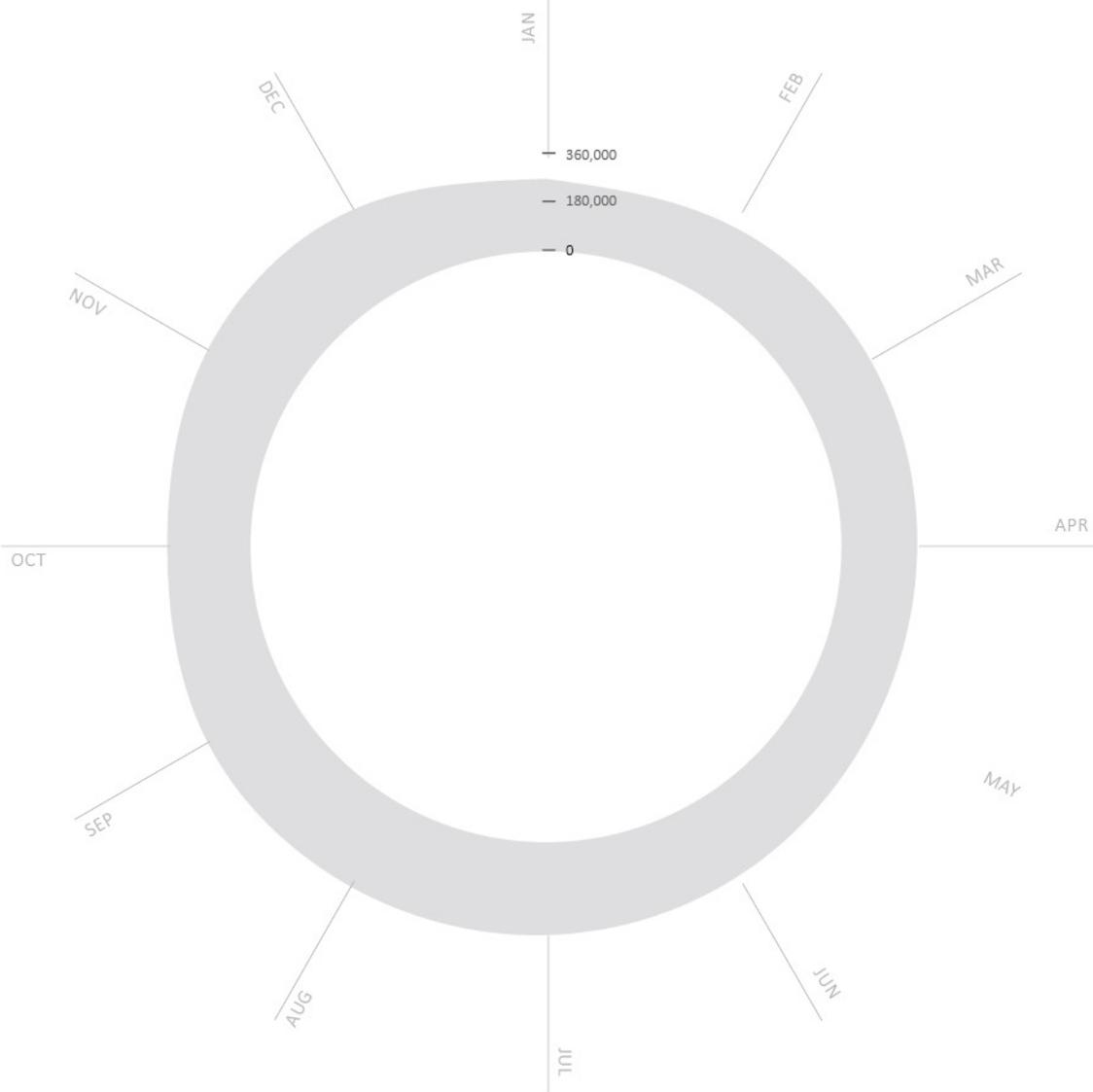
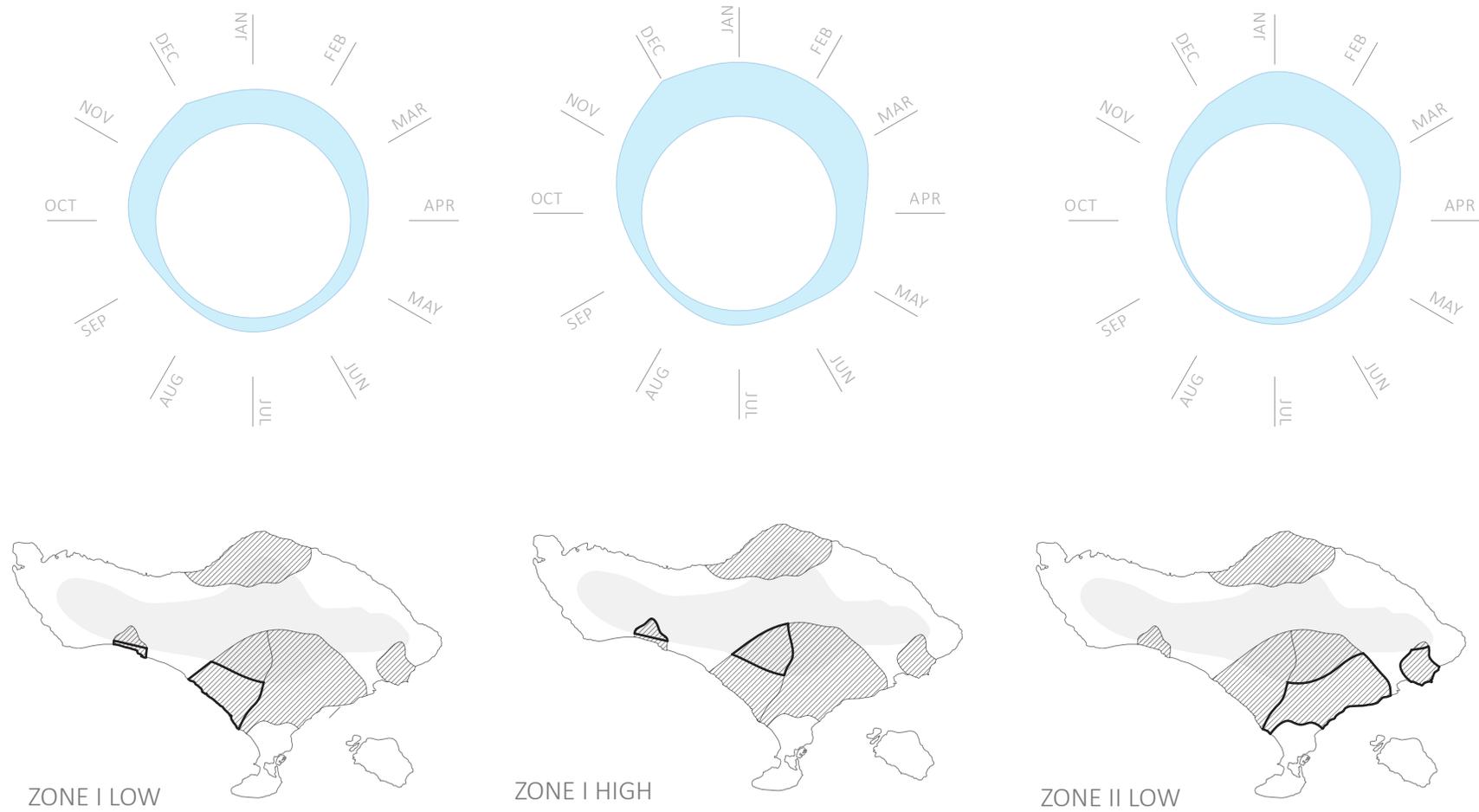
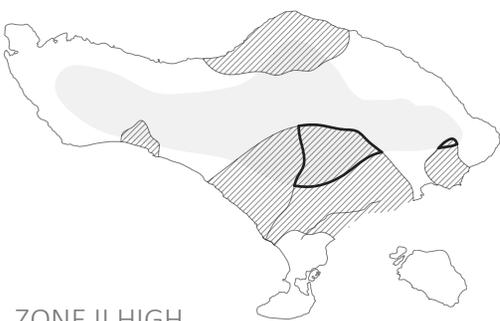
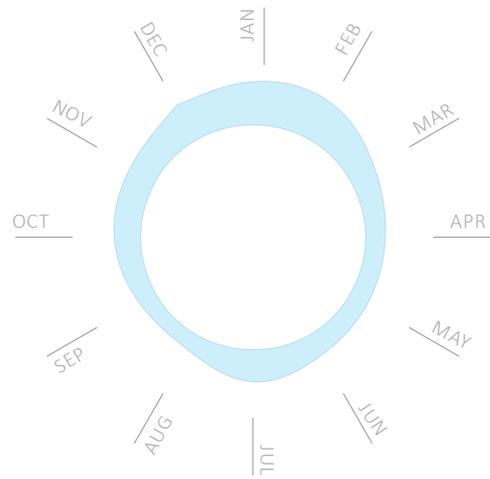
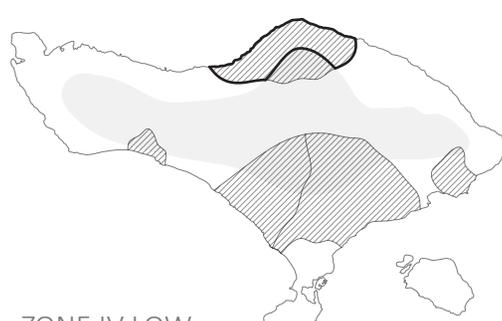
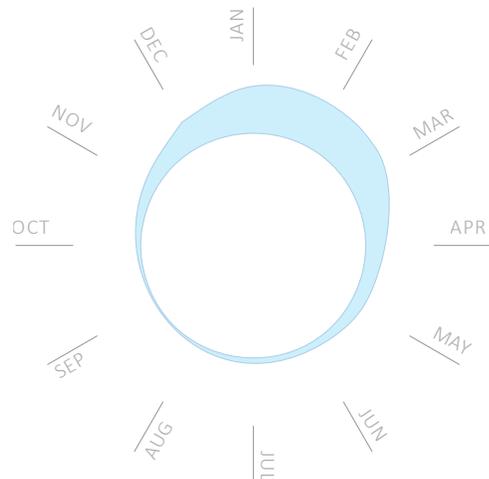


FIGURE 49: MONTHLY RAINFALL IN KEY AGRICULTURAL ZONES

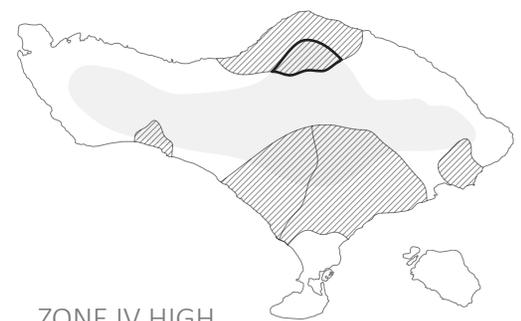
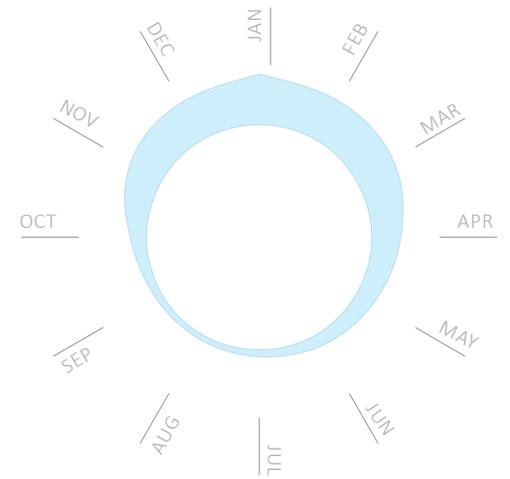




ZONE II HIGH



ZONE IV LOW



ZONE IV HIGH

FIGURE 50: WET AND DRY SEASONS

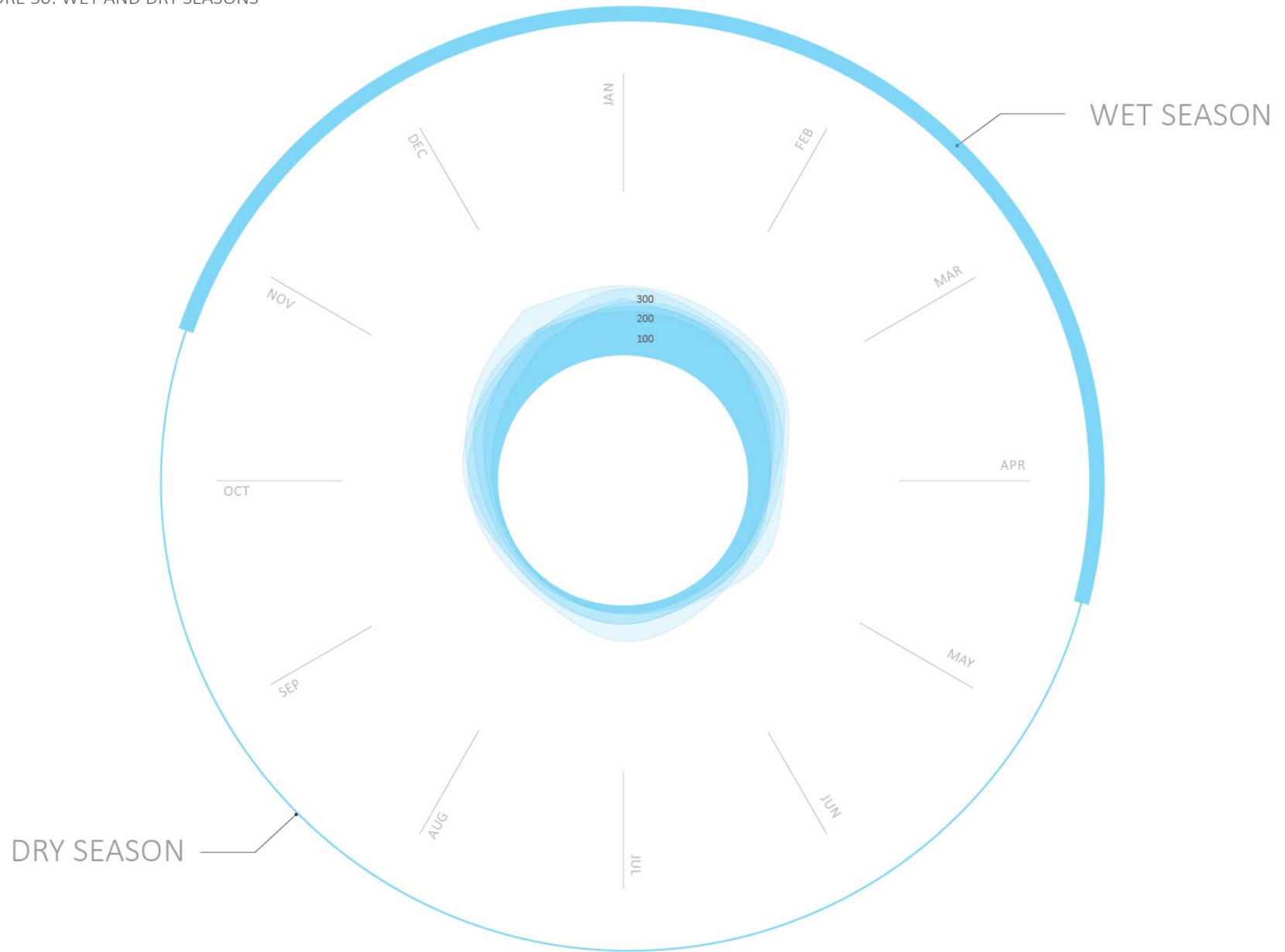


FIGURE 51: WET RICE AGRICULTURE CYCLES



FIGURE 52: SEAWEED FARMING CYCLES

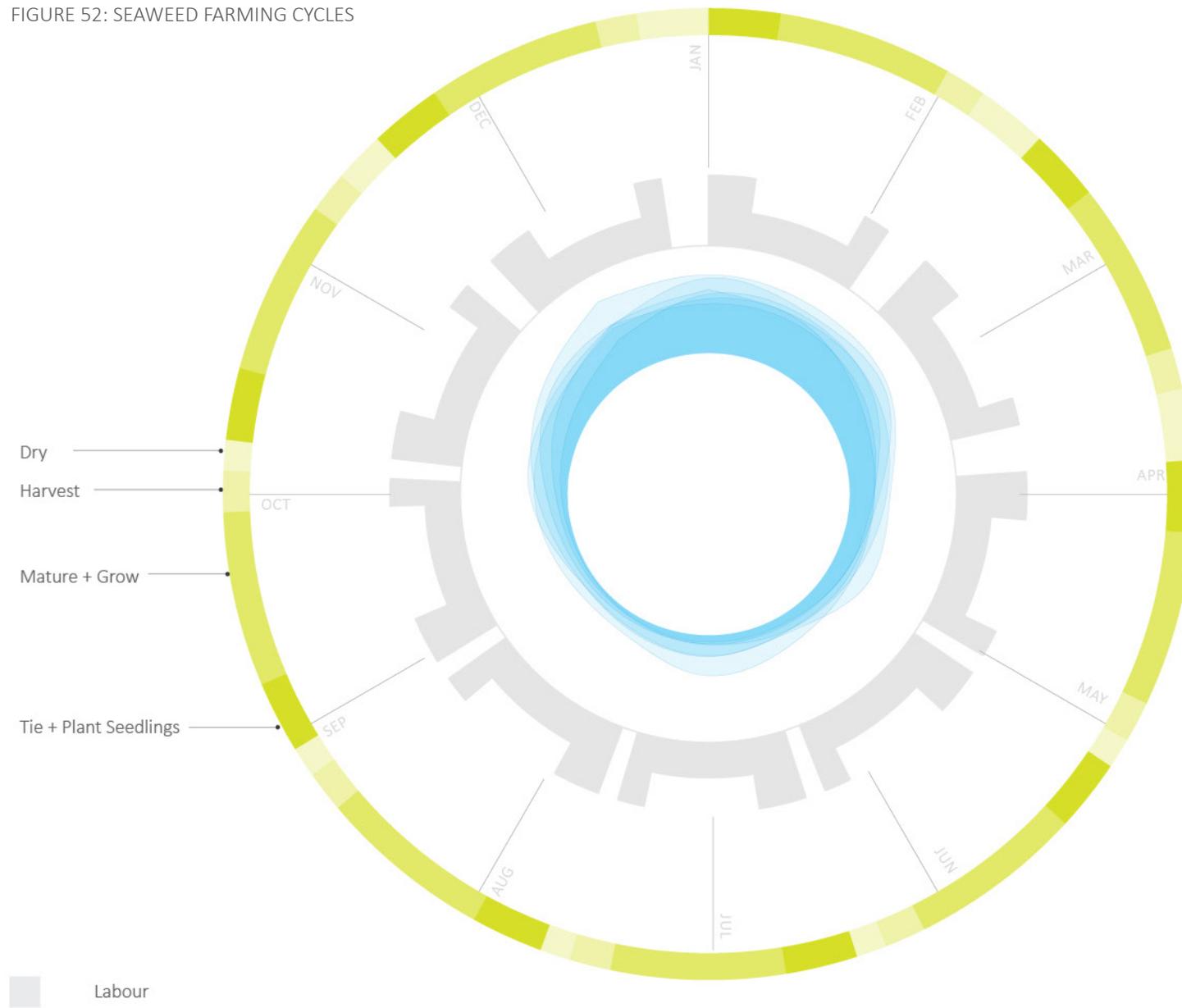


FIGURE 53: FOUR KEY CONDITIONS

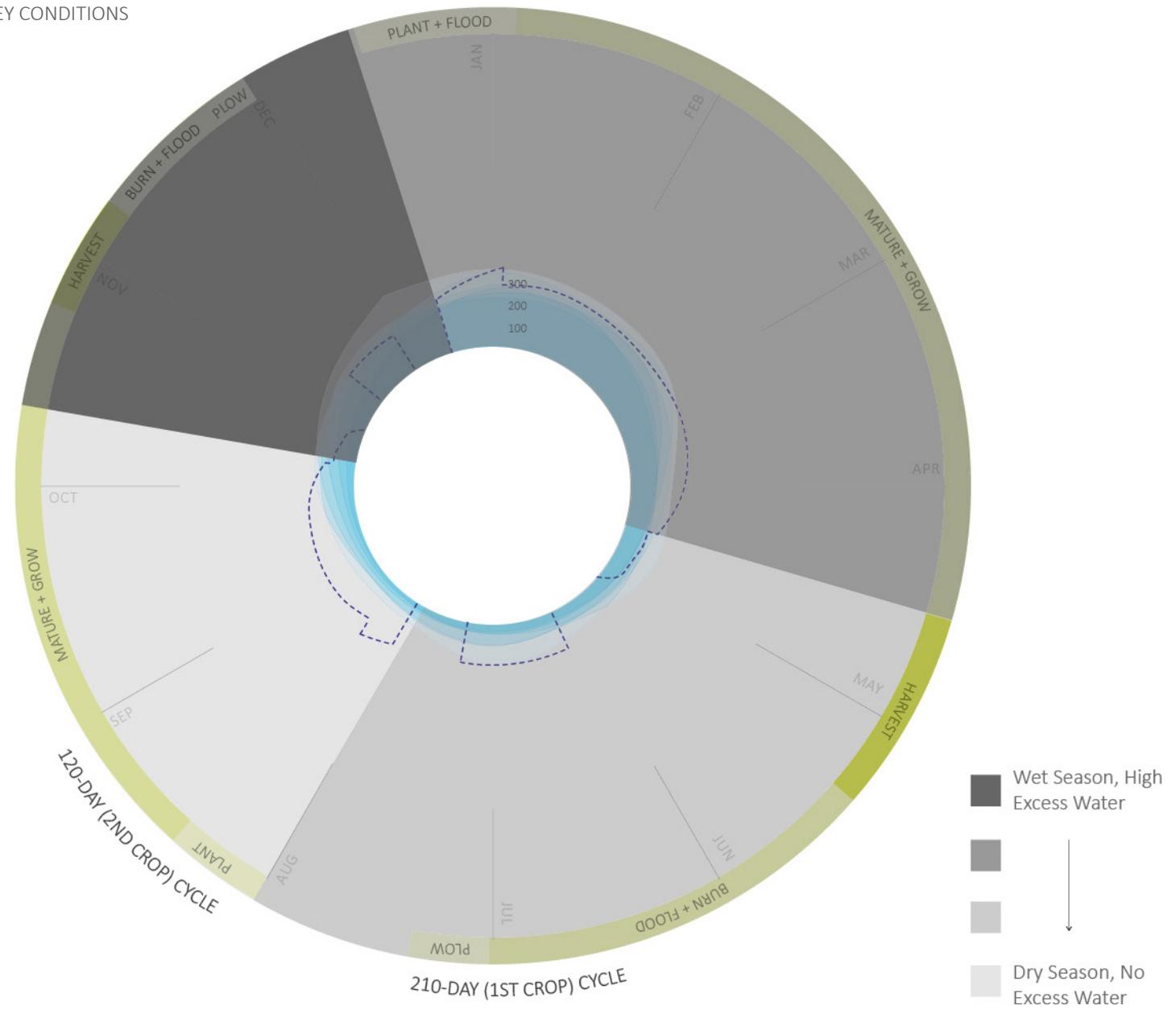
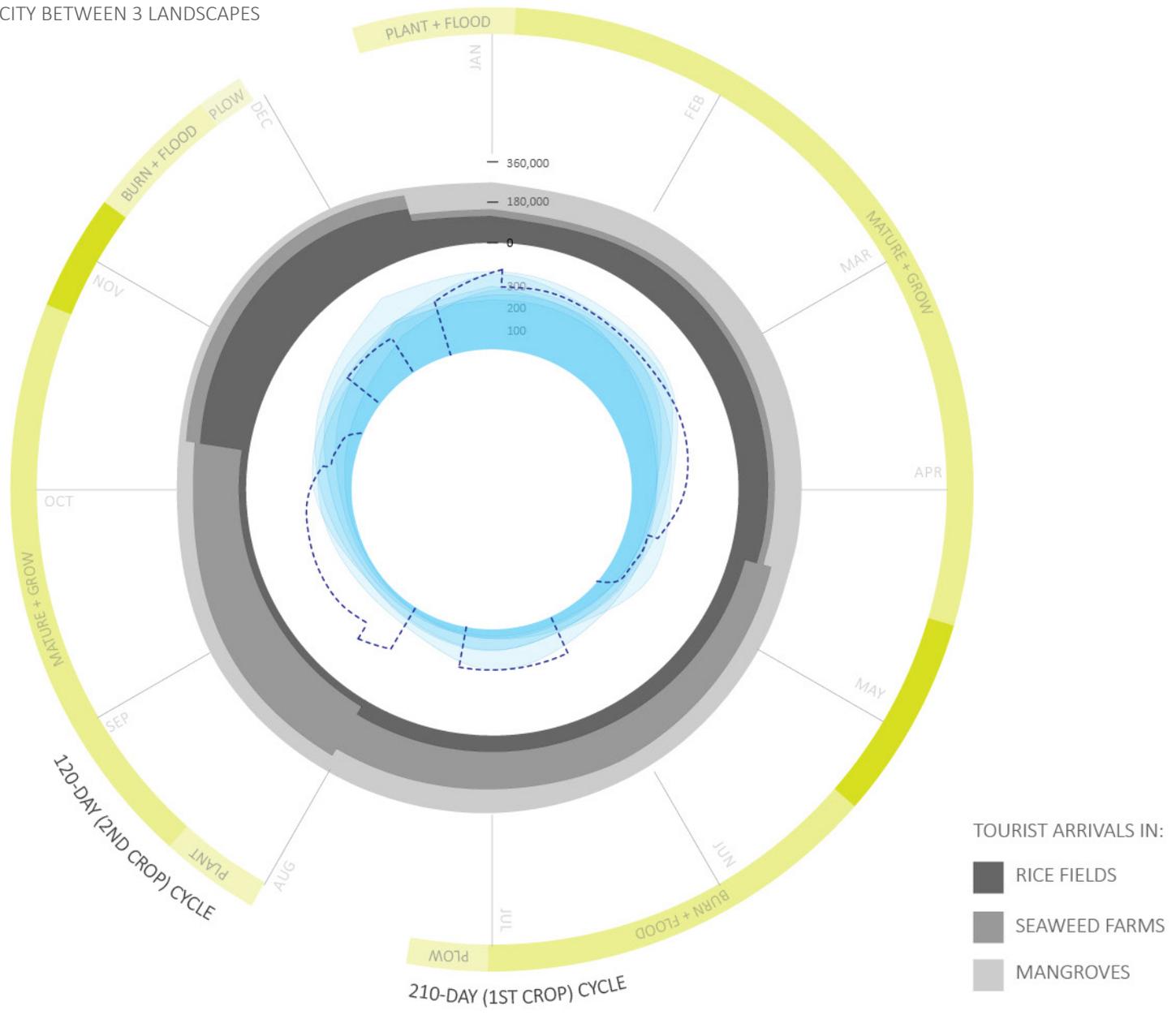
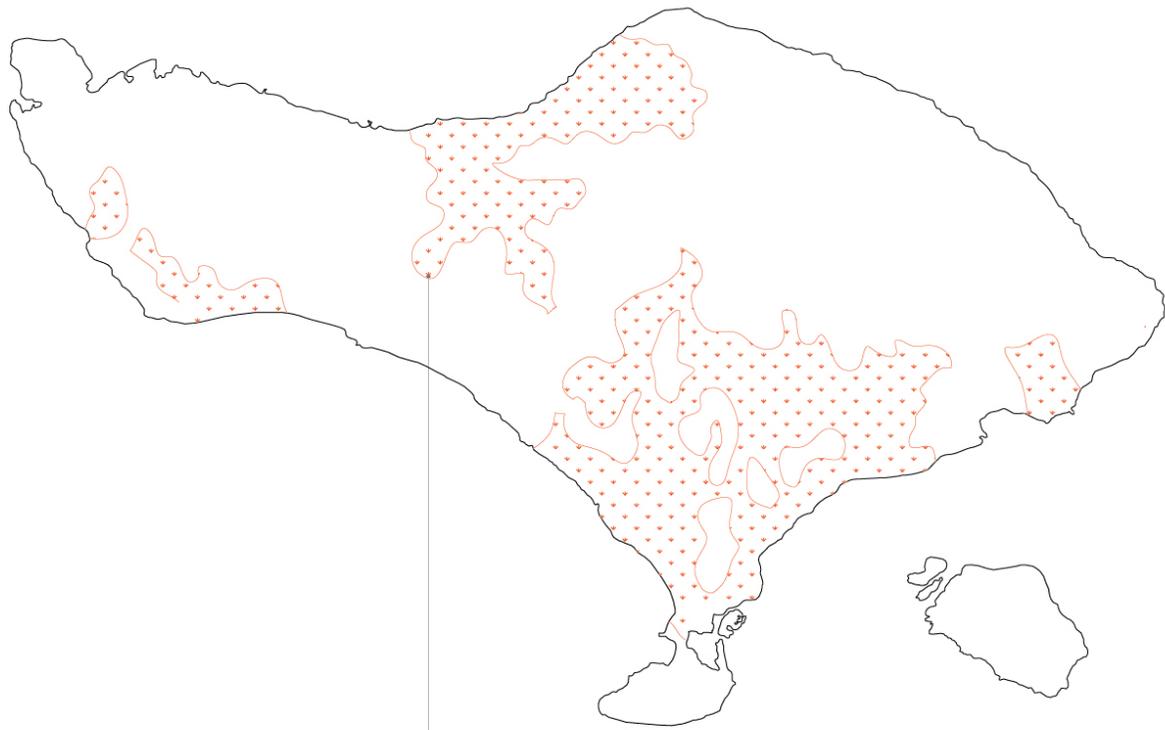


FIGURE 54: REDISTRIBUTED TOURIST NUMBERS TO RICE FIELDS



FIGURE 55: RECIPROCITY BETWEEN 3 LANDSCAPES





Rice Fields

RICE FIELDS

The test site for the rice fields, exemplifies a common condition on the island, where resorts will situate themselves on steeply sloped sites overlooking a landscape of terraced rice fields (Figure 59).

Playing off the extensive water features in Bali's resort architecture, in the rice fields the project manifests as an exaggerated water landscape comprised of terracing pools. The landscape extends between two existing luxury resorts, and consists of a series of collection, filtration, and tourist bathing pools (Figure 60).

During the wet season, which represents a period of high tourist activity in the rice fields, collected rainwater is cleaned through bio filtration plants before being used in a variety of tourist pools. The water from the bathing pools then drains into a second set of filtration pools, where it is cleaned with biofiltration plants before being sent to the existing irrigation canal feeding the rice field. Greywater from the resorts are also collected and cleaned in the secondary set of filtration pools (Figure 64). Thus, instead of discarding used water into rivers that feed into the ocean, water from tourist activities is reused a second time, helping to alleviate some of the water shortages that the rice fields are

experiencing. In this manner, the resorts effectively become collecting and cleaning agents of water, through a landscape that accommodates the desires of luxury tourists as well.

During the dry season (Figures 61, 65), where there is no excess water, most of the pools are allowed to dry up and the landscape transforms to offer a different experience. Floral plants bloom to create a landscape of fragrant gardens. The plants were selected for their blooming patterns (Figure 62) as well as for their potential use for teas, oils, and fragrances, in order to serve the spa program. Structures accommodating pool programs in the wet season transform to facilitate the program of a marketplace, where edible bio filtration plants from the dried pools are harvested and sold.

As water levels recede in the dry season, paths that are inaccessible in the wet season, are revealed and become accessible (Figure 63). While during the wet season, the project still manifests as an enclave catering to luxury tourists as it is only accessible from the resorts, during the dry season the landscape becomes accessible to a nearby village and creates a point of direct access to the rice fields. The landscape transforms to act as a more public space, where tourists and locals are more closely integrated in a

more intimate experience. In this manner, the project cycles between phases of catering largely to mass tourist activities and phases of eco-tourist activities. Based on the research of alternative tourism, and specifically of examples of alternative tourism projects in Bali, it doesn't seem viable for these facilities to exist as separate entities from the mass tourism industry. The thesis hypothesizes that by creating cycles that couple the two, a more balanced condition is created, where an infrastructure serving mass tourist activities (and consequently generating a sizeable income) is allowed periods of rest, during which tourism is not eliminated, but a less resource intensive tourist experience is provided. While resorts are typically designed as enclaves, the thesis questions the possibility of operating the enclave on a cycle, where it could spatially open up to other members of the community during certain seasons. The thesis suggests that if the project is able to change states, and provide varying experiences, as well as revive itself from falling into a 'tourist-infested' category (by disintegrating the boundaries of the enclave at certain times of the year), then it is more likely for tourist numbers to remain heavily constant over the long run instead of peaking for a short period and experiencing a dramatic fall as tourists seek the next 'authentic' place. Taking

into account the political economy at play, and recognizing that creating a new proximity between tourists and farmers will create new tensions, the project manifests in a way where the proximity between the two groups is not always visible. In the wet phase, although water is getting delivered to the rice fields, this isn't visible to the tourist, who perceives the infrastructure as an exaggerated water landscape. However, in the dry season, a different experience is offered, where there are increased possibilities of interaction between local and tourist groups. The project assumes that the changing program would attract a greater number of eco-tourists. The resorts are still able to offer a luxurious experience though, on a less resource intensive level, as the villas transform from offering private pools to offering private floral gardens (Figures 76-81).

Drawing on the logic of the water temple infrastructure, where structures are placed to mark locations where water is entering a system in order to establish spatial relationships to specific components of the irrigated landscape, the project also places structures at crucial points of water transfer. Three of these are explored in further detail in Figures 66-75.

FIGURE 57: TRADITIONAL WATER FLOWS

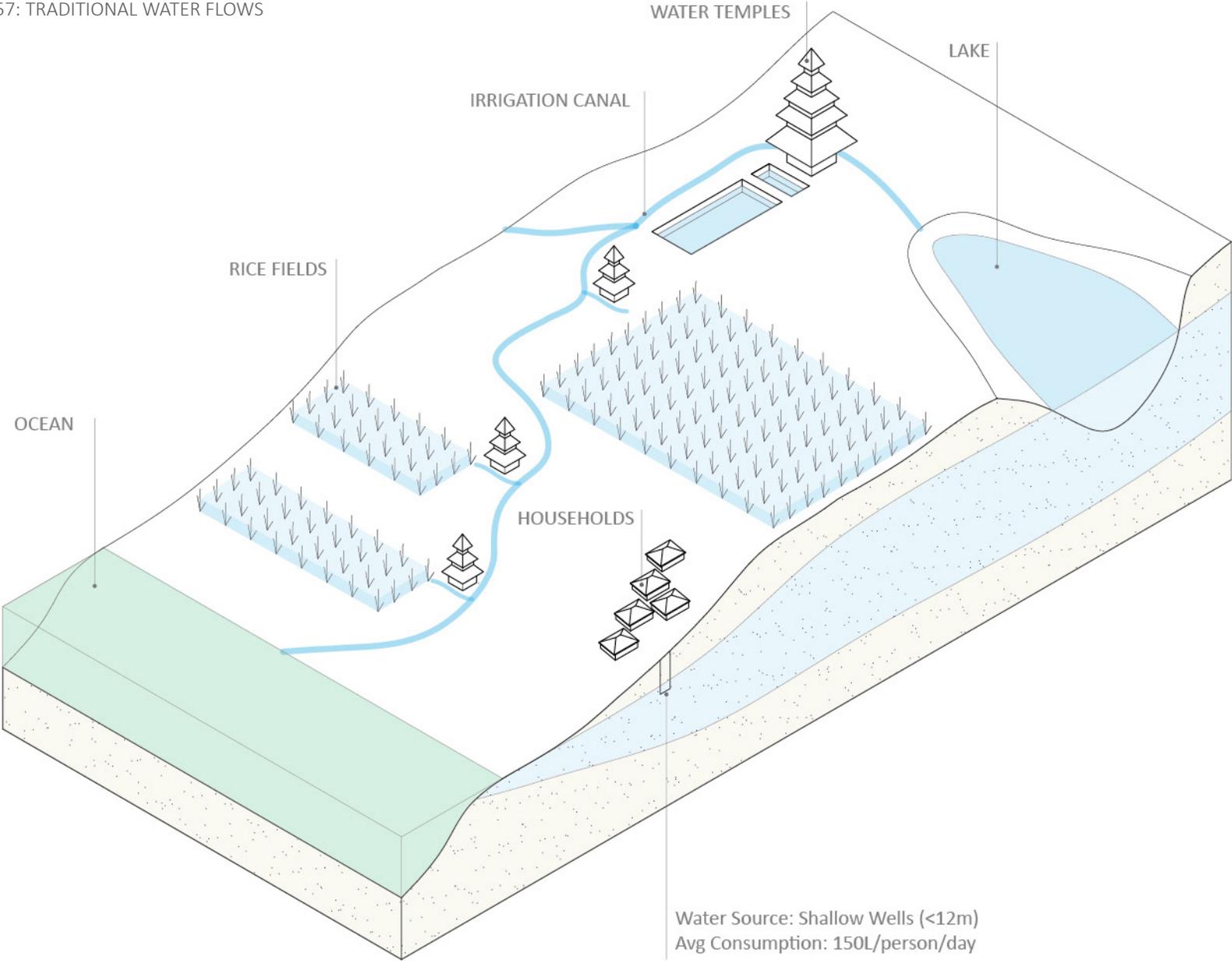


FIGURE 57: IMPACTS OF RESORTS OVERPUMPING GROUNDWATER

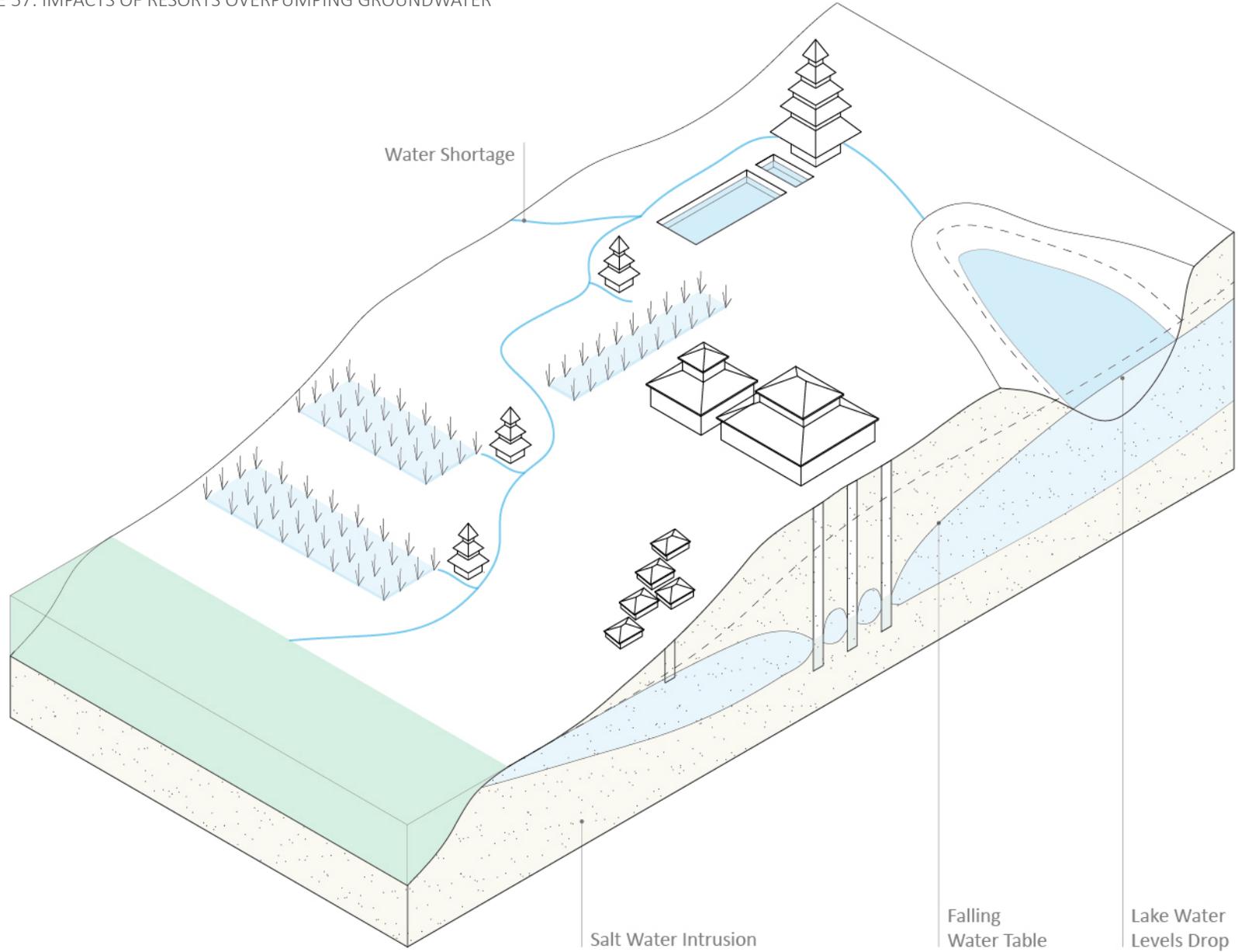
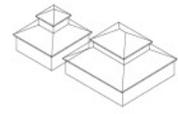
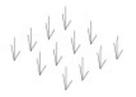


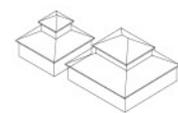
FIGURE 59: TYPICAL RESORT CONDITION EXISTING



Resort 1



Rice Fields



Resort 2



Local residences

Trees

Irrigation Canal



FIGURE 60: TYPICAL RESORT CONDITION PROPOSAL

WET

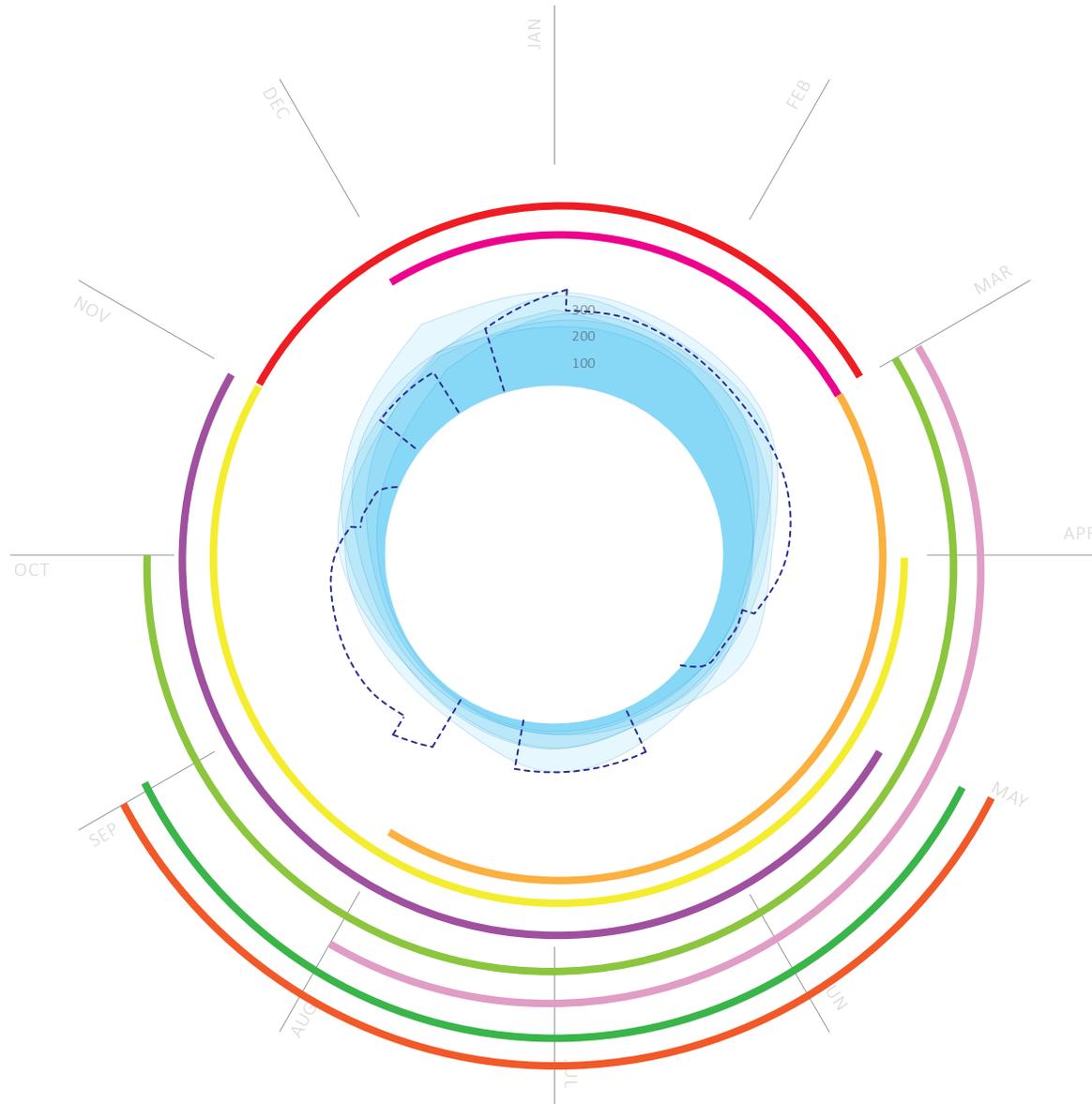


FIGURE 61: TYPICAL RESORT CONDITION PROPOSAL

DRY



FIGURE 62: FLORAL PLANTS BLOOMING CYCLES



Frangipani (*Plumeria* sp)
(Flowers used for Religious offerings, and for fragrance)



Garden Balsam (*Impatiens balsamina*)
(Flowers used for Religious offerings)



Jasmine (*Jasminum sambac*)
(Flowers are used for offerings, scenting tea & fragrant oils)



Pagoda flower (*Clerodenum paniculatum*)
(Used for offerings, attracts birds bees and butterflies)



Cananga (*Cananga odorata*)
(Used for offerings and fragrance, can be used for aromatherapy oils and perfumes)



Heliconia (*Heliconia* sp)



Globe Amaranth (*Gomphrena globosa*) Flowers Bloom
(Flowers Used for Religious offerings but also can be used for tea)



Alamanda (*Allamanda cathartica*)
Flowers Bloom



Adenium (*Adenium obesum*)

FIGURE 63: NUMBER AND TYPES OF TOURISTS

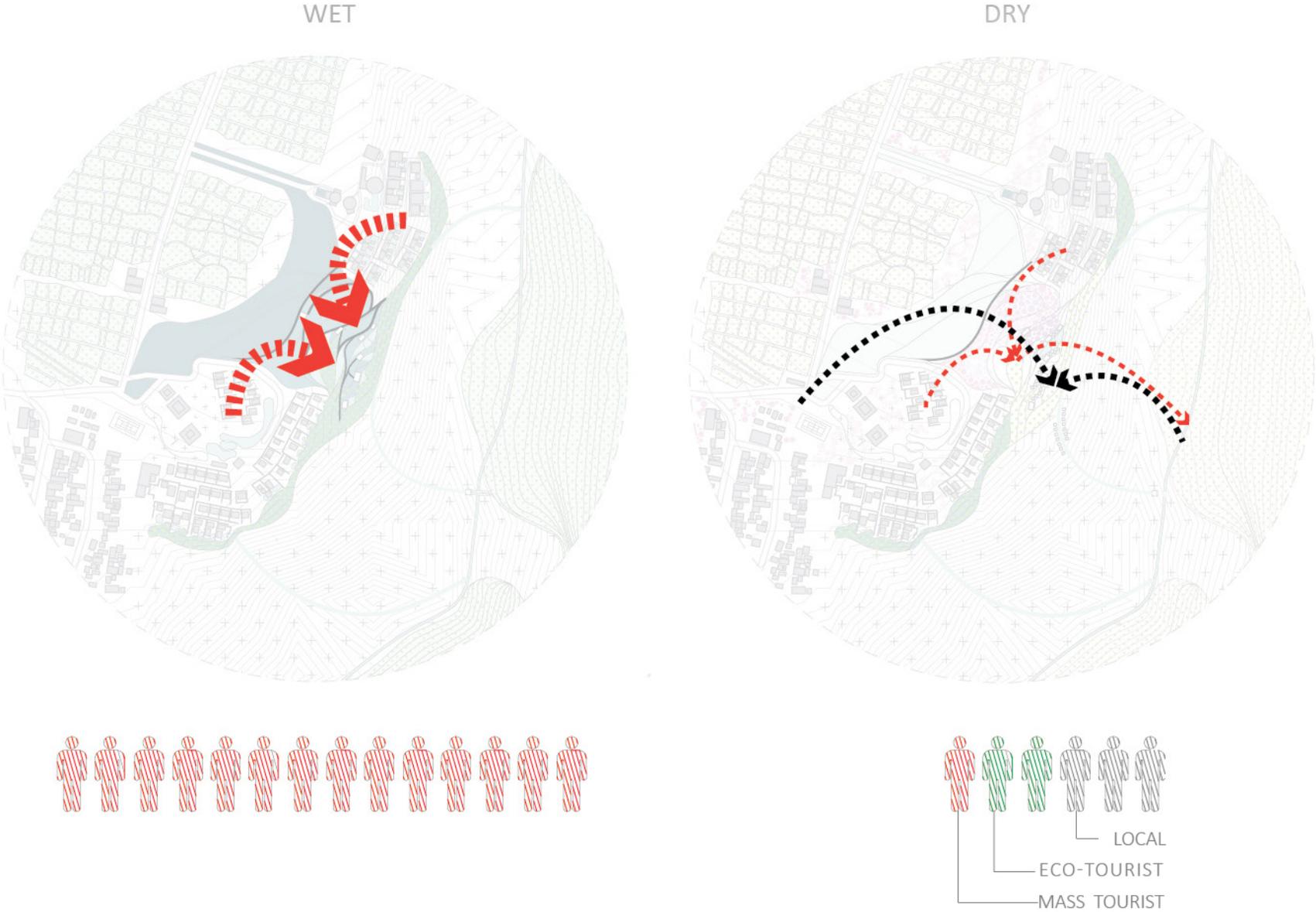
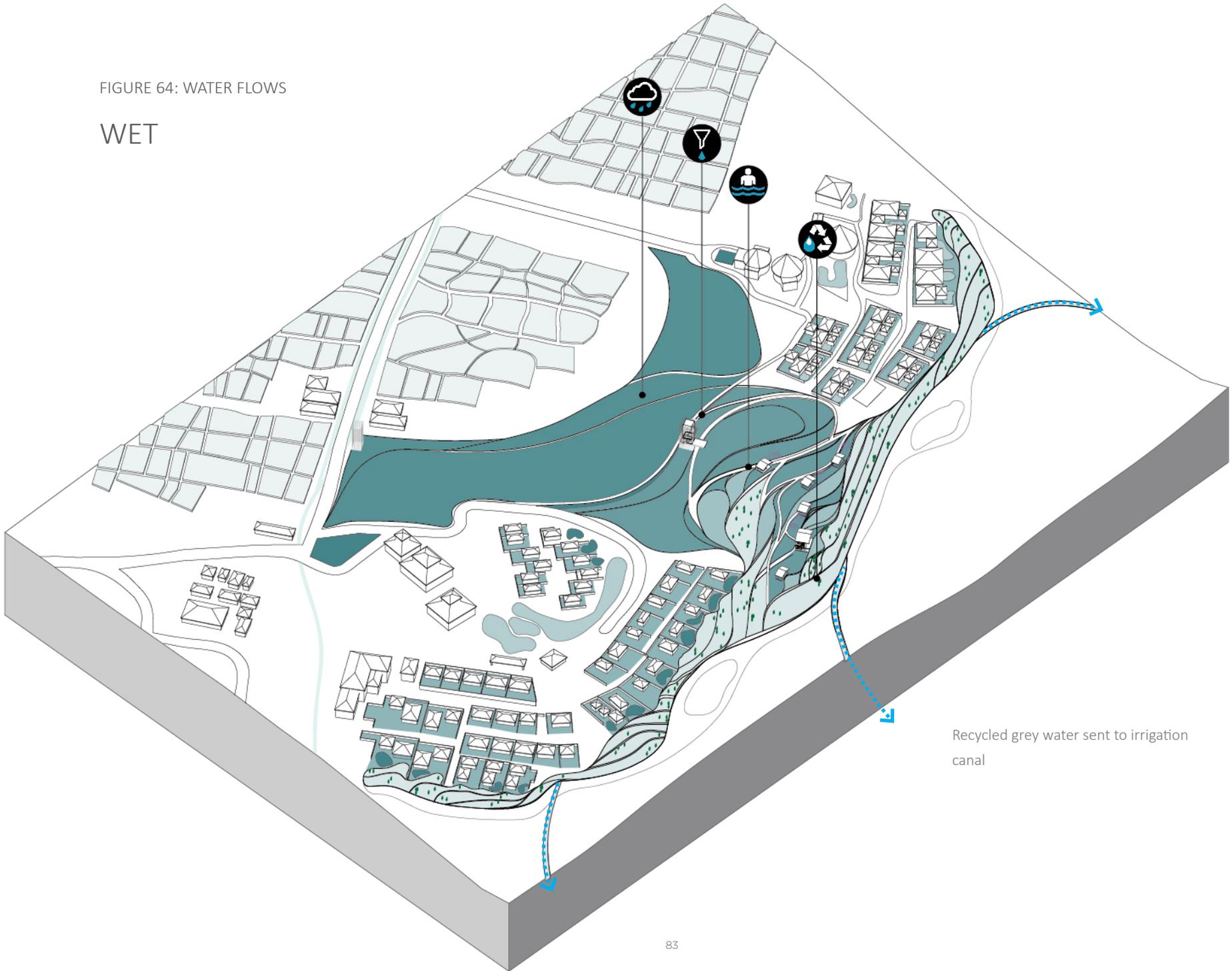


FIGURE 64: WATER FLOWS

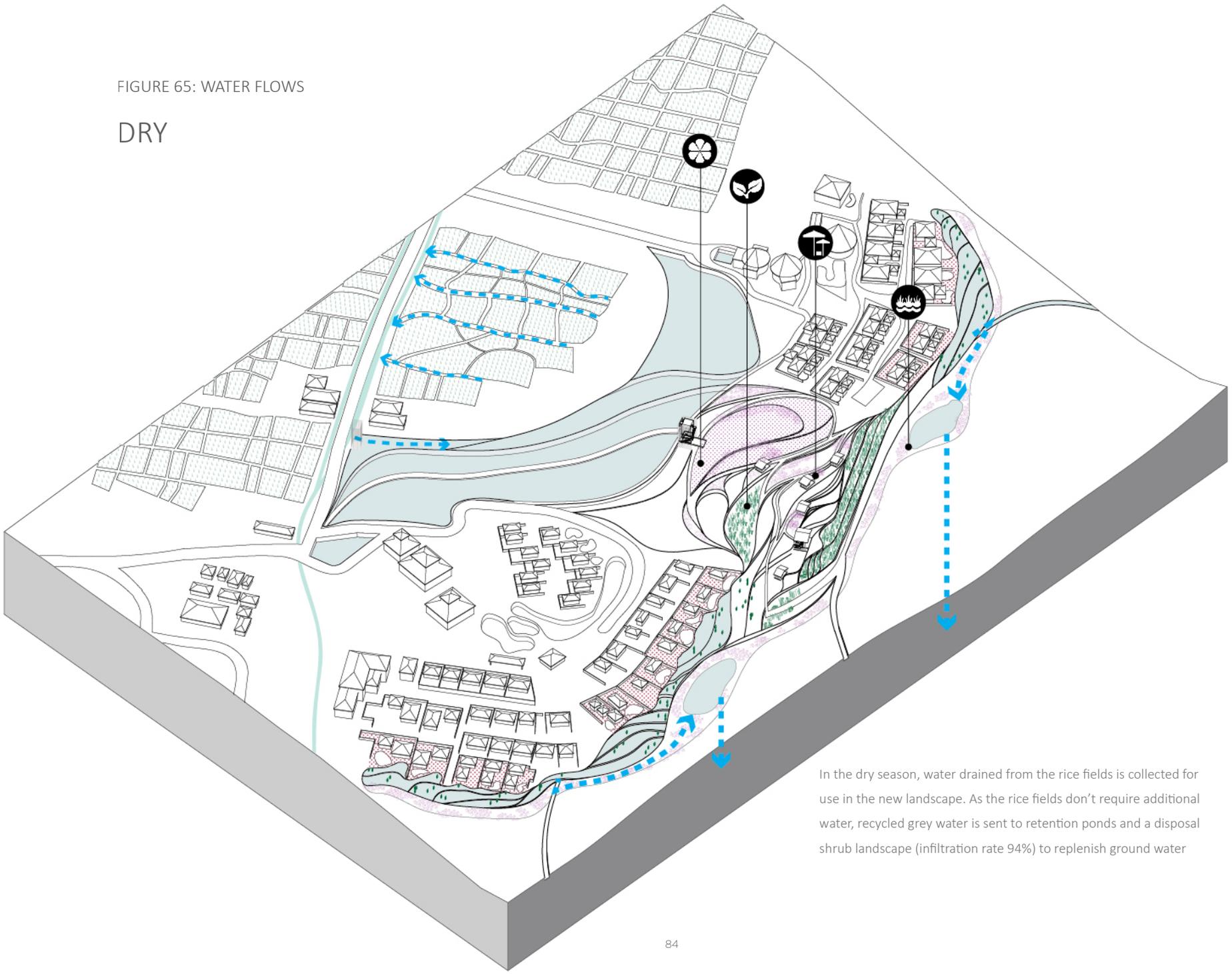
WET



Recycled grey water sent to irrigation canal

FIGURE 65: WATER FLOWS

DRY



In the dry season, water drained from the rice fields is collected for use in the new landscape. As the rice fields don't require additional water, recycled grey water is sent to retention ponds and a disposal shrub landscape (infiltration rate 94%) to replenish ground water

FIGURE 66: WATER TOWER DETAIL

WET

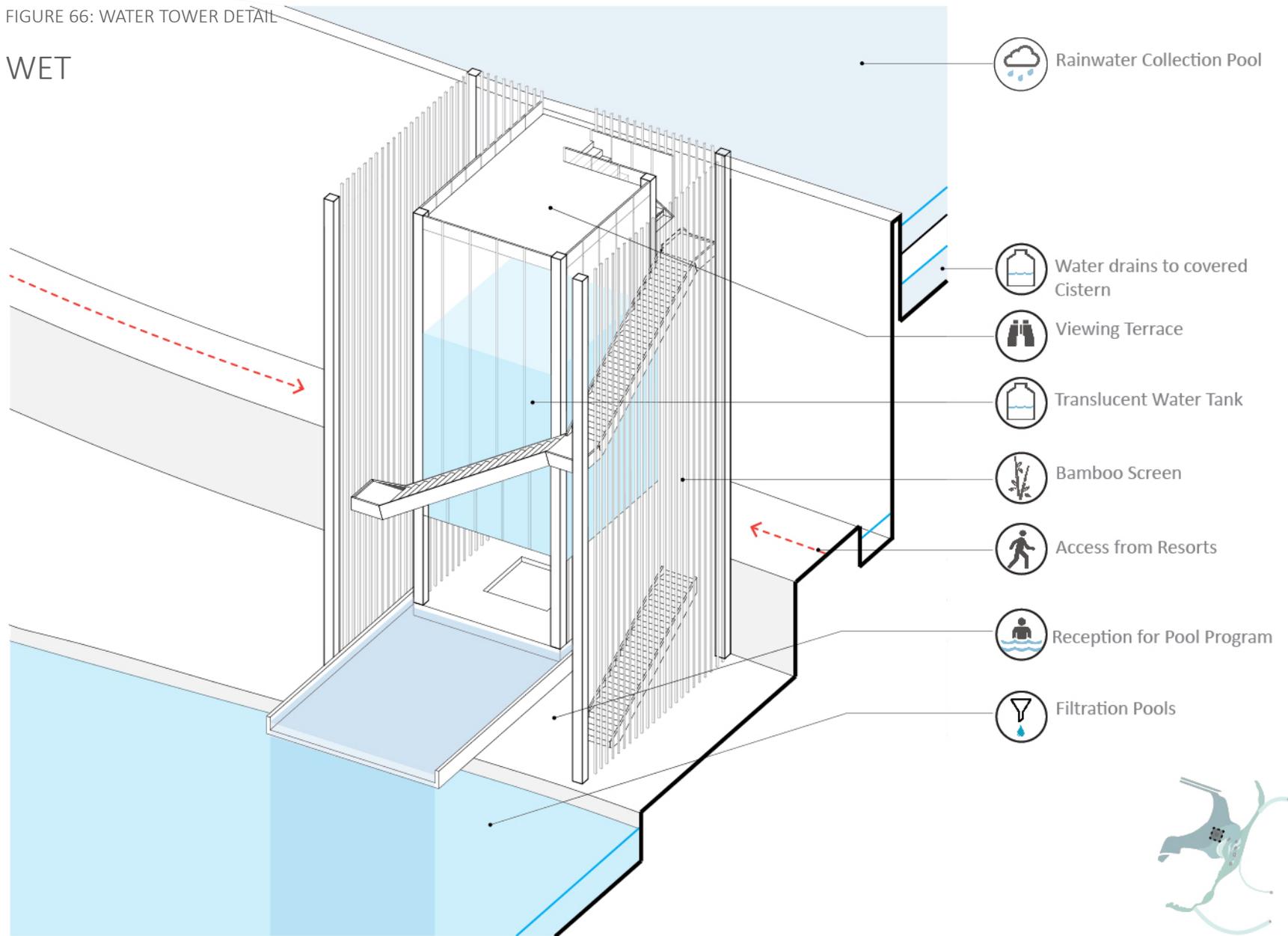
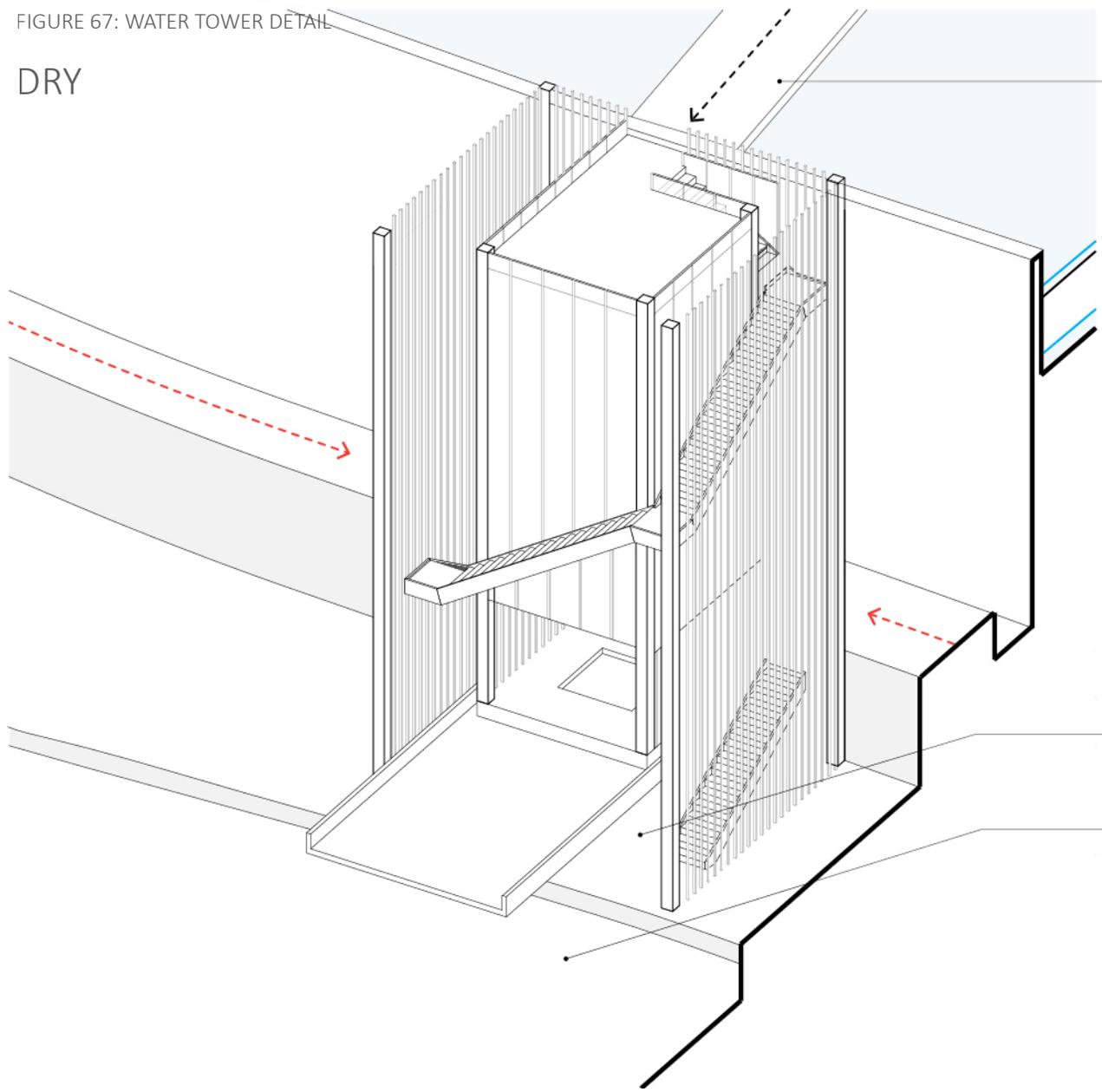


FIGURE 67: WATER TOWER DETAIL

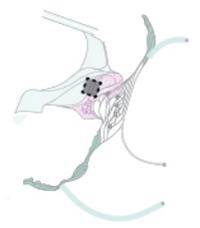
DRY



 Water Recedes, Path from town accessible

 Reception for Spa Program

 Fragrant Plants Bloom



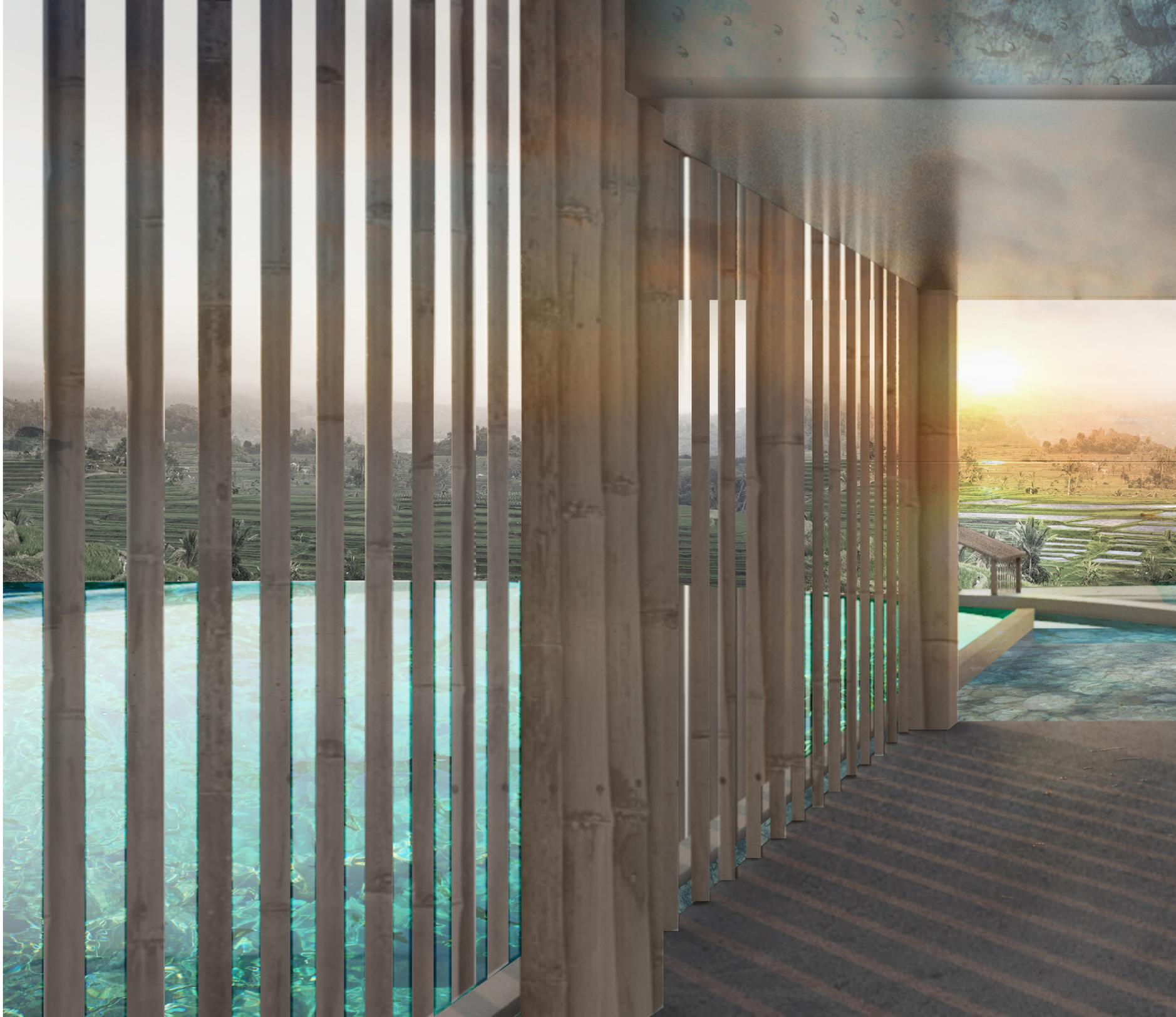


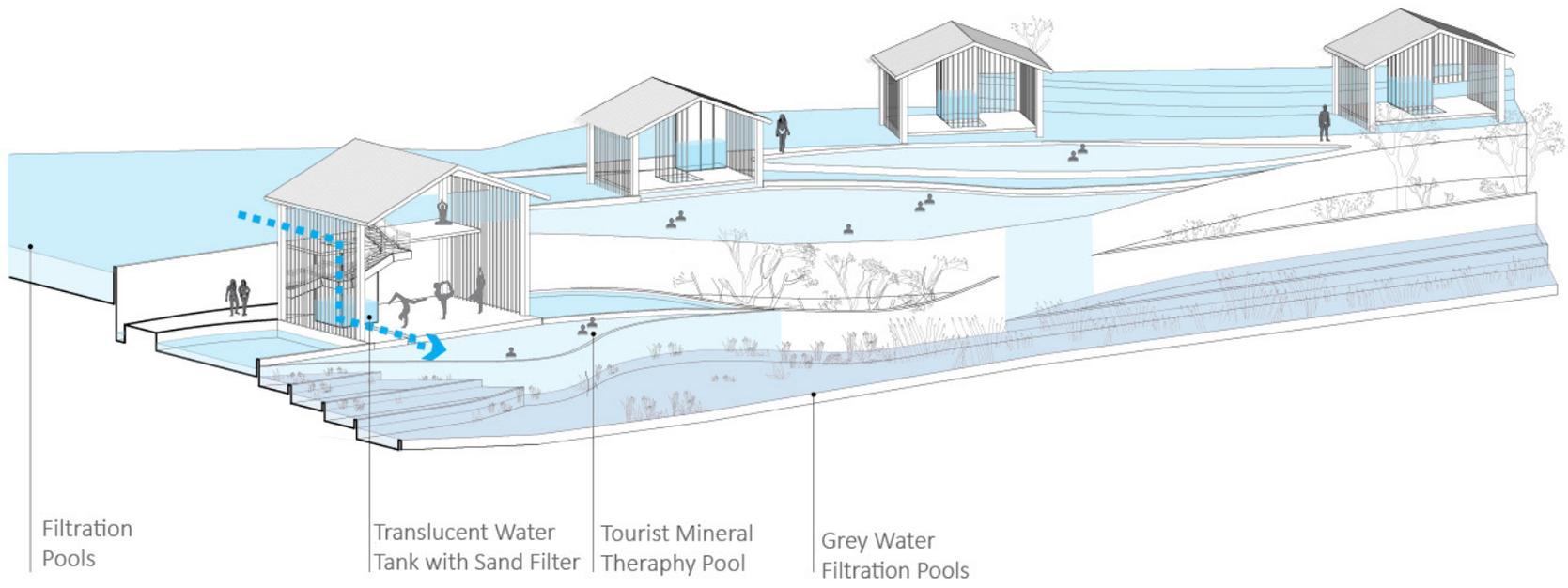






FIGURE 70: TOURIST POOLS DETAIL

WET

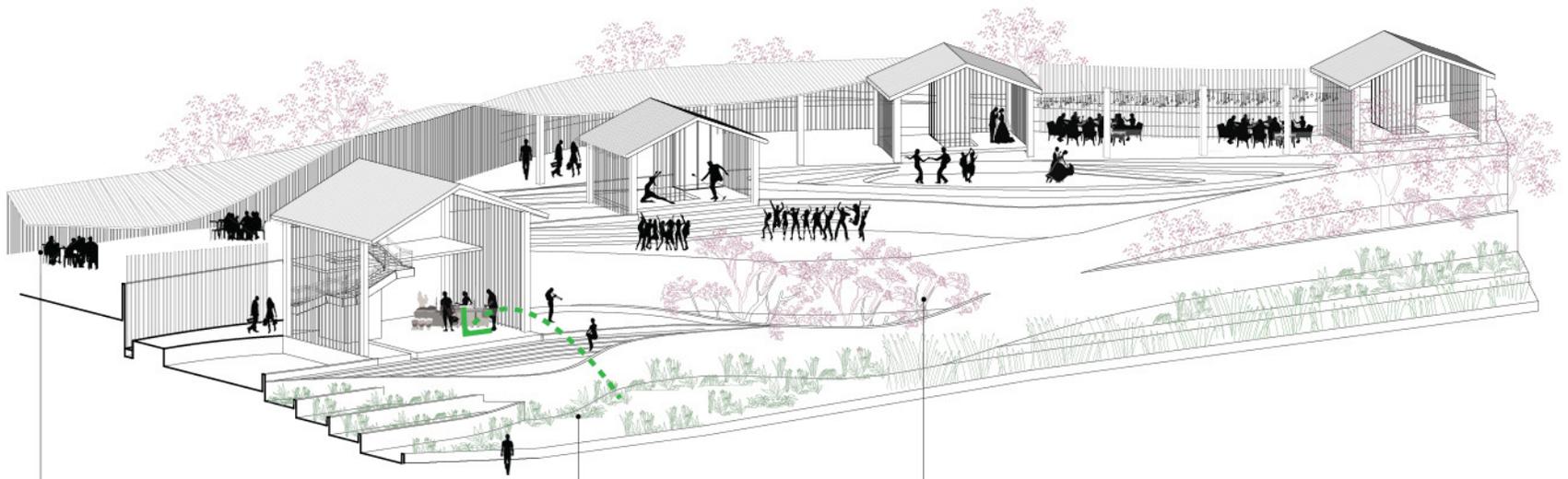


Structures control water delivery to tourist pools.
Building program associated with pool program.



FIGURE 71: MARKETPLACE DETAIL

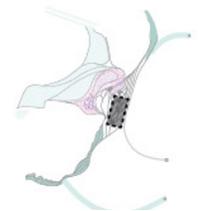
DRY



Temporary structures and permanent pavilions create large connected public spaces (for markets, outdoor performances, outdoor dining parties, and possibly host small wedding parties)

Edible biofiltration plants (watercress, celery) harvested and sold in seasonal market

Floral plants bloom. Flowers used for teas + scents+ spa products



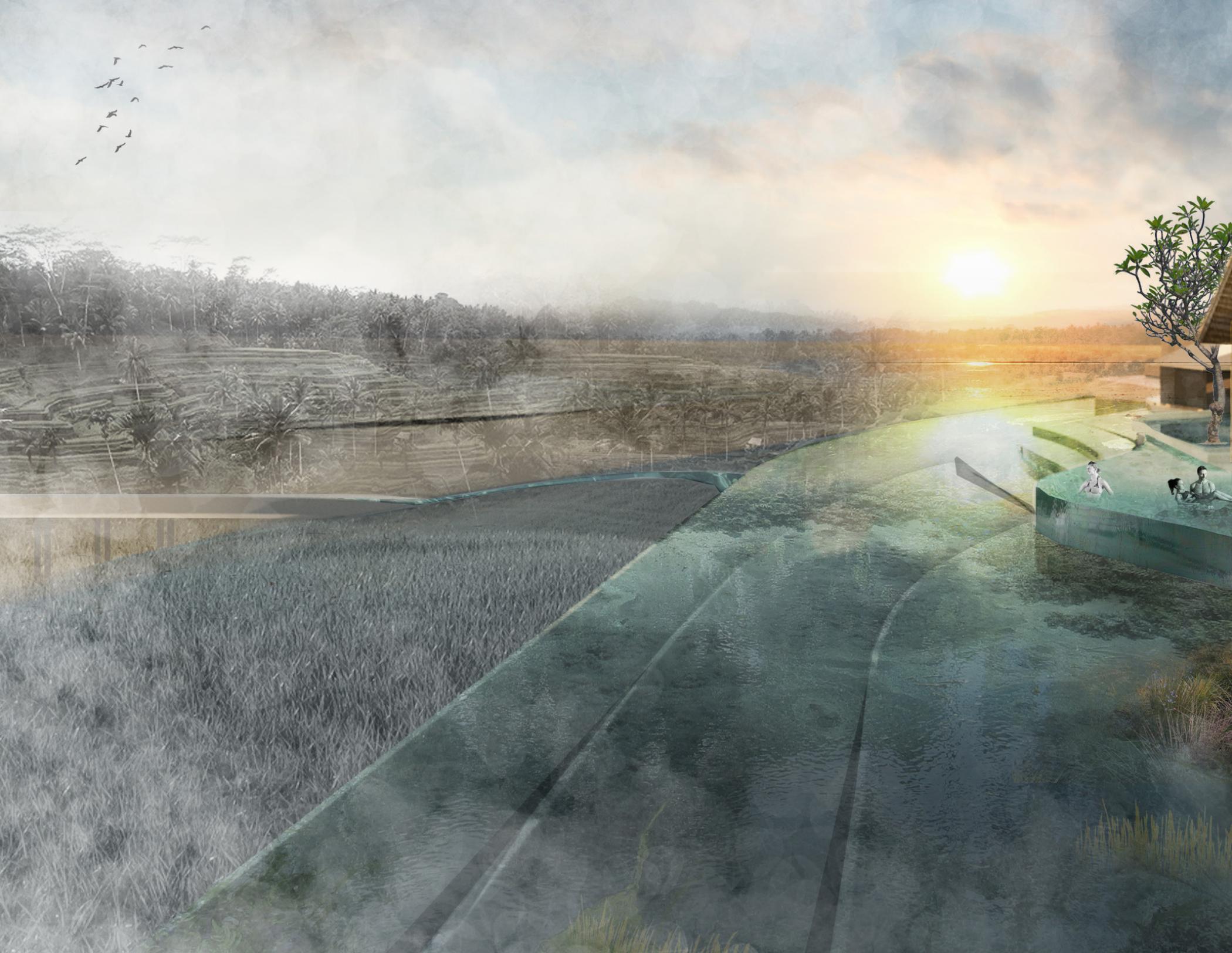








FIGURE 74: CONNECTION TO EXISTING IRRIGATION CANAL DETAIL

WET

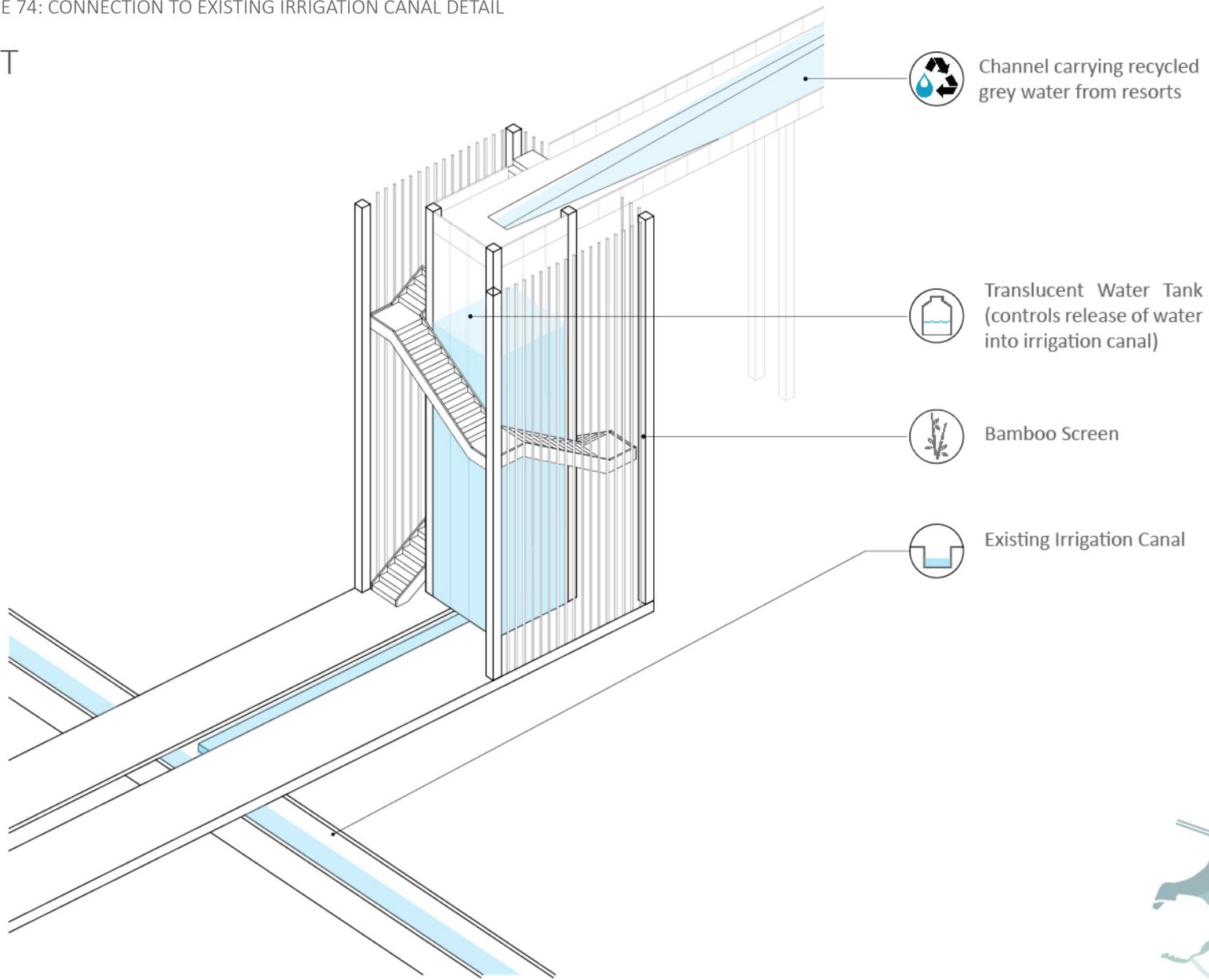


FIGURE 75: CONNECTION TO EXISTING IRRIGATION CANAL DETAIL

DRY

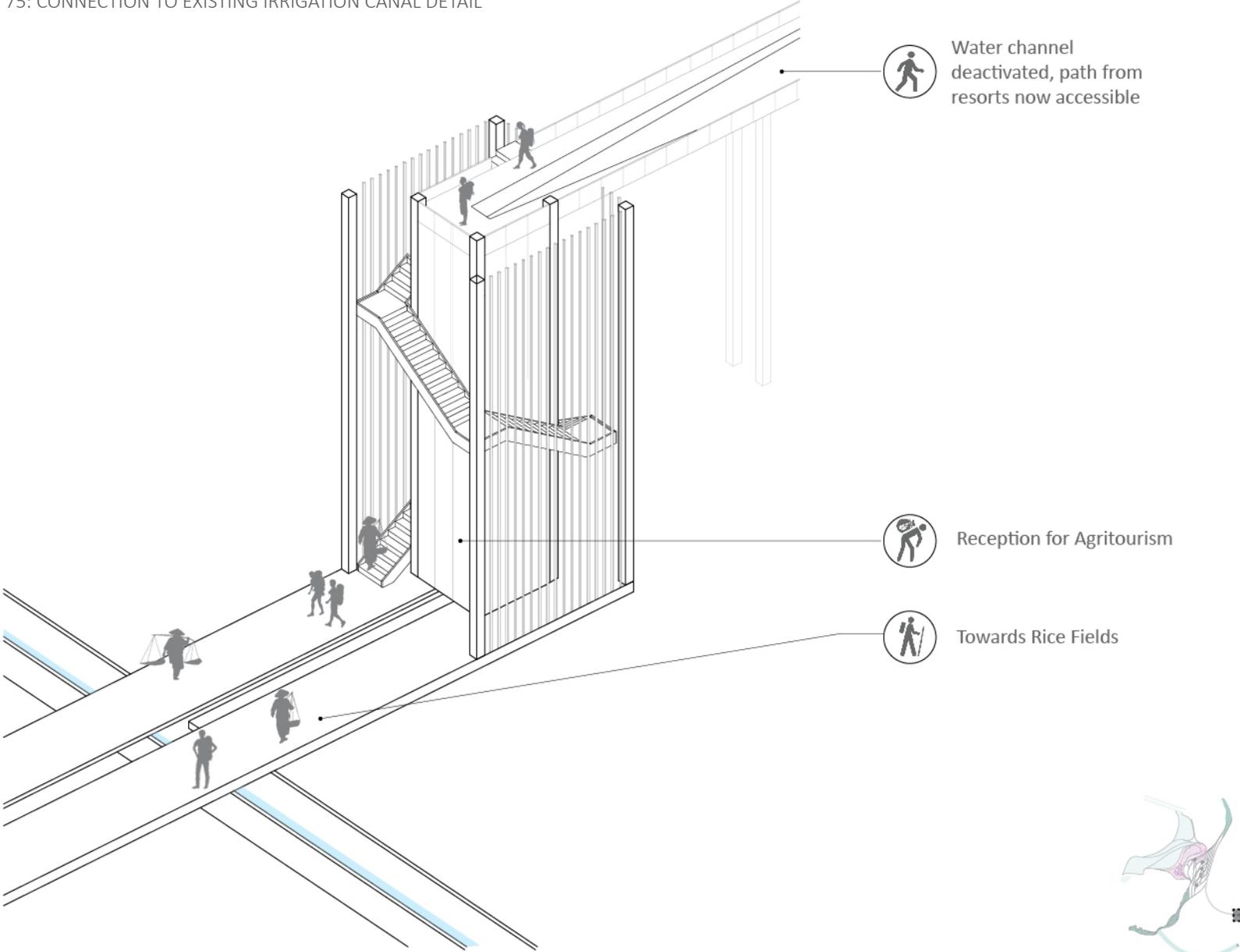


FIGURE 76: VILLA PLAN EXISTING

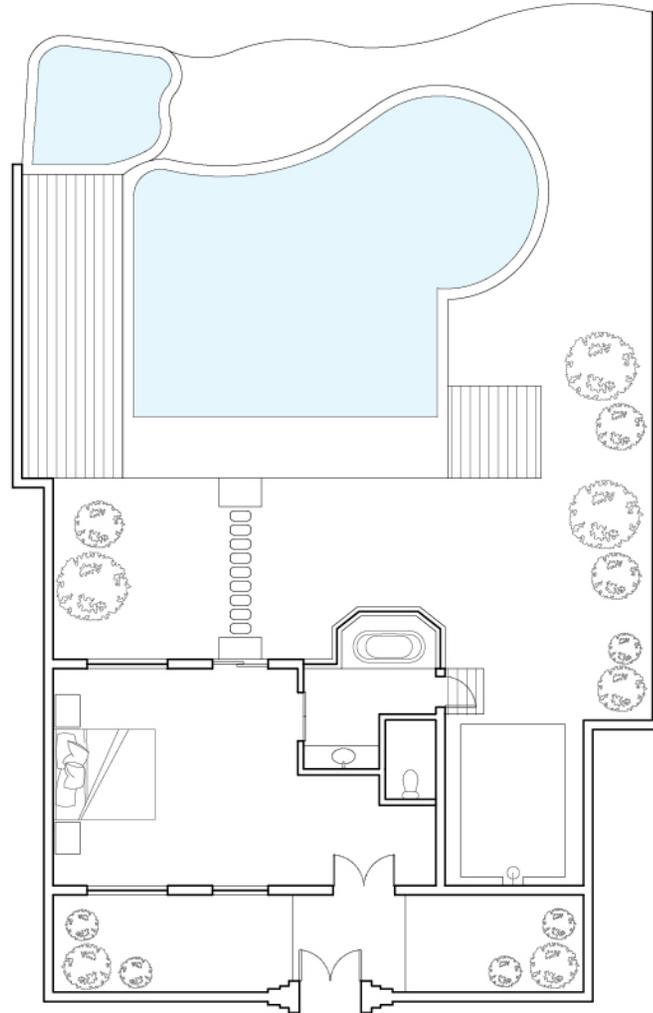
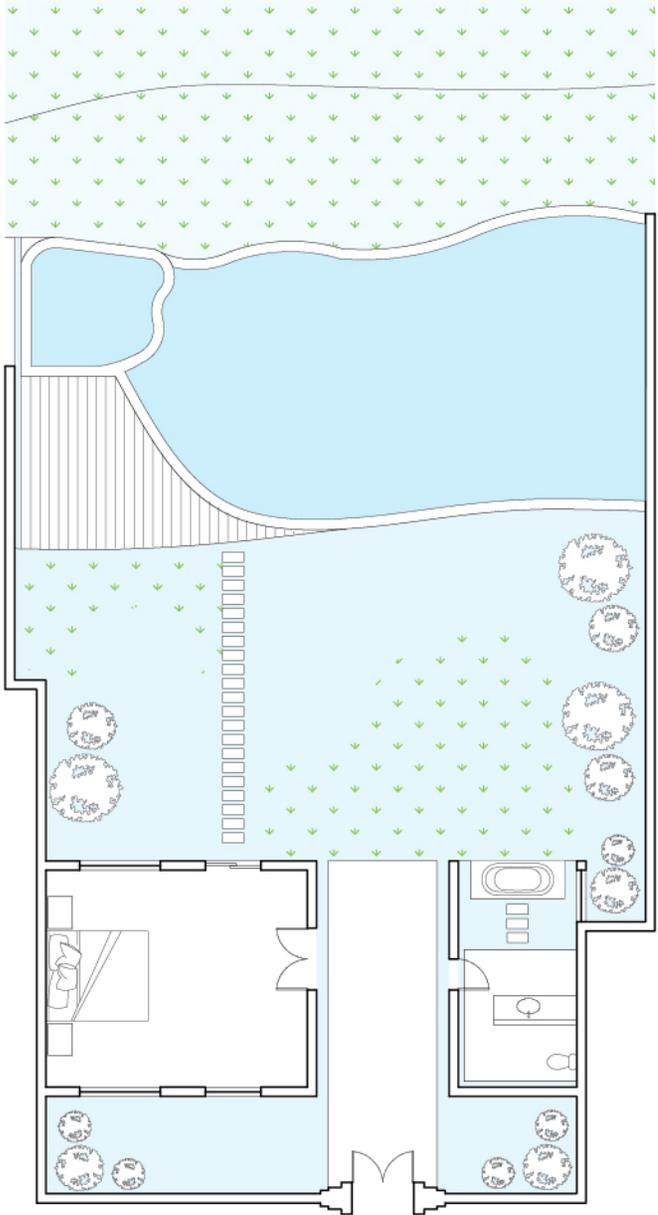


FIGURE 77: VILLA PLAN PROPOSED

WET



Connects to Greywater Filtration Pools of Water Terrace Infrastructure



Infinity Pool



Biofilter pool



Rainwater collection ponds with underground cistern

FIGURE 78: VILLA PLAN PROPOSED

DRY



FIGURE 79: VILLA AXONOMETRIC PROPOSED
DRY (OCCUPIED)

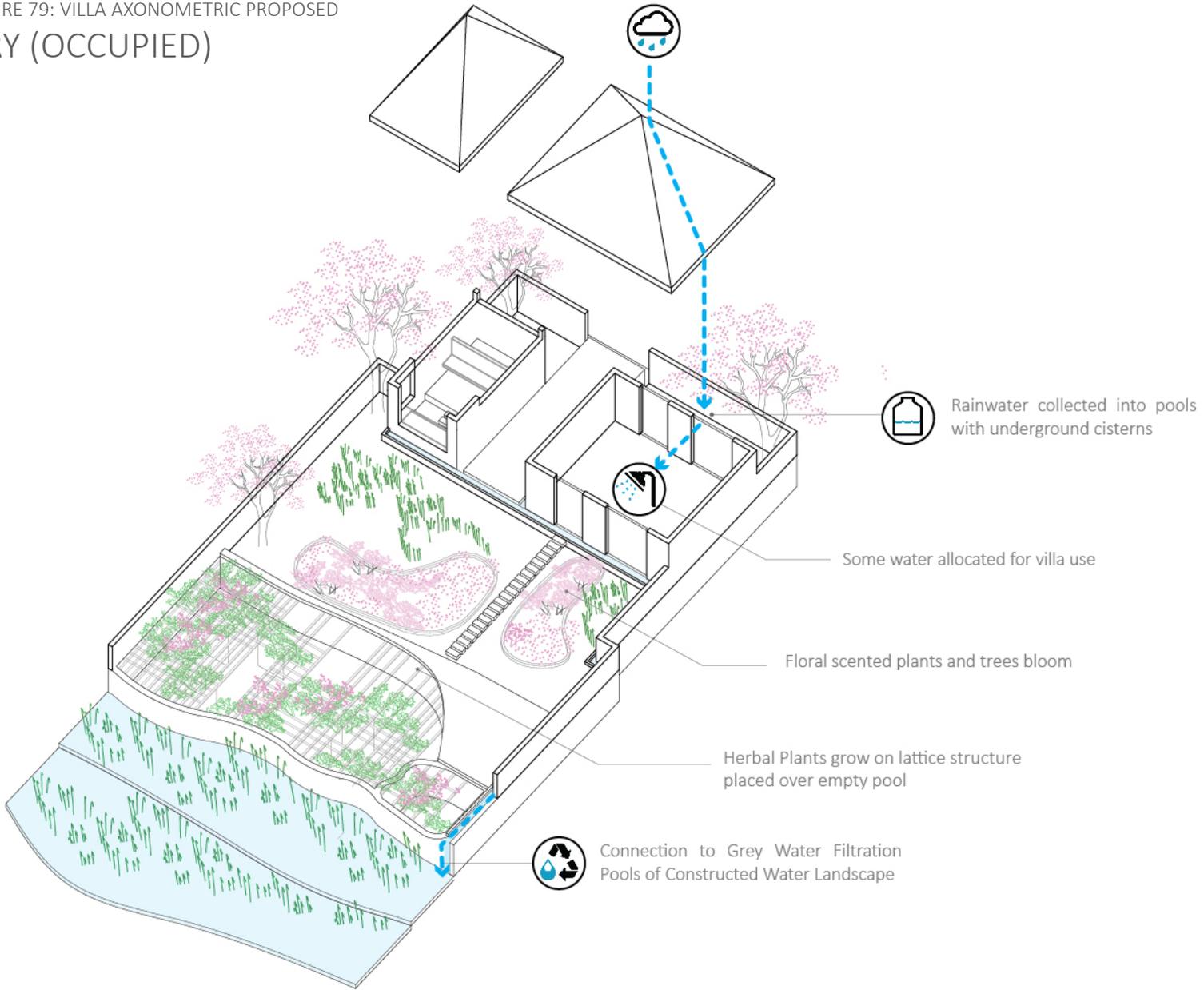


FIGURE 80: VILLA AXONOMETRIC PROPOSED
DRY (UNOCCUPIED)

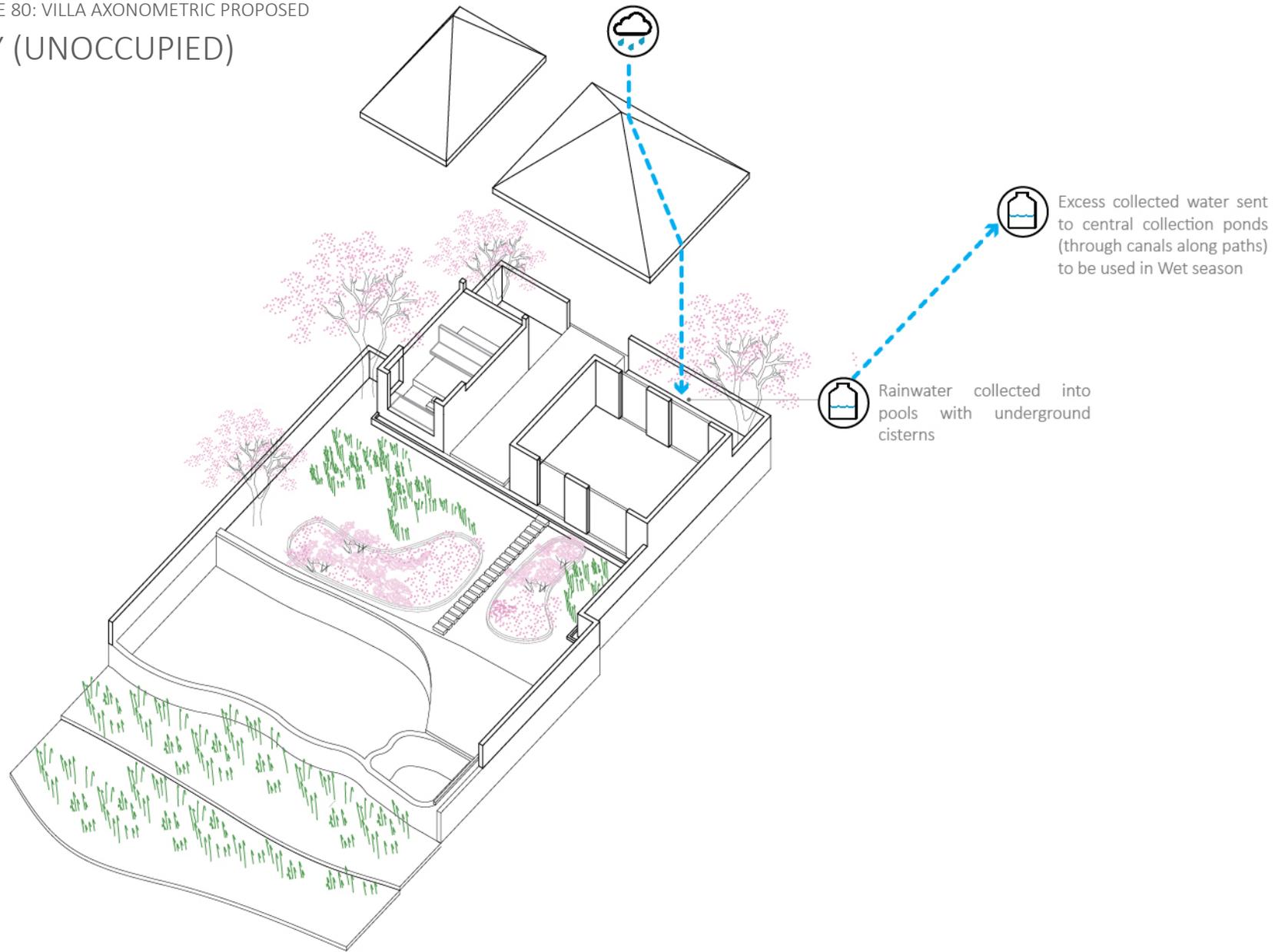
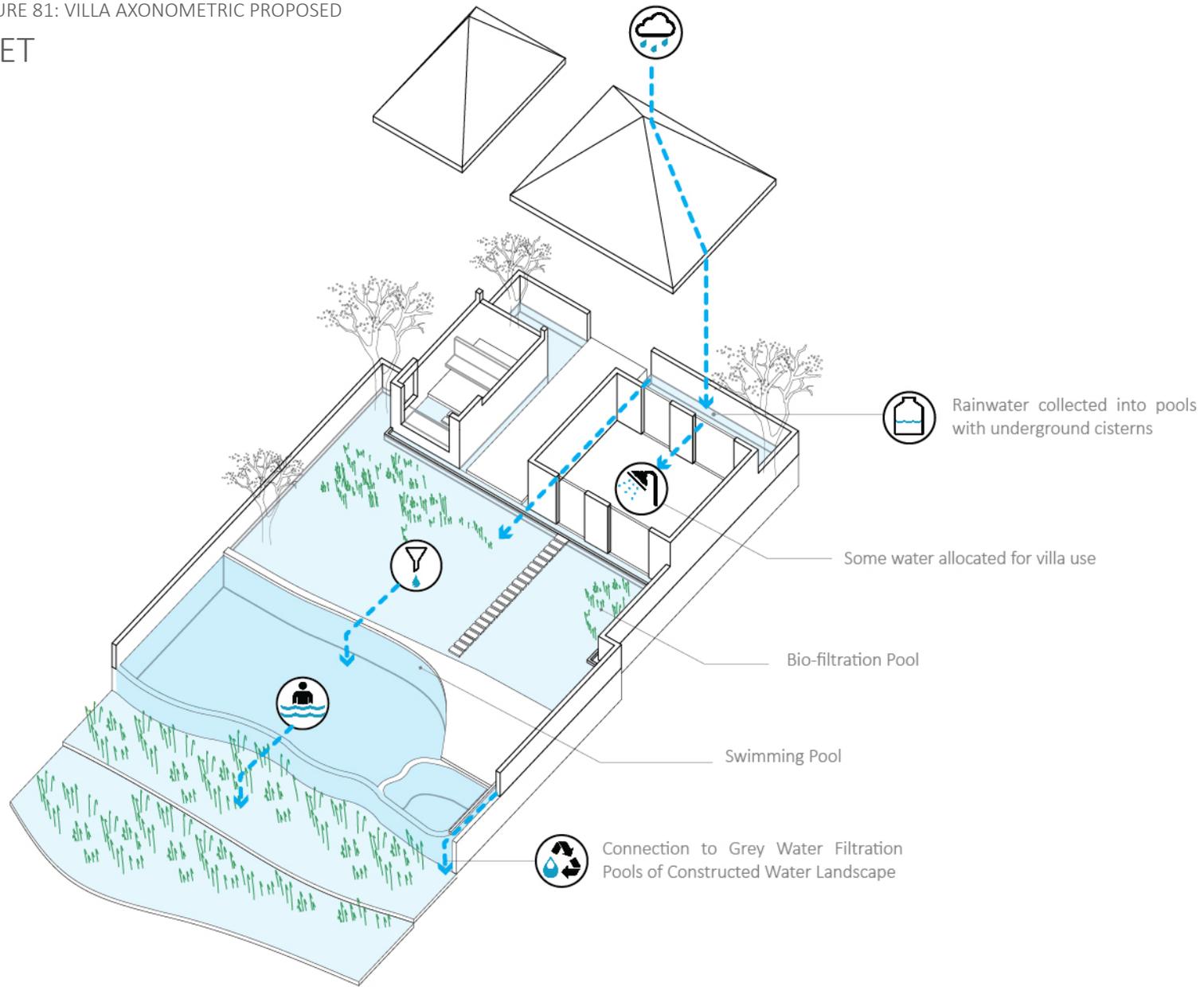
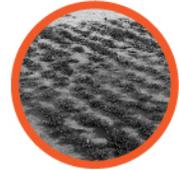


FIGURE 81: VILLA AXONOMETRIC PROPOSED

WET





Seaweed Farms

SEAWEED FARMS

As resorts territorialize the coastal land, and privatize beaches, seaweed farmers have diminished access to the shallow waters used to grow seaweed, and also have to travel further in search for vacant land to dry their seaweed under the sun. The thesis questions how we can rethink the relationships between tourism and territory in this context.

Situated between the islands of Nusa Lembongan and Nusa Cenedia, the project creates a shorter access route across the shallow waters between the islands, and connects two tourist hotspots. The project seeks to manipulate the use of existing materials on the site, namely bamboo posts, rope, and nets, in order to create an infrastructure that cycles to leverage tourists and seaweed farmers in different seasons. Inspired by aerial photographs of the site, and of images of seaweed farming in Fujian, China (Figure 83), the project manifests as a field of bamboo posts of varying heights, across which layers of nets are stretched across. These nets can be raised to serve as tourist platforms and accommodate programs such as resting hammocks (Figures 88, 90), or lowered to just below the surface of the water to serve as a framework onto which to grow the seaweed (Figures 89,91).



Figure 83: Seaweed Farms in Fujian, China, utilize a field of bamboo poles to create structures supporting nets of seaweed

Continuing the idea of shifting accessibility from the project in the rice fields, the lifting and lowering of nets effectively changes the paths of travel in different seasons.

Figure 94 illustrates the different zones of program in the project during high tourist season, and how these programs transform during the low tourist season to offer a different visitor experience (Figure 95).

Whereas the project is highly accessible by foot in the high tourist season, with access to outer areas provided by boats or kayaks (Figure 96), the low season emphasizes travel by boat (Figure 97) and thus handles smaller amounts of traffic. The experience of the site thus changes during high and low seasons, accommodating different numbers and types of tourists.

Dimensions of the units, each 5mx5m, are based to align and work with the existing seaweed farming plots, which are 10mx10m. Different zones of program include: a 'drying tower forest', where bamboo structures provide racks to dry the seaweed, and also double as viewing towers and iconic lanterns (Figures 105-106), a floating market and a restaurant that would feature the local aquaculture and



Figure 84: Aerial View of Seaweed Farms, grown in rectilinear units

seaweed, a swim zone and net playground where tourists can bathe in shallow pools, lounge on hammocks, or tan on sun decks (Figure 103), enclosed zones for tourists to engage in seaweed planting and harvesting, and floating pools (Figure 100) where tourists can lounge in private units in slightly deeper waters. (The program of the floating pools is derived from an existing attraction across Indonesian islands, where tourists rent private ‘party boats’, and lounge in the middle of the ocean.)

During the low tourist season, programs shift to accommodate more production based activities. While some programs are still active as they serve multiple stakeholders, such as the market, restaurant, and floating towers, the exclusively tourist-related programs are deactivated and transform to productive uses. Figures 98-101 illustrate how the floating pools transform to act as a structure for integrated multi trophic aquaculture (IMTA). This system of farming groups a compatible variety of species together as the waste of one species serves as food for another¹ (Figure 98). The inclusion of these IMTA units not only begins to diversify the products harvested from the landscape, but also enables greater economic stability as farmers are only feeding one species but gaining the returns of multiple species. In

addition, because of the added nutrients from the waste of the other species, the seaweed experiences an increase in growth rate², further contributing to the economic well-being of the farmers. The system also helps with biomitigation as the natural recycling between species minimizes waste created by farming³. In order to act as a sustainable aquaculture farm, periods of deactivation are required as well, in order to limit the intensity of impact on the surrounding ecosystem. Thus it works well to engage in a cycle, where when these units are dormant for farming, they become active as tourist pools, allowing them to continually generate an income in a more sustainable way.

The project proposes a rental scheme, where units are either being used by the seaweed farmers or rented out to tourist operators for tourist-related program. Groups of farmers can stagger their growing periods, so that drying periods are offset. This would enable the newly introduced drying towers to accommodate a greater number of seaweed farms, than if the growing periods were all synchronized. In addition, this system would always allow a degree of tourist activity on the site, although it would still fluctuate between periods of heavier and lower tourist activity.

FIGURE 85: SEAWEED FARMING

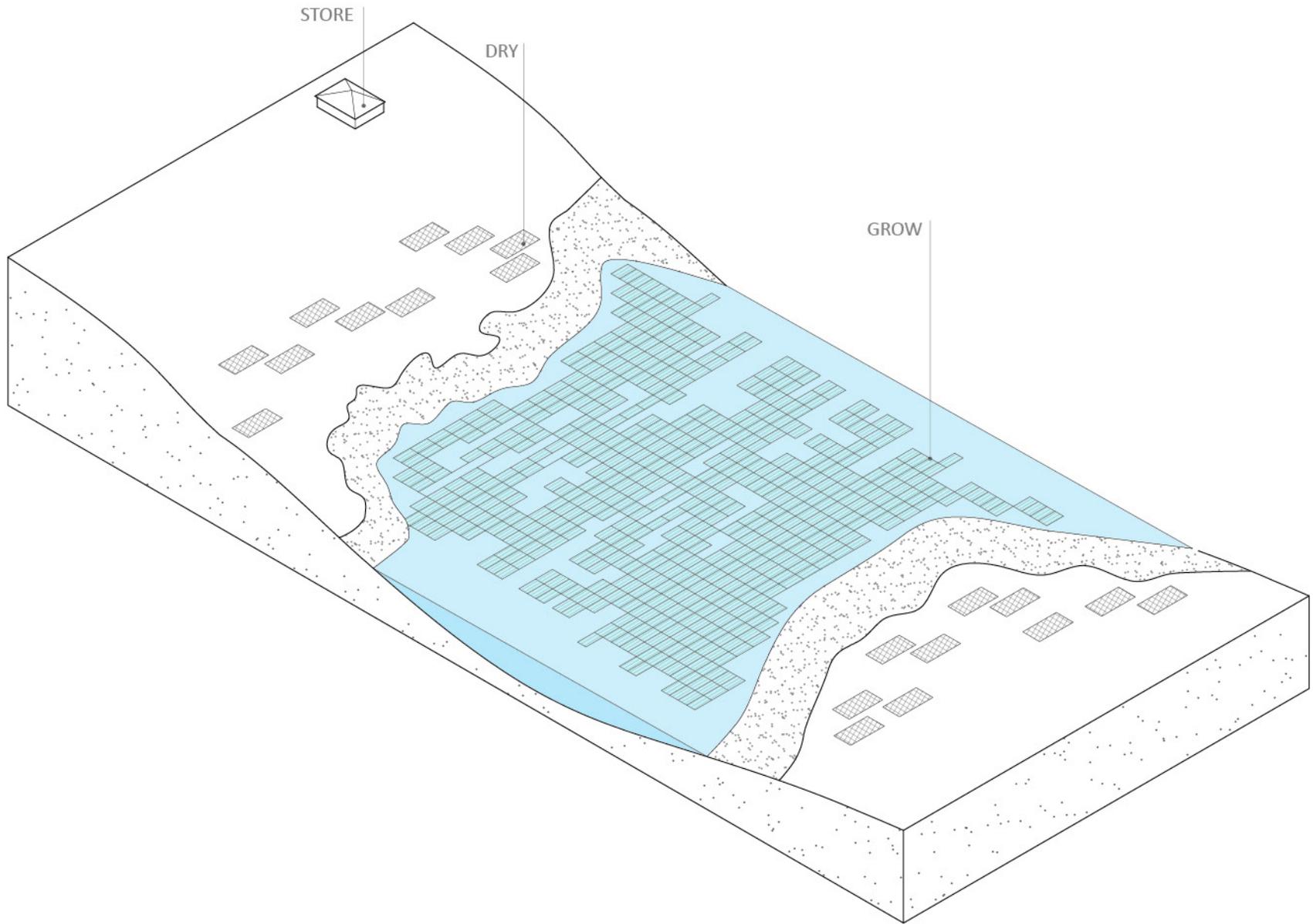


FIGURE 86: SEAWEED FARMING- IMPACT OF RESORTS

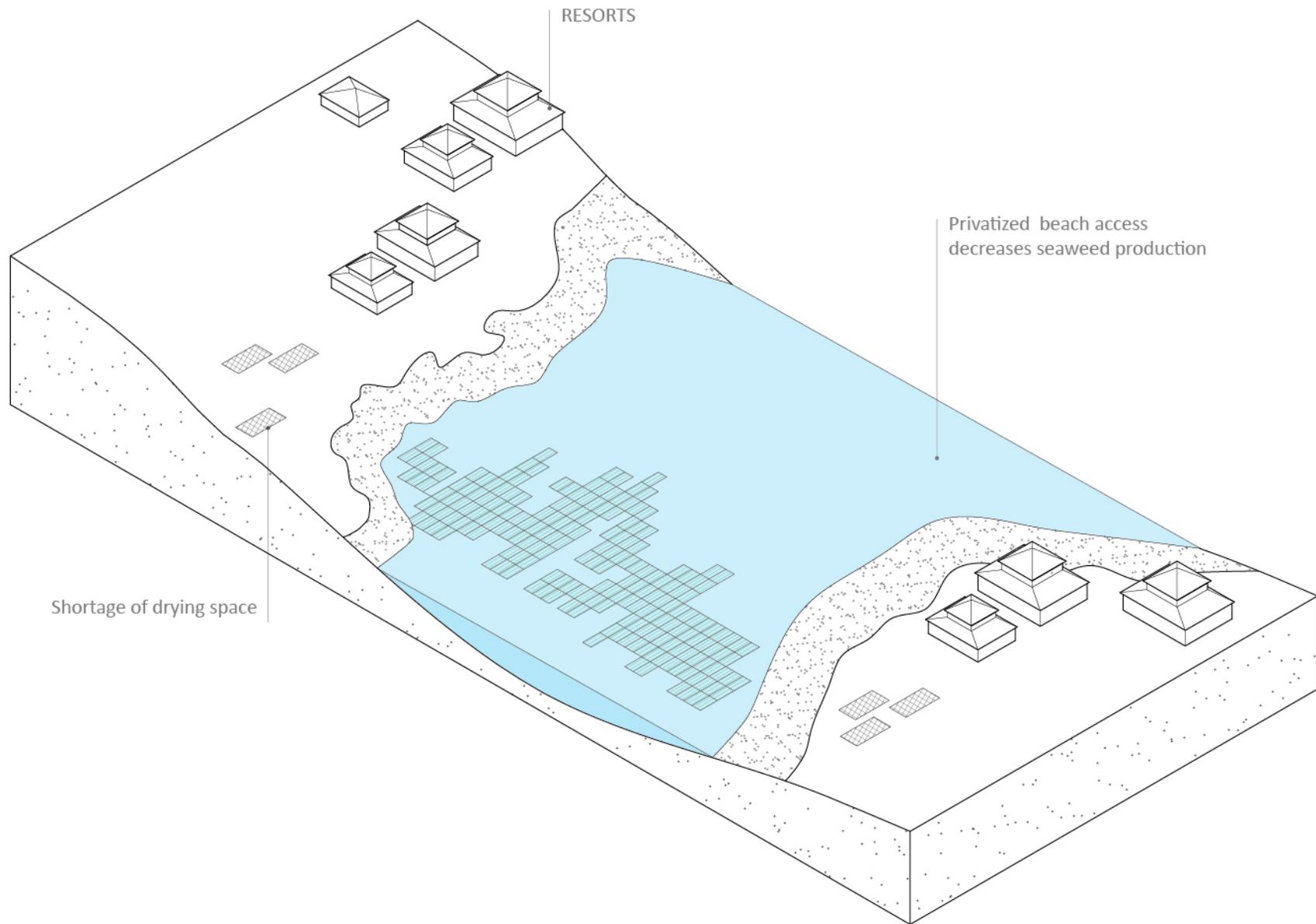


FIGURE 87: ADD A FIELD OF BAMBOO POLES AND ALIGN WITH EXISTING SEAWEED FARMING UNITS

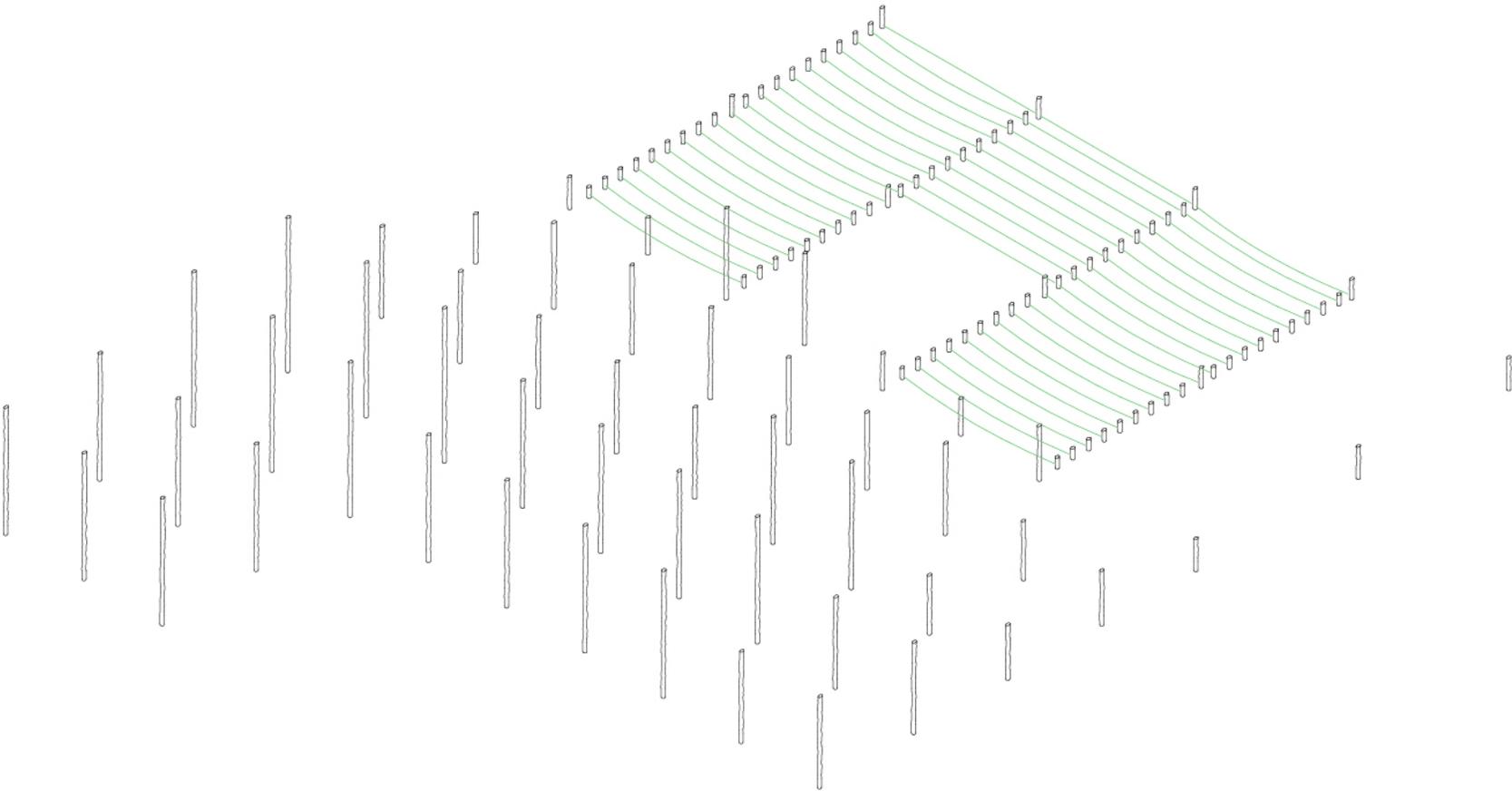


FIGURE 88: NET CONFIGURATION CONCEPT

HIGH TOURIST SEASON

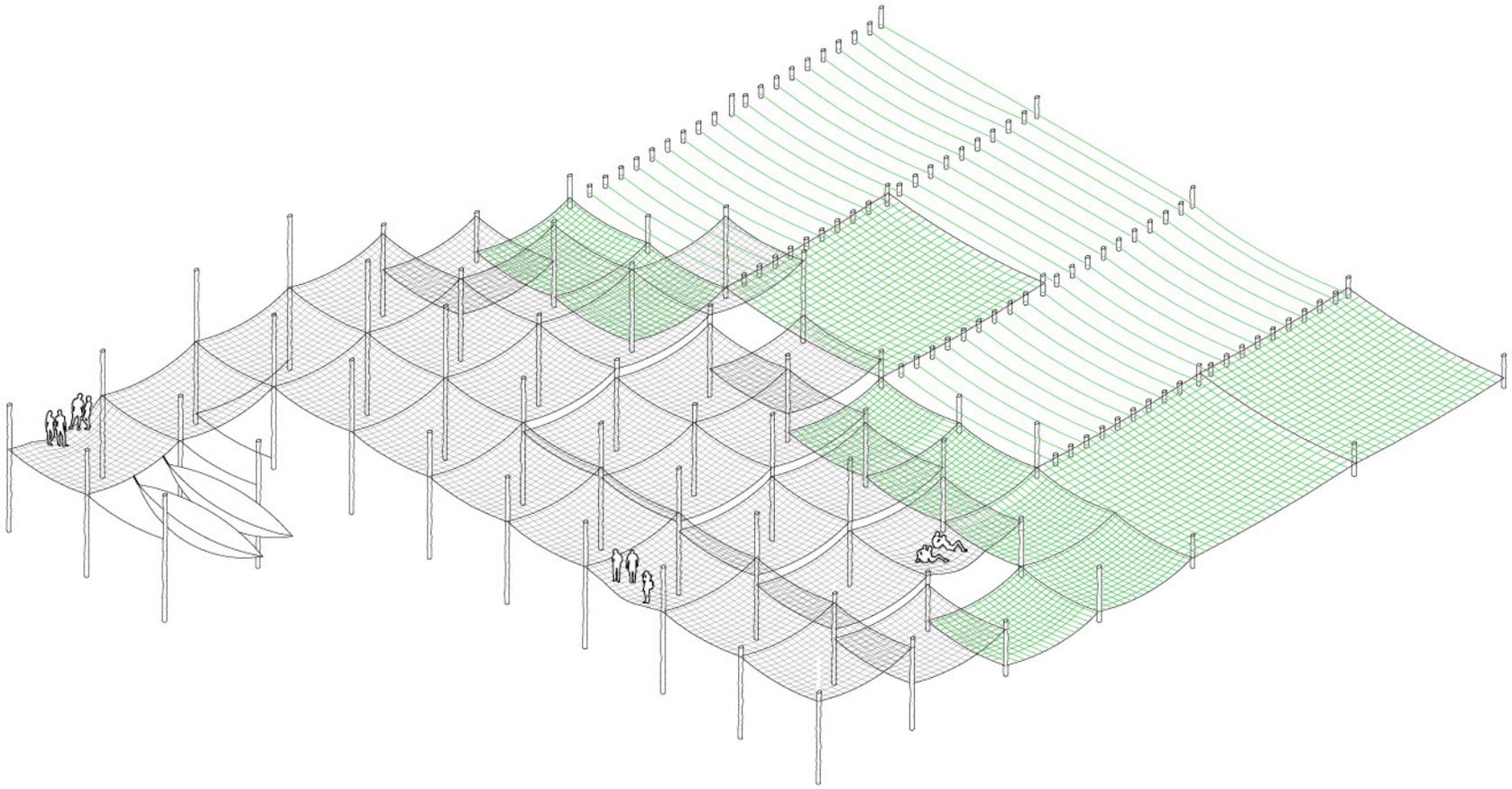


FIGURE 89: NET CONFIGURATION CONCEPT

LOW TOURIST SEASON

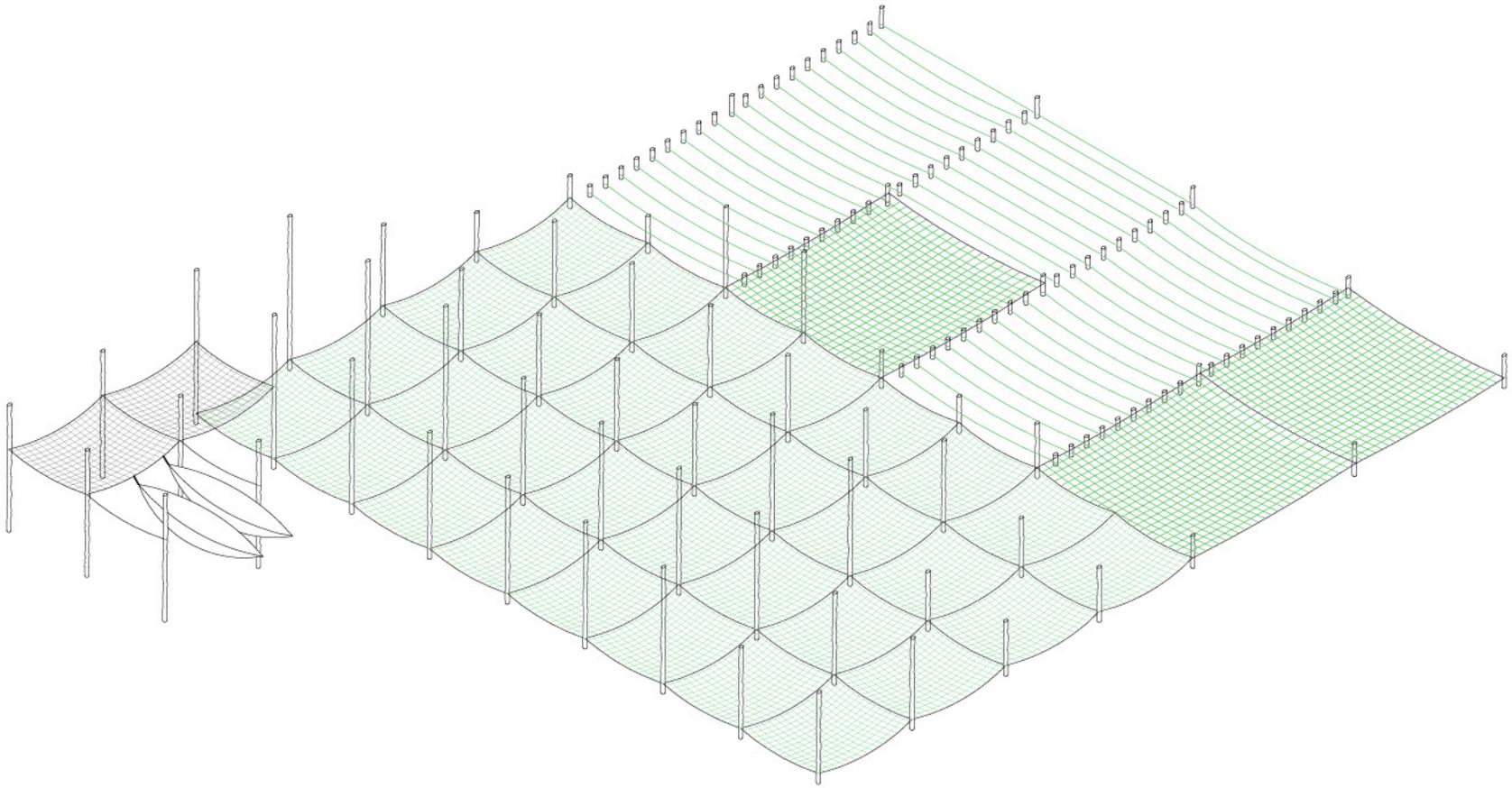


FIGURE 90: NETS RAISED TO SERVE TOURIST INFRASTRUCTURE

HIGH

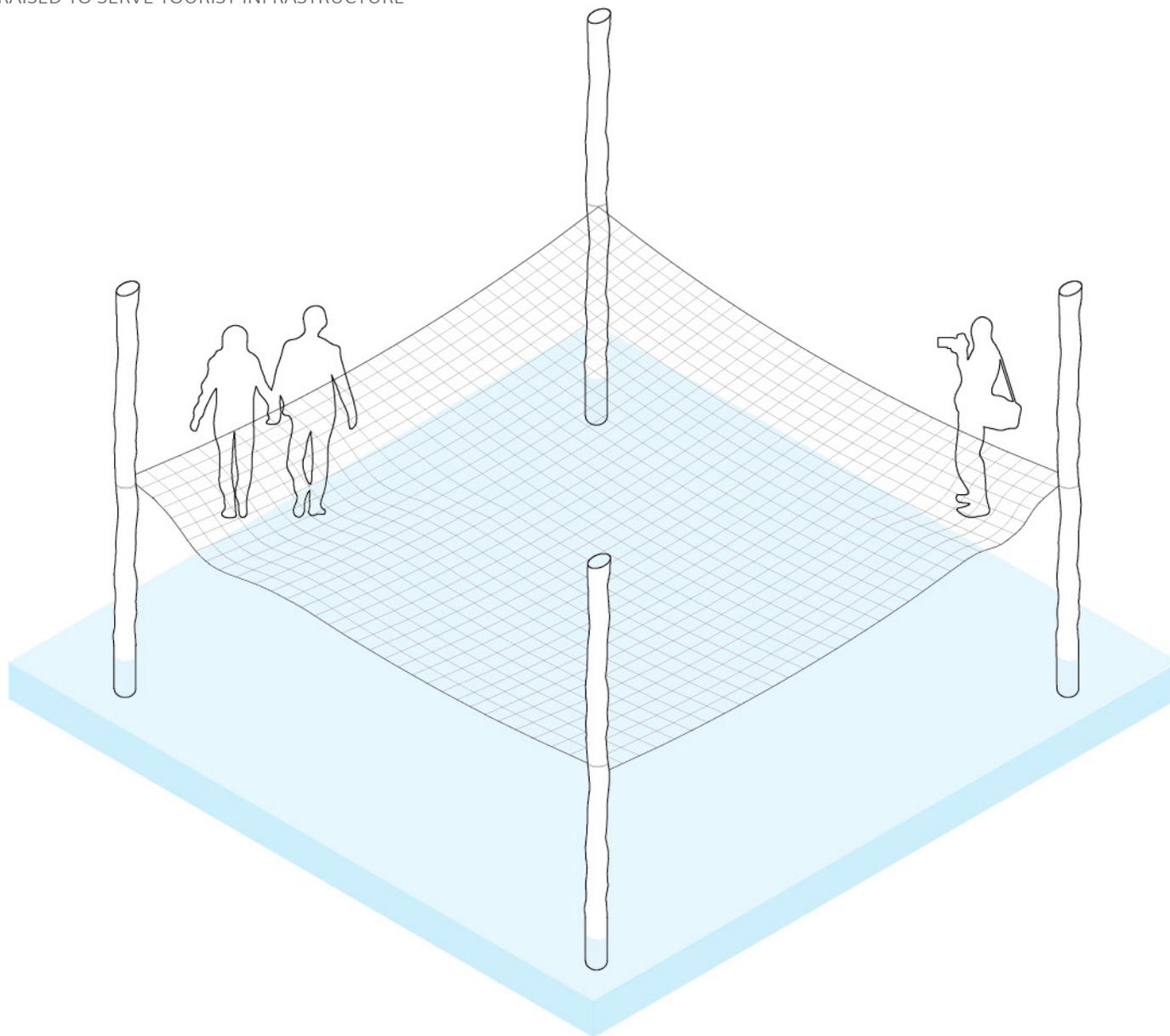


FIGURE 91: NETS LOWERED TO PROVIDE FRAMEWORK TO GROW SEAWEED

LOW

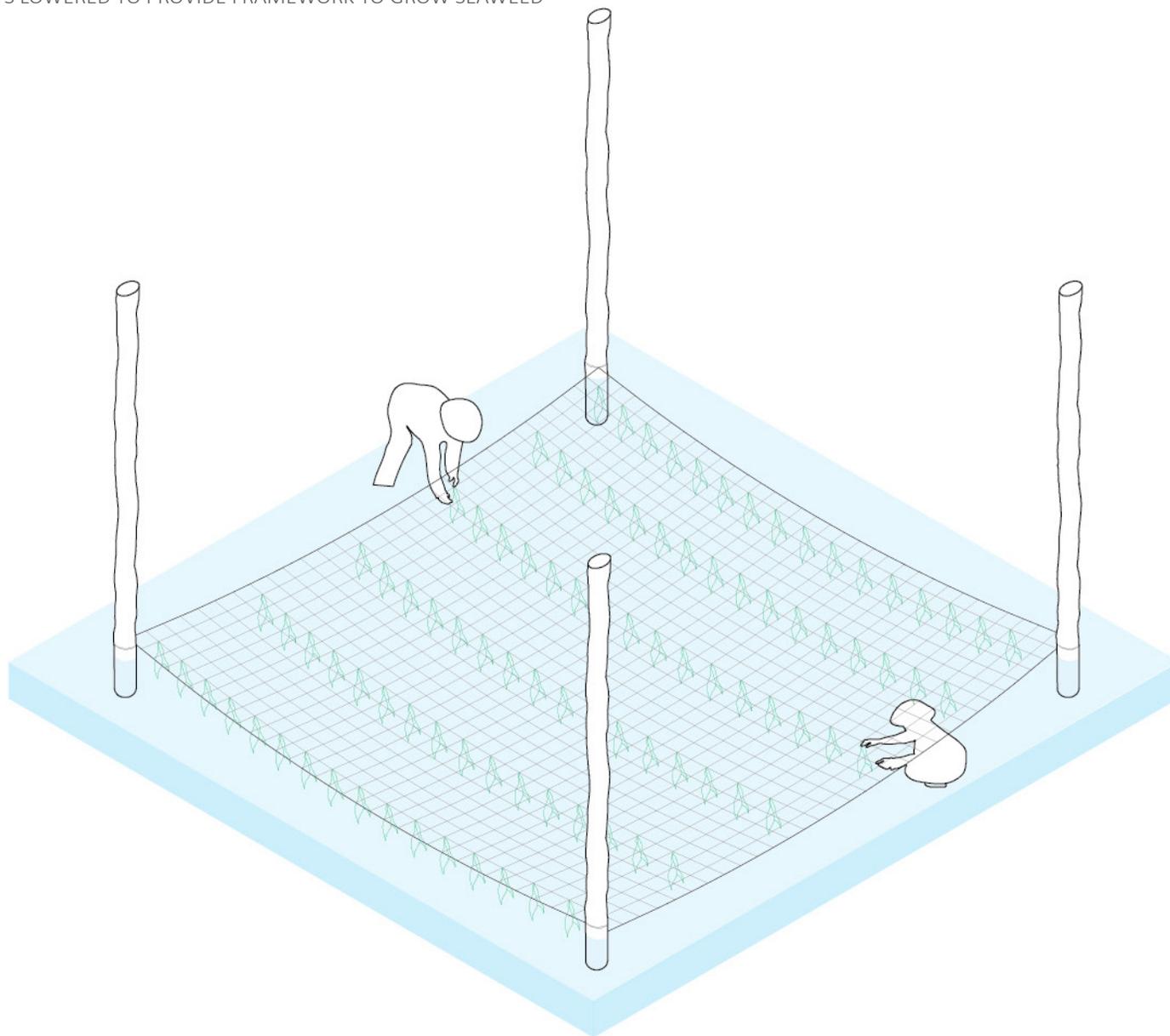


FIGURE 92: SEAWEED FARMS KEY MAP

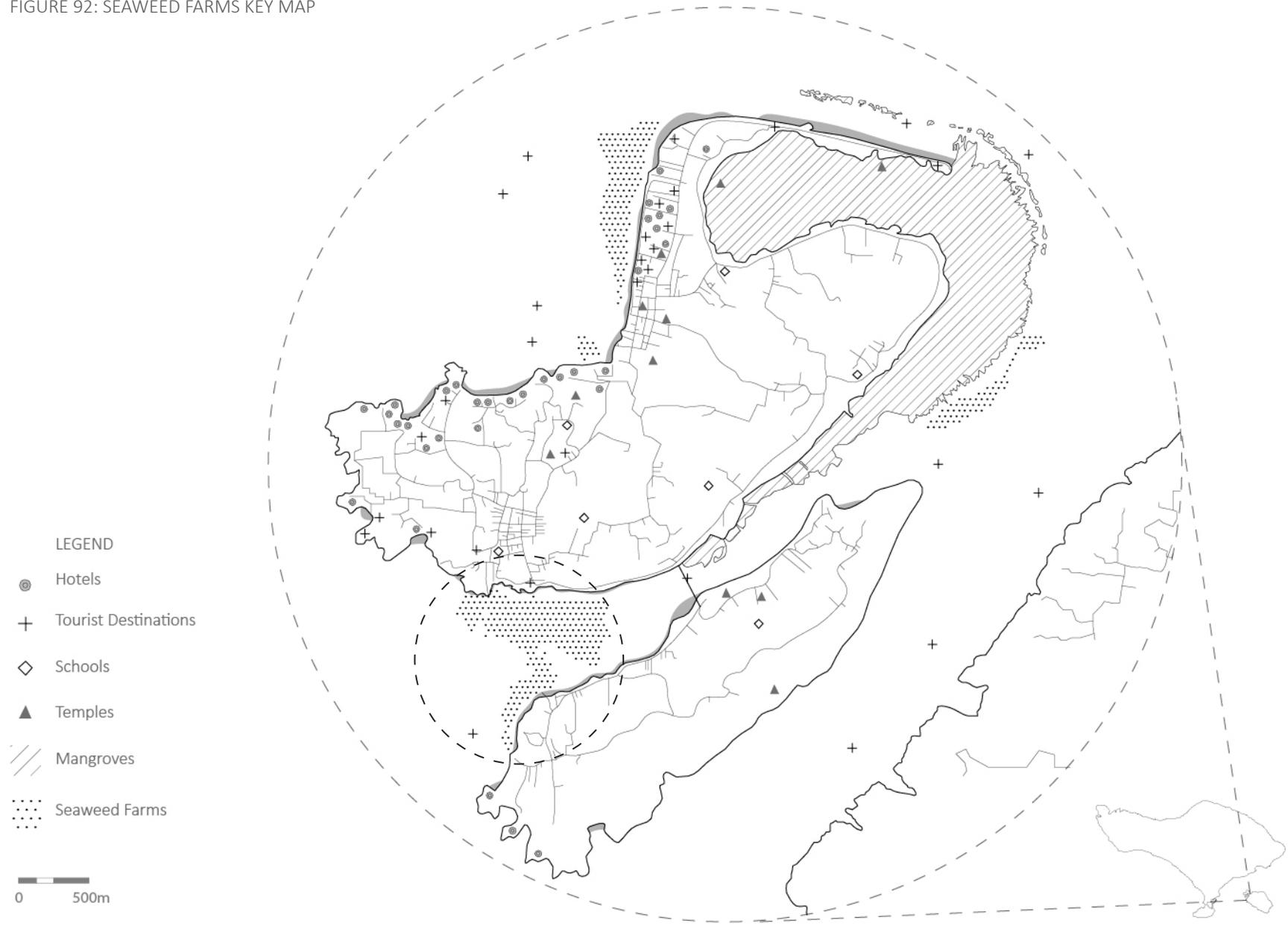
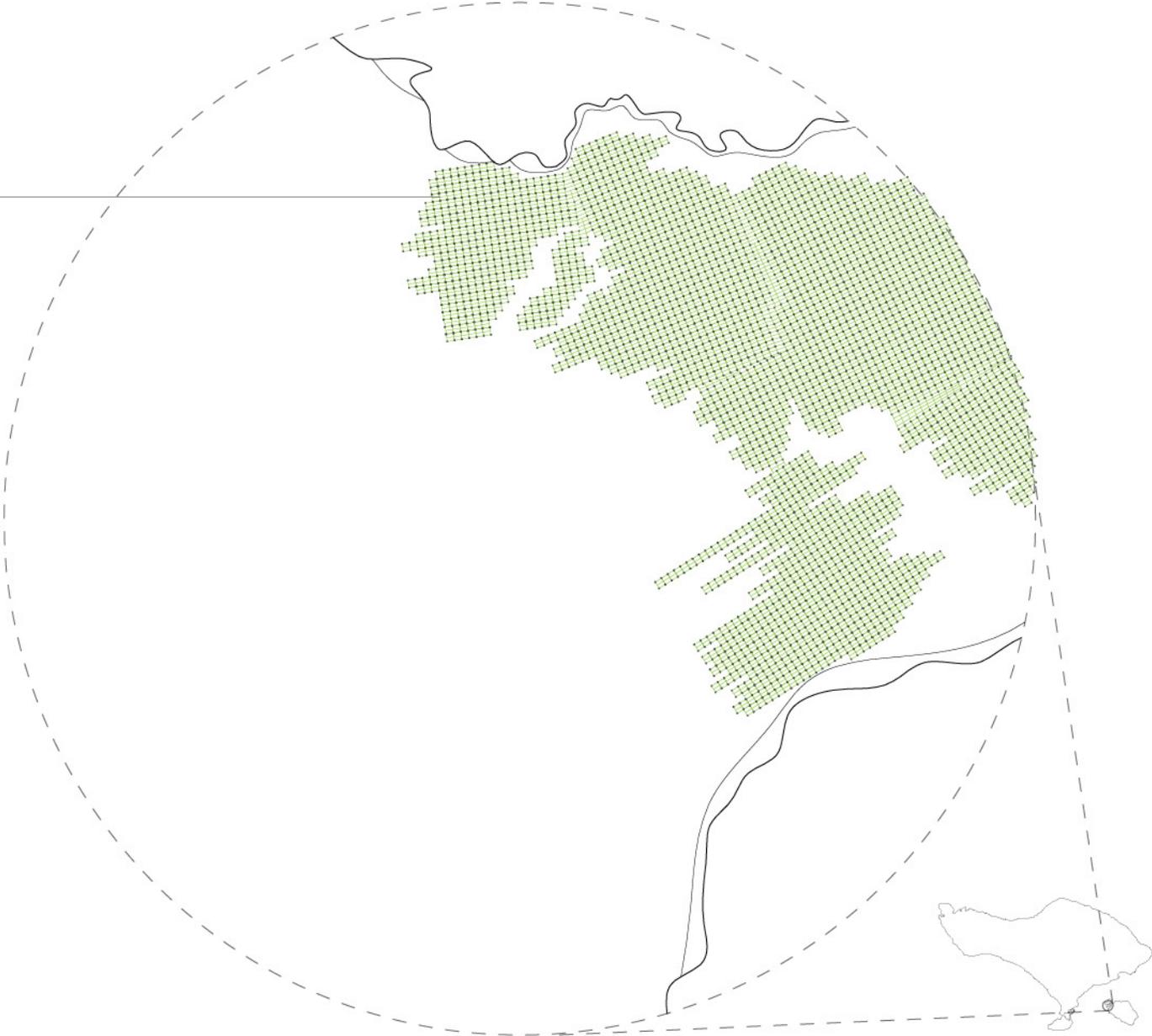


FIGURE 93: EXISTING SITE



Existing Seaweed Farms



0 100m

FIGURE 94: PROPOSED SITE

HIGH



Seaweed Growing Units



Boat Dock



Floating Pool



Net Playground and Shallow Swim Zone



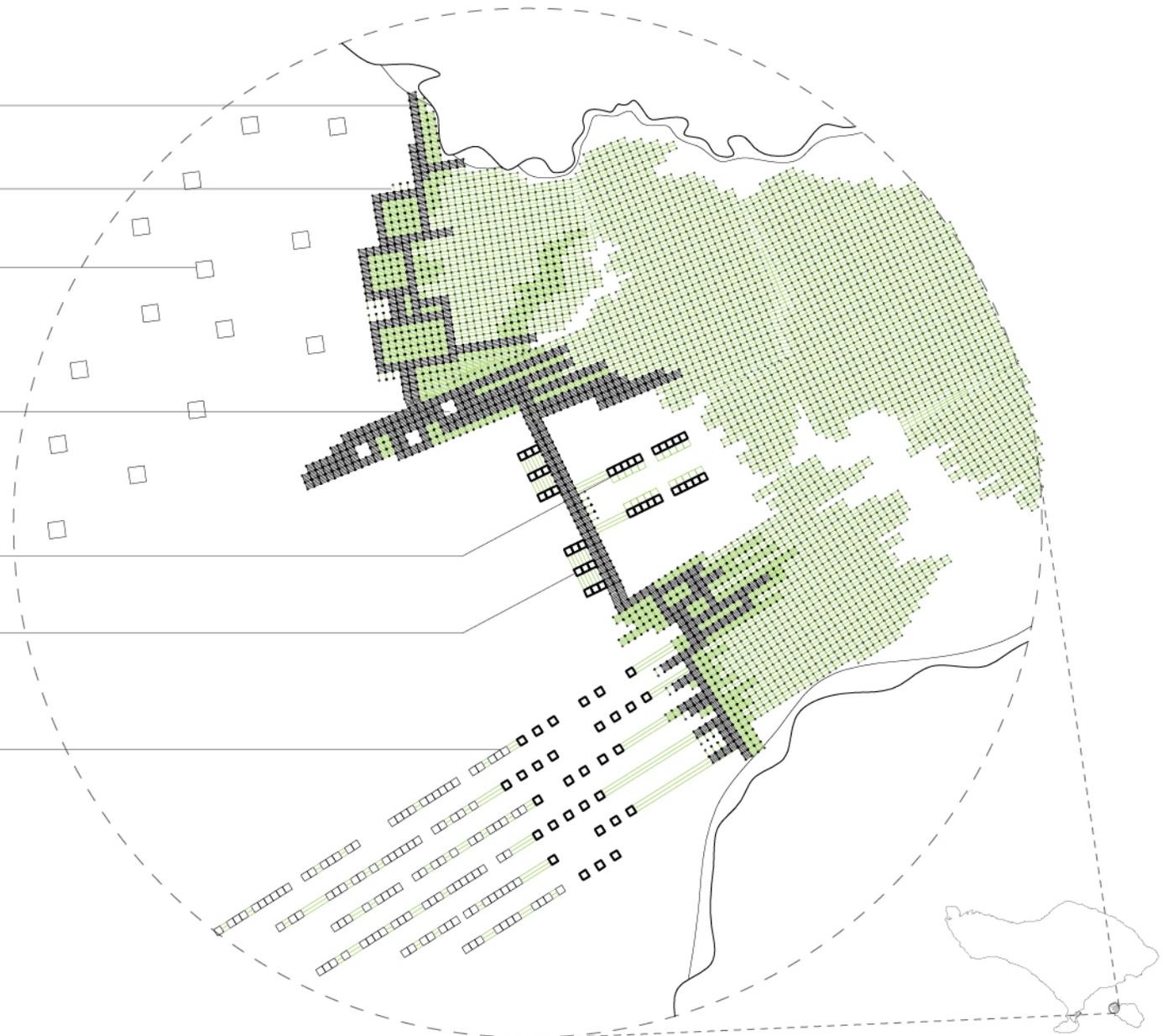
Floating Market



Restaurant Featuring Local Seaweed + Aquaculture



Drying Tower 'Forest'



0 100m

FIGURE 95: PROPOSED SITE

LOW

-  Seaweed Growing Units
-  Boat Dock
-     Aquaculture
-  Floating Market
-  Restaurant Featuring Local Seaweed + Aquaculture
-  Drying Tower 'Forest'
-  Seaweed Growing Units (Floating Method)

0 100m

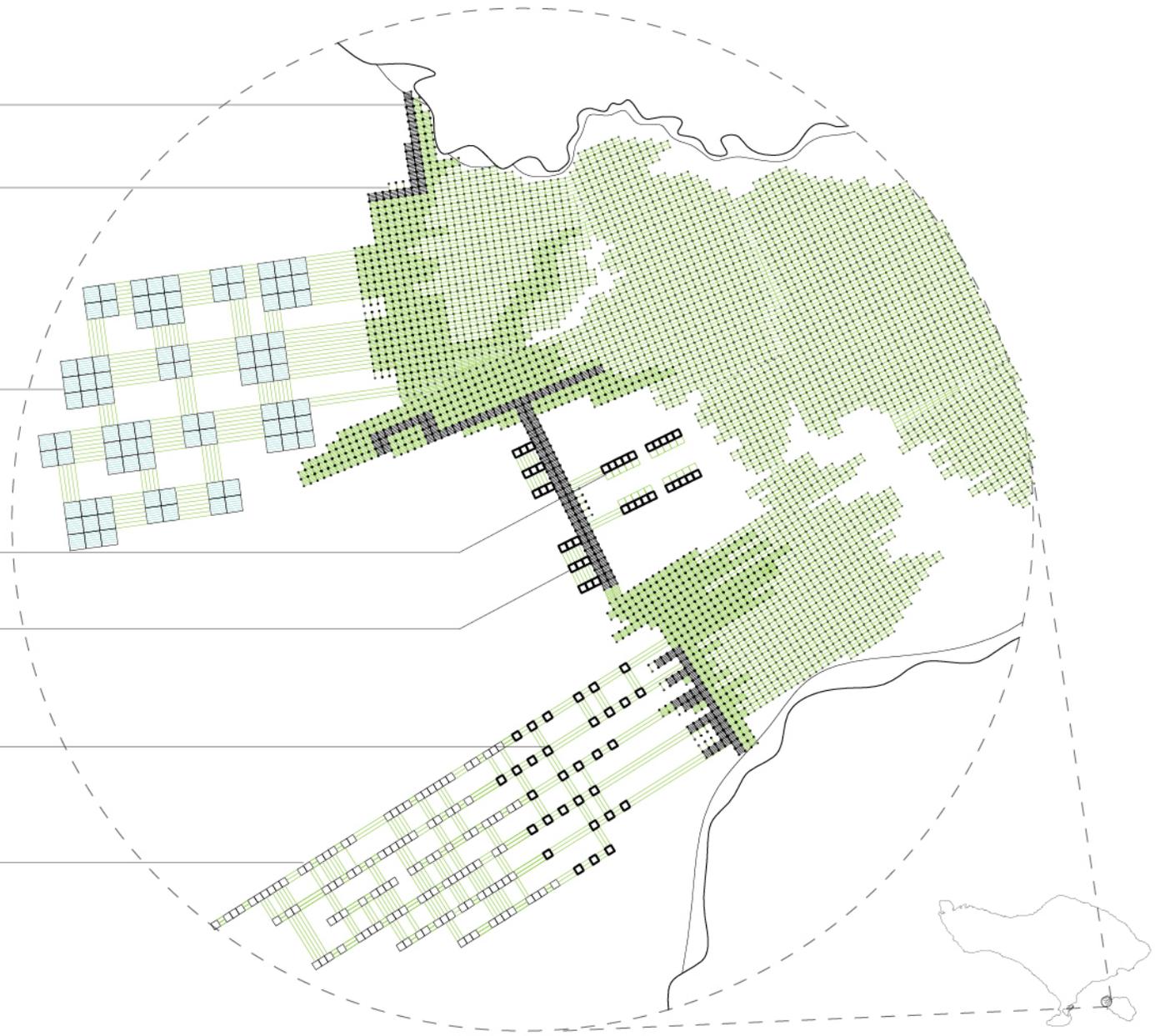


FIGURE 96: TOURIST AND AQUACULTURE FLOWS

HIGH

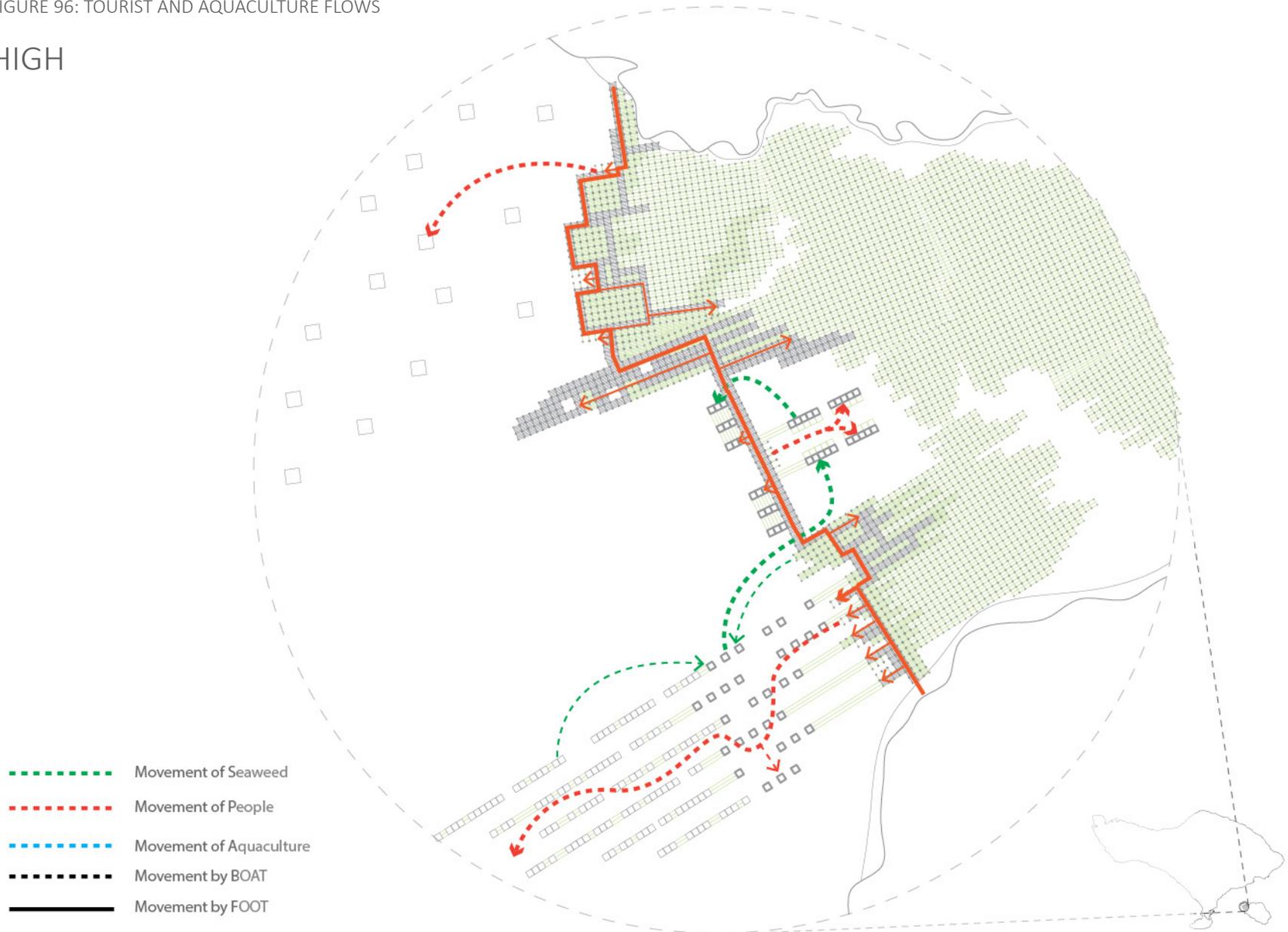


FIGURE 97: TOURIST AND AQUACULTURE FLOWS

LOW

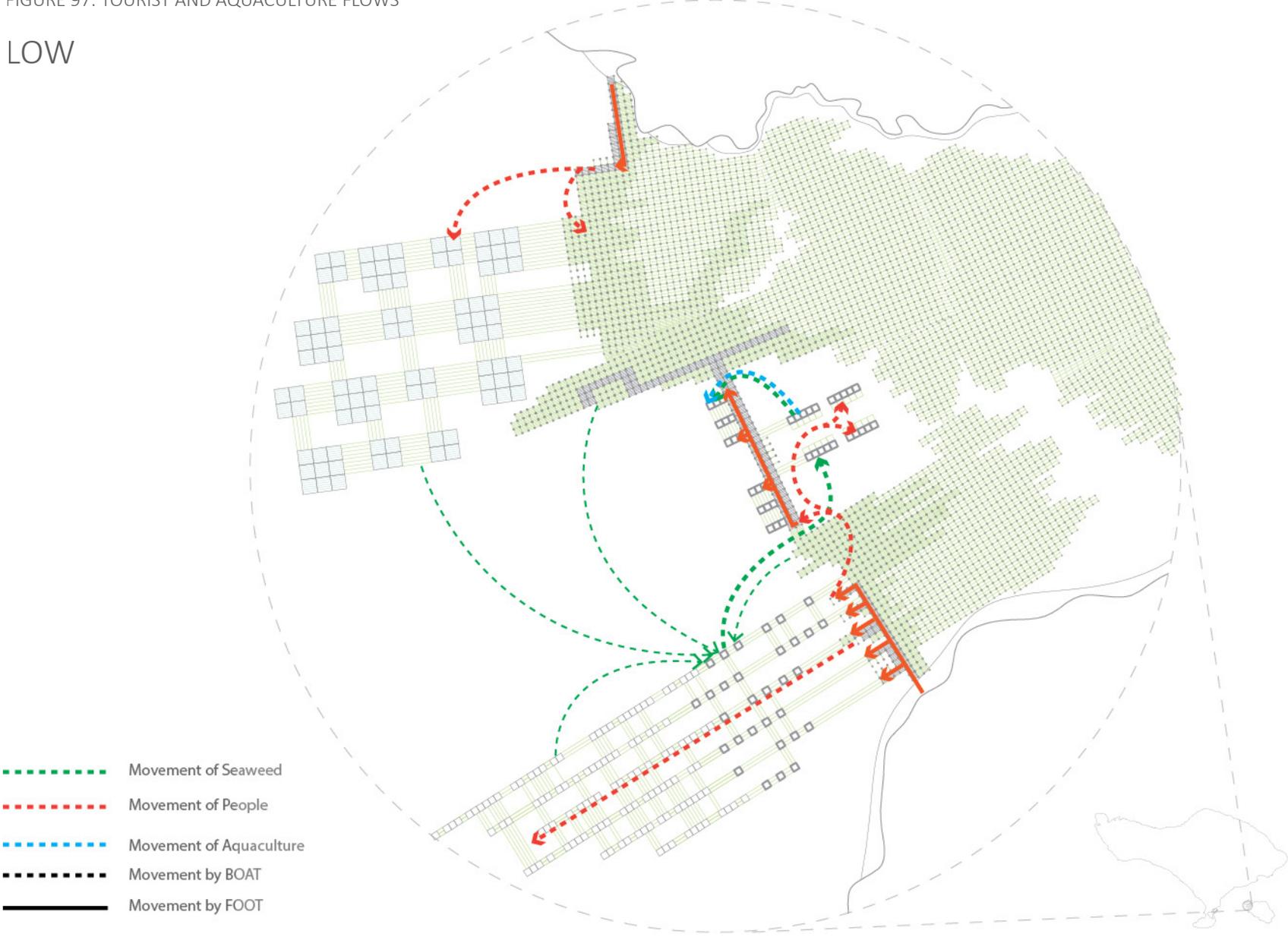


FIGURE 98: INTEGRATED MULTI TROPHIC AQUACULTURE (IMTA) PRINCIPLE

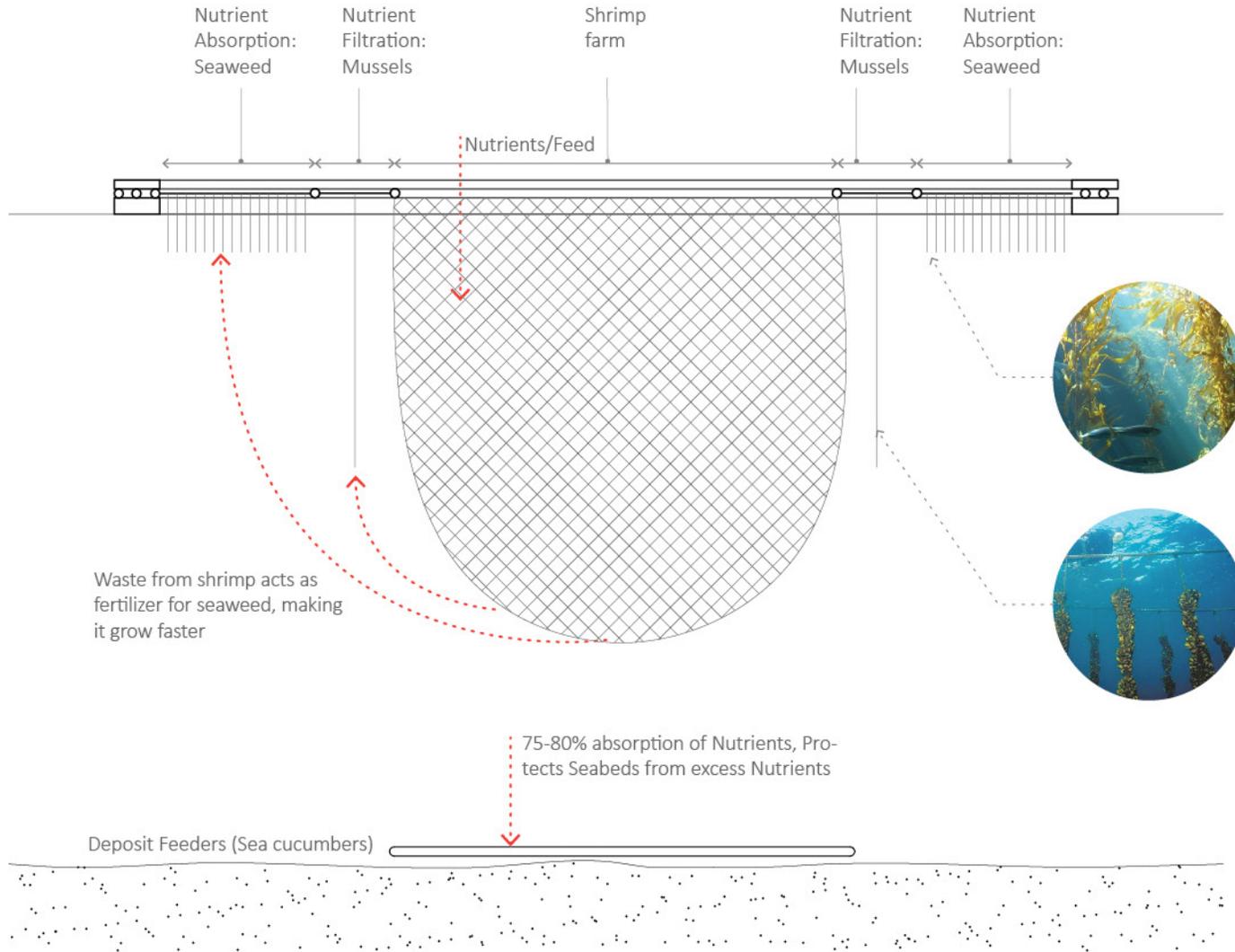


FIGURE 99: FLOATING POOLS IN HIGH SEASON TRANSFORM TO IMTA UNITS IN LOW SEASON

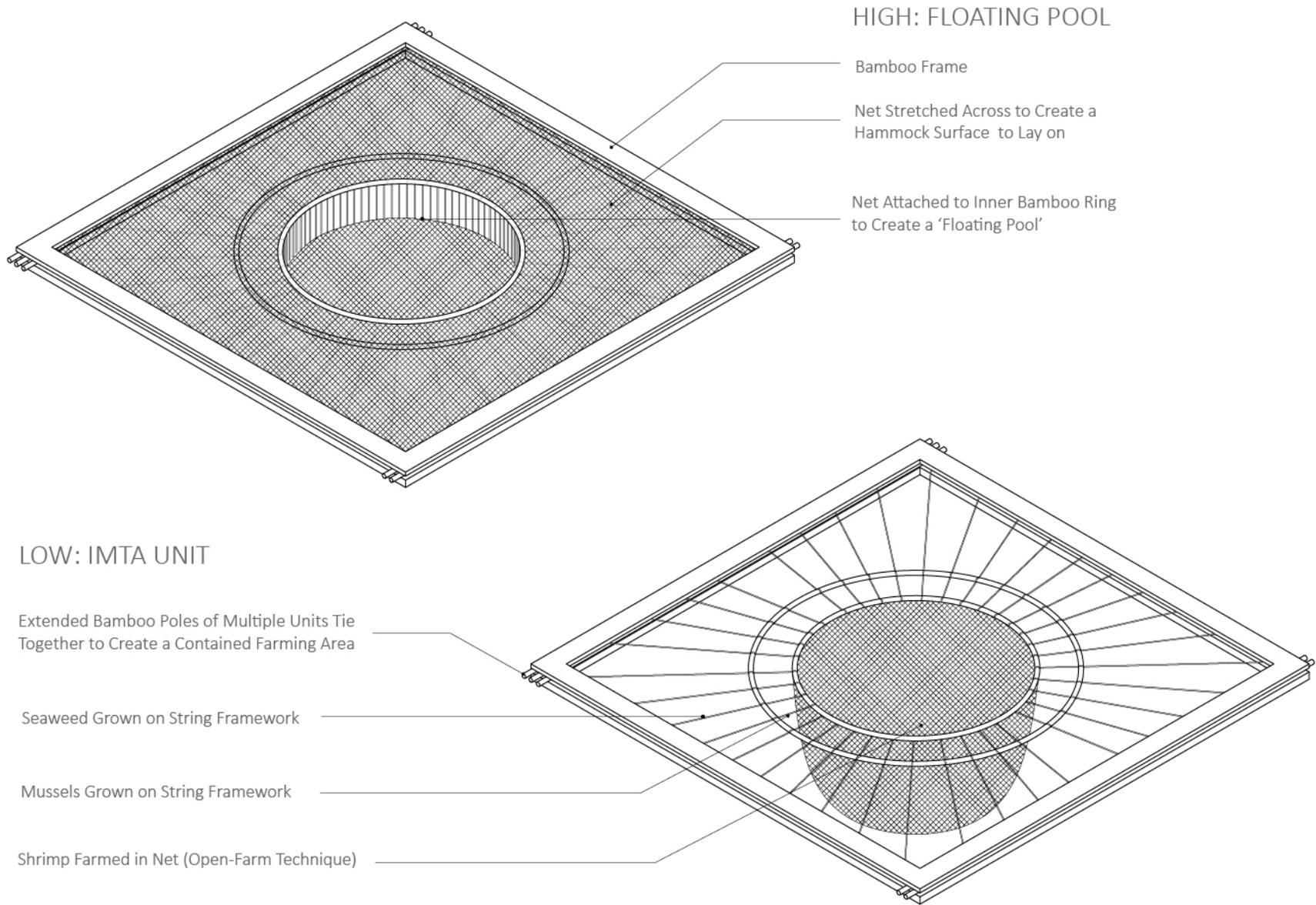


FIGURE 100: FLOATING POOLS (HIGH TOURIST SEASON)



FIGURE 101: IMTA UNITS (LOW TOURIST SEASON)

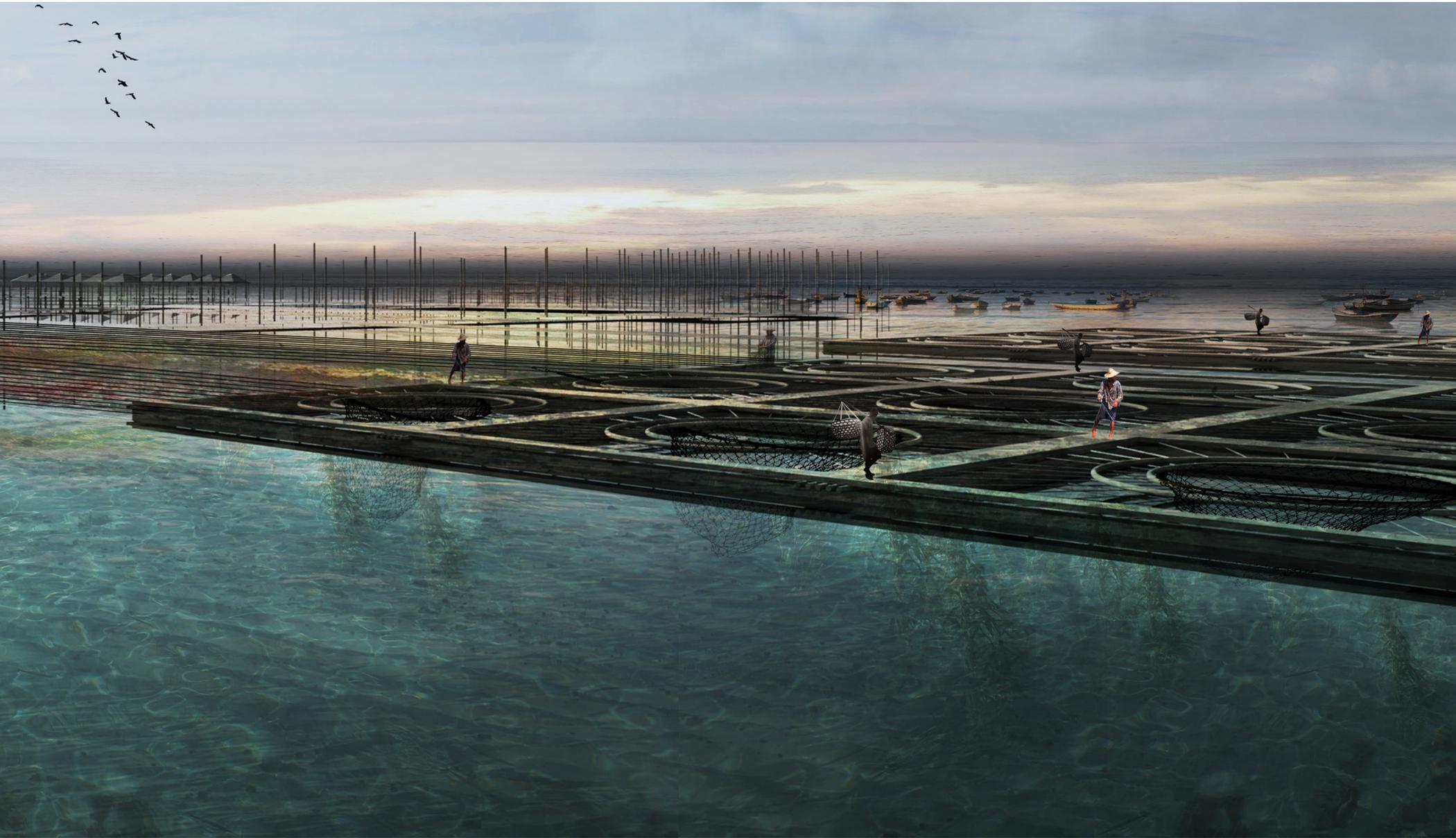






FIGURE 102: IMTA UNITS (LOW TOURIST SEASON)-
TOURIST SNORKELING BELOW SURFACE OF WATER

FIGURE 103: SWIM ZONE AND NET PLAYGROUND RENDER (HIGH)

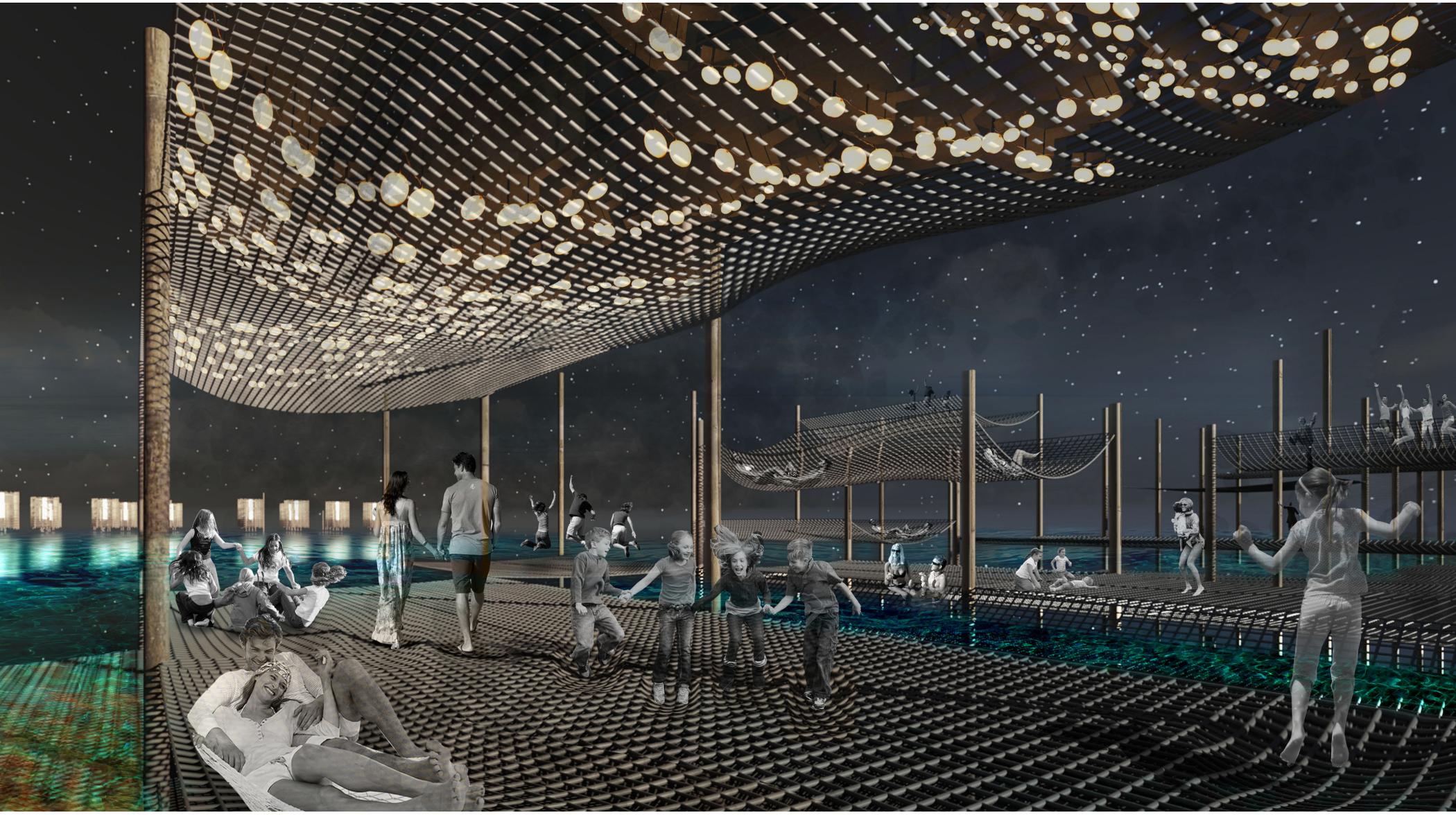


FIGURE 104: SWIM ZONE AND NET PLAYGROUND RENDER (LOW)

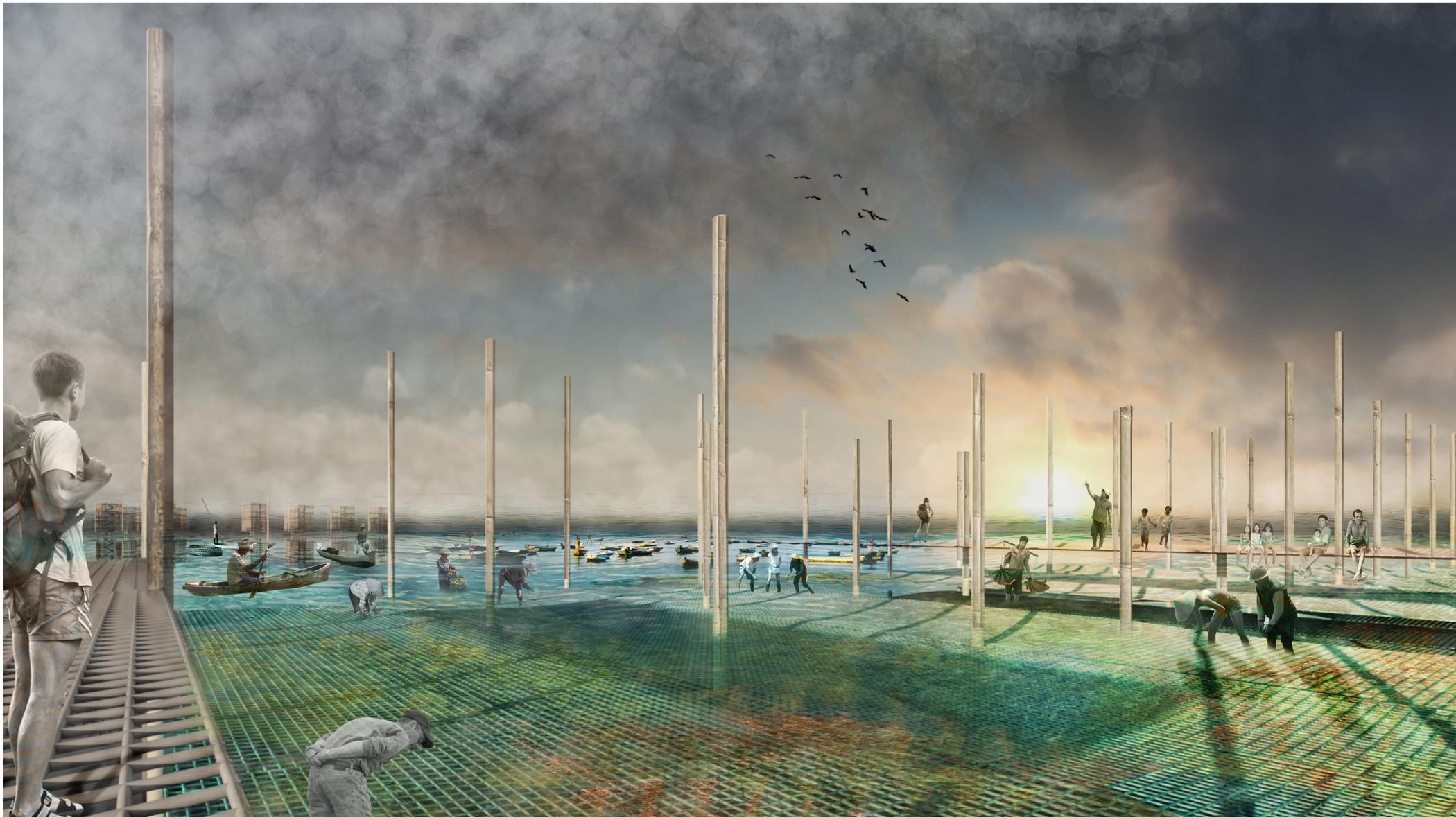
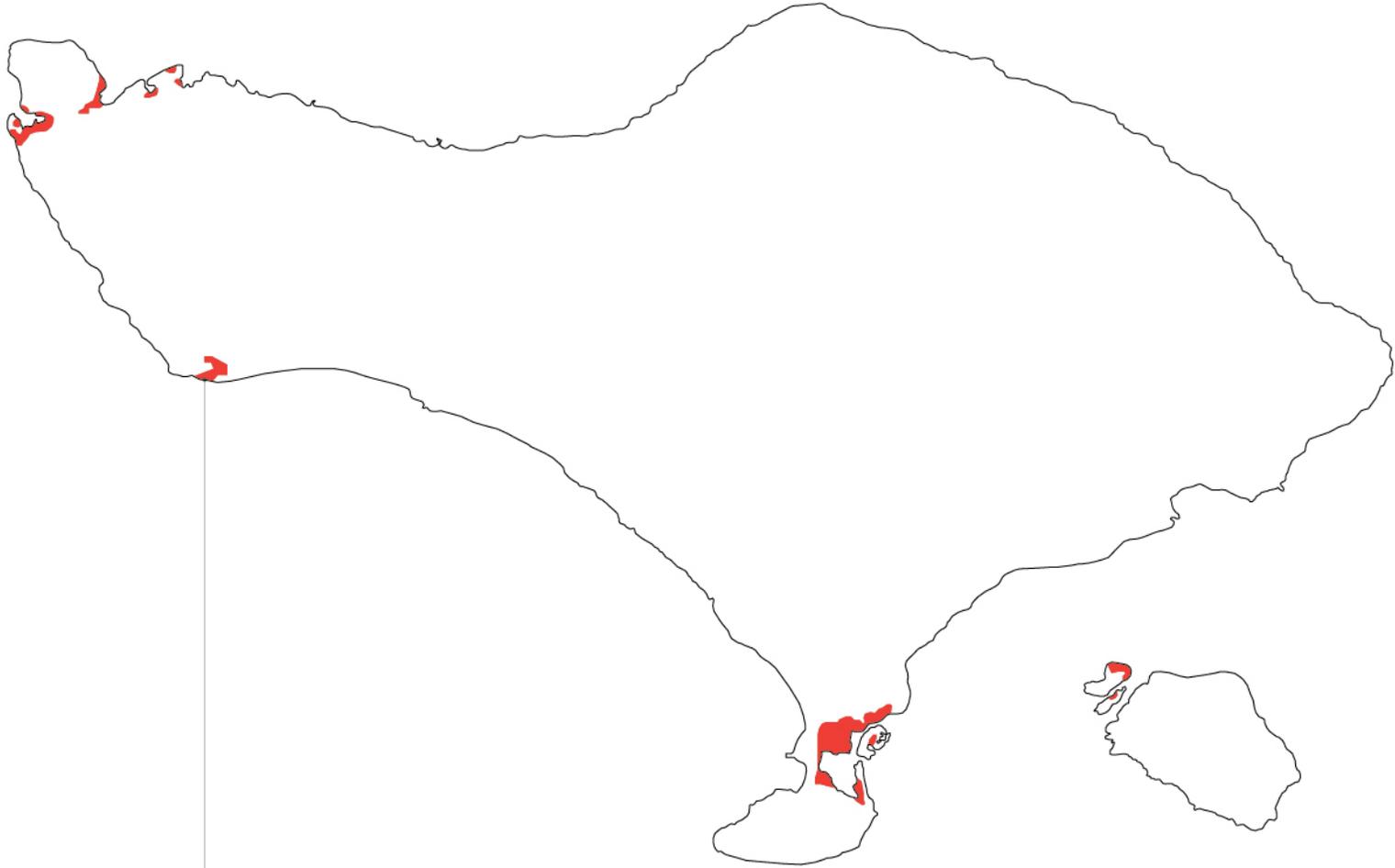


FIGURE 105: DRYING TOWER FOREST (HIGH)



FIGURE 106: DRYING TOWER FOREST (LOW)





Mangroves

MANGROVES

Developer PT Tirta Whana Bali International (TWBI) plans to commence a \$2.5 billion project, on land reclaimed from Benoa Bay, that will eventually eliminate the remaining 700 hectares of the once-protected mangrove wetlands⁴. (Benoa Bay used to host the largest mangrove community and estuary in Bali, but between 1975-1997, 53% of the mangroves were lost to conversion of fishponds, to meet demands for aquaculture from tourist restaurants, and other commercial uses⁵. This contributed to the decline of offshore fishery by reducing habitat. Increasing coastal developments in the area also resulted in a complete eradication of seaweed farming by 1990⁶.)

The new project includes the construction of villas, apartments, luxury hotels, a Formula One racing circuit, and a theme park (Figures 108, 113). Artificial islands would take up 75% of the bay area, and could cause massive flooding problems in the low lying areas nearby as sea levels could rise as much as 1.6m in the surrounding area (most notably Tanjung Benoa & Sanur) as a result of this activity⁷. Silt from dredging activities would also swamp the reefs and mangroves⁸. The land reclamation project will destroy the



marine ecosystem in Benoa, especially the coral reefs which will eventually become covered by sediment particles⁹. This is the largest tourism development in Bali since Nusa Dua or Pecatu, and goes completely against the hotel moratorium drawn up in 2009 by the Bali provincial government¹⁰.

Shortly before announcing the project, the developers launched an environmental publicity campaign and brought in soccer star Cristiano Ronaldo as a 'Mangrove Ambassador' to spearhead the planting of mangroves in the south of the island¹¹. The president of Indonesia at the time, President Susilo Bambang Yudhoyono, was also present. In May 2014, presidential regulation no. 51/2014 changed the status of the mangrove forest from a protected wetland, allowing the project to take place in this location¹² (Figure 112). Protests by religious leaders, politicians, musicians, academics, artists, and farmers, have been held to stop the controversial development. Regardless of whether or how quickly the plan will continue, this example is illustrative of the politics of land development in Bali and how environmentalism is used as a social veil.

Figure 108:
Rendering of
the proposed
project for
Benoa Bay



Figure 109: 'Bali Mandara' Highway running through site

The site of the mangroves is located in the south of the island, in Benoa Bay (Figure 110). The site is surrounded by areas of heavily developed tourist zones (Nusa Dua on the right of the bay and Kuta to the left of the bay). There is also a newly constructed highway that runs across the bay (Figure 109), which the island is very proud about as it showcases their development in technology and construction.

The project in the mangrove site reacts to the proposed development by PT Tirta Whana Bali International, and questions the relationship between tourism and territory in relation to ecology. Taking into account the political economy of Bali, and the way in which the hand of the law often sways to accommodate investors with large monetary power, the project doesn't seek to dismiss TWBI's proposal altogether, but suggests implementing certain regulations in order to create a more sustainable development. The proposed regulations take advantage of the cycle of tourist flows that repeatedly occur in Bali, where new attractions will experience a peak of tourist arrivals followed by a subsequent eventual fall as the area becomes too heavily laden with tourists. Understanding this inevitable cycle, the thesis suggests allowing the developers to build their villas

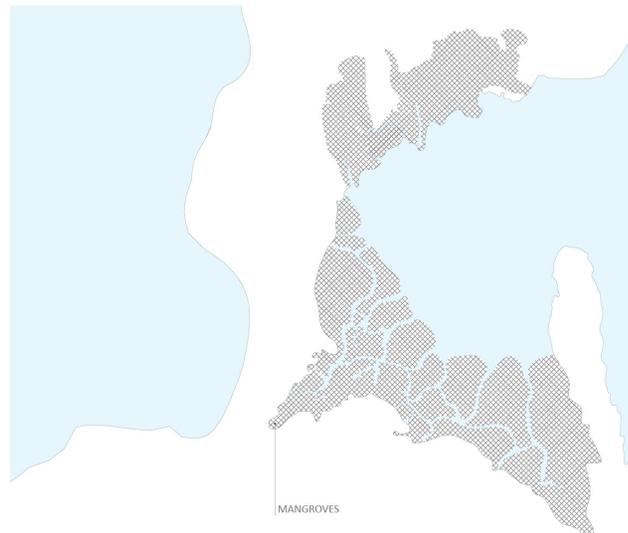
but regulating against dumping large amounts of reclaimed land on the site, and requiring the use of materials that are easier to disassemble (Figure 114). As tourist arrivals gradually decrease and revenues fall, these structures can be dismantled, eventually leaving an infrastructure that is set up to allow the mangrove ecology to flourish. Based on existing methods of mangrove planting, where bamboo poles provide vertical support for young mangroves, the project imagines that the remaining field of bamboo posts, which were initially funded and put in place by large scale investors building luxury villas for tourists, now provide a framework on which to grow the mangroves (Figure 115).

As the mangroves mature, the repeating cycles of tourist flows suggest that the site will once again gain popularity as it becomes discovered by active tourists (Figure 117). As the site gains increasing popularity, the bamboo poles can double as a framework for a new tourist facility (Figures 118-119). Continuing the idea of sites that cycle between periods of high and low activity, the new facility would operate in a similar fashion to the projects in the rice fields and the seaweed farms, leveraging different stakeholders at different times of the year.

FIGURE 110: EXISTING SITE



FIGURE 111: EXTENT OF MANGROVES IN BENOA BAY



PRE 1969 MAP - MANGROVE AREA



CURRENT MAP - MANGROVE AREA

FIGURE 112: CHANGING ZONING LAWS



2011 ZONING MAP



2014 ZONING MAP

FIGURE 113: DEVELOPER'S PROPOSAL

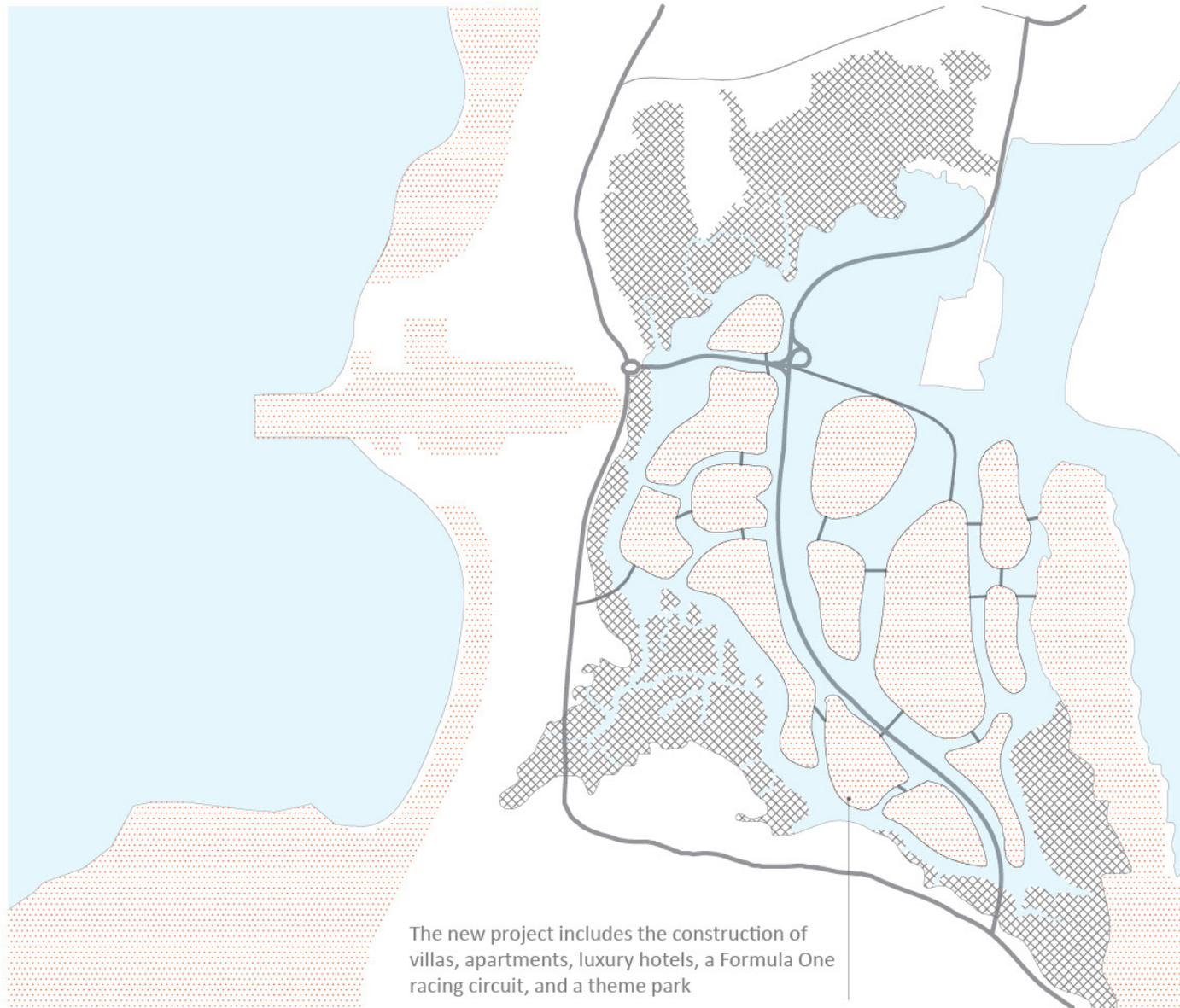


FIGURE 114: YEAR ONE- ALLOW DEVELOPER'S TO BUILD THEIR VILLAS BUT REGULATE AGAINST DUMPING LARGE QUANTITIES OF LAND AND REQUIRE THE USE OF MATERIALS THAT ARE EASIER TO DISASSEMBLE



FIGURE 115: YEAR FIVE: AS TOURIST NUMBERS DROP AND REVENUES DECREASE, DISASSEMBLE VILLAS, LEAVING ONLY STRUCTURAL POLES IN PLACE. THESE POLES ACT AS A SUPPORT TO TIE YOUNG MANGROVES TO



FIGURE 116: YEAR 8- MANGROVES MATURE



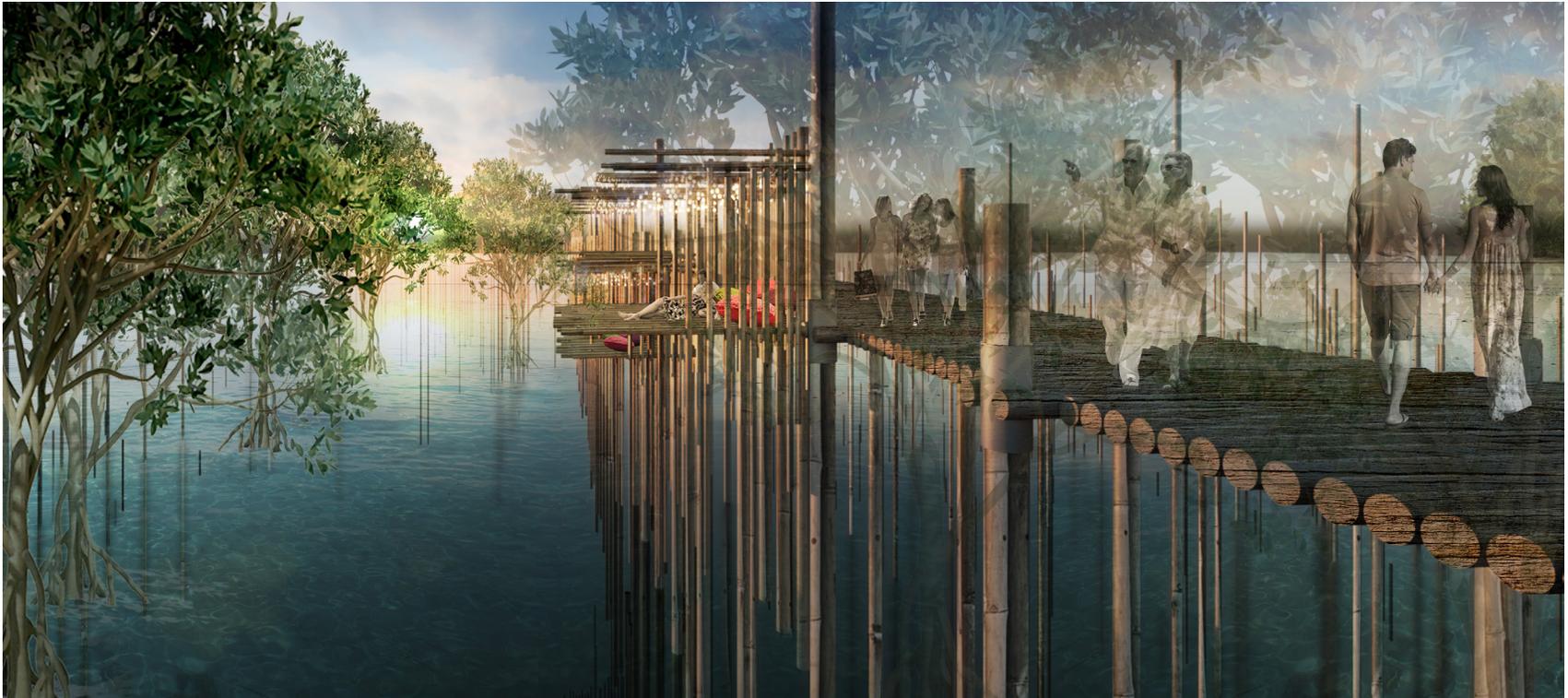
FIGURE 117: LANDSCAPE BEGINS TO ATTRACT ACTIVE TOURISTS



FIGURE 118: NEW FACILITY LOW TOURIST SEASON



FIGURE 119: NEW FACILITY HIGH TOURIST SEASON



Before being planted, mangrove seedlings are usually grown for a few weeks in a nursery condition (shallower waters so that the seedling is not too far below the surface of the water). Seedlings can be planted in reefballs, which provide the young mangroves a base support, until their roots grow large enough to ground themselves into the earth. The project proposes the implementation of a series of platforms (made from sustainably harvested mangrove wood) that during low tourist season would slide down the bamboo poles in order to create a nursery condition until the mangroves are ready to be planted (Figure 120). Once the young mangroves are ready to be planted, they can be placed along a second set of bamboo poles, to restore the ecology in another zone. In high tourist season, the platforms can raise significantly above the water level to act as a pathway for tourists. As these platforms raise and lower in different configurations, paths of accessibility and modes of travel change. The project proposes restoring the mangrove ecology in Benoa Bay in phases (Figures 121-122). After each cycling of low and high tourist phases, enough mangrove seedlings are nurtured to be ready to be planted in the next zone and the cycle can repeat.

FIGURE 120A: PLATFORM AT NURSERY CONDITION (LOW SEASON)

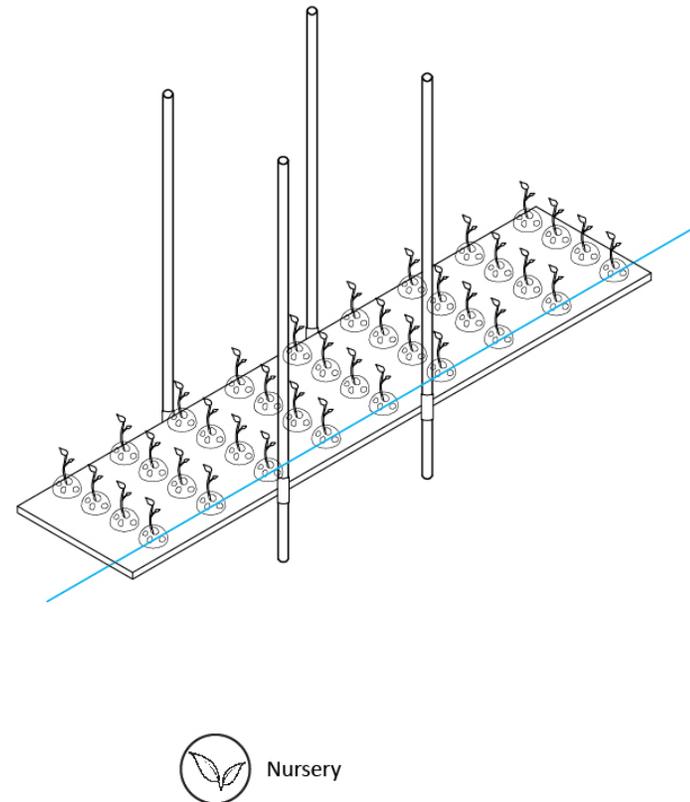
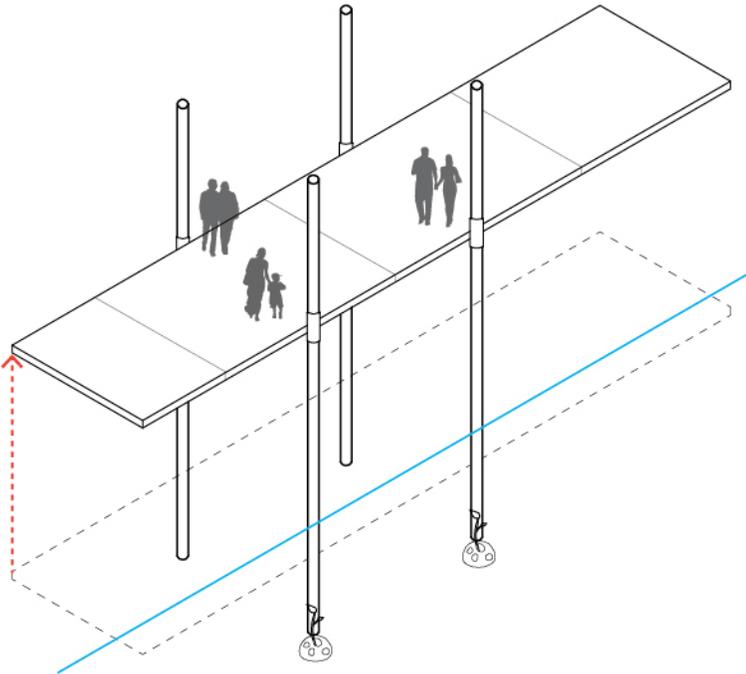
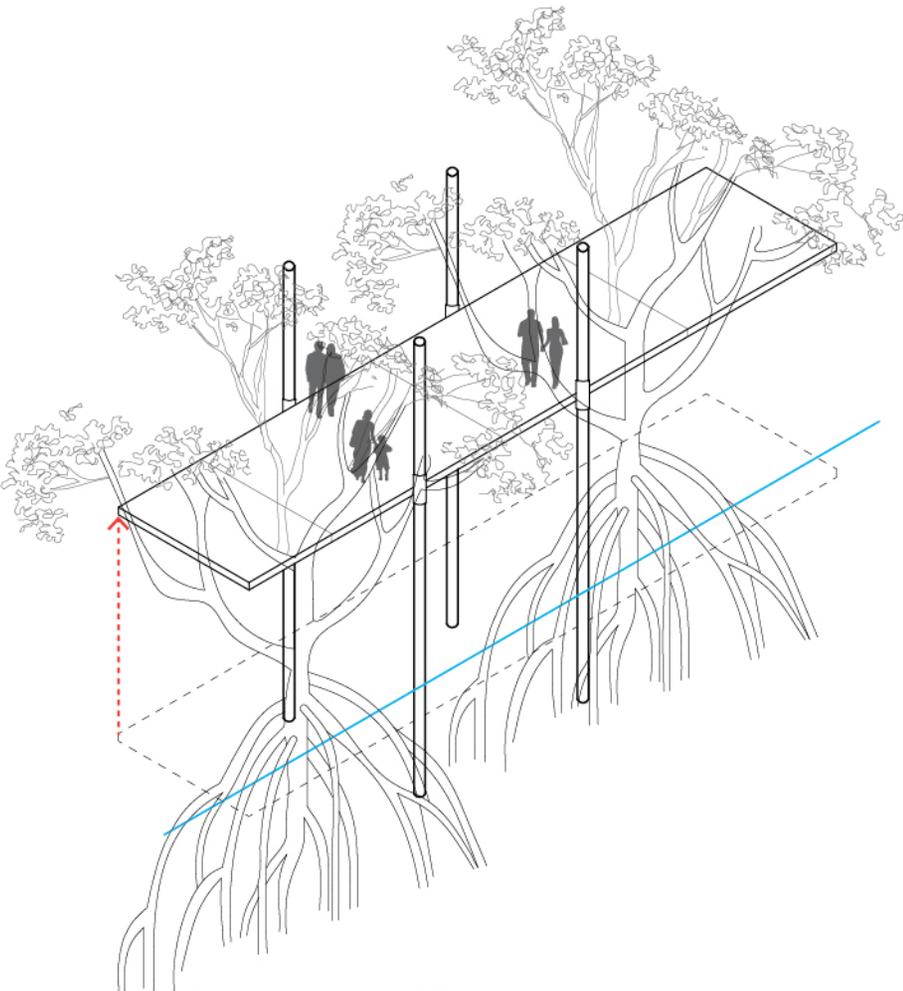


FIGURE 120B: PLATFORM AS WALKWAY (HIGH SEASON)

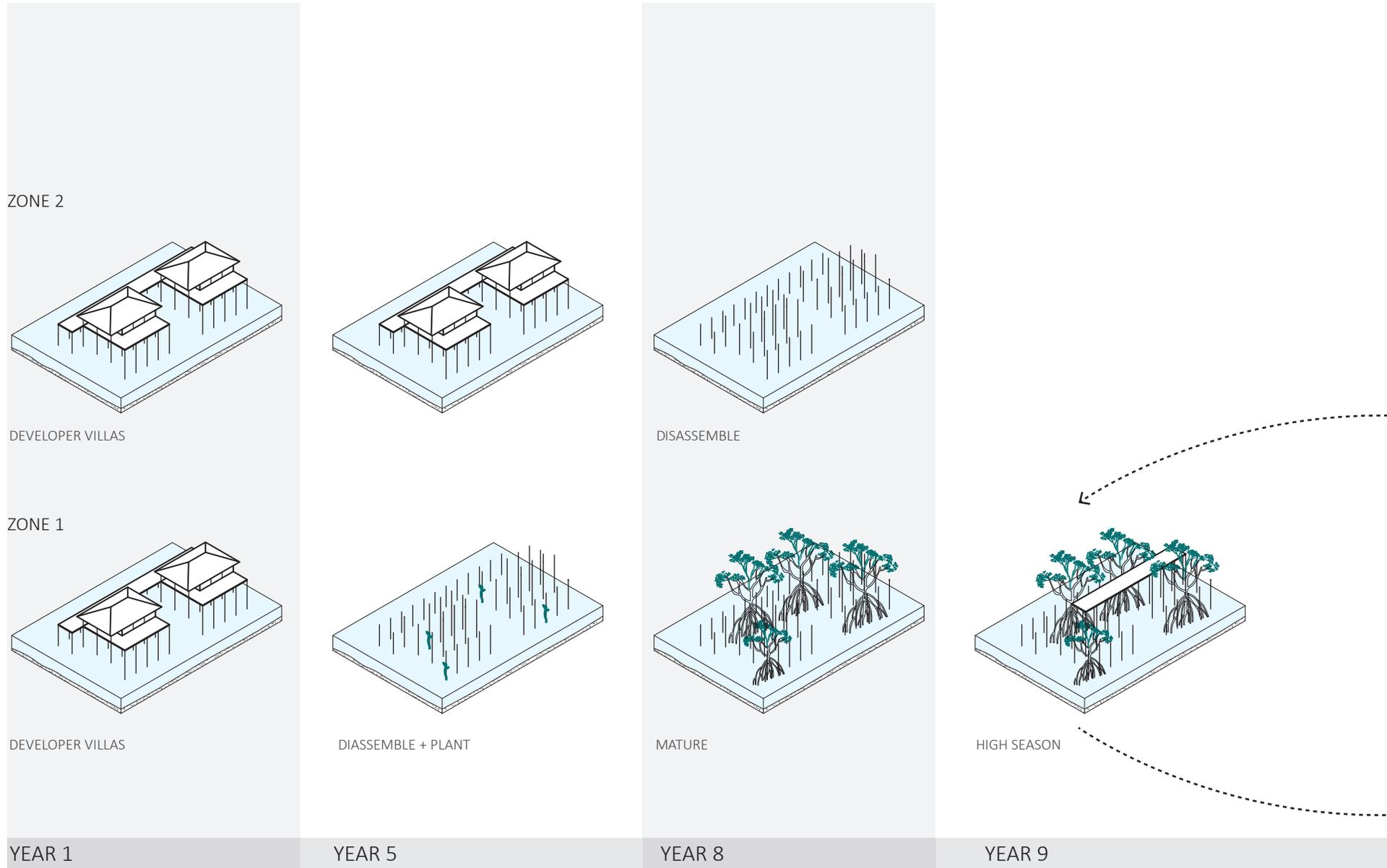


 Walkway  Mangrove Planting



 Walkway  Mangroves Mature

FIGURE 121: MANGROVE PHASING CONCEPT



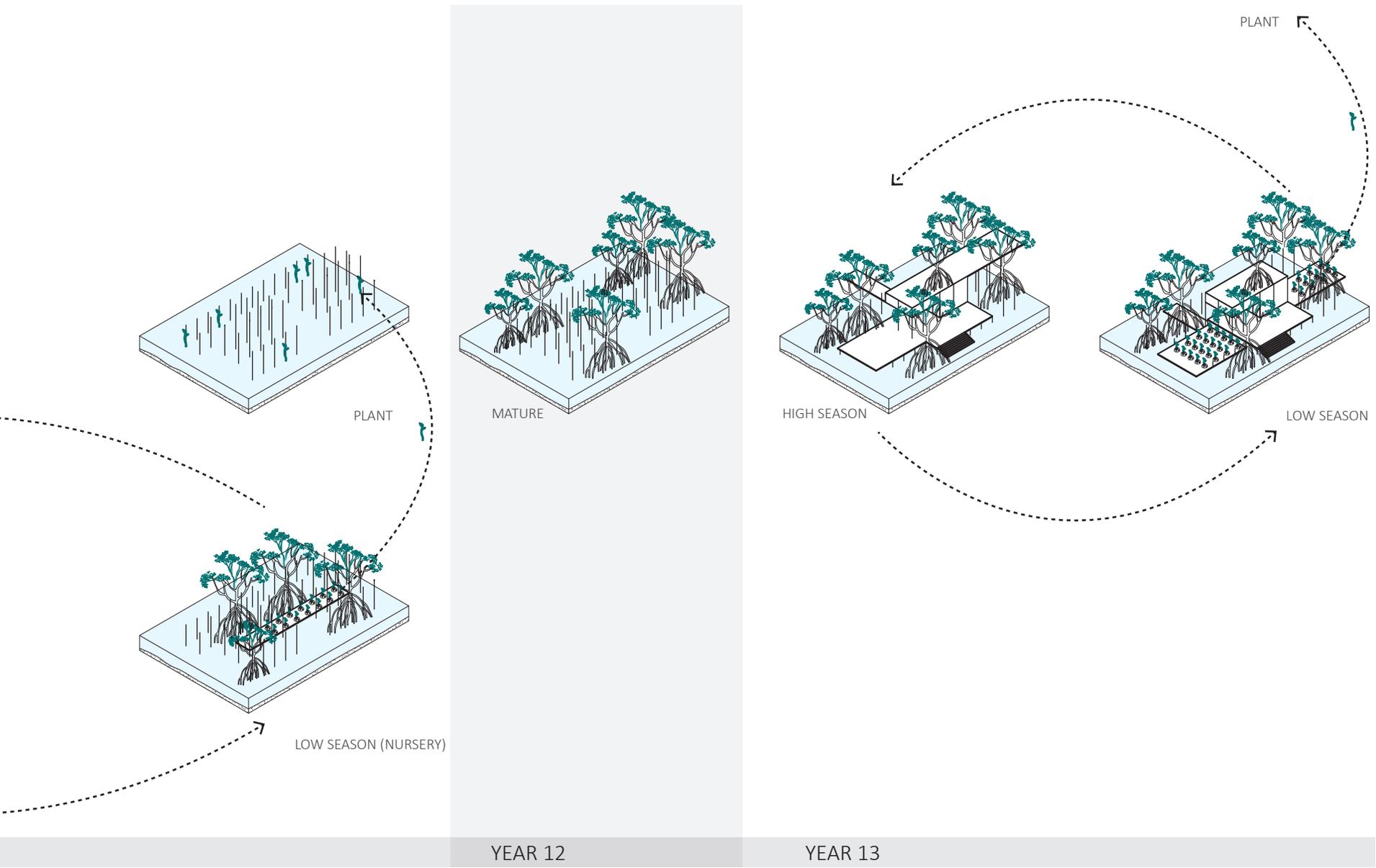
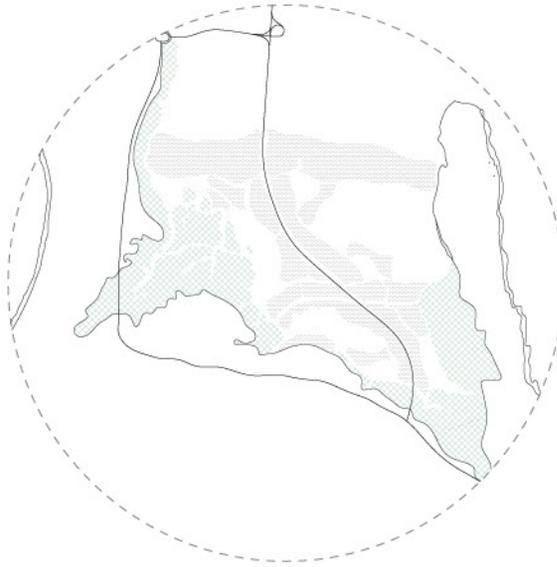
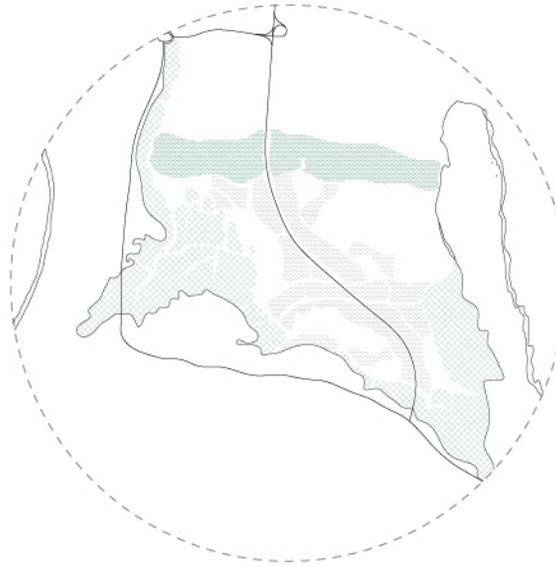


FIGURE 122: PHASING MAPS

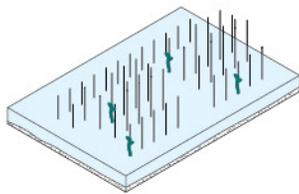
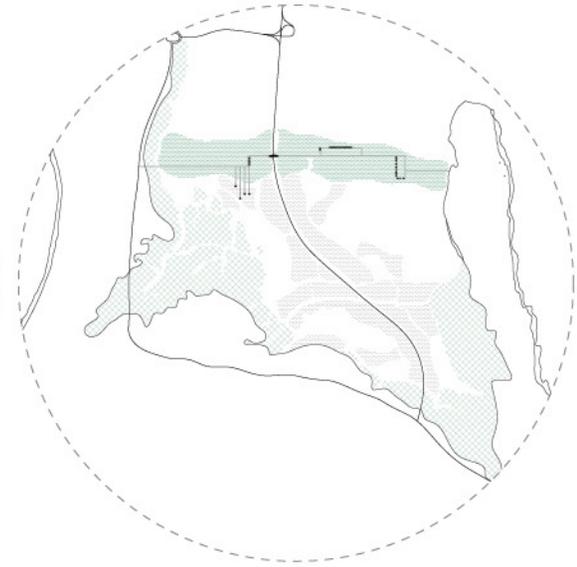
YEAR 5



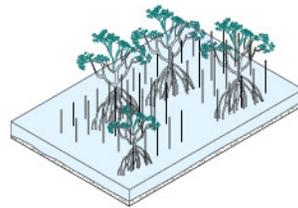
YEAR 8



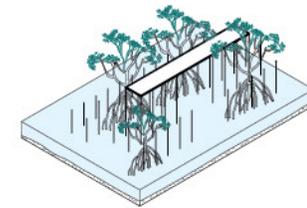
YEAR 9



DIASSEMBLE + PLANT



MATURE

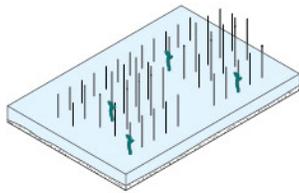
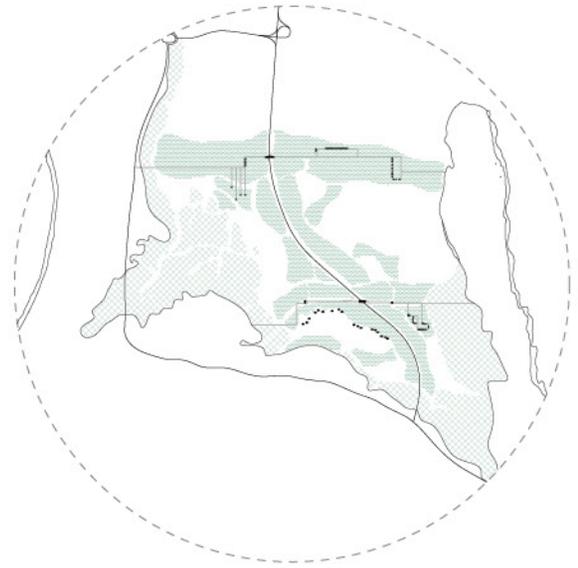
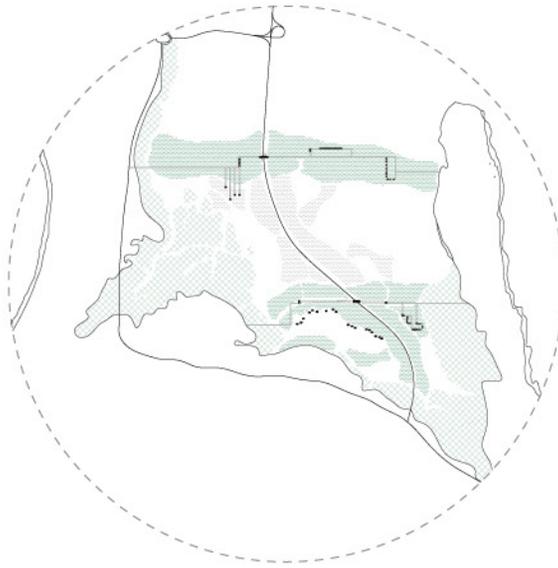
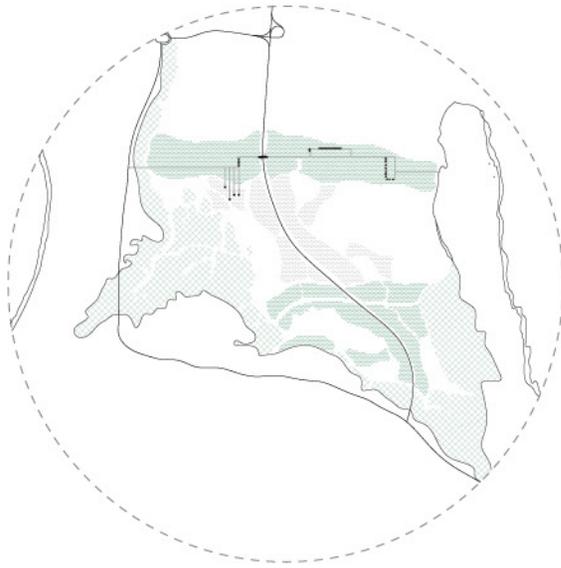


BUILD ZONE 1

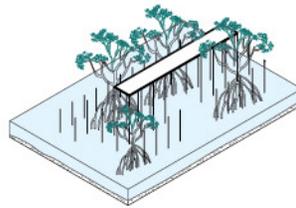
YEAR 10

YEAR 13

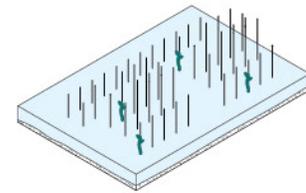
YEAR 17



PLANT ZONE 2 (FROM MANGROVE NURSERY LOW SEASON ZONE 1)

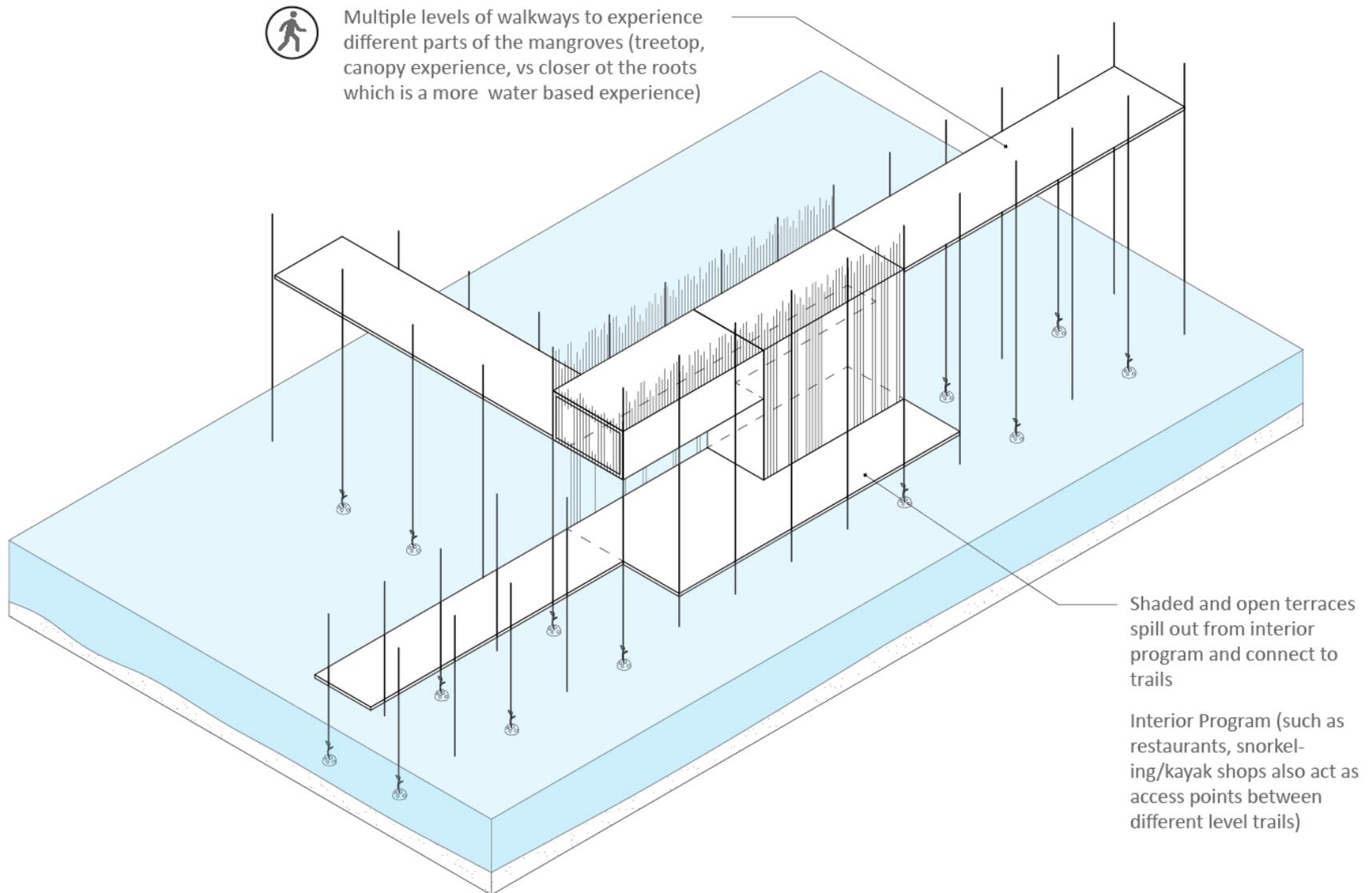


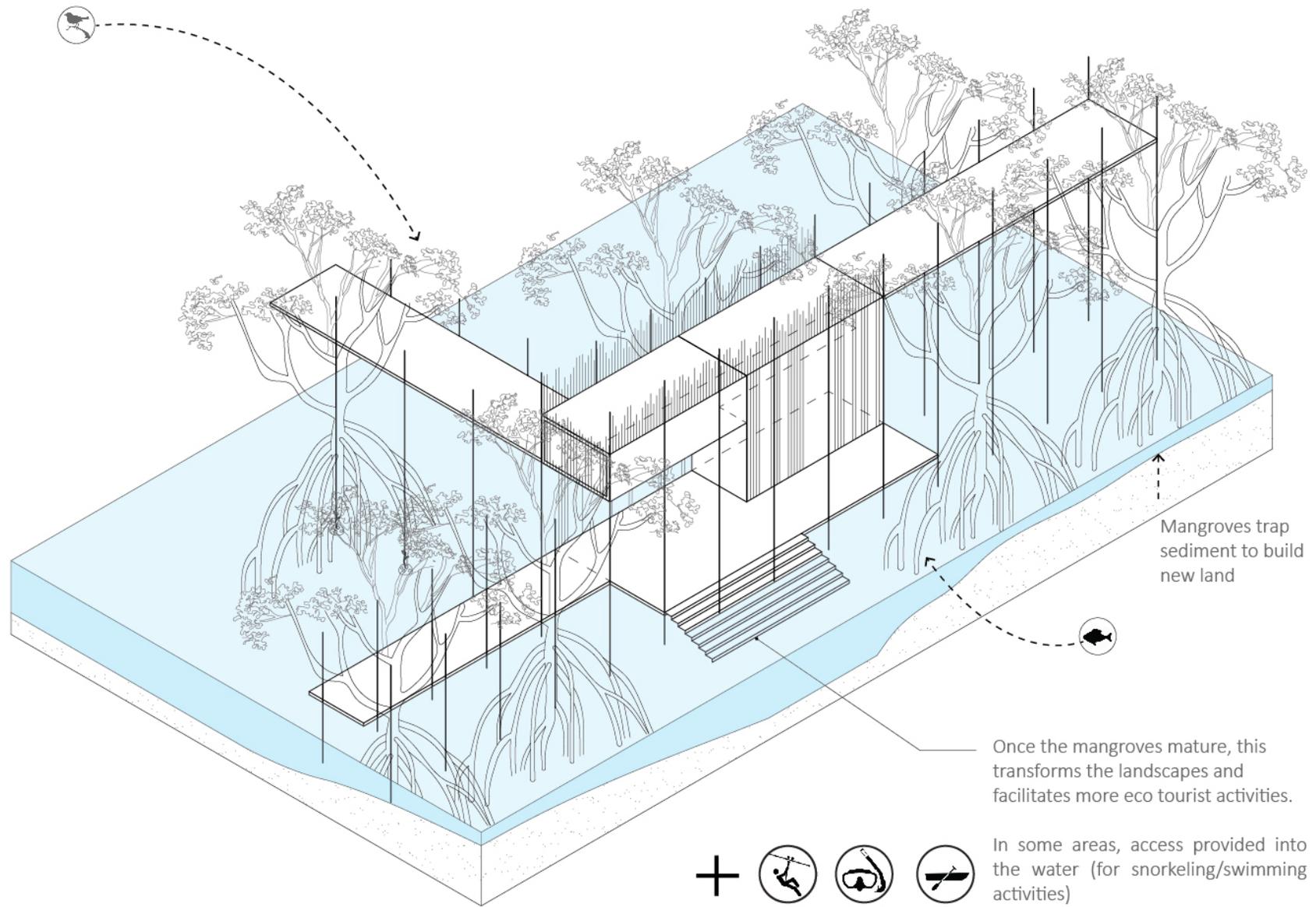
MATURE + BUILD ZONE 1



PLANT ZONE 3 (FROM MANGROVE NURSERY LOW SEASON ZONE 2)

FIGURE 123: REMAINING STRUCTURE FROM DEVELOPER'S VILLAS DOUBLE AS FRAMEWORK FOR GROWING MANGROVES AND NEW TOURIST FACILITY





Figures 125-134 illustrate the programs that are introduced in the new tourist facility. Programs transform in the high and low season to leverage tourists and production at different times of the year. For example, picnic pods in the high tourist season transform to structures that support long-line oyster spat farming in the low tourist season (Figures 132-133, 118-119). Enclosed pools in the high tourist season transform to crab farming pens in the low tourist season (Figures 130-131). This program draws from existing farming activities in the north of Bali

where there has been a recent tradition of farming mud crabs in the mangrove forests, a species that can be farmed sustainably especially if operating in cycles.

Taking into account that mangrove forests often lack popularity in Bali due to the lack of accessibility, the project takes advantage of the highway that runs through the site, creating not only a high degree of visual accessibility but also providing points of physical accessibility from the highway.

FIGURE 125: PROPOSED SITE

HIGH

Airport Runway

New Toll Road

Existing Mangroves

LEGEND

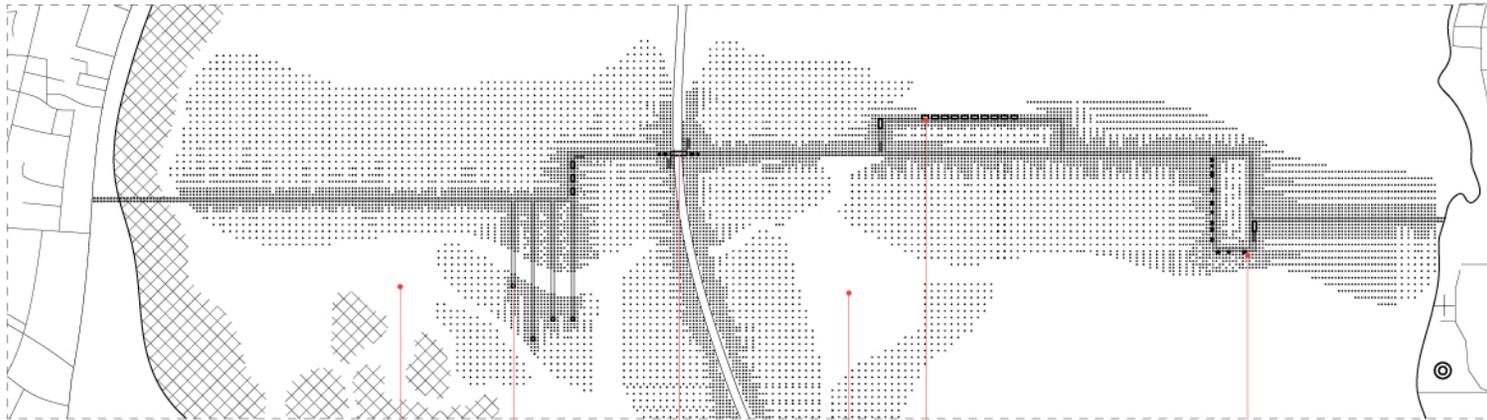
- Hotels
- + Tourist Destinations
- ◇ Schools
- Major Roads

0 500m



FIGURE 126: PROPOSED SITE PLAN ENLARGED

HIGH



0 250m



Kayaking



Bird Watching
Towers



Market



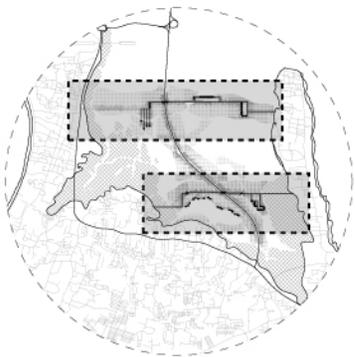
Restaurant Featuring Mangrove
Food/Drink Products



Treetop Picnic Pods



Ziplining



KEY MAP



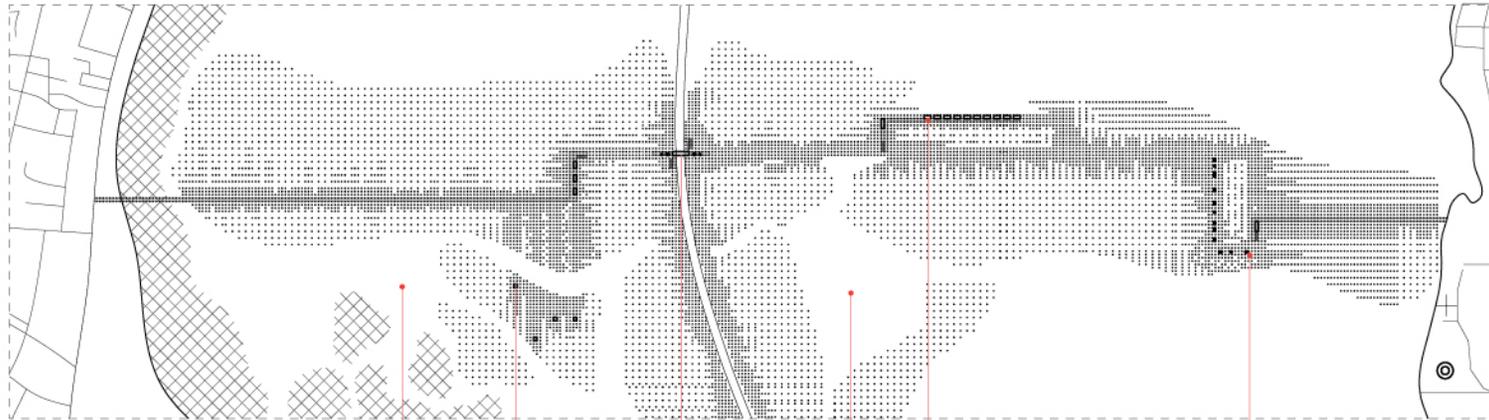
Enclosed Pools



Treetop Yoga

FIGURE 127: PROPOSED SITE PLAN ENLARGED

LOW



0 250m



Kayaking



Bird Watching
Towers



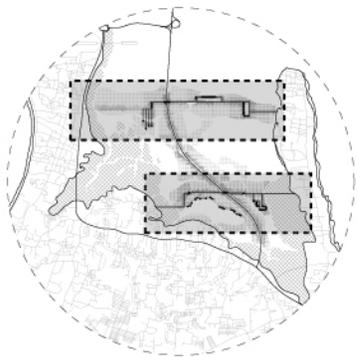
Market



Restaurant Featuring Mangrove
Food/Drink Products



Oyster Farming



KEY MAP



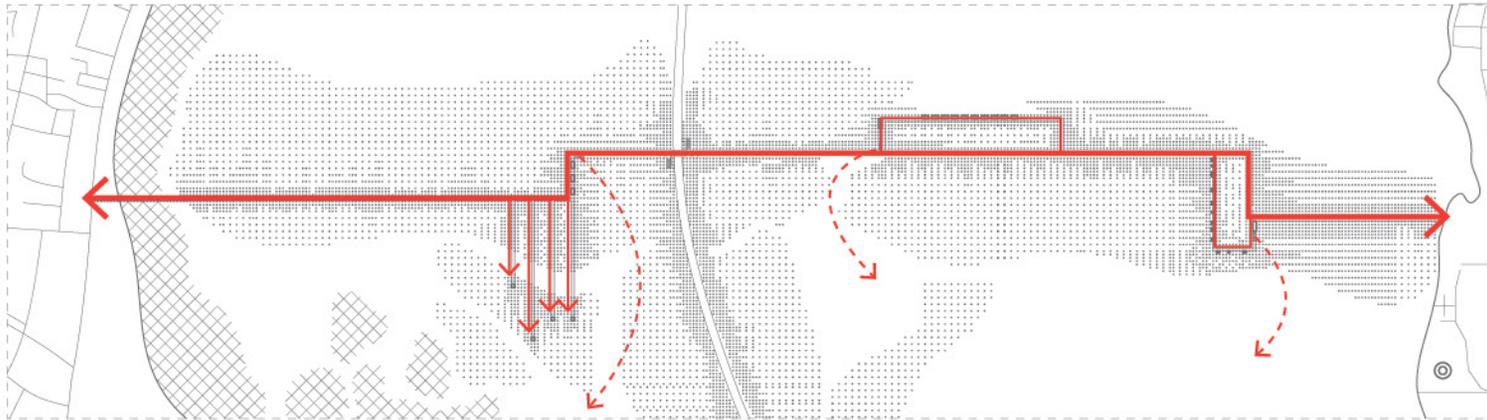
Mud Crab Farming



Treetop Yoga

FIGURE 128: TOURIST AND PRODUCT FLOWS

HIGH



0 250m

- Travel by foot/bike
- - - Travel by boat

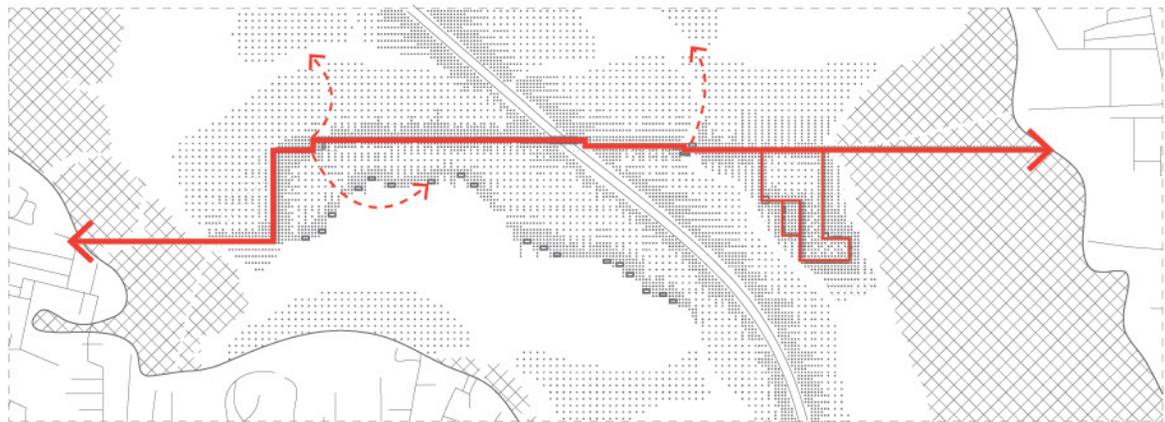
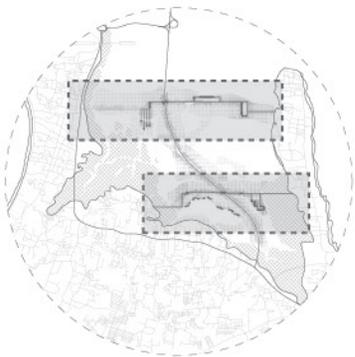
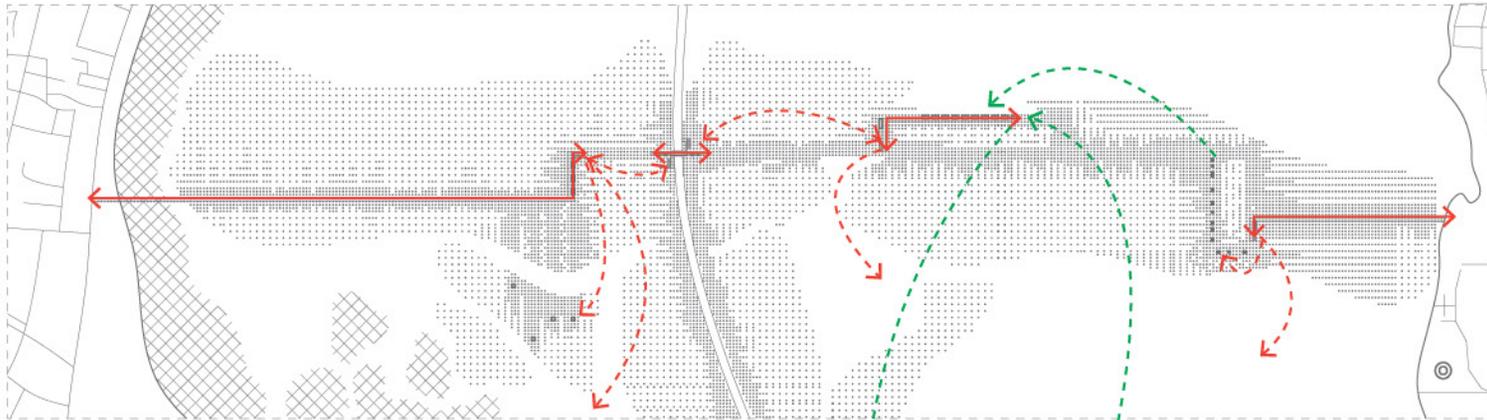


FIGURE 129: TOURIST AND PRODUCT FLOWS

LOW



0 250m

- Travel by foot/bike
- - - Travel by boat
- - - Aquaculture flows

Waste from kitchen used as part of feed for mudcrabs

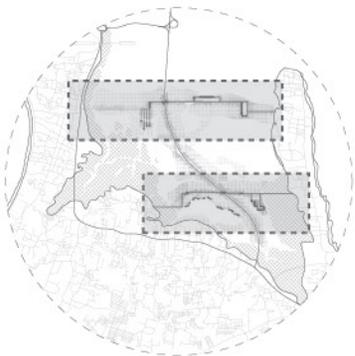


FIGURE 130: LOW TOURIST SEASON

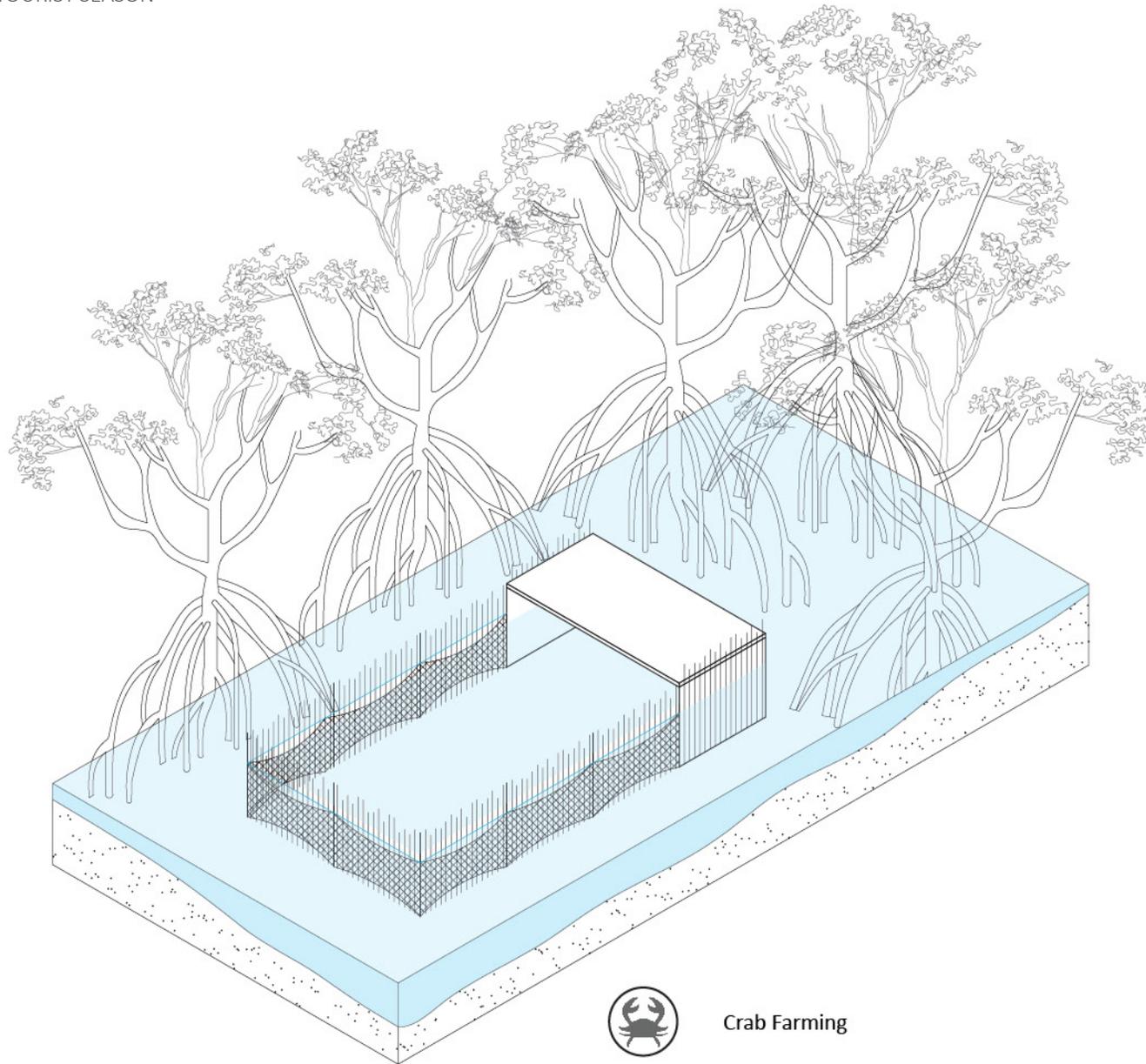


FIGURE 131: HIGH TOURIST SEASON

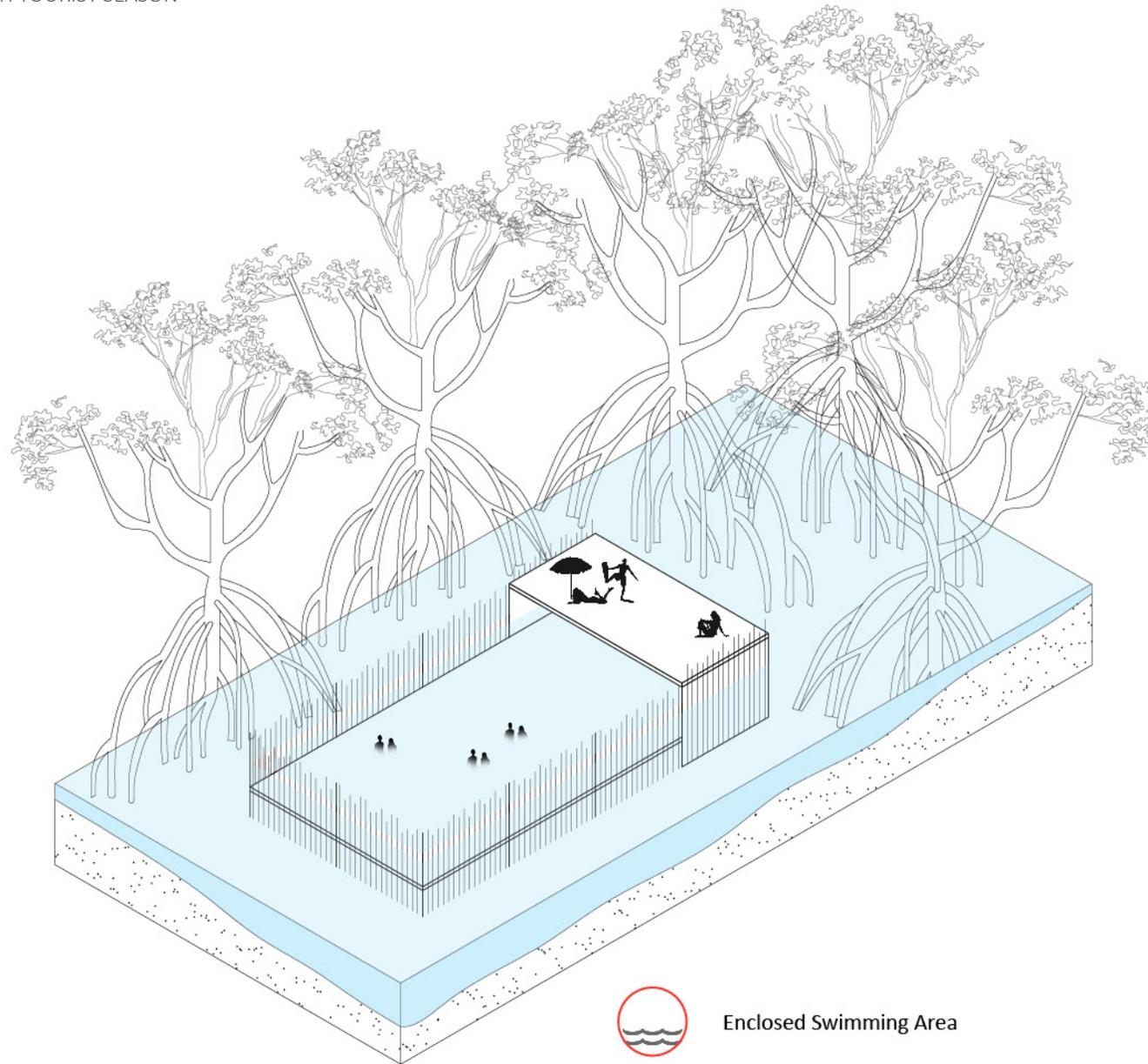


FIGURE 132: LOW TOURIST SEASON

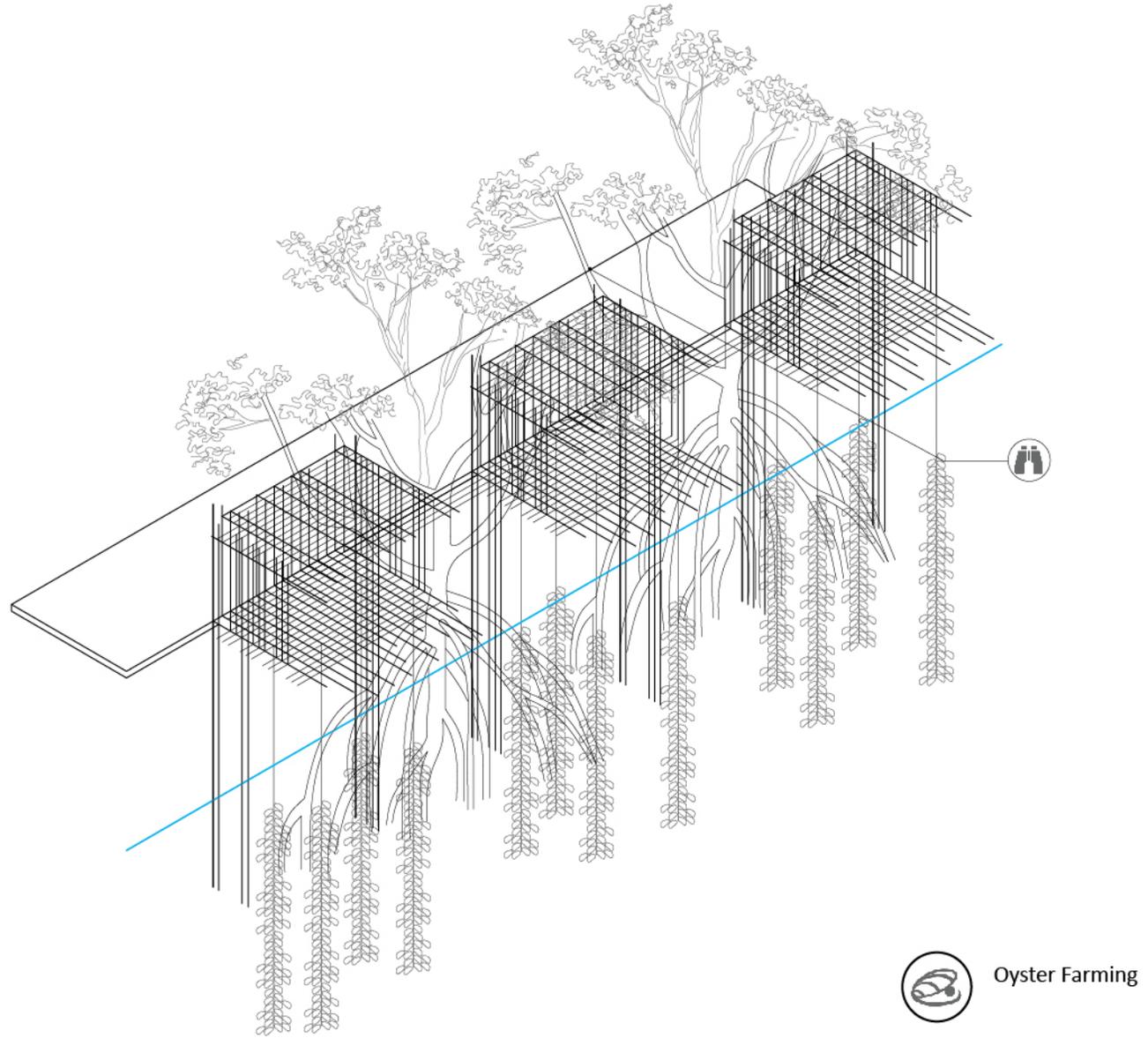


FIGURE 133: HIGH TOURIST SEASON

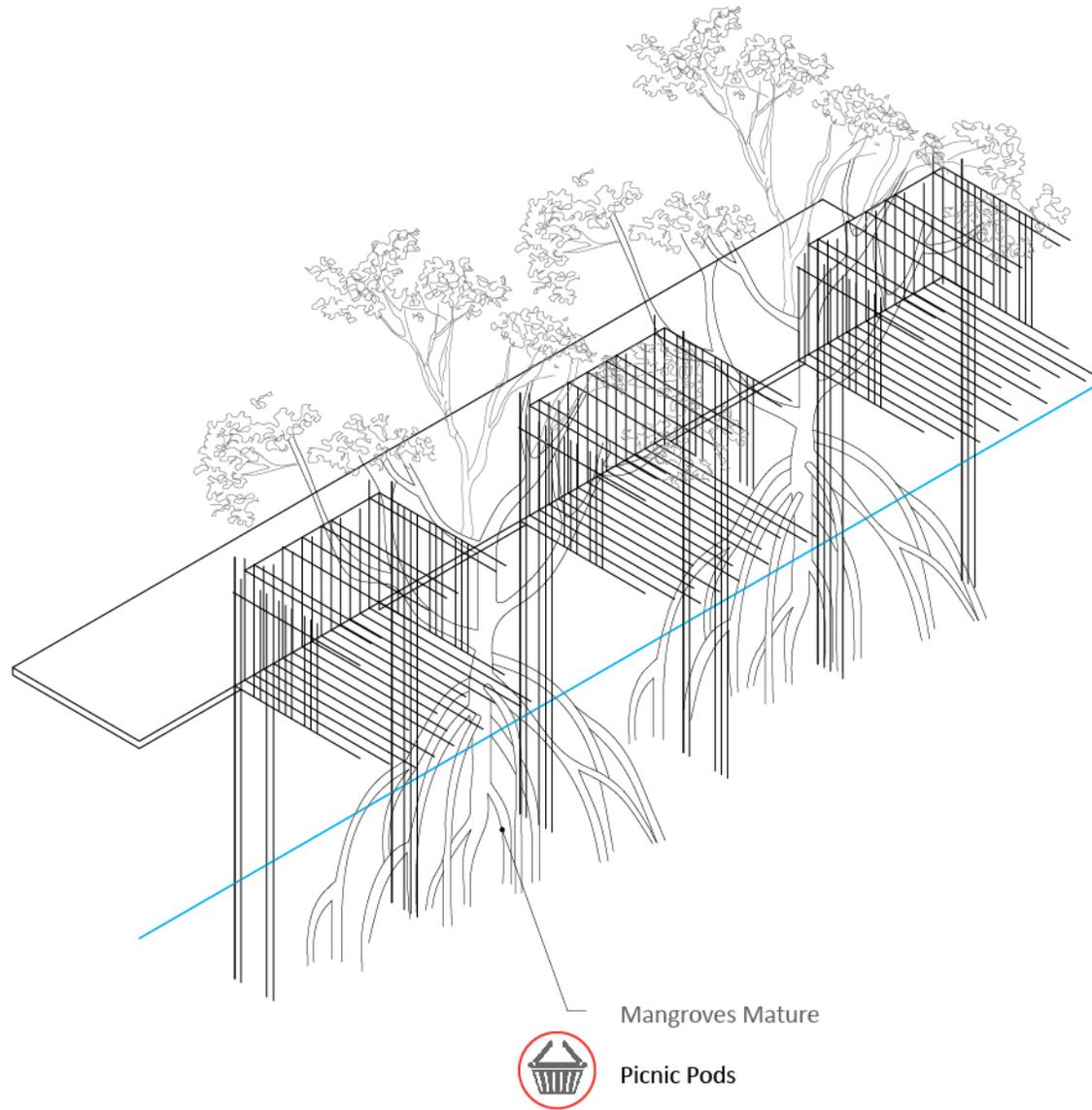
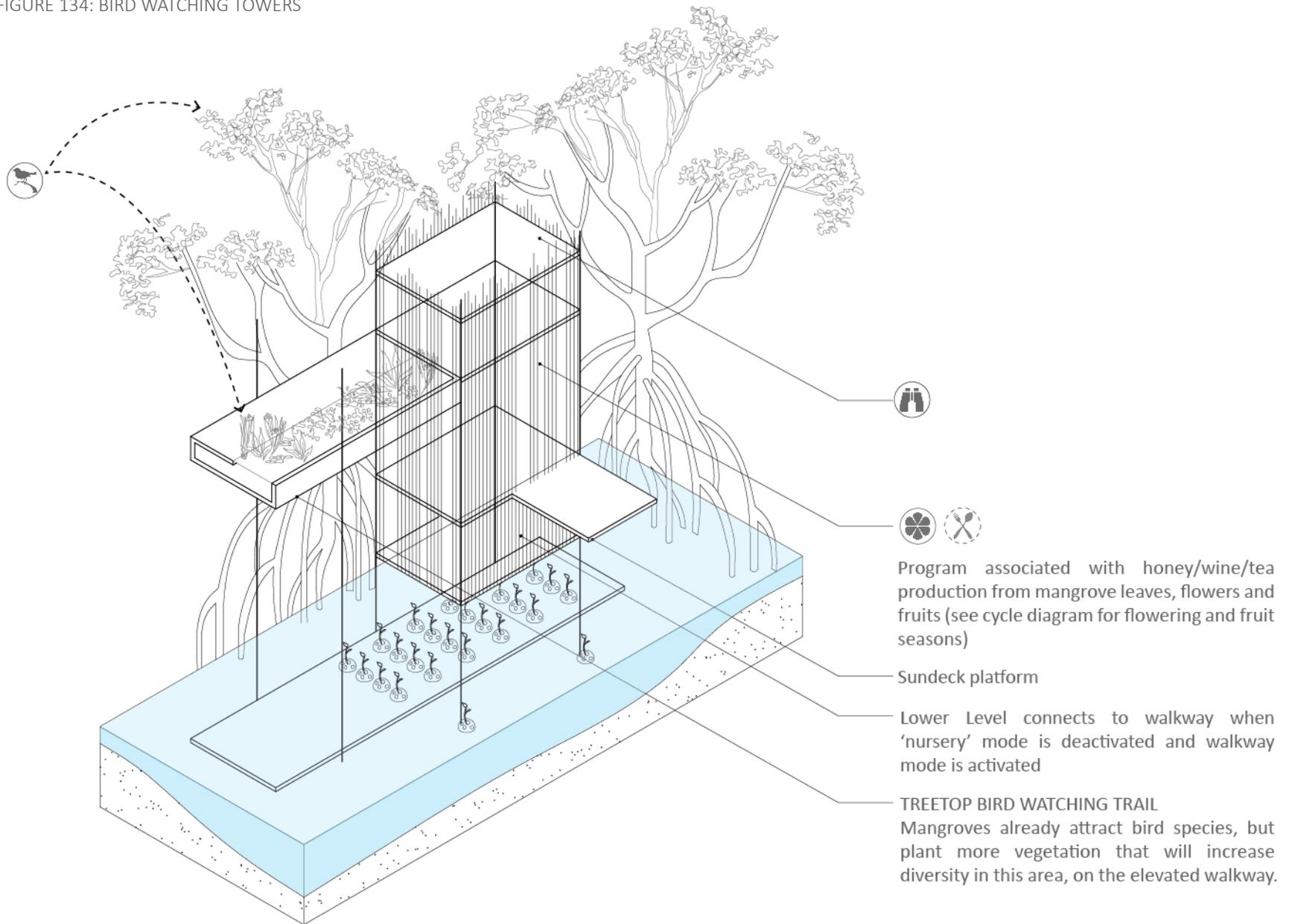


FIGURE 134: BIRD WATCHING TOWERS



TEST SITES CONCLUSION

The three sites were specifically selected to explore how a response would vary for conditions in different stages of development, taking into account the unique relationships between the stakeholders involved in each and their relationship with the landscape.

The site of the rice fields represents a landscape that has been popular for several years, but one that does not host a heavy concentration of development. Rather, highly exclusive resorts situate themselves in these areas, and often accentuate the inequitable distribution of resources between a foreign elite class and the local population. These locations attract resort dwellers who may not engage with the local culture to a great degree. However, the site is also an attraction to backpackers and active tourists who may visit for day trips to get a glimpse of agricultural life. The project situated in the rice fields thus attempts to cater to the present users, providing programs and opportunities suitable to these differing groups in its alternating cycles. Perhaps more importantly though, it attempts to harness the economic power of the resorts to fund an infrastructure that might begin to mitigate the inequitable distribution of water as luxury resorts place themselves amongst the agricultural landscape.

While the site of the rice fields is an established tourist destination, where resource extraction is a key issue, the site of the seaweed farm is only currently beginning to gain popularity. As an emerging frontier, where capital intensive developments are just beginning to move into the site, the project looks specifically at mitigating the currently inequitable relationship between tourism and territory. While the site currently attracts mostly backpackers, there are a few resorts along the coast that host luxury tourists, but the area is still experiencing a limited number of tourists in general. Taking into account the number and types of tourists in the location, as well as the early stage of development of the site, the project attempts to create an infrastructure that is less demanding in terms of material use. The

resulting project is a flexible infrastructure that takes advantage of existing materials, allowing for the possibility for the project to start from the bottom up and potentially grow in an ad-hoc manner.

In comparison to the seaweed farms, the site surrounding the mangroves is almost completely at the other end of the spectrum in terms of development. Existing in the midst of the heaviest concentration of tourist developments in Bali, it is surrounded on the one side by the planned luxury enclaves of Nusa Dua, and on the other, by the sprawling sites of spontaneous developments in Kuta, Sanur, and Legian. Considering the long history of development surrounding the site, and the way in which laws and zoning regulations have been altered to accommodate investors with large monetary power, largely by highly politicizing environmentalism, the project looks specifically at the relationship between tourism and ecology. Taking into account the current proposal for the site by developer PT Tirta Whana Bali International, and understanding Bali's political context, the project seeks to question how infrastructures laid in by developers can be optimized to leverage ecology in the following iterations of its life, at which point it may be crowd funded by environmental activists before the next development is ready to take place.

Each project was thus interested in investigating how a proposal would respond to the unique tensions that exist between current users and the surrounding landscape, resulting in proposals that varied from focusing on the relationships between tourism and water, tourism and territory, and tourism and ecology. These perhaps represent a small sampling of the current issues involving tourism on the island, but are representative of three common and highly pertinent tensions in Bali. The intention in all the projects is to ultimately create infrastructures that begin to mitigate some of the current inequalities on the island, by harnessing the political and economic power of the tourist industry to impact change.

CONCLUSION

The thesis intends to investigate the possibilities of creating a more symbiotic model for tourism development on the island, by employing the capital powers of the tourist industry as agents of change. It seeks to explore how one could manage sprawling, resource-intensive tourist developments by proposing a model that operates on temporal cycles and displays an increased sensitivity towards existing cycles, economies, cultures and ecologies. The design proposal that grew out of these ideas is not intended to be a complete solution to all the problems the island is facing, but instead is a suggestion intending to serve as a first step in provoking a discussion about the ways in which we might begin to conceive and optimize the political and temporal contexts of the landscapes within which our built worlds are operating.

The proposal attempts to create a scenario where tourist facilities leverage farmers, but in a manner that is profitable to tourist operators as well. In the rice field project for example, both groups are utilizing discarded water from the other. This is obviously beneficial to the rice fields, as

stresses related to water shortage are alleviated through replenished groundwater and the available use of recycled resort water. The intention is that farmers would once again be able to obtain higher crop yields, making the toiling of their land more economically viable than it currently is. While the area in which rice is grown may not increase, the project aims to create a situation where at least this area doesn't continue to decrease. The reuse of water is also economically beneficial to the owners of the tourist facilities. Because of the increasing water shortage on the island, pumping water is becoming increasingly more expensive in Bali. The proposed design would translate to increased profits for the tourist operators because: a) by introducing another supplementary water source, rain water, there is already less reliance on the well water, b) by recycling discarded water from the rice fields in the dry season, a tertiary water source is introduced. Reduced dependability on well water not only reduces stresses on the groundwater, but also amounts to decreased utility costs for resorts. If policies could be implemented to reduce water use in the resorts, they could even begin to

move towards a situation of self-sufficiency. The closer resorts could get to this state, the more profits they could reap. While the proposed project facilitates greater profitability from its operation, the experience it provides could exaggerate this economic benefit further. The proposal still creates the luxurious water landscapes that tourists crave, and in fact exaggerates it greatly, but in a way that doesn't cost as much for the tourist facilities to sustain.

While the design proposal does begin to ameliorate some of the ecological problems the island is facing, there are still a number of challenges that arise, specifically in regards to questions of ownership and the political economy at play. Especially in the rice fields, the tension between labouring agriculture work and more immediately profitable tourist businesses, is still very much prevalent. Even if some of the water stresses are alleviated, the question remains: why would farmers be inclined to continue tending to their fields and not trade off their land for less labour-intensive and more immediately profitable tourist facilities? Considering an extreme possibility, there is potential for the tourist industry

to begin to take ownership, or engage in a co-ownership with the farms. Perhaps in this scenario, the resorts might begin to pay farmers to tend to the landscape because it is in their interest to maintain the view, landscape, and immersion into an authentic experience, which they market. This would also make the resorts more inclined to actually recycle the greywater from the resorts and build the infrastructure that sends it to the rice fields. (However, even in the possible case where resorts are reluctant to send the recycled greywater to the rice fields, water from the infrastructure can still be released to the disposal landscape to replenish the groundwater. This would still indirectly benefit the rice fields, and could be marketed to the resort developer as simply a value added aesthetic feature.) In the dry season the project proposes programs such as marketplaces, where local produce is brought and sold. Capitalizing on the fact that Bali is also a popular foodie destination, and that there is an increasing appeal to foreigners in organic produce, there is an incentive for the tourist facility to want to maintain the prosperity of the neighboring rice fields where these

fresh products are coming directly from. Hence it might be viable to suggest that the resorts do in fact begin to take ownership, or co-ownership, of the farms. In this scenario, instead of having locals working exclusively in the tourist or agriculture industry, and having to trade off one for the other, the cycles set up by the project provide opportunities for labour to oscillate. Taking advantage of the different high and low seasons of the two industries, locals could put their feet in both economies, enjoying the profits from both. In this scenario, the politics of power still remain debatable though, as a foreign class takes over increasing control. While they may have the power to impact change in an ideal situation, there is still a chance of exploitation that comes with increased ownership.

A similar challenge arises in the project situated in the seaweed farm. While the cycling of the infrastructure creates opportunities for farmers to have their feet in both the tourist and farming industry, without having to trade one off for the other, the success of the proposal relies on a dependable operator ensuring that the oscillation is in fact taking place. Because of the inevitable difference in profit between seaweed products and tourist facilities, there is a chance that the project will want to gravitate towards more

continually serving the tourist industry. The proposal attempts to address this by creating tourist programs that depend on the prosperity of the aquaculture. However, the success of the project still depends on an operator that has a long term vision for the site. Even though the project proposes a rental scheme, considering the political situation in Bali, it probably isn't viable to suggest that the farmers are the owners of the plots because of a history of forceful shifts in ownership. However, similar to the project in the rice fields, there is potential for the tourist industry to begin to take ownership. This assumes that it is in the interest of the operators of the facility to ensure the prosperity of the seaweed farms, and that this will be enough to ensure fair rental prices to farmers. This scenario might be feasible under the assumption that the experiences on the site are marketed as unique and dependent on the prosperity of the aquaculture.

While the long term phasing of the mangrove project is perhaps more accurate in its assumption of the investor profile, there are certain assumptions that the project takes as well. The project allows developers with a short term profit vision to continue building their villas, but only under certain regulations. The project assumes that these regulations will be followed, which may or may not be the case, considering the

history of the swaying hand of the law in Indonesian politics and economies. However the project takes advantage of the knowledge that tourists will move away from a site once it becomes very heavily populated with foreigners, and seeks to question how the infrastructures laid in by developers can be optimized to leverage ecology and subsequently production in the following iterations of its life.

The patterns of development in Bali suggest that the tourist industry will permeate into any potentially profitable market. Instead of resisting this force, the thesis proposes taking advantage of the power of the tourist industry to impact change. Tourist facilities will continue to develop on the island, and architects have the potential of utilizing these built environments to mediate the current imbalance. As designers of these spaces, by understanding the political, economic, social, and ecological contexts, and foresee long term ramifications, our profession has the ability to sell proposals that are able to provide long term benefits for the multiple groups of stakeholders involved. As architects, we have the potential of selling these proposals, to the developers hiring us, by the unique experiences they are able to offer. The condition of oversupply in Bali, where investors build facilities after leaders promise increased foreign arrivals,

no matter how unrealistic, can be taken to our advantage. If there is a condition of oversupply on the island, and assuming there always will be, as the island's history reveals that the gap between available and occupied hotel rooms continues to grow, then this also means that there inevitably is a high degree of competition between tourist facilities. By selling projects as profit generators, partially by the way they operate and partially by the unique experiences they are able to provide, architects can begin to gain more authority over these projects and impact change. If a project is able to operate in cycles, it generates a new set of possibilities and experiences not otherwise available. While certain challenges of the proposal may need to be investigated in further detail, especially in regards to the potential income generation of these sites in comparison to typical tourist developments, the thesis intends to spark a conversation concerning how one might begin to approach building in response to temporal cycles especially in a context politically charged with questions regarding rights to territory and access. Areas of tensions are often where opportunities lie – how can we gain access to these? Perhaps it's appropriate to start working with the language of the 'cheaters' to begin to 'cheat' the system.

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¹⁰Diska Putri Pamungkas, "Walhi Slams SBY for Ronaldo Forest Stunt," *Jakarta Globe* (Jakarta, Indonesia), Jun 26, 2013. <http://thejakartaglobe.beritasatu.com/news/walhi-slams-sby-for-ronaldo-forest-stunt/>.

¹¹Bell, "Bali Uprising".

¹²Ibid.,

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APPENDIX A

Cyclical Strategy Animation

This appendix is an animation video illustrating the cyclical strategy of the design proposal. The file name of this video file is “Pulsing Territories Perpetual Frontiers_1.mov”.

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APPENDIX B

Rice Field Design Phases Animation

This appendix is an animation video illustrating the cyclical phases of the design in the rice field site.

The file name of this video file is "Pulsing Territories Perpetual Frontiers_2.mov".

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APPENDIX C

Seaweed Farm Design Phases Animation

This appendix is an animation video illustrating the cyclical phases of the design in the seaweed farm site.

The file name of this video file is “Pulsing Territories Perpetual Frontiers_3.mov”.

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APPENDIX D

Mangrove Design Phases Animation

This appendix is an animation video illustrating the cyclical phases of the design in the mangrove site.

The file name of this video file is "Pulsing Territories Perpetual Frontiers_4.mov".

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