

BEYOND
REMNANT

BEYOND REMNANT

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MASTER OF LANDSCAPE ARCHITECTURE THESIS BOOK
AUBURN UNIVERSITY
MAY 2016

THE POSITION OF LANDSCAPE ARCHITECTURE IS NOT ONLY THE
"ART OF GARDENING", BUT ALSO THE 'ART OF SURVIVAL'.

P R O L O G U E

THIS MASTER THESIS IS WRITTEN BY HANLU YU WITHIN THE AUBURN UNIVERSITY'S LANDSCAPE ARCHITECTURE PROGRAM. THE THESIS WAS WRITTEN IN THE PERIOD FROM THE AUGUST 18TH, 2015 TO MAY 2ND, 2016.

BEYOND REMNANT IS A STRATEGICAL RE-FRAMED CITY PARK SYSTEM PROJECT IN THE AREA OF TUSCALOOSA AND BIRMINGHAM, ALABAMA. THE RESEARCH AIMS TO ANSWER THE QUESTION THAT 'HOW A CITY PARK SYSTEM CAN BE RE-DESIGNED TO PROACTIVLY ENCOURAGE THE TORNADO RECOVERY STRATEGY', WHICH EMERGED FROM THE DEVASTATING DAMAGE CAUSED BY THE 2011 TORNADO SUPER OUTBREAK. THROUGH THE INVESTIGATION OF THE HISTORY OF POST-DISASTER RECOVERY STRATEGY, AND THE EXISTING CITY EMERGENCY MANAGEMENT AFTER DISASTER, THE RESEARCH ARGUES THAT THE ROLE OF LANDSCAPE ARCHITECTURE HAS BEEN OVERLOOKED AND SHOULD BE PROACTIVELY EMBEDDED. A SYSTEMATIC THINKING HAS BEEN APPLIED INTO DESIGN TESTS, INCLUDING DESIGNS OF PARKS IN DIFFERENT SCALE, PROPOSAL OF AN EVACUATION ROUTE SYSTEM, AND COOPERATION WITH RELAVANT FIELDS.

SEVERAL PEOPLE HAVE CONTRIBUTED TO THIS THESIS. I WOULD LIKE TO THANK MY PROFESSORS AND COLLEAGUES. THIS PROJECT WOULD NOT HAVE BEEN POSSIBLE WITHOUT THEIR HELP. THANK YOU SO MUCH FOR ALWAYS ENCOURAGING ME. BESIDES OF THAT, I MUST EXPRESS MY VERY PROFOUND GRATITUDE TO MY PARENTS AND TO MY FRIENDS FOR THEIR UNFAILING SUPPORT AND CONTINUOUS ENCOURAGEMENT THROUGHOUT MY YEARS OF STUDY AND THROUGH THE PROCESS OF RESEARCHING AND WRITING THIS THESIS. I OFFER MY REGARDS AND BLESSINGS TO ALL OF THOSE WHO SUPPORTED ME IN ANY RESPECT DURING THE COMPLETION OF THIS PROJECT.

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A B S T R A C T

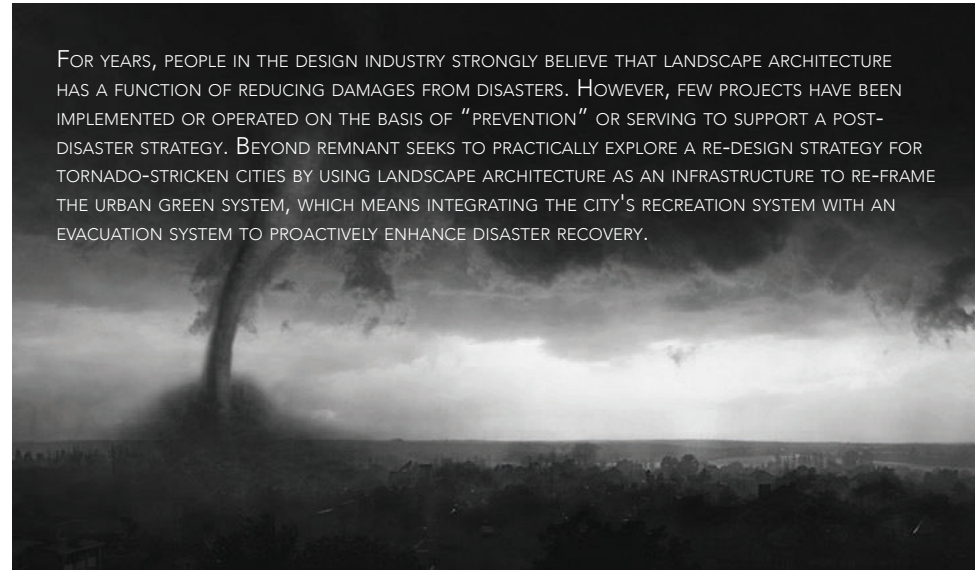
CITIES' SAFETY ISSUES IS ONE OF THE MOST IMPORTANT ISSUES FACING HUMANITY TODAY, DUE TO ITS HIGH POPULATION DENSITY AND HIGHLY CENTRALIZED PROPERTIES. OVER THE YEARS, THE FREQUENCY AND INTENSITY OF TORNADOES AND OTHER SUCH DISASTERS STRIKE MORE AND MORE CITIES. BECAUSE OF THIS, THE UNITED STATES IS PAYING MORE ATTENTIONS TO THE DISASTER RECOVERY PROCESS.

IN THIS NEW ERA OF UNPRECEDENTEDLY CHANGES OF INDUSTRIALIZATION AND URBANIZATION, THE ROLE OF LANDSCAPE ARCHITECTURE IS NOW ON THE EDGE OF TRANSITION. LANDSCAPE ARCHITECTS THEORETICALLY BELIEVED THAT THEY ARE NOT ONLY THE ART OF GARDENING, BUT ALSO THE 'ART OF SURVIVAL'. HOWEVER, THERE ARE FEW PROJECTS HAVE BEEN IMPLEMENTED OR OPERATED ON THE BASIS OF "PREVENTING" OR WORKING WITH POST-DISASTER STRATEGY. THESE FORMIDABLE DISASTERS ARE THE GREATEST CHALLENGE AND CRUDE TRUTH THAT LANDSCAPE ARCHITECTS HAVE TO FACE REALISTICALLY. IT IS THE TIME FOR THIS PROFESSION TO TAKE THE GREAT OPPORTUNITY TO PRACTICALLY POSITION ITSELF TO PLAY THE KEY ROLE IN THE DISASTER RECOVERY STRATEGY.

UNLIKE THE TRADITIONAL POST-DISASTER RECOVERY PROCESS, BEYOND REMNANT SEEKS TO PRACTICALLY EXPLORE A RE-DESIGN STRATEGY FOR THE TORNADOES STRICKEN CITIES. USING LANDSCAPE ARCHITECTURE AS INFRASTRUCTURE TO RE-FRAME THE CITY GREEN SYSTEM, WHICH IS HYBRIDIZING THE CITY RECREATION SYSTEM WITH EVACUATION SYSTEM TO PROACTIVELY ENHANCE THE RECOVERY.

WITH THE INSPIRATION OF 2011 TORNADO SUPER OUTBREAK, THE DESIGN TESTS WERE APPLIED IN THE TUSCALOOSA AND BIRMINGHAM AREA, WHICH ALL DEADLY IMPACTED FIVE YEARS AGO. THE FIRST DESIGN TEST WAS A CITY PARK, WHICH LOCATED NEAR THE TUSCALOOSA CITY CORE AND CLOSE TO THE BLACK WARRIOR RIVERWALK. A SET OF PREPARATION COMPONENTS WAS PROGRAMED IN THE CITY PARK RE-DESIGN PROJECT IN TUSCALOOSA. THE SECOND DESIGN TEST IS IN THE CITY OF BIRMINGHAM, ALABAMA, WHICH TORNADOES FREQUENTLY HAPPEN AND DEVASTATE PROPERTIES. IN THE TEST, A SYSTEMATIC LANDSCAPE RE-DESIGN PROJECT WILL BE APPLIED IN THE CITY RANGE. THEN ZOOM INTO THE SOUTHWEST NEIGHBORHOOD, WHICH CALLED FAIRFIELD. THE TEST FRAMES THE ROLE OF LANDSCAPE ARCHITECTURE AND EXPLORES THE ARRANGEMENT AND MANAGEMENT OF CITY GREEN SYSTEM IN EMERGENCY RESCUE STAGE AND FOLLOWING STAGES. AIMING TO EXPLORE BOTH OF THE PROACTIVE APPROACH OF DISASTER RECOVERY AND REACTIVE ARRANGEMENT.

FOR YEARS, PEOPLE IN THE DESIGN INDUSTRY STRONGLY BELIEVE THAT LANDSCAPE ARCHITECTURE HAS A FUNCTION OF REDUCING DAMAGES FROM DISASTERS. HOWEVER, FEW PROJECTS HAVE BEEN IMPLEMENTED OR OPERATED ON THE BASIS OF "PREVENTION" OR SERVING TO SUPPORT A POST-DISASTER STRATEGY. BEYOND REMNANT SEEKS TO PRACTICALLY EXPLORE A RE-DESIGN STRATEGY FOR TORNADO-STRICKEN CITIES BY USING LANDSCAPE ARCHITECTURE AS AN INFRASTRUCTURE TO RE-FRAME THE URBAN GREEN SYSTEM, WHICH MEANS INTEGRATING THE CITY'S RECREATION SYSTEM WITH AN EVACUATION SYSTEM TO PROACTIVELY ENHANCE DISASTER RECOVERY.

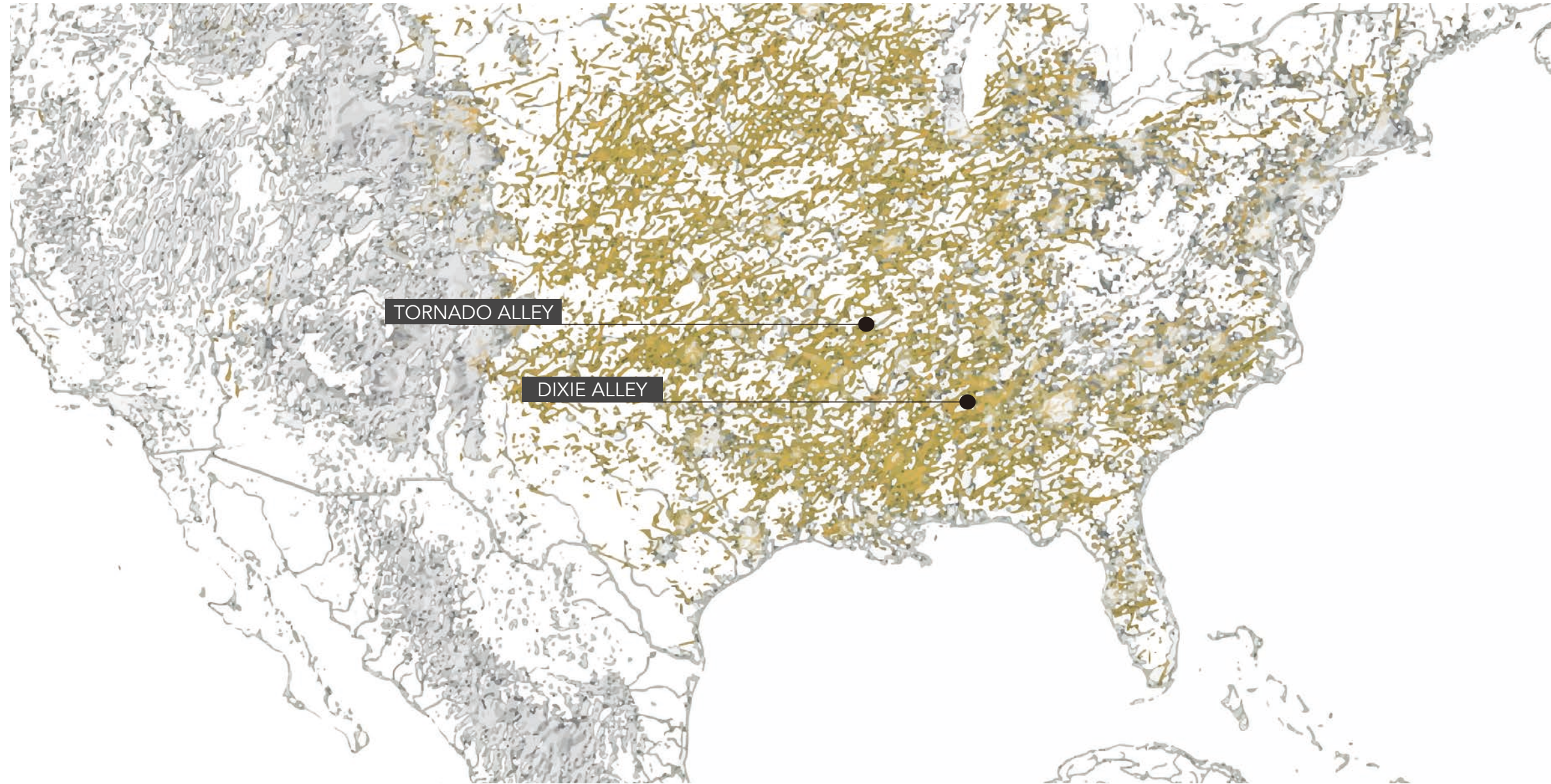


I

INTRO

IN THIS CHAPTER, THE RESEARCH EXPLORES THE CONDITION OF TORNADO DESTRUCTIONS IN THE UNITED STATES, INCLUDING THE FORMATION, LOCATIONS OFTEN HIT BY TORNADOES, FREQUENCY AND INTENSITY OF OCCURRENCE, AND ENVIRONMENTAL AND ECONOMICAL IMPACTS.

- I01 - GENERAL STUDY OF TORNADOES
- I02- IMPACTS



GENERAL STUDY OF TORNADOES

The tornado is one of the most deconstructive natural disasters in the world. Originally, the word "tornado" is derived from "Tronada", a Spanish word meaning thunderstorm, which was later written as "Ternado" by British sailors in the 1500s to mean "a violent tropical storm".

A tornado is a rotating column of air extending from a thunderstorm to the earth. It can move as fast as up to 300 miles per hour (mph). For a tornado to come into being, there must be a mixture of warm, moist air and cold, dry air. The collision between these two different types results in instability in the atmosphere. Then the wind changes its direction and moves faster to create huge, rotating winds. It is this invisible, horizontal spinning effect that produces supercell thunderstorms and generates the deadliest and most destructive tornadoes.

According to the statistics from National Oceanic and Atmospheric Administration (NOAA), about 1000 tornadoes occur each year in the United States, especially in tornado alleys, which mean areas that are frequently hit by tornadoes in the southern plain. Although 95% of tornadoes are below EF-3 intensity and 77% of tornadoes are rated as "weak" (EF-0 or EF-1), they still have a huge adverse impact on society and ecology. They often destroy massive amounts of properties, vegetation, and wildlife habitats, cause economic loss and sometimes take lives.

Twenty-three percent of tornadoes are considered as "violent" (EF-3 and above), which can be more destructive and deadly.

I M P A C T S

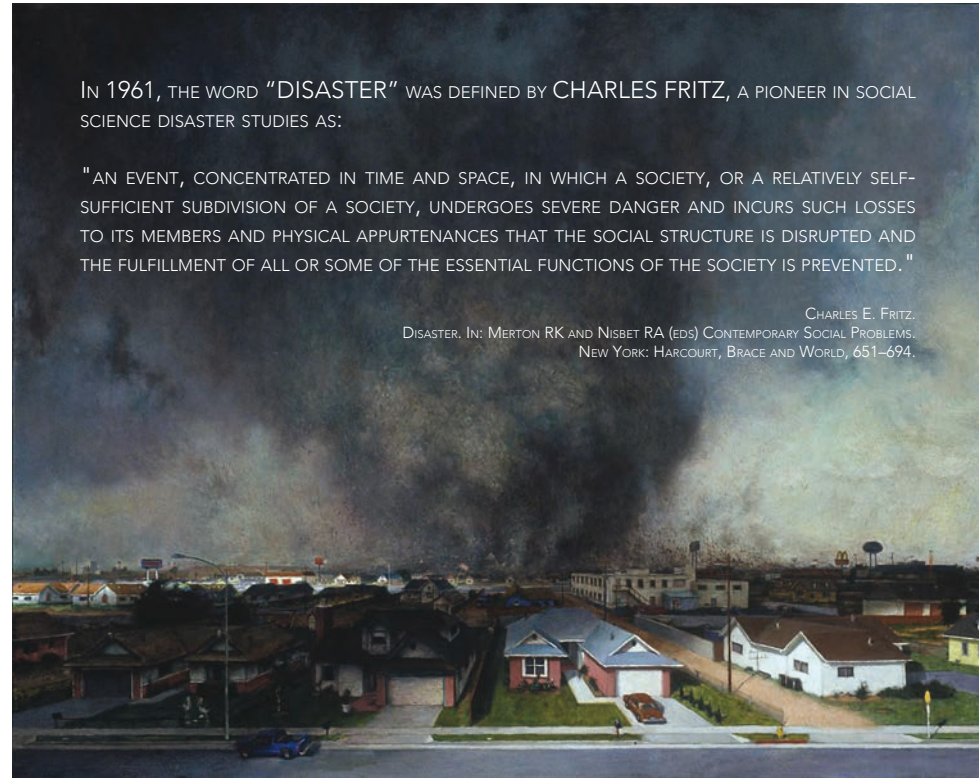
There is no doubt that property damage is a great harm caused by tornadoes. Weak tornadoes can whip roofs off buildings and break windows. Stronger tornadoes have been shown to level buildings. This can cause a considerable amount of economic losses.

Compared with other types of extreme natural disasters like hurricanes and earthquakes, tornadoes affects smaller areas but cause greater damages. Tornadoes are able to directly devastate homes and properties in both urban and rural areas. Their impacts on buildings are clearly visible, but their effects on nature are often not as visible.

In disaster stricken areas, trees and plants can be uprooted or destroyed with diseases under the soil being carried away by the spinning wind and spread to somewhere else. Wildlife may be killed or deprived of natural habitats, which could disrupt local ecosystems, or even worse, pose a threat to the endangered species. To some extent, tornadoes exerts its influence on the environment by destroying buildings and plants. They also kill animals, which could affect the food chain and disrupt the entire regional ecosystem. Typically, a tornado carries dirt, soil, and debris as it moves until it eventually drops it or hits somewhere else, which causes even more damage.

Buildings and the natural environment can be impacted so dramatically by a tornado that its after-effects would still be felt in years afterwards. Some lands might be contaminated by debris and chemical or radiation leaks, with some regions being seriously polluted. Thus, the recovery program may have to last for decades. Even with that measure, almost 50% of destroyed structures can never be re-built. The number of abandoned settlements increases year after year, which become "ugly scars" on maps.





IN 1961, THE WORD "DISASTER" WAS DEFINED BY CHARLES FRITZ, A PIONEER IN SOCIAL SCIENCE DISASTER STUDIES AS:

"AN EVENT, CONCENTRATED IN TIME AND SPACE, IN WHICH A SOCIETY, OR A RELATIVELY SELF-SUFFICIENT SUBDIVISION OF A SOCIETY, UNDERGOES SEVERE DANGER AND INCURS SUCH LOSSES TO ITS MEMBERS AND PHYSICAL APPURTENANCES THAT THE SOCIAL STRUCTURE IS DISRUPTED AND THE FULFILLMENT OF ALL OR SOME OF THE ESSENTIAL FUNCTIONS OF THE SOCIETY IS PREVENTED."

CHARLES E. FRITZ.
DISASTER. IN: MERTON RK AND NISBET RA (EDS) CONTEMPORARY SOCIAL PROBLEMS.
NEW YORK: HARCOURT, BRACE AND WORLD, 651-694.

II

UNDERSTANDING THE CONTEXT

IN THE CHAPTER UNDERSTANDING THE CONTEXT, THE RESEARCH SEEKS TO POINT OUT THE RESPONSIBILITIES AND CONTRIBUTIONS OF RELEVANT SUB-FIELDS IN DISASTER RECOVERY, AND DIAGRAM THE HISTORY OF POST-DISASTER RECOVERY STRATEGY.

- 201 - RELEVANT FIELDS
- 202- HISTORY OF THEORY

RELEVANT FIELDS

As shown in the researches, the path of a tornado can extend to reach several states and result in billions of dollars in damages, both visible and invisible. Therefore, there is an urgent need for professional fields to cooperate in dealing with the complicated task of tornado recovery.

These days, many experts talk about “building back better”, concepts like “resilience” and “sustainability”, and how a crisis can be turned into an opportunity by citing the case of Germany and Japan in 1945.

In practice, the recovery efforts, as writers of Guardian have found out, can be very different, piecemeal, dilatory, bureaucratic, and even venal. It seems that urban planners never miss an opportunity to miss an opportunity. But occasionally, just occasionally, they surprise us on the upside too, and reimagine the city in ways that might have been impossible had no disaster struck.

Ian Davis and David Alexander. *Recovery from Disaster*
(Routledge Studies in Hazards, Disaster Risk and Climate Change).
Routledge. 2016.

FEMA - (Federal Emergency Management Agency)

FEMA is an agency of the United States Department of Homeland Security, whose primary purpose is to coordinate the response to a disaster that has occurred in the United States. While on-the-ground support of disaster recovery efforts is a major part of FEMA's charter, the agency provides state and local governments with experts in specialized fields and funding for rebuilding efforts and relief funds for infrastructure by directing individuals to access low-interest loans, in conjunction with the Small Business Administration.

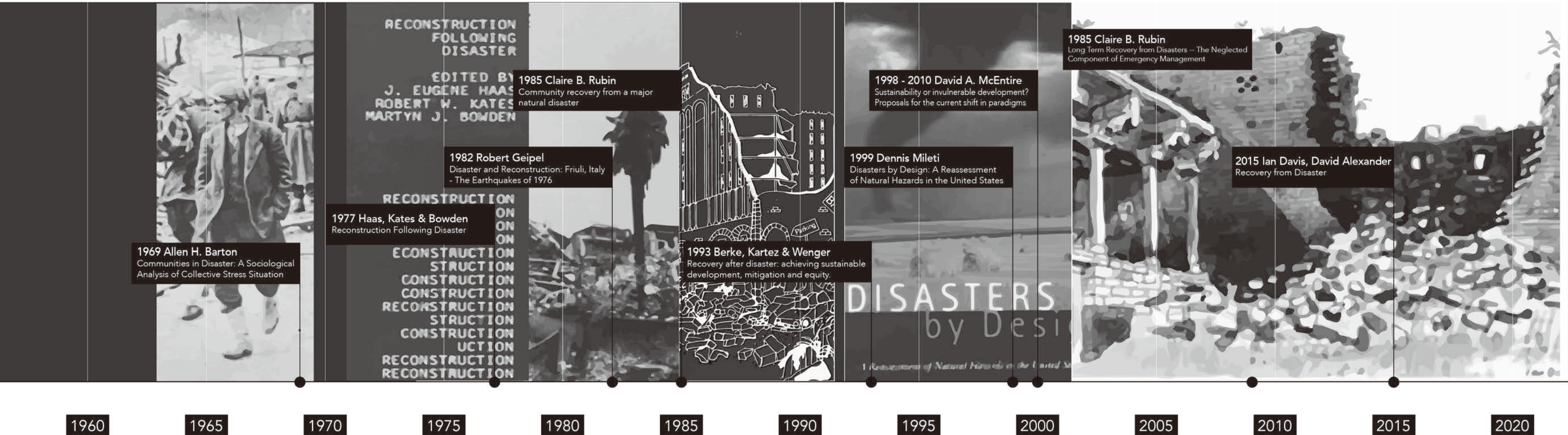
EPA - (U.S. Environmental Protection Agency)

As a national agency, EPA provides its expertise to other Federal agencies, states and communities in areas of EPA responsibility such as drinking water and sewage disposal works, brown fields, air quality, and clean-up of oil and hazardous materials. It can help other agencies to inform communities, states and federal partners of rebuilding for the long-term viability of local people, economies and natural ecosystems.

AIA - (American Institute of Architects)

The AIA serves as the voice of the architecture profession and the resource for its members in service to society. Engaging multiple professions in helping to rebuild a better community after the disaster, its major goal is to purpose plans for disaster-stricken regions and meet the need of sustainability in planning.

HISTORY OF THEORIES



1969 Allen H. Barton
Communities in Disaster: A Sociological Analysis of Collective Stress Situation

1977 Haas, Kates & Bowden
Reconstruction Following Disaster

1982 Robert Geipel
Disaster and Reconstruction: Friuli, Italy - The Earthquakes of 1976

1985 Claire B. Rubin
Community recovery from a major natural disaster

1993 Berke, Kartez & Wenger
Recovery after disaster: achieving sustainable development, mitigation and equity.

1999 Dennis Mileti
Disasters by Design: A Reassessment of Natural Hazards in the United States

1998 - 2010 David A. McEntire
Sustainability or invulnerable development? Proposals for the current shift in paradigms

1985 Claire B. Rubin
Long Term Recovery from Disasters -- The Neglected Component of Emergency Management

2015 Ian Davis, David Alexander
Recovery from Disaster

1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010 2015 2020

Haas, Kates & Bowden gave the initial structure to the post-disaster recovery process

Rubin emphasized post-disaster mitigation and planning

Berke, Kartez, and Wenger added social and economic dimensions

As the disaster recovery literature has matured throughout the 1980's and 1990's, research has moved away from descriptions of the recovery process towards a paradigm for disaster management that incorporates a mitigation component designed to reduce vulnerability and susceptibility to future disaster events.

HISTORY OF THEORIES

Barton is the first person who literarily summarized the existing post-disaster recovery processes in his book titled *Communities in Disaster: A Sociological Analysis of Collective Stress Situation* in 1969. In the book he explored how individuals and communities respond during post-disaster period, in which he described the relationship between nature and society in chaos.

Haas, Kates & Bowden were the first to propose an initial structure for the post-disaster recovery strategy. They argued that "the disaster recovery is ordered, knowable and predictable". By examining the recovery efforts in four major disasters, they built a model that divided the recovery process into four overlapping periods:

Emergency Period,
Restoration Period,
Replacement Reconstruction Period,
and Betterment and Developmental Reconstruction Period.

Geipel conducted a research into the reconstruction approach following the Friuli earthquake in Italy that took place in 1976, aiming to explore how history, culture and politics in Italy interacted with the recovery process after the disaster. He found that the disaster enhanced the inequalities that had already been in existence in Italy and the traditional difference in people, functions, and power relationships becomes more evident than before, allowing little space for any change of relief policies.

Rubin studied the obstacles to assessing recovery that was regarded as an outcome. Unlike the previous research that had treated recovery as a dependent variable, he decided to take the concept of recovery as a process. To his way of thinking, recovery is nothing but an endless process, which makes it impossible to provide a thorough assessment of the recovery at just one attempt. He discovered that the process of recovery was not always in line with the sequence proposed by their model, as new problems occur from time to time unexpectedly.

Berke, Kartez & Wenger explored the reasons for the success of disaster reconstruction and recovery processes, with their focus on inter- and intra-community relationships. Disaster recovery can be affected by the level of both vertical and horizontal relationships, as they unavoidably show the extent

to which the recovery programs that are meant to meet the demand of the society and households are influenced. The horizontally and vertically integrated model gives people a new perspective to understand the community characteristics that are likely to impact the outcome of disaster recovery. This model suggests its link with power and critical social networks.

According to **Mileti**, any change in the thinking pattern of disaster management will not take place until a new perspective of a global system is adopted; responsibility for risks and disasters is taken; ambiguous attitudes, frequent change, and surprise are anticipated; short-term thinking is rejected; a broader understanding of social forces and their roles in disasters and hazards is developed; and the notion of sustainable development is fully accepted (p. 26-29). Mileti regards the acceptance of sustainable development movement as a central part of the shift in thinking pattern that he has advocated. The sustainable hazards mitigation paradigm put forward by Mileti practically strengthened the ideas originally proposed by Gilbert White and colleagues decades ago, and integrated findings in more recent studies. The sustainable hazards mitigation method consists of six key parts: 1) environmental quality should be maintained and strengthened; quality of life should be maintained and enhanced; 2) local resiliency to and responsibility for disasters should be fostered; 3) the significance of sustainable, vital local economies should be recognized; 4) equality within and between generations should be identified and ensured; 5) the approach to consensus should be built; 6) this method should be first tested at local places.

Meanwhile, **McEntire** has invented another disaster paradigm which criticises the sustainable hazards mitigation (sustainable recovery) method on the ground that sustainable development is an ambiguous notion, unable to cope with the fundamental reasons of the disaster (namely vulnerability) and thus less fit for the artificial disastrous events, such as industrial or traffic accidents. In this particular paradigm, the post-disaster context is viewed as a period where efforts can be made to increase the flexibility of individuals and communities in case of future disastrous events. This may inspire further discussion on "building back better" after great hazardous incidents.



III

CHARACTERISTICS AND POTENTIALS

WHAT'S THE ROLE OF LANDSCAPE ARCHITECTURE IN THE PROCESS OF DISASTER RECOVERY?

LANDSCAPE ARCHITECTURE, AS A HYBRID PROFESSION, ENCOMPASSES BROAD CONSCIOUSNESS AND FUNCTIONALITIES, INCLUDING DYNAMICS, PROACTIVITY, AND PARTICIPATORY APPROACH.

THE RE-DESIGNED LANDSCAPE SYSTEM HAS THE ABILITY TO AIM THE CITY STRUCTURES TO PROACTIVELY FACILITATE FURTHER DISASTER RECOVERY, AND TO MEET THE CITY NEEDS AND CULTURE ROOTS, AND HELPS TO FOSTER THE RELATIONSHIP BETWEEN RECOVERY ORGANIZATIONS AND LOCAL COMMUNITIES TO RECOVER PHYSICALLY AND PSYCHOLOGICALLY.

- 301 - CHARACTERISTICS
- 302 - RE-FRAMED DISASTER CYCLE
- 303 - POTENTIALS
- 304 - A PARK SYSTEM

C H A R A C T E R I S T I C S

D Y N A M I C S

A significant fact about tornadoes that cannot be overlooked is their unpredictability. Thus, the environment shifts and is impacted by devastating storms and winds over time when a tornado hits.

"Recurrent but unpredictable natural events create distinctive and profoundly unsettling temporal regimes. Landscape theorists and practitioners are familiar and accomplished at designing around and through predictable cyclic phenomena such as diurnal changes in light, temperature and activity, seasonal changes, lifecycles, ecological successions and so on. Even irregular events like rainstorms are framed statistically, with predicted return periods providing a conceptual design platform for storm water systems. Prediction of earthquakes, however, remains a dark art. "

(Bowring, Jacky, and Simon Swaffield. "Shifting Landscapes in-between Times." Harvard Design Magazine 36 (2013): 96-104)

Is it possible to fend against unpredictable changes by designing?

Some types of episodic change are already recognized as factors which will transform landscapes in ways that can be foreseen, but at unpredictable times.

P R O A C T I V E N E S S

"Proactive practice has a long precedence in the past of environmental design, with many advances in design theory and planning practice coming from proactive practitioners. Frederick Law Olmsted, the founder of modern landscape architecture, was a proactive practitioner of green vision and strong will. Olmsted, in the design of New York City's Central Park as well as many of his later public works, pursued a vision of addressing broad social and environmental problems."

Francis, Mark. "Proactive practice: Visionary thought and participatory action in environmental design." Places 12, no. 2 (1999).

More recently, landscape architects have not only contributed to improving the environment, but also helped to increase the sustainability and promote the resiliency. Proactive practice has become a tool for the landscape architecture profession to solve problems in a shifting setting, for instance, in disasters.

In of the face of uncertainties, it is vital to pay careful attention to what is known.

If cities stricken by disasters in history had collectively acted upon the knowledge of landscape dynamics already embedded in its situations, then many lives would have been saved, and communities and families would not have been so vulnerable to disasters.

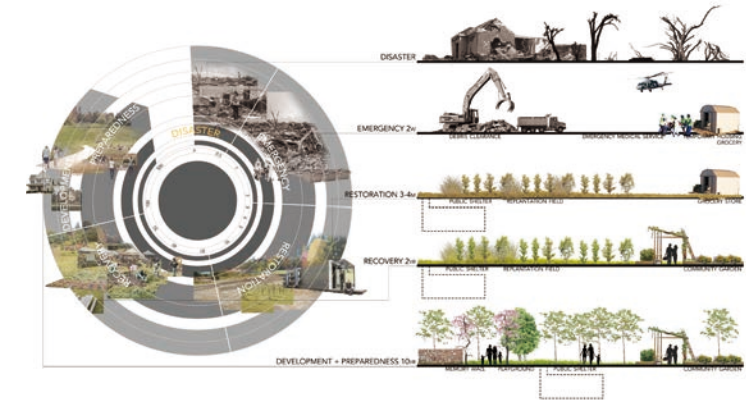
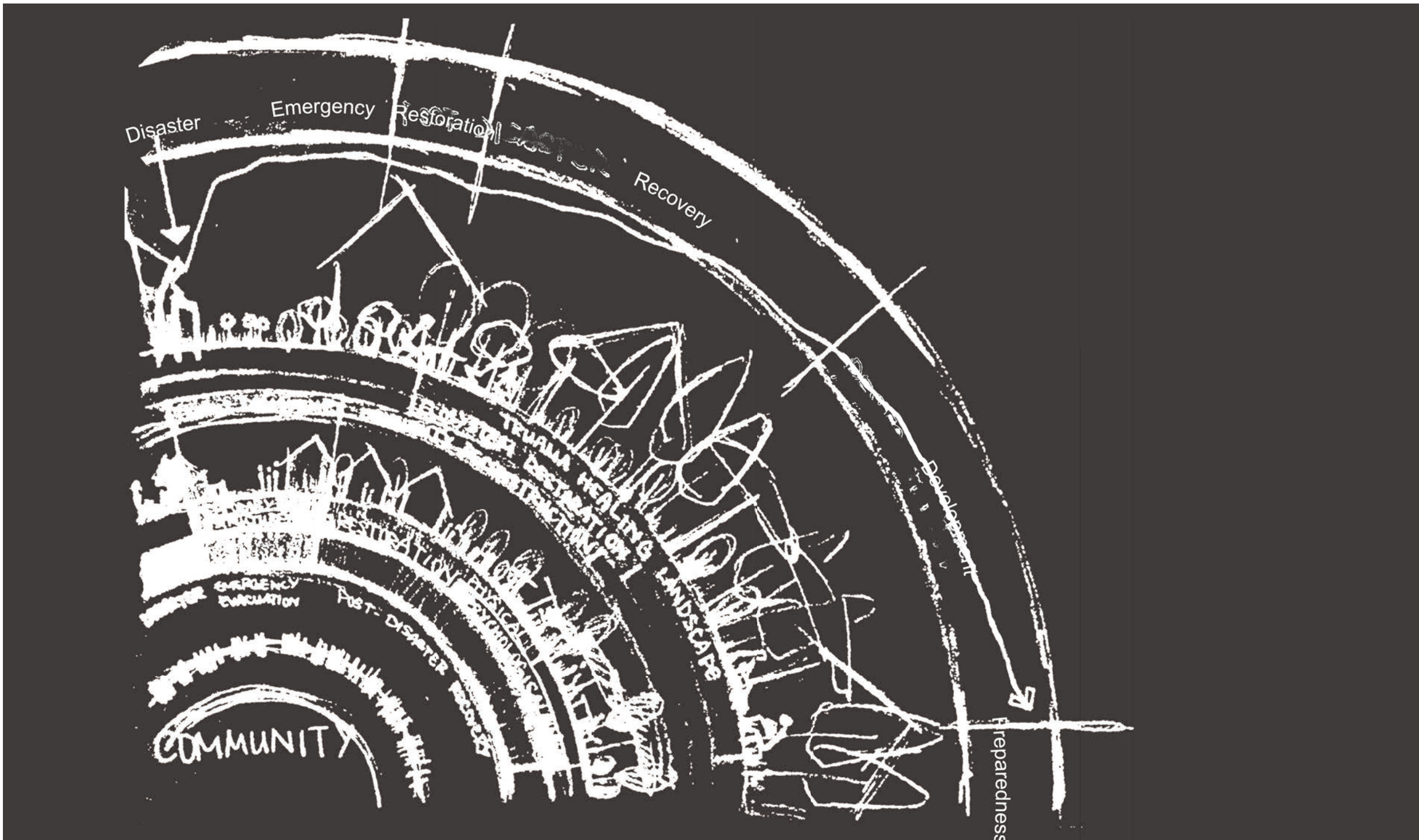
P A R T I C I P A T O R Y A P P R O A C H

One of the most profound experiences in the profession is the recognition of the continuing power of the local communities.

"Neighborhoods with inherited social capital or that had invested in community building were better able to respond and have led in planning for reconstruction. In a globalized and uncertain world, community based action becomes ever more important as a way to strengthen local relationships and capacity to adapt to the challenge of in-between times."

(Bowring, Jacky, and Simon Swaffield. "Shifting Landscapes in-between Times." Harvard Design Magazine 36 (2013): 96-104)

While the landscape architecture profession can dramatically encourage the community participation locally and even worldwide, many individuals become tied closely and constantly because of disasters like tornado, earthquake, hurricane, and flood. This kind of post-disaster arrangement serves as a way to make intangible power become tangible, and eventually facilitate the recovery process.

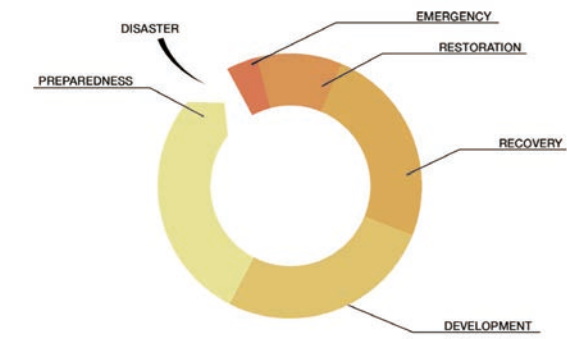
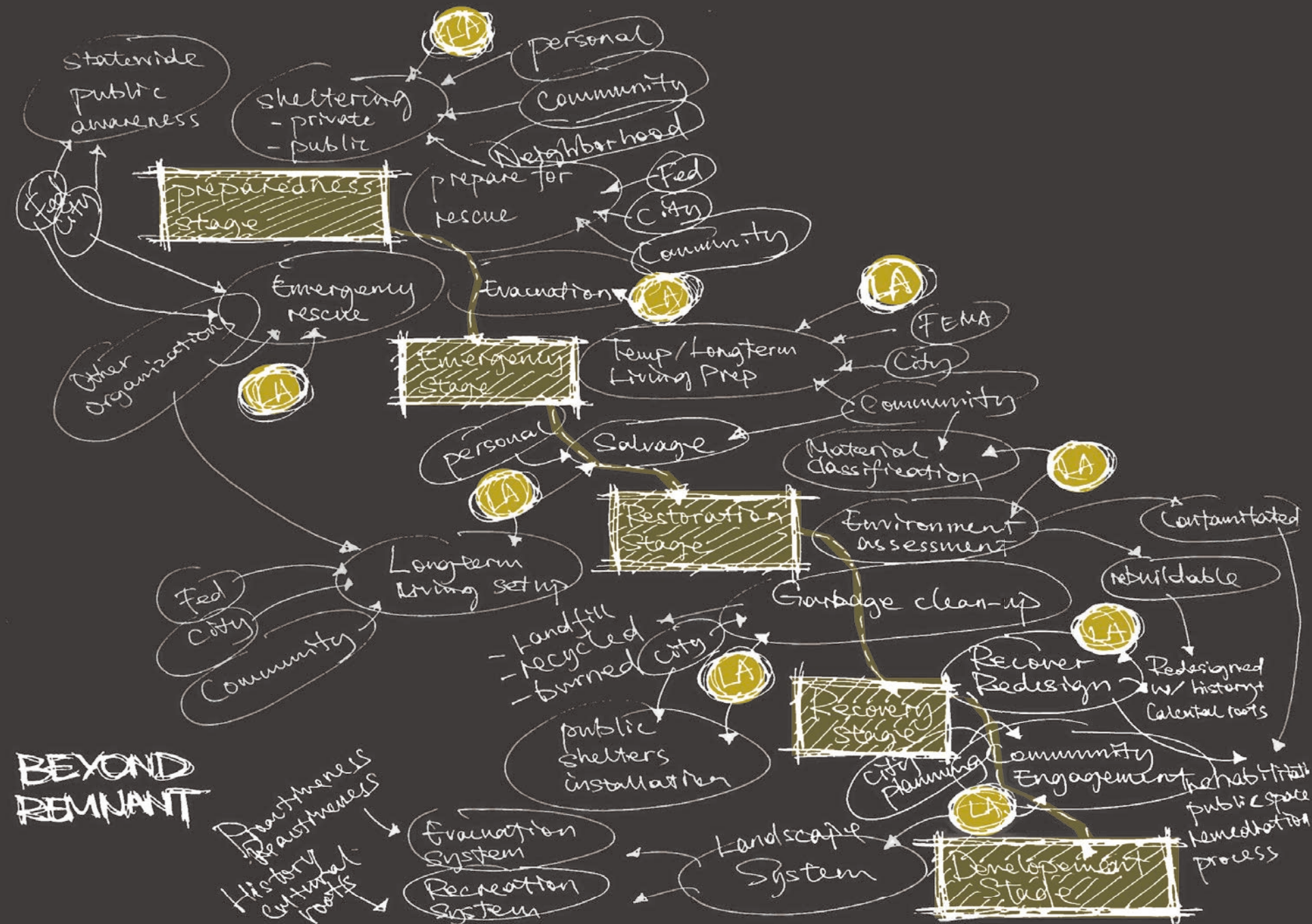


R E - F R A M E D D I S A S T E R C Y C L E

By looking at the post-disaster recovery strategies in history, a revised disaster cycle has been recognized and shaped. As studies of disaster recovery abounded throughout the 1980's and 1990's, researcher started to shift attention from descriptions of the recovery process onto a paradigm of disaster management that incorporates a preparatory component and a mitigation component to reduce vulnerability to future disastrous events.

Five overlapping stages of a disaster cycle can be defined as:

1. **Preparedness**
before disturbances
2. **Emergency**
1-2 weeks after disturbances
3. **Restoration**
3-4 months after disturbances
4. **Recovery**
2 years after disturbances
5. **Development**
10 (or more) years after disturbances



POTENTIALS

Throughout the disaster cycle shown above, there are many opportunities for landscape architects to get involved and play a part.

Generally, the landscape architecture profession can enter the recovery process immediately after the 3-4 month restoration stage.

However, the reorganized disaster cycle shows several potentials, some of which were merely theoretically proposed but have never been put into practice.

The brainstorm diagram shows that landscape architects can work in close liaison with other parties like FEMA, EPA, individuals and communities, to prepare for the upcoming events and help to evacuate citizens in the preparedness and emergency stage. It means that landscape architecture can be more proactive and play a part in the neighborhood earlier than usual.

Apart from that, landscape architecture can help EPA in environmental assessment and communication with the public during the restoration stage.

The recovery stage, unlike the existing arrangement, mobilizes more interventions and activities. For example, it involves contamination remediation, debris clean-up and recycle, community garden maintenance participated by local residents, and community memorial activities.

A P A R K S Y S T E M

According to the research, the conference center and its parking lots are used as the primary evacuation site for both emergent and temporary shelter. This kind of highly concentrated service has led to variety of social and environmental issues, including traffic congestion and unequal accessibility.

Taking 2011 Birmingham Tornado as an example, freeways were closed immediately after the emergency happened to ensure the transportation for emergency services. Thus, citizens were unable to reach the service site for shelter.

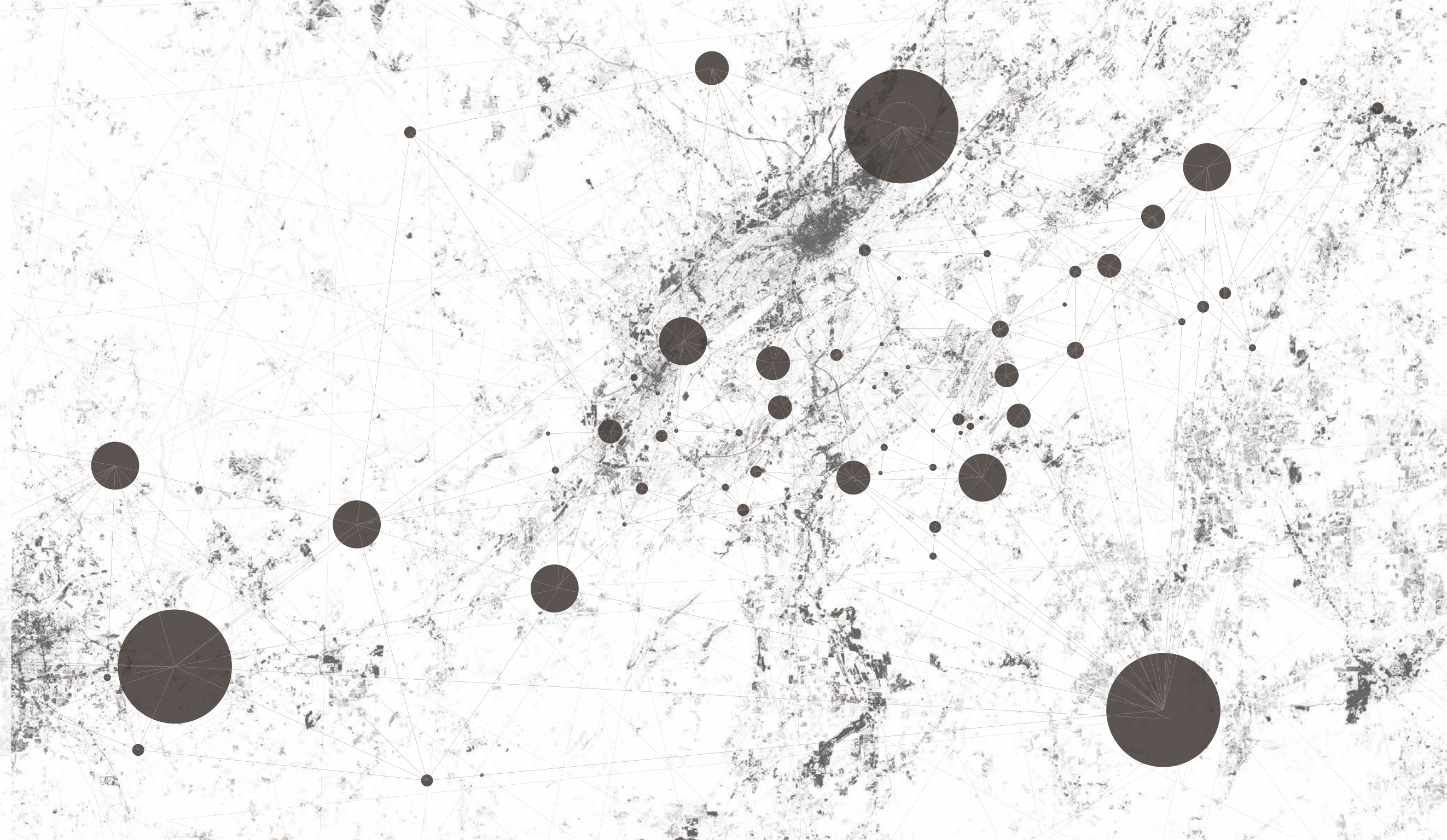
To increase the accessibility and reduce the pressure on highly concentrated traffic, one way is to separate the service from evacuation activities.

Based on the national storm-warning system, the evacuation routes and sites can be designed into a node-n-link system with multiple locations that can be reached on foot, equally accessible routes, and a clear evacuation route signage system.

In case of the paralysis of the whole city after a tornado hits, some backup systems should be built. That means communities should be connected with each other through a frame of multi-system.

Considering that multi-system idea, the existing "green system" seems to be a perfect choice. By overlaying the 'green system', which including parks and vacant spots, with the 'node-n-link' evacuation network, a highly accessible and multi-functional system could be implemented.

In further researches and design tests, this multi-system setting will be applied in the Tuscaloosa to Birmingham area.



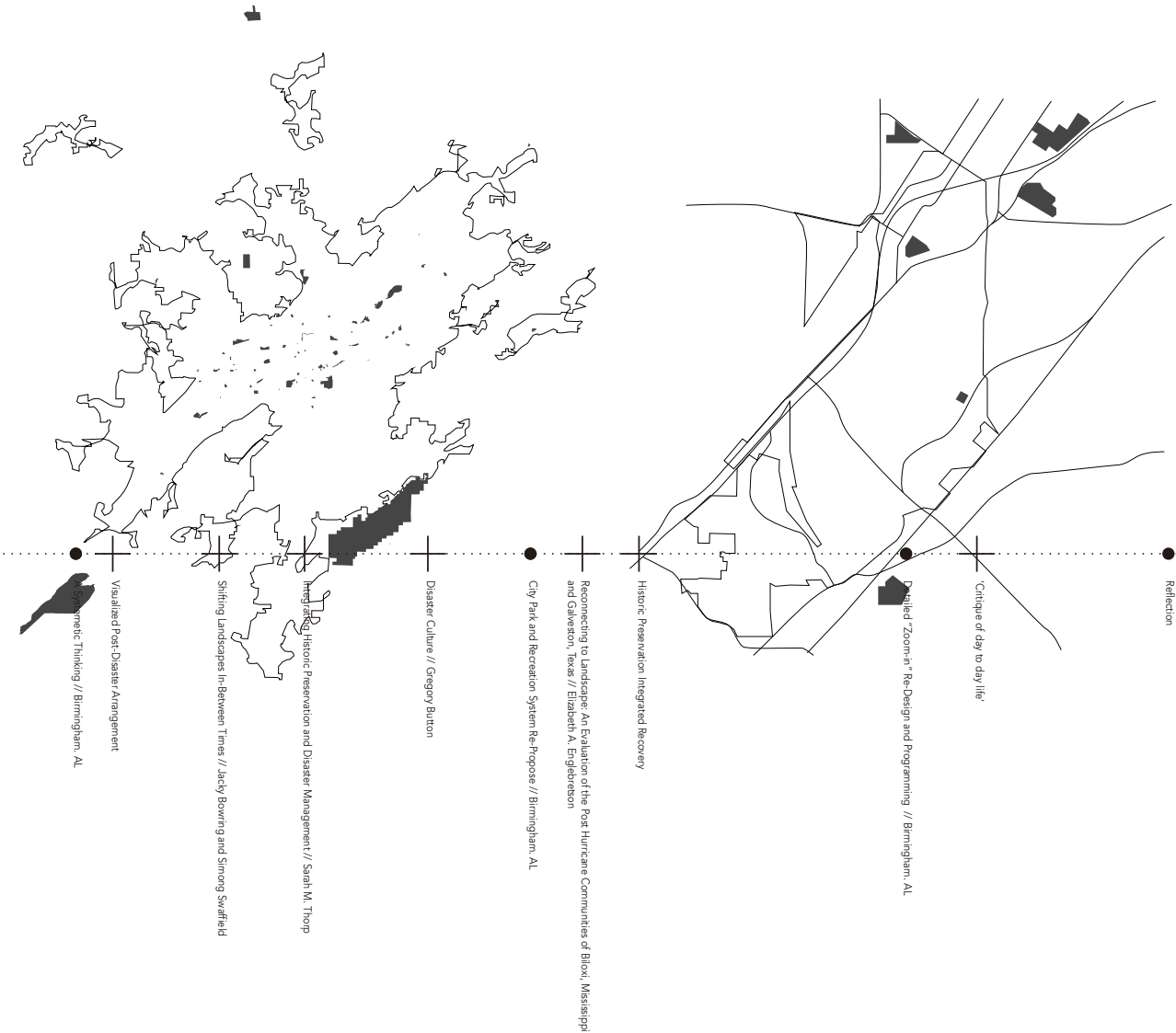
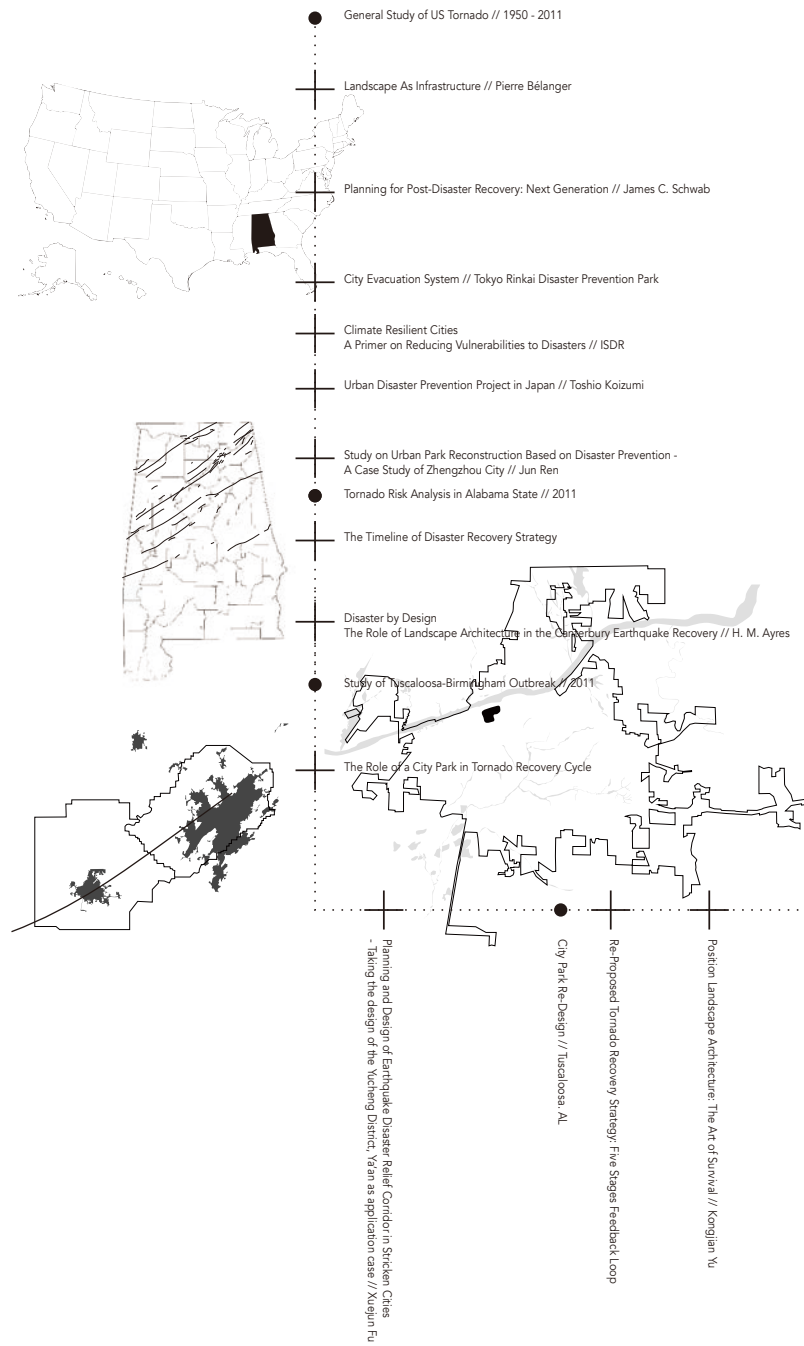


IV

DESIGNING AND EXPLORING THE VISION

THIS CHAPTER INTRODUCES THE RESEARCH AND DESIGN PROCESSES AND WORKFLOWS, EXPLAINS THE REGION OF DIXIE ALLEY, EXPLORES THE APRIL 27 2011 TORNADO OUTBREAK, REPRESENTS PRECEDENT STUDIES OF TOKYO RINKAI DISASTER PREVENTION PARK AND PRATT COMMUNITY RECONSTRUCTION PROJECT, AND EXPLORES THE VISION OF THIS RESEARCH.

- 401 - RESEARCH PROCESS
- 402 - THE DIXIE ALLEY
- 403 - APRIL/27/2011 TUSCALOOSA-BIRMINGHAM
- 404 - PRECEDENTS
- 405 - EXISTING DEVELOPMENT
- 406 - FUTURE VISION



RESEARCH PROCESS

The research started with the exploration of the 2011 Tuscaloosa-Birmingham tornado super outbreak. By working through the City Park Re-design project in Tuscaloosa, a clear position of landscape architecture has been identified. With the programming taken away from Tuscaloosa, a systematic land operation was applied to the existing city framework in Birmingham.

Taking the Fairfield area as an example, the functions of parks and vacant spots were categorized and repurposed. In the Ensley Park Recreation Center in Fairfield of Birmingham, many design ideas were realized and tested.

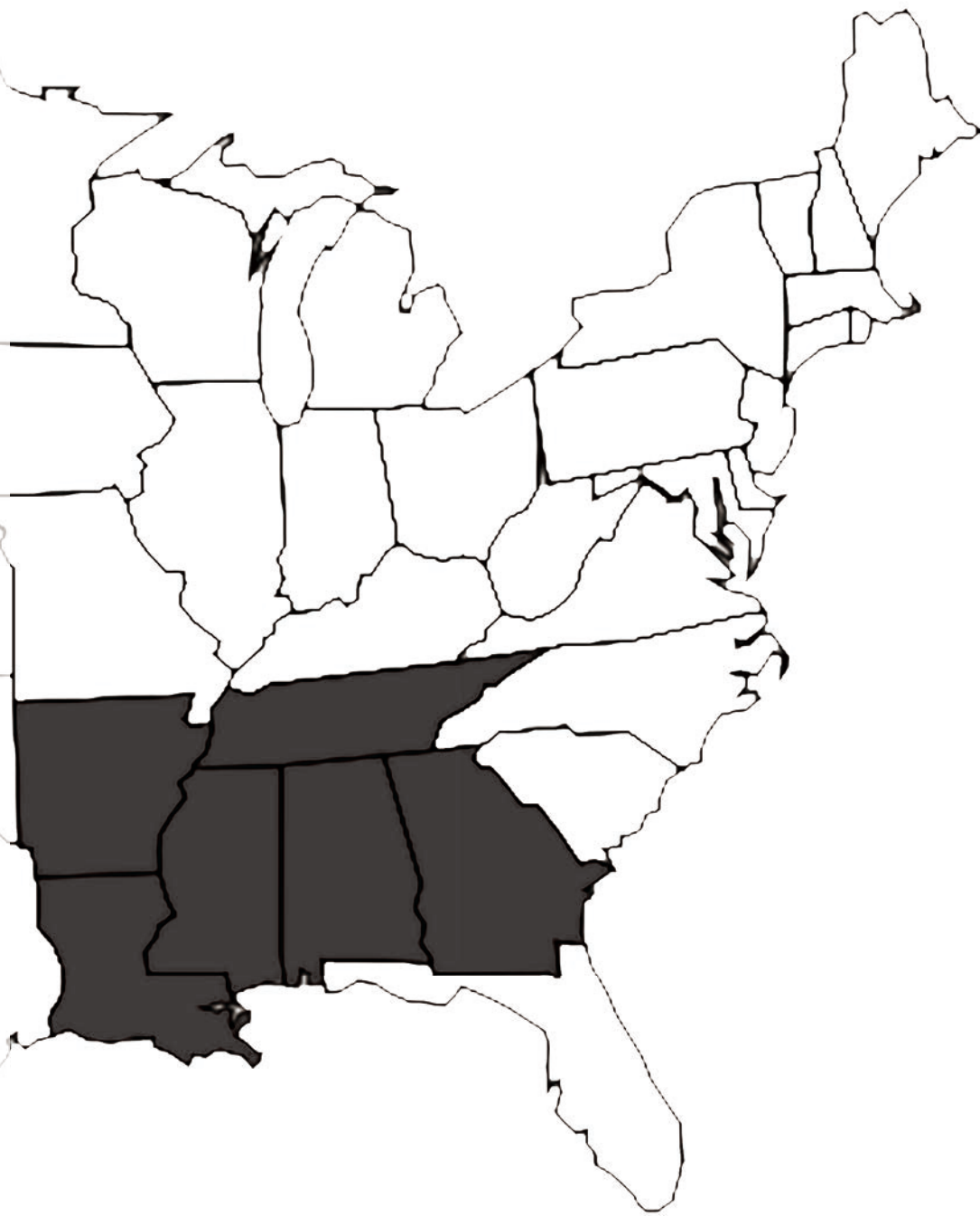
DIXIE ALLEY

A less well-known term is "Dixie Alley". It generally refers to the region prone to tornado development in the southeastern US. This alley includes the states of Arkansas, Louisiana, Mississippi, Alabama, Tennessee, and Georgia.

Besides tornadoes, this area is also hit by several tropical storms or hurricanes every year. Tornadoes often come into being when the low-pressure system sweeping through the area and colliding with the moisture tropical systems moves ashore from the Gulf coast. Generally, the Dixie Alley seems like a geographical extension of the Tornado Alley in the Great Plains. However, there are many differences between the two regions because of their different climates and temperatures. Owing to its tropical climate, the Dixie Alley is relatively warmer than the Tornado Alley.

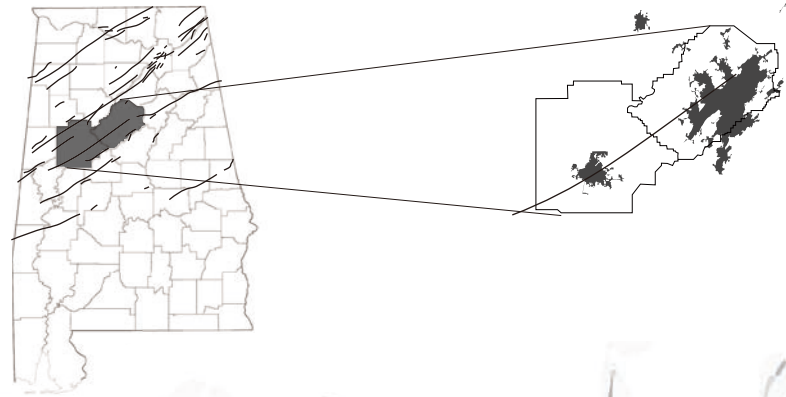
One of the many differences is that Dixie Alley experiences a lot more tornadoes during the fall/winter months (November-March) than Tornado Alley. Because of the persistent high temperatures (environmental conditions most likely to generate tornadoes), Dixie Alley actually suffers three tornado "seasons" out of the year (as opposed to one tornado season for the traditional Tornado Alley). (Figure 4) Tornadoes tend to become active in the course of activity in springs, falls, and early-to-mid winter months. This means that Dixie Alley doesn't see a peak of tornado activity as the Tornado Alley does.

The second difference is that there are more trees and terrains in the Dixie Alley area than the Tornado Alley, which can hide any approaching tornadoes from view.



The third difference caused by the different weather systems is the times of tornadoes. The Dixie Alley has a tropical climate and it's different from the climate in the Tornado Alley. Tropical weathers cause higher temperature, which means the fastest, longest-lasting, and deadliest twisters strike the Southeast often under cover of night. And these twisters forming in this region make the Dixie Alley known as the most dangerous region in the United States.

The fourth one is the difference in infrastructure and population density. To make matters worse, the Dixie Alley is home to many manufactured mobile houses that have weak walls and poor or no foundations. What's more, far fewer homes in this region have a basements where the house owners can take shelter when a tornado hits.



A P R I L 2 7 2 0 1 1
T U S C A L O O S A - B I R M I N G H A M

The 2011 Super Outbreak was the largest and deadliest tornado outbreaks ever recorded, affecting the Southern, Midwestern, and Northeastern United States and causing catastrophic destruction in its wake.

The states in the Dixie Alley suffer the most from the outbreak, especially the state of Alabama. Many other areas throughout the southern and eastern United States were also afflicted by it. There were a total of 355 tornadoes confirmed by the National Weather Service (NWS) and Environment Canada in 21 states all the way from Texas to New York and southern Canada. Widespread and highly destructive tornadoes occurred on each day of the outbreak, with April 27 seeing the most activities from tornadoes with a record of 211 tornado touchdowns at the midnight. Four of the tornadoes were destructive enough to be rated EF5. Generally, such tornadoes occur at a frequency of once a year.

The tornadoes in the Dixie Alley claimed more than 300 lives during the outbreak from April 25 to 28, one of the deadliest tornado seasons in history. The name of the Dixie Alley has been known to public since the 2011 Super Outbreak.

T O K Y O R I N K A I D I S A S T E R P R E V E N T I N G P A R K

Rinkai disaster prevention park is a primary model of disaster-themed park in Japan, which aims to aid disaster mitigation and the prevention of secondary disasters through landscaping. It built a fundamental list of essential elements, and some transformation possibilities. The city park project takes inspiration from this flexible and adaptive design idea.

Besides of the facilities provided, the park also provide the evacuation training courses, plant maintenance courses, and disaster education class. In the ordinary time, the park management deartment will host BBQ parties and music festivals.



P R E C E D E N T S

Japan is the first country to point out what role landscaping should play in such disasters as earthquakes and urban fires. After several deadly disasters, the profession in Tokyo started to build city parks with functions of disaster mitigation and prevention.

Back to the 19th century, after the Chicago fire, urban planners redefined the role of city parks and city park systems. This green "nod-n-link" system was designed to disperse the dense buildings in cities as well as to fend against disasters.

After the 9.11 attack, America paid more attention to emergency management and preparedness arrangement. A "disaster-prevention" community was designed and established throughout the nation.

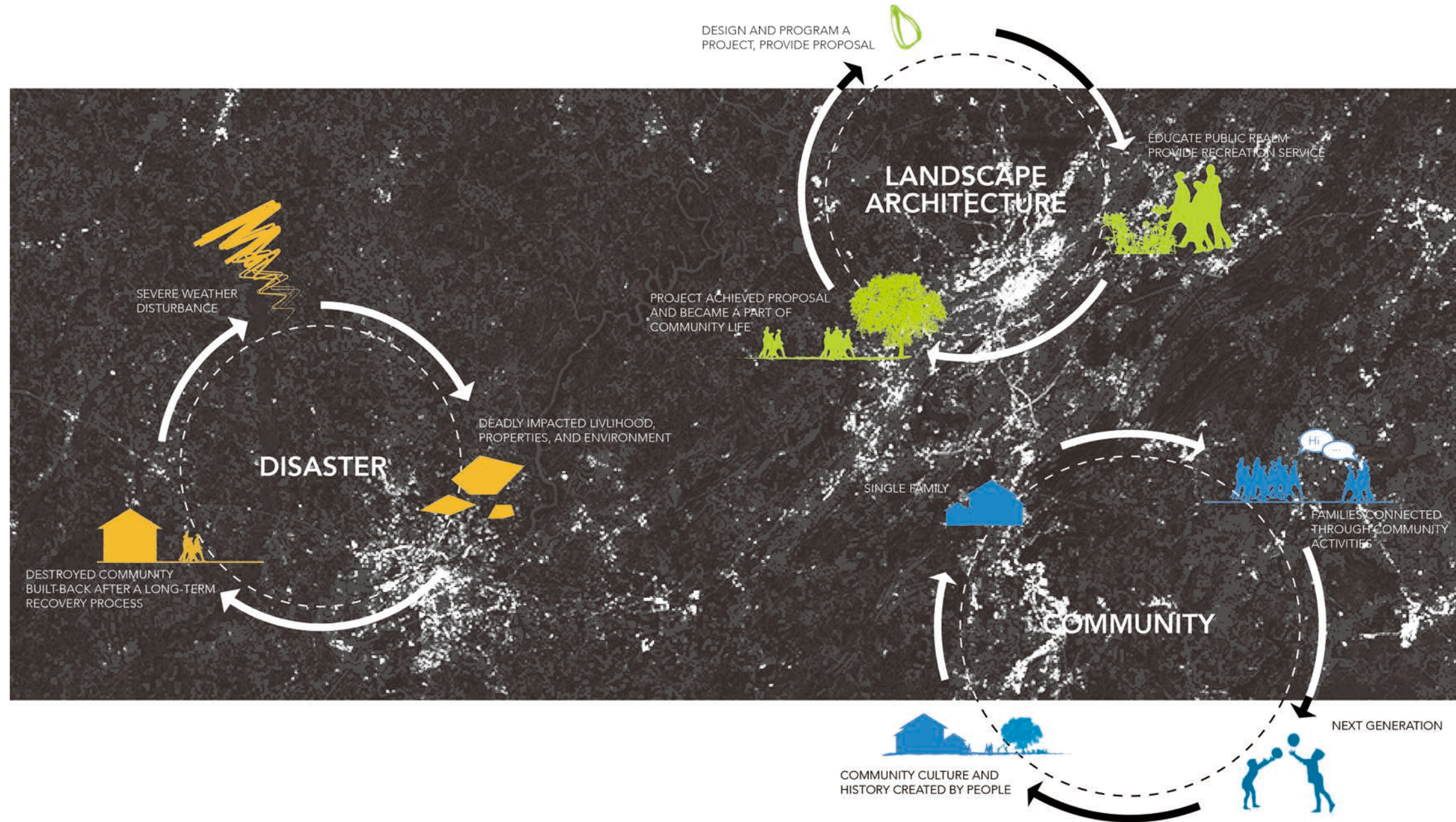


EXISTING DEVELOPMENT

R E B U I L D I N G T H E P R A T T C O M M U N I T Y

In the fifth year after the tornado touchdown, the Pratt Community rebuilding project is under construction in the northern part of downtown Birmingham.

The principle is to prevent damages from future natural disasters and increase the resiliency. Political capital will be necessary to ensure the implementation of proposed recommendations, and adhere to the Triple Bottom Line core values of People, Planet & Prosperity. It is aimed at creating a new neighborhood for the Pratt Community, a caring community, to promote health and well-being.



FUTURE VISION

The existing cycles are disaster cycle, landscape cycle, and community cycle. Each cycle has its own life period and different performance.

The research is trying to combine the disaster cycle with the society, culture, history, and environment to create a new type of landscape form with overlaid disaster arrangement.



V

DESIGN INTERVENTION

- 501 - RESEARCH QUESTION
- 502 - BACKGROUND OF TUSCALOOSA
- 503 - DESIGN PROPOSAL
- 504 - REFLECTIONS
- 505 - BACKGROUND OF BIRMINGHAM
- 506 - PARK SYSTEM DESIGN PROPOSAL
- 507 - FAIRFIELD
- 508 - DESIGN PROPOSAL OF ENSLEY PARK
- 509 - REFLECTIONS



R E S E A R C H Q U E S T I O N

HOW CAN A CITY PARK SYSTEM BE RE-DESIGNED TO PROACTIVELY ENCOURAGE THE TORNADO RECOVERY STRATEGY?

- WHAT CAN WE CONTRIBUTE FOR CITY/PUBLIC IN FIVE STAGES?
(EMERGENCY, RESTORATION, RECOVERY, DEVELOPMENT, PREPAREDNESS)
- HOW CAN WE HELP TO RECOVERY NATURAL ENVIRONMENT, BUILT ENVIRONMENT, COMMUNITY HEALTH, AND REGIONAL ECONOMY?
- WHAT'S THE ESSENTIAL COMPONENT FOR PREPAREDNESS?
- HOW CAN THE FACILITIES BE TRANSFORMED THROUGH DISASTER CYCLE?



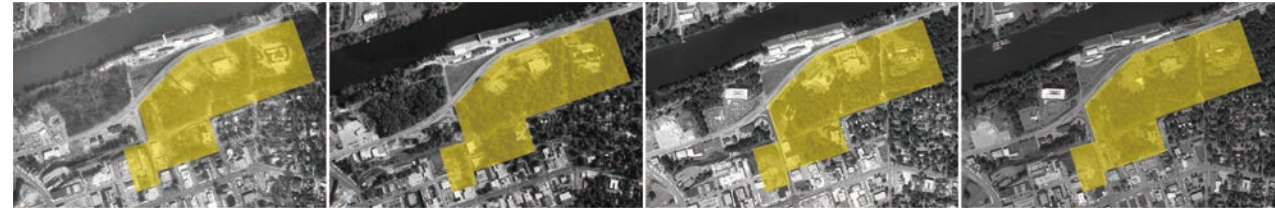
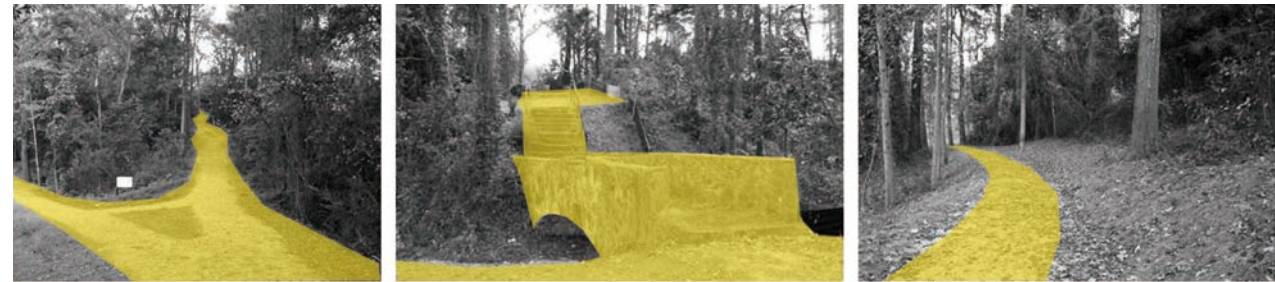
BACKGROUND OF TUSCALOOSA

A huge devastating tornado touched down on Tuscaloosa in 2011, which caused huge property damages and casualties. The city emergency management department immediately started to launch rescue and recovery activities after the disaster. Operations and activities in different time periods were documented in detail.

Years after that, the city reconstruction project covered 70% of the damage from the tornado. Some green corridors were designed on paper but never actually built. The city operation department overlooked the role of green space in the recovery process.

For cities like Tuscaloosa, which is frequently hit by natural disasters, a large multi-functional city park with several green spaces is absolutely necessary for citizens. Some facilities can be made adaptive so that they can be used by citizens for evacuation and sheltering and provide a temporary or long-term living space for citizens and a safe shelter and evacuation place with basic amenities like electricity, food, and clean water. To meet these needs, six aspects should be considered: living environment, recreational space, circulation route, basic facilities, and garbage disposal. The park should be made adaptable to different circumstances, or able to quickly transform its functions in an emergency.

In previous studies, an open flat place is usually used as the evacuation space to serve the purpose of emergency rescue and temporary living. For instance, city parks, parking lots, sports fields, green spaces are often used during a disaster. However, without a full integration of essential preparedness components, well-designed utility resources and evacuation routes, every disaster and rescue would result in huge costs and waste of time. Therefore, the urban green space, as an indispensable part of a city, has a close connection with its surrounding residents and essential elements for preparedness and thus can serve as a regional evacuation area for the city and citizens.



D E S I G N P R O P O S A L

The first design test is applied to a single site design, which is a city park located in the center of the Tuscaloosa city, University of Alabama, and the black warrior river.

However, the city park is only a part of the whole strategy. The next step is to build a safety landscape system for the public. Some facilities can be adapted for the purpose of evacuation and sheltering. The neighborhood should also be redesigned for better preparedness.

Some functions should be provided for the benefit of community:

- 1-Temporary or long-term living space for citizen, a safe shelter and evacuation site with basic utility resources like electricity, food, and clean water.
- 2- Emergency rescue route, parking space, or heliport.
- 3- Information gathering, announcement, and education.
- 4- Emergency supply and garbage disposal.
- 5- Disaster recovery assistance.

T H E Q U E E N C I T Y P A R K

The Queen City park is on the National Historic Register as it was built by the WPA in the 30's. WPA built a stone entrance, two trails through the woods down an incline that were lined with brick and had steps, a stone bridge a stone pavilion and a barbecue pit. Near the fire pit area was a bench called the "Courting Bench" which young couples of the day used when out walking.

The original purpose of the design was to connect a downtown neighborhood with the public softball field, picnic areas and a wading pool and the river front.

The ball field was replaced by the Tuscaloosa County Public Library in 1976.

The pool house is currently being restored and will open as a Transportation Museum for Tuscaloosa, highlighting the River and its importance as a method of transportation in the development of West Alabama.



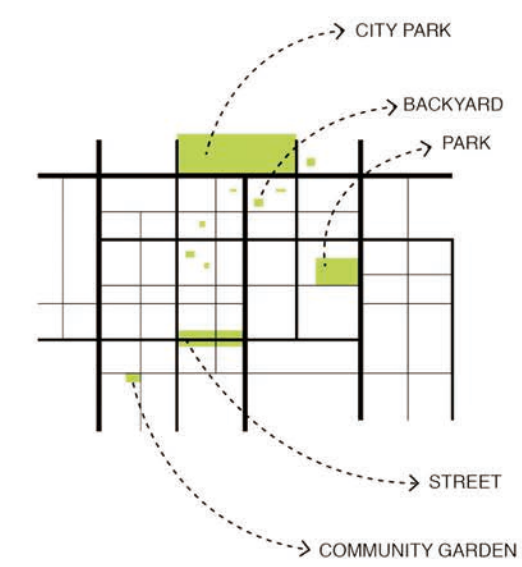
To meet these needs, six aspects should be considered: built environment, recreational environment, circulation route, essential facility, and garbage disposal. The park should be adaptable for different circumstances, or transform its functions in a short time for emergency.

Built environment including libraries and museums will serve as a sheltered area for citizens at both ordinary and emergency time. Educational center can be used as the command center during a disaster to collect and release information.



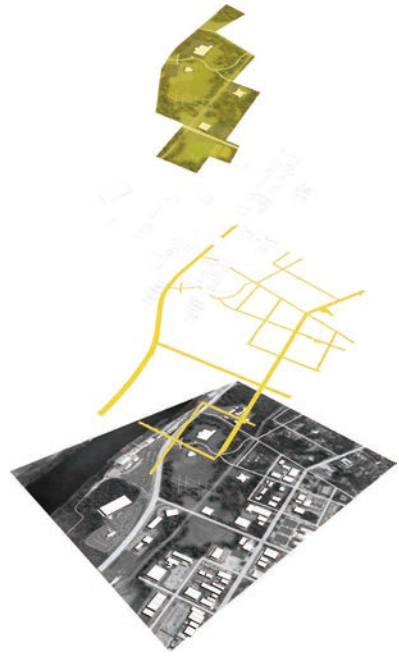
After all, the park, with all its multi-functional on-site facilities will serve the recreation and evacuation purposes.





The Queen City park is not the only place for evacuation. Flat grounds like huge parking lot, sport fields can also be use as lower-level sites for emergency management. Small spots like community centers should be used as a garbage collection and classification station. For the old communities with a risk of crumbling buildings, public shelter installation is necessary.

On-site circulation and off-site circulation should be considered as a whole. The park should be achievable for citizens, and have hard paving roads and sufficient space for large vehicles like ambulance and fire truck. The route for FEMA to set up temporary mobile houses on the site is important as well. Signage system should be redesigned with clear evacuation guidance, and specific color.



There is a buffer zone around the park as the fire break. Flat grounds like large lawns can be used either as sites for hosting festivals weekly, or as a temporary and long-term living place with designed underground utility lines. Solar panels can also be used as a source of power after a disaster, in case of disruption of power lines. Hard paving areas like parking lots can be used for garbage collection and disposal. Garbages should be classified and recycled.

Some facilities like benches, lights should be replaceable. Benches should be able to easily transform into a temporary shelter. Illumination should be controllable for different circumstances and equipped with a radio speaker for emergency management. Other recreational facilities like pavilions and children's playgrounds can be used as food courts and temporary stores after a disaster. Community gardens can be used as small farmlands to produce food for residents both before and after a disaster.

For the whole park, restrooms and bathrooms are necessary. Besides some restrooms in building, some temporary restrooms should be set up for survivors after a disaster.



LEGENDS

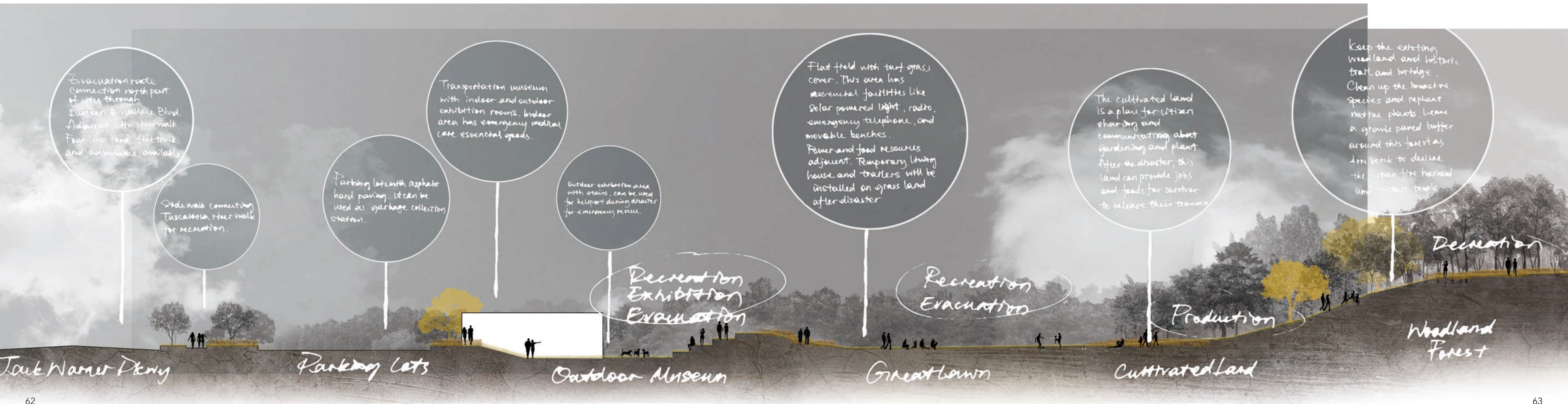
- 1 Great lawn (Temporary living #1)
- 2 Grassland (Temporary living #2)
- 3 Woodland trail
- 4 Cultivated land
- 5 Ball field
- 6 Historical site
- 7 Wetland

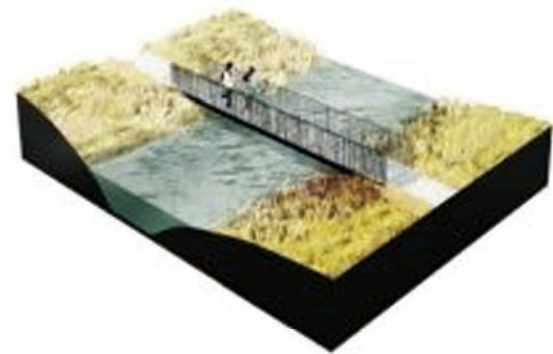
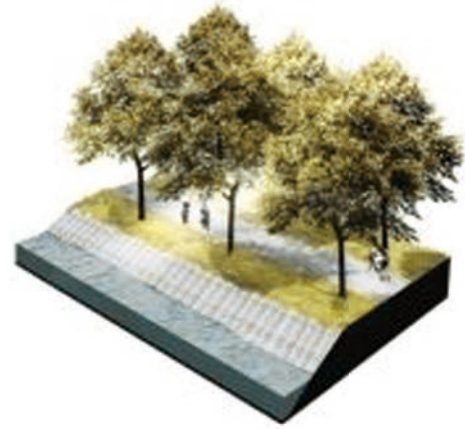
Apart from the redesign of the infrastructure, the community should be mobilized to participate in disaster recovery. A good distribution of labor is important for survivors. Survivors can help to clean up debris, collect garbage and grow food. These activities will help them to reduce depression.

After one or two years' recovery, some new technologies and new facilities will be introduced with the help of communities. At the usual time, the park can be used as an education center. Parents can take their kids there to learn the disaster cycle for better preparedness.

The spatial arrangements of the site can be easily read through the section.

The parking lots are adjacent to the Tack Warner Pkwy, which connect the on-site to the off-site transportation system. At the usual time, parking lots will provide approximately 400 parking spots for visitors. During the emergency time, in addition to providing parking space, part of the parking lot will be occupied by the utility vehicles to provide emergency services. The museum and library will be used as shelters and emergency medical service centers. Badly injured survivors will be transferred from the outdoor museum exhibition area by helicopter. The large lawn will serve as a temporary living space for survivors.





Connected with the Black Warrior Riverwalks, the park acts as an attraction point in the recreation green corridor.

To facilitate on-site activities and increase the attraction, four types of footpaths are proposed:

- 1- Riverwalks
- 2- Wetland trails
- 3- Production garden footpaths
- 4- Creek overpasses



Emergency evacuation and sheltering



Temporary stores
Debris recycle
Communication engagement



Camping and RV set-up
Emergency rescue and medical care
Solar powered LED lights



Recycled materials reuse
Facility Reconstruction and maintenance



PUBLIC SHELTER EMERGENCY EVACUATION

Public warning will started hours before the disaster. Park signage system is designed with evacuation navigation, and lightening system is designed as navigation cue. For tornadoes and heavy storm, interior areas like ublic library and transportation museum can use as life shelter. For earthquakes, flat area like lawn will become the evacuation spot for citizen.

PUBLIC SHELTER EMERGENCY EVACUATION

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For tornadoes and heavy storms, interior areas like the public library and transportation museum can be used as life shelter. For earthquakes, flat areas like lawns can become the evacuation area for citizens.

SOLAR POWERED LED STREET LIGHT

Designed with emergency telephone and radio speaker. Provide power resource for temporary needs. Standard light wattages range from 40 to 200 watts. Architectural mount withstands 200mph gusts.



TEMPORARY LIVING SPACE

By the end of the emergency stage turf grassland will be cleaned up for trailers and temporary housing. Street lights will become the power sources for temporary housing.

EMERGENCY RESCUE AND MEDICAL CARE

Footpath will be used as emergency evacuation route for fire truck and ambulance. Indoor museum can set up for emergency medical clinic and emergency surgery. Outdoor space around public library and museum will set

TEMPORARY LIVING SPACE

At the end of the emergency stage, turf grassland will be replaced by trailers and temporary housing. Street lights will provide electricity for temporary housing.

EMERGENCY RESCUE AND MEDICAL CARE

Footpaths will be used as emergency evacuation routes for fire trucks and ambulances. The indoor museum can be set up as an emergency medical clinic or operating room. Medical treatment tents will be set up in the outdoor space adjacent to the public library and museum.

SOLAR POWERED LED STREET LIGHT

The lights are equipped with emergency telephones and radio speakers and provide electricity for temporary needs. Standard light wattages range from 40 to 200 watts. Mounts are able to withstand 200mph gusts.





ORGANIZATION

Some design and disaster recovery organizations will be involved into the post-disaster recovery strategy.

COMMUNITY PARTICIPATION

To relieve the post-disaster stress for survivors, community participation is necessary during the restoration stage. Some activities like harvest, planting, garbage collection, and moving can provide job for survivors to relief their trauma. Community participation will help to promote community health and partly recover public psychology.

BALL FIELD

During the restoration stage, ball field and parking lots will use as garbage collection station for further recycling and reuse.

TEMPORARY STORE

To ensure the quality of temporary living, some store and food trucks will be installed into park.

SOLAR POWERED LED STREET LIGHT

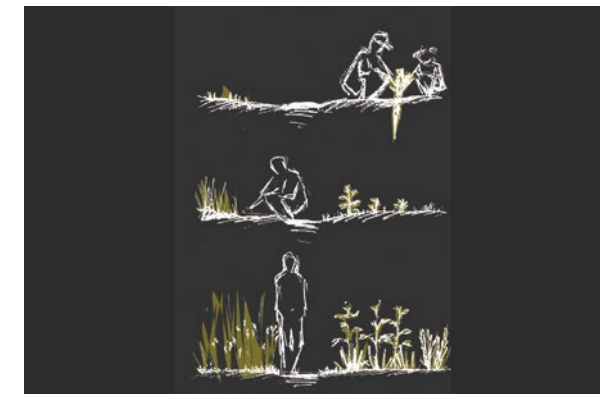
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REPLANTATION

After emergency stage, grassland and cultivated land needs maintained and replanted. Communities can help to recover the environment.

FACILITY RECONSTRUCTION

After emergency stage, some facilities like light and road pavement need to be improved and reconstructed.

MATERIAL RECYCLE AND REUSE

During two-year recovery stage, some debris and garbage will be collected, recycled, and reused to build new structures and facilities. Material reuse can help to release the financial press and to some extent recover the regional economy. Some materials can be used to build the memorial.

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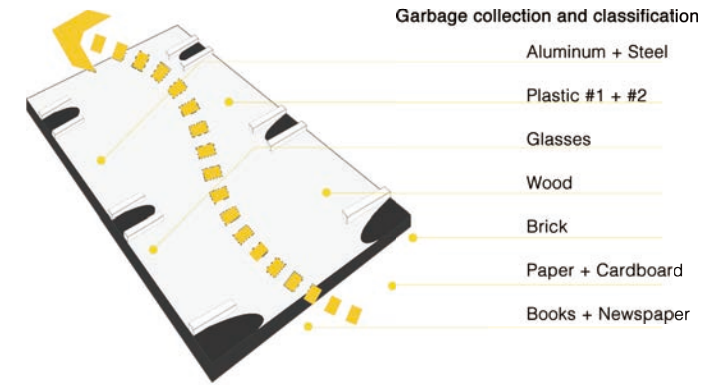
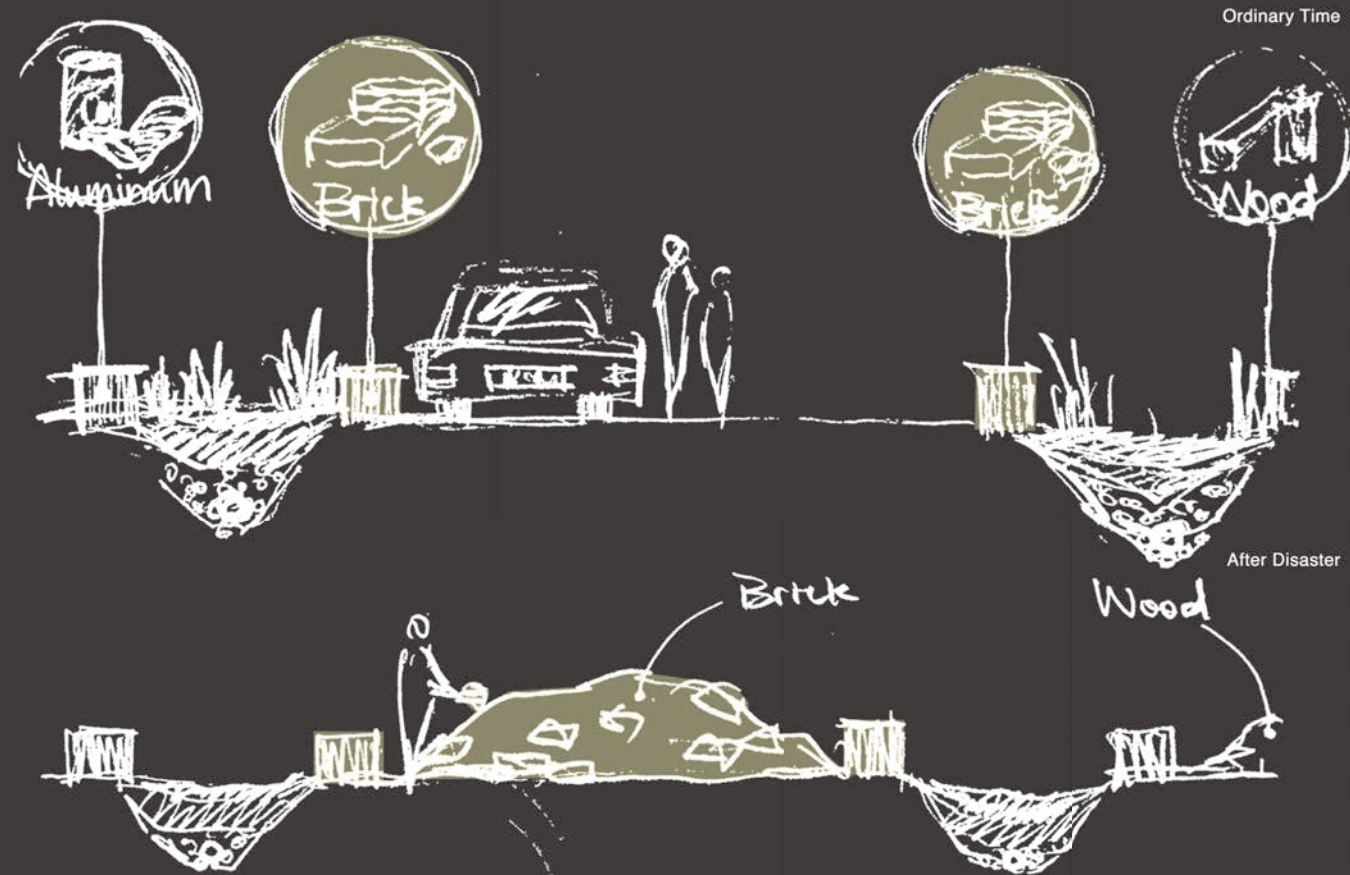
REPLANTATION

After the emergency stage, grasslands and cultivated lands need to be maintained and replanted. Communities can help to recover the environment.

MULTI-FUNCTIONAL PARKING LOT

Garbage collection and reuse is an indispensable part of disaster recovery. Hard paving area like parking lots can be used for garbage collection and disposal. Garbage should be classified into different categories and processed separately, like aluminum, wood, plastic, glasses, and bricks.

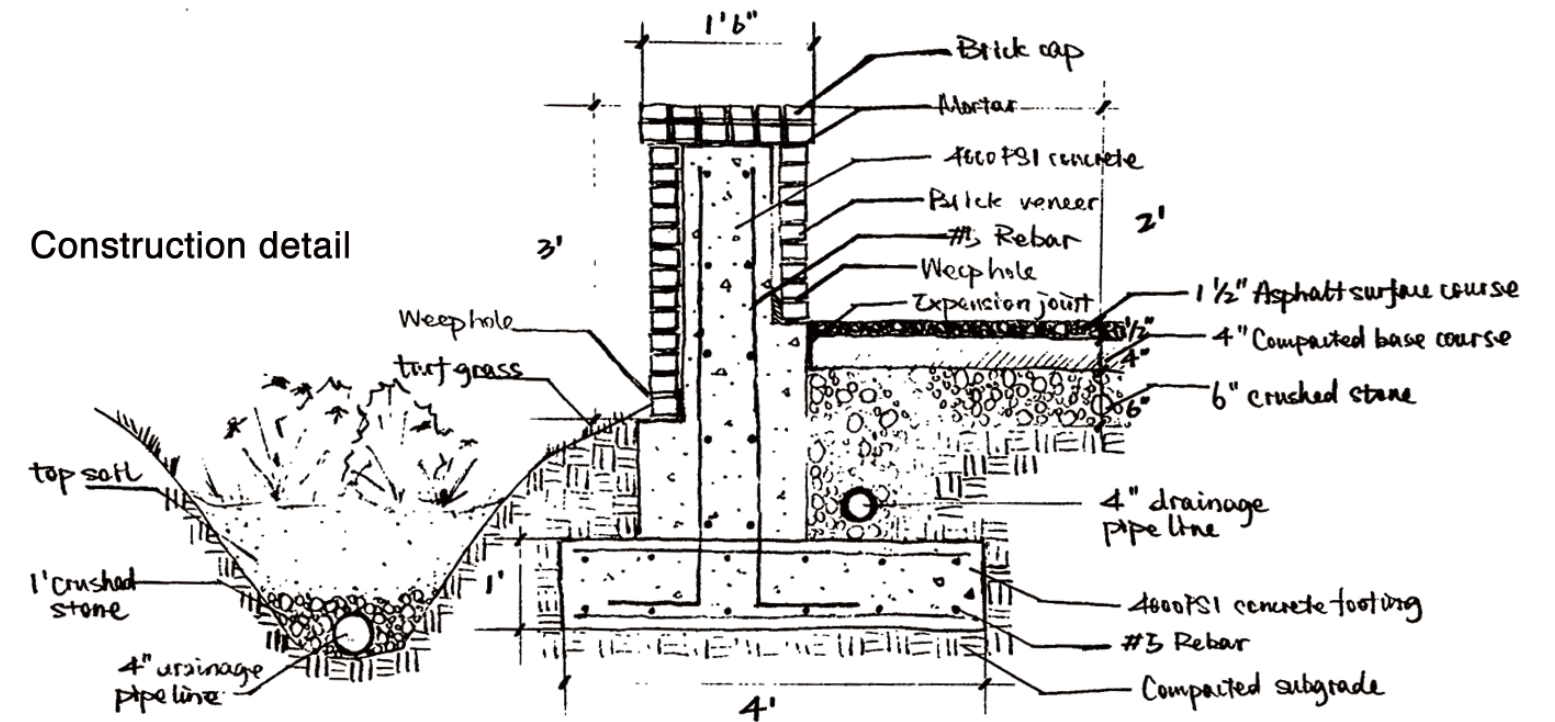
The parking lot is designed to include a bio-retention pond and seating wall, and divided into multi sections. To better inform the public of where their garbage should go, seating walls are designed with recycled material.



For example, the seating walls along a "brick" section are built with recycled bricks recycled from debris. Material recycle and reuse can easily reduce the economic pressure on the region. In addition to the economic recovery value, the reuse of certain old materials can also retain the memory of the place.

Material sources:
Local waste material recycle and reuse

Construction detail

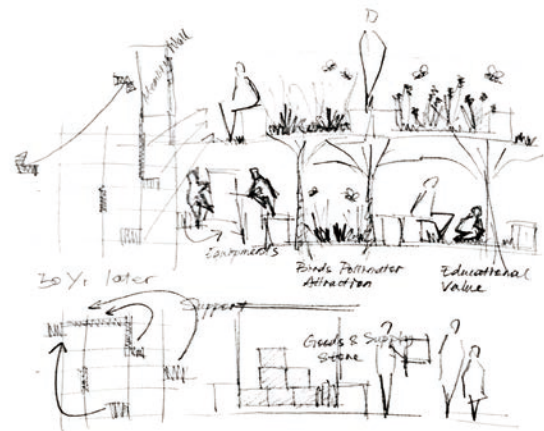


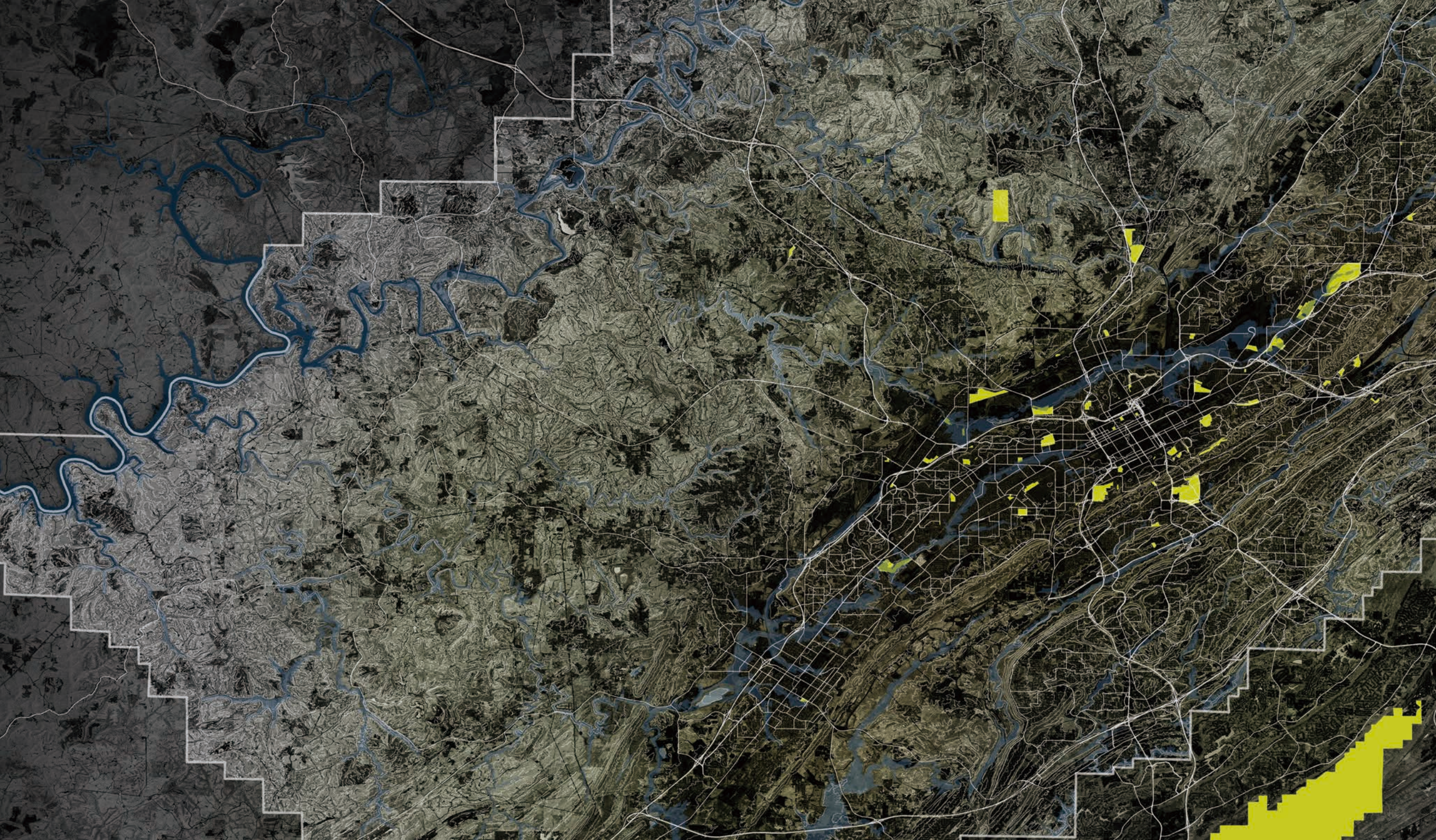
R E F L E C T I O N

The city park I redesigned seems to be made up by isolated sections.

To ensure the smooth evacuation and following recovery activities, a unified system is necessary for operation. The city park should be a part of the whole strategy. Flat grounds like huge parking lots, sports fields can be used as lower-level areas for emergency management. Small spots like community centers should be used as garbage collection and classification station, or as a temporary shelter area.

The idea of multi-functional landscape need to be reconsidered from a regional and systematical perspective.





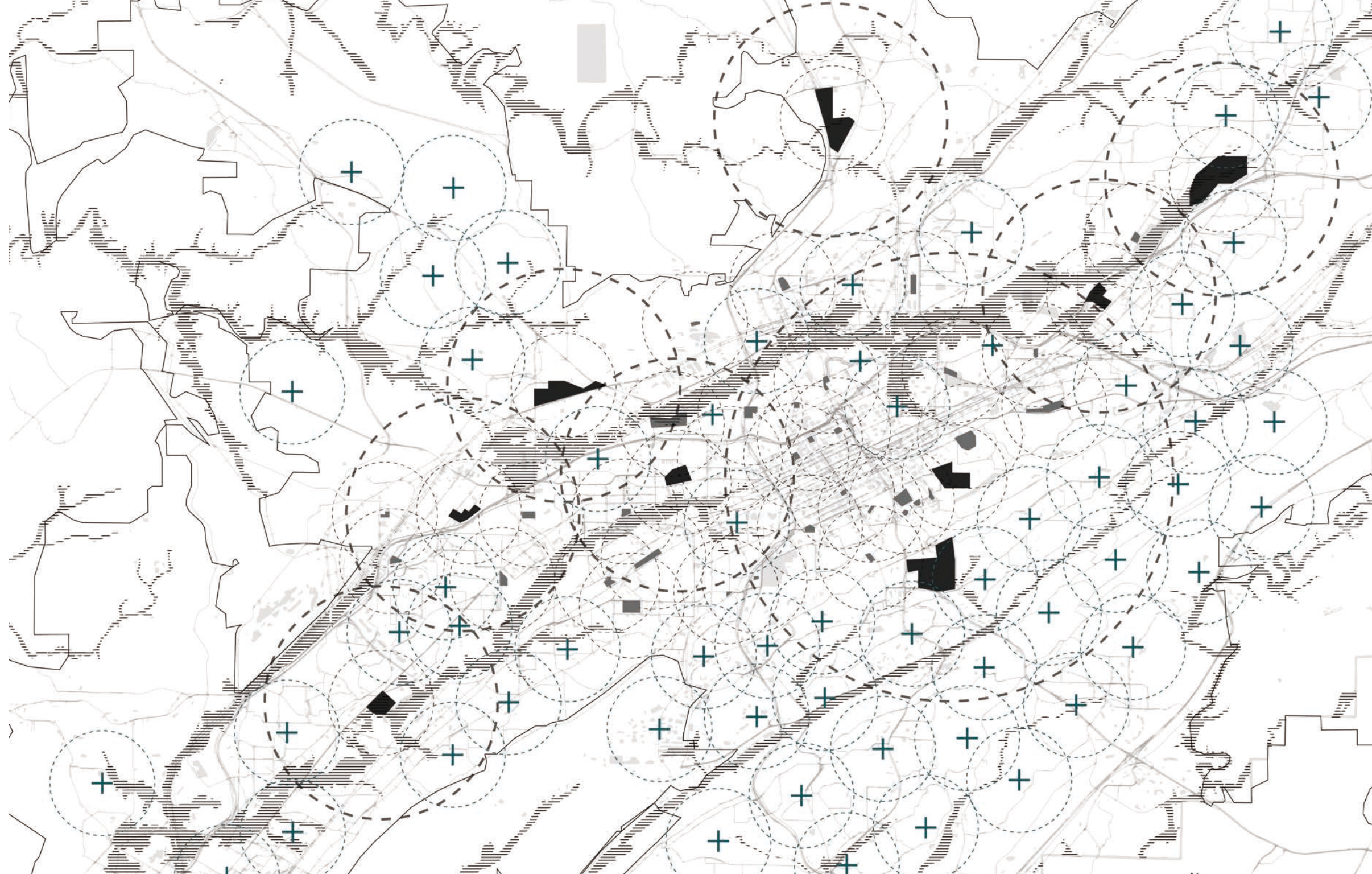
B A C K G R O U N D O F B I R M I N G H A M

In the past decades, tornadoes have hit the city more and more frequently. Despite the huge cost by tornadoes and storms, a secondary urban disaster made more damages, that is, flooding. To redesign the city green system for tornado preparedness, flooding should never be overlooked.

The re-designed landscape system is to implement evacuation functions into the city form. Its main function is to provide refuge for refugees and asylum-seekers in emergency rescue, including: preventing fires and containing the spread of fires; mitigating or preventing damages caused by explosions; serving as a temporary shelter (emergency shelter, temporary collection sites, evacuation transit points, etc.) and refuge shelter, evacuation roads, first aid sites, hub of relief supplies; becoming the helicopter landing sites; being used as an educational space of anti-disaster knowledge.

Each site has different functions, which not only includes ordinary recreation, beautiful landscape, but also could play the part of emergency shelters, disaster prevention channel, fire barriers, disaster relief material distribution, temporary hospital and temporary living place and many other functions after disasters.

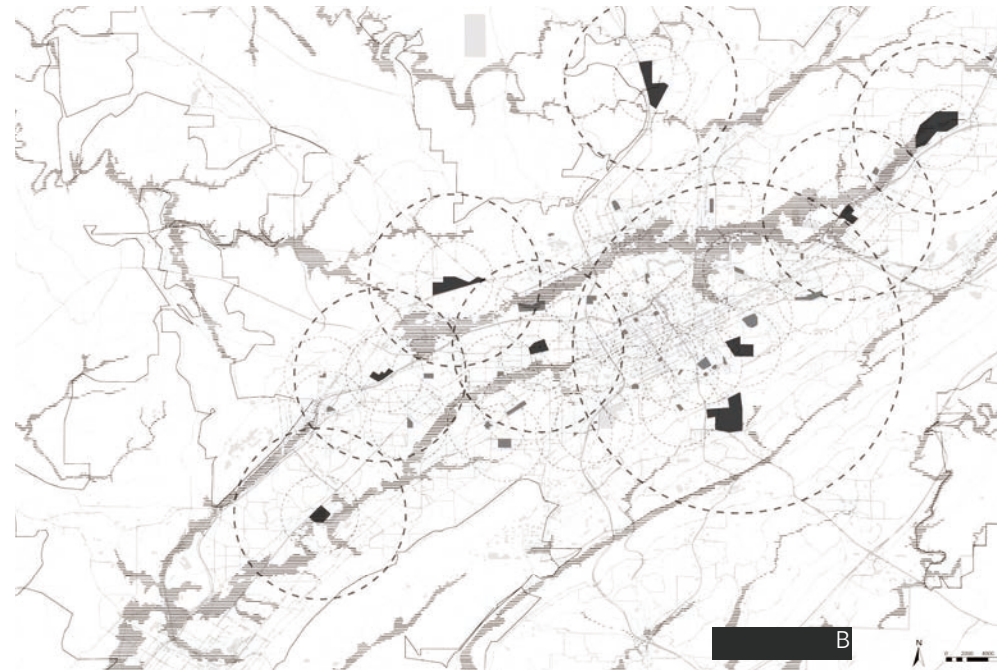
A century ago, Olmsted brothers devised a systematic greening plan for Birmingham. Some parks and corridors have been built. However, the green works were isolated and fragmented by subsequent urban development. This project will reframe a park system by using the existing incomplete "node-n-link" network, and exploiting the existing emergency management operation. Based on the soil condition and flooding zone, parks will be selectively redesigned and proposed. Parks near the flooding zone are designated as the protection buffer. Other relatively flat parks and vacant spots are used as the evacuation sections and sub-sections, which also can be used for post-disaster recovery.



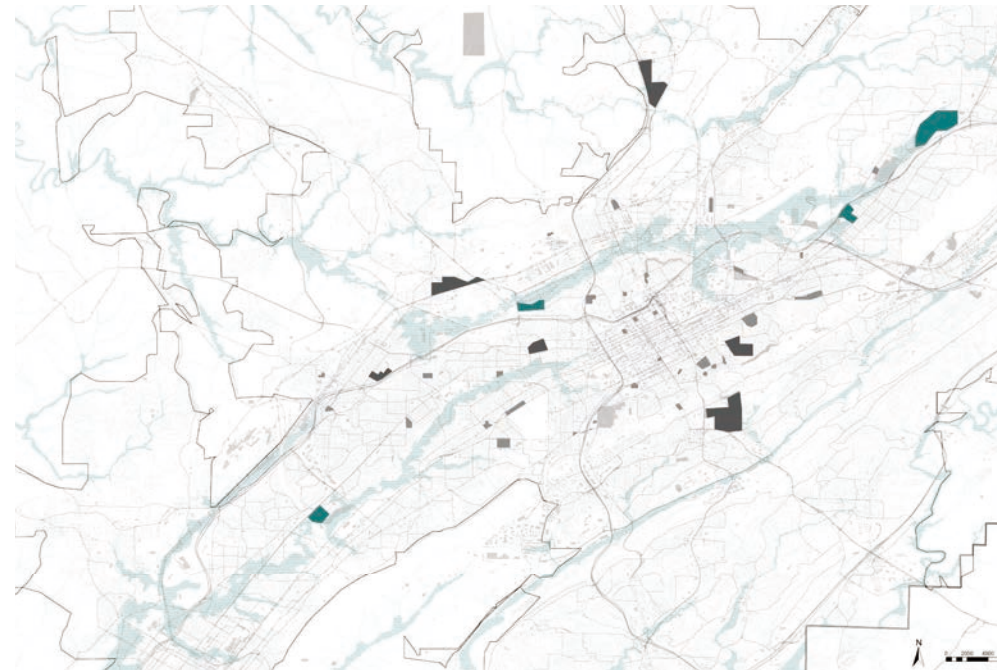
P A R K S Y S T E M
P R O P O S A L

Based on the geological and population analysis, parks will be selected and connected with green corridors. Pocket park, community park, city park, regional park, shelters, and green corridors are the components to form this new system. Citizens can easily find shelters and pocket parks for emergency evacuation. In the following stages, community parks and city parks can lead the restoration and recovery arrangement while regional parks can support and accelerate city recovery.

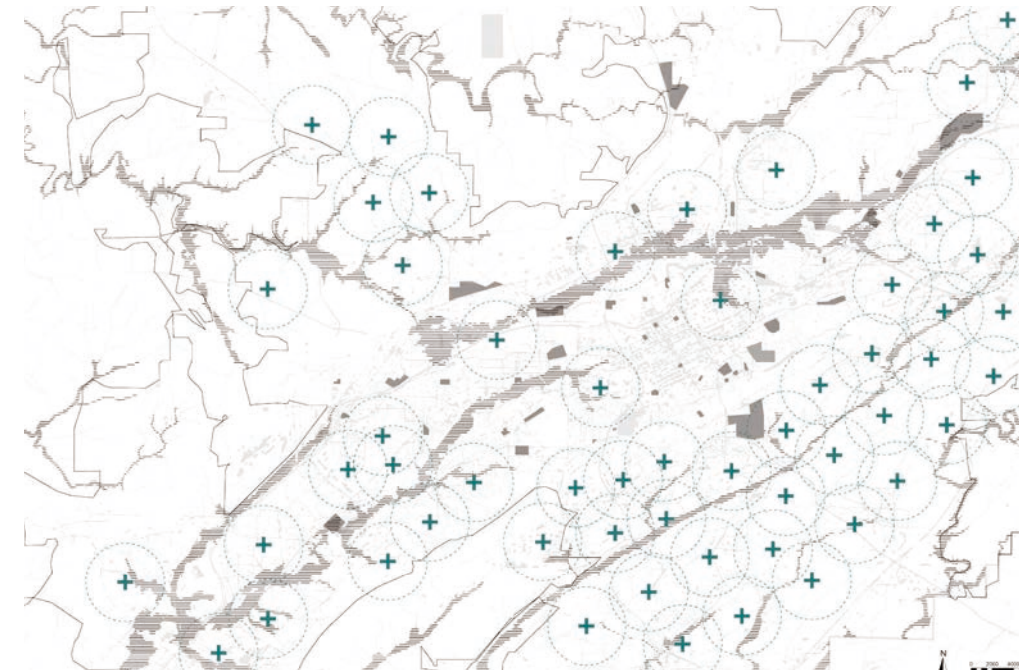
Besides the systematic idea, material and plants, psychological recovery strategy and community engagement also need to be considered.



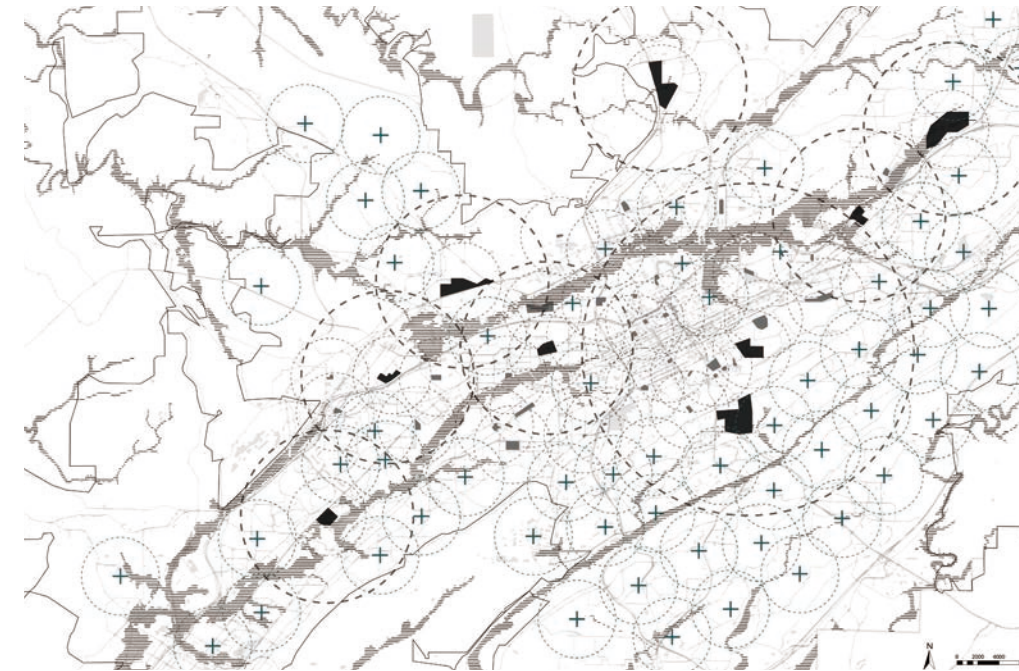
The existing parks in city region. Based on the scale and on-site topography, parks' serving radius could be estimated.



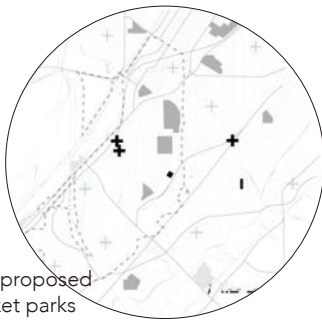
According to the disaster report, tornadoes are often followed by flooding to disturb the urban life cycles. So the parks and green spaces in the flood plain should take charge of the flooding control, and act as a protecting buffer for surrounding areas.



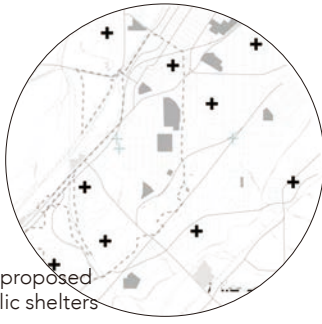
By figuring out the potential shelters and re-proposing the functions of parks, the whole city should be covered within the serving radius of park systems, especially those areas where population concentrates and where there are high risks of natural hazards.



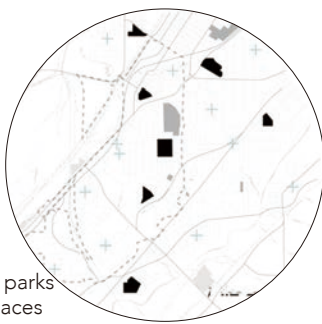
Re-proposed city park multi-system



Vacant lands proposed to build pocket parks



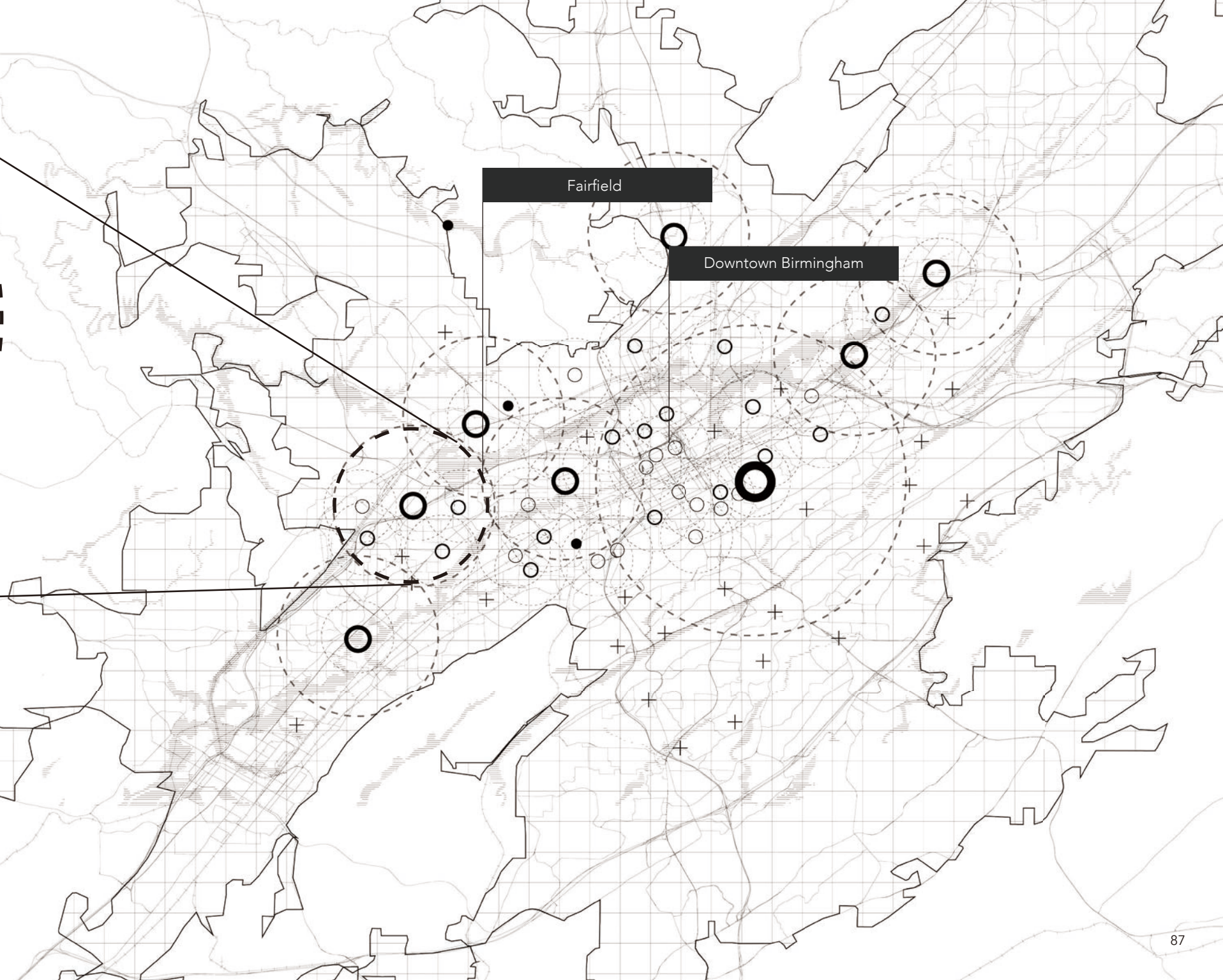
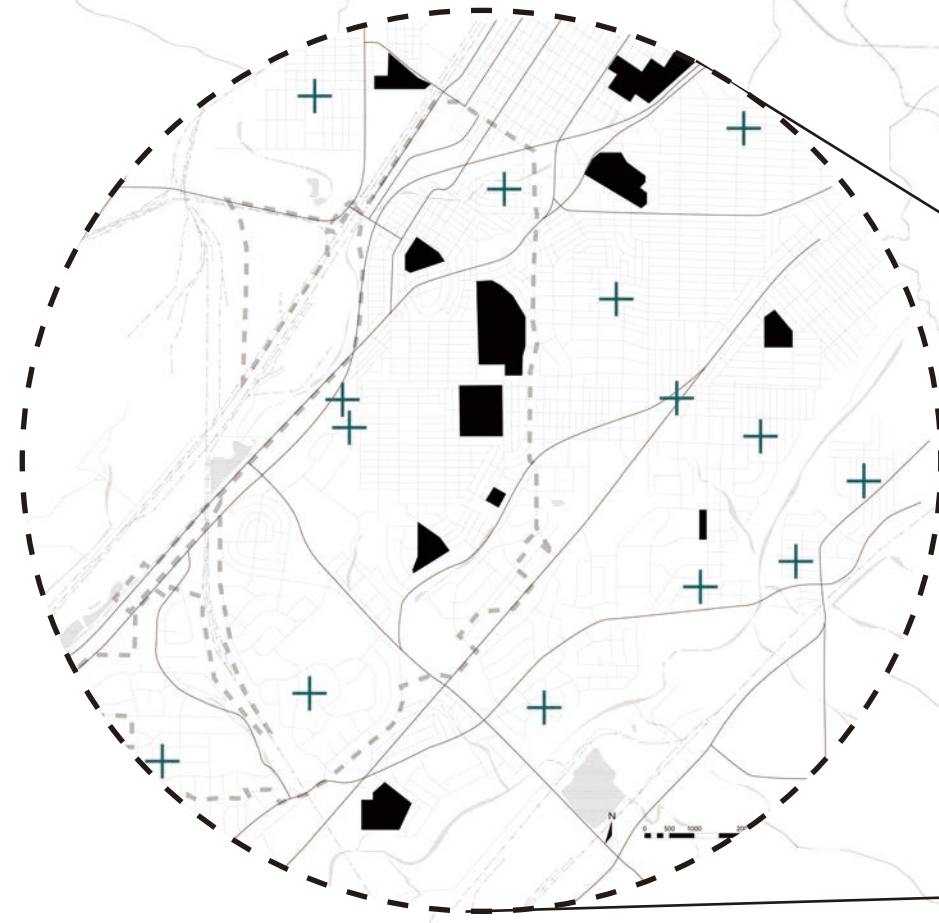
Vacant lands proposed to install public shelters

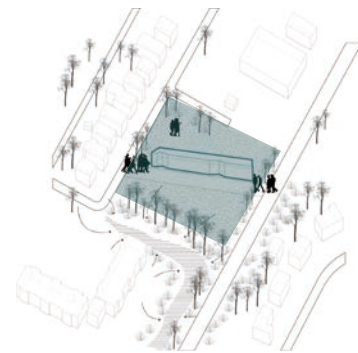


Middle-sized parks and green spaces



Large-sized parks and green spaces





S
Proposed pocket park



XS
Install public shelter



M
Middle-sized ballfield



L
Large-sized city park



F A I R F I E L D

Fairfield is a city in western Jefferson County, Alabama, United States. As part of the Birmingham, Alabama, metropolitan area and is located in southeast of Pleasant Grove with a population of 11,117 according to the 2010 census.

Taking the park single-system in Fairfield area as an example. Other systems in the vicinity will serve as the back-up system for Fairfield to support and promote recovery if this area is hit by a disaster.

The parks can be categorized by their functions and sizes.

All the small-sized spots are located within 15 minutes' walking distance from emergency sheltering.

The medium-sized spots like community parks and sports fields are used for short term sheltering, supplementation sub-section, or debris recycling station.

Some large-scale parks can be used for larger evacuation operation, and a relatively longer period of sheltering.

The regional-scaled parks function as the food and power supplier for post-disaster recovery, aiming to promote the recovery process.



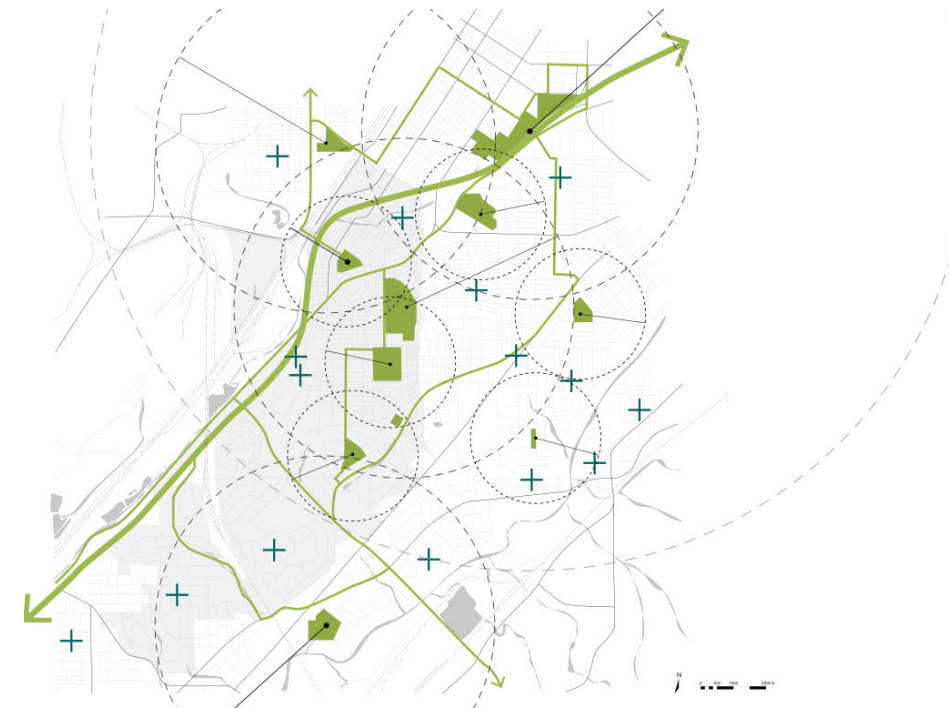
Existing park location



Park's serving radius



Proposed transportation system



Re-proposed shelters



The existing park is half-sized than the proposal. By recognizing vacant and abundant surrounding areas, the adjacent school playground and abundant community properties could be reused and serve as a part of the city park.

This park is acting as a sports center for the region, which includes four baseball fields, two football fields, ten tennis courts, a children's playground with equipments, an indoor recreation center, and an indoor community library.

The design site lacks storm water management, leaving almost fifty percent of the area at the risk of being flooded.



DESIGN PROPOSAL OF ENSLEY PARK

Besides of to design the Ensley park as an emergency arrangement highly centralized complexity, the park should be designed with the perception of 'node-link' system and to ensure the day-to-day life criteria for citizens and survivors.

The design proposed to encourage the existing ball games on-site and build every facility transformable to perform differently based on different situations.



The Ensley park is designed to ensure the requirement as listed below:

1. Emergency transportation for non-stop services
2. Highly centralized camping area for survivors to live for at least one month
3. Emergency medical care and rescue for citizens who get injured
4. Storm shelters to prepare for disasters and secondary disasters
5. Supplementation storage for regional supply and recovery process
6. Debris collection and recycle to decrease the material waste and promote regional economy
7. Public engaged recovery activities for survivors to heal the psychological trauma

DISASTER



PREPAREDNESS

EMERGENCY

RESTORATION

RECOVERY

DEVELOPMENT

EVACUATION

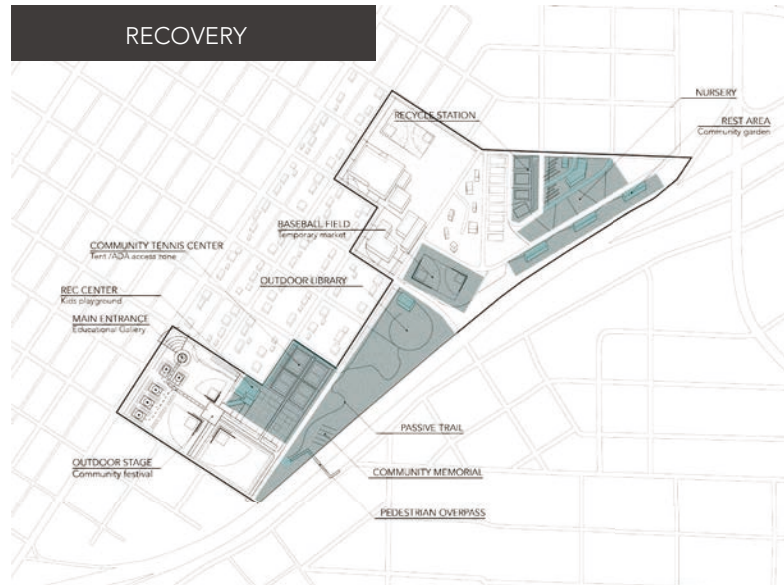
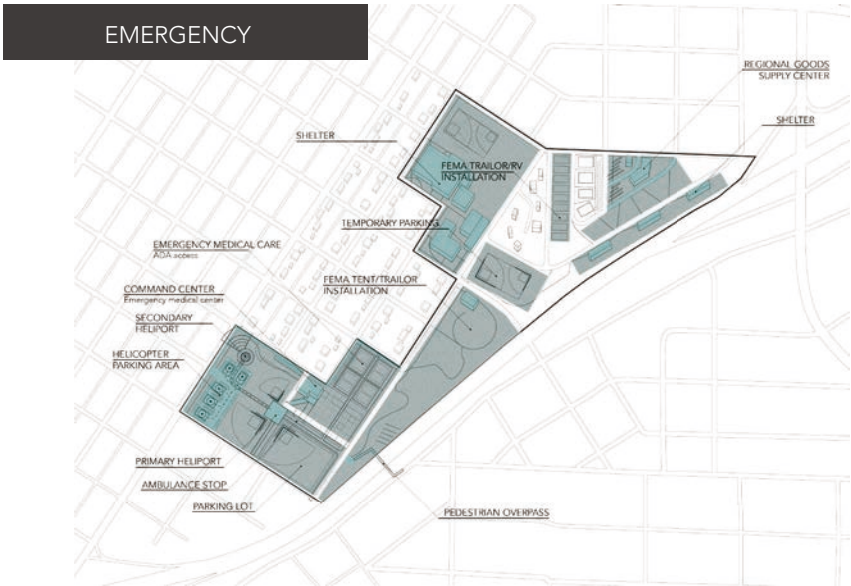


FEMA EMERGENCY RESCUE
MEDICAL CARE



ON-SITE ACTIVITIES





S I F F O R T I N G P E R F O R M A N C E

While the park is designed certainty, the performances on-site are shifted to adapt different circumstances.

All the facilities applied in the park can ensure both of the pleasure needs and emergency needs.

For instance, the Baseball field is designed with painted dash line on the ground. In the day-to-day time, the dash line can help to measure the distance and for kids to play with. During the emergency time, the dash line will be acting as an emergency parking lots with clear parking spot outline.

The community recreation center will be transformed to the emergency medical center with an extension clinics.

The passive woodland is designed to ensure the temporary camping and 'the critique of day to day life'.

The plant nursery will be transformed to supply truck and utility service truck parking spots.

The pavilions will become the public storm shelters for citizens who seeks for sheltering.

H E L I P A D + H E L I C O P T E R P A R K I N G

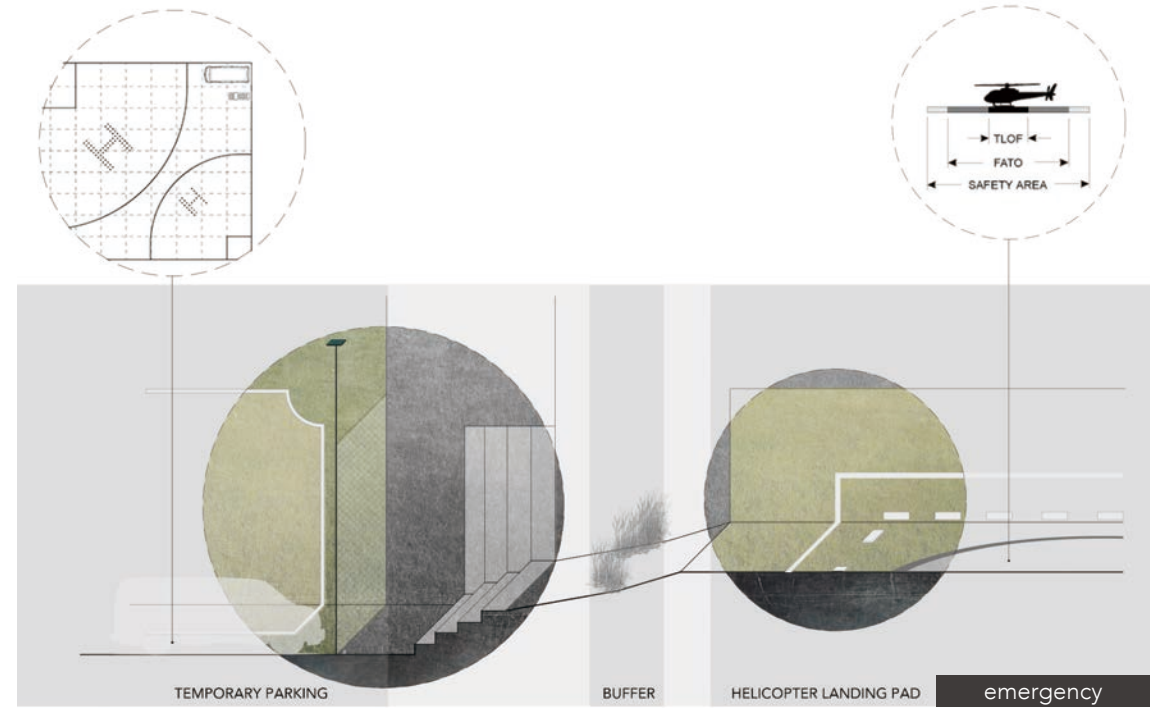
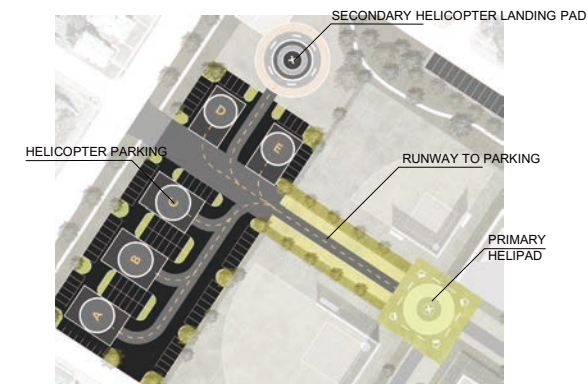
There are two helicopter landing pads proposed in the park. The primary helipad is located in the center of the community baseball field complex with eight feet higher than the surrounding ball fields. The secondary helipad is located at the park main entrance and designed with entrance water fountain.

The existing parking lots are redesigned and repainted with dashed navigation clue and clear helicopter parking spots.

B A L L F I E L D

The Baseball field is designed with painted dash line on the ground. So that, in the day-to-day time, the dash line can help to measure the distance and encourage kids to play with.

During the emergency time, the dash line will be acted as an emergency parking lots with clear parking spot outline on the ground to separate the emergency transportation circulations.



ON-SITE CIRCULATION

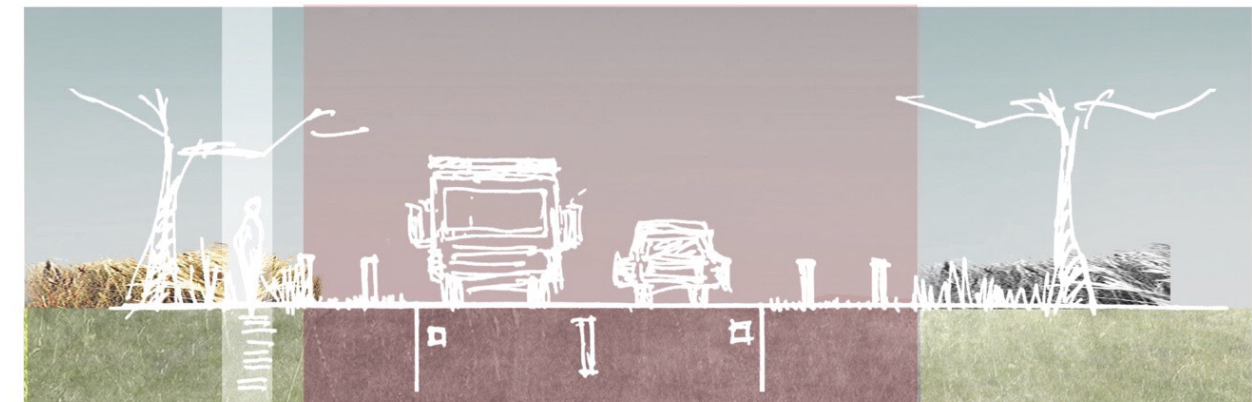
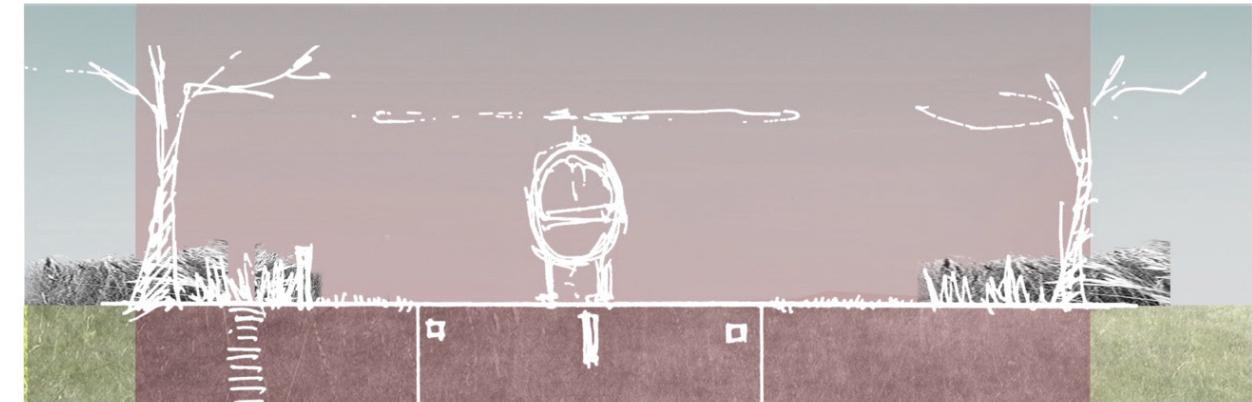
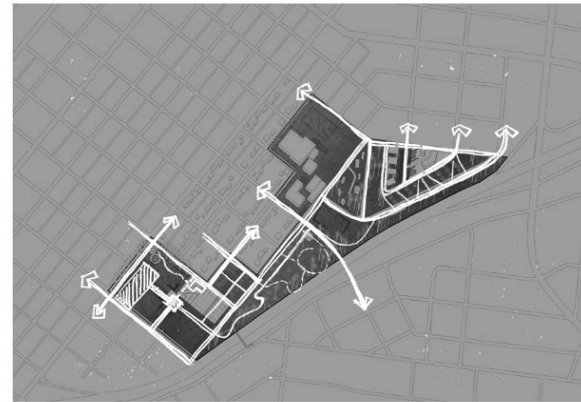
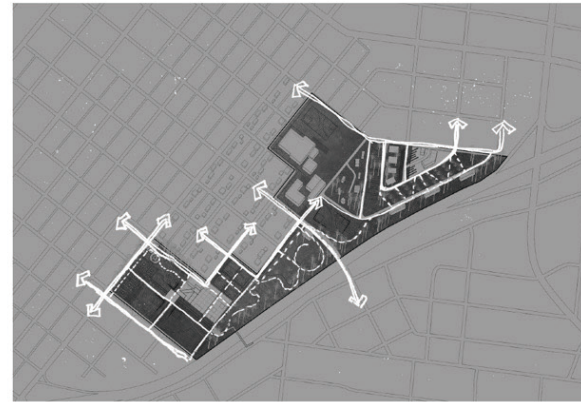
The on-site traffic control plays an important role to help ensure the non-stop emergency transportation and emergency rescue.

One way to control the traffic is to place several bollards at the entrances.

By closing the roads, vehicles won't be able to pass through the park, a safety, and quiet recreation space will keep serving the citizens.

By half open the entrances, emergency service trucks will drive through the park, picking up injured survivors and dropping off supplies. At the same time, tall grass planted by roadside will become the vegetation buffer to separate cars and people.

By closing the entrances but opening the roads, a safety helicopter runway will be ensured.

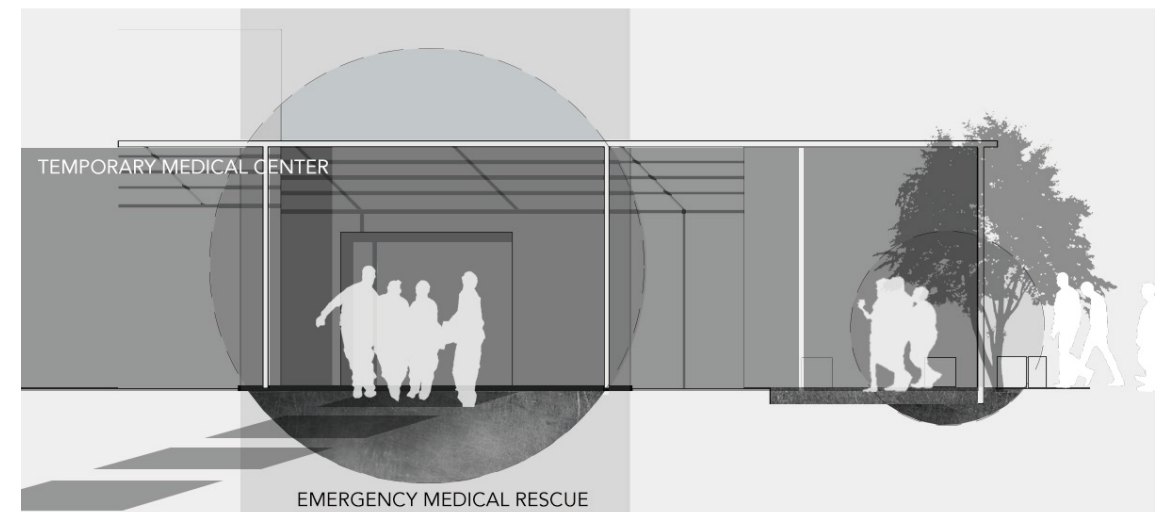
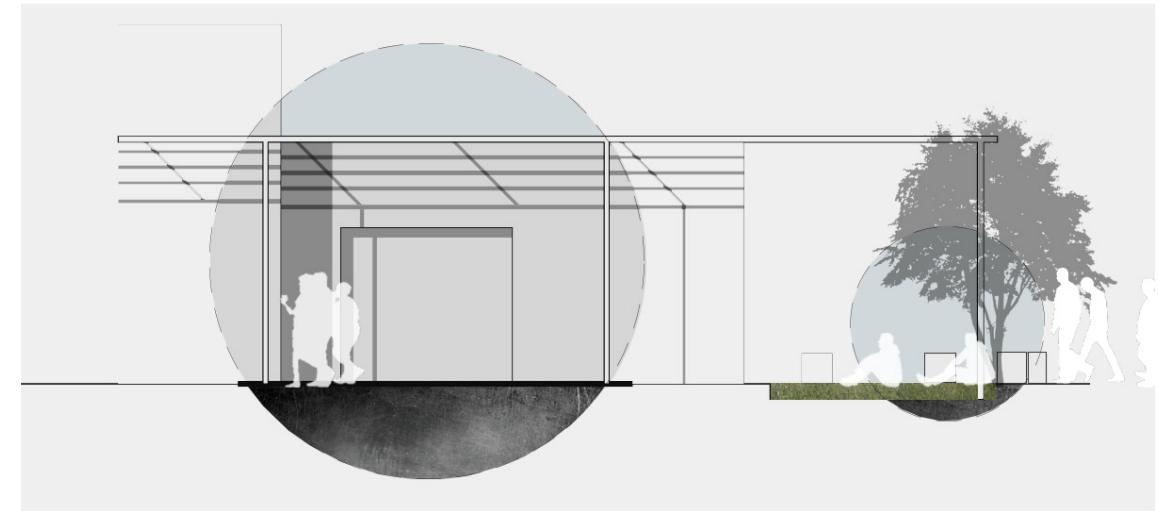
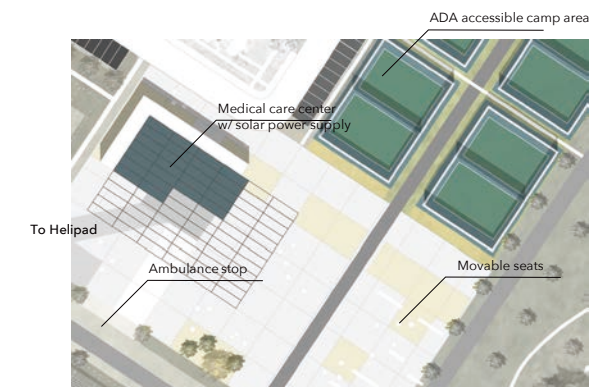


R E C C E N T E R +
M E D I C A L C E N T E R

The existing community recreation center is a fully constructed structure. The design proposes to extend the indoor area and create a flexible zone with pavilions on top.

During the ordinary time, this area can provide shades and seats for elder people. They can use this pavilion for chat and picnic. The solar panels installed on the rooftop can collect and provide power for lights and other facilities.

When the emergency comes, the rec center will be used as the emergency medical center. The pavilion area will perform as a temporary clinic with closed curtains or folding doors, and provide a safe indoor area for patients. Badly injured survivors could be picked up by either helicopters or ambulances. The movable seats can be reordered to make temporary beds for patients.



O U T D O O R L I B R A R Y + T E M P O R A R Y C A M P I N G

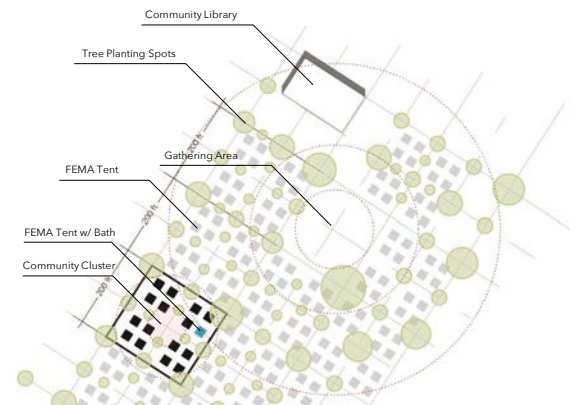
The outdoor library is a turf grass covered flat area with few mature oaks. The design proposed to transform this area into FEMA camping zone for survivors.

Using the idea of the "critique of everyday life," to build the disaster landscape, which exists not only as a disaster structure but also as a parallel to the "normal structure" (pre-disaster). The disaster landscape should ensure the community normal activities and encourage the community cohesiveness.

This area is planned to plant trees along the 100 ft by 100 ft grid to create outdoor living rooms. Over time, the trees will provide a comfortable shady woodland for a community.

During the day to day time, people can use this area as an outdoor library or passive trail.

When the emergency comes, the planted form becomes the priority. FEMA will help to install the tents based on this form. While the disaster passed, this area will be highly utilized by the concentrated community, which can easily generate stress and panic emotions. Each formed square area will provide power and gathering area for people to chat and help to release the high pressure. People from the same community could be gathered and create a cluster.

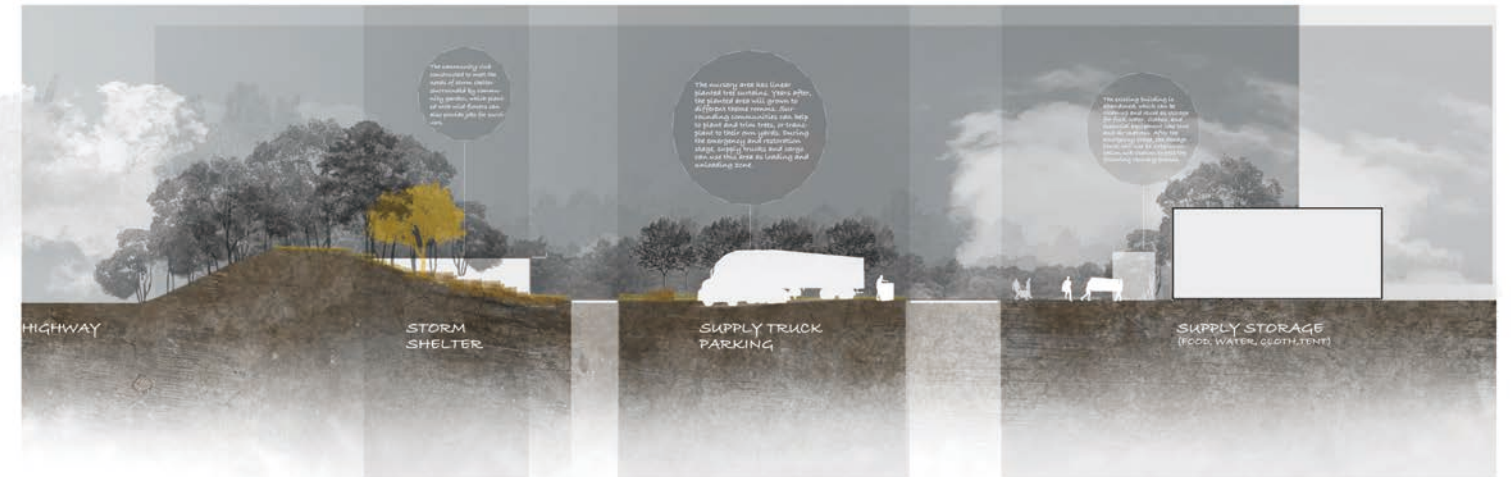
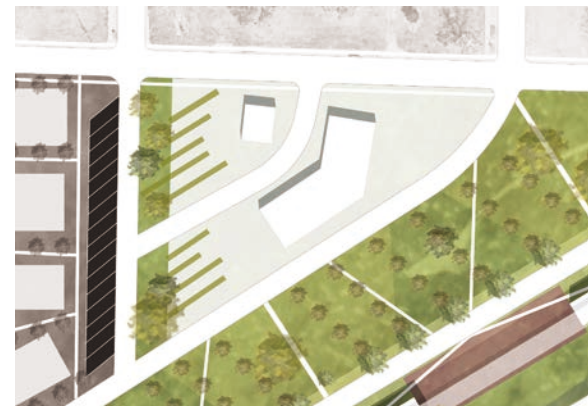
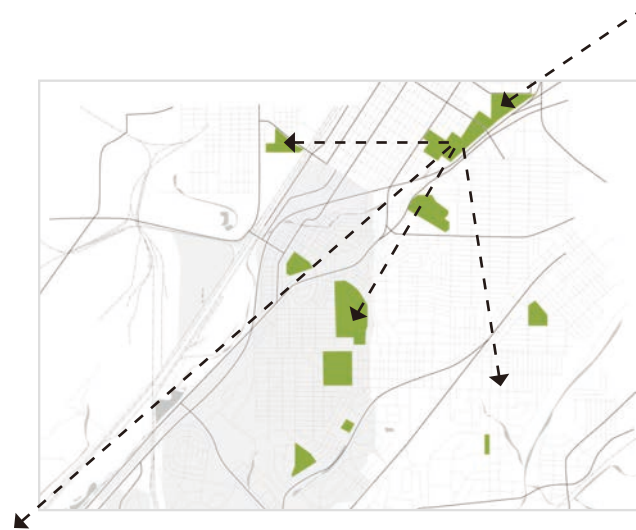


C O M M U N I T Y C L U B +
N U R S E R Y +
S U P P L Y S T O R A G E

The community club constructed to meet the needs of the storm shelter. Surrounded by the community garden, which planted with wild flowers can also provide jobs for survivors.

The nursery area has linear planted tree curtains. Years after, the planted area will grow to different theme rooms. Surrounding communities can help to plant and trim trees, or transplant to their own yards. During the emergency and restoration stage, supply trucks and cargo can use this area as loading and unloading zone.

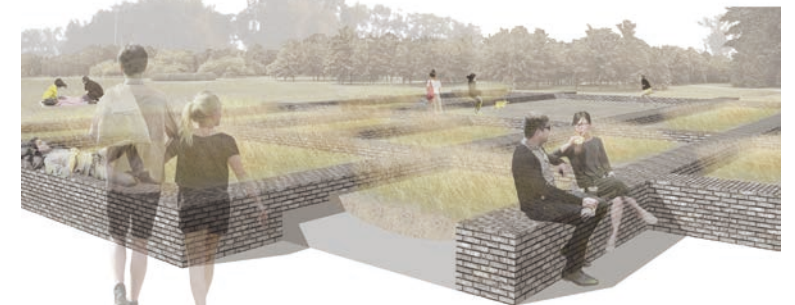
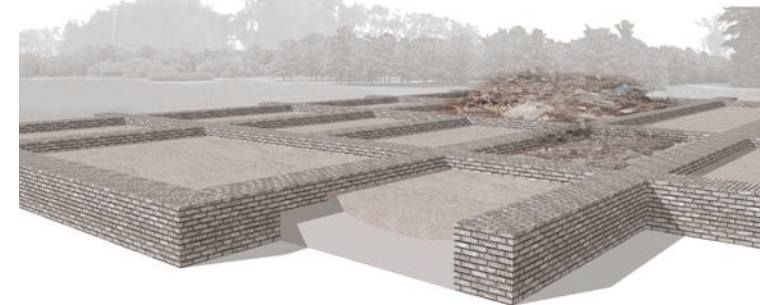
The existing building is abandoned, which can be clean-up and reuse as storage for food, water, clothes, and essential equipment like the tent and air mattress. After the emergency stage, the storage house will use as supplementation sub-station to help the following recovery process.



D E B R I S C O L L E C T I O N
A N D R E C Y C L E

Every time after tornadoes, debris clean-up takes at least ten weeks to complete. That debris usually has three ways to be treated: waste incineration, landfill, material recycle and reuse.

Debris treatment usually cost both money and time and left environmental impacts like pollution and damage. To collect debris and waste in different classifications can help to promote the debris treatment process, and help to relatively recover the local economy by reuse the materials.





R E F L E C T I O N S

As shown above, the redesigned park system could immediately respond to the emergencies and severe weathers, and transform its performance from 'recreation mode' to 'emergency mode' to adjust itself to fit the appropriate situation.

While the park system has been designed to get ready for disturbances, the notification program should be next step.

How to build the park system be well-known to the community?

For instance, the Tokyo Rinkai Disaster Prevention Park made a set of classes and trainings enhance its awareness.

The notification program should be easily observed and understood by the public realm. Some similar experience courses could be applied to the Birmingham's park multi-system.

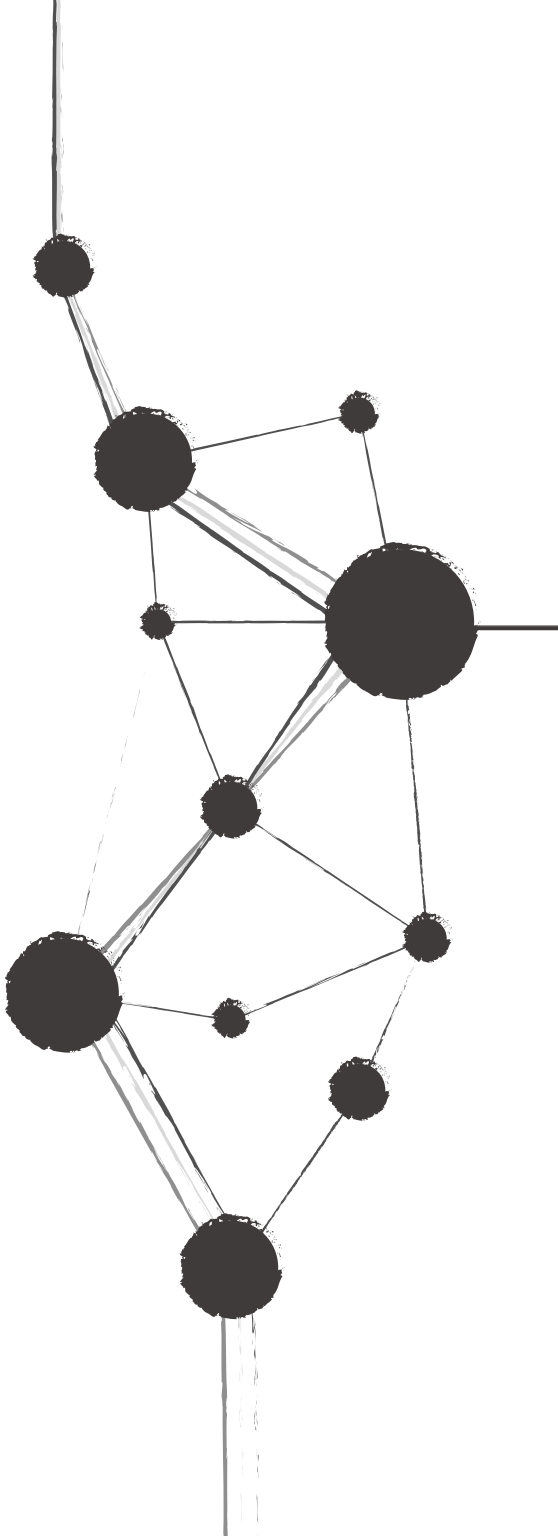
In the further research, the research and test area should be extended into the community by reform the streetscapes and signage systems.







VI
CONCLUSION



- CAN PROACTIVELY ENCOURAGE THE DISASTER RECOVERY PROCESS, AND GET READY FOR THE UPCOMING DISTURBANCE AND CHAOS.
- CAN OFFER A MULTIDIMENSIONAL VIEW OF THE PROBLEM BY BEING ABLE TO WORK ACROSS A VARIETY OF SCALES AND UNDERSTAND MULTIPLE INFLUENCING FACTORS.
- PLAY AN INTEGRATING, FACILITATING ROLE BETWEEN DISCIPLINES AND THE WIDER COMMUNITY ARE CAPABLE OF FACILITATING THE REGENERATION OF MORE VIBRANT, SUSTAINABLE, RESILIENT COMMUNITIES.
- ARE MOST SENSITIVE TO THE NEEDS OF PEOPLE AND OF THE NATURAL ENVIRONMENT AND THE CO-DEPEND- ENCE OF CULTURAL AND BIOPHYSICAL DIMENSIONS.
- HAVE AN ABILITY TO PRODUCE CREATIVE (GRAPHICAL) VISIONS AND INNOVATIVE SOLUTIONS TO INTEGRATING MULTIPLE OBJECTIVES.
- HAVE AN ABILITY TO RECONCILE WHAT THE LAND IS DICTATING.
- UNDERSTAND THE WHOLE PROCESS OF REGENERATION, NOT JUST WHAT TO DO, BUT WHO CAN/SHOULD BE INVOLVED, HOW BEST TO TAKE ACTION AND WHEN TO IMPLEMENT STAGES OF CONSTRUCTION.
- ARE KNOWLEDGEABLE IN URBAN REGENERATION, GREEN INFRASTRUCTURE, URBAN ECOLOGY, AND SUSTAINABLE URBAN DESIGN PRACTICES THAT CONTRIBUTE TO RECONSTRUCTING A CITY THAT IS MORE SUSTAINABLE AND RESILIENT TO FUTURE HAZARDS AND CHANGES.
- ARE CONCERNED WITH REGENERATING SENSE OF PLACE, CULTURAL IDENTITY AND MEMORY IN OUR CITY, AT A TIME WHEN SO MUCH PRE-EXISTING CHARATER HAS BEEN DESTROYED.

THIS RESEARCH AIMS TO ANSWER THE QUESTION OF 'HOW A CITY PARK SYSTEM CAN BE RE-DESIGNED TO PROACTIVELY ENCOURAGE THE TORNADO RECOVERY STRATEGY' THROUGH THE DESIGN TESTS. IT ALSO TRIES TO PUSH A NEW LANDSCAPE PERCEPTION.

IN THE DESIGN TESTS PRESENTED, A CITY PARK IN TUSCALOOSA HAS BEEN RE-PROPOSED, AND SYSTEMATIC IDEA HAS BEEN TESTED IN BIRMINGHAM. A RE-DESIGNED PARK SYSTEM HAS BEEN APPLIED TO THE CITY OF BIRMINGHAM AND HAS CONSIDERED ALL GREEN SPACES AND PARKS AS A WHOLE. AS TESTED, THE REDESIGNED PARK SYSTEM COULD IMMEDIATELY RESPOND TO THE EMERGENCIES AND SEVERE WEATHERS, AND TRANSFORM ITS PERFORMANCE FROM 'RECREATION MODE' TO 'EMERGENCY MODE' TO ADJUST ITSELF TO FIT THE APPROPRIATE SITUATION.

FOR THE FURTHER RESEARCH, THE TEST AREA SHOULD BE EXTENDED INTO THE COMMUNITY BY REFORM THE STREETSCAPES AND SIGNAGE SYSTEMS. THE RESEARCH SHOULD BE MORE CLOSED TO THE LIVELIHOOD, WHICH MEETS THE PUBLIC NEEDS.



VII

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