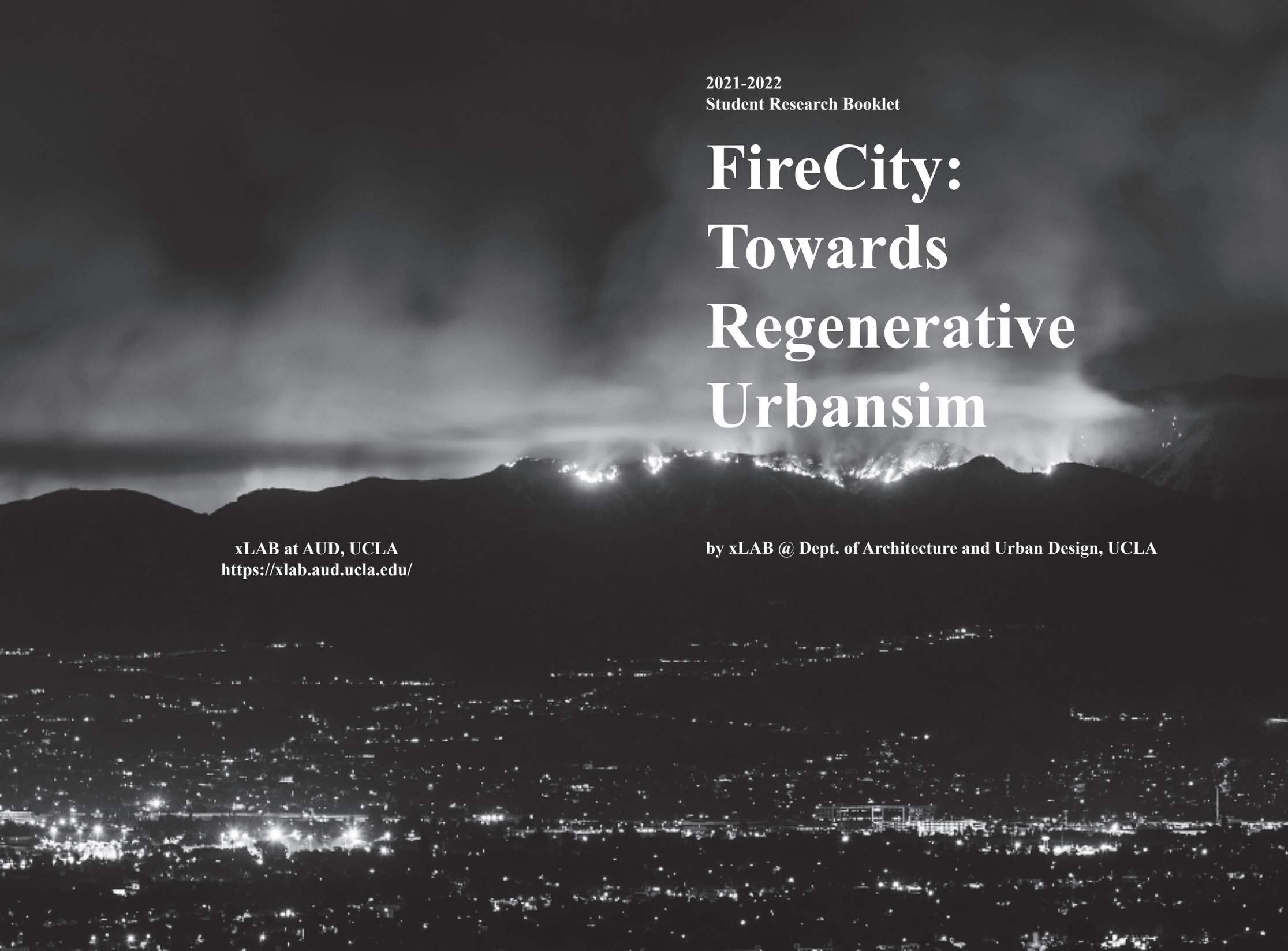

2021-2022
Student Research Booklet

FireCity: Towards Regenerative Urbansim

xLAB at AUD, UCLA
https://xlab.aud.ucla.edu/

by xLAB @ Dept. of Architecture and Urban Design, UCLA

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FireCity: Towards Regenerative Urbansim

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Forward

Across the globe, 21st-century cities face a growing number of technological, social, and environmental challenges. The increased intensity of global risk establishes an urgency to define new strategies for designing buildings, cities, and environments. Various efforts by many entities have taken place to address this issue. One such effort is ArcDR3 (Initiative for Disaster Risk Reduction and Resilience Initiative), an international collaborative project led by the UCLA xLAB and the International Research Institute of Disaster Science at Tohoku University in collaboration with the Association of Pacific Rim Universities and involving 14 studios at 11 universities in the region. This project investigates a methodology, named "Regenerative Urbanism," for building disaster-resilient environments through design studios linked to research on disasters in various regions by each university.

In adopting and modifying the global ArcDR3 Grand Syllabus to the Los Angeles regional context, the FireCity research studio focuses on the fire-risk-reduction and fire-resilience, both at Wildlife Urban Interfaces (WUIs) and within interstitial multi-hazard zones within California. This studio engages with relevant authorities and experts within the UCLA community and beyond. It will operate as a combined think tank whose culminating projects will contribute a vital array of design visions and knowledge to the ArcDR3 initiative.

This collection of essays presents a series of perspectives by the students on Regenerative Urbanism, an updated paradigm of resilience in urban design. Its strategies are conceived as mitigatory and anticipatory, with ideas of adaptability, flexibility, mutation, and symbiosis embedded in their methods and techniques to ensure the unfolding of more robust, balanced, and just societies.

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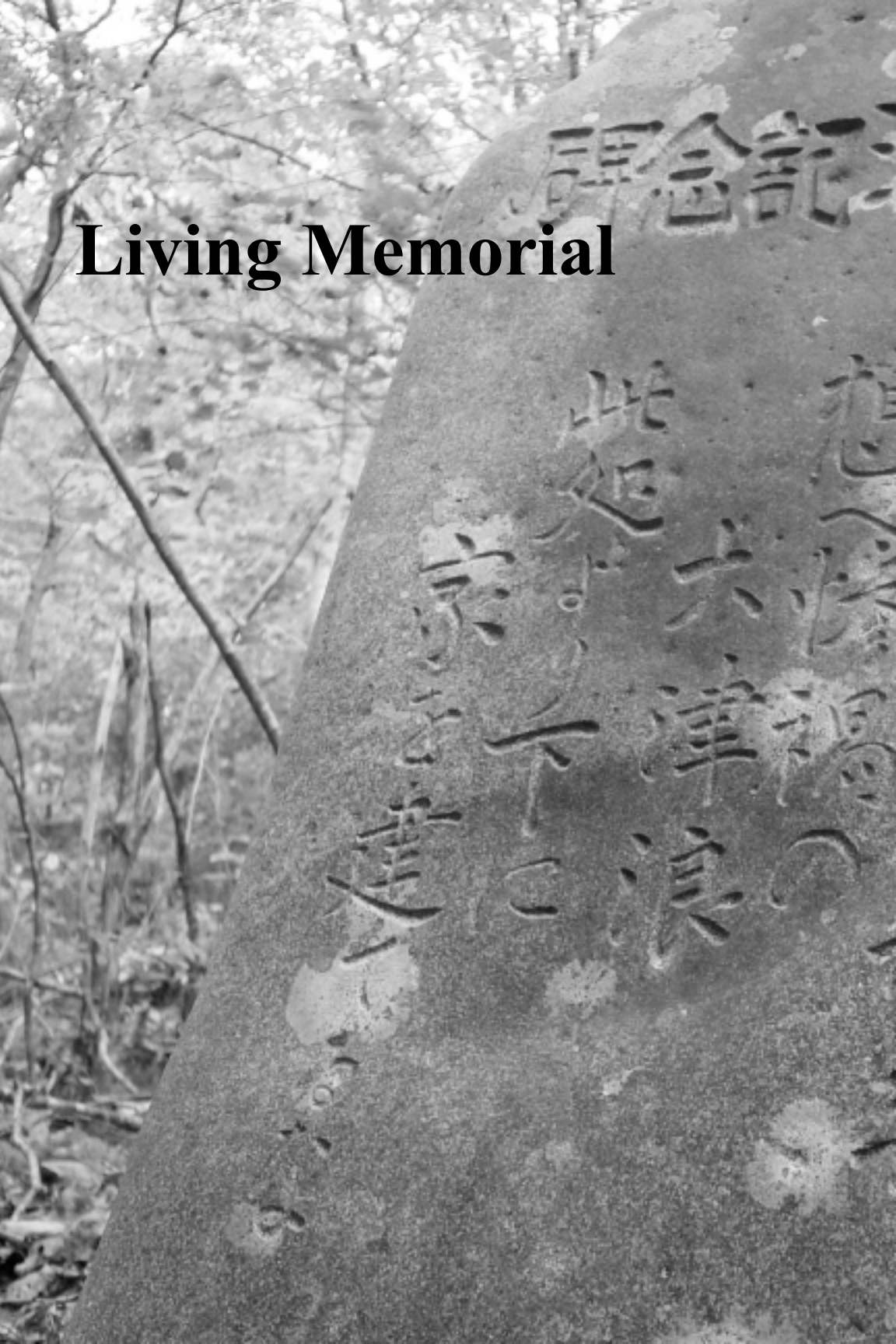
Living Memorial



Giant Tsunami Memorial, T. Kishimoto, 2011

Living Memorial

Julie Shay and Marina Archangeli

After disasters, Regenerative Urbanism must serve as a living memorial to commemorate loss at a personal, communal and local scale while acknowledging the strength and resilience that the community embodies. The term regenerative connotes processes or things that renew, restore or revitalize themselves and their own sources of energy and materials. Regenerative Urbanism creates a balance where buildings, people and their surroundings, both natural and man-made, work together to restore resources rather than deplete them. Living Memorials can deepen the understanding and definition of Regenerative Urbanism as they are dynamic and revitalizing, providing new opportunities for community recovery, growth and inspiration. A Living Memorial is transformative and creates new life and meaning in the wake of a disaster, whether that be social or environmental.

Traditional memorials often consist of monuments where visitors, whether personally touched by the event being commemorated or members of the community, can come, pay their respects, express solidarity and remember the event, catastrophe or individuals, that resulted in loss. Traditional memorials are so pervasive across cultures and continents that numerous spaces and structures can be conjured in seconds: the Lincoln Memorial in Washington, D.C., the Hiroshima Peace Memorial, the Taj Mahal, the Washington Monument, and scores more. Traditional memorials can take many forms: statues, dedicated buildings, public art, museums, arches, highways, or parks and need not be erected in the same or nearby space as the event it memorializes.

Traditional memorials may also seek to inspire a better future; remembering a great individual can inspire visitors to strive for similar greatness, remembering tragedies can serve to warn the public of possible dangers and inspire them to learn

from the past in order to work towards a different future. Traditional memorials are embedded in our cities and do not conflict with Regenerative Urbanism. While traditional memorials do inspire reflection, empathy, a sense of community and even action, living memorials are intrinsically dynamic, requiring rather than allowing exploration, experimentation and discovery.

The Salk Institute

The Salk Institute in La Jolla, California, designed by Louis Kahn, was created to be a place for excellence and for creative minds to come together and collaborate for the greater good. A golden engraving lies on the floor at the entrance to the institute: "lies in dreams, in imagination and in the courage of those who dare to make dreams into reality." This golden engraving honors Jonas Salk, but this is not the essence of why this institute is a Living Memorial. In 1949, a polio pandemic tore through the world and with no cure, it maimed children, killed adults and instilled fear across the world. So fearful were parents that a new phrase was coined, "summers without children," to describe the empty swimming pools, playgrounds and parks during the summers of the early 1950s. In 1955, Salk's polio vaccine liberated the world from this ruthless virus. His work changed the course of history helping to end the fear of annual outbreaks and the havoc that they wrought. While the Salk Institute honors the memory of Dr. Salk, its purpose, its design and its reason for being is to serve as a Living Memorial to the catastrophe that was the polio pandemic and to provide a space to continue conducting research that can solve the world's problems.

Salk Institute, Doug Letterman, 2017

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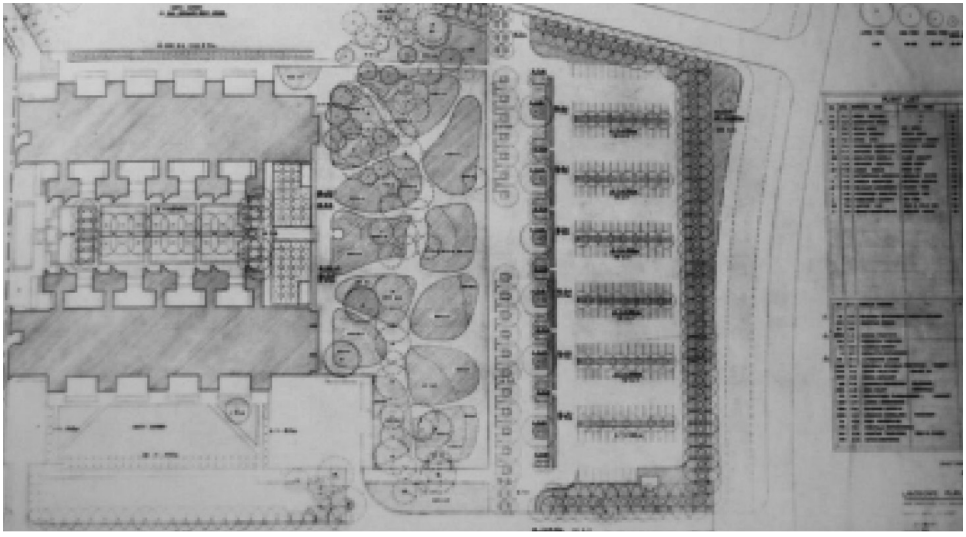
When looking at the architectural design of the Institute, there is a striking difference between the façade that is oriented to the east and the one that is oriented to the west. The windows face towards the ocean, giving the western face of the buildings a human scale and more transparent façade. Because there are no windows on the eastern facade, it has a much different scale from the face to the west and an opaqueness faces the city. By strongly emphasizing the connection towards nature and the humanity of the buildings, the physical design of the Salk Institute relates to Regenerative Urbanism due to the orientation towards nature and because of how it considers the scale of the human and how both humans and nature interact with the structure.



Salk Institute Landscape Plan, Posted as Modern Monumentality, Louis Kahn, by Virginia Duran, 2013 (The initial plan called for a planted center court which was ultimately left as unplanted to connect the two buildings to one another.)

The Salk Institute is a Living Memorial rooted in a past disaster that endangered humanity and works toward bringing people together in an environment that supports finding innovative solutions and discoveries to new threats to humankind. Far from only remembering or even learning from the past, the Salk Institute inspires new generations of researchers to make new discoveries and provides the space to make that possible. For instance, The Harnessing Plants Initiative is researching a new approach to fight climate change by optimizing a plant's natural ability to capture and store carbon and adapt to diverse climate conditions. Another example, the Conquering Cancer Initiative, is a scientific initiative to bring scientists together to find new strategies to cure deadly cancers, including pancreatic, ovarian, lung and brain cancers. Through the ongoing research at the Salk Institute, scientists continue to work towards a different future that is more well informed by the research findings and results.

Freshkills Park

Barges transport waste to Fresh Kills in 1973, A Filthy History: When New Yorkers Lived Knee-Deep in Trash, Hunter Oatman-Stanford, 2013.

Freshkills Park is an example of Regenerative Urbanism because it transforms a previously unusable area into the largest park in New York City. Fresh Kills landfill was in operation for over 50 years; it opened in 1948 and served as the main landfill for household garbage in New York City. At its most busy time, over 10,000 tons of garbage arrived every day. While many other landfills were closed throughout New York City due to developing environmental regulations, Fresh

Kills was allowed to remain open.

Order that was agreed upon between the city and the state, resulting in it becoming the largest landfill in the country. However, the landfill was closed in 2001 due to public pressure and beginning shortly thereafter, plans for a redevelopment of the space began.

The park is in the process of being redeveloped into productive public space which will provide public programming, including nature hikes, kayaking, public art and birdwatching. Despite the park not yet being fully open and operational there is already a calendar of events published that includes research and education opportunities for the public. The sustainable reuse of the land meant that no new land needed to be cleared to create recreational facilities for the city, but the park plans go much further than just creating space for the public. Field Operations, the landscape architecture firm behind the Draft Master Plan, incorporated open grasslands and waterways into a cohesive plan that provides new habitat suitable to a variety of vulnerable species and local wildlife.

Fresh Kills Park, Draft Master Plan, 2006

Because of the renewed landscape, rehabilitated habitat and public programming options, Freshkills Park is an example of Living Memorial. The park goes beyond

just creating something new and useful from something that was previously abandoned, it is becoming a completely revitalized landscape that educates its visitors and has become a space for community engagement. New York could have very easily closed the Fresh Kills landfill and left it as an inaccessible landscape. However, the city has created not only a community asset but also a space for ecological resurgence, public education programming and a connected network of paths, recreational waterways and roads. Freshkills Park is a Living Memorial because of its relation to the history of New York City and the revitalized areas for public use.

One World Trade Center

NYC's biggest buildings and best-known towers are welcoming back workers with ritzy extras, Edmund J. Coppa, 2021.

One World Trade, completed in 2014 and designed by David Childs and a team at SOM, is the main building of the rebuilt World Trade Center in New York City. The construction of the new tower was part of an effort to memorialize the area where the Twin Towers previously stood and to demonstrate the resilience of the city and commerce. The building was designed to be the tallest building in New York and the Western Hemisphere and become a new icon on the New York skyline. These efforts were intrinsically tied to the current building code at the time and both the architects and structural engineers took it upon themselves to imagine a new set of rules to follow that could then be adopted across the city to ensure that future buildings would not succumb to a possible terrorist attack.

When it came to the design of the Freedom Tower, the design team created something grounded in the "real." For some, that could be constituted solely as a building being constructed, but the Freedom Tower goes further than being a "beacon of light" or inspiration after a catastrophe. There was an intention to create a space that memorializes a catastrophe but also serves as a living and energetic center of world commerce in which people will work, collaborate and visit: a memorial that is very much alive and regenerative. While the architect's ambition was to create a simple, yet monumental, building that would become a new landmark in Manhattan, they also worked with their structural engineering team to design a structural system that would make One World Trade Center the safest tower ever built, something that was as yet undefined by the building code and would go on to influence the design of building codes in the Manhattan area. The design and inclusion of their hybrid concrete and steel structure utilized ultra-high-strength concrete at 14,000 psi which was the strongest concrete ever poured in New York. Through conversations with emergency responders and other community members, the design team included a concrete "core [that] contains two interlinked access stairs and a dedicated first-responders' stair – to allow first responders to climb the building quickly in the event of an emergency, while people escape – a feature that is now standard in New York building codes." Designing for a future as-yet-unwritten code demonstrates the forward thinking nature of the design team and shows how proactive thinking can be wrapped into the planning of a Living Memorial within the context of New York. The Freedom Tower is an example of Living Memorial because the structural system of the building created a new standard that had previously been unimagined in Manhattan. It took the lessons learned from the worst modern day catastrophe in New York and turned them into something productive that could be used for future skyscraper design.

These memorials bring people together and are able to fold the past into the present, educating people and lifting their spirits. They are alive and are active agents of change that encourage community engagement and education, and are spaces for living, working, problem solving and creating a better present and future. The Salk Institute is a space for scientists to conduct research and continue to strive to better the world's ills; Freshkills Park is over 2,000 acres dedicated to habitat rehabilitation and community education; the Freedom Tower created a new standard of building in New York that means new additional new buildings in the city will be safer and stronger. These three projects cover different scales, from research institute to urban park to building standards and despite operating on different scales, demonstrate how people can come together to take inspiration from a catastrophe and turn it into a productive use of space that serves as a positive example for others to follow.

In designing a memorial to seminal events in our history today, Regenerative Urbanism must be a central concern. This can be seen as a limitation, but instead

should be viewed as an opportunity to create a design that not only embeds an important memory into the social consciousness but also rejuvenates itself rather than becoming a drain on society or worse, a relic. Efforts must go beyond the prototypical idea of rebuilding to incorporate community education and engagement as well as provide the opportunity for new uses. More than the types of materials used or replacing buildings that were destroyed, a Living Memorial offers the community an opportunity to reflect and remember the past events while at the same time providing spaces to help the public move toward a more productive and better world.

Regenerative Urbanism as a Meta-Morphological Fabric

Pixabay

Regenerative Urbansim as a Meta-Morphological Fabric

Angelica Luna and Claire Rosenberg

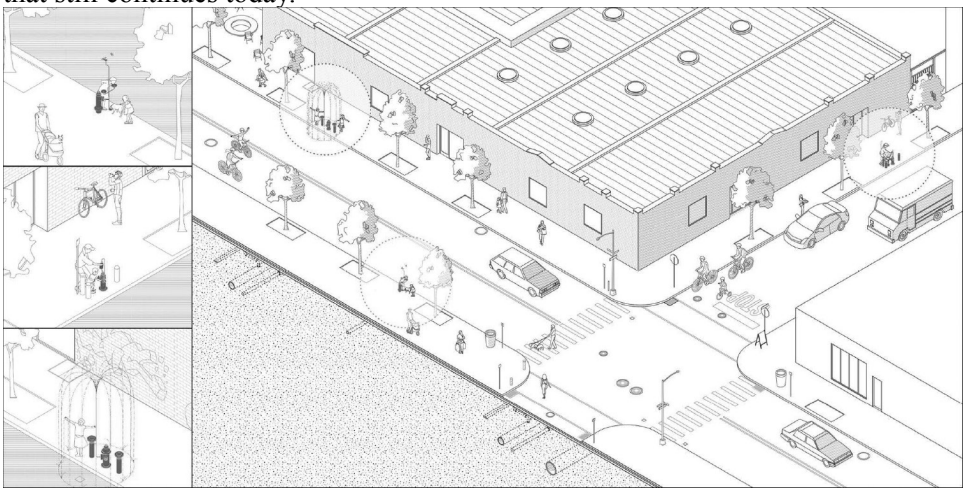
Regenerative Urbanism as a meta-morphological fabric proposes a system of interwoven elements, as opposed to megastructures, individual discrete parts, or interdependent parts, which can account for system redundancies and flexibility in response to disaster. Such parts are dynamically embedded within the existing urban fabric or the fabric of everyday life, and have multiplicitous uses aside from just one solution-based function. Disaster preparedness systems which are integrated into the existing condition, whether that existing condition is infrastructural or social, have a variety of benefits: 1) They can be more widely employed and adopted, 2) They can benefit the individual or community outside of their disaster-driven purpose, and 3) They can facilitate connections through their networked approach. Through an examination of case studies at a variety of scales – from the fire hydrant, to the use of micro grids, and finally to cultural burning – a new understanding of urbanism emerges which is characterized by the non-hierarchical, the dynamic, and the scalable.

Fire Hydrant

For an example of a meta-morphological fabric, one needs look no further than just outside their door. Something that is typically only encountered as an annoyance due to its association with parking restrictions, the simple fire hydrant is an illustrative example of a distributed micro-network. In 1801, Frederick Graff patented the first fixed above-ground cast iron hydrant (Brown 2019). The distributed network of fire hydrants in a city depends on each individual hydrant's GPM (gallons per minute), which dictates the minimum number of fire hydrants on a city block and their average spacing (Yuill 2017). A hydrant's GPM can

be determined by its painted color, which quickly indicates to firefighters how much water is available. In certain places, a hydrant's color can reveal even more information, such as interior corrosion or potability.

Beyond their prescribed function, fire hydrants have a variety of other uses – not all of them intended, and some of which are even illegal. With these uses in mind, the fire hydrant is an apt example of a diverse tool which is well-integrated within the urban fabric. Quite familiar are black and white photographs of children playing in the spray of illegally opened hydrants on a hot summer's day, a practice that still continues today.



New Public Hydrant, Tei Carpenter and Chris Woebken, 2018, (Images courtesy of chriswoebken.com)

This practice also continues legally in some communities, which provide their residents with low flow sprinkler heads to attach to hydrants and cool off in particularly hot weather. In a more top-down approach, in the New York City heat wave of 1896, then chief of police Theodore Roosevelt approved the opening of fire hydrants to provide relief, sending teams of men around the city to hose down the asphalt to bring the temperatures down (Davies 2010). Additionally, fire hydrants are often the most accessible parts of a water distribution system, therefore completely interwoven within an existing macro-network. Given their accessibility and station-like character, certain groups can request permits to access water from fire hydrants, such as contractors for temporary water use or residents who wish to fill their swimming pools. They are also a convenient gauge to monitor water system pressure and detect leaks.

Tei Carpenter of Agency Agency, in collaboration with designer Chris Woebken, tapped into these multiplicitous, often overlooked uses of the fire hydrant in their project New Public Hydrant. With an interest in exploiting existing small-scale

infrastructure, Carpenter and Woebken proposed a series of open-ended and flexible fixtures and extensions to hook up to fire hydrants such that they could be used as a drinking water source (for both humans and animals) in New York City, where tap water is clean enough to drink without requiring filtration (Kwun 2018). Bright blue faucet fixtures attach to hydrants for filling a water bottle while other extensions attach to serve as drinking fountains, dog water bowls, bird baths, or a sprinkler to play and cool off in. The project's re-analysis of the fire hydrant spotlights a powerful micro-solution which is embedded within the existing macro-network of our water system. It not only takes disaster (in this case, fire) as a given, but also has the potential to produce a scalable system characterized by a flexible network which hosts multiple micro-solutions to a variety of macro problems.

Microgrid

Another level of resilience within the urban fabric is microgrids. Microgrids create a distributed network of power and services that offers infrastructural support to help communities quickly recover after disaster. For many regions, however, the macro power grid is currently part of the critical infrastructure that supports other kinds of important infrastructure, whose resiliency has become progressively more essential (Wang 2020). The growing occurrence of extreme natural events and subsequent blackouts emphasize the need for an available power supply that can be sustained through these disruptions, to allow critical services and communities to quickly recover (IEEE 2022). Microgrids can enhance the resilience of power systems during emergencies by planning for these events and supporting a community's ability to bounce back. Microgrids are relatively small, controllable power systems composed of one or more generation units. Their loads can connect to the local power grid continuously, but also be disconnected from its macro-grid during extreme natural events and operate autonomously, powered by diesel or renewable energy. Additionally, several multiple microgrids can be connected to form a series of smaller networked distribution systems that can share energy resources and better bolster a neighborhood's resiliency (Wang 2020).

In these cases, a network of microgrids can support each other to provide continuous power supply and prevent the collapse of needed infrastructure. This prevents bottlenecks to services and allows communities to be more self-sustaining . For example, the Stay Lit program by Feed the Second Line and Glass Half Full are outfitting New Orleans restaurants with solar panels so that when the main grid crashes after a hurricane, they can continue to feed the city. The initiative is fundraising for equipment and to cover installation costs for restaurants to pre-plan solar powered resilient restaurants around the city, especially in the most vulnerable neighborhoods, where there are higher percentages of poverty and more people who are unable to evacuate (Feed the Second Line, n.d.). These

restaurants then become part of a network of decentralized resilient "safety hubs" that actively support their communities. With these restaurants already dispersed throughout the city, the outfitting of microgrids enable these restaurants to become meeting points during disasters. This also allows communities to connect families, receive resources, and help begin recovery. Thus this series of microgrids, whether operating as autonomous islands or working as neighborhood networks, can help bolster a community's resilience by becoming interwoven within a neighborhood and ensuring services can be provided to survivors. This supports not only safety during an emergency, but facilitates connections and enables community members to be supported during the rebuild process.

Left: Resilient Restaurants, 2009 (http://www.forecastsolar.com), Right: Hot Meal after Hurricane, 2005 (https://newsday.co.tt/)

Prescribed Burning

Another method of preventative integration is cultural burning. This process involves creating a series of small controlled fires which integrate community action with a networked resistance against wildfire. Beginning as an indigenous practice, cultural burning prepares the environment to reduce the intensity of wildfires by removing fuels, allowing for increased biodiversity, and expressing the cultural practices of indigenous communities. For more than 13,000 years, native tribes across California and the world used small intentional burns to renew local food, medicinal, and cultural resources, create habitats for animals, and reduce the risk of larger, more dangerous wildfires. By clearing overgrowth of brush, the cool fires maintain landscapes as a biologically diverse and livable habitat for animals and promote better water flow and drought tolerance (Sommer 2020). It also reduces the risk of dangerous wildfires by burning different areas of the forest floor. This series of interconnected burns throughout a landscape creates diverse burn ages of the soil and avoids a large massing of fuel sources. In turn, this creates a mosaic of habitat fuel types, slows the spread of fires, and can reduce a fire's intensity (Avitt 2021). This use of "good fire" is not just about reducing the risk of wildfires, but is also an essential part of nature, influencing not only local environments but regional conditions as well.

After decades of fire suppression, indigenous groups have been reintroducing the practices of controlled burning to cultivate fire-shaped landscapes and in turn, change perspectives. An example of successful controlled burning is the recent KNP complex fire, where the regular burns conducted by state officials and indigenous communities have been credited with the minimal damage to the sequoia forest park during the wildfire (National Park Service 2022). While controlled burning practices like prescribed burning have practical applications and have proven effective in mitigating wildfire, cultural burning has the additional benefit of reinforcing community, and providing education about the history and potential future of the landscape. These low-burning practices are further beneficial to not only undeveloped landscapes like national parks but human occupied spaces as well. In Tulsa Oklahoma controlled burning is being conducted around WUI adjacent neighborhoods over a five year period (Schuler 2020). This requires a team with intimate knowledge of the land as well as fire, slowly incorporating a series of micro fire practices throughout select areas of neighborhood and landscape. With the advantages of controlled burning being recently recognized, Governor Newsom recently signed legislation to further promote the use of burning practices in California (Smith 2021). This sets the stage for more communities to adopt the cultural practices surrounding "good fire" that not only protects the community but can become a cultural staple. By integrating cultural burns back into undeveloped and WUI regions, cultural burning offers a way to not only live with and manage fire, but use it to enrich and educate communities. Furthermore, Native American tribes working alongside firefighters creates an interconnection between not only micro fire events, but a network of groups including Native groups, non-native communities, and firefighters. Thus through both networks of fire and involved entities, at-risk communities can learn how to not only protect their homes and regional neighborhood, but also learn about the history of fire traditions surrounding cultivating materials, food, and developing bio-diverse habitats.

Left: Prescribed Burning, 2019 (Photo by Photograph by Kevin Cooley), Right: Communal Fire Burning, Forest & Rangeland Management 2019 (westgov.org/)

Disaster is inevitable. The rising frequency of disasters, both natural and man-made, over the past several decades indicates that "resiliency" is not enough.

Resilient approaches aim to withstand, and even to recover, but do not learn nor benefit from system stresses; they re-establish a prior equilibrium rather than adapting to new realities. In the case of cities and natural disasters, Regenerative Urbanism proposes a new way of thinking about responses to system stresses and incorporates them into the interface between the city and its environment. The systems within a city should not be viewed as separate entities, and the city itself should not be viewed as detached from its regional environment. The urban environment as a meta-morphological fabric introduces a framework with which to view the interface between the man-made and natural – the 'controlled' and uncontrollable. Through networks, flexibility, and multiplicitous solutions that engage with residents on both an infrastructural and social level, new disaster approaches can be imagined which can not only become part of the language of our everyday lives, but also even improve them.

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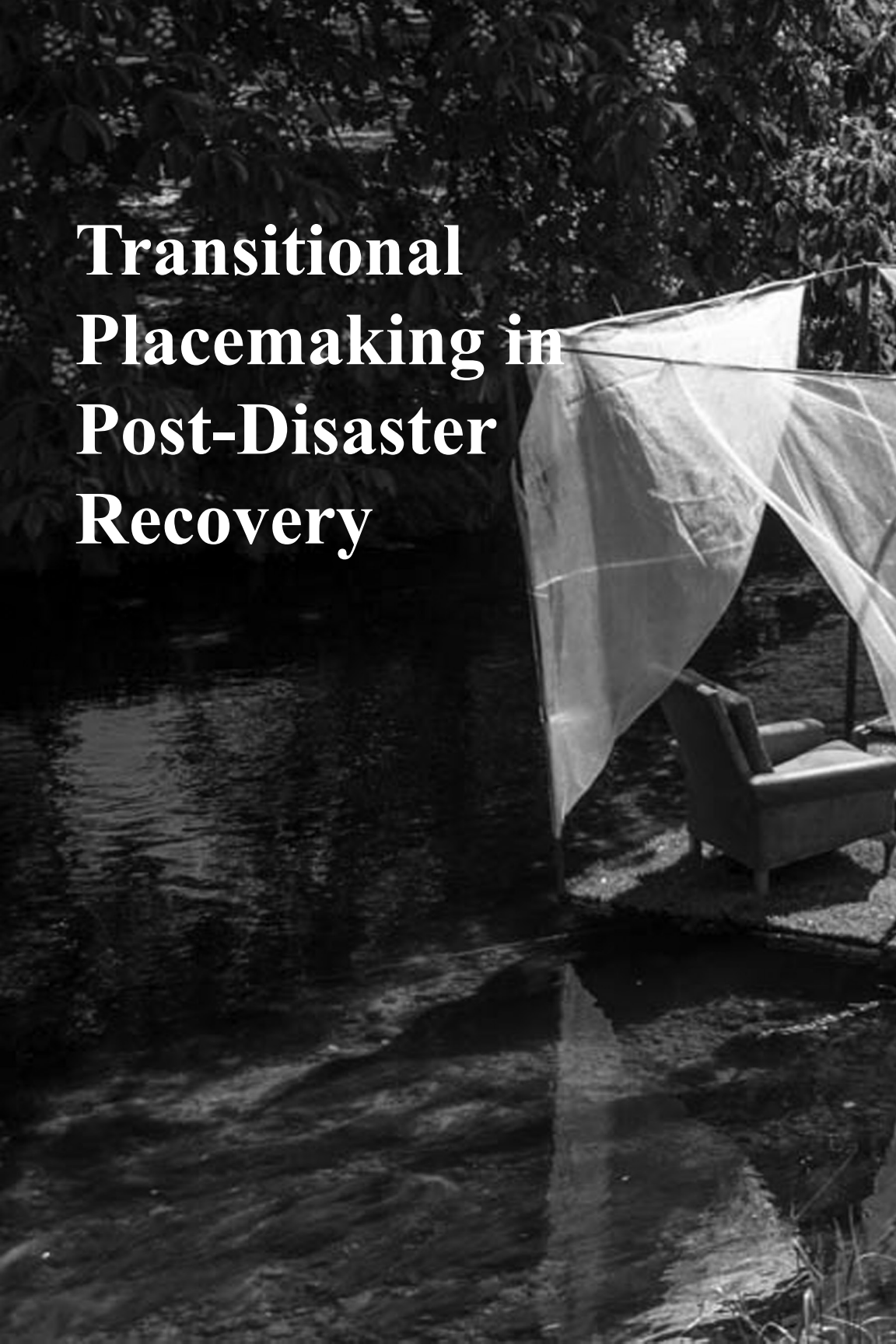
Transitional Placemaking in Post-Disaster Recovery



Floating structure on the Avon River part of the FESTA Canterbury Tales in Christchurch, New Zealand, Jocelyn Kinghorn, 2013.

Transitional Placemaking in Post-Disaster Recovery

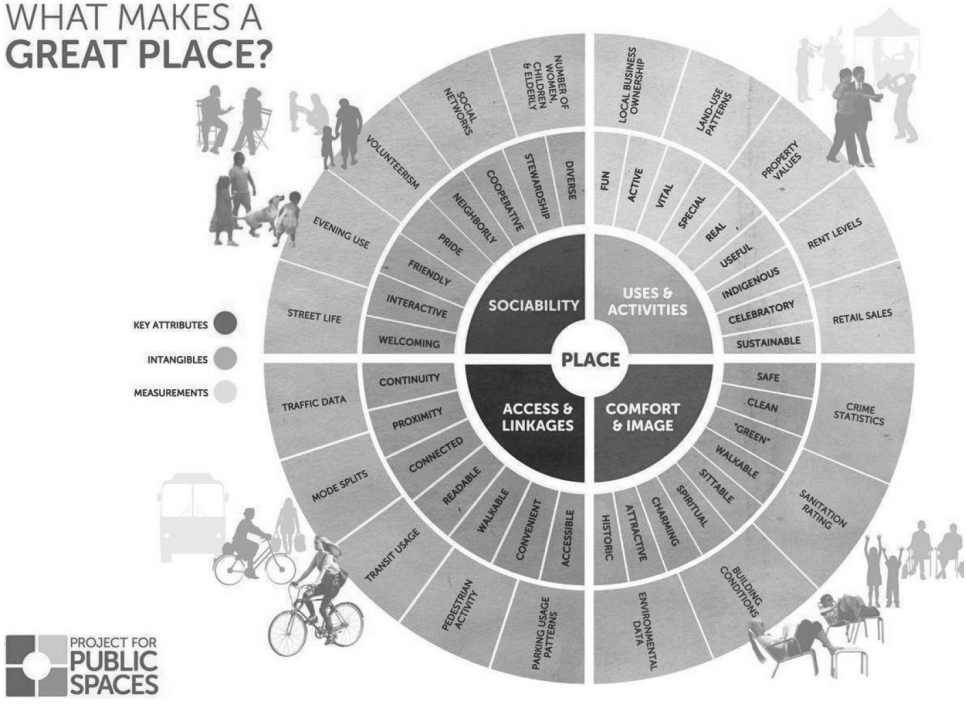
Monica Roh and Xiuwen Qi

Placemaking has been broadly defined as the process of negotiating the relationship between people and their environment. In contrast to urban planning, the concept of placemaking is more diffuse, as it includes a wider spectrum of actors and informal place-forming practices (Dimmer 2016). This essay proposes a concept of "transitional placemaking" in order to shift attention to more temporal means that happened during the transitional period between the occurrence of disaster and a full rebuilding and recovery of the affected entities. Placemaking helps to refocus planning on local involvement. While most planning processes are mainly reserved for experts, transitional placemaking opens up the process through engaging the communities and finding solutions at the local level. This also allows for things to move forward in a shorter time frame, often with the goal of being "Lighter, Quicker, Cheaper" (Fisher 2019). When people see the change, even those who are not actively involved in the first place because they think rebuilding is all the government's effort can be drawn into the process. One local, place-based solution can lead to broader long-term strategies and provides tools for quick action alongside local people.

Temporary Urbanism after the 2011 Earthquake in Christchurch, New Zealand

While sustainable urban development is commonly understood as a long-term strategy, natural disasters may interrupt this endeavor unexpectedly and force cities to rethink existing frameworks (Wesener 2015). Placemaking effort in the recovery from the 2011 earthquake in the city of Christchurch is closely tied with the emergence of temporary urban interventions. Some of them are transitional retail spaces that support the local retailers in bringing people back to the city

center. Some of them are small-scale public facilities that create gathering spaces or the communities to restore social interactions. Transitional placemaking is used as an overarching guideline that people should take action, feel involved, and physically engage in the rebuilding of the city. These initiatives can be considered as testing grounds in parallel with the 'official' planning process. They aim for quick and direct actions that can provide lessons learned for future permanent solutions. Christchurch City Council (CCC) recognized transitional spaces as an opportunity and provided financial support by establishing the Transitional City Project Fund (TCPF) to improve and enrich the community's experience and participation in Christchurch's recovery (CCC 2014).



(Fig. 1) The existing "Place Diagram" by the PPs. source: (PPs 2003b).

The first example is the Re: START Mall, a temporary shopping area that opened only 8 months after the earthquake (Fig. 2). It is located adjacent to Ballantynes, the surviving and much-loved traditional Christchurch department store. It consisted of a number of converted shipping containers that housed over 50 businesses, as well as food trucks, markets, artworks, and street performers. The idea is to encourage not only the residents but also local retailers who were displaced to return to their central city. Re: START Mall includes a specialist grocer, a handmade shoe shop, and an independent bookstore. These kinds of shops used to populate the buildings in the historic part of town, which was the worst hit during the earthquakes. The project architect Anton Tritt from the Buchan group

described why using containers to build a temporary shopping precinct. Containers are strong, modular, ubiquitous, and most importantly exude a sense of safety in an earthquake zone. They are pierced with windows, folding doors, and canopies, and painted in bright and cheerful colors. Plenty of spaces are created for intimate and sheltered gatherings. The design of the mall was well-received that it gave a boost to the economic activities during the post-disaster recovery phase. It was included in the Lonely Planet travel guide and attracted many tourists. The Re: START mall was a critical hub for connecting people through retail activities for 5 years until the permanent retail developments. The success of the temporary mall also inspired a number of design responses in the permanent mall. For example, the small-scale laneway and courtyard retail model with anchor tenants was subsequently used in several projects. This demonstrates the capacity of grassroots placemaking to act as a testing ground to shape permanent regeneration solutions.

(Fig. 2) Left: Re:START Mall, Iain McGregor/Stuff, 2011, Right: CityUps, FESTA, Erica Austin, 2014.

The second example is FESTA, the Festival of Transitional Architecture. Amid the chaos and uncertainty of the disaster, citizens in Christchurch recognized the loss of civic space for public activities. The scope of redevelopment extended beyond economic feasibility, into social enhancement. FESTA emerged in 2012 as a place-based weekend-long festival that celebrated urban creativity. It later turned into a biennial festival. Drawing on Christchurch‘s new culture of collaborative temporary urbanism, FESTA held a series of events such as workshops, and live performances, occurring alongside interactive installations and pop-up stalls. The events were financially supported by donors who seek to contribute to Christchurch’s ongoing regeneration. The LUXCITY (Fig. 3) in 2012 was the first invitation for people to physically go back to the central city since the earthquake. It was a moment of grief and loss for many when they see the damage, but the emotion soon gave way to delight and amazement when people had the chance to encounter others in the streets and became absorbed by the joyful architectural installations and urban activities. LUXCITY established the model for future FESTA events - bringing together different organizations in the city and developing networks and relationships. A large number of participants joined the event and collectively re-imagined the future of Christchurch. It celebrated the

active citizenship that emerged since the earthquake. This temporal recurring event also aimed to generate longer-term benefits to the communities after temporary solutions have been tested. It influenced the council and government authorities in making strategic plans for the city (Halliday 2017).

(Fig. 3) Left: Tens of thousands of people reclaimed the central city during LUXCITY at FESTA, Bridgit Anderson, 2012. (Fig. 4) Right: CityUps, FESTA, Erica Austin, 2014.

A Transitory Rescue Base

With earthquakes, an inevitable aspect of life in Japan, those most affected by these occurrences are often the small communities that live in these disaster-prone areas. Designers can recreate these lost places as a transitory space accurately by accounting for the specific needs and traditions of the local community they will serve. Each project is an opportunity to ensure that order and privacy amidst the chaos are ensured to those who need it most.

(Fig. 5) Left: Paper Church Kobe by Shigeru Ban Architects, Hiroyuki Hirai, 1995. Right: Interior of Paper Church Kobe, Hiroyuki Hirai, 1995.

The 2005 Paper Dome project (Fig. 5) was built by Shigeru Ban in light of the 1995 Great Hanshin earthquake, also known as the Kobe earthquake, which caused widespread damage to structures and infrastructure while displacing a large number of inhabitants within the Southern region of Hyogo Prefecture. The temporary church building, constructed of paper tubes, was built for the Takatori Catholic Church, located in Nagata-Ku, Kobe, and acts as a paradigm of a transient disaster relief center in the wake of disaster. The Takatori parish was made into a

rescue base, essentially acting as a community center which offered a place to stay for those whose place of worship had been destroyed, yet not entirely lost.

Perhaps the use of impermanent materials in conjunction with the ways in which these elements were assembled underscores the aim towards fashioning a once familiar place, all the while imbuing it with a momentary quality. The exterior facade had been enclosed in a skin of corrugated, polycarbonate sheeting, within which fifty-eight paper tubes (325mmx 14.8mmx 5m) were placed in an elliptical pattern. The space in between the eclipse and the outer edge of the rectangular site formed the corridor, providing lateral support. The entrance housed a widened spacing between the paper tubes, unifying the interior-exterior connection with the help of the fully-glazed facade. A majority of the materials utilized had been donated by various companies at the start of the project, the entire development of which culminated in a mere five weeks. Ban created and recreated a sense of place for local community representatives, the Takatori Church itself, and the non-profit organizations based in the Takatori district. Here, individuals and the society at large could gather in a community-based cultural exchange. Perhaps a significant outcome of the Paper Dome project is the fact that after the Takatori parish decided to build a larger, more permanent church structure, the Paper Dome was deconstructed in 2005 and donated to a Catholic community in Nantou County Taiwan. Taiwan had suffered from the 921 earthquakes of 1999 and was able to reconstruct their own place of worship using the very materials of the Paper Dome that had been shipped to them.

(Fig. 6) Soma City HOME-FOR-ALL by Toyo Ito & Associates + Klein Dytham Architects, Koichi Torimura, 2015.

(Fig. 7) Soma City HOME-FOR-ALL by Toyo Ito & Associates + Klein Dytham Architects, Koichi Torimura, 2015.

On the same note, yet another project that serves as an exemplar of a transitory space for a displaced community after the large-scale disaster is Toyo Ito and Klein Dytham's 2015 Soma City HOME-FOR-ALL project. This built project serves as an action of the Home-for-All initiative, which sought to build small community centers in the heart of the acres of temporary housing that were built to replace the 250,000 homes that were destroyed in the 2011 Tohoku earthquake and tsunami. Soma City HOME-FOR-ALL has been executed as a large straw hat that is held upright by cross-laminated timber columns which resemble trees (Fig. 7). This playful indoor space allows for children to play while also protecting them from the background radiation levels that have been of ongoing concern. If the children cannot play outside, the building, temporarily at least, evokes that same sense of playing in a park among nature; it is more than an indoor space, the small outdoor porch, or engawa, provides a smooth gradient from outside to inside, a balance with nature. The construction itself has called for the gathering of the community at large, with donations from all over Japan through the T-point card system and by construction material and equipment suppliers fully funding the project. In this sense, the structure acts as a common setting through which groups can lend their knowledge and skills to support socially regenerative efforts through a remaking of place. It is this transitional place that brings together the children and their families into one cohesive space and enables people to look to the future once again.

Social regeneration or the reestablishment of social and cultural ties that members of a disaster-stricken community lose hold of is perhaps an approach that architects and community members can take towards the rejuvenation of, and even the enhancement thereafter, of the bond between people and their sense of place. What's more, beyond the reconstruction of a place and its identity stands transitional placemaking, the very creative process which consists of impermanent materials in order to produce an ephemeral space. Transitional placemaking works with and perhaps transcends the material dimension of architecture to provide a temporal environment, one conducive to the same levels of sociability, comfort, and connection between people and their sense of place that was present before the occurrence of the disaster. The scope of development that results from this course extends beyond economic feasibility, into social enhancement; the process shifts to one of collaboration throughout the entire project development process through community values and their connections to such places; and infrastructure and buildings extend to provision for the needs of the community. Thus, ephemeral placemaking can be thought of as a framework through which the design and the granting of physical form and spatial aspects to a momentary place has imbued within it the social processes that compose the very places themselves; it focuses on people and their needs, desires, and visions for the place in which they feel contributes towards their identity.

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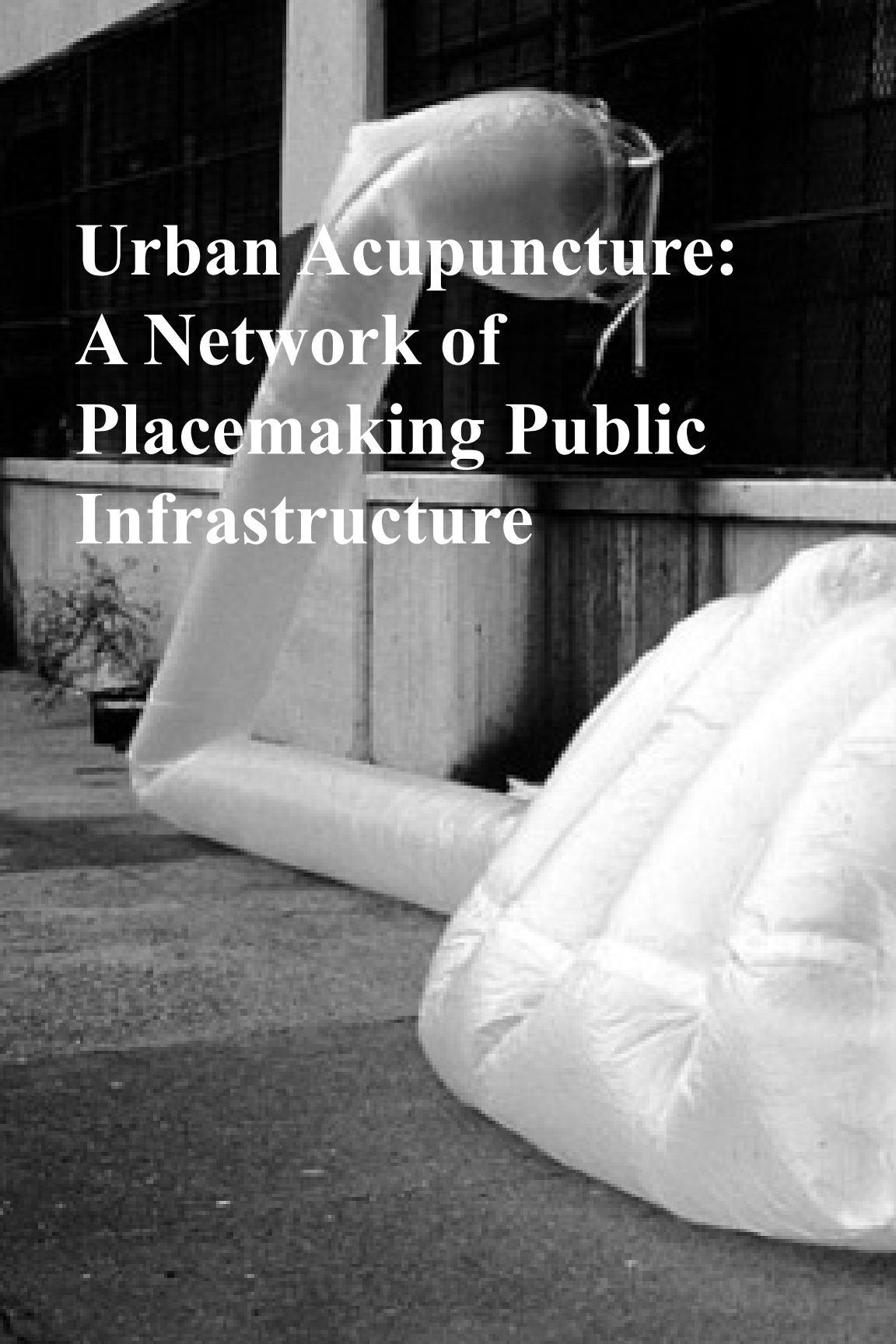


Urban Acupuncture: A Network of Placemaking Public Infrastructure

Plastic bags, polyethylene tubing, hooks, tape, paraSITE, Michael Rakowitz, 1998

Urban Acupuncture: A Network of Placemaking Public Infrastructure

Andrei Sharyshev and Gibson Bastar

The relationship between the built and natural environment is one that is lacking in harmony. As settlements grew into towns and towns into cities, building construction evolved and led to more substantial impacts on the surrounding natural environment. Additionally, the rapid and aggressive development of the natural landscape into commercial and residential property makes these communities more vulnerable to natural disasters. For instance, when forests that regularly experience natural burn cycles are razed and developed into residential communities, these communities have a higher risk of destruction by fire due to the surrounding environmental conditions. Though natural disasters are just that- naturally occurring phenomena- their frequency and severity have exponentially increased as our climate has become less hospitable. Over the last decade, cities and their surrounding context have been damaged or destroyed from unprecedented natural disasters in the form of fires, storms, and floods to name a few. Our research focus is across all phases of the disaster timeline, and specifically investigates how to improve recovery through enhanced social connectivity in the built environment.

The term Regenerative Urbanism addresses the iterative process of recovery after a disaster, seeking to rehabilitate and enhance the relationship between humans and nature, thus mitigating the impacts of future disasters on communities. In particularly vulnerable locations such as coastal cities and developments within the wildland urban interface (WUI), the conditions of a fragmented social climate only further this vulnerability and exacerbate the recovery process. Our research finds that an essential component of Regenerative Urbanism is a nimble and evolving constellation of communication, informing and protecting people before, during, and after disasters. This constellation manifests through a series of built

interventions throughout the city context, an urban acupuncture that is designed to stimulate the surrounding community through public programming and services.

Social capital is fundamental to building and sustaining community resilience, though it is a component that is experienced more than it is seen. The term refers to the networks that connect individuals to each other, providing recipients with information, reliable data on the trustworthiness of the other network members, and access to resources. (Aldrich 2017) Social capital can be understood within three distinct categories- bonding, bridging, and linking- that, when combined, lead to a well-connected community of individuals who can rely on one another before, during, and after disasters. Bonding social capital connects like-minded people with one another and can commonly be understood as the connections between members of the same family, and close friends. These connections tend to be with people from similar backgrounds, national and ethnic origins, and class. (Aldrich 2017) Bridging social capital encompasses a broader network, connecting individuals who may have many differences, but share a common interest or experience, often through institutions such as schools, clubs, or corporations. (Aldrich 2017) This form of social capital is essential in that it connects people who otherwise might not interact, leading to broader understandings of one's community and the people living in it. Linking social capital connects everyday individuals to people in positions of power such as elected officials. This type of social capital often occurs through more formal relationships established through community organizations and NGOs, as well as conversations at town hall meetings. In the context of disaster preparedness, linking social capital might occur through Community Emergency Response Team (CERT) training workshops. These teams and leaders would then be in contact with broader emergency response organizations, as well as local governing bodies.

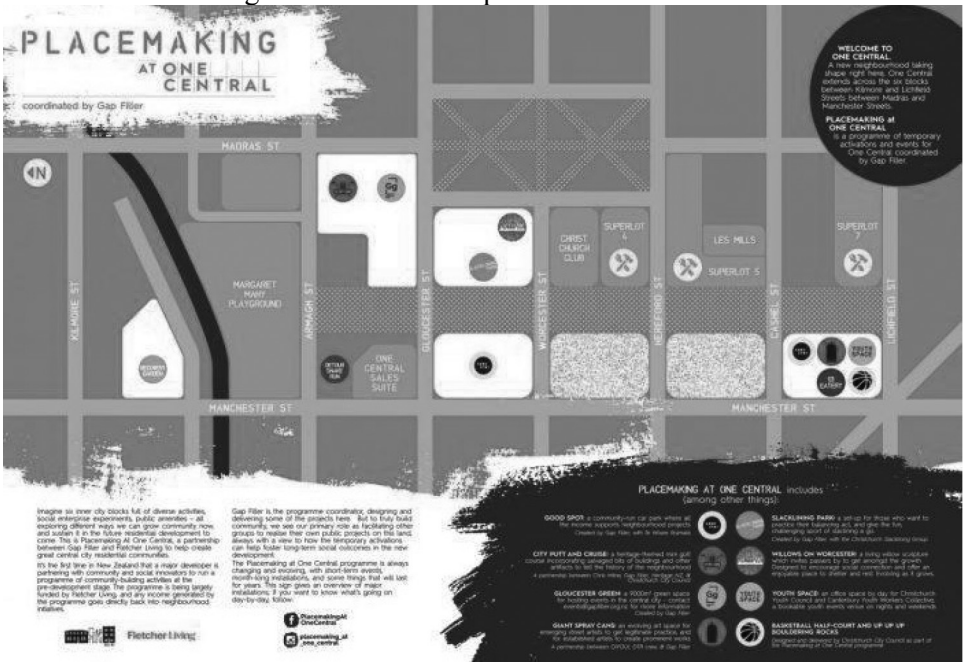
By anchoring the interventions to disaster preparedness and recovery, Urban Acupuncture considers all three types of social capital; communities within the WUI are united in their physical vulnerability to wildfire disasters, and by accessing and engaging with these spaces will form stronger bonds with those around them. The common ground established within these hubs supplements connections outside of schools and the workplace by providing free services and space for public use. The following examples begin to speak to ways that organizations have designed programs and spaces that foster human connection and fortify the range of social capital types.

Gap Filler Organization in Christchurch, New Zealand

In September of 2010 New Zealand experienced a major earthquake with a magnitude of 7.1 that originated near the city of Darfield. Although there was no loss of life and just a few injuries, a majority of buildings and structures were

heavily damaged. (S.H. Potter)

Following the 2010 earthquake in Christchurch, one of the local residents, Coralie Winn, initiated an organization whose mission is to promote a social change, to bring a question of how we think about vacant spaces and what we can do with them while they are not doing anything. One of the most important aspects of their mission are volunteers who play a major role in the organization allowing it to create and build projects that would bring local people together to enhance their social capital abilities and recover emotionally from the disaster. (Wilson 2015) The earthquake destroyed massive swaths of the city, including spaces for people to get together and dance. Gap Filler responded to this by building a dance floor on a vacant lot and used a converted coin-operated washing machine to operate speakers. For $2 anyone has access to 30 minutes of lighting and sound and can connect their own mobile device to play their own music. Beyond the immediate recovery phase following a disaster, it can be difficult to find ways to have fun and socialize with little means. This lightweight form of placemaking provides an outlet for such recreation, as well as a method of occupying vacant lots in the city to revitalize once stagnant and deserted space.



Placemaking at One Center, Gap Filler Organization, 2013.

The placemaking efforts of Gap Filler is an effective method of Urban Acupuncture, identifying a social need and generating community engagement through public programming. When construction materials and labor are in high demand following catastrophic disasters, the lightweight, low cost, and informal

intervention serves as an important step in the incremental recovery of communities. The Gap Filler is an example of bonding social capital that connects like-minded people with one another. As Gap Filler Organization says about its visions for the future: "Through participation, needs are met, citizens are seen and heard, and the status quo is challenged in such a way that people come back for more, expect similar experiences, or are motivated to participate in future projects. Gap Filler wants people to be vocal and visible with respect to how they are represented in the places they live and work." (About Us 2022) Their vision for the future is further summarized in 5 bullet points that became the framework for all future projects: 1) build identity, community and connection (helping to create a related series of distinct places and personalities in otherwise fallow land); 2) bring the area to life (prior to and during construction, starting now, with fun and surprising activities and amenities for people to use, and opportunities for them to create); 3) encourage long-term stewardship and sustainability (cultivating an ongoing culture of doing things as a community); 4) stimulate central city living (showcasing the benefits and appeal of mixed uses in close proximity); and 5) foster partnership and collaboration (engaging the diverse range of people and organizations).

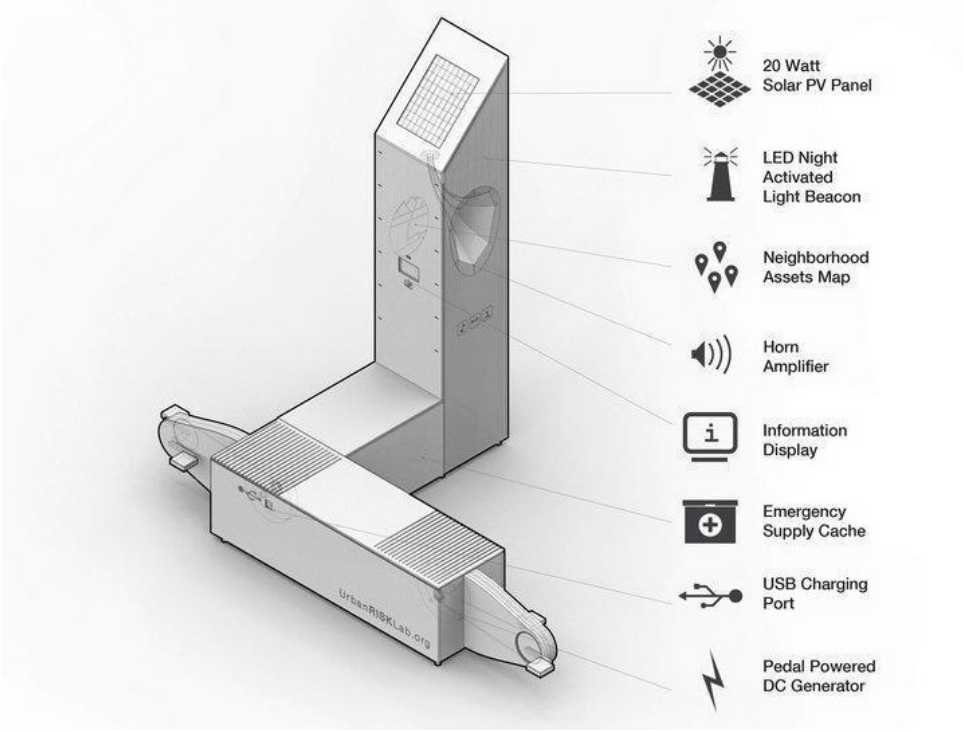
Detour Snake Run, Gap Filler Organization, 2013.

MIT Urban Risk Lab: Risk Map and PREPHub Projects

The Urban Risk Lab is an interdisciplinary organization of researchers and designers led by MIT. The Lab approaches issues of climatic, hydrologyic and seismic risks in a way that challenges designers and researchers to be innovative in their techniques and processes. The mission of the Urban Risk Lab is to develop methods, prototypes and technologies that would allow to design cities and communities with embedded risk reduction and preparedness to increase their resilience. (About 2022)

The MIT Urban Risk Lab proposed two projects that speak extensively to the problem of linking and bonding social capital. The first project is the infrastructural intervention called The PREPHub. It is an innovative kind of infrastructure made

to provide resiliency to the local community through strategically placed hubs that operate as gathering place for those affected by the disaster to allow them to access water, food, energy and other resources as well as provide them with a meeting destination to find family and friends who might have been affected or injured during the disaster. (Campbell-Dollaghan 2016) Their research suggests that those affected by the disaster tend to evacuate to public open spaces which have infrastructure to support the latter to find their family and connect with emergency authorities.

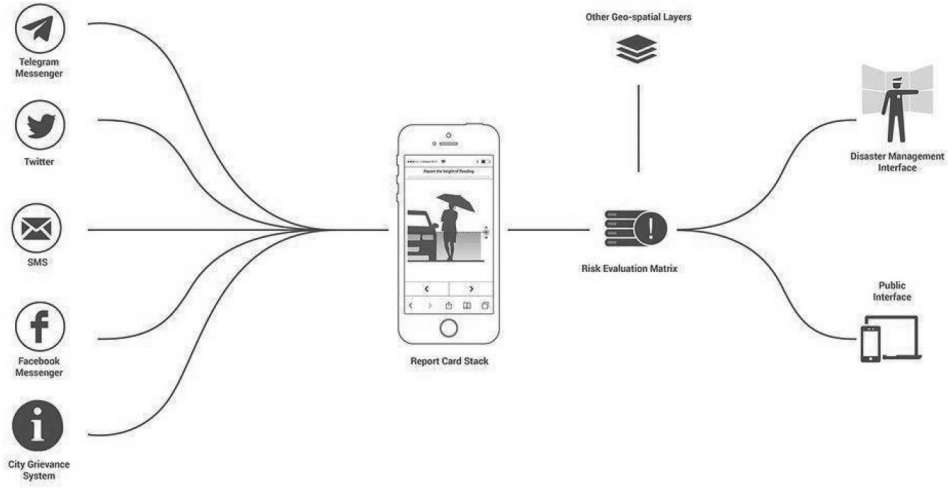


PREPHub Prototype, MIT Urban Risk Lab.

Although PREPHub is an ongoing research, the prototype showed its efficiency in teaching local community members to get familiar with the proposed technology during safe times, since the prototype is designed to be available and educational all year long. Besides teaching the community, PREPHub's "meeting place" function disciplines local residents in acknowledging the fact that there is an exact place to meet with family and friends after the disaster, thus enhancing their bonding social capital abilities.

On the other side of building a resilient community, the MIT Urban Risk Lab proposed another intervention that differs from the previous proposal in its approach. While the PREPHub can be seen as a buildable intervention, the Urban Risk Map is not a buildable intervention but rather an example of linking

social capital which strives to connect people from the community with those in power. The Urban Risk Map is a tool for citizen reporting to map time-sensitive information. The tool provides local residents with information regarding the disaster to connect with emergency managers in an effort to cut down on response time. Besides connecting to local emergency authorities this tool allows residents to connect to each other to provide information on the status of the disaster as well as to help navigate to a safe location.



Urban Risk Map, MIT.

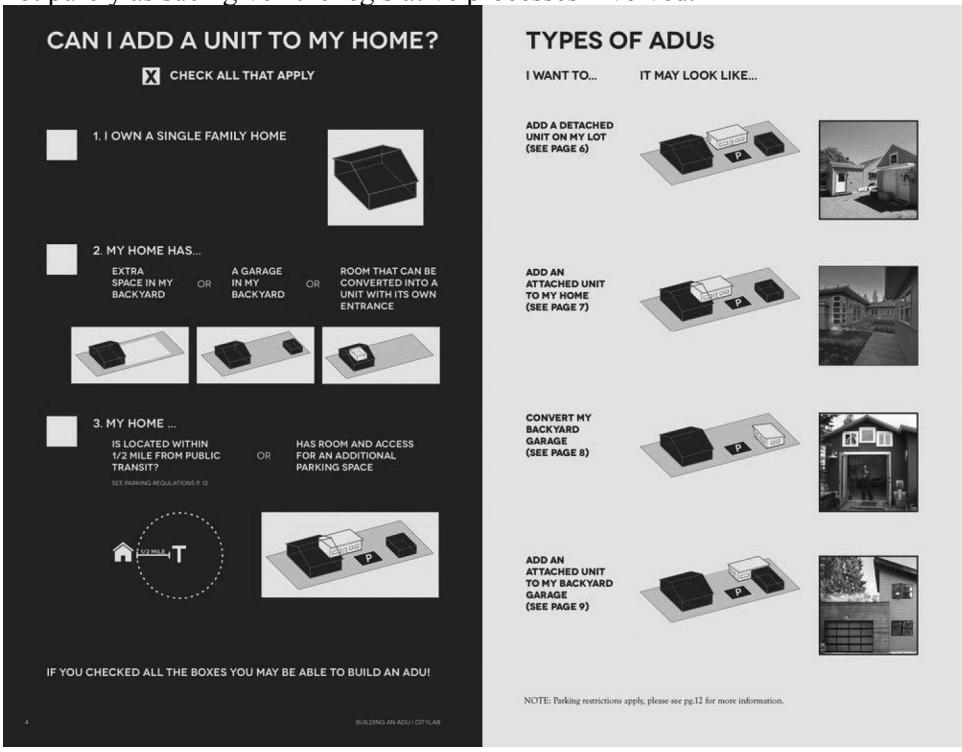
While this proposal is still under research, Urban Risk Map proved its efficiency and reliability during high-intensity rainfall in Jakarta in February of 2017. During this event, over 300,000 local residents utilized this tool to inform others and navigate through the disaster. (Mia Wannewitz 2020)

This proposal suggests an affordable yet quickly applicable intervention that is aimed to provide immediate relief to the victims of the disaster by empowering local residents with an ability to report real time information on available resources. When compared to an architectural intervention, the Urban Risk Map could be seen as a highly efficient tool that allows to cut down on the time needed for implementation, which otherwise would be drastically longer when trying to get approval for a buildable intervention.

California Accessory Dwelling Units (ADUs)

In early 2017 a new California state law was put in effect that encouraged homeowners to build accessory dwelling units (ADU) on their property. The implementation of this law brought a greater awareness to the housing crisis in the state and set a precedent for lawmakers in other states to follow. Additionally, it empowered homeowners with a greater sense of agency over their property,

providing the option for individuals to make an impact should they choose to rent the property below market rates to low-income residents. Within this frame of reference, the ADU law could be seen as a form of bottom-up urbanism, though not purely as such given the legislative processes involved.



ADU Handbook pg. 4-5, CityLab UCLA, 2017.

An interdisciplinary think tank in the city of Los Angeles called CityLab further instrumentalized this law by designing and distributing an ADU Handbook. The handbook serves as a how-to manual that explains the guidelines around building an ADU on your lot and provides specific steps for how to build one. (Jane Blumenfeld 2017) This handbook can be understood as two potential forms of social capital- bridging and linking- within the urban landscape. The ADU establishes linking social capital between the general population of homeowners and broader legislation that can be used to change their surrounding social and built environment, potentially generating a form of passive income and thus access to resources in the process. During the construction process of building an ADU, homeowners will interact with several individuals and service providers within their community, from the building department to architects and contractors. An additional connection that would fall under bridging social capital is that of the homeowner and the new resident of the ADU. In keeping with the potential

homeowner looking to buck the system, an ADU could provide affordable housing to someone in a neighborhood that they might not have been able to afford to live in beforehand and open new opportunities to connect them into a new network of resources and people. Within the context of disasters perhaps incentives could be offered to homeowners who host displaced residents at rates well below market value, such as tax breaks or subsidies.

In addition to generating forms of social capital, the ADU legislation, as well as CityLab's ADU Handbook could serve as a new tool for the post-disaster context and recovery process. Beyond emergency housing, temporary shelters and gathering spaces are fundamental to maintaining communication among neighbors, where needs, resources, and experiences can be shared with a collective support system. A disaster recovery handbook might feature strategies for where to locate gathering spaces and low-cost building methods and materials for designing and constructing them. As the process of recovery continues these informal spaces could be considered as future sites of Urban Acupuncture, as they will have an established network of users who are familiar with the location.

While there is a wealth of existing research endorsing the direct connection between strong social capital and greater resilience within communities affected by natural disasters, the ways in which social capital can be generated are more nuanced and experiential. Indeed, characteristics of a well-connected community can be identified, such as high degrees of transparency between governing bodies and their constituency, and a range of community resources for under-served populations, but the processes that led to this degree of connection are less documented and clear. However, an urban fabric that provides a hospitable environment for social capital to flourish can be seen in the work of Gap Filler and MIT Risk Lab's PREPHub. When people are connected to those inside of their social, financial, and ideological spheres as well as beyond them, a greater understanding of their needs and resources available to them is discovered and can lead to a more productive and robust recovery process.

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Regenerative Bio-Urbanism

Research divers placing hundreds of terracotta tiles, home to small baby coral hybrids, onto the central Great Barrier Reef, 2019.

Regenerative Bio-Urbanism

Cheng Zhang and Xiaoyue Wang

Bio-urbanism believes that a city is a system and that the main body of a city is a multi-compositional interaction, which affects each other in a non-linear way. This concept reveals that urban growth is a complex phenomenon that encompasses social, economic, and environmental aspects and the overlap between them. Humans have altered the earth's natural processes, shaped the landscape, and caused changes in phenomena on a global scale in either positive or negative aspects. Around the world, cities are expanding, and populations are growing. Not only do humans pollute the natural environment, but the pollution directly threatens human health and indirectly affects the human environment through degradation of the natural environment. In other words, Humans build cities that influence natural environments, while natural environments can also influence cities. Consequently, the artificial intervention biology method that utilizes a particular organism can protect the habitat of other animals or microorganisms to ensure the sustainable development of the natural environment.

Based on the overall concept above, our argument is using artificial intervention biological methods, which is part of the concept of bio-urbanism, can be used to counter malignant disasters such as freshwater stream disappearance, coastline erosion, and ocean acidification, contributing to the recovery of the watershed and coastal resilience. Today, three trends related to climate change, hyper-economics, and maritime logistics are affecting water lines globally. In this case, water lines have been transformed into risk zones and conflict between land and water systems. The most common phenomenon resulting from coastline destruction would be sea raising. Therefore, the environmental responses would harm the inhabitants' (aquatic lives and birds) living environment. The bio-urban strategies can help

reduce the risk of waterline erosion in coastal areas and minimize the negative impact on human and animal lives.

The following case studies show how people utilize biological methods to help the coastal environment restore its resilience. They focus on creating a bridge to establish the relationship between human activities, natural activities, and city activities, a nature-based solution that can provide biodiversity benefits.

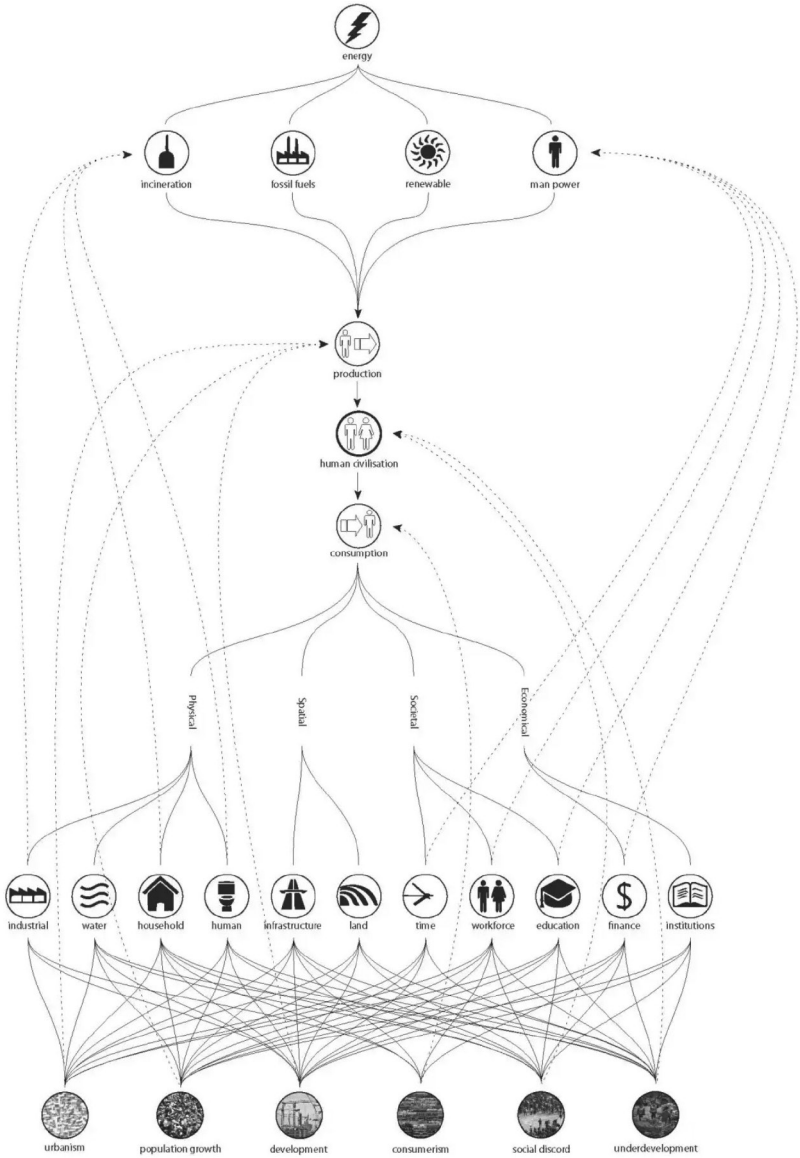
The Methow Beaver Project: Methow Watershed Restoration work with Beavers

The first example is a project on river restoration in the Methow Basin. The project seeks to rehabilitate the Watershed, which has been lost for 200 years, by reestablishing active beaver communities in the streams of the Methow River sub-basin, effectively increasing river storage and improving water quality. (Woodruff 2016)

Pillars of Resilience, Tahoe Conservancy, 2021.

Nowadays, riparian habitats continue to be affected by ongoing human activities, large-scale wildfires, subsequent erosion, and temperature patterns

resulting from climate change. As a solution, beaver assiduously building dams and ponds, capturing sediment, cutting down trees, and improving overall habitat will improve watershed function and resilience, protect freshwater resources in arid areas, and improve habitat quality and complexity connectivity for a multitude of species, including endangered salmon. However, the habit of beavers digging holes and felling trees has damaged crops and even brought devastating damage to infrastructures such as roads and dams. (Wetzler 2011) Thus, lethal removal has long been one of the options for dealing with the beaver problem.



Architecture, Energy, Matter 2, Semester 1, Fracking the Karoo, 2015.

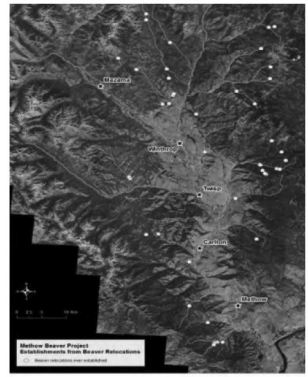
Beaver Dam, Methow Salmon Recovery Foundation, 2021.

The Methow Beaver Project offers a new solution to the beaver problem for peaceful coexistence, working with beavers, and using inexpensive ways to conserve water and improve wetlands in response to drought and climate change. So far, the Forest Service has supported the Methow Beaver Project, which has established beaver families at 39 sites in the Methow Watershed. (Methow Beaver Project, n.d.) Although the economic cost of moving the beavers is much higher than killing them, the ecological benefits of the project are immeasurable. Each year, the Methow Beaver Project worked with willing Landowners who conflicted with beavers to transfer them to US Fish and Wildlife Service National Fish Hatchery. (Woodruff 2016) Here, the beavers are weighed, sorted, and evaluated, and eventually, they are released into their suitable new habitat, a tributary of the Methow River. At the sites where the beavers are released, the project prepares poplars for the beavers as food to help them adapt quickly to their new home. Since 2008, the Methow Beaver Project has released 274 beavers in the Methow River Area, and beavers have established their new habitats in 45 locations. As of October 2015, 30 sites had formed stable beaver ponds. (Woodruff 2016) These beaver ponds add complexity to the river's ecological diversity and provide habitat for salmon. At the same time, it improved the water storage capacity of the river and the ability to adapt to the climate. During the rainy season, these beaver Ponds can store large amounts of water to reduce the risk of flooding, and during the dry season, they can slowly release the water stored in beaver Ponds to alleviate drought.

Before and after installing a Beaver Dam Analogue, Biohabitats, 2018.

Subwatershed	2015 release sites	2015 success	Total release sites	Total successful sites
Lower Chewuch	7	2	23	10
Upper Chewuch	0	0	5	0
Beaver Creek	2	2	8	4
Upper Methow	1	0	2	0
Middle Methow	4	3	7	6
Lower Methow	1	0	7	7
Libby Creek	2	0	4	2
Black Canyon Creek	0	0	3	3
Lower Twisp	0	0	2	1
Total	**17**	**7****	**61**	**30**

*Early Winters, Lost River, Wolf Creek, Upper Twisp, and Gold Creek Assessment Units are lower priority for release
** Woody, Benson South Fork, Copper Flat, Bear Ck. at Flow, Beaver SF Camp, Beaver SF Cattle Guard, Lower Beaver Ck.



Beaver relocate sites in the Methow Basin, Methow Beaver Project, 2015.

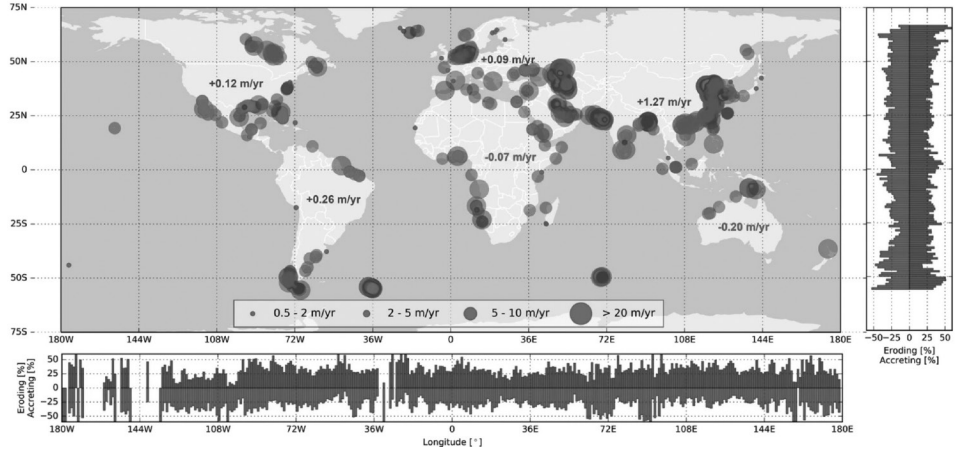
In 2015, the Twisp River Fire swept through the area, killing almost all above-ground vegetation in these drainage systems. Beaver ponds, however, act as a fire barrier. Sediments trapped by beavers create wetlands around the pond, making the beaver pond a firebreak for forest fires. Moreover, these wetlands significantly improve the ecological stability of the whole area and its ability to heal itself after a wildfire.

In short, this case highlights respect for nature and the ability of ecosystems to repair themselves, using biological methods to restore river systems in the Methow Basin and improve the ecological stability and fire-fighting capacity of the entire region.

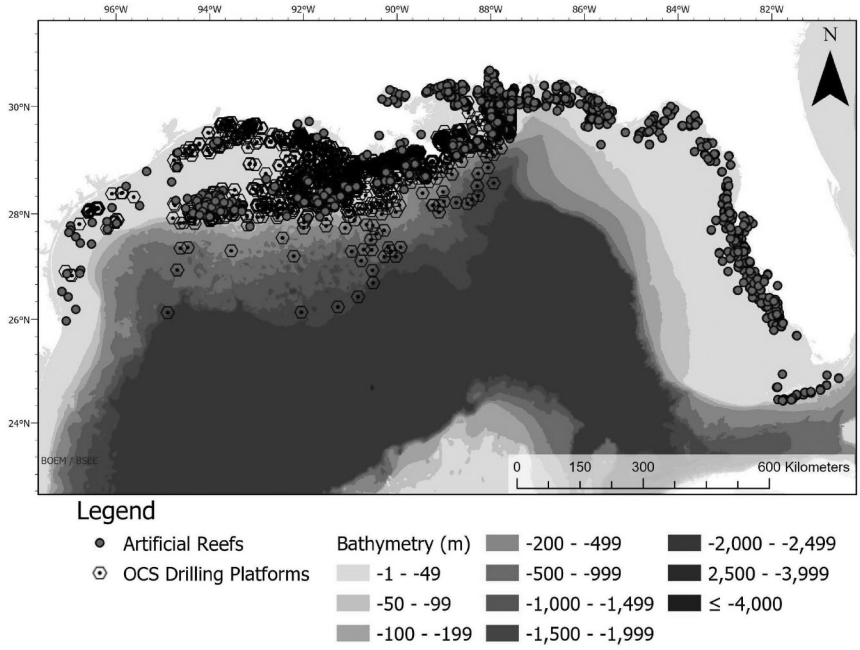
Rigs-to-Reefs: The Gulf of Mexico Coastline Restoration

A second case study approaches restoring coastal habitats by using disused petroleum platforms, also called oil rigs or drilling platforms, to create living coastlines in the Gulf of Mexico. From 1984 to 2016, 24% of the world's beaches continue to erode at more than 0.5 m/yr. About 16% of the beach are experiencing more than one m/yr erosion rate. (Luijendijk et al. 2018) In the United States, coastal erosion causes an estimated $500 million in coastal property damage, including building damage and land loss. (Coastal Restoration Toolkit, n.d.) The Gulf of Mexico, the "third" coast of the United States, is plagued by coastline erosion. This 300-million-year-old ocean basin would have had a strong natural barrier, with coastal forests, coral reefs, and swamps, against coastline invasion. But for nearly 100 years, the rapid development of the oil industry, climate warming, rising sea levels, and coastal storms—natural and manufactured factors—have combined to destroy the natural buffer habitat in the Gulf of Mexico. At the same time, the high concentration of people and property in the Gulf has led landowners to build seawalls and other infrastructure to meet the challenges of rising sea levels.

(Coastal Restoration Toolkit, n.d.) The hardening of the coastline intensifies the destruction of the natural habitats by the sea and eventually forms a vicious circle. Therefore, compared with artificially hardened coastlines, restoring coastlines to their natural state and rebuilding living coastlines is the key to mitigating coastline erosion and bay economy.



State of the World's Beaches, Arjen Luijendijk, 2018.

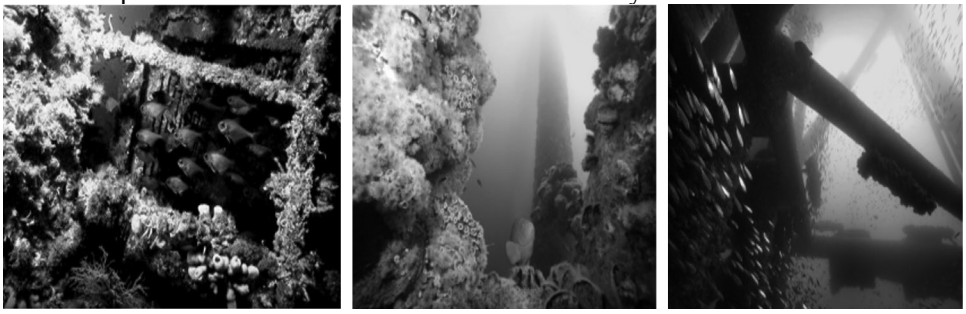


Distribution of drilling platforms in the northern Gulf of Mexico, BSEE/BOEM Data Center, 2019 and NOAA, 2016.

In the Gulf of Mexico, there are more than 500 decommissioned oil rigs. (Miglietta 2020) Some oil rigs have become habitats for many marine creatures that thrive on reef ecosystems because many structures have been 30 years or longer in the water. Therefore, it is undoubtedly better to keep the oil rigs than remove them altogether, destroying the reef ecosystems they support.

The Rigs-to-Reefs program provides a way to convert these abandoned oil rigs, where oil companies choose to retrofit abandoned oil rigs that are valuable for improving the ecosystem after completing an ecological assessment. A modified oil rig with the well capped and the upper 85 feet of the platform removed. The underside of the platform is preserved, allowing it to continue to support the ocean's ecosystem as an artificial reef. Substantial cost savings have been achieved by successfully converting abandoned oil rigs into artificial reefs. At the same time, the project has significantly reduced ecological damage and protected the valuable habitat created by the oil rigs for Marine life. Subsequent research found that these platforms made artificial reef ecosystems that attracted and increased fish species and populations. (American Petroleum Institute, n.d.) These reefs effectively dampen the impact of the waves and protect the coastline. Additionally, the abundant fish resources brought about by thriving marine habitats bring better economic income to fishers.

From this example of how coastlines can be repaired, we can harness the power of nature to create stronger living coastlines rather than building more substantial and more permanent barriers with cement traditionally.

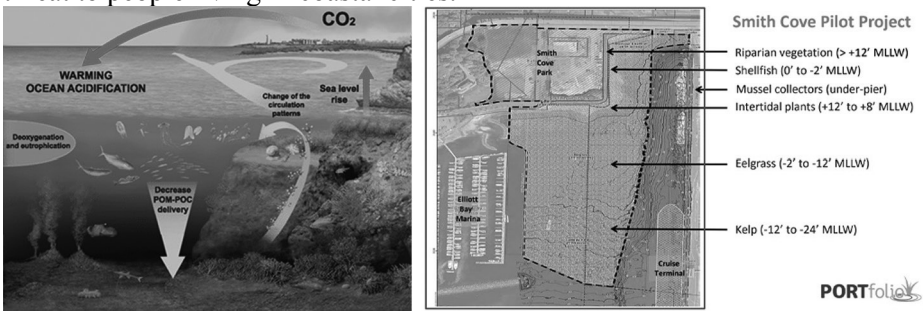


The coral reef ecosystem formed by the Rigs-to-Reefs program, Bureau of Safety and Environment Enforcement, Unknown Date.

Blue Carbon Pilot Project: Aquatic Plants Alleviate Ocean Acidification in Seattle

The impact of climate change on the marine environment extends far beyond coastline erosion, with Earth's oceans now 25 percent more acidic than before the Industrial Revolution. Ocean acidification is threatening the survival of ocean life, including mussels, corals, oysters, and sea urchins, making it harder for these shellfish to build skeletons and shells.

Scientists believe the unexplained death of shellfish at Seattle's Oyster Hatchery is most likely due to ocean acidification, which leads to corrosive water. In this case, oyster growth is being monitored in Seattle's Smith Cove, where scientists hope to protect marine life and the shoreline by planting aquatic plants to reduce carbon dioxide emissions from ocean acidification. Aquatic plants can store carbon to offset carbon dioxide emissions from ocean acidification, and too much carbon dioxide in the ocean is deadly to marine life. It can also lead to coastline degradation, affecting other coastal creatures and human life. Aquatic plants are a direct and effective way of protecting coastlines by biological means. The oceans absorb about 30% of the carbon monoxide released in the atmosphere, and like carbon monoxide levels in the atmosphere increase, so does the ocean level. (National Oceanic and Atmospheric Administration 2020)This increase causes seawater to become more acidic and causes carbonate ions to be relatively less abundant. Carbonate ions are essential components of structures such as seashells and coral skeletons. The decline in carbonate ions makes it harder for clams, sea urchins, shallow-water corals, deep-sea corals, and calcium plankton to build and maintain shells and other calcium carbonate structures, leading to the collapse of shoreline rocks and shellfish. Thus, ocean acidification leads to the death of Marine life and leads to the destruction and erosion of shoreline rocks, which is a huge threat to people living in coastal cities.



Left: Ocean Acidification, by A. Gennari, 2019. Right: Blue Carbon Pilot Project Plan, PORTfolio, Unknown Date.

Smith Cove is the site of Seattle's Blue Carbon Pilot Project, hosting numerous fishing and commercial vessels, hosting more than 150 cruise ships in 2018, and connecting to two busy rail networks. " Blue carbon" is a term used to describe the process of carbon sequestration and then absorption of carbon dioxide from Marine ecology and the atmosphere. (Nellemann 2019) Algae, seagrass, and mangroves are plant resources involved in blue carbon sequestration. "The Port's Blue Carbon Pilot Project was Envisioned by a former Port graduate student intern and is envisioned technical and marine science support from the Puget Sound Restoration Fund and the Washington State Department of Natural Resources(DNR). The project kicked off with important baseline surveys in The spring of 2018." (Cain, n.d.)

In October 2018, the Kenneth K. Chew Shellfish Research and Restoration Center placed three tons of shellfish beds with native Olypia oyster larvae at the lower intertidal zone of Smith Cove as observation samples, followed by the planting of Eelgrass, Kelft, and other Marine plants that help store blue carbon, and established eight experimental sites. Experiments were conducted to understand the conditions for the successful restoration of native oysters. Smith Cove became one of ten sites in Washington state. DNR set up to monitor climate change and ocean acidification starting from January 2020, to see oysters' restoration and if aquatic plants can help restore ocean acidification. This project is now in a three-year long-term testing period, but so far, the survival rate of oysters has improved, Jon Sloan, Senior Environmental Program Manager at the Port of Seattle said. (Cain, n.d.)

Left: Shellfish beds with native Olypia oyster larvae, Puget Sound Restoration Fund, 2007. Right: Blue Carbon Restore Plants, Secret Sea Visions by Jones Shimlock, Unknown Date.

This case study illustrates how local Seattle researchers planned a long-term project involving bio-means to prevent the shoreline from collapsing due to ocean acidification and also increase the survival rate of shell organisms.

According to the three cases above, we learned that designers helped beavers build artificial habitats in dry areas and worked with beavers to restore wetlands and shorelines in the Midwest, thus improving the local climate and lack of freshwater resources. The second one illustrates that Converting abandoned oil Wells into artificial coral reefs has successfully restored the Gulf's natural barrier and recovered the shoreline's ability to resist erosion. And the last one is a project in which people utilized aquatic plants to store blue carbon to reduce the emission of carbon dioxide in the ocean and strengthen the resilience of ocean creatures and the human habitat.

Bio-mean is a way to use different groups of organisms or creatures to restore an ecosystem's positive work circle without increasing additional burdens on the natural environment. In Bio-urbanism, human beings, cities, and nature are never separated but interact with each other. Still, human activities are dominated, so we

should consider how to use natural resources to improve and restore the natural environment of water and shoreline in a regressive way. In return, the human habitation environment would also gain improvement.

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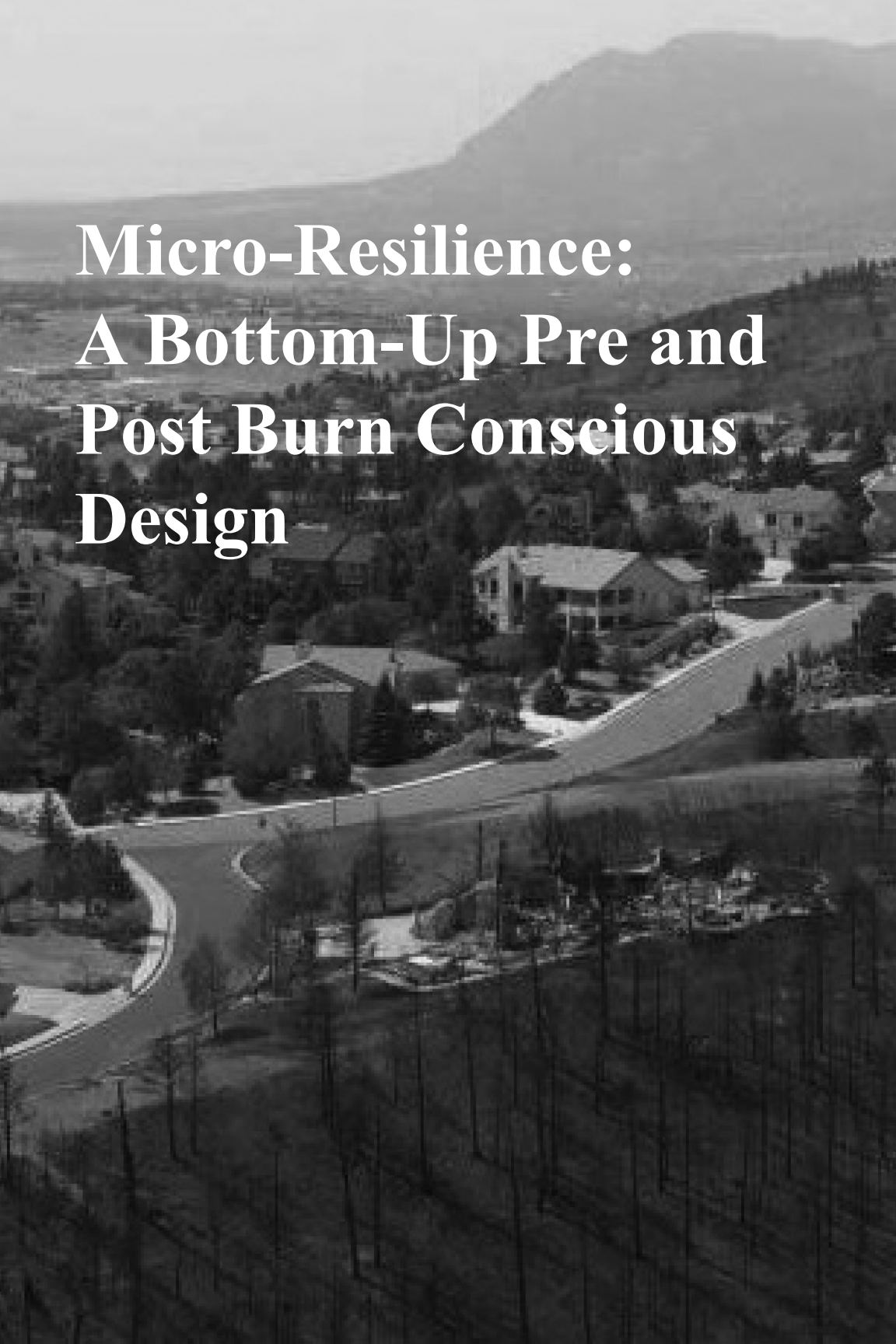


Micro-Resilience: A Bottom-Up Pre and Post Burn Conscious Design

Damage from the 2012 Waldo Canyon Fire in a wildland-urban interface near Colorado Springs, Colorado, Kari Greer, 2015.

Micro-Resilience: A Bottom-Up Pre and Post Burn Conscious Design

Qiuying Lu and Tiffany Orozco

Micro resilience is bottom-up pre and post burn conscious design thinking which seeks to further resource individuals on how one can provide/enforce low cost urban strategies and services in a manner that promotes mutual dependence between communities and the wild urban interface (WUI) on which they reside.

Resilience begins with the understanding that extreme wildfires are inevitable. With top-bottom methods, 98% of wildfires were kept small but still 2% of wildfires became severe, especially when combined with extreme weather. Most of the wildfires now are being controlled by top-down methods, which leads to the acceleration of fuel accumulation, and then a higher risk of severe fires. Therefore, severe wildfire is inevitable even if most wildfires were under control. In this sense, it is necessary for us to build the last line of defense in an extreme situation in a bottom-up way, which is to prevent our houses from burning. This is primarily done through the application of fire conscious/resilient space and materiality within landscape and dwelling.

The top-down methods of controlling the wild-fire are mainly suppression. This way actually increases the risk of fire later, since wild-fire is a crucial way to clean the fuels from plants in the environment. Falling leaves, branches and dead trees continue to add fuel to the ground, and the more fuel that accumulates, the worse it is for the trees to grow. So wildfires are an important means of removing fuel in ecosystems without human intervention. If most of the wildfires are maintained in small scale, the accumulation of fuel actually becomes the basement of later extreme fire. Thus, the current methods have many drawbacks, which couldn't 100% get rid of wild-fire.

However, it doesn't mean that people could not survive when extreme conditions happen. Home Ignition Management(HIZ) is a method that believes people should coexist with wildfire with bottom up methods. Based on HIZ theory, a wildfire would not totally wipe out everywhere it comes across. To make an object ignited and keep burning, the ignition requirements, which is also called Ignition Triangle- fuel, oxygen, heat should be always met. That is to say, if there is a place that doesn't meet Ignition Triangle, it's not going to ignite even if it is in the middle of a severe wildfire. With this mindset we are able to create a safe environment in a dangerous circumstance. Therefore, for a house involved in a fire, the lack of meeting ignition requirements will finally make it survive, even if the surrounding area was burned out. The lives of residents ultimately depend on the local conditions of houses. So micro-resilience will provide a more powerful protection, for it offers a precise control of the local conditions for each house.

Micro Resilience can be obtained through the following methods:

A) HIZ Management

Whether a house burns or not depends on the ignition characteristics of a home in relation to burning objects within 100 feet of a home. According to Jeff Cohen's HIZ theory we can prevent the house from ignition by spacing the flora. This is why understanding the basics of our Home Ignition Zone is crucial to the sustenance and survival of the environment and dwelling.

Flying embers are the most common source of home ignition during wildfires, therefore the spacing, materiality, and nativity of plants surrounding our homes are key to prevention of ember ignition.

The fundamental basic management of a home's HIZ according to Micro-Resilience can be further understood in the following diagram:

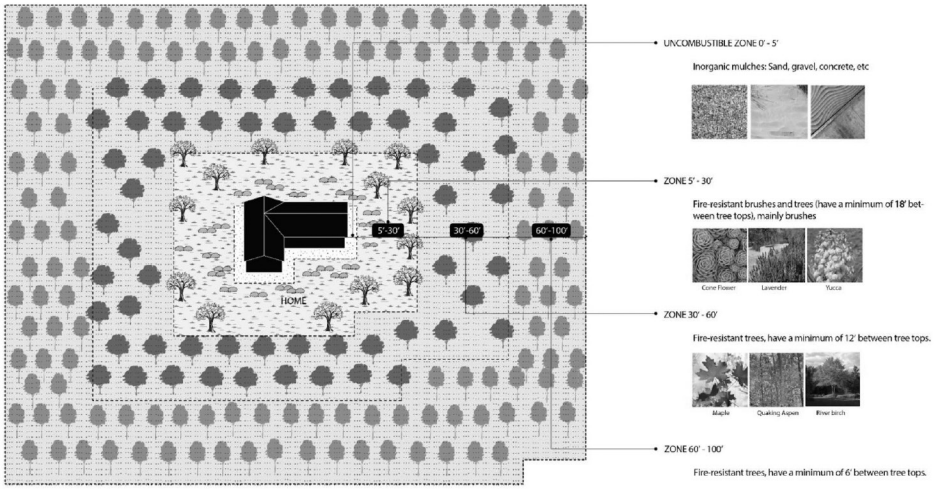


Image by Authors

The management of flora is controlled within the distance of the plants in 3 offset zones of the house itself. The distance between ripples and the flora within the ripples could help eliminate the distribution of embers and fire. Furthermore, the materiality of ground can prevent the spread of fire by serving as a buffer as well as usable outdoor space.

During the Weber Fire of 2012, this home and the plants in the surrounding area survived in the fire that wiped out the hill, since it controlled the density of trees within 100ft of it. At the same time, the almost zero shrub density around the fire also effectively blocked the spread of fire. The broad HIZ zone also helped firefighters have a relatively safe space to suppress the wildfire, and offered an area for the house owners to evacuate. This example demonstrates the effectiveness of the HIZ zone, showing that each individual can survive a fire by spacing of vegetation within the HIZ zone. Compared to top-down methods like prescribed burning, spacing the flora and managing the landscape in this way, the residents have higher control of the security of their own property in a low cost and higher initiative.

B) Fire Resilient design:

Within WUI some dwelling burned out not because of directly touching the fire flames, but because the wind blew up the embers to go across the roads and ignited the combustible material around the house. The images

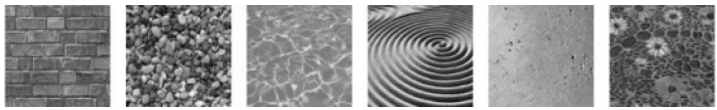
below reveal this clearly, for these two houses which both experienced big fires, the left one was intact even if the forest around it had burned out. Whilst, In the right one, the home burned out by flying embers although most of the forest still exists. That means that the fate of a house within a WUI is to some extent independent of its surroundings. It can still survive in a hazard fire, but can also be very fragile even in a small fire. What matters is if the house meets the fire-ignition requirements, that it is built with fire resilient materials, and it's placement within the HIZ ripples.

A house survived the Weber Fire near Mancos in 2012 thanks to careful planning and maintenance of defensible space, Published in the Durango Herald, 2018.

As seen in the Previous image, it is extremely important for home owners and their community to take an active role in understanding how one's home materiality can prevent or provoke a burn. It is crucial for buildings within a fire environment to be built with the most fire resilient materials, this inherently means one might have to deviate from the conventional and familiar. One of the most accessible, affordable, sustainable, and resilient materials are adobe (earth).

Inorganic materials like brick, stone, sand, etc. work as a fire buffer in the role of landscaping. The implementation of these materials can produce

extremely interesting designs and allow for the HIZ ripples ground to embody alternative materialities which can be used as safe spaces and outdoor activity zones.



Inorganic materials for the ground.

Fire-resistant shrubs and trees.

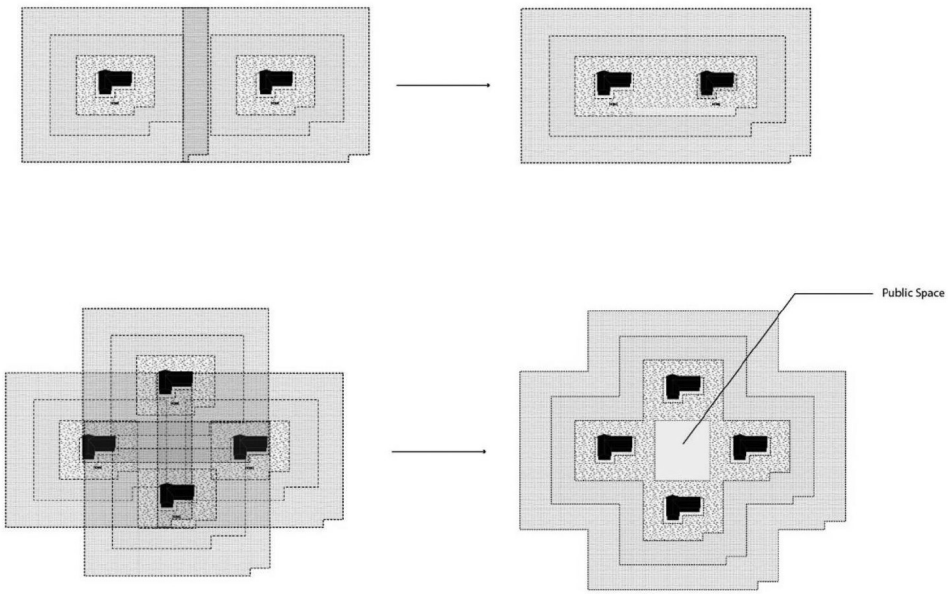
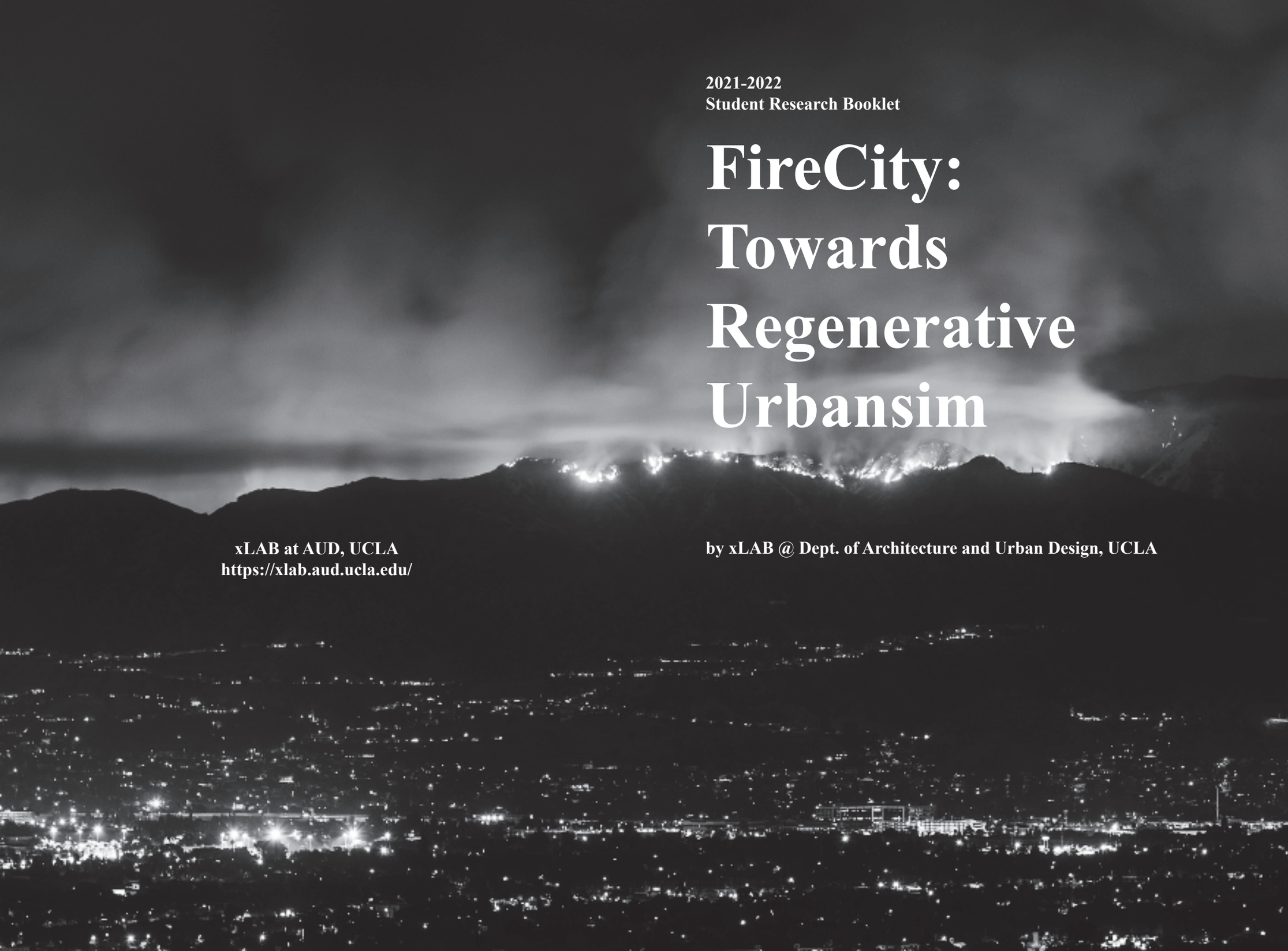


Image by Authors

Within Micro-resilient HIZ rippling, we also strive to eliminate the embodiment of an isolated single family home in the combinatorial logic of different ripple. After the ripple of several houses are merged together, the area in between can act as public utilities such as pools, gyms, playgrounds, auditorium, etc. by doing so we increase inorganic surface area and create an interactive collective.

Wild Urban Interface prior to the burn are typically untamed and

unmanaged, thus increasing the fire fuel that caused a complete burn of homes and neighborhoods. As time pases and population growth increases humans forget and move back into the fire ecology, thus making it crucial for conscious regeneration plans and infrastructure to take place. Micro Resilience equips individuals and communities with the necessary information and tools for understanding and implementing regenerative pre and post burn home and community building strategies. Rather than viewing of living in a fire ecologies as a tragedy, it enables us to understand that fire is a natural part of this ecosystem, and in choosing to hold space in fire/burnscapes we assume the role as caretakers of our homes and the land. It is crucial for us to understand that it is not enough to just rely on the top-bottom and collective strategies to control the fire. The public resources available to fight fires are limited, when extreme weather happens, the fast-spreading and wide-range fire will be a serious threat. Thus, we propose developing micro resilience strategies that are applicable to both pre/post wildfire communities, so that the bottom-top efforts could reduce the risk of being caught in a fire and enhance the anti-fragility of a community.



2021-2022
Student Research Booklet

FireCity: Towards Regenerative Urbansim

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