

Visual interactive
urban design in commemorative public spaces

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Abstract

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This paper focuses on the application of the "digital landscape" in the design of memorial spaces. The framework of the thesis includes three aspects. First, it explores the definition of traditional public memorials, and its implementation techniques, systems, and materials; A second investigation seeks to understand the role of environmental psychology in memorials, and the impact of digital interaction on mental health. The third foci is the interpretation of using HCI as a tool in designing digital landscapes. The site chosen for this thesis is in Beichuan, China, where in 2008 an earthquake took many children's lives. This narrative includes a review of Chinese traditional memorial culture and the role of modern technology in computer science. The design will contribute to the field of the digital landscape and thanato-sensitive designs (TSD) in the HCI field.

Acknowledgment

I would like to express my most profound appreciation to my committee members, Professor Daniel Winterbottom in the Department of Landscape Architecture, and Professor Daniel Abramson in the Department of Urban Planning and Design. Their advice and guidance continually led me through the critical thinking of memorials and public space and expanded the width of my topic. They tried their best to accommodate meeting times so that I can receive their feedback simultaneously from both departments. Without their guidance and persistent help, this thesis work would not have been possible.

In addition, I would also like to thank Professor Ken Yocum and Professor Jeff Hou, who prepared me for the thesis writing and introduced me to a variety of possible topics, and I also appreciate their support in my future research in HCI study.

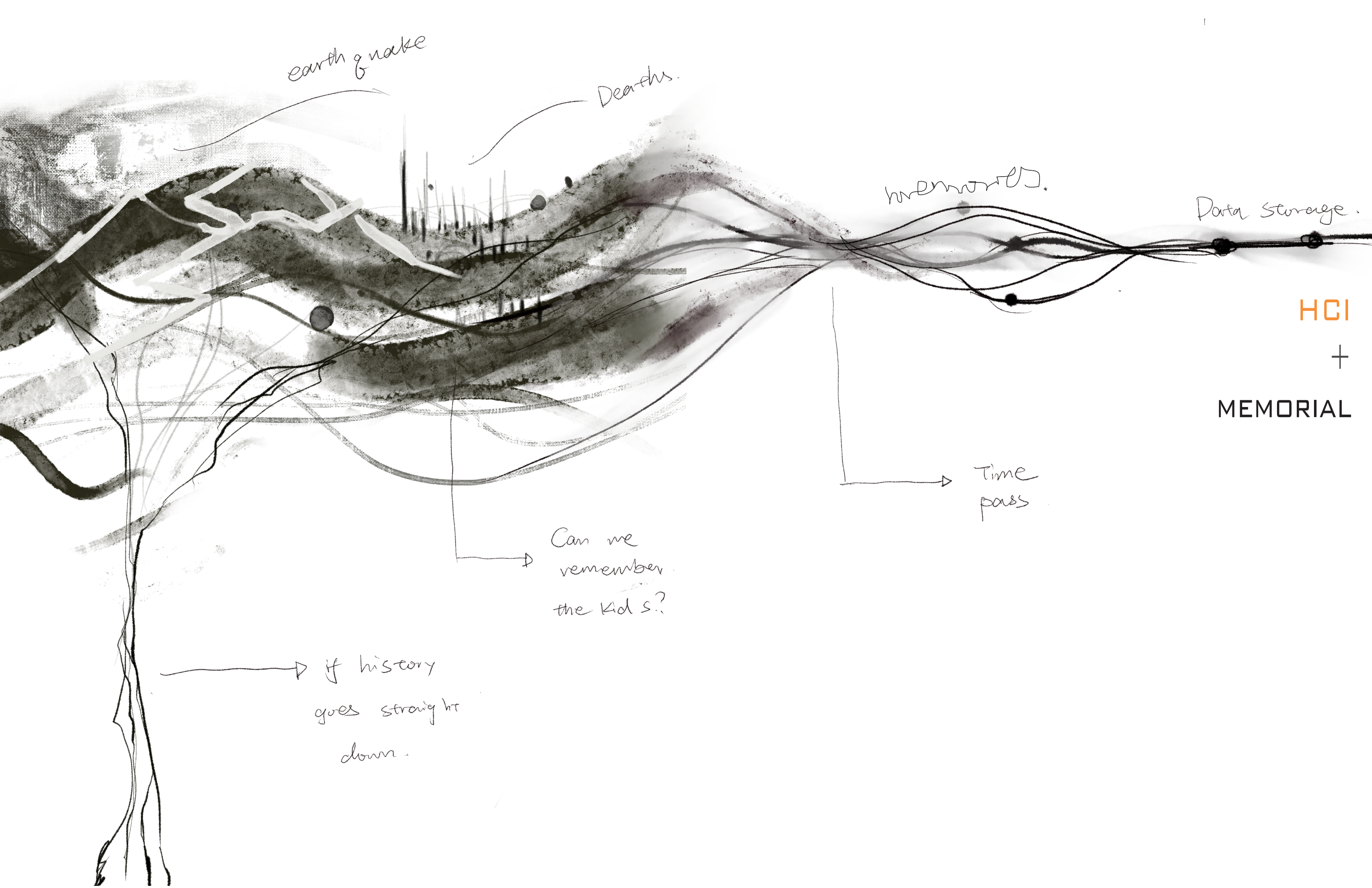
Thanks to the Department of Landscape Architecture and Department of Urban Planning for providing a multi-disciplinary education, and a tolerant academic environment, so that I have space to explore, learn from mistakes and grow up.

[**VISUAL INTERACTIVE URBAN DESIGN**
IN COMMEMORATIVE PUBLIC SPACES]

UNIVERSITY OF WASHINGTON 2021
MASTER OF LANDSCAPE ARCHITECTURE
MASTER OF URBAN DESIGN
CONCURRENT DEGREE THESIS

LIANG HUANG

COMMITTEE GROUP
DANIEL WINTERBOTTOM
DAN ABRAMSON



earthquake

Deaths.

memories.

Data storage.

HCI

+

MEMORIAL

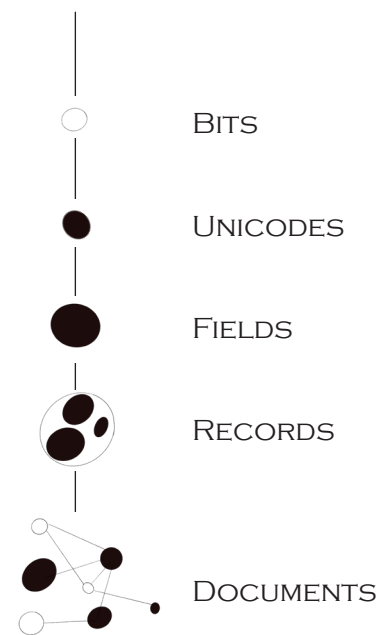
Time
pass

Can we
remember
the kids?

If history
goes straight
down.

Data Layers

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"The data hierarchy of java in HCI from smallest to largest is:

Bits or binary, which are values of 0 or 1.

Unicoes, which are single values of numbers or letters

Fields, which are composed of characters more than one.

Records, which are several fields.

File, which contains multiple records."

-- Brian Warner, 2015.

C HPT. 1 INTRODUCTION

- 1.1. ABSTRACT
- 1.2. PROJECT SCHEMA
 - 1.2.1 FRAMEWORK
 - 1.2.2 COLOR STUDY
- 1.3. THEORETICAL FOUNDATIONS
 - 1.3.1 DIGITAL LANDSCAPE
 - 1.3.2 FORMS OF MEMORIAL
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1.1 ABSTRACT

This paper focuses on the application of the "digital landscape" in the design of memorial spaces. The framework of the thesis includes three aspects. First, it explores the definition of traditional public memorials, and its implementation techniques, systems, and materials; A second investigation seeks to understand the role of environmental psychology in memorials, and the impact of digital interaction on mental health. The third foci is the interpretation of using HCI as a tool in designing digital landscapes. The site chosen for this thesis is in Beichuan, China, where in 2008 an earthquake took many children's lives. This narrative includes a review of Chinese traditional memorial culture and the role of modern technology in computer science. The design will contribute to the field of the digital landscape and thanato-sensitive designs (TSD) in the HCI field.

KEY WORDS

- Human computer interaction
- Virtual reality techniques
- Digital landscape
- Public spaces
- Museology
- Commemorative landscapes
- Materialogy
- Gamification
- Environmental Psychology



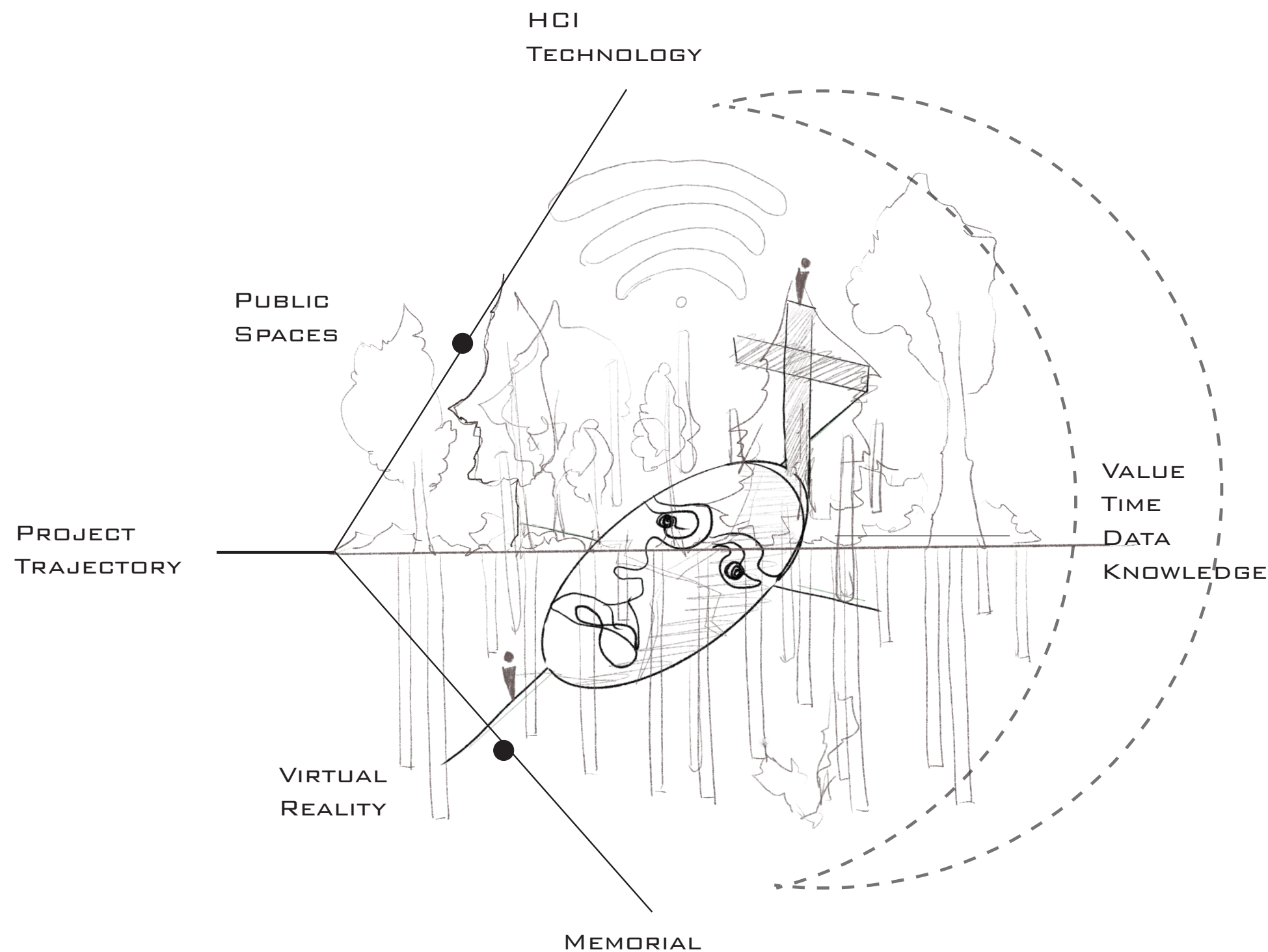


Figure 1. Conceptual Drawing shows the project trajectory.

Whatever way we look at this rapid-changing society, it is hard to ignore the acceleration of urbanization and population growth caused by the profound impact of economic and technological development. Open spaces in the city are shrinking and often only tiny grounds for nature and recreation remain. With the impact of Covid-19, people's lifestyle has also changed from the traditional home to work mode towards working from online platforms. Smart cities, human-computer interaction, and artificial intelligence will become commonplace soon.

Digital urban design is also a part of the "art of science." In the context of the current era of smart cities, digital technology has penetrated all aspects of planning and gradually expanded its influence on the daily public space and way of life. At present, many cities have begun to use big data for spatial planning and traffic management, but few have applied it to urban preservation and commemorative public spaces. Therefore, research on visual interactive urban design in commemorative public spaces is meaningful and will hopefully stimulate new ideas and connect those from multiple disciplines.

The framework of the thesis includes three aspects. First, it explores the definition of traditional public memorials, and its implementation techniques, systems, and materials; A second, investigation seeks to understand the role of environmental psychology in memorials, and the of digital interaction on mental health. A third foci is the interpretation of using HCI as a tool in designed digital landscapes. The project trajectory began with a landscape design, and focused on public spaces, HCI technology, virtual reality, and memorial.

+ Color Study

In "Lust for Life," which documented Van Gough's artist's experience, Irving Stone asserted that "the mathematical formula for allocating blank space on the canvas can be recorded in a small book. I have already worked it out. The painter only needs to read this book and go to the drugstore, buy some color cans with detailed instructions, paint according to the rules, and then he can become a scientific and excellent painter." (Stone, 1984) In his opinion, color is not neutral and innocent-- color selection and the metaphorical meaning it carries are often the beginning of rational artistic creation.

Digital landscapes are not an exception to art creation. Color study in digital landscapes becomes more conceptual but not random-- it borrows psychological implications that different colors represent various emotional changes. The strategy is to build up the color relationship using different compositions and determine which pigment best represents those mixtures of emotions. (Heller, Psychologie de la couleur – Effets et symboliques, 2009) The mosaic of colors will form a heterogeneous pattern.

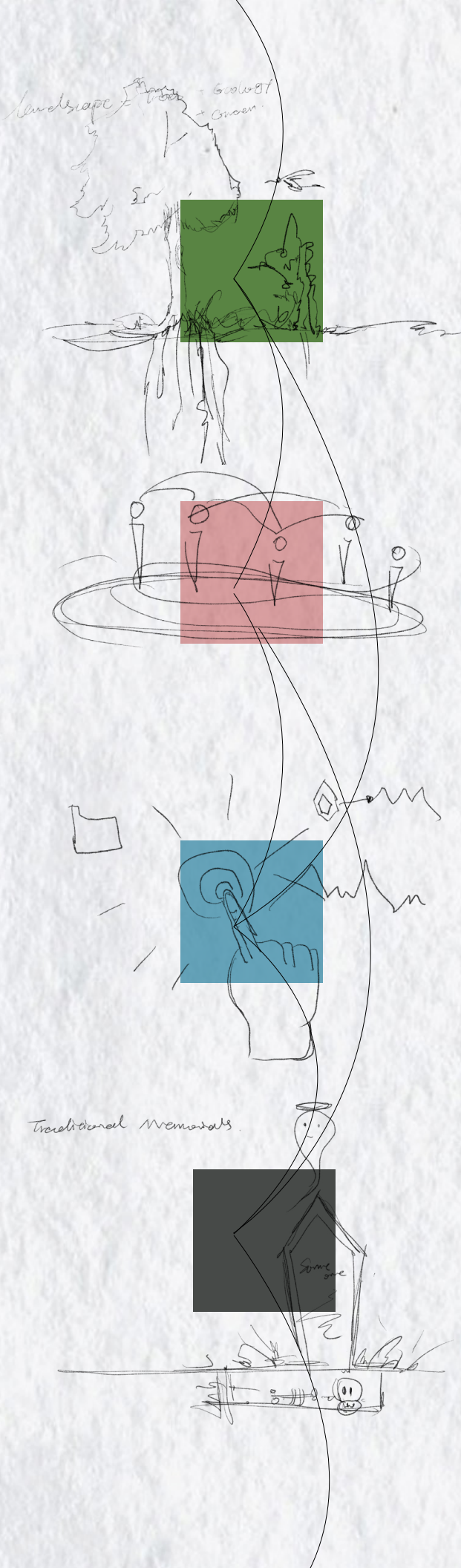
The topics covered in this thesis include four parts: landscape architecture, traditional memorials, public spaces, and human-computer interaction. Represented in four distinct colors, at a scale from organic to inorganic.

Vertebral cells in our eyes do not respond the same way to the amount of light. When a beam of light was applied to the eye's retina, the highest values of vertebral cell sensitivity were found in three regions with frequencies of red, green, and blue. (Different from the three primary colors) That is to say, with different intensities and proportions, the human can produce any color perception. (Qingquan, 2006) The study of color blocks has laid the keynote of this thesis. When it comes to the subsequent site design and web Interface design, these colors will play important roles. Combining these colors, the collision between nature and machinery, the combination of tradition and technology, and the mixture of organic and inorganic matter will gradually expand.

"Color reflects human civilization and spiritual demands. It takes on the responsibility of embellishing life and beautifying environment."

Honglei Xu, 2013

ORGANIC



INORGANIC

LANDSCAPE
ARCHITECTURE

HEX #dddf00 100% OPACITY

Green is the intermediate color between yellow and blue in the visible spectrum. Its frequency ranges from 520 to 610THz, and wavelength ranges from 577 to 492nm. Of all the colors that the human eye can capture, green has the largest wavelength change that we can perceive. This stems from our ancestors' evolutionary need to survive in a green environment. (Rui, 2019) Landscape architecture has an inherent connection to the color green.

PUBLI
SPACES

HEX #bc4749 50% OPACITY

Public spaces are the open venue between architectural entities, conduct public communications, hold various activities, and carry diverse residential culture. Whether organic or inorganic matter, public spaces are inclusive of everything. Because of the nature of variety and vitality, the red color suits it well. Red has the longest light wave in the visible spectrum, 780 to 622nm, and it is the most eye-catching wave. (Xiao, 2017) Red gives people a sense of proximity and expansion, which can stimulate various emotions.

HUMAN
COMPUTER INTERACTION

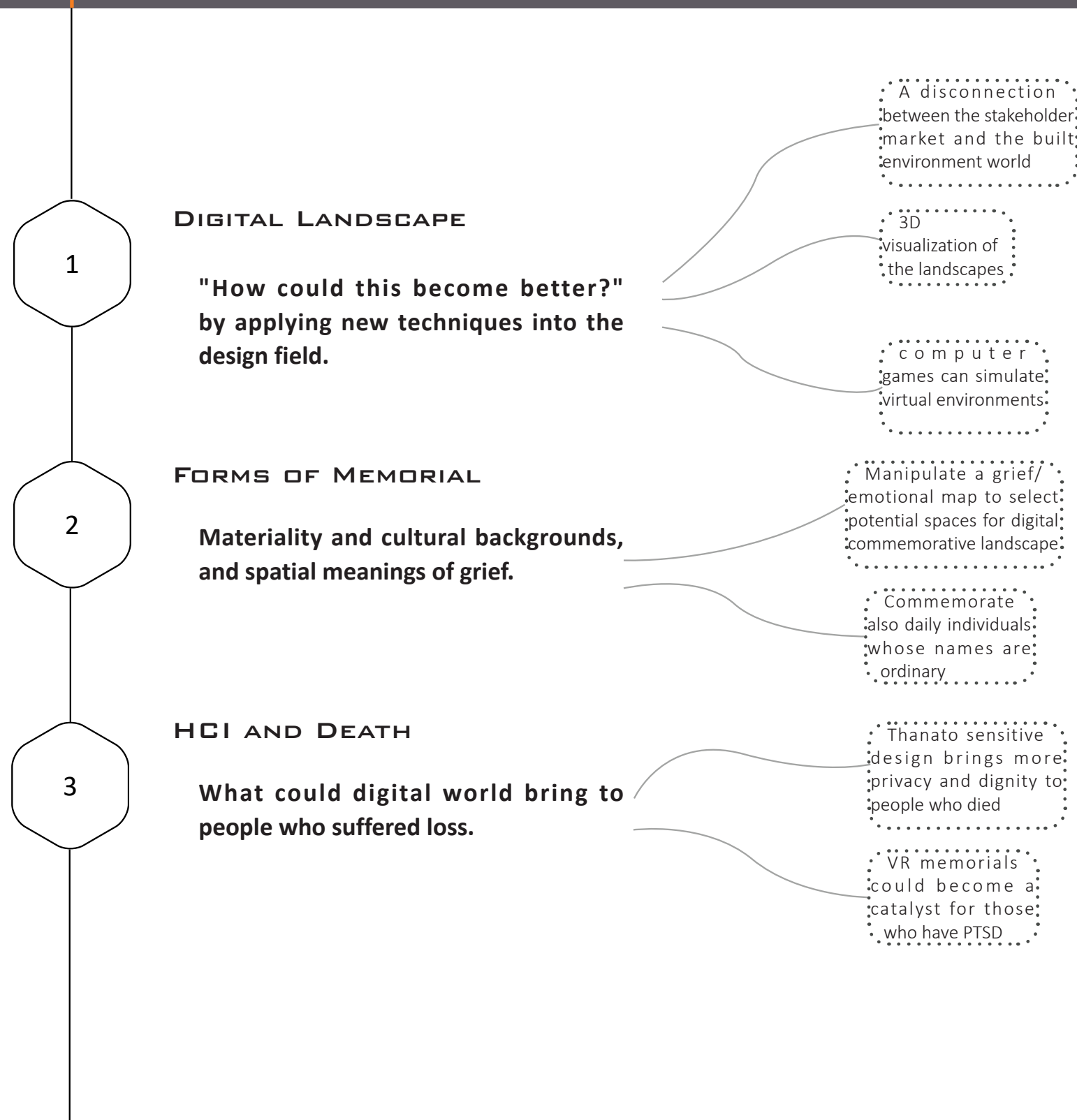
HEX #3587a4 75% OPACITY

It is not hard to find today's tech companies always using blue as background or logos. Blue is often deemed as a rational color. (Xiao, 2017) In fact, all scenes in the real world have a shade of blue. In color psychoanalysis, blue represents reason and the constant search for truth. (Heller, Wie Farben wirken, 2004) The use of blue symbolizes a new exploration in the field of HCI.

TRADITIONAL
MEMORIALS

HEX #474a48 100% OPACITY

Memorials are always meant for commemorating the deceased person or incident. Things that are left behind in the waves of time become inorganic. However, their impact can last even for centuries. Black, defined as the absence or complete absorption of visible light in the eyes, is the opposite of white. Pigments that absorb all the visible light in the spectrum and reflect no light appear black in human vision. (Heller, Psychologie de la couleur – Effets et symboliques, 2009) From the perspective of cosmology, black is the essential color of the universe. When we combine memorial and black together, it means the mystery of life and means that the soul will return to the universe.



The main question asked was "how could this become better?" by applying new techniques into the design field.

Ivan Heitman (2016) raised his concern about a disconnection between the stakeholder market and the built environment world. While many fields are moving forward using new algorithmic design tools, the landscape architecture industry is left far behind. He also argues that while landscape urbanism has adopted ecological theories, the potential of a more scientific design practice that takes the system as its object rather than the form goes mostly unexplored. There needs to be a collaborative platform for designers and engineers to communicate and share information simultaneously connected with design and engineering. Similarly, Griffon Sebastian (2011) also mentioned a challenge in participatory methods during communication with the stakeholders using 3D visualization of the landscapes.

One of the potential solutions that bridge the technological shortage during the collaborative process is gamification. Adrian Herwig (2001) pointed out that many computer games can simulate virtual environments such as synthetic landscapes and extremely close-to-reality in real-time PCs or game consoles. We could borrow the game engine, create a collaborative platform, and present a preliminary example within a collaborative landscape planning process. Zeile Peter (2005) also supported Adrian's idea with an approach borrowed from the entertainment industry - especially from the computer game industry that has used standard techniques for preparing 3D city models. Landscape architects could also use these technologies to build up details. He also mentions that 3D game engines offer real-time 3D rendering, coupled with logical and straightforward navigation assistance, and could be utilized for tourism, city and location marketing, and the reconstruction of vanished historical scenarios.

As gamification gained more traction in digital landscapes, Li Mo (2019) raised a question in her study that "what might gamification of the participatory design look like" and the studies proved that it could help various groups understand the experience of space through this interactive tool, increase participation from groups of people with low participated rates, and increase a sense of place attachment.

+ Forms of Memorial

The core ideas in the literatures were focusing on materiality, cultural background, and meanings of grief.

Maddrell Avril (2016) highlighted the significance of the spatial dimensions of the universal human phenomena of bereavement. The study provided geographical scholars with a lens on the dynamic assemblage of self-body-place-society that constitutes culturally inflected individual and shared everyday grief maps, providing insight to relational spaces, emotional-affective geographies, and therapeutic environments. Such mapping method also informs the spatial analysis and data collection.

The idea of memorials addressed not only heroic or great people but also daily individuals whose names are ordinary. Vealy Kylie (2006) thought that in the past decades many people died but that the societies do not commemorate them because they are not famous or rich. Individualization via memorialization has become a way for past and current societies to commemorate life in the event of a death. Memorials online could become a tool for a collective digital landscape formation.

+ Psychological Needs

One of the central arguments in psychology is the need for grief to remember loved ones.

Doevening Katrin (2015) stated that experiencing the loss of a loved one is an experience most people can and need to share and empathize with. And Deborah Whitebead (2015) showed in her examination of infant loss, that a Christian evangelical woman uses mommy blogging communities for collective memorialization. The digital world supports the therapeutic process of a shared? private grief. Both studies showed psychological needs are fulfilled through the use of various communication features on online memorial sites and medias.

Some people say that as long as a person's name is mentioned he is not entirely dead, and the presence of the dead on the Internet is a very interesting phenomenon indeed. Quanmei Pai (2019) believes that the dead tend to "survive" for some time within the social network they already have, whether or not they are deliberately preserved. This has led to a socially influential death: celebrities may continue to play an essential role after they die. The digital presence of the average person today is also likely to continue to be felt by others in comparison to the pre-information age. We may encounter an ethical problem when artificial intelligence which is capable of reasoning and learning, can survive the death of a person's body and continue to be part of his or her humanity on-line.

Micron company a manufacturer of VR glasses also believes that VR memorials could become a catalyst for those who have PTSD. VR could provide patients with more immersive, and accessible experiences, as they can present stimuli that vividly triggers anxiety in an individual patient and enables the patient to reinterpret and reconstruct the negative emotional response to the traumatic event. (818)

2.1. MEMORIAL IN URBAN DESIGN

Memorial /mə'môreəl/

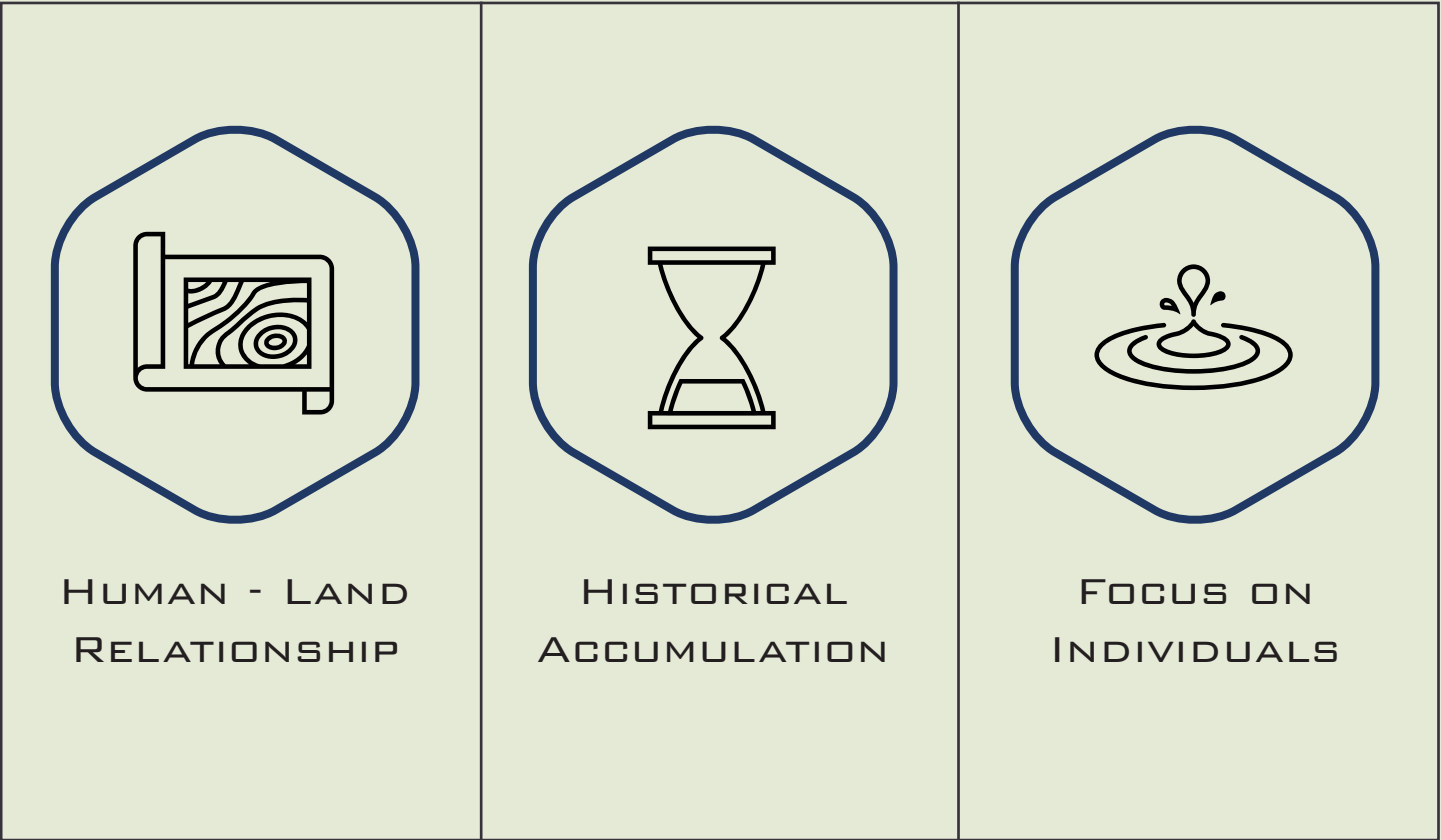
Something, especially a structure, established to remind people of a person or event. A statement of facts, especially as the basis of a petition.

– Oxford Dictionary

Compared with other landscape designs, memorials have a more profound humanistic connotation and historical accumulation. The Russian writer Gogol once said: "Architecture is the memorial monument of the times." It can be seen that memorials have the basic functions of the landscape while containing the historical traces that people tend not to forget. A commemorative landscape is particularly important to people's emotional resonance and spiritual support during the present stage.

The uniqueness of the memorial is that it is a repose place for affections that carries emotions into the underground world, rather than a basic shelter. We as humans need a solid and tangible place to feel lost. The stones and mud in the past created a physical link through time. It can both ease the pain of the moment and convince the world that the pain is not in vain, that it will somehow live in shared memory and be passed down from generation to generation.

+ 2.2. CHARACTERISTICS



C HPT. 2 MEMORIAL

- 2.1. MEMORIAL IN URBAN DESIGN
- 2.2. CHARACTERISTICS
 - 2.2.1 HUMAN-LAND RELATIONSHIP
 - 2.2.2 HISTORICAL ACCUMULATION
 - 2.3.3 FOCUS ON INDIVIDUALS
- 2.3. DIGITAL MEMODIALS
- 2.4. CASE STUDIES
 - 2.4.1 FLOW OF TIME
 - 2.4.2 PERMANANCE
 - 2.4.3 COMMUNITY PARTICIPATION
 - 2.4.4 DIGITAL ARTS

+ Human-Land Relationship

Based on the previous analysis, it can be seen that the selection of environment and land-use mitigation are inseparable parts in the creation of memorials. Different topography, urban forms, social structures, public policies, history, culture, and ethnicity will produce different commemorative subjects. Memorials are bound to stress the relationship between humans and land.

Since local cultures are embedded in the design of memorials, the design of display techniques should also be emphasized in the process of expression – it should not be simplified as the scaling of concrete objects. Memorials and landscape as a combination, the expression needs to have regularity – which merges native narratives and has particularity – which creates a deeper perception towards a special event to connect memorials and viewers.

+ Historical Accumulation

"Show me your city, and I will tell you what the residents of that city are pursuing culturally." --- Eliel Saarinen, the father of modern American design.

Apart from the influence of the natural environment, the historical and cultural accumulation of the site is also the basis of

the creation of commemorative landscape. Human activities are promoting the evolution of the social environment. The creation of a commemorative landscape can have an essential connection with the site's history and culture and reveals the civilization level of the city. To some extent, the cultural connotation of a memorial reflects the historical deposits of a city and represents the civil accomplishment of the citizens. (Guo, 2018)

+ Focus on Individuals

As common sense, when people mention memorials, they will first jump to a great man who died, a significant historical event, or a textbook precedent. It seems like a monument can only be built for earthshaking-scaled things. The topic of "humanity" is often ignored.

Commemorative spaces can not only stay in the scale of "big" – they should connect to the social background and dive into individuals' wellbeing. It not only memorizes the past but also inspires later generations to carry on the edification.

+

Commemorative landscape can be an environmental complex with the purpose of remembering, stimulating group memory, and inheriting history. On this basis, new interactive technology can be achieved to store big data so that the traditional history telling can be changed into data and retain forever in digital memorials.

The most common digital memorial is the web graveyard. It was created because people are too busy to attend physical funerals. Furthermore, as humans become more empathic people can also use electronic cemeteries to pay tribute to the loss of strangers. For example, in Spring 2020, when Covid 19 pandemic swept China, although many people did not know Dr. Li Wenliang in person (Green, 2020), they still worshiped him in the electronic cemetery after he passed away, acknowledge his contribution and influence on the society. The web graveyard has three features:

Space-Time Unlimited

The network memorial platform allows users to break through the barrier of time and space and realize all-weather and globalized memorialization.

Environmentally Friendly

In China, people are still used to burning paper to pay homage to their ancestors. (Mei, 2020) On this basis, the loss caused by fire is enormous. Digitalized memorialization is a way of saving resources and protecting the environment.

Permanence

The network memorial platform can permanently preserve the written data, images, and audio and video data of ancestors, forming open access and network library, which is convenient for the inheritance of ancestors' culture.

2.4 CASE STUDIES

+ The memorial that reflects the flow of time

9/11 Memorial by PWP

As a Chinese poem goes in Tang dynasty by Xiyi Liu, "flowers are blossoming every year, but people are growing old year to year." He expressed the subjective feeling of time flowing. The memorial itself contains the nature of time. It remembers the historical events in the past and interferes with the present life, and contains the future prospect. PWP's design uses a picture of the four seasons to represent time. In the Sacred Space, the orderly array of tall trees strengthens the sense of place and time. The redundant shrubs are removed so that the contrast of scales between human and tree are exposed making it easier to notice seasonal changes and sense time. (PWP, 2015)



Image Courtesy: PWP Landscapes

+ The memorial that reflects permanence

5/12 Wenchuan Earthquake Memorial Hall by Tongji University.

The project was designed with the concept of "crevices" that tried to mimic the landform of earthquake. The main building was named "the crack", which means "to freeze the disaster moment like lightning between the earth, leaving the eternal memory for posterity". The whole building is cut in fissure, and extends outwards through the sinking square and footpath, which is integrated with the gentle grass slope. The part of the building is raised and exposed to the ground, implying new life and hope. The orderly rows of pine and cypress are like monuments to the victims, symbolizing the continuation of their lives in the form of green plants. (Xiangcun, 2017)



Image Courtesy: World Architects

+ The memorial that engages community participation

Sian Memorial Park by Iroje Architects & Planners

Tens of thousands of souls have gathered here in the name of death, and the scale of this cemetery is like a small city. Each individual building volume is arranged in individual terraced house on the site. "Row houses" of appropriate size converge to small communities and are connected to the rest by paths on slopes and steps. Shared facilities include small parks and plazas, as well as mourning halls located between each "neighborhood." It is not the dead who live in the cemetery, but the memories of them. In this way, the act of sweeping a grave becomes a kind of community interaction between the living and the dead.



Image Courtesy: ArchDaily

+ The memorial that embeds digital arts

Remembrance, Ai Weiwei in 2010

"Remembrance" went beyond the physical form of a memorial, making it a piece of data that lives on the web forever. It is designed to be visited through virtual access, and mourned by reading the names of the deceased. Seemingly invisible but powerful. While Ai Weiwei's statement offended the Chinese government and was full of political satire, it did express people's anger at the cover-up of information and their longing for humanity.

Link to the art piece <https://www.youtube.com/watch?v=XnVBCdkRTX0>



Image Courtesy: Khanacademy

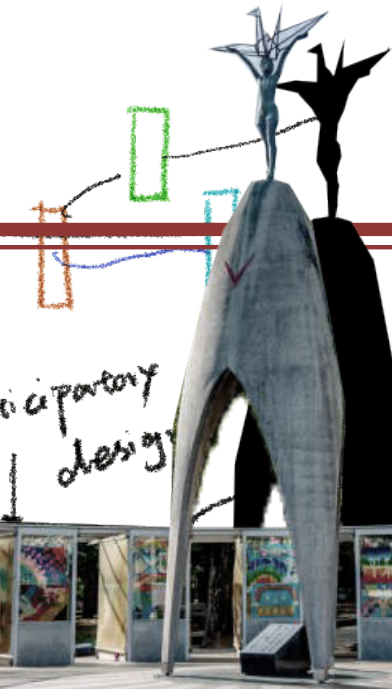
PRECEDENT STUDY DIAGRAM



VIETNAM VETERANS
MEMORIAL
WASHINGTON D.C.
ARCHITECT: MAYA LIN, 1982



participatory
design



CHILDREN'S PEACE MONUMENT
HIROSHIMA, JAPAN
ARTIST: KAZUO KIKUCHI, 1958

BACKPACK MEMORIAL:
REMEMBRANCE
ARTIST: AI WEIWEI, 2010



She was
here before.

EARTHQUAKE MEMORIAL MUSEUM
WENCHUAN, CHINA
ARCHITECT: TONGJI UNIVERSITY, 2013

SANDY HOOK PERMANENT MEMORIAL
CONNECTICUT, USA
LANDSCAPE ARCHITECT: SWA 2018



C HPT. 3 REVIEW OF HCI

- 3.1. THEORIES AND APPLICATIONS
- 3.2. HCI AND MEMORIALS
- 3.3. THANATOSENSITIVE
DESIGN(TSD)

Human-Computer Interaction, short for HCI, refers to the process of information exchange between people and computer in order to complete a certain task through a programmed language and interaction. (Dong, 2004) And HCI as a research field, is situated at the intersection of computer science and design. The term of HCI was first used in 1980 and then popularized by the book, The Psychology of Human-Computer Interaction. (Card, Moran, & Newell, 1980) The term is intended to convey an open-ended dialog between the users and computer that breaks time and space limitation.

“The speed of system iteration is much faster than the tortoise speed of human evolution. In the digital world of human-computer interaction, systems challenge us far more than the skills we possess.” -- Ant Design 4.0: Creating Happy Work,by Wai Lin

"Imitating the natural communication of people" is a mainstream human-computer interaction concept. With the revolution of human’s cognitive ability, such as empathy, forecasting, or cheating, the computer behavior will also become more diverse. (Yang, 2020) Such complexity makes the interactive design more relaxed and humanized, no matter it is system applications, intelligent devices and or virtual reality. The design interface will show up as users needs, and give appropriate guidance without rigid memorialization or understanding the operation.

+ HCI + Landscape Design

Landscape design has a characteristic of complexity and dynamics (Wei, 2016), which contains multiple disciplines and movement of objects. The combination of HCI and landscape architecture design provides the possibility to express flow of time. The dynamic interactive art installations based on HCI can enhance sensory experience in landscape architecture, and on this basis, HCI technology can effectively identify the rules of dynamic landscape system and realize visualization. (Wei, 2016) Meanwhile, HCI is also conducive for the multidisciplinary cooperation and the creation of massive databasse, like the Building Information Modeling and online spatial libraries.

The webpage online cemetery became a craze in the recent years due to the reasons of the ease in building HTML web pages, the strong participatory characteristic of the internet, and the inconveniences brought by the Pandemic. However, the digital memorials should not stay in the two-dimensional webpage form, the future development should be paying attention to the diversity of functions and interaction between real and virtual space to bring people a multi-sensory experience. For example, in the layout of physical space, more attention should be paid to the psychological needs and grasp the change of scales, just as Ashihara Yoshinobu’s theory about the “human-scale”.

HCI breaks through the limitations of time and space, and helps people get rid of the dependence on a single device and software. It enables cross-regional and even global coordination. This collaborative technology requires us to treat new things with tolerance, that is, we should not blindly follow the trend or be a slave to tools, but build off the principles of environmental science, using the new algorithm to promote the development of landscape design.

The physical memorial combined with HCI has the dual attributes of science and art, which is nourished by humanities, and inseparable from the support of technology. For example, during the actual design-build project, we may use the software like grasshopper or python combined with hardware system to display the virtual simulated 3D or 2D dynamic landscape, and form

an interactive process with participants. Or it can display images lined with 3D GIS, and complete the control and analysis of large scenarios like disaster mitigation, regional planning, or population migration. The application of HCI in memorial design can also restore the scenario and enhance the atmosphere of the place.

However, the digital or HCI related memorial cannot completely replace traditional cemeteries. To achieve a sense of rituality, humans always need a physical touch for a solid thing to express grief. In China, people set up stone monuments for deceased people. The stone material is not easily perishable and can preserve for a long time, which is a good indication of people's memories of the dead. A virtual world cannot easily replace the history that was carried by aging materials.

Thus, the research direction of this paper is to develop a more dimensional space based on the traditional cemetery, to bring people a better grieving experience, and that death can be more accessible and their fore more fully respected and remembered.

3.3 THANATOSENSITIVE DESIGN (TSD)

+ THANATOSENSITIVITY /'θænətɒˌsensə'tivəti/

Thanatosensitivity describes an *epistemological-methodological approach into technological research and design that actively seeks to integrate the facts of mortality, dying, and death into traditional user-centered design. (Michael Massimi and Andrea Charise, 2009)

The term thanatosensitive is derived from the ancient Greek mythological personification of death.

*Epistemological-methodological: A philosophy concerned with knowledge and a contextual framework for research.



“THANATOS”

Greek: Θάνατος (Thánatos), “Death”

As the transition from life to death in **Elysium** became a more attractive option, Thanatos came to be seen as a beautiful Ephebe. He became associated more with a **gentle passing than a woeful demise**. Many Roman sarcophagi depict him as a winged boy, very much akin to Cupid: “Eros with crossed legs and torch reversed became the commonest of all symbols for Death”

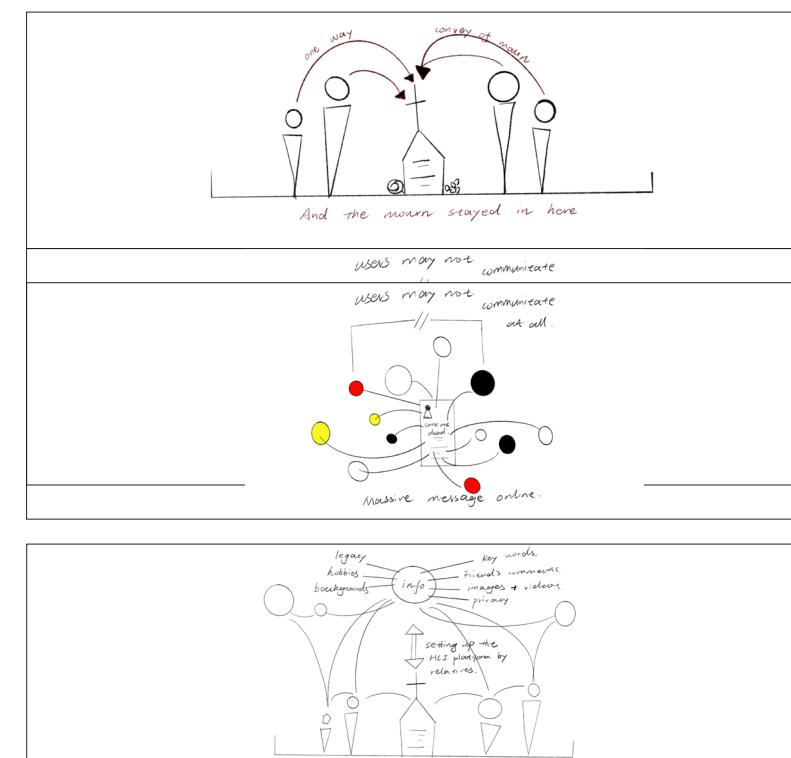
Figure 2. A conceptual drawing of Thanatos.
Courtesy: Liang Huang

TSD identifies itself as belonging to the HCI community. HCI is referred to within the TSD literature as the location in which it operates and contributes. (Massimi & Charise, 2009; Massimi et al, 2011; Massimi, 2014).

My understanding of what brings together TSD, HCI and this broader collective is their human- or user-centred mutual focus when they **frame a situation for research and design inquiry**. This act of ‘framing’ or ‘to frame’ a situation is a term borrowed from Schön and Rein (1995) and Stolterman (2008), in order to refer to the kinds of implicit and explicit judgements and decisions that are made in a ‘socially situated’ design and development process (Stolterman, 2008; Schön & Rein, 1995).

Stolterman describes this framing from the perspective of a designer that practitioners have to make decisions about who or what to pay attention to and listen to. Similarly, **landscape designers also make decisions about what to disregard from all potential sources at hand** (Stolterman, 2008).

TSD emerged, interestingly, as a non-prescriptive design methodology. Rather than outlining particular formulaic steps or methods to follow for TSD, **it is more of a ‘lens’, a ‘domain’ and a ‘tool’ for thought**, framing a potential situation, introducing considerations and making the end of life visible (Massimi, 2012).



PHYSICAL FUNERAL

A better sense of funeral and more serious in acknowledging the death. A one-way message convey.

ONLINE MEMORIAL

Allows more posts from outside, even with someone who never know. A one-way message convey. Lack a sense of ceremony. Hard to experience or get collective information about the deceased people.

HCI INTEGRATED FUNERAL

Allows people to exchange information and learn more about stories/history of the death. Not totally online. Include “Interactive” process. More friendly to those who are closer to the deceased one, and better privacy.

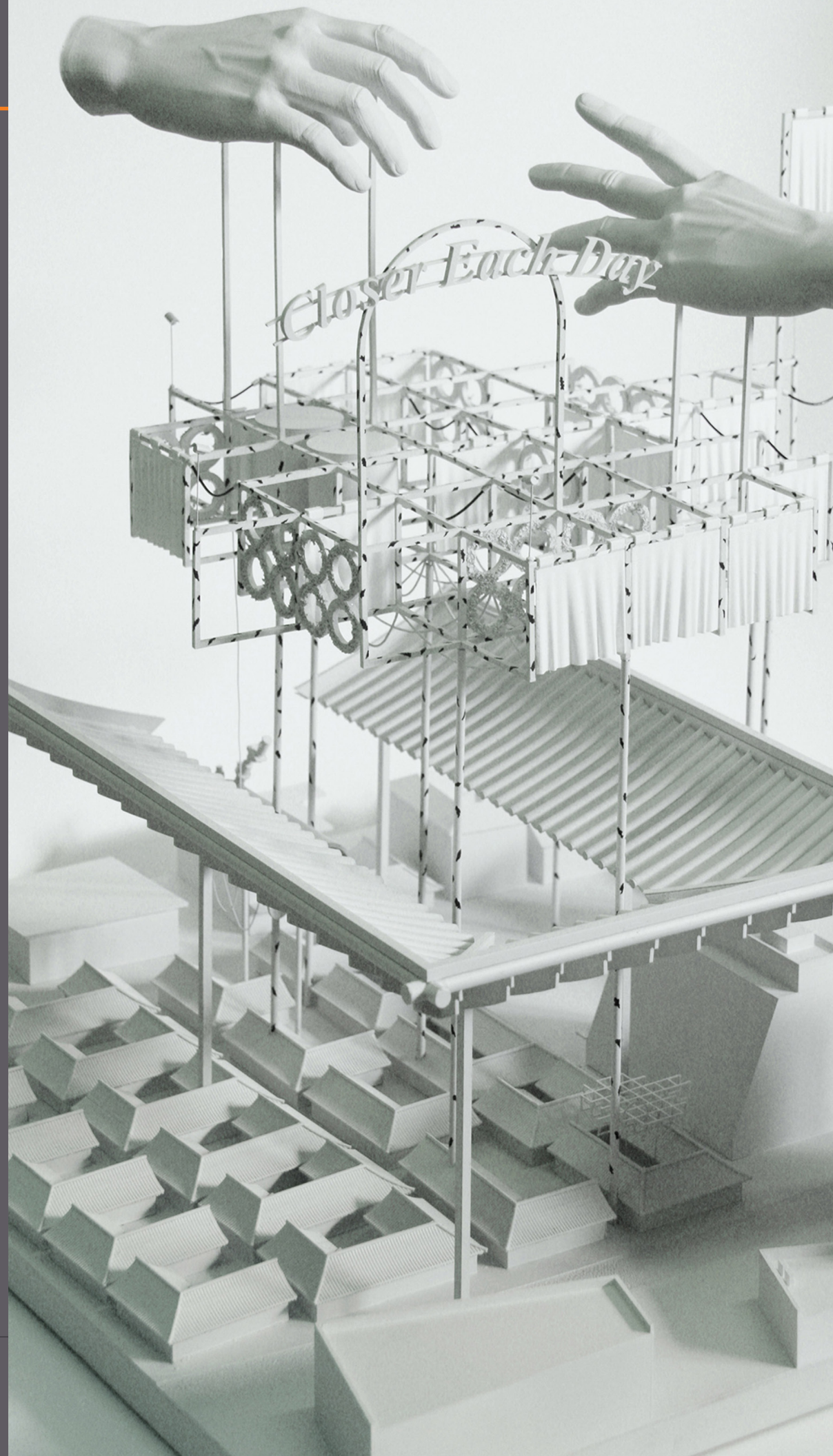
BEREAVEMENT

/bɪˈriːvmənt/

Bereavement describes the state or fact of being deprived of something or someone.

TSD typically focuses on **positive interventions** for those who have experienced loss or who would identify with bereavement. Furthermore, these themes of bereavement and loss stretch across and encompass a range of phenomena.

Bereavement is not simply the experiencing of grief. It can include many different activities: taking on new roles, learning how to engage with outsiders, managing the deceased's assets, creating and organizing mementos, finding support, and so on (Massimi, 2012).



PRECEDENT

Common Accounts built a prototype funeral home in Seoul. They believe that modern technologies could be used to create new, eco-friendly funeral rituals.

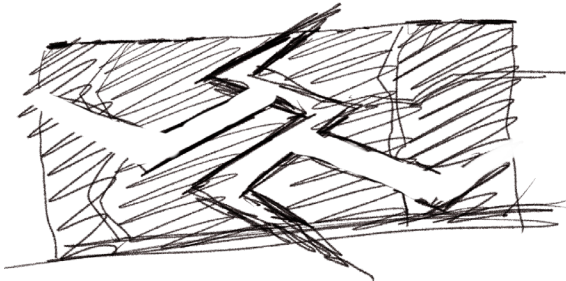
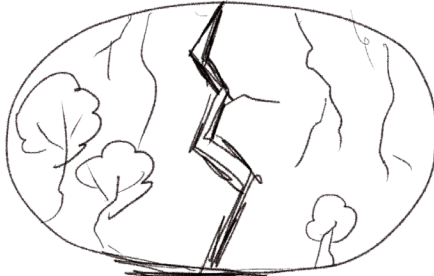
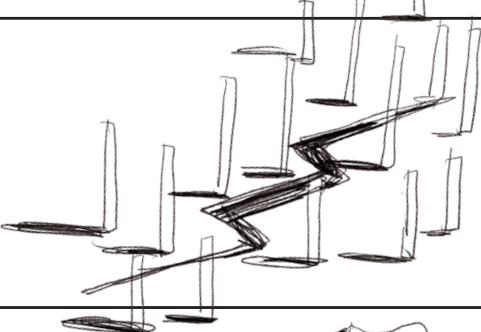
"Burial and cremation, as we know them, are dead," explained Gertler.

"Today's city can no longer afford to keep the material business of death at arm's length, given diminishing land availability, environmental concerns, and the prospect of your digital afterlife."

The prototype encouraged to reuse the liquefied bodies to fertilise plants and flowers, and use interactive social media accounts to generate a virtual afterlife.



THREE ORDINARY FUNERALS. Courtesy: Common Accounts Architects.

	<u>EARTHQUAKE SITE</u> IN WENCHUAN, CHINA
	<u>THEORIES</u> ENVIRONMENTAL PSYCHOLOGY
	<u>TECHONOLOGY</u> HUMAN COMPUTER INTERACTION
	<u>INTERVENTION</u> THE ECHOING GROUND
	<u>INTANGIBLE</u> LOCAL POLICIES

C HPT. 4
SITE DESIGN
THE ECHOING
GROUND

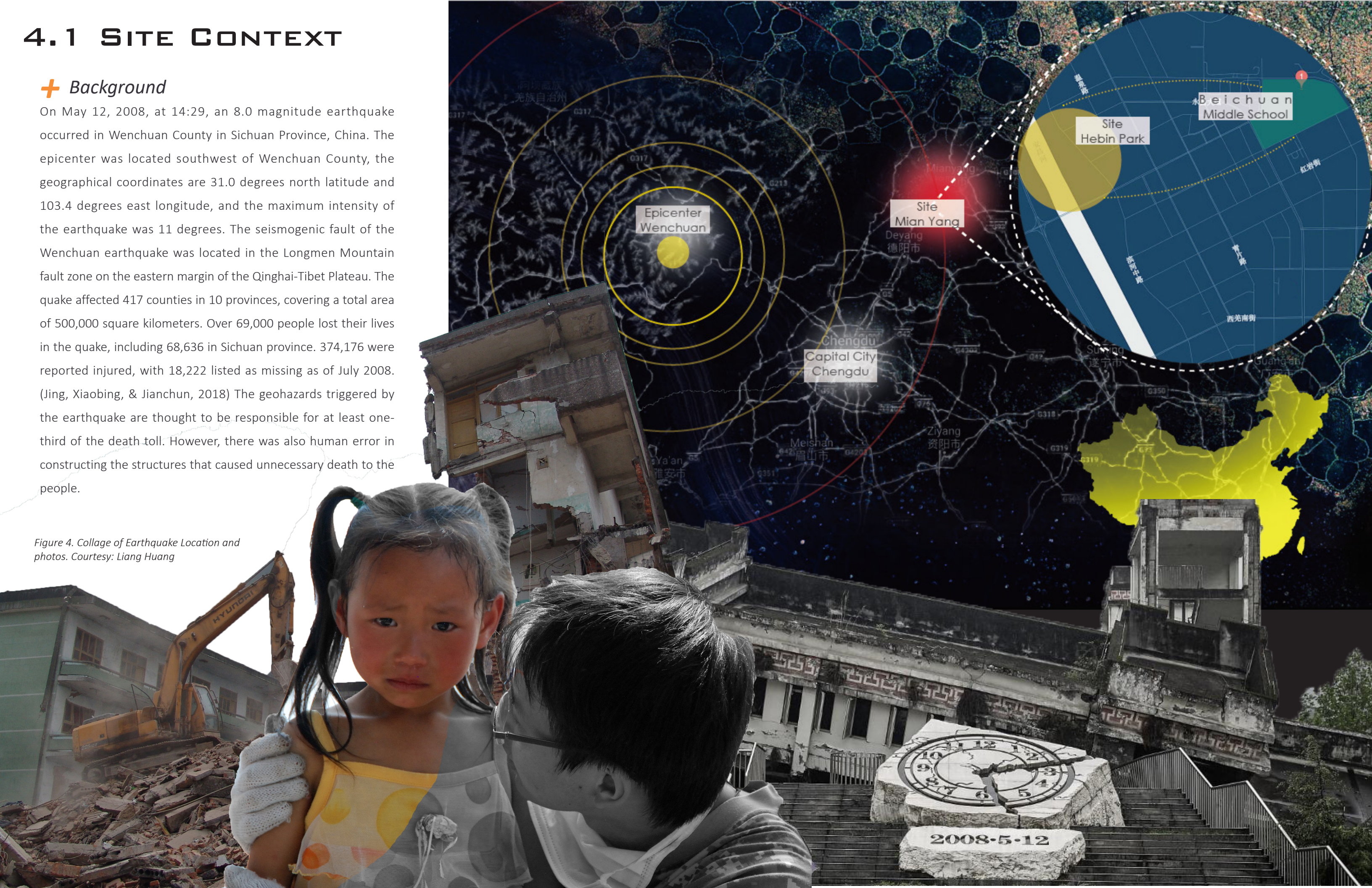
- 4.1. SITE CONTEXT
- 4.2. DESIGN NARRATIVES
- 4.3. DESIGN DETAILS
- 4.4. PLANNING POLICIES

4.1 SITE CONTEXT

+ Background

On May 12, 2008, at 14:29, an 8.0 magnitude earthquake occurred in Wenchuan County in Sichuan Province, China. The epicenter was located southwest of Wenchuan County, the geographical coordinates are 31.0 degrees north latitude and 103.4 degrees east longitude, and the maximum intensity of the earthquake was 11 degrees. The seismogenic fault of the Wenchuan earthquake was located in the Longmen Mountain fault zone on the eastern margin of the Qinghai-Tibet Plateau. The quake affected 417 counties in 10 provinces, covering a total area of 500,000 square kilometers. Over 69,000 people lost their lives in the quake, including 68,636 in Sichuan province. 374,176 were reported injured, with 18,222 listed as missing as of July 2008. (Jing, Xiaobing, & Jianchun, 2018) The geohazards triggered by the earthquake are thought to be responsible for at least one-third of the death toll. However, there was also human error in constructing the structures that caused unnecessary death to the people.

Figure 4. Collage of Earthquake Location and photos. Courtesy: Liang Huang



+ Geological Analysis for the earthquake

The earthquake occurred in the thrust nappe tectonic belt of Longmen Mountain in Sichuan Province. This structural belt is the boundary of the Bayankara block in the Tibetan Plateau (Figure 5) and the South China block in the east of China. It has experienced a long history of geological evolution and has a very complex structure. The late Cenozoic tectonic deformation is mainly focused on Guan Xian-Jiangyou fracture (the front-mountain fracture), Yingxiu-Beichuan fault rupture (the central fracture), and Wenchuan-Maoxian fracture (the back-mountain fracture) and their related folds. The 8.0 magnitude earthquake resulted from the Longmen Mountain thrust nappe pushing in the southeast direction accompanied by a clockwise shearing of the land. The Yingxiu-Beichuan fault rupture has been active since Holocene (10,000 years), and its long-term geological slip rate is less than 1 mm per year. GPS observations showed that the deformation of the Longmen Mountain tectonic belt is also characterized by thrust and dextral shearing, but the deformation speed is not immense. (China Earthquake Administration, 2016) Therefore, Longmen Mountain structural belt and its internal faults belong to unique faults with low seismic activity and potential danger of super strong earthquakes.

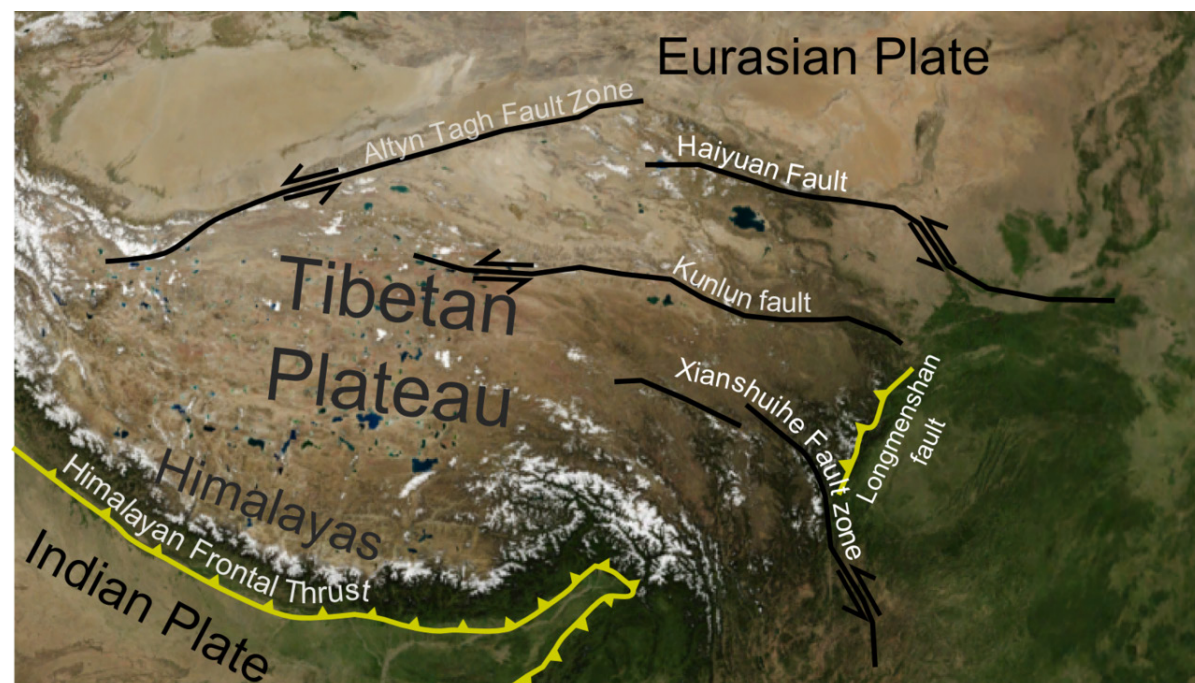


Figure 5. Tibetan Plateau and surrounding areas showing location of main fault zones.
Courtesy: Mike Norton.

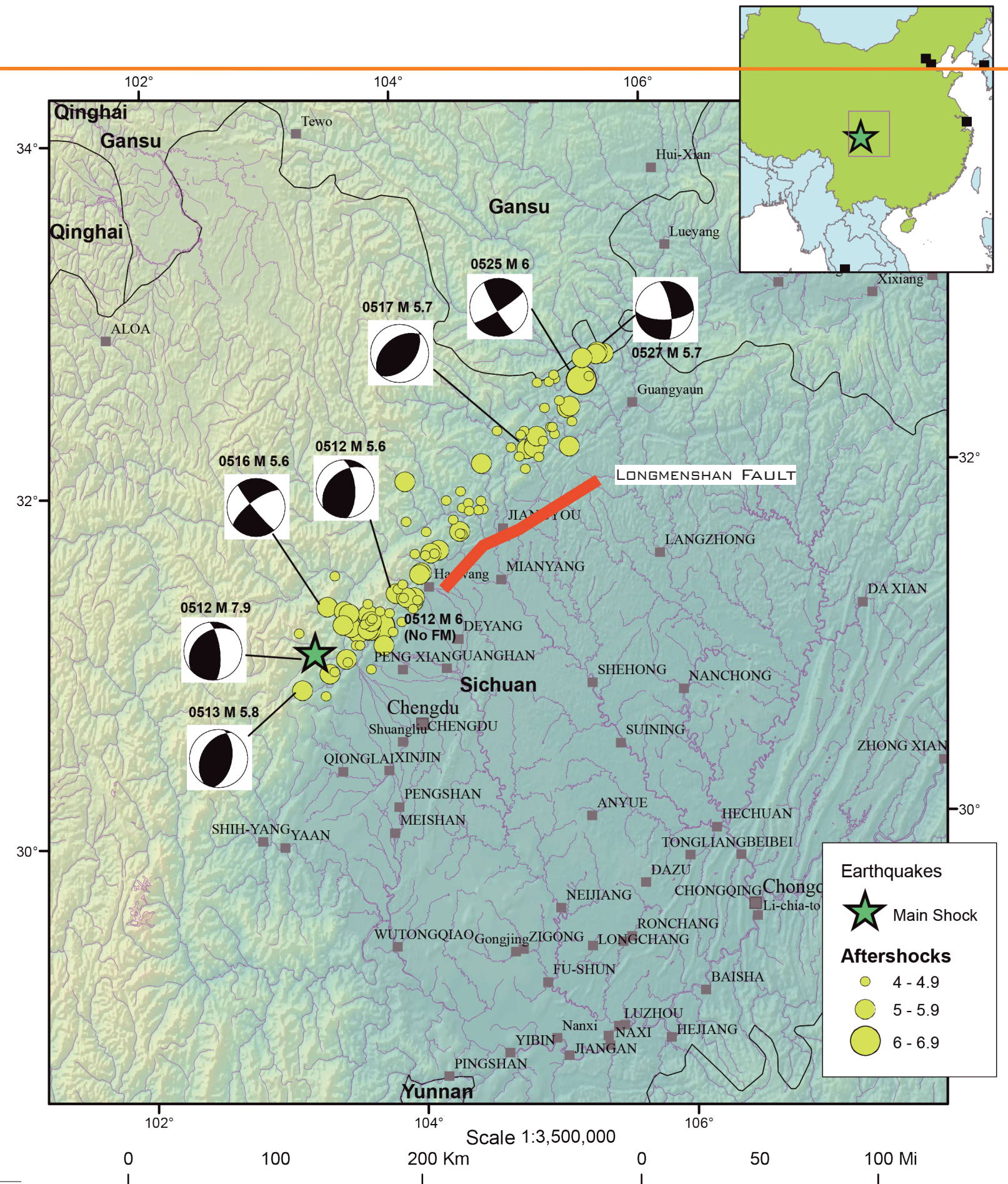


Figure 6. M7.9 Eastern Sichuan, China, Earthquake of 12 May 2008 and Aftershocks. Courtesy: USGS

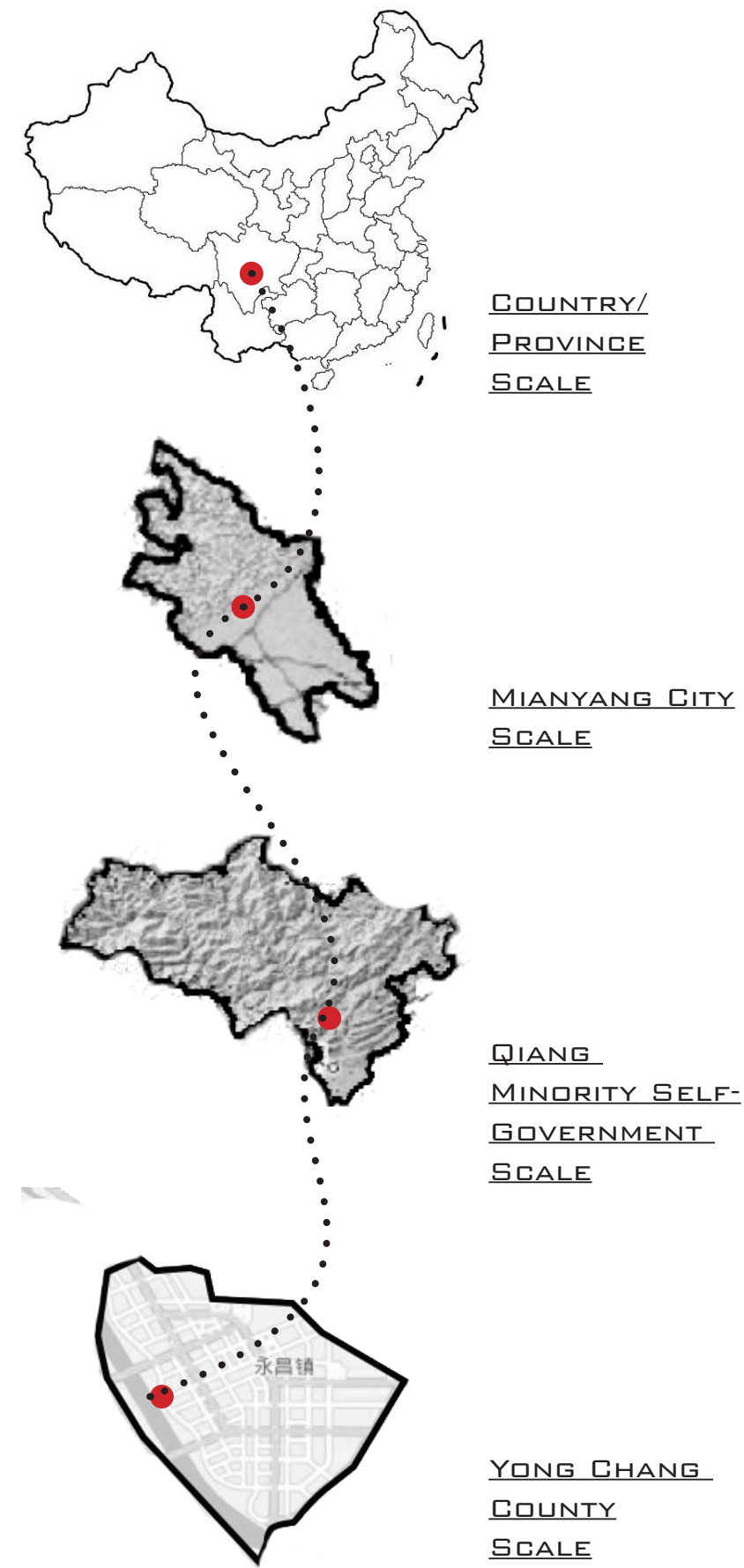


Figure 7. Site Location in different scales.

4.2 DESIGN NARRATIVES

+ Site Selection

Hebin Park in Beichuan County.

The site chosen is a natural waterside park 0.6 mile west of Beichuan Middle School where half of the students and teachers were wiped out by this disaster. The park resides in an underused large flat area, and is close to two major highways.

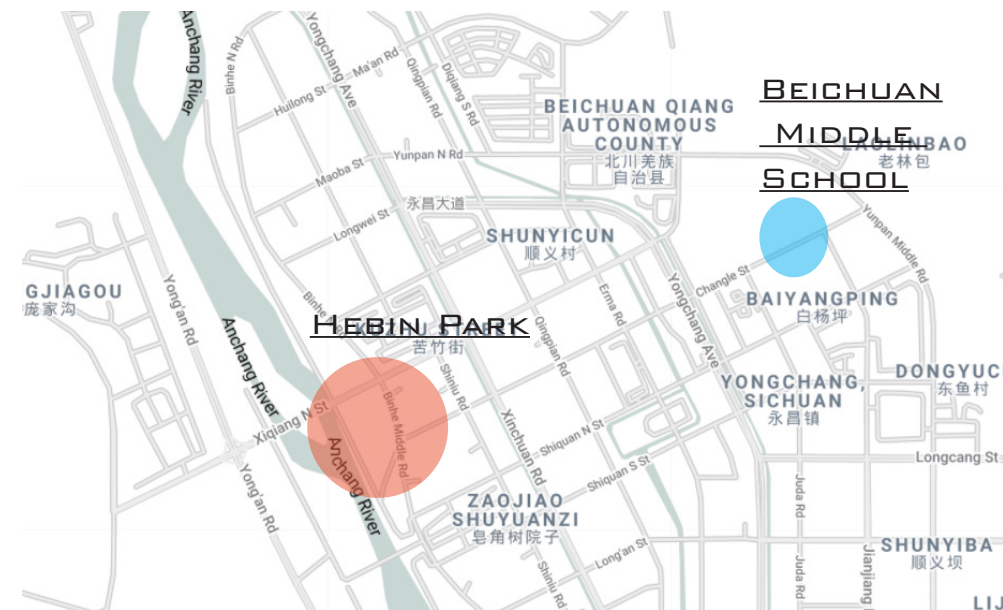


Figure 8. Site Selection Map.

+ Issues

"A natural disaster and the actions and consequences associated with it can make a difference depending on how people look at it. If it is not remembered, if it is not thought about, if it is not reflected on, nothing would change." Guo Yuhua, a Chinese conservative intellectual and professor of sociology at Tsinghua University.

In December 2008, Tan Zuoren, a Chinese environmentalist and writer, began to conduct an independent citizen investigation on the list of students who died in the disaster and formed a preliminary investigation report in March 2009. Draft report shows that although the high intensity of the earthquake is one of the main reasons for building collapse, another major issue was the unqualified building structure.

In the National People's Congress and the Chinese Political Consultative Conference in March 2009, a Hongkong reporter raised a question about human error during the earthquake. However, the executive vice governor of Sichuan Province, Wei Hong, concluded that the main reason for death was the high intensity of the earthquake, indirectly denying the existence of the "tofu slag" project. Since then, officials in China's Ministry of Construction have never mentioned the building quality problems that caused the school collapses in the earthquake. Allegations of shoddy school construction have continued since the quake, and official figures on the number of dead students have been slow to come out.



Image: On the first Children's Day after the earthquake, parents of the victims of the Xinjian Primary School in Dujiangyan held their children's photos to commemorate the event. They were dressed in uniform with the words "We will resolutely seek justice for the students". Courtesy:BBC Chinese.

+ Design Concept

There were so many monuments, museums, and memorials built to commemorate the loss inflicted by the earthquake, but there is none to remember the kids who died in this disaster. Like many people who experience the earthquake in 2008, we want to ask, how many people died in the disaster? How many kids are deceased? Moreover, where are their parents? Are their minds settled down after so many years? There was not even acknowledgment of the number of children who died in the quake. The idea of the site design is to try to tell people what happened using landscape narratives and acknowledge the death of kids. Facing the loss of so many lives and the incomplete disclosure of information, the thesis aims at revealing the process of how they died, and in turn, give these longing parents a virtual place to relieve their emotions and grieve.

In the preliminary thinking of designing the memorial, I hoped to introduce the concept of time into the design. Space should express the eternity of the frozen time-- the moment when the earthquake happened, and the flow of time-- the years spent by those parents, as well as the change of mood. In terms of the timeline, the victims of the earthquake were lost in 2008, but these parents have to move on. The core idea is to have the participants move through three different spaces, experience the change in atmosphere from opening – suppressed – relieved. And reveal the human error that was intentionally buried by the authority, remember the names, and move on in the future after visiting the memorial.

The name of the memorial was inspired by a Taiwan singer Zheng Zhihua's song, “stars light up my door, let the lost children find their way home.” The memorial plaza is a symbol to acknowledge their existence and call the children home. I hope to simulate the night sky with the lighting effect, so it is named Echoing Ground.

GROWING

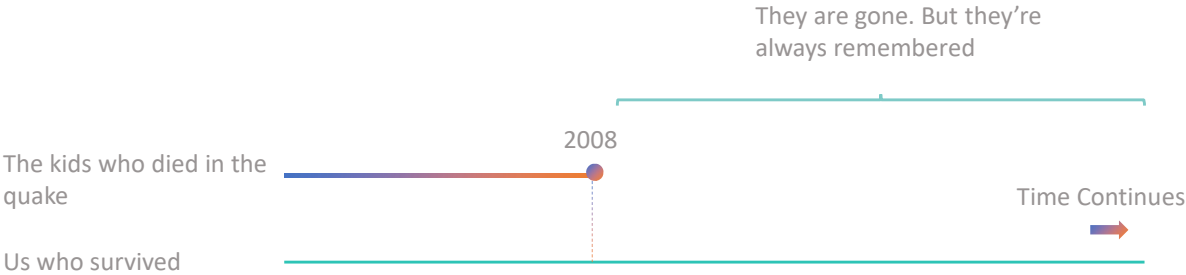


Figure 9. The growing time line.



Figure 10. The location map and narratives.

+ Local culture: the Qiang Minority and its Shamanic Religion

Beichuan Qiang Autonomous County is an autonomous county under the jurisdiction of Mianyang City, Sichuan Province, China. It is also the only Qiang Autonomous County in China. (Chai, 2008) Qiang minority is an ancient ethnic group in western China. The ancient Qiang people had a broad and far-reaching influence on the development of Chinese history. The Qiang, who call themselves "Erma" or "Erbaa", are known as the "people on the clouds." Most of the Qiang people live in high mountains, and a few live near towns along highways, with other Tibetan ethnic groups. They depended on animal husbandry for their livelihood.

In the ethnic religion of the Qiang people, the ancestral clergymen are called the "shibi (释比)". They are religious leaders, priests, and shamans of the Qiang people, acting as intermediaries between gods, human beings, and ghosts. They are the most authoritative cultural inheritors of the Qiang people. In general, there are two kinds of shibi jobs – priests, who worship gods, cures diseases, and drives out ghosts; and wizards that help divination, protect fire, and make witchcraft. After the May 12 earthquake in 2008, there are only 3 shibis left in Beichuan.

In the design of this memorial, I hope to integrate the totem and white stone culture of Qiang and the sacrificial culture of shibi shamanism and divide the narrative into two layers,

Primary Narrative: The basic narrative that carried out the whole design is the Shibi Culture's ritual ceremony. The process includes three steps, namely understanding, acknowledgment, and appreciation. The site design will lead people to go through this process, educate them about the disaster, mourn for the kids, and transform the experience into an appreciation of nature.

Secondary narratives: The 2nd narrative is included within acknowledgment in the primary narrative. This part aims to acknowledge the death and respect for the kids, provide a conversation between parents and deceased kids, and lead parents through a therapeutic path.

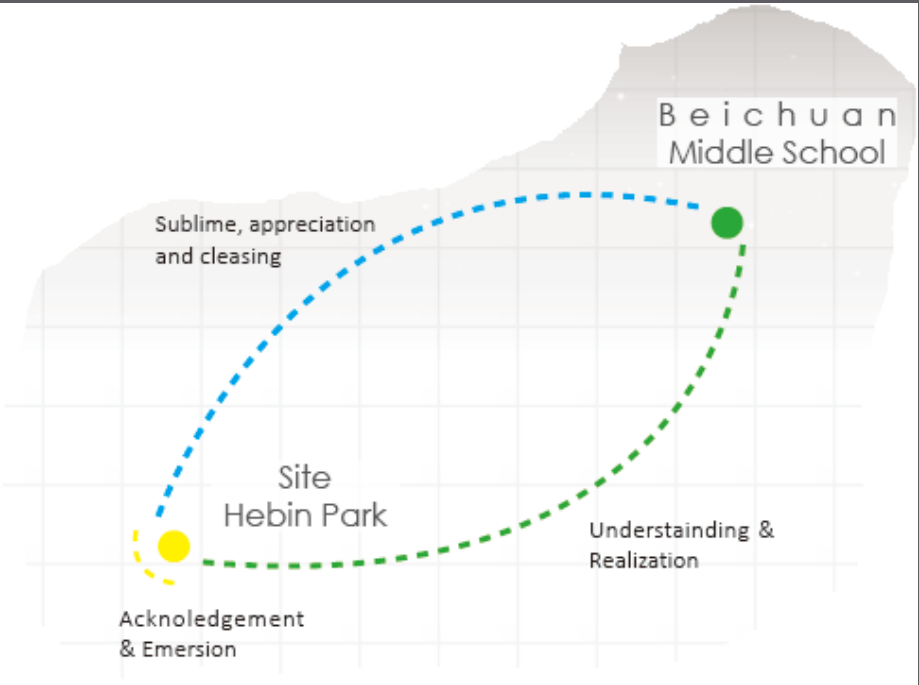


Figure 11. The two layered narratives.



Image: The Qiang Shibi performance of praying for good fortune
Courtesy: CPCNews



Image: The Qiang Shibi totem.
Courtesy: CPCNews

+ Overall Site Design

In order to comply with local customs, historical habit and minority religions, the physical design included the circulation of streets and residential areas. The street in front of Beichuan Middle School is the cultural street. Residents can learn about historical events through the pavement and wall paintings. The memorial park is divided into three parts, the opening, the echoing ground, and the therapeutic garden. The experience through the park will focus on calming, praying and relieve. The way back to the school is the end of the memorial walk, and represents the completion of the ritual.

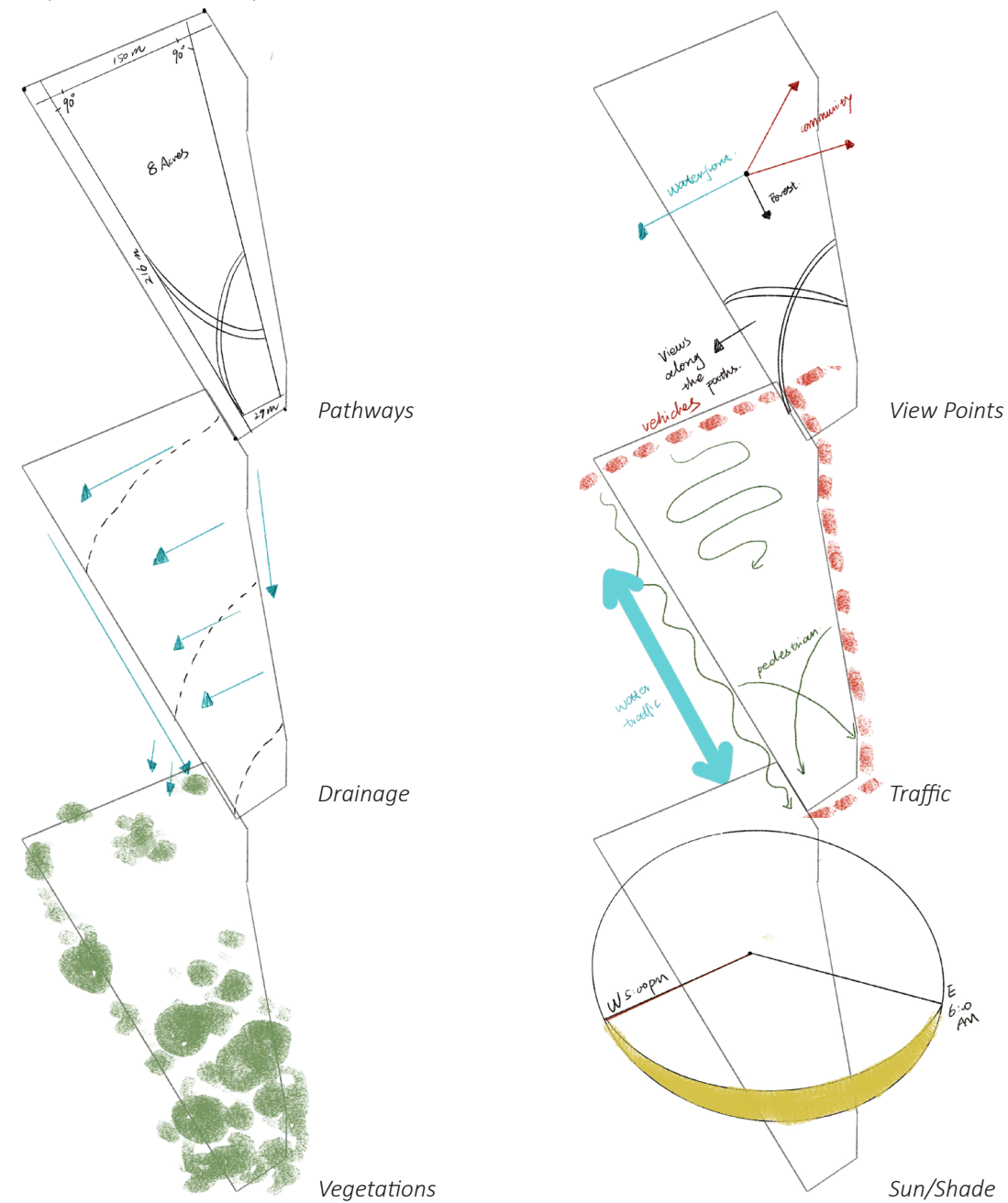


Figure 12. Circulation

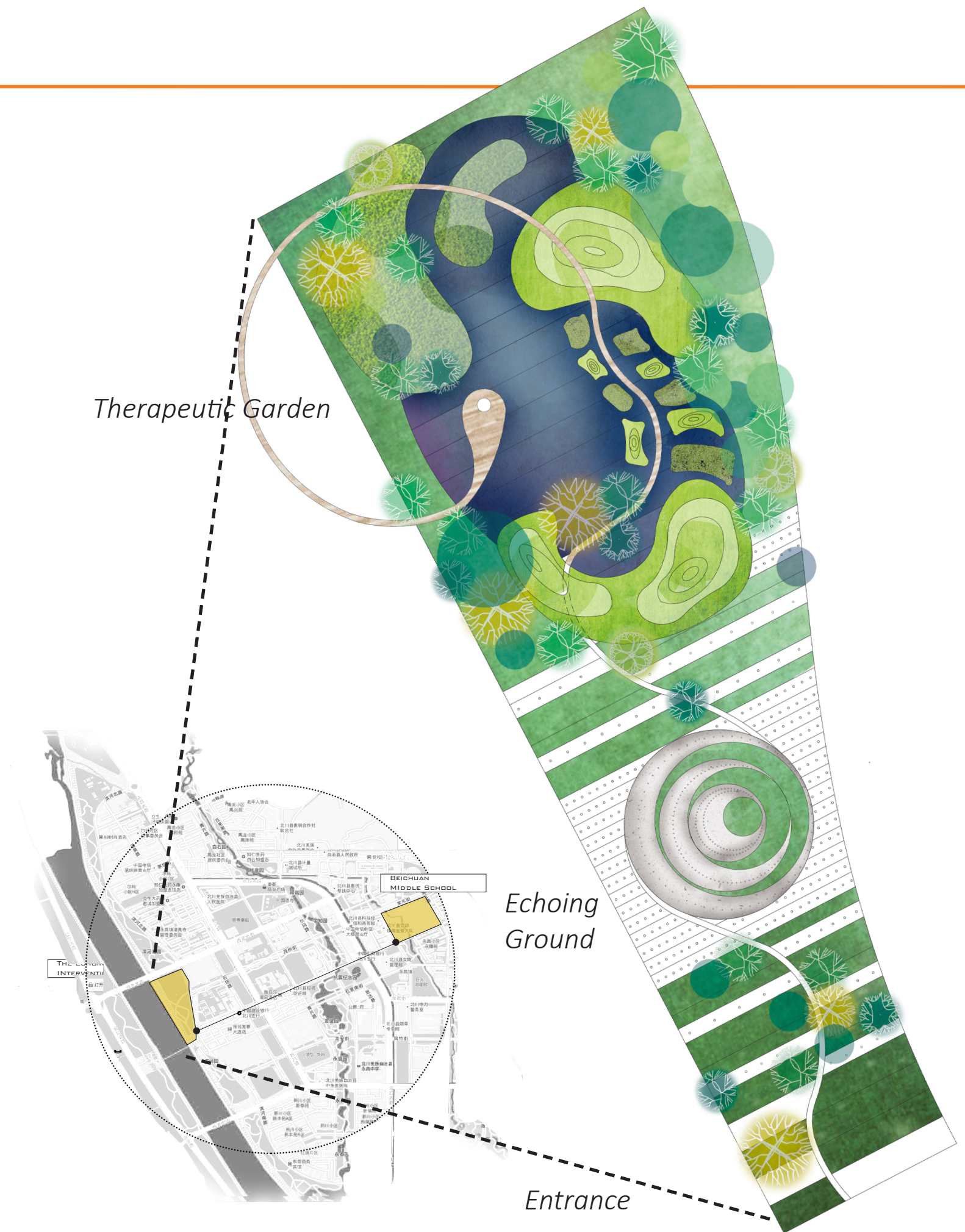


Figure 13. Site Design

+ Moving Through: From Beichuan Middle School to the echoing ground

This path simulates the process of “understanding” in *Shibi* Culture.

Since Beichuan Middle school was completely destroyed and rebuilt, the ruins were no longer there, and the original residents were moved out. If students who enrolled later in Beichuan Middle School wanted to know about the history, the best way is the subtle influence on the street. For example, through seeing the design of small furniture, the participatory painting, and graffiti on the wall they will absorb the information and remember the history. In the process of walking towards echoing ground, people will have a mental preparation in advance, and they will not be at a loss when entering the memorial.

+ Moving Through: The Entrance

This entrance to the memorial is the beginning of “acknowledgment” in the *Shibi* Narrative. We would recognize the death of the students at the moment we enter the memorial. The scale of the entrance imitates the design of the 9/11 Memorial by PWP. There is no redundant tree arrangement, but only the local Ginkgo tree in a horizontal array. The ground is matched with local white stones, as if they become the shadow of the Ginkgo tree. People are calm in this space, and can easily perceive the transition of the four seasons. The open plaza is also connected to the riverbank, which will make people's navigation very easy. For those who do not want to go to Memorial, there are options to exit.



Figure 14. Rendering of the entrance

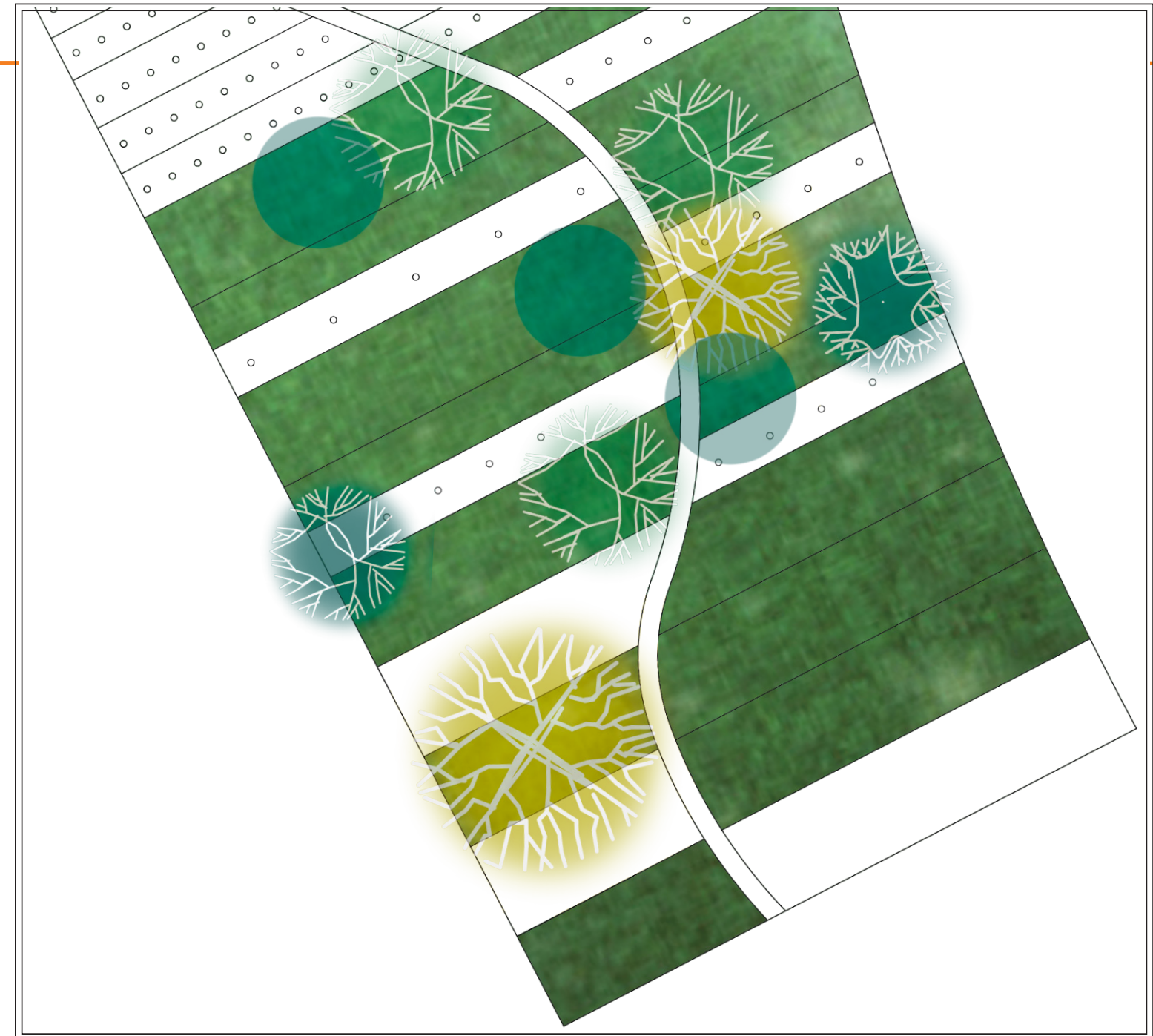


Figure 15. Plan of the entrance



Figure 16. Section of the entrance

+ Moving Through: The Echoing Ground

The Echoing Ground is the main part of the memorial.

It is divided into two parts: physical design and HCI design to allow people to interact in multi-dimensional ways. In terms of physical design, 1000 hollow steel pipes were selected and erected here in order to simulate the huge death toll, like a steel forest. They measure eight feet tall, taller than the average adult. The feeling of walking through this steel forest is oppressive and intense because it is intended to mimic the urgency of schoolchildren who cannot breathe after being crushed by buildings. At the same time, the pillars have openings at the top, and as the wind blows, the pillars resonate, as if children are calling for their families. Utilizing the HCI, each column has a QR code, which directs the viewer to an online interface, storing the information of the dead children in Beichuan Middle School, and serving as an online historical data museum. Online platform users can also participate in community decisions and interactive light shows from remote locations. While many residents have already left the city, their engagement has not been diminished by distance. The part about this interface will be explained in detail later in the thesis.

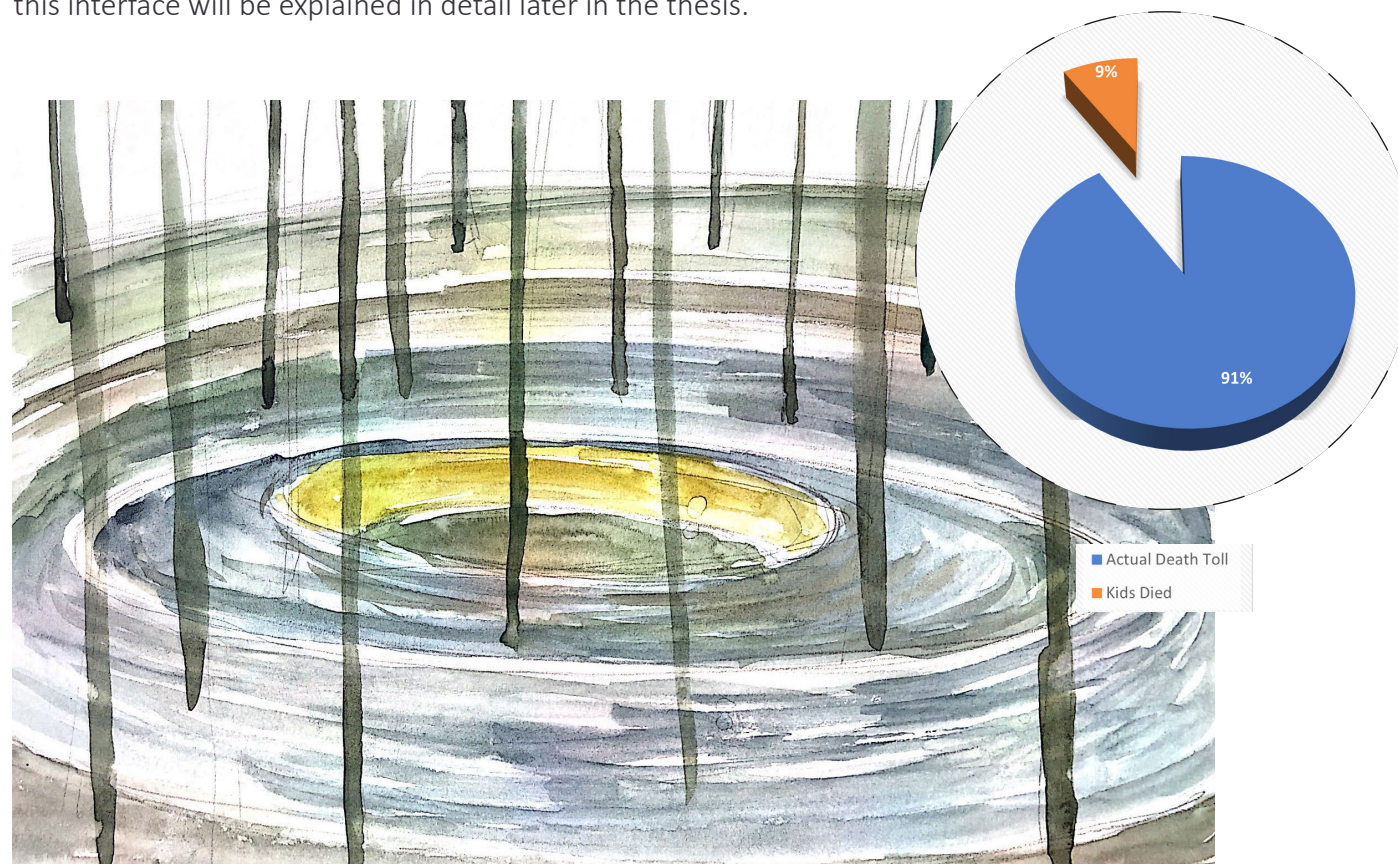


Figure 17. Rendering of the Echoing Ground

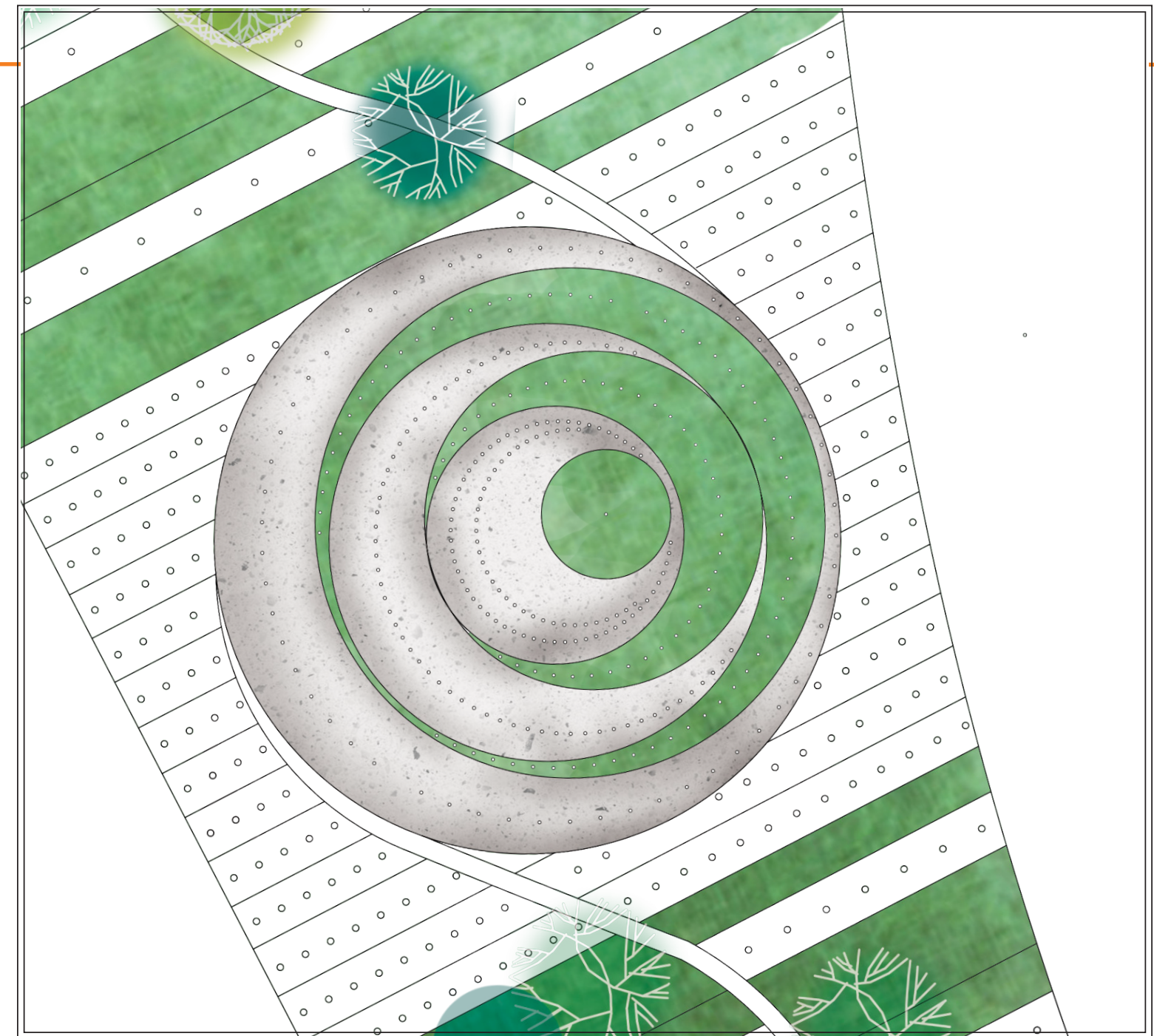


Figure 18. Plan of the Echoing Ground

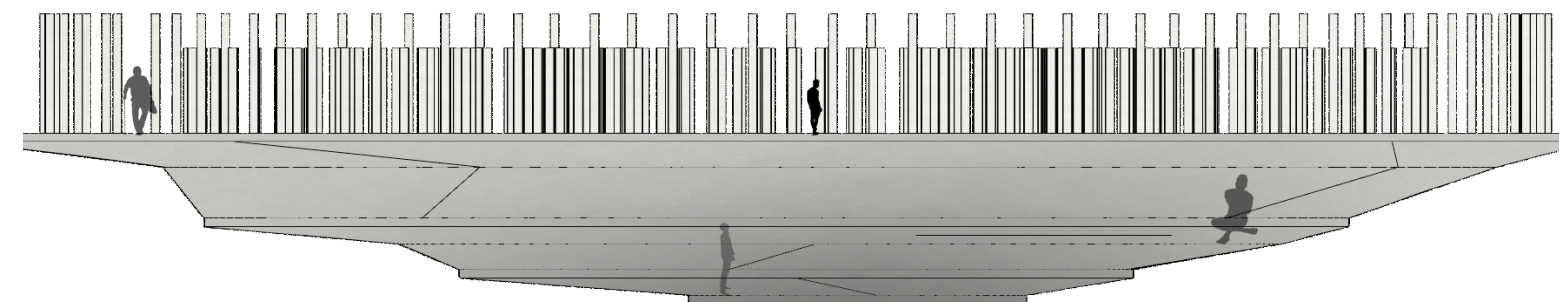


Figure 19. Section of the Echoing Ground

+ Moving Through: The Therapeutic Garden

This is the third part of the 2nd Narrative and the end of the memorial. It is a therapeutic wetland garden. Inside the garden are undulating mounds and waterscapes. Walking through this garden, the heights and views are changing. One's mood also calms down with the open vision and views across the landscape. All the parents wanted, was a peaceful heaven for their lost children and serenity in their own hearts. This part makes extensive use of water and reflections, suggesting the connection between the living and the dead.

+ Moving Through: The Way Back

As people exit the therapeutic garden, they will reach the way back to Beichuan Middle School. Not all visitors will take this route home; and some may retrace their steps or exit by the middle path. Therefore, when designing the final “appreciation” part, I weaken the physical form of it. On the way back to school from Memorial, a series of Raingarden system and white stone stones were designed as a guidance, meaning that people should never forget their own culture. In fact, this road can also be traversed in reverse, but wherever direction people go, the important echoing ground cannot be skipped.



Figure 20. Rendering of the Therapeutic Garden



Figure 21. Plan of the Therapeutic Garden

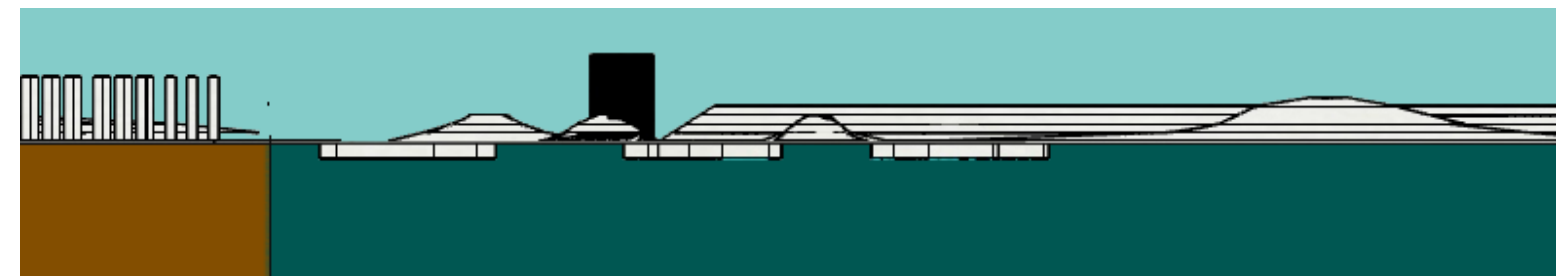


Figure 22. Section of the Therapeutic Garden

+ Moving Through: The HCI Design

[THE ECHOING GROUND] INTERFACE

[The Echoing Ground] is an interactive interface that users could interact with in multiple ways. During the daytime, the ground is a memorial for people to visit, and people could touch the poles and hear the echo as if the kids are responding to them. Each Pole has its own unique number and users could upload documents of the deceased people. So that the ground is also a collective museum for the kids who died. During the nighttime, the ground becomes illuminated, and the lights beneath the poles are programmable. Users could upload the patterns online and they will show up in the ground.



On Site Experience

- Commemorate the loss
- Interact with the wind pole



While Away...

- Create commemorative art online
- Document the deeds of the deceased
- See the light show through live stream

Who's the Potential User?

- Parents who lost kids in the earthquake
- Local people who want to commemorate
- Students of the BeiChuan School
- People who want to learn the history

Define User's Needs

- A space for parents to confirm and commemorate the deaths of kids
- A historical museum that documents the past
- An interactive plaza for surrounding communities

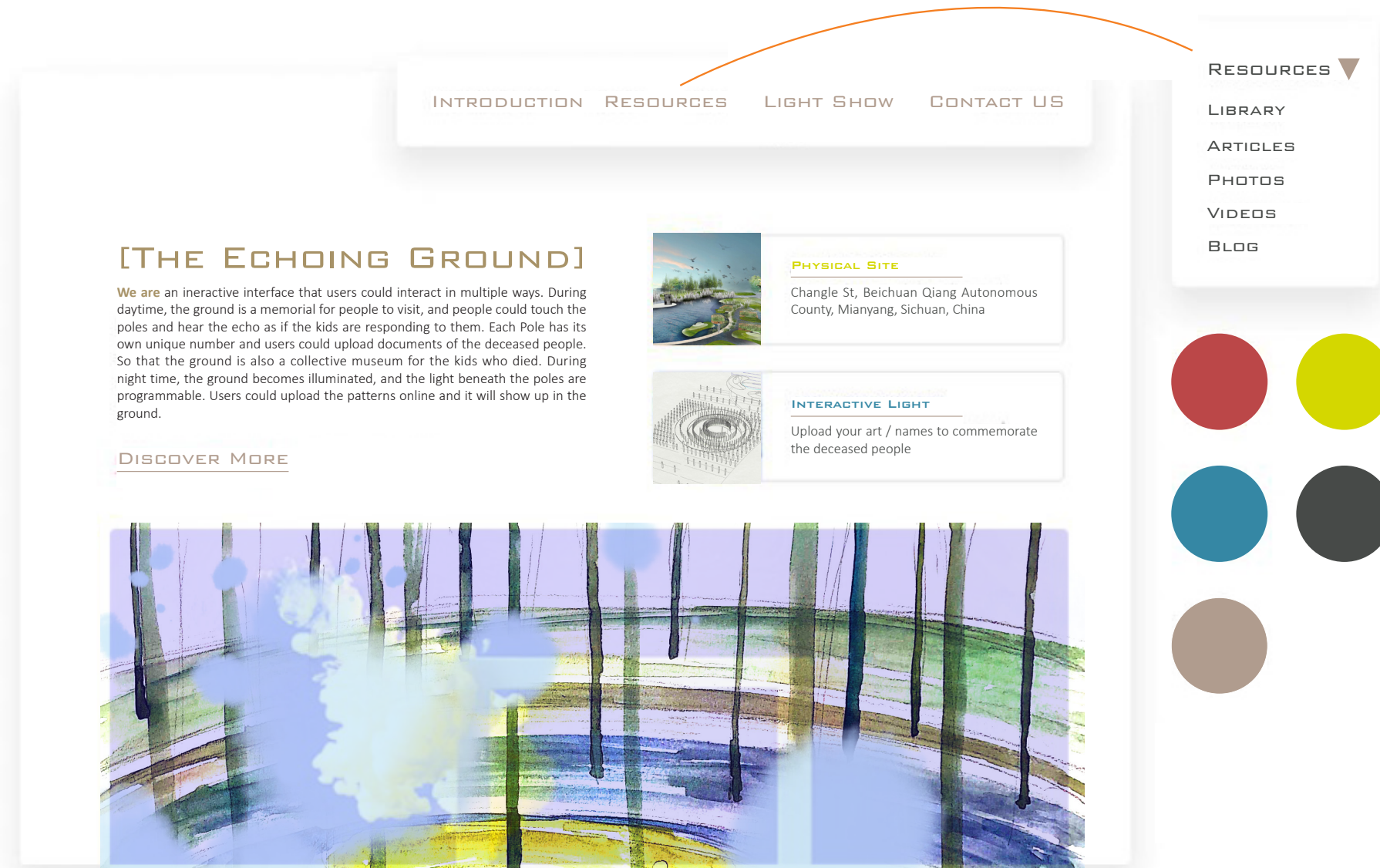
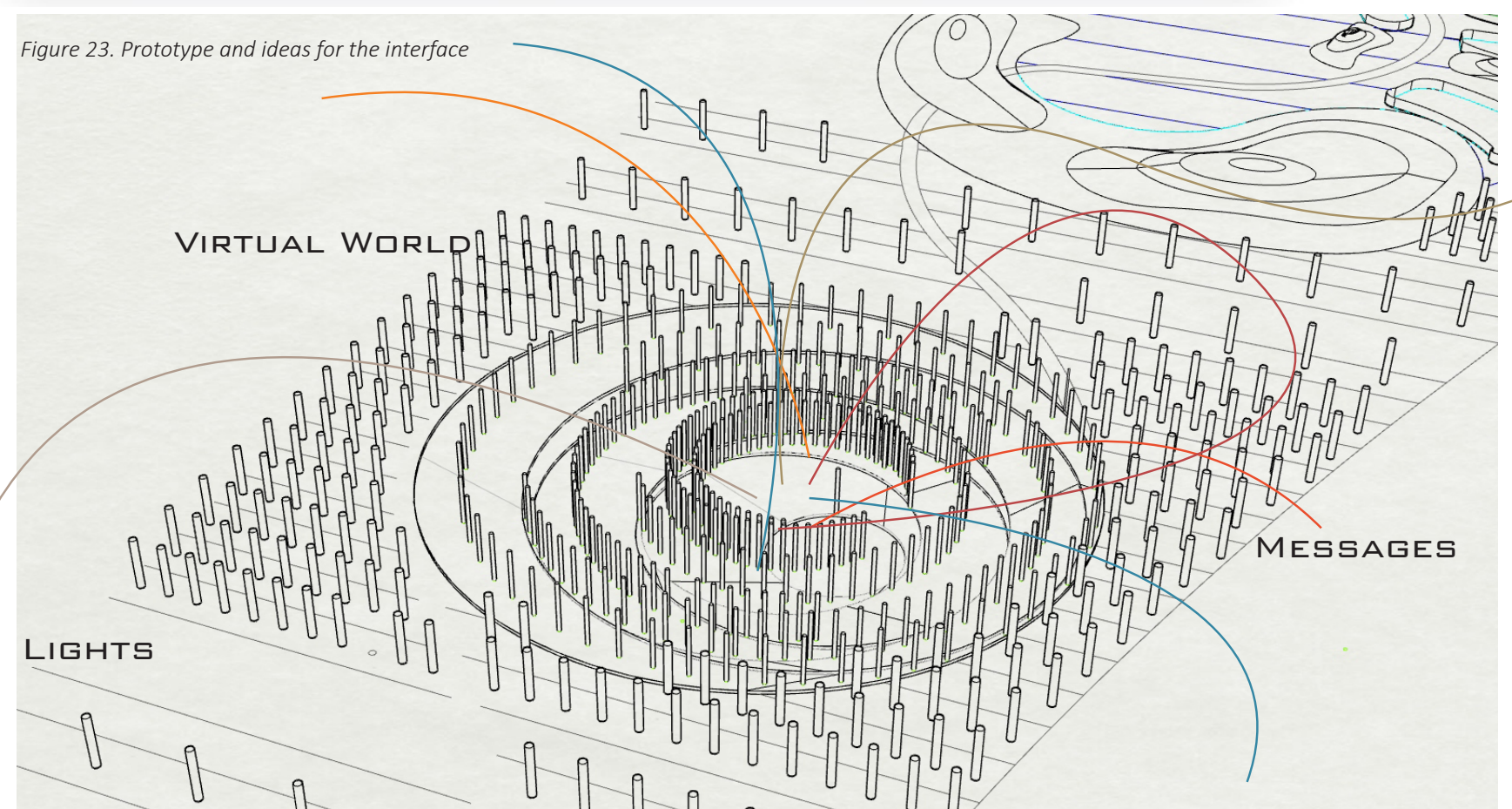
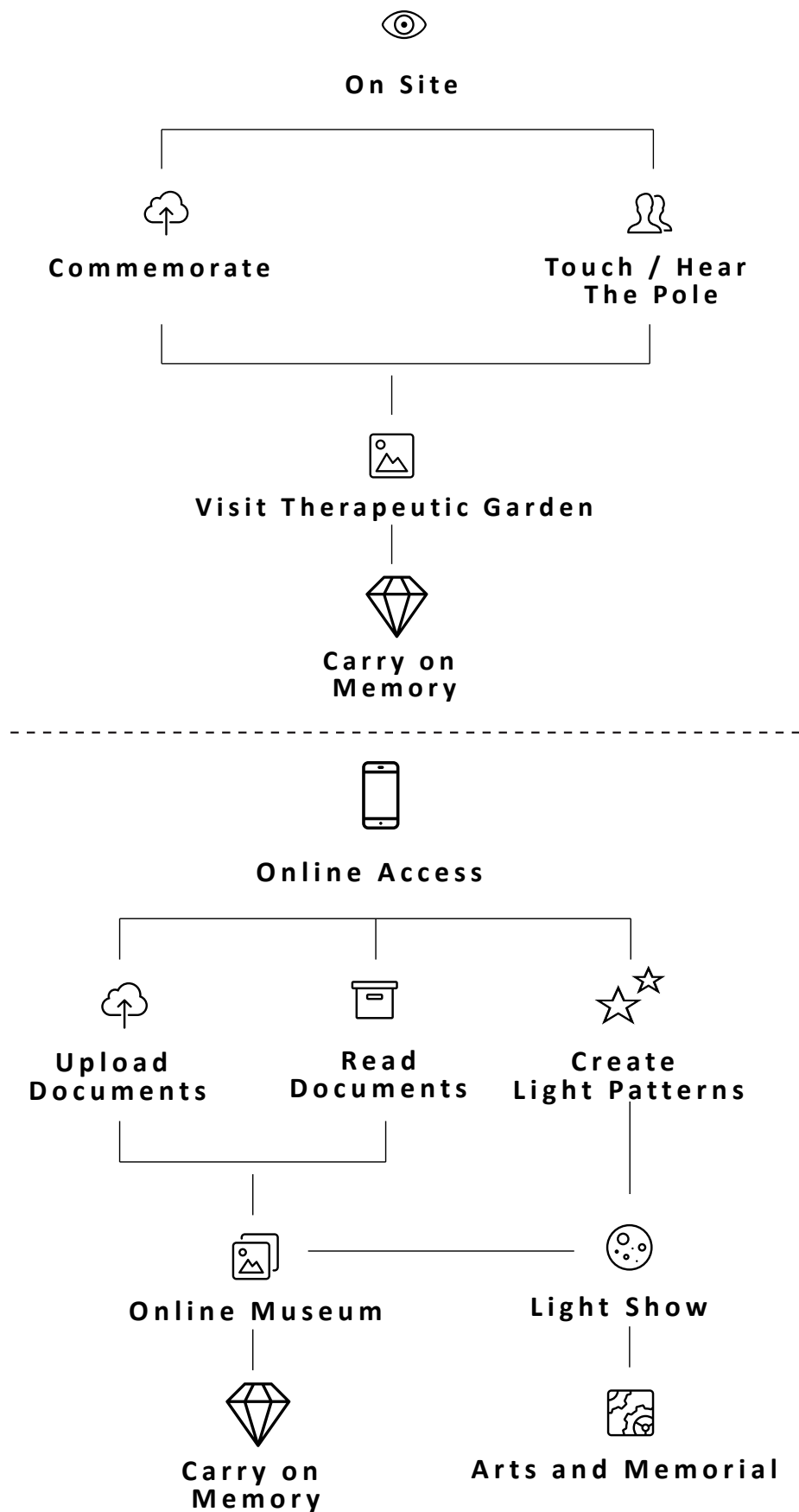


Figure 23. Prototype and ideas for the interface



+ Task Flow



+ Meaning of HCI on Planning Level

After the disastrous event, the condition of Beichuan became not livable, and many parents who lost kids have chosen to move away from the city. After the memorial is established, it is very unlikely that they would return to this place for regular worship. HCI's interactive experience can virtually reunite the previous community, diminish the limit of distance, and enable aboriginal people to participate in Echoing Ground. The decision-making process of the Light show is also completed by local residents, which greatly improves the participation of residents and provides a virtual place of appearance for those who have passed away.

+ Interactive Light Show

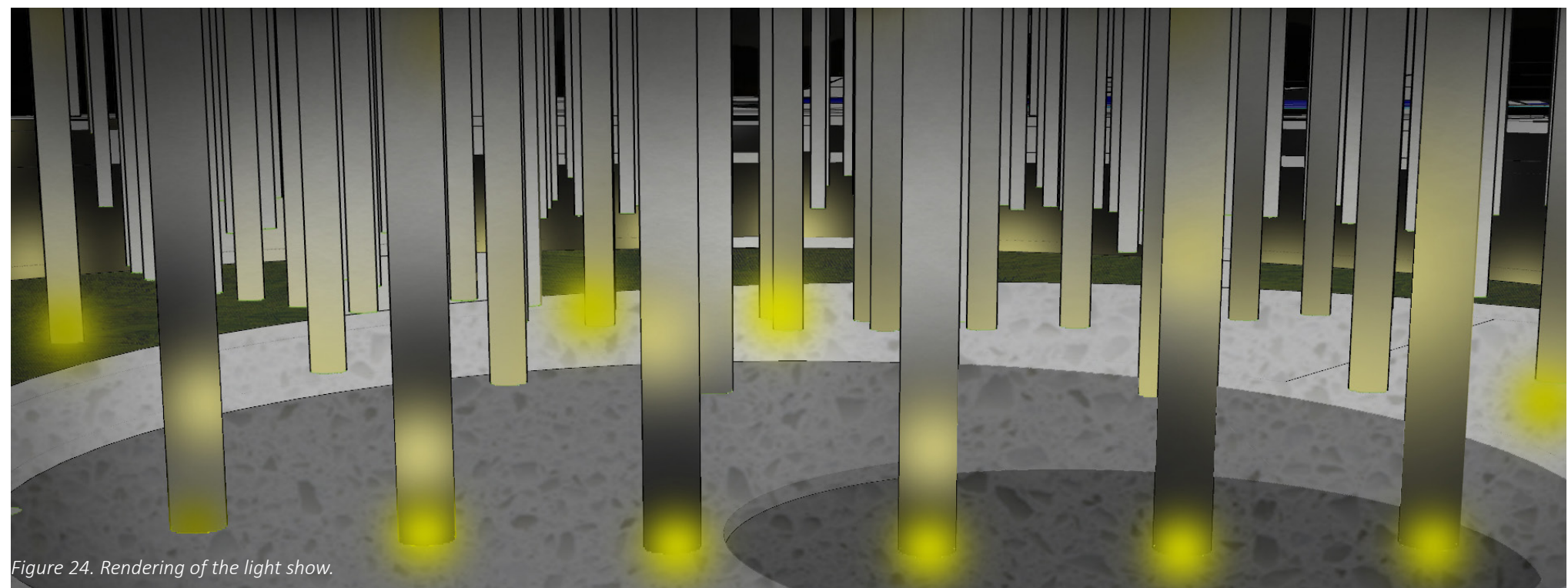
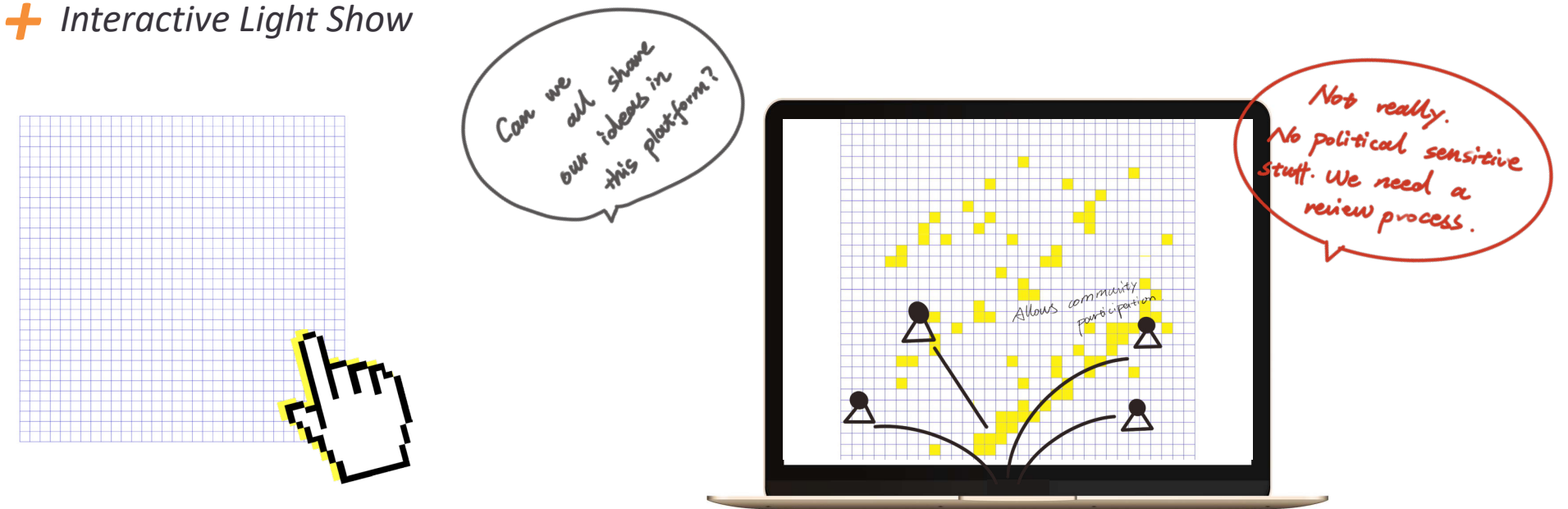


Figure 24. Rendering of the light show.

Reviewers come from
Beichuan original residents.





Figure 25. Rendering of the whole site

4.4 PLANNING POLICIES

+ Basic disaster situation in Beichuan

The massive Wenchuan earthquake has caused extensive damage to local population, economy, society, and industries. In China's "assessment of the disaster scope of Wenchuan Earthquake" in 2008, the area is divided into four types according to the disaster severity: extremely severe disaster area, severe disaster area, light disaster area and affected area. Beichuan county, the site chosen for Thesis, was the first of the most severely affected areas.

In Beichuan, the death rate is 70 to 570 per 1,000 people, and the population migration rate is 390 to 513 per 1,000 people. More than 1.3 million houses collapsed, with the highest direct economic losses of 2.764 billion yuan. (See data in Figure 27) If we zoom in and look at the bar chart related to the school, it shows that the construction area of the school building is 159,300 square meters in total, and the collapsed school building occupies 139,900 square meters, up to 87%.

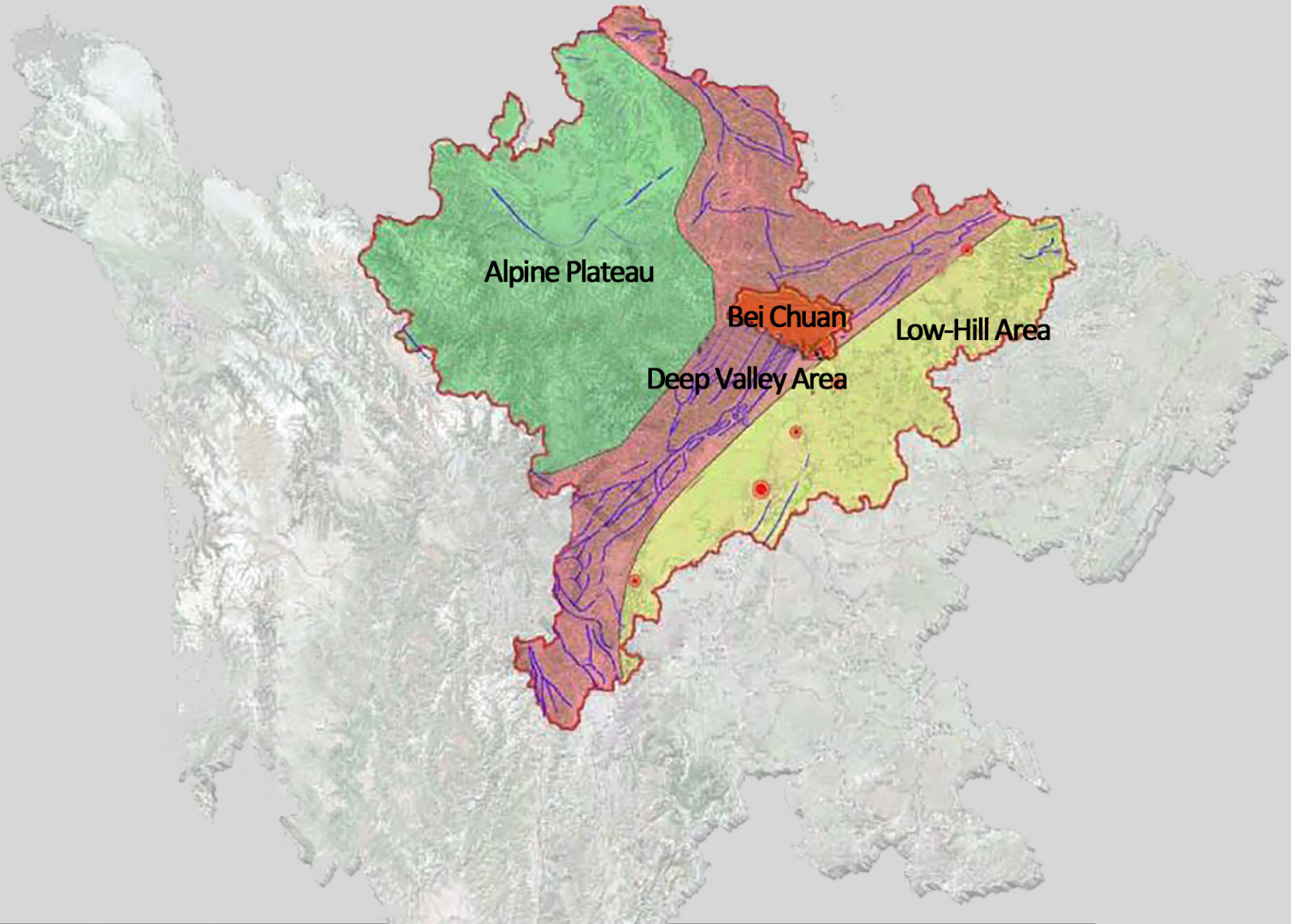


Figure 26. Geomorphological information of the earthquake site.

(People/1000 People)

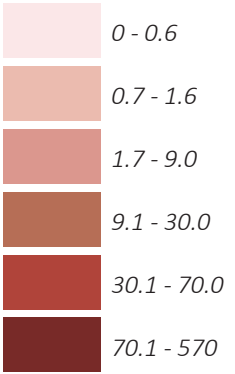


Figure 27. Death Rate Per 1000 People in Each County.

Hundred Million(s)

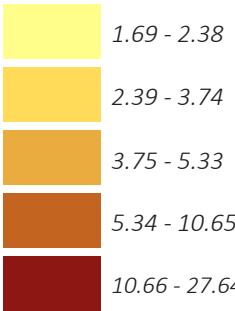


Figure 28. Direct Economic Loss in Each County.

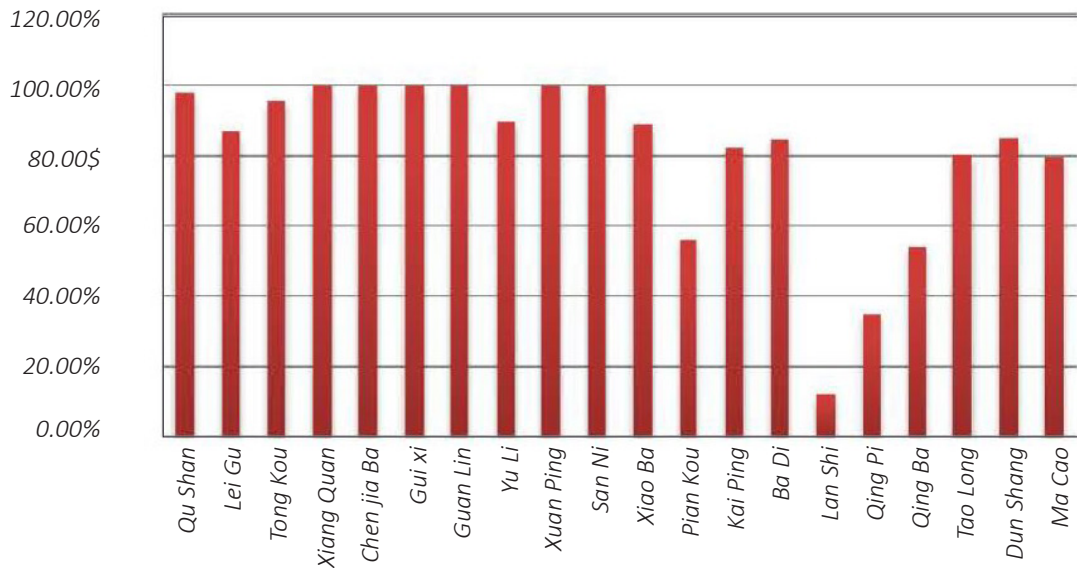


Figure 29. Collapsed school buildings accounted for the proportion of the original school area.

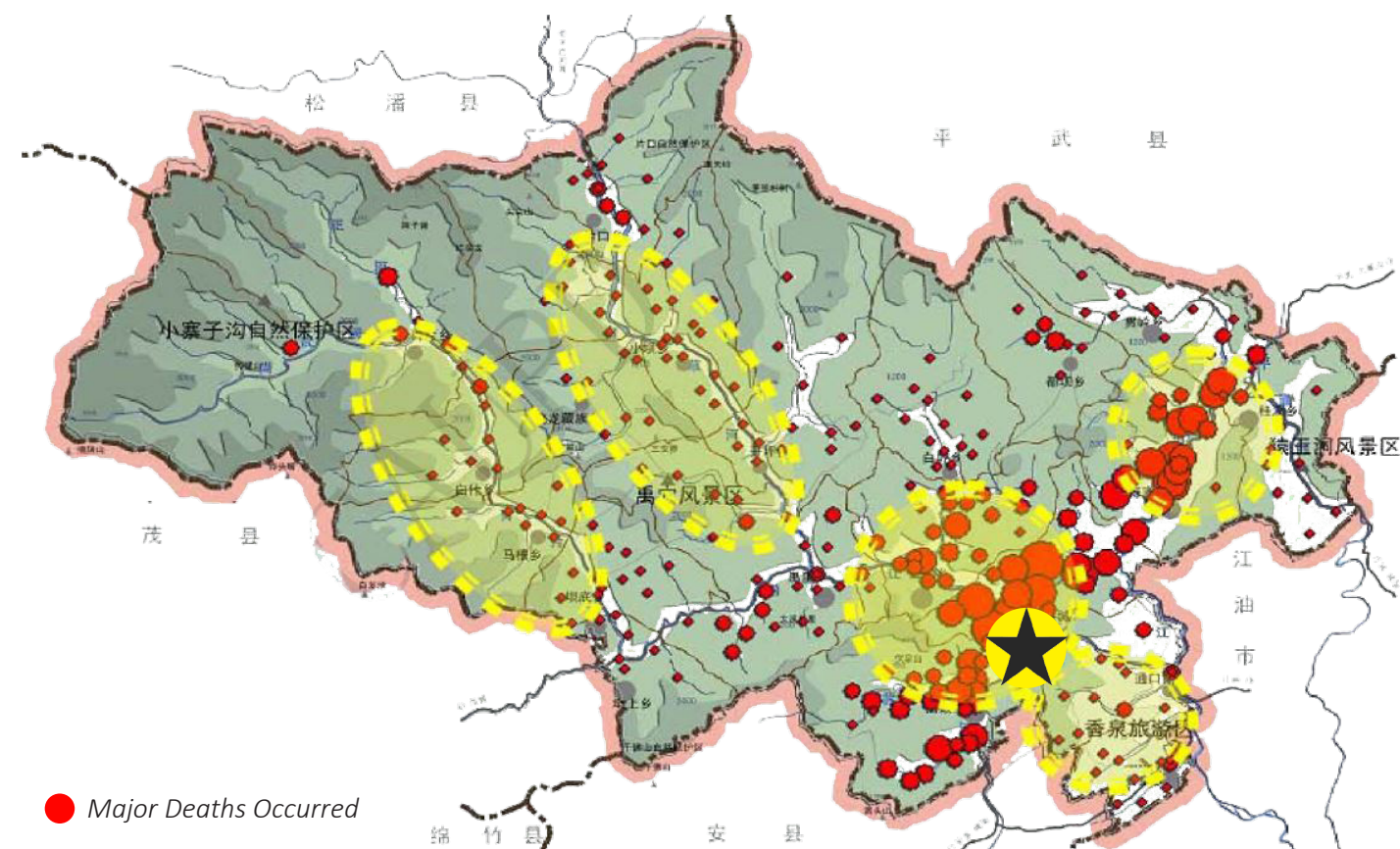


Figure 30. Main Deaths Concentration Areas

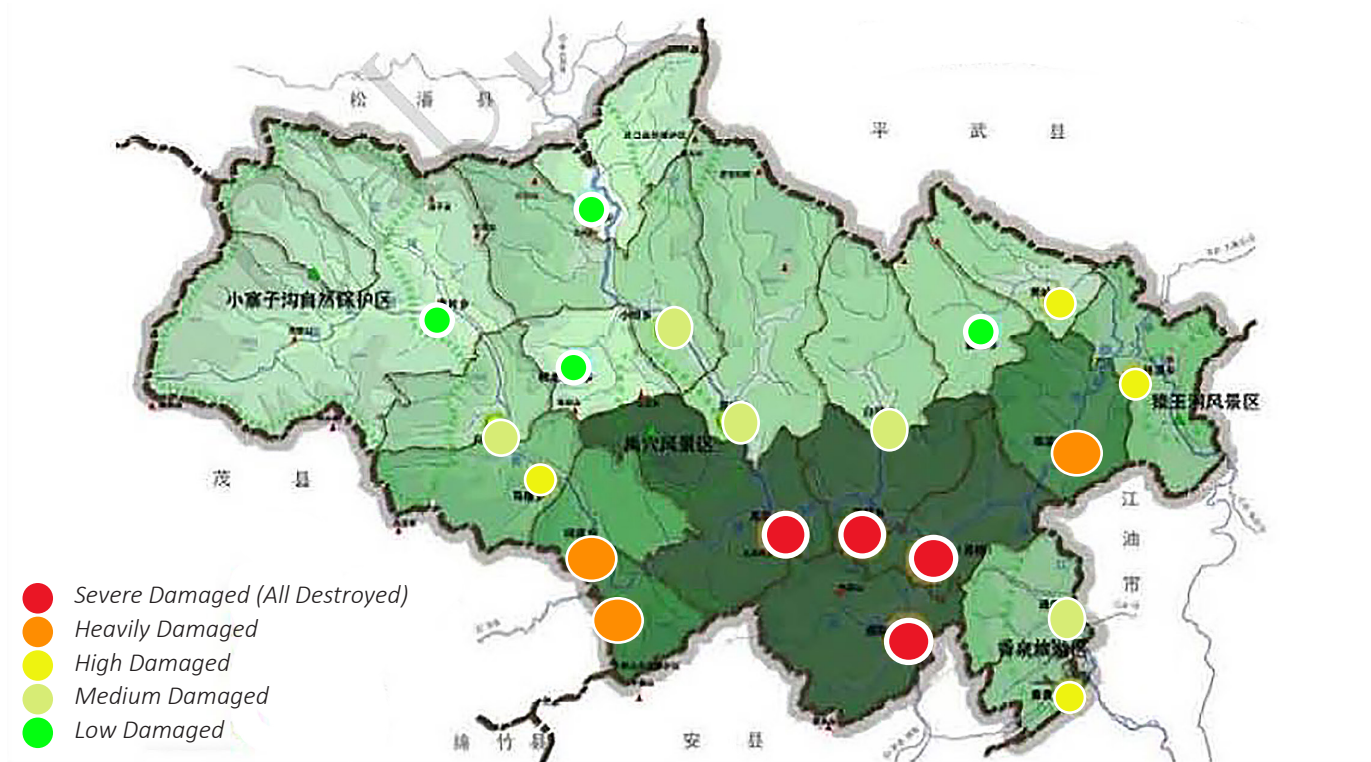


Figure 31. Beichuan county damage degree assessment

+ The impact of the earthquake on urban and rural development

1. Disaster status analysis

As can be seen from the distribution of the affected population in the figure, the death population is mainly concentrated in three areas-- along the Chengqing Highway, forming a strip-shaped distribution, along the northwestern mountainous areas forming a dotted distribution, and the Longmen mountain fault zone forming a three-point distribution. Besides, roads and Bridges have been damaged to varying degrees, causing a paralyzed transportation. The collapsed houses are also scattered in the earthquake fault zone and disaster-prone areas. Since these areas have the most concentrated population in Beichuan County, the relocation of massive residents will also become the core of the reconstruction process, and as a consequence, the industrial structure will also adjust accordingly.

2. Challenges

According to the data mentioned above, the original development foundation of Beichuan has suffered serious losses in terms of urbanization. Infrastructure, transportation, and public services have been degraded. According to the regulations on post-disaster recovery and reconstruction issued by the State Council, the original landform was razed to the ground, leaving 145,000 people homeless. On this basis, the agriculture oriented Beichuan county was difficult to resume production after the earthquake. Moreover, the local industry foundation was basically blank, and the tertiary industry was almost completely disappeared. Beichuan was quite limited in the self-accumulation and self-development ability.

Apart from the urban infrastructure, Beichuan County's environmental carrying capacity is also seriously inadequate. According to the analysis of the Ministry of Water Resources in China, Beichuan County is categorized as the "poor suitability zone", which is mainly manifested by the susceptibility of secondary mountain disasters and the very small amount of potential usable land. The area unsuitable for urban and industrial development accounted for 43.7% of the total area of the county. In addition, the continuous aftershocks have caused the displacement and heterogeneity of landmarks, reducing the area of arable land and the space for wildlife to grow, blocking ecological corridors, and breaking the food chain. Beichuan County's previous in environmental management were in vain.

+ How does the Echoing Ground fit into the new Beichuan's urban and rural planning policy?

1. The overall planning of the county

As the only Qiang Autonomous County in China, the new Beichuan County will become an important economic and cultural center of the entire Qiang minority in western Sichuan. With the development of the Tangjiashan Lake and the earthquake ruins, Beichuan was believed to become a service base for both natural and cultural tourism. However, the fact is that until 2021, Beichuan only undertook the economic development and the construction of the new Beichuan Middle School, while the earthquake ruins memorial was located elsewhere. The design of Echoing Ground not only inherits the traditional culture of Qiang, but also combines new innovations. It organically integrates with modern civilization, fills the vacancy of "heritage site" and complies with the overall planning requirements of Beichuan County.

2. Land use structure

As shown in the figure, the land use planning of new Beichuan county can be summarized as: a corridor, a ring, a belt, and an axis. (China Academy of Urban Planning & Design, 2009)

"A corridor" refers to the Anchang River, which runs from north to south. This river is an important ecological channel to improve the county environment and the microclimate. The Echoing ground is just located beside Anchang River. The therapeutic garden wetland filters the runoffs on the street and then digests it into Anchang River. The memorial will play a role in cleaning the stormwater and also responds to the ecological needs of this corridor.

"A ring" refers to the urban public service ring along Qilu Avenue. The services include office building, production, commercial, open green spaces, and education. The Echoing Ground's two-layered narrative, along with its proximity to Beichuan Middle School, could serve as a social education platform, reinforcing national spiritual bonds, and serving as an outdoor classroom for historical presentations. Additionally, the HCI feature can also provide online educational opportunities for remote residents.

"A belt" refers to the city park that runs through the north and south by combining the original river system Yongchang River. In the newly approved "East Bank Ecological Restoration Project of Anchang River" in 2021, the Anchang River is divided into four sections--leisure area, cultural experience area, romance area, and wetland development area. (See Figure 32) The Echoing Ground sits within the cultural experience area, which is in line with goal of the project, and connect the green space of Beichuan become an organic whole.

"An axis" refers to the north-south layout of the urban land that follows the natural topography. The Echoing Ground circulation conforms to this layout and strengthens the internal connection between the two sides of the river. Moreover, its Qiang ethnic style can be perfectly connected with the local ethnic commercial street, which can promote the local tourism and economic development.

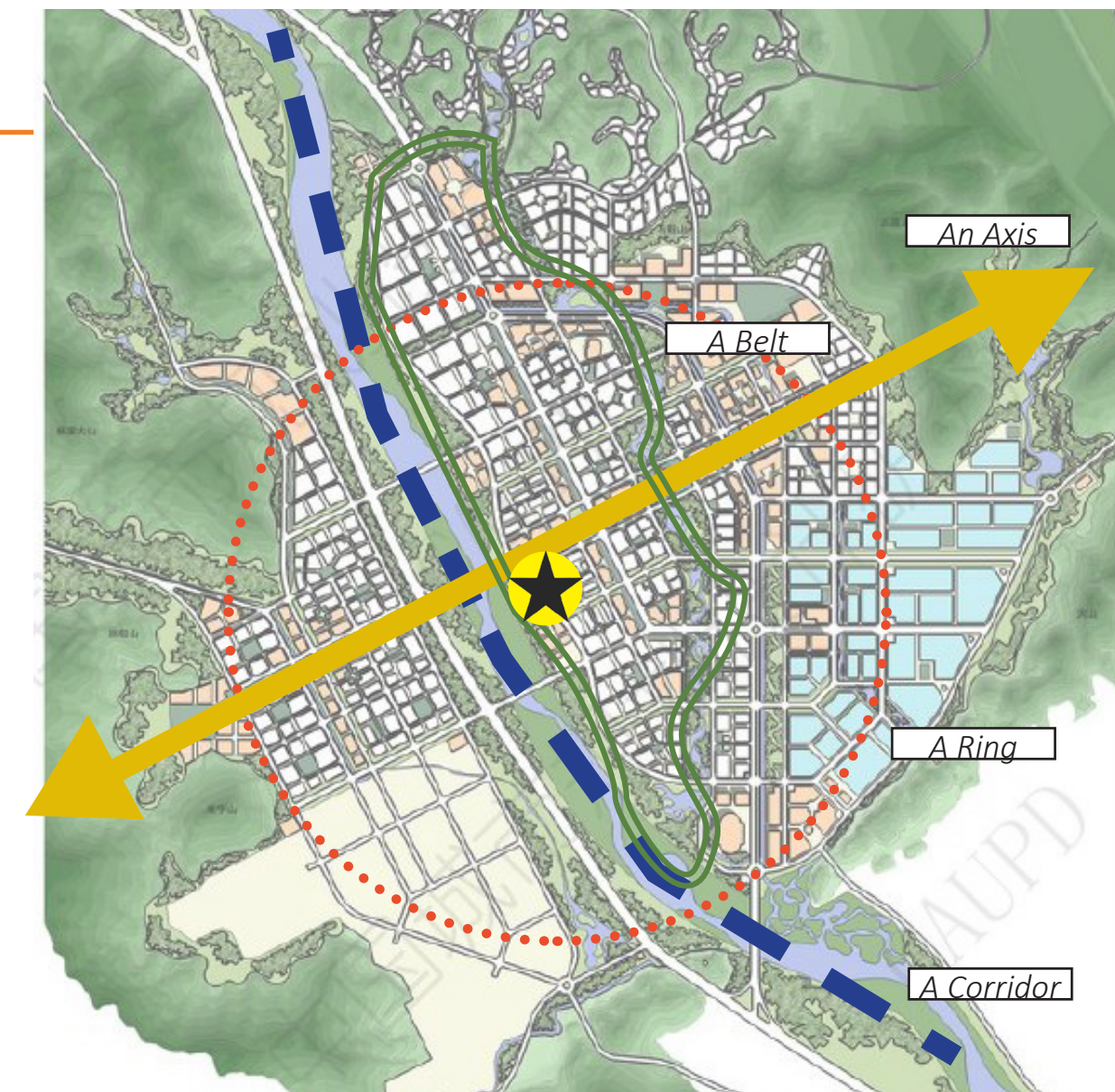


Figure 32. Land use planning: a corridor, a ring, a belt, and an axis.

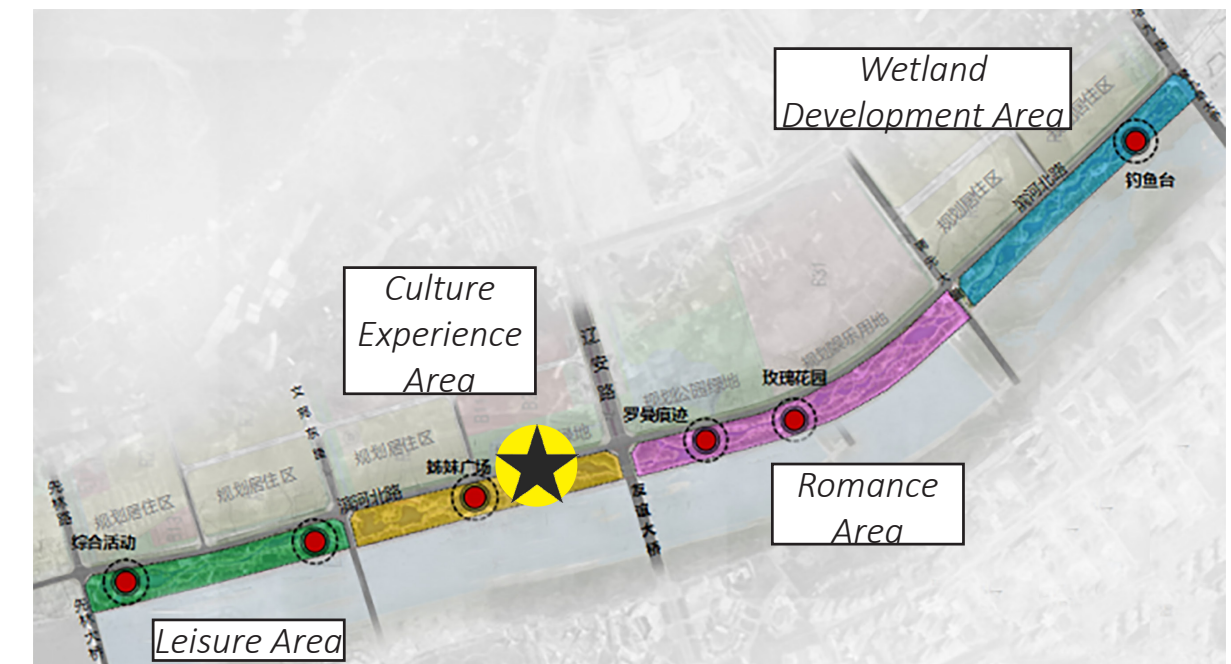
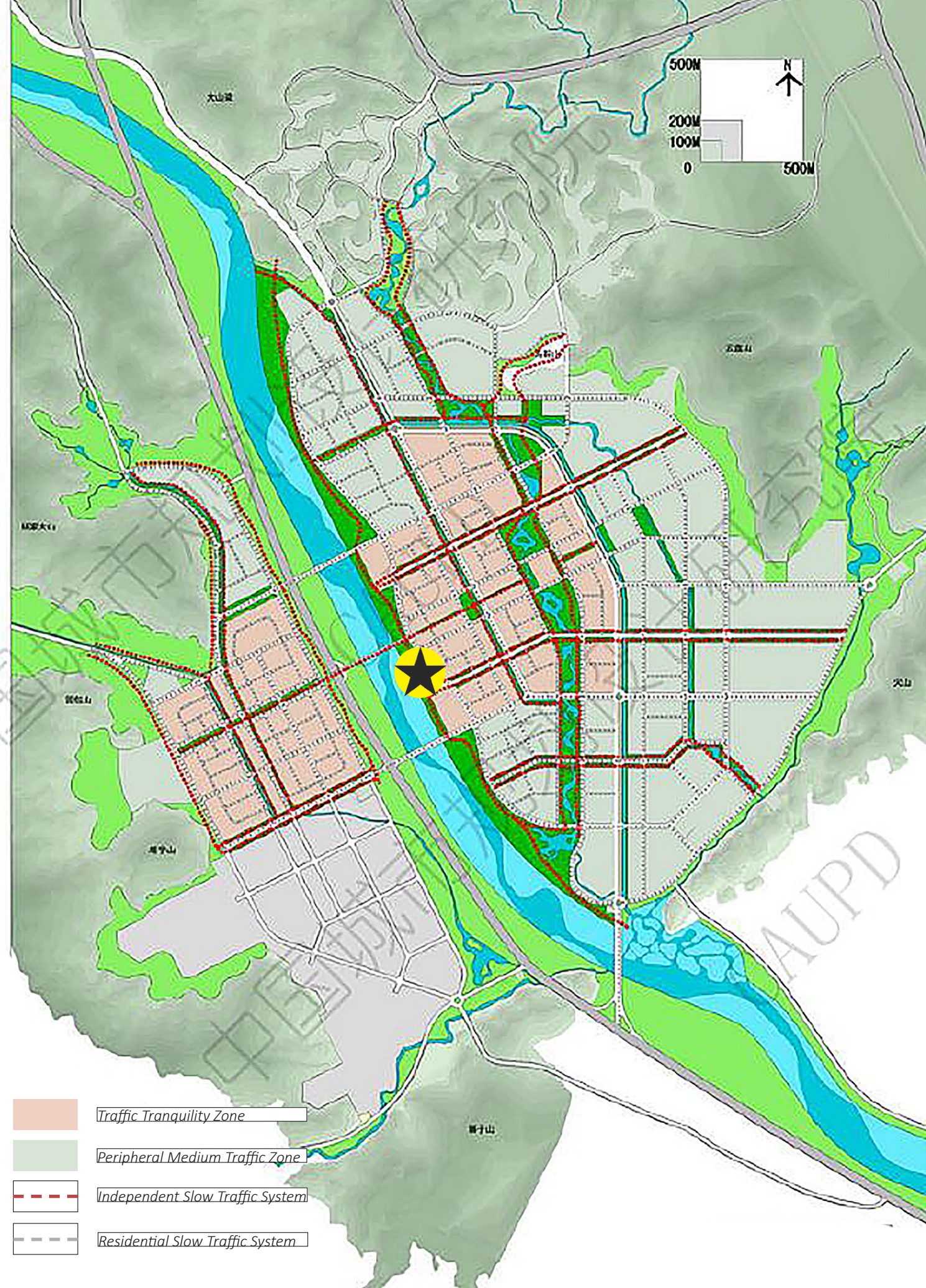


Figure 33. East Bank Ecological Restoration Project of Anchang River



+ Transportation Planning

In terms of transportation planning, the traffic network presents the structure of X-shaped roads and parallel lines. The X-shaped roads include Qilu Avenue, Xinchuan Road, and Gulei Road. Parallel lines include North Xiqiang Street and South Xiqiang Street. Based on this network, the arterial street presents different forms in different functional areas – grid form in industrial area, fishbone form in residential area, and freestyle network form in the mountainous area.

According to traffic safety, Beichuan County puts forward the system planning of slow urban transportation. The county is divided into two zones by vehicle speed – the core traffic tranquility zone, low speed that is less than 15km/h, and the peripheral medium speed traffic zone, less than 20km/h. The Echoing Ground sits within the traffic tranquility zone. (Showing in figure 34)

The slow traffic system also includes the independent slow traffic system and the residential slow traffic system. The independent slow traffic system is closely combined with the urban green fields, presenting a form radiating from the core to the surrounding. Combined with the topography and the surrounding layout, the chronic passageway is set independent of street vehicles, focusing on providing convenience for residents. The residential slow traffic systems are laid out along city roads to address daily traffic needs. The road from Beichuan Middle School to the Echoing ground is in the independent slow traffic system, while the exit is in the residential system.

Figure 34. Beichuan Transportation Planning

+ Street Sections

1. North Shiquan Street

This is the road from Beichuan Middle School to EG, which belongs to independent slow traffic system. Both sides of Shiquan North Road are commercial areas. There is also a museum close to Beichuan Middle School, which has high requirements for traffic safety and slow walking activities. The distance between roadside buildings is big, the non-motorized lanes and pedestrian paths are on the same side. The placement of educational and historic information along the promenade in conjunction with street-facing businesses ensures a good atmosphere for the neighborhood.

2. Binhe Road

Binhe Road is the road at the west side of Echoing Ground. The whole street is designated for slow traffic. In combination with the slope of the protective embankment of Anchang River, the walking path created an ideal space for recreational activities.

3. North Xiqiang Road

This road leads back to Beichuan Middle School. It is a thoroughfare in the residential area. The planning goal for this road is to ensure fluent mobility and adequate activity spaces. It sits within the residential slow traffic systems. The width of road is 20m, with two lanes in both directions. Non-motor vehicles and motor vehicles are on the same side, and the non-motor lanes are distinguished from the motor lanes through the pavement. The walking path is 4 meters wide.

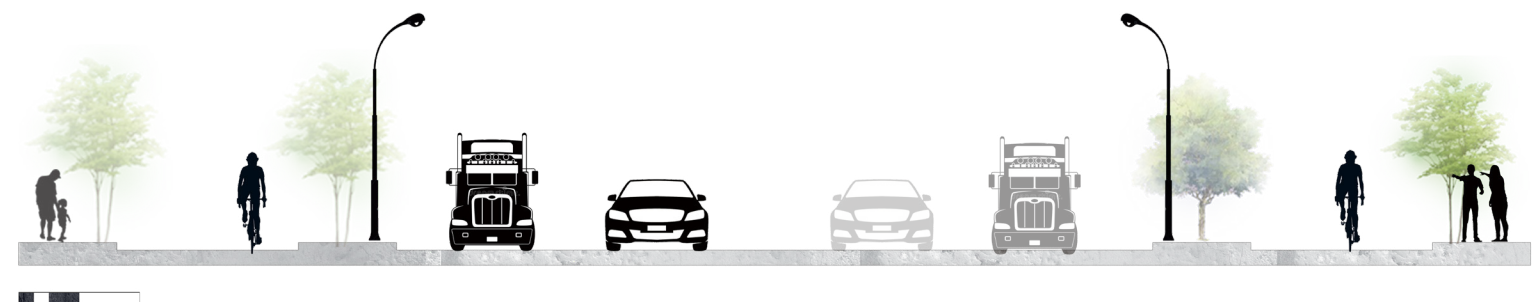


Figure 35. Section of North Shiquan Road.



Figure 36. Section of Hebin Road.

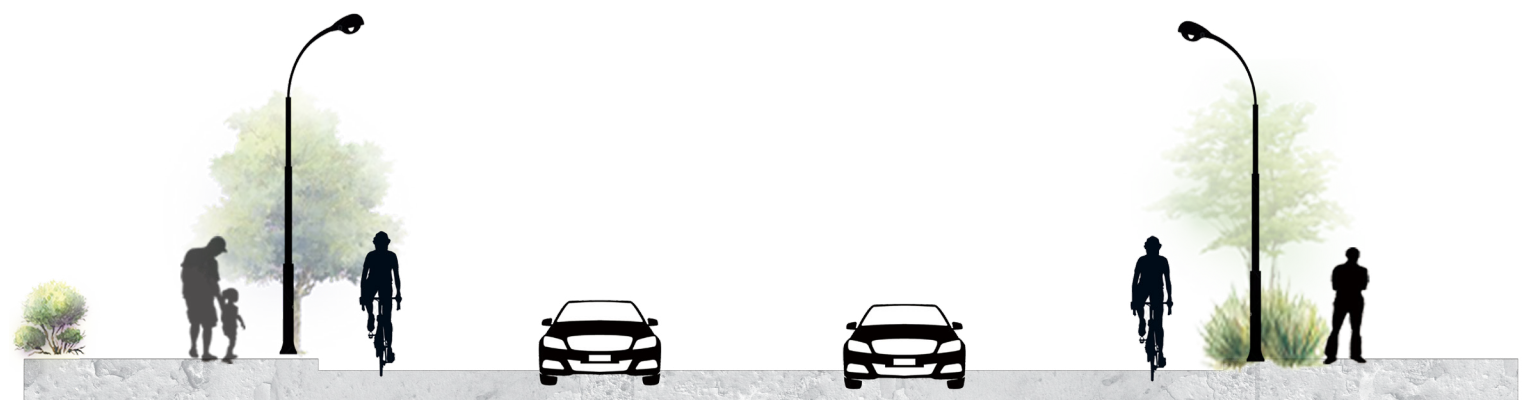


Figure 37. Section of North Xiqiang Road.

C HPT. 5 CONCLUSION

5.1. CONCLUSION
5.2. DEFICIENCIES
5.3. QUESTIONS

+ 5.1 Conclusions

This thesis focused on the application of "digital landscape" in commemorative landscape design. It analyzes the application of HCI through precedent studies and narrows its focus on the role of AI technology in the case of Echoing Ground's studio project. The conclusion can be summarized in the following aspects:

1. In atmospheric rendering, digital technology can convey the effects that traditional landscape communication cannot using the effects of sound, electricity, and light. It has a strong appeal and can quickly settle people into the mood of commemorating.
2. Digital technology is not limited by time and space. It can carry almost infinite information on a tiny chip, and also convey the two-dimensional graphics into a multi-dimensional experience. Using HCI can effectively store the information into the online library and create common memories of a community.
3. Finally, in terms of planning, an innovative city park is bound to bring Beichuan new development in the tourism industry. With the publicity of the 5.12 earthquake theme, new visitors could expand local economies. In the meantime, the aboriginal residents who moved out after the earthquake can also connect back with Beichuan, and enhance the community engagement through the digital format.

+ 5.2 Deficiencies

The research of combining HCI with landscape design is still in the exploratory stage. In the process of this study, I gained a lot through investigation of history, and obtained a deeper understanding of the earthquake disaster and the importance of post-disaster trauma treatment through sensitive place making. This paper attempts to study the construction of a memorial after the earthquake from the perspective of combining landscape with science and technology.

Due to the limited ability of the author, there are the following deficiencies:

1. The landscape planning and design established in this paper is only for the analysis and research of Beichuan County, and the perspective is from the author's point of view, so surveys or tests cannot be carried out. Moreover, there may be other possible platforms or locations for building the memorial, due to the limited ability of the author, and expanded evaluation of the inventory has not been made.
2. The selection of cases has limitations. China is a country that has vast territory, abundant resources, and diverse environments. The author only selected a representative town and school for research. Other schools, regions and population groups affected by the disaster were not involved. The design of this memorial has exclusiveness for some users.
3. The research content of this paper involves multiple disciplines such as psychology, geology, urban planning, landscape architecture, etc. The author's professional ability is limited to cover all of the detailed knowledge in this paper. Currently, there are only a few theses that talk about landscape design from the perspective of HCI, and the author is only in the exploratory stage. In addition, the number of well-studied cases is limited, which may not be deep enough and needs to be further deeply explored.

+ 5.3 Questions

1. Why is this virtual component important?

The 5.12 Wenchuan Earthquake was a huge disaster for Chinese people. Although the country made rapid response and rescue actions at that time, the lives were buried under the ruins and truth began to fade away. The percentage of human errors in this

disaster is still unknown. The quality of construction work is still a sensitive subject even in 2021. I also met some barriers when I tried to access data from Chinese Government websites. Both Tan Zuoren and Ai Weiwei were jailed for investigating such matters. In this highly politicized and centrally controlled environment, it is not realistic to accuse the government for not disclosing data, and ask them to apologize-- or if we want to publicly mourn the memory of some sensitive people. We will be "harmonized" immediately. When I was doing the physical design of the memorial, I thought that the Echoing Ground could not be put in Beichuan. But now we have HCI and an online platform, and the virtual component can also store information, so I thought of combining them and hiding sensitive things in the virtual space.

2. Why Lighting?

Light, sound, touch, and other external things can have an impact on people's mental condition. In the solemn atmosphere of Memorial, artificial sounds or unnatural tactile experience may cause disrespect to the deceased and aversion to the worshipers. The use of soft breathing lights at night does not interfere with people's bodies directly, but can affect people's mood through regular rhythms. The lighting on the ground mimics a silent response to the sky, just like the earth mother talking to the deceased kids.

3. What did you learn from the new planning of Beichuan County?

I think there are still some shortcomings in Beichuan County's new planning. Although the prospect for new Beichuan is vast and following the trend, I think this is going too fast and should slow down. The geomorphological analysis shows that the canyon topography of Beichuan still makes it vulnerable to future earthquakes. As long as the earth's crust keeps moving, there is a possibility of another earthquake happening here. I appreciate the fact that the government is building multiple cultural public spaces such as "Romance Area" for leisure and dating, but the underlying issues should be addressed. Therefore, the design should also consider the requirement of earthquake prevention, and deal with the evacuation corridors in the complex topography. These are less mentioned in transportation planning and land use planning. The planners should consider about the potential safety hazard first.

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