Final Report
July 2016

Coopelluvia

Facilitating Urban Water Commoning

Submitted by **Stephanie Newcomb** MSArch Candidate
In partial fulfillment of the MSArch in Drylands Design,
Woodbury University School of Architecture

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Coopelluvia

Facilitating Urban Water Commoning

Exploring possibilities for a new water commons in dry cities through small-scale water collaboratives

WOODBURY UNIVERSITY
ARID LANDS INSTITUTE
M.S.ARCH IN DRYLANDS DESIGN THESIS PROJECT
FALL 2015 - SUMMER 2016

Abstract

With current city and county stormwater capture plans focusing on public land, this investigation focuses on possibilities of **water collectivization between private properties**. Water commoning is an opportunity for a new method of urban water stewardship: one that empowers individuals and neighborhoods to engage directly with building and maintaining local water supplies. A water commons is the shared collection, distribution and management of water as a resource. Evaluating the San Fernando Valley as a case study, specifically within low-income Latino neighborhoods, the investigation focuses on a process of commoning between residents using rainwater harvesting as a platform for untapped economic, social, and cultural potentials. **The goal is to produce a methodology for a hyper-local water supply model that inhabits the threshold between private properties and produces multi-benefit hydro-social space.**

Introduction

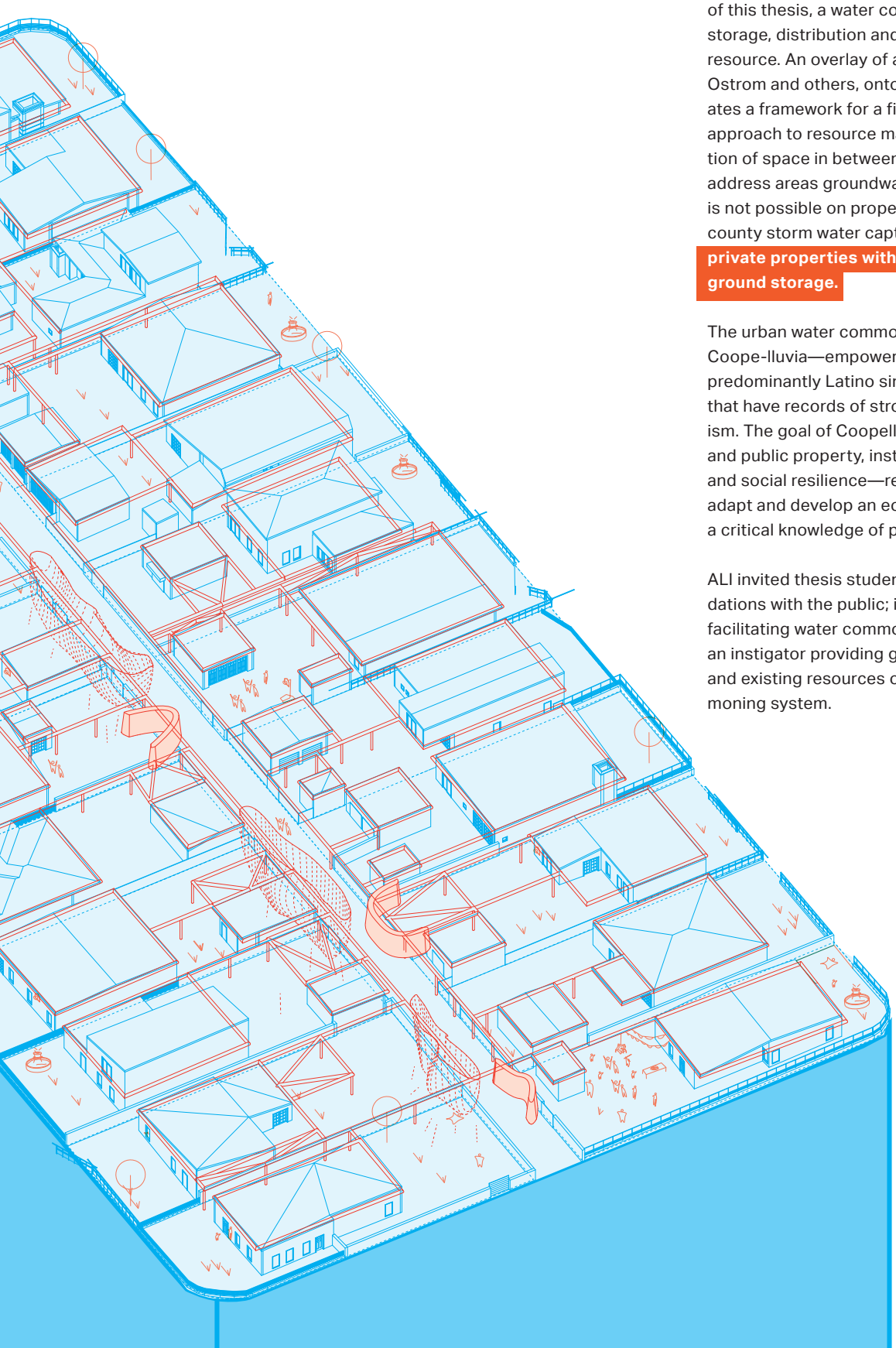
Coopelluvia: Facilitating Urban Water Commoning proposes an alternative hyper-local networked rainwater supply model that leverages neighbor interaction to create space for local water storage as well as social amenities. Situated within the research agenda of the Arid Lands Institute, this investigation continues a legacy of exploring possibilities through Hazel—a high resolution digital tool that informs water-smart decision-making—using the San Fernando Valley as a test bed. **By using commoning concepts and strategies, this investigation proposes a method for re-introducing commoning into urban life, resilient water supply and alternative socio-political spatial systems.**

The conceptual underpinning of this thesis is rooted in the question, how can theories of the commons inform collective strategies for urban water stewardship? For the purpose

Coope-lluvia

Cooperative
Cooperativa

Spanish for rain
Lluvia, femenina



of this thesis, a water commons is the shared collection, storage, distribution and management of water as a tangible resource. An overlay of a commons paradigm, derived from Ostrom and others, onto place-specific Hazel logic, creates a framework for a finely distributed watershed-based approach to resource management and the social production of space in between private properties. The goal is to address areas groundwater augmentation thoguh infiltration is not possible on properties unaddressed by local and county storm water capture master plans –ie, **it targets private properties with capacity for capture and above-ground storage.**

The urban water commons model—also known as Coope-lluvia—empowers residents within low-income, predominantly Latino single-family dwellings in communities that have records of strong social and environmental activism. The goal of Coopelluvia is to blur the notion of private and public property, instilling a sense of localized ecological and social resilience—referring to the ability to maintain, adapt and develop an ecological and/or cultural identity and a critical knowledge of practices.

ALI invited thesis students to share research and recommendations with the public; in this case a pamphlet as a tool for facilitating water commoning. The pamphlet is designed as an instigator providing guidelines to hardware, software and existing resources on how to build your own water commoning system.

ALI @ Glance

Forty million people in the American West depend on snowmelt to grow food, slake their thirst, and run their towns, cities, and industries. Twenty-two million of them live in Southern California, eleven million in the greater LA metropolitan area. As in many parts of the world, western water supplies are over-allocated and populations are growing. Increasing variability in precipitation—the primary projected impact of climate change on the hydrologic cycle—exacerbates the stress: longer droughts, less snowpack, and earlier snowmelt are already observable. Current climate models estimate that 70 percent of western snowpack will be gone by 2100.

The solutions to these challenges do not all lie in policy or technology fixes. Some lie in design, with major implications for shaping space and experience. The Arid Lands Institute (ALI) provides planning and design assistance to communities in water-stressed environments, urban and rural.

As we work to maximize local water resources—harvesting stormwater; recycling wastewater; conserving industrial, commercial, and domestic water; augmenting groundwater—how do we craft buildings and districts that visibly celebrate their precise hydrologic functions? How would architectural systems, building codes, and zoning laws have to change? What shape would neighborhoods, architecture, and the urban experience take if design fully recognized and exploited the aesthetics, cultures, economies, and ecologies of life in drylands? What are the full expressive potentials of localized resources and resilient design?

Drylands design innovation in Los Angeles has the potential to benefit not only the city's residents and ecosystems, but those of its man-made watershed, stretching from the San Joaquin Delta to the Owens Valley, the Colorado Rockies.

Solutions in Los Angeles and the US West have the potential to benefit, by example, 1.2 billion people living in water-stressed regions on every continent.

Urban Water Challenges facing Los Angeles

In alignment with ALI's mission, this investigation explores the following design challenges:

Adapting to hydrologic variability
Given decreasing snowpack due to climate change and increasing urbanization demands, we need to leverage our local water resources. According to studies led by UCLA atmospheric scientist Alex Hall[1], local Los Angeles Basin precipitation levels will stay similar to historic rainfall amounts in Southern California. Although inter-annual variability is to increase, rainfall levels are projected to remain constant.

De-coupling the water-energy nexus
Three aqueducts –Los Angeles Aqueduct from Owens Valley, California aqueduct from Northern California (State Water Project) and Colorado River Aqueduct from the Colorado River–convey water into Southern California. Two of the three systems are energy-intensive with high corresponding CO2 outputs. In the State Water Project, one acre-foot of water requires 3000 kWh of energy to deliver to LA; on the Colorado River Aqueduct, one acre-foot requires 2000 kWh.[2] Overall, water and wastewater systems are extremely energy intensive, requiring approx. 3% of annual U.S. electricity consumption;[3] and approximately 20% of California's. Localization of water resources will decrease California's dependence on imports and reduce associated energy inputs and carbon emissions.

Diversification of water portfolio
Existing infrastructures are sized to an assumption of stationarity, where systems are calibrated to a presumed natural cycle that fluctuates within an unchanging envelope of variability.[4] However, in the face of decreased snowpack, longer and hotter drought periods, and infrequent but intensive rain events, decentralized water infrastructures can help mitigate these extremes, creating a more resilient network for the future of urbanized areas. Approximately 82% of water demand in Los Angeles can be met through the strategic use and reuse of a broad-scale local water resource portfolio.[5]

Decentralized supply models for vulnerable communities
As recognized by Los Angeles' Integrated Regional Water Management Plan (IRWMP), Disadvantaged Communities (DAC) are areas of limited resources, more vulnerable to climate impacts.[6] Vulnerabilities include: ability to meet water conservation goals, reduced resiliency to drought and potential increase in municipal water demand. New models for water supply capture and management that prioritize climate adaption in disadvantaged communities build environmental and social justice.

In short, Facilitiating Urban Water Commoning translates these larger challenges into contextual urban design issues that provoke the following questions:

+ Can watershed thinking be downscaled?

+ Where do we need to retrofit the built environment to maximize local water collection?

+ Where do we design appropriately scaled storage systems for maximum social benefit?

Hazel

With a goal of maximizing a local water portfolio through aquifer recharge, ALI has studied the hydrologic patterns of San Fernando Valley to address the question: Where are ideal areas for infiltration? And where is above-ground storage advisable?

ALI is developing a digital tool called Hazel that provides high-resolution data (accurate to 30 sqm) linking surface and subsurface conditions to identify suitable and unsuitable infiltration sites. The digital tool uses layers of historical data, geology and hydrology analysis in combination with urban land uses to model the upper Los Angeles River Basin (also known as the San Fernando Valley Basin).

One result of the Hazel tool logic is the idea of a hydrologic zoning overlay. Hazel reveals layering of surface and subsurface conditions that can be identified as three types of zones:

Hydrologic Zoning 1 (HZ1) **INFILTRATE HERE**
Hydrologic Zone 1 indicates the optimal conditions for water infiltration into the aquifer. Indicates that soil conditions will allow for easy percolation with no threat of contaminants. In these areas, best management practices should allow for landscape solutions for infiltration.

Hydrologic Zoning 2 (HZ2) **HYBRID**
Hydrologic Zone 2 indicates a hydrid zone in between HZ1 & HZ3. There might be opportunities for infiltration, however these might depend on the proximity of non-infiltration zones. The best solution might be a combination of infiltration, conveyance and storage practices that are best suitable for each site.

Hydrologic Zoning 3 (HZ3) **DO NOT INFILTRATE HERE**
Hydrologic Zone 3 indicates areas that are not suitable infiltration. Subsurface conditions –non-porous or contamination-prone–suggest that water is best detained on the surface and stored for direct use or conveyed to another zone.

The tool is being developed to be used by planners, policy makers, architects and designers of the built environment to prioritize land suitability and best management practices. However, using Hazel logic is also an opportunity for new best management practices to emerge based on zoning overlays. **Continuing the tradition of ALI / MSArch program, this thesis investigation tests the capabilities of Hazel logic within the San Fernando Valley's HZ3, on low-income private property.**

The Commons

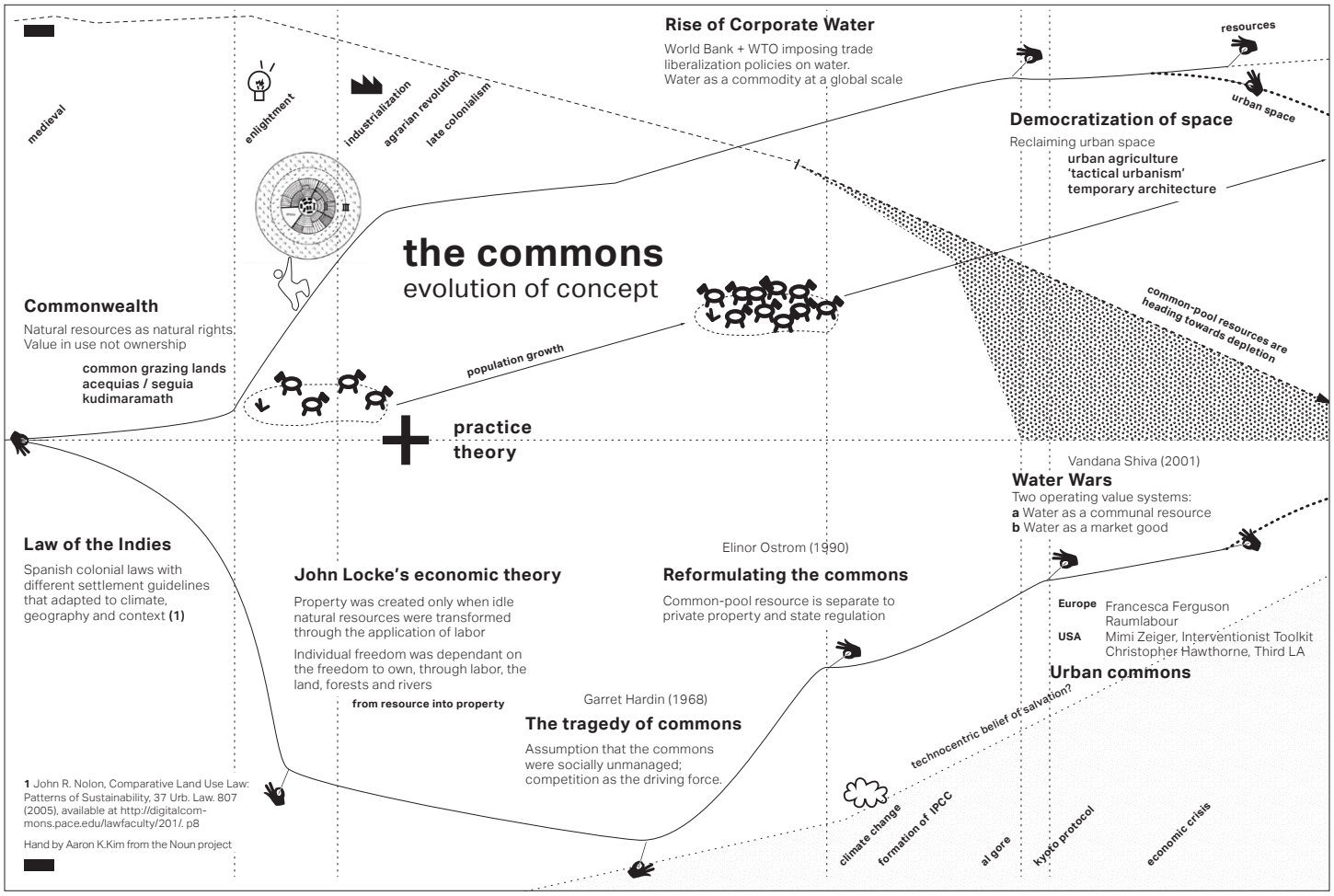
What is a commons?

The concept of the commons is not monolithic, but has evolved in multiple social, economic and political contexts as a form of resource management. As defined by the International Association for the Study of the Commons (IASC), the commons is neither public nor private —it is a natural or manmade resource that can be shared as a common-pool resource. However, its definition is more complex depending on the resource and associated sharing system. More importantly, is to think of the commons as a process—of negotiating relations and physical resources—that is composed of (a) the common-pool resource and (b) the act of commoning.[7]

For the purpose of this research, I am referring to the physical requirements of managing a shared resource as hardware, and the process of negotiating social relationships around the resource, as commoning software.

The concept of commons has evolved over time with ebbs and flows in both theory and practice. Initial governance structures integrated theory and practice given the open, literal, physical tie between resources and land management.[8] Historically, commons were mostly lands managed for shared grazing or timber. Historical examples include meadows—also known as lammas—in England; ejidos in Mexico followed the 1910 Mexican Revolution. Similar to common grazing lands, water was treated as a sovereign resource. Most surface water was initially unregulated; however, within drylands, regulations over water use were prevalent with-seasonal variability and cultivation periods. Some historical water commons include qanats in the Middle East; sequias in the Middle East and acequias in Spain, Latin American and United States' Southwest; tapping into underground water sources with puquios in Peru ; and kudimaramath in South India pre-colonial period and well into colonial times.

Historically, commoning worked in the context of an under-populated society, where survival dictated disciplined collaboration to sustain a resource base. An increase in population at a global scale shifted this notion, as popularized by Garrett Hardin's (1968) "Tragedy of the Commons." Hardin defines commons as resource-based on an assumption of infinite renewal and lack of accountability. He argues that the tragedy comes with a spike in population, where a myth of infinite resources undermines the possibility of disciplined or regulated use. Over time, a separation of theory and practice in commoning has increased with industrialization, private property ownership, population growth, and neo-liberal economic governance policies.



Mapping a timeline of practice and theory of the commons in terms of popularity of use and influence within human governance.

In contemporary understanding, the commons is more often a verb rather than a noun. **Elinor Ostrom popularized the commons within the field of economics by comparing real-world self-governing common-pool resource systems and creating a set of characteristic operational guidelines observed in successful practices.**[9] Ostrom's study has been essential in understanding the dual strategy of the commons as a physical and as agovernance structure. Within contemporary urbanism, commoning has become a tool for political instigation to reclaim urban space and resources from neo-liberal policies. Activists like Vandana Shiva have used concepts of the commons to argue for water and other resources as a human right in the face of increasing privatization[10] while artists, designers and architects have employed commoning as a tool to articulate locally managed productive public space.[11] Design-based initiatives—mostly events in urban spacessuch as parking day, pop-up pavilions, festivals, food truck events—have focused on spatial articulation through symbolic re-appropriation of public space and have not yet addressed other urban resources in long term planning. On the other hand, initiatives such as community gardens have offered ways to increase the productivity of underused space but are usually—within Los Angeles—on re-appropriated public lands.

Elinor Ostrom's Design Principles

Clearly defined boundaries

Individuals or households with right to withdraw resource units from the common-pool resource and the boundaries of the common-pool resource itself are clearly defined.

Congruence

a. The distribution of benefits from appropriation rules is roughly proportionate to the costs imposed by povision rules.
b. Appropriation rules restricting time, place, technology and/or quanity of resource units are related to local conditions.

Collective-choice arrangements

Most individuals affected by operational rules can participate in modyfing operational rules.

Monitoring

Monitors, who actively audit common-pool resource conditions and appropriator behaviour, are accountable to the appropriators and/or are the appropriators themselves.

Graduated Sanctions

Appropriators who violate operational rules are likely to recieve graduated sanctions (depending on the seriousness and context of the offense) from other appropriators, from officials accountable to these appropriators, or from both.

Conflict Resolution Mechanisms

Appropriators and their officials have rapid access to low-cost, local arenas to resolve conflict among appropriators or between appropriators and officials.

Minimal Recognition of Rights to Organize

The rights of appropriators to devidse their own institions are not challenged by external governmental authorities.

Nested Enterprises

Appropriation, provision, monitoring, enforcemen, conflict resolution, and governance activitioes are organized in multiple layers of nested enterprises.

* For larger common-pool resource management

Design Principles for Elinor Ostroms "Reformulating the Commons"

How does it work?

Building on Elinor Ostrom's work, a commons is a governance structure determined by a common-pool resource and its social structure (also known as a design principle). Using this understanding, a commons model has two components: resource—tools of physical management or **hardware**; and practice—tools of social management, or **software**.

Hardware refers to the physical parts of a system including the shared or common-pool resource and the components needed to manage it. These physical components vary depending on the resource they manage: fences and cattle gates are designed to contain and direct usage of common grazing lands; website platforms are designed to support and control common information; ditches, gates and dams are designed to channel and direct water in acequia irrigation districts; vertical shafts and outlets are necessary for the functioning of the qanat.[12]

Software refers to the regulations, policies and practices necessary to maintain, operate and develop a common-pool resource; software is comprised of the rules or principles that regulate use of the resource's physical components. This understanding of software is based on Elinor Ostrom's design principles [see table left]. Ostrom defines a design principle as "an element or condition that helps to account for the success of the institutions in sustaining and gaining the compliance of generation after generation of appropriators to the rules in use."[13] These can be rules, regulations, or guidelines that identify (a) the common-pool resource (b) players in a common, (b) the roles of each player (c) the how, when and where to extract from a common-pool resource and (d) methods of assessment. Essentially software refers to the underlying social structure management of the common-pool resource. Some examples include the roles of a mayordom@ and commissioners in acequias,[14] or the contribution steps for Wikipedia, or the role of Atelier d'Architecture Autogérée in managing the urban acupuncture of R-Urban.[15]

Localization of resources:

REGIONAL

+ Complements existing centralized infrastructures and bureacracy
+ Reduces embodied energy + carbon emissions
+ Increases community accountability
+ Decreases stormwater flooding and pollutant loads during rain events
+ Increases visibility + awareness of watershed cycle
+ Leverages expanding social production

LOCAL

+ Increases accountability within households
+ Complements resource supply
+ Saves money in utility costs
+ Increases resilience in emergency
+ Social platform for multi-benefits

Why should we apply water commoning to LA?

Currently in Los Angeles, the ecological and cultural identity of water limited by water's invisibility within a centralized delivery system. In order for the city to maximize its local water portfolio sustainably, it needs to recognize systems thinking approaches to its urban resources. Commoning recognizes the value of a resource to its land and the value of a shared resource.

Re-thinking and re-designing strategies of catchment that encourages watershed thinking rather than privatized archipelago thinking can yield to a sustainable accountability of growth and extraction by integrating residents into an ongoing awareness process. So instead of continuing a passive fixed invisible centralized infrastructure approach, what if we can re-imagine a context into active visible hyper-local catchments?

Commoning wil make a contingency of networked reserves, embedding resilience within Los Angeles. Although the need for commoning may not be apparent for present-day Los Angeles, preparedness is an inherent part of climate adaptation and mitigation strategies. Commoning can help build a preparedness network that complements existing infrastructures and provides multi-benefits. Over time, t**hese networks will refine a collaborative, consensual, dynamic management of water as a resource. Facing a threat of water scarcity, commoners will know how to ration, negotiate and conserve for optimized stewardship.**

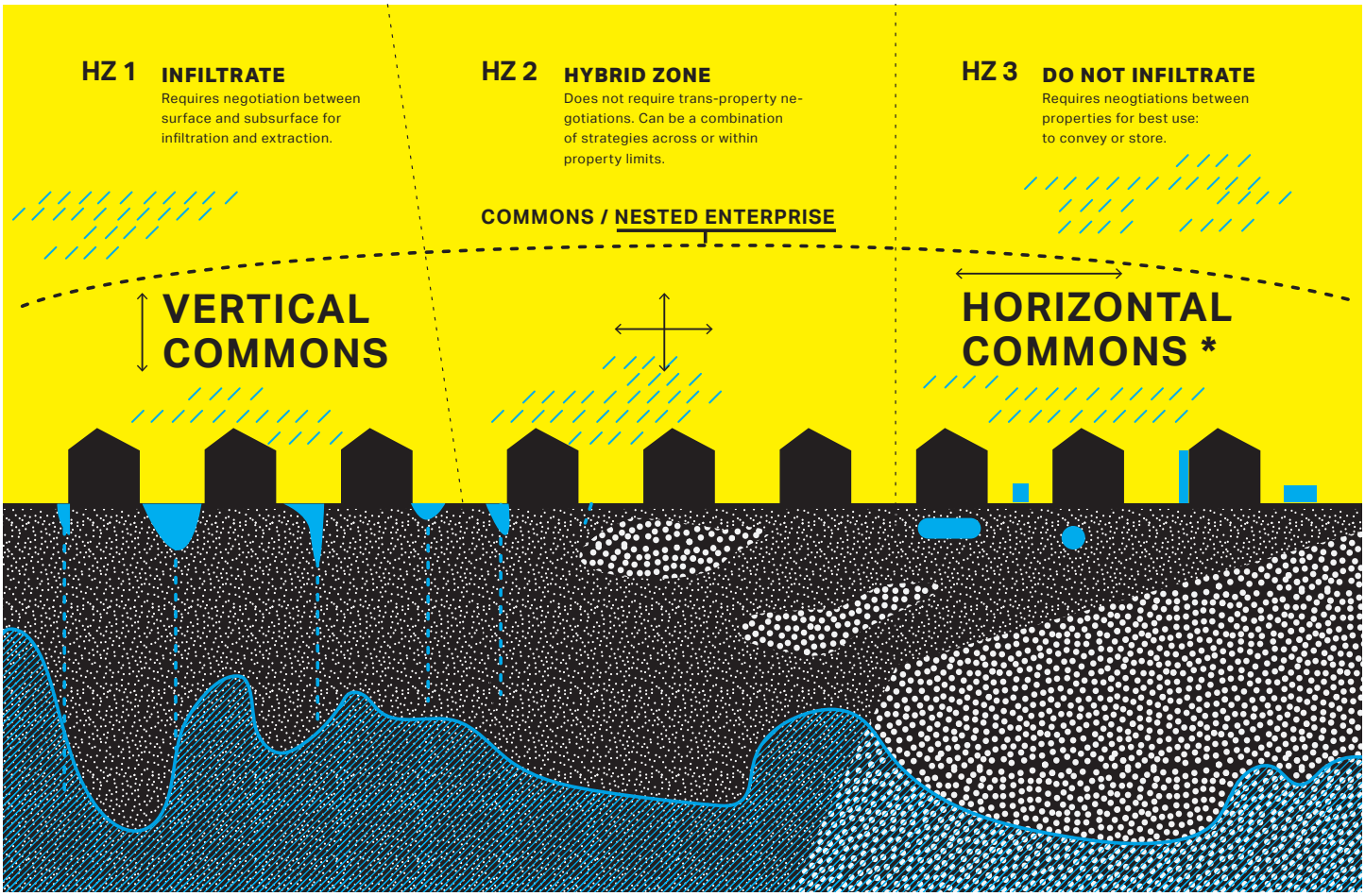


Diagram showing commoning strategies for each hydrologic zone to guaranteee a collaborative governance.

How would it work based on Hazel?

Using Hazel's hydrologic zoning, overlaid with commoning principles, at least two models of resource management emerge.

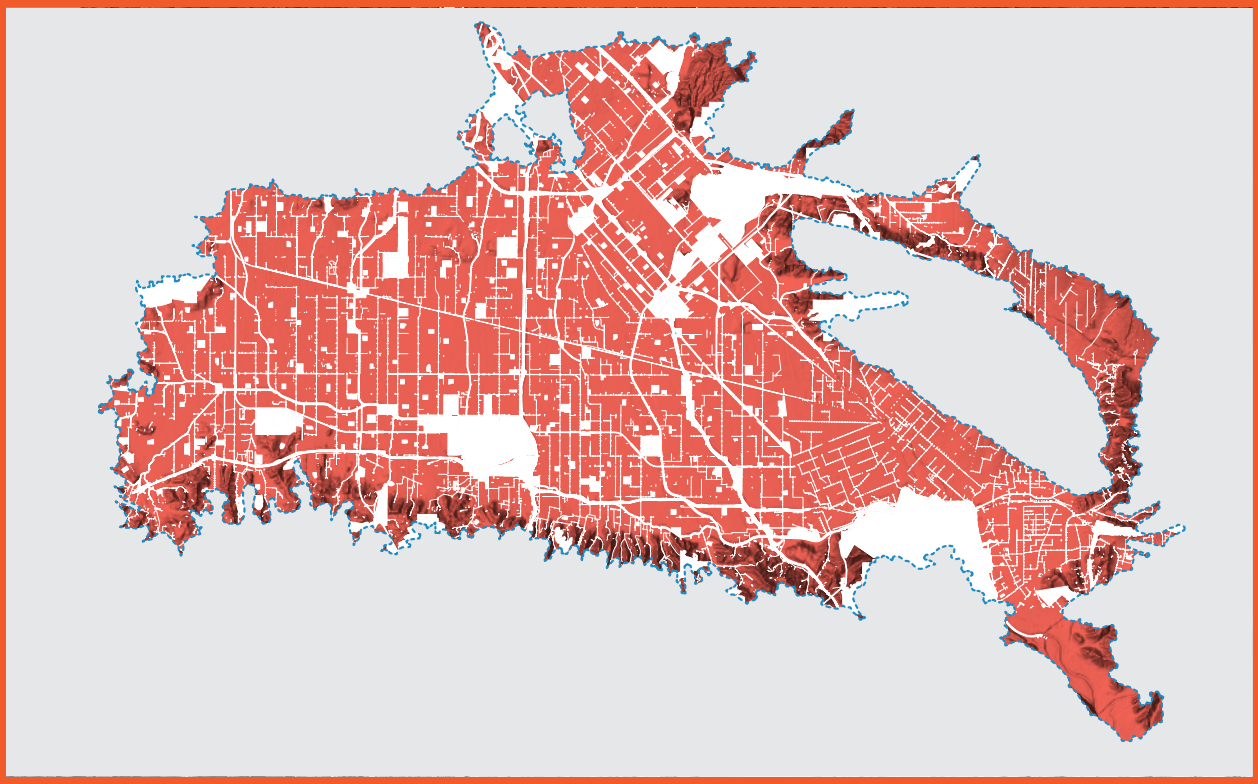
Vertical Commons

In HZ1, where water percolates from surface to subsurface to augment the groundwater aquifer, many existing best management practices could be effectively implemented within property boundaries and social negotiations beyond property limits are not necessary. If property owners are participating in the optimization of their groundwater basin through appropriate hardware, maintaining rights to augment, manage and withdraw from the common pool, and reaping material rewards from their practices, HZ1 could be seen as a "Vertical Commons." This scenario, however, requires a level of jurisdictional complexity in terms of surface land use and santitation practices. A new Vertical Commons (HZ1) might be most achievable in terms of hardware (fairly straightforward landscape-based green infrastructures for enhanced percolation), and least plausible in terms of rewriting basin software: with groundwater basins over allocated, contested, heavily adjudicated and crossing in and out of political and regulatory frameworks, it would require new water laws and new water metering technologies outside the scope of this thesis.

Horizontal Commons

In HZ3, where conditions are not suitable for infiltration, and yet every drop of rainwater/stormwater is a valuable buffer against reduced snowmelt deliveries, social negotiations across and in between properties can be seen as integral to guaranteeing a local storage and catchment for water supply. **HZ3 is seen as "Horizontal Commons" and is the focus of this investigation.**

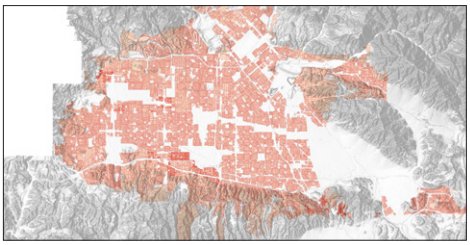
Case Study: San Fernando Valley



Composite public land and infrastructure [in white] throughout the SFV is the primary target of stormwater capture. The focus of this thesis is those areas highlighted in red.

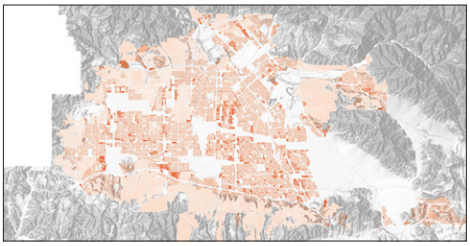
ALI's Hazel research focuses on the Upper Los Angeles River Basin, also known as the San Fernando Valley Basin–a 225-square-mile sediment-filled basin draining to the Upper LA River. While the Valley has been impacted by severe drought along with much of the West—from 2012 to 2016, it received only 5 to 8 inches of rain per year—precipitation in the Valley is predicted to correlate substantially to historical norms (high inter-annual variability but averaging approximately 17 inches per year).[16] If this is the case, **rainwater harvesting and stormwater capture are an untapped opportunity in the area.**

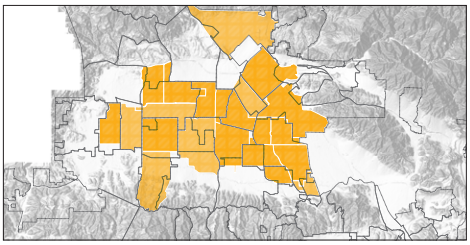
Given that current stormwater plans – including Greater Los Angeles County Integrated Regional Water Management Plan (IRWMP), Bureau of Sanitation and Department of Public Works Los Angeles Stormwater Program and Los Angeles Department of Water and Power (LADWP) Stormwater Capture Master Plan – focus and prioritize public property – catchment basins, storm pipes, parks, civic centers, schools and other publicly owned land –as the main surface target for capture, how can we take fuller advantage of hundreds of square miles of private property as catchment surface? Specifically, **can commoning facilitate rainwater harvesting and on-site stormwater capture and re-use \ on private properties in the"do not infiltrate" (HZ3) zones?**



Private property / Residential

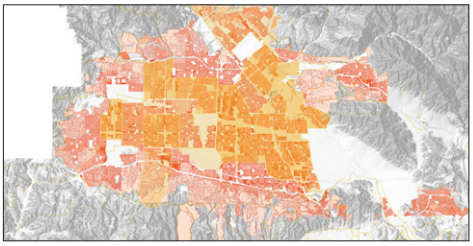
- High Medium
- Medium
- Low Medium II
- Low Medium I
- Low
- Very-Low, Minimal

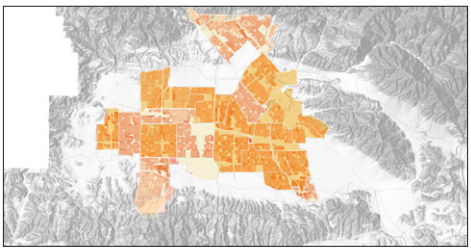


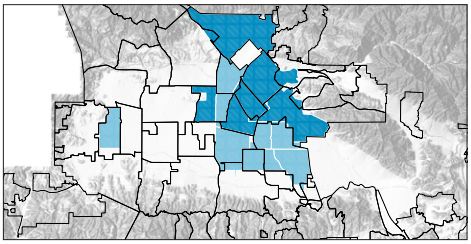


Low-Income Demographic

- Lowest Income Area 0- $55,470
- Low Income Area $55,470-73200

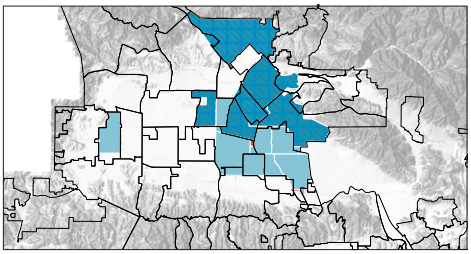






Latino Demographic

- Highest Latino Population
- High Latino Population



Suitability analysis using demographic and land use data determined which areas within SFV determine neighborhoods suitable for commoning investigation looking at prominant land use values, income and demographic areas.

Source: Mapping LA, LA Times

Where is commmoning suitable?

Using 30-year precipitation normals, ALI estimates 200 square miles of the San Fernando Valley could infiltrate approximately 92,000 acre feet of stormwater into the aquifer. However, 40% of the San Fernando Valley—approximately 88 square miles—is not suitable for infiltration. Residential land use is the largest land use throughout the valley and thus an opportunity for replicable and collaborative approaches.

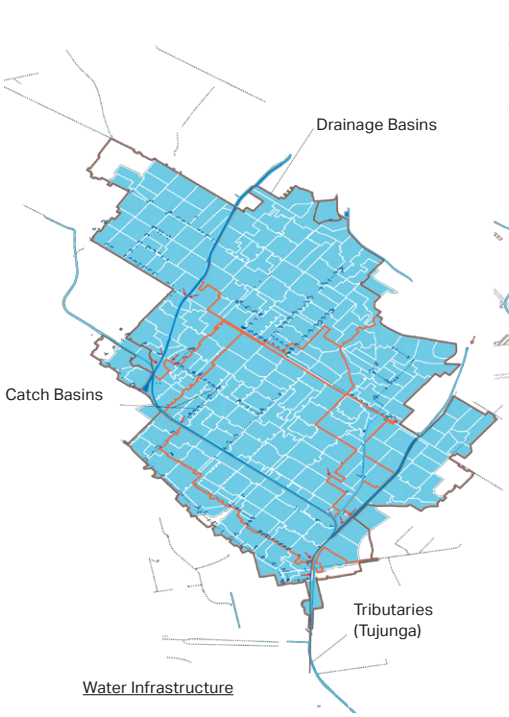
Within HZ3, I analyzed locations of disadvantaged communities in HZ3, with a focus on low-medium to low zoning densities. The result is a set of single-family dwelling neighborhoods within Latino communities in the northeast valley.

To enhance the likelihood of strong, socially networked water-capture collaborations succeeding, it was important to identify neighborhoods with the following characteristics: high evidence of informal social space (blurring boundaries between public and private); evidence of community pride and identity (indicating potential for cohesion and collaboration), and strong existing environmental and social justice organizational networks (ability to organize, formulate, and advance shared local objectives).

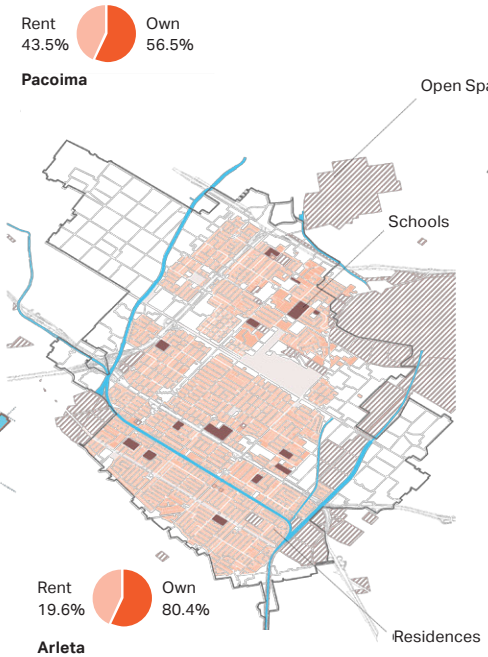
Observational fieldwork in the northeast Valley HZ3/low-income/low-medium density areas ultimately led to a focus on Arleta and Pacoima. Both showed ample characteristics indicating a suitable biophysical and socio-cultural environment for HZ3 Horizontal Commoning.

40%

Approximate area of the San Fernando Valley Basin is suitable for capture and direct use above grade and not fo groundwater augmentation..



Water Infrastructure



Land Use

Proposed park and open space

Case study: Pacoima / Arleta

Pacoima and Arleta are located within the Tujunga/Pacoima watershed. It is the largest sub-watershed of the Los Angeles River Watershed; it compromises both remote open space within the San Gabriel Mountains as well as highly urbanized portions. The three main tributaries are the Big Tujunga, Little Tujunga and Pacoima Washes. The watershed has a steep slope especially within the mountains and drops rapidly towards the valley floor.[17] The drastic slope and urbanized –mostly impermeable –valley floor make this watershed susceptible to flooding especially downstream.

Arleta-Pacoima neighborhoods are located approximately 23 miles northeast of downtown Los Angeles. **Both neighborhoods are located at the juncture of the Pacoima Washes. Some of the community issues include: hazardous wastes removal, potential overflow of tributaries, development constraints caused by poor lot configuration, proximity of residential-industrial areas, deteriorating housing, need for affordable housing, lack of open space and amenities.** [18]

Fieldwork observations demonstrated an active community involvement in a socio-spatial dialectic with a special attention on environmental issues. At a planning level, there are several initiatives to address the parks, open space and environmental concerns including the Arleta-Pacoima Open Space Vision Plan,[19] Pacoima Urban Greening Vision Plan[20] and Pacoima Wash Vision Plan[21] among others. **On the field there are several environmental and social justice non-profits with an active presence including Treepeople, River Project, Pacoima Beautiful –for environmental issues – and MEND –as an active social justice player.**

ARLETA	PACOIMA
32,622 inhabitants L.A. Dept. of City Planning	81,318 inhabitants L.A. Dept. of City Planning
10,034 inhabitants / m²	10,510 inhabitants / m²
$65,649 Median Income	$48,066 Median Income
4.0 Median household High for city & county	4.3 Median household High for city & county
80.4 % House Ownership	56.6 % House Ownership
71.7 % Latino population	85.6 % Latino population

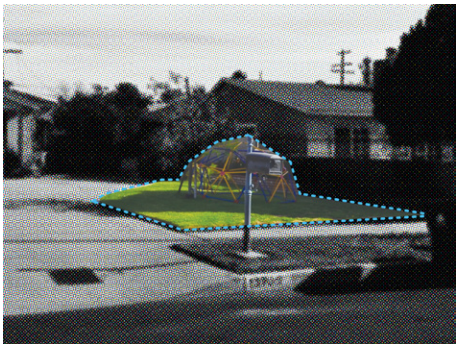
BLURRING BOUNDARIES

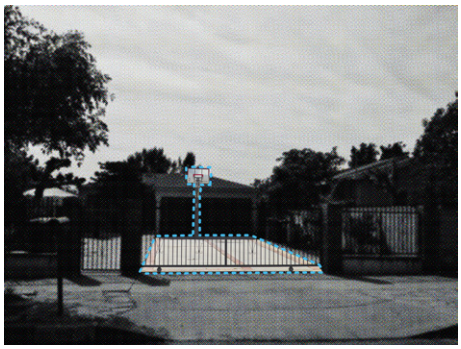
Evidence of

+ Informal social space at domestic and public domain
+ Underused open space activated by pedestrian social interactions
+ Evidence of community pride
+ Strong environmental/social justice networks

As Indicators of

+ Adaptation mentality
+ DIY construction techniques
+ Social cohesion
+ Organization and political will
+ Connection between built environment and social and environmental goals





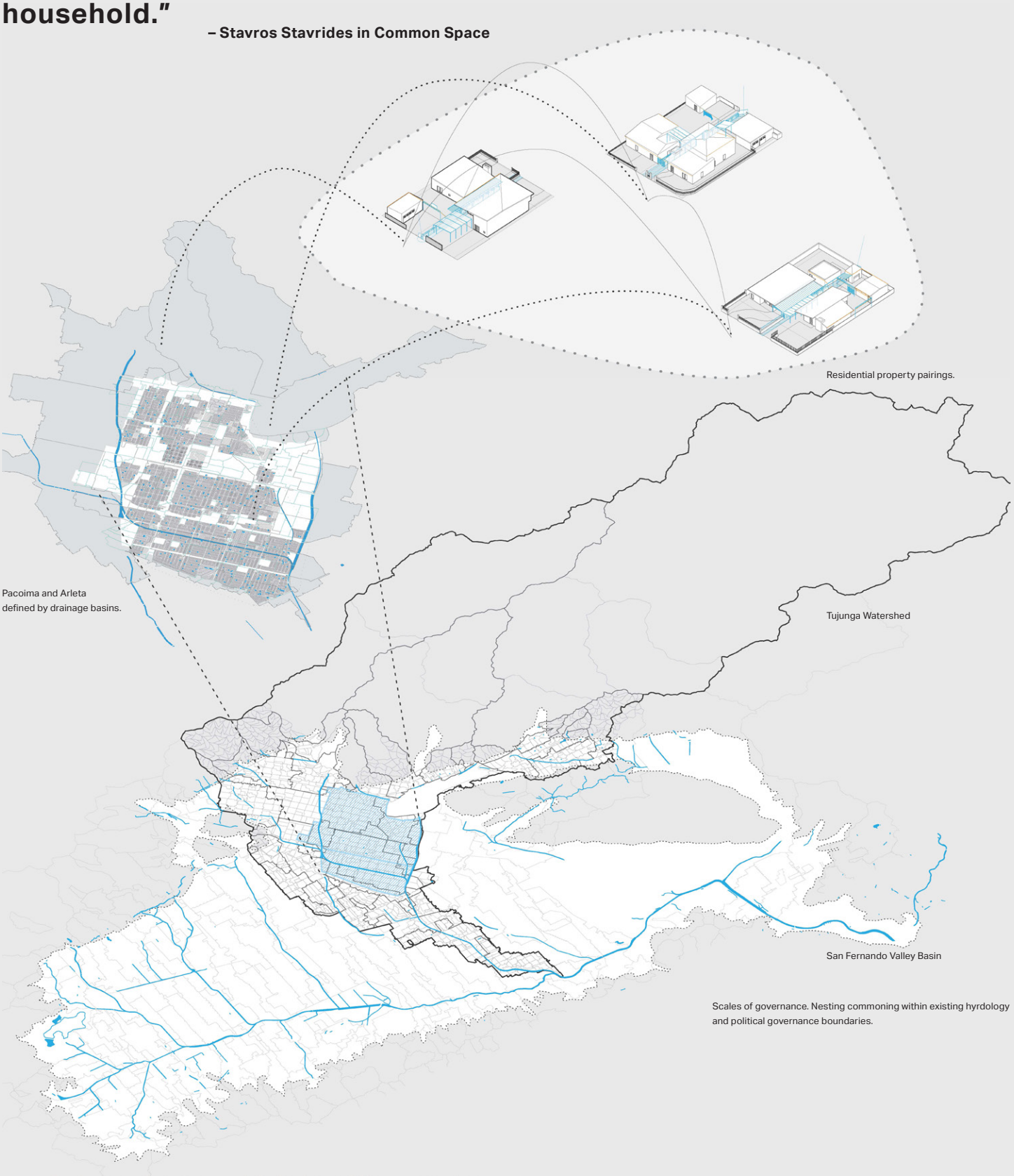
MEND

Pacoima Beautiful

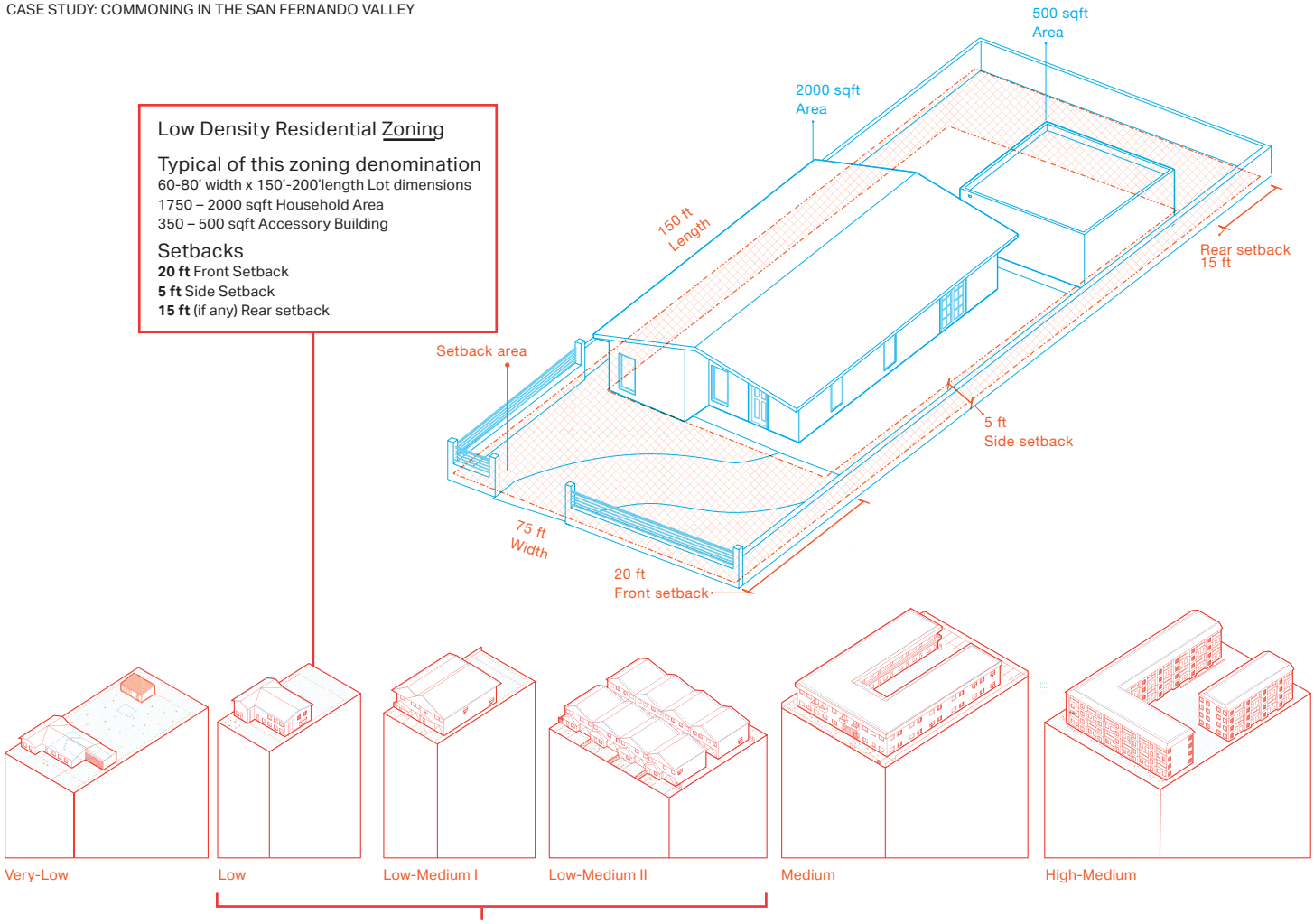
TreePeople

"By focusing on the single family dwelling in relationship to its neighbors, the seeds of collective action and commoning are at the very heart of the private realm, the household."

– Stavros Stavrides in Common Space



Scales of governance. Nesting commoning within existing hyrdology and political governance boundaries.



TYPICAL RESIDENTIAL TYPOLOGIES IN PACOIMA / ARLETA

Typology Study

Field work visits during CicLAvia, Pacoima Beautiful's Sustainable Saturdays, weekends and weekdays focused on observing the social and spatial characteristics of each neighborhood. Ultimately, it was clear that instead of picking one physical site, a typology study would have broadest application.

Single family residential is the largest land use in these neighborhoods—around 40%. Within single family residential, half of that area is located in areas not suitable for infiltration/suitable for localized capture and storage.

House ownership in both neighborhoods is also among the highest when compared to other neighborhoods in the city and county. Median household size is high when compared to the rest of the city—Arleta at 4 individuals per household and Pacoima at 4.3. It is common practice for many residents who live in this typology to live with their family in the main household and rent out the accessory building. In some cases a main household has also been subdivided and rented as smaller portions. This practice of "hidden densities" is where a single family house is subverted to an increasing population. Ancillary units to single family typologies have been common practice as a way to illegally increase urban density while maintaining the character and form of the neighborhood. There are current city-led efforts to support ancillary units as a principle vehicle for densification and affordability. The revision of current permitting and cost-barriers will allow for ancillary units or "granny flats" to become more wide-spread.

Toolkit for a Urban Water Commons

Guidelines for a typical single family dwelling neighborhood in the San Fernando Valley

NEW WATER COMMONS MODEL

Practice / **Software**

Collaborative
Participatory
Space

\+

Resource / **Hardware**

Water use
Water collection
Water conveyance
Visibility

= **WATER RESILIENT STRATEGIES**

To encourage a cooperative approach between individuals living in the HZ3 do-not-infiltrate zone, residents need an expanded lexicon of hardware (above-ground storage, treatment and use) options; those options need to be affordable, visible, and accessible; hardware needs to be configurable to offer multiple forms of economic and social benefit; and it needs to be coupled with software that clearly articulates principles, roles, responsibilities, and rights.

To facilitate access to disparate information and in an attempt to level a steep on-ramp to wide adoption, we identified the need for a tangible, hand-held resource that provided basic information quickly. Why a water co-op? What's hardware? What's software? What would my family gain? What would my neighborhood gain? The toolkit is presented in the form a Spanish/English pamphlet, designed to accelerate consideration of an urban water commons.

Kit of Parts: Hardware Toolkit

Infiltration
It is the movement of water into the soil.

Collection
Areas and surfaces where rainwater is collected from, also known as catchment area.

Conveyance
The action or process of moving water from one place to the other.

Storage The space where water is contained locally instead of running off into the storm drains.

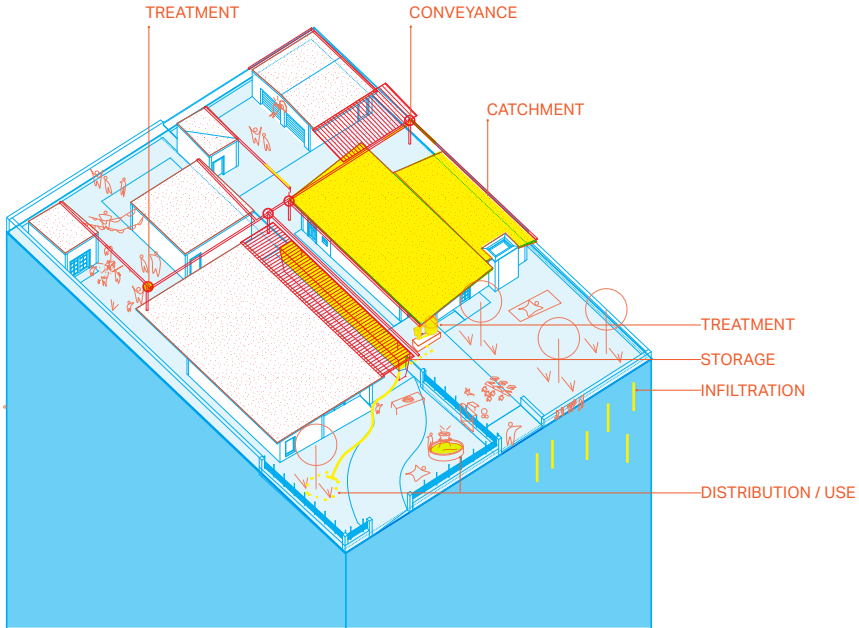
Treatment Refers to the act of cleaning water through passive or mechanical methods using filter fabric and/or chemicals and energy.

Distribution / Use Refers to the use of stored rainwater in the exterior or interior household designated use.

Hardware refers to the physical components of a harvesting system including: collection or catchment area, conveyance, storage, distribution, measuring devices and onsite treatment.

These components provide configurable and flexible options to harvesting rain water between two properties. Development resulted in a shopping list of some ready-made, some market-ready, and some speculative components. The shopping list includes components for catchment, conveyance, storage and distribution of rain water as well as providing opportunities for coupling with amenities to create social space.

The hardware toolkit is seen as a resource for individuals and their neighbors to customize and hack. Customization and hacking is seen as essential to commoning practice.



Design Criteria: Hardware

In HZ3, where you can't infiltrate, we need to retrofit and re-design rainwater harvesting components for communal catchments. Focusing on the sideyards between two properties as smallest common denominator, a kit of parts for a visible collection network must be:

Informal / adaptable, easy to access, flexible and re-configurable

Hardware that is accessible in terms of off-the-shelf solutions and ability to handle and use. Configurability is especially directed towards improving existing storage containers to be more modular in size and in configuration. Focusing on market-available components means that interested individuals can start to customize their own system immediately and do not need to wait for specialized designs to be fabricated. Some components will be speculative however, they are proposed as ideas for improvement and are comparable to other parts on the market and ready to be switched if developed.

Cost-effective / low cost($), high-return, for productive space

High return on investment means that benefits of the system will yield offset costs either in terms of: direct financial savings (reduced utility bills); economic potential (increased real estate value and/or productive landscapes fostering micro-entrepreneurial activities and/or cost-sharing); qualitative value, including thermal comfort, spatial flexibility, visual interest, etc.

Participatory / engaging, direct, visible and measurable

If one cost of the invisibility of centralized systems can be said to be the social and environmental cost of disengaged citizens, one reward of distributed hyper-local systems is the potential to engage residents directly, promoting resource management as an everyday dimension of urban citizenry. As such, systems need to be scaled and designed to be tactile, visible, measurable, and enaging.

Low or no energy intensive

Capturing local water, even accounting for the treatment of stormwater, reduces energy inputs by at least 66% of imported water. Gravity-fed local systems keep energy consumption low, de-coupling the energy-water nexus. For energy needed to pump or treat, distributed water systems can be powered by distributed solar or comparable renewable energy sources.

In one winter month:

1400
Gal Collected

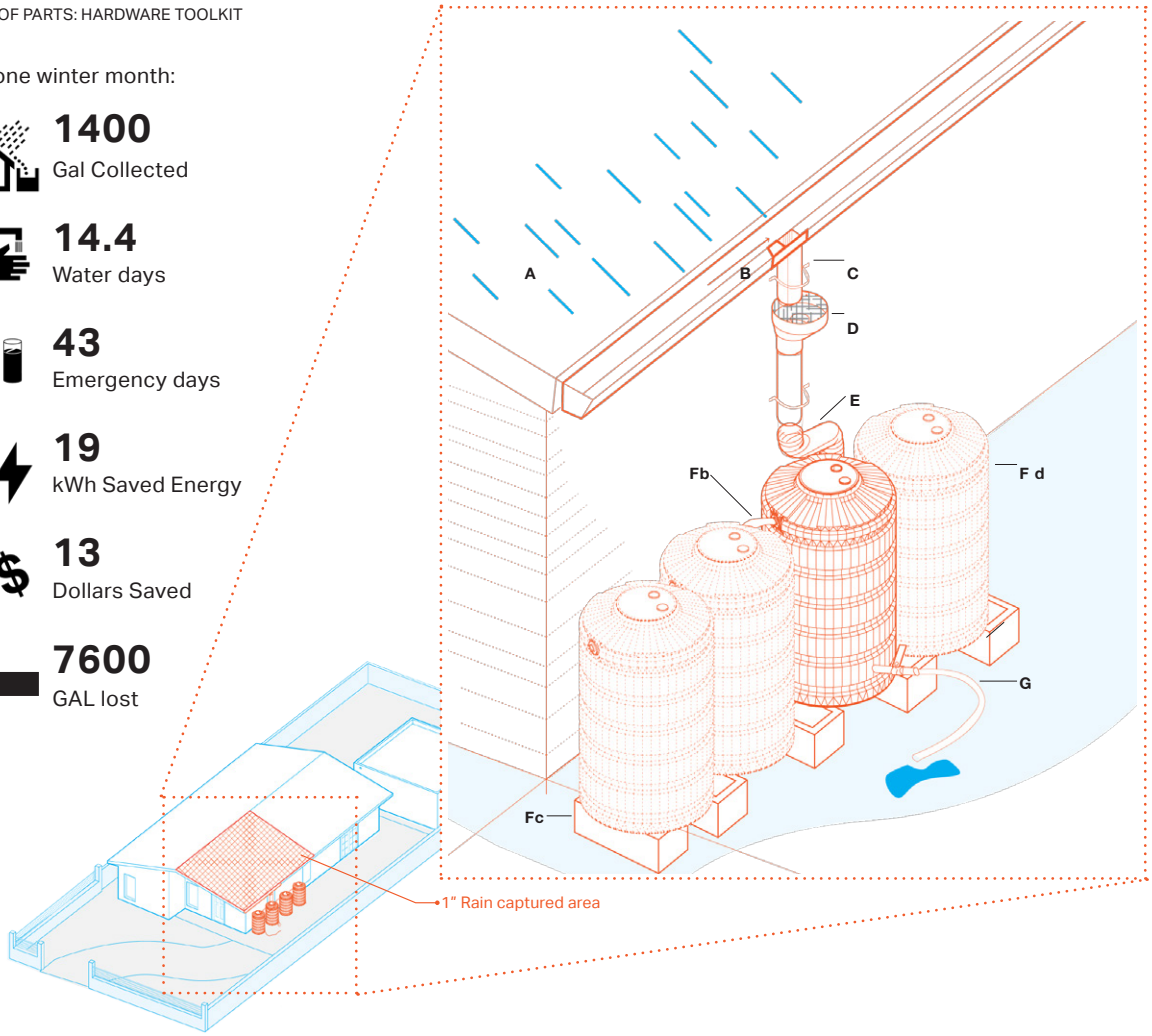
14.4
Water days

43
Emergency days

19
kWh Saved Energy

13
Dollars Saved

7600
GAL lost



A ROOF
Clean existing roof and prune overhanging trees and greenery. Remove debris often.

B GUTTER
Adjust screens, repair when needed, clean often.

C DOWNSPOUT

D LEAF-EATER
Wipe debris off

E ELBOW

F RAIN BARRELS / CISTERNS
a. Strap onto wall for seismic support.
b. Connect containers to capture overflow.
c. Elevate if possible for gravity-fed use. Use 12" or 15" cinder blocks.
d. Check for leaks, build-ups and holes.

G SPIGOT / VALVE
Connect to hose, drip irrigation system, or a spigot!

Rebate Rain Barrel Model

Overcoming Barriers to Wide Adoption

A rain barrel is a storage container of approximately 50-100 GAL for above ground use. It is commonly a human proportioned barrel often recycled from other purposes –such as food containers. The rain barrel has become very popular under rebate programs, where often the city and/or utility service offers a discount upon purchase of a container. Rebate programs became a way to incentivize homeowners into collecting water from their roofs during drought years to offset imports for residential irrigation. In Los Angeles, this practice has been extremely popular through Metropolitan Water District's Socal Water $mart program where a rebate of $75 per container –a maximum of $300—is offered for up to 4 rain barrels of a minimum capacity of 50 GAL.

Despite its popularity, there has been a mixed reception of adoption. Although many have applied for the program, there are limitations at an educational, installation and architectural scale. There are instances where, many homeowners upon receiving the barrels do not install them.[23] In other cases, some homeowners who are interested, do not know where to get rain barrels equivalent to a rebate price. In most cases to match rebate price, there has been partnerships with manufacturers for mass distributions based on community-wide interest –not only an individual. The program does not economically address installation and or other components involved in the system such as downspouts, gutters and other smaller hardware. This last point is especially difficult for most low-density residential properties—especially older structures—where gutters are not already in place. Although some non-profits offer installation and installation workshops with mass distributions, these efforts are not compulsory.

Once installed, the four barrel rebate program works only at a meager scale when compared to water demand for irrigation and/or possibilities of capture from typology roof areas. The rebate program once installed, can capture around 200 GAL worth of rain water. However this accounts roughly for only 400 sqft of area in a 1" storm. In a low density typology, the main household roof area is approximately of 2000 sqft; therefore 1600 sqft of the roof area is stormwater runoff. The 200 GAL amount compared to the water demand for irrigation also runs low, where typical hose watering for a 750 sqft area require 250 GAL. Conserving and optimizing system—with drought-tolerant planting and drip irrigation systems—might help to stretch rain barrel reserves, but only to a one or two more watering days.

In one winter month:

1800
Gal Collected

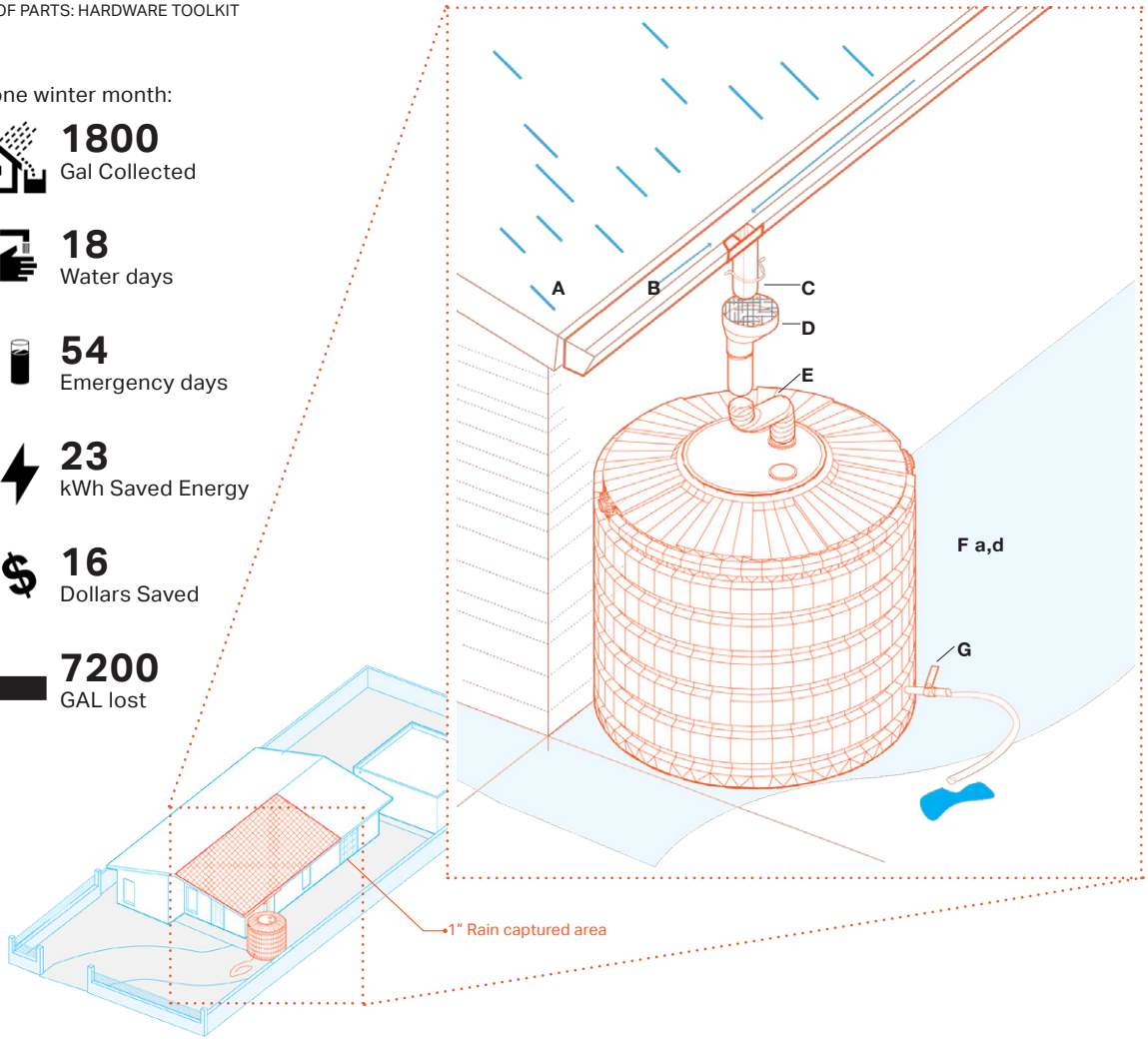
18
Water days

54
Emergency days

23
kWh Saved Energy

16
Dollars Saved

7200
GAL lost



A ROOF
Clean existing roof and prune overhanging trees and greenery. Remove debris often.

B GUTTER
Adjust screens, repair when needed, clean often.

C DOWNSPOUT

D LEAF-EATER
Wipe debris off

E ELBOW

F RAIN BARRELS / CISTERNS
a. Strap onto wall for seismic support.
b. Connect containers to capture overflow.
c. Elevate if possible for gravity-fed use. Use 12" or 15" cinder blocks.
d. Check for leaks, build-ups and holes.

G SPIGOT / VALVE
Connect to hose, drip irrigation system, or a spigot!

Rebate Cistern Model

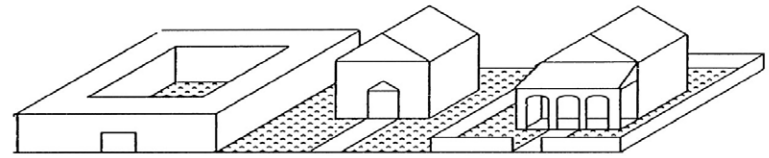
Overcoming Barriers to Wide Adoption

A cistern is a storage container of 100 GAL or more for above ground or underground use. Cisterns are popularly used as underground containers for large volumes however, this involves moving soil –including energy pumps for displacing water– which is added initial setup and continuing operational cost. There are also above ground cisterns that are usually from 100 GAL - 5000 GAL. Above ground cisterns take up a large amount of space –up to 10 ft in diameter for 5000 GAL capacity –and are fairly visible thus, require initial planning in terms of placement. There is a comparable cistern rebate program through the Metropolitan Water District Socal Water $mart program. The rebate covers only one cistern with a capacity greater than 100 GAL and up to $300 in dollar value. The dollar amount is the same as the rain barrel rebate program and can cover a 200-300 GAL cistern depending on the manufacturer and retail point.

Similar to a rainbarrel rebate program, there are similar limitations in terms of education, installation and architectural scope. The cistern rebate model success is greatly affected by a lack of accessibility to cost-effective containers and preliminary planning required for siting the container within a property. Since roof, gutter and downspout hardware is similar to a rain barrel setup, the cistern setup shares similar limitations regarding cost-effective installation. Initial planning required to place a cistern can lead to awkward spatial configuration especially if using larger cisterns in small plots.

Once installed, the cistern like the rainbarrel, is a small scale solution to roof catchment area and irrigation demand. At best, if the cistern has a capacity of 300 GAL, it is taking 500 sqft of area in a 1" rain event; around a quarter of a typical household with a 2000 sqft roof area.

Diagram by James Rojas shows space for 'enaction' in between residences.



Evolution of East Los Angeles Vernacular
Diagram by James Rojas shows the evolution of single family house vernacular.

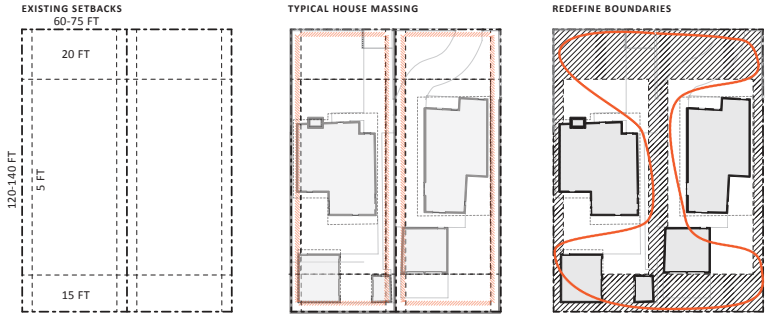


Diagram showing the typical setback area for low-density residential zoning now to be an opportunity for 'enaction'.

Fence as Opportunity

If we want to start to address the city as catchment, two questions quickly arise: How can we maximize capture? Where do we place appropriately scaled storage systems?

In maximizing the potential of run-off capture in the HZ3 do-not-infiltrate zone, storage is the most challenging piece of the equation. Solutions need to maximize catchment vis-à-vis storage.

Based on observations of the built environment and James Rojas' work on Latino Urbanism, the investigation focuses on studying the 'enacted' space around residences. Rojas defines the 'enacted zone' as privatized space defined by harder built edges where props and physical structures anchor users and give them a sense of control.[23] In residential neighborhoods, the enacted zone is any space contiguous to a residence and up to the street. There are two layers to this zone: the yard and the sidewalk. For the purposes of commoning, the investigation focuses on the fence as a space for shared production.

In American culture, the residential fence delineates private property boundaries. Traditional Latin American homes extend to property line and thus, the street is often used as semi-public/semi-private space where residents set up small businesses, socialize and engage with the community.[24] **To create a similar context, residents retrofit the American vernacular to create similar physical contexts where the fence is an extension of the house to delineate property. As a fluid and permeable surface, a fence and its contiguous yard and street is where social interactions between neighbors, children and families occurs.** At the threshold of domestic property, the fence is a comfortable point for social interaction between the yard and sidewalk. It is common to see activities such as: garage sales using the fence as a

Rasquache-Nahuatl origin-refes to an attitude that was lower class or improvised, claimed by the Chicano population as a way to codify all Chicano cultural production theatre, literature, and visual art. Scholar and cultural critic Tomás Ybarra-Fausto's theorization of rasquachismo as a set of aesthetic practices that adopt an oppositional stance to dominant culture (often DIY) and articulate a Chicano identity.[26]

hang space that bring domestic artifacts outside; a push-cart passing by will capture attention and exchanges at the fence; if the fence is a short concrete wall, it can be a bench or a space for chess.

The yard is a space of personal and cultural expression and reflects how Mexican/Latino cultural values are applied to American suburban form.[25] Part of this cultural expression is that of Rasquache—an aesthetic practice that articulates a Chicano identity **[see adjacent]**. As a bi-cultural expression, it includes a mixture of American and Latino aesthetic through props; it is the Virgin of Guadalupe sitting within a field of pink plastic flamingos, next to a pre-fab concrete water fountain, underneath the American flag. The personalization of a yard not only uses cultural expression to bridge the space between the house and the street but consequently creates different types spaces for children to play, for informal markets and for human scaled social interaction.

Based on fieldwork observations and Latino Urbanism studies, there is an opportunity to re-think areas within residential property as spaces not only for social but also environmental benefits. **Storage systems should leverage social space of a fence as an opportunity for interaction,** one that maximizes water and quality of space. By occupying the threshold of private property, storage systems can become visible to users and re-define urban form through its spatial –perhaps environmental –rasquache. Reclaiming setback area as a productive landscape is a necessary step in order to re-think the city as catchment.

Shopping List

Use this shopping list to guide you with design and create outdoor spaces.

NOTES

◡ a. We recommend investing in tanks that are designated for potable use. This allows for future flexibility for designated use. UV resistant with a mesh for mosquitos.
b. Existing rebates for rain barrels and cisterns.
c. Re-purposed food storage containers or home-made metal barrels can also be used. Water will not be for potable grade. These will not qualify for rebate.

★ Indicates components that do not exist in the market. These are ideas for further development.

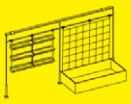
O We recommend these to improve quality of the water collected.

\+ We recommend third-party installer.

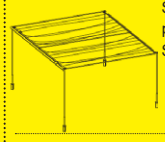
~ We recommend:
a.Weather Barrier Rain Coat 2000 for less desirable roofing materials
b. Topcoat W. O. B. White
for concrete or metal roofing.
For more information:
harvestingrainwater.com/

CONVEY+HOOP
Structural piping+water conduit. Attach a basketball baseboard.

CONVEY + GOAL
Structural piping+water conduit. Hang soccer goals.

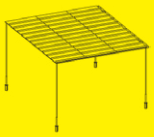


CONVEY + FARM
Structural piping+water conduit. Hang planting sacks or support trellis.

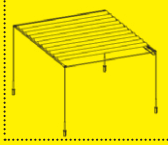


CONVEY+DRY
Structural piping+water conduit. Set up a laundry rack.

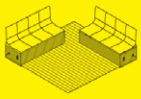
CONVEY + HANG
Structural piping+water conduit. Hang a hammock.



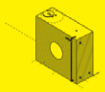
HARD ROOF
To increase catchment area. Potential for future solar panels.



SOFT ROOF
To increase catchment area. Operable and flexible option.



STORE + HANG
Clip bench top to create seating.

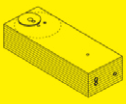


STORE + PLAY
Holes through cistern can create a playful surface for kids.

STORE + SKATE
Clip ramp to provide skate-able surface for all ages!

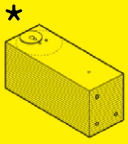
STORE + WORK
Level surface clipped onto top of collective cistern for shared work surface.

★



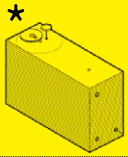
COLLECTIVE CISTERN
24" height. Polyethylene plastic, roto-molded, double layered.

★



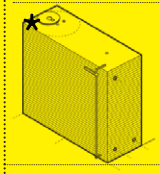
COLLECTIVE CISTERN
36" height. Polyethylene plastic, roto-molded, double layered.

★



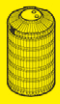
COLLECTIVE CISTERN
60"height. Polyethylene plastic, roto-molded, double layered.

★



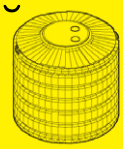
COLLECTIVE CISTERN
72"height. Polyethylene plastic, roto-molded, double layered.

◡

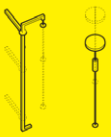


RAIN BARREL
50-100 GAL. Potable grade -polyethylene plastic- for above ground use.
light proof to prevent algae blooms

◡



CISTERN
100 + GAL. Potable grade -polyethylene plastic- for above ground use.



LEVEL GAUGE -VISUAL-
Uses floating ball to measure water inside, shows visually.

yaktekindustries.com

LEVEL GAUGE -METRICS-
Uses floating ball to measure water inside, shows in dial.

O ~

ELASTOMERIC COATING
Apply to roof to improve catchment surface.

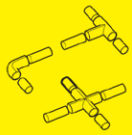
O

LEAF EATERS
Filter to remove large debris.

O

FIRST FLUSH DIVERTERS
They flush out the first minutes and separate contaminated water before collecting water.

FILTRATION
Filtration is for potable or semi-potable use (shower, washing). Use carbon filters.

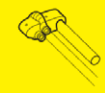


JOINTS, ELBOWS, TEES
Aluminum or stainless steel pieces to join structural piping.

★

BOLTED CLASP
Polypropylene clasp for bolting onto surfaces
-backboards-

★



SLIDING CLASP
Polypropylene clasp to hang parallel to a structural pipe for sliding purposes.

★

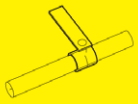
STRING CLASP
Polypropylene clasp used for tying wire or string.

★

GUTTER CLASP
Polypropylene clasp holding structural pipe and gutter.

★

CONDUIT CLASP
Polypropylene clasp holding structural pipe + water conduit.



VALVE
Recommended for low-flow applications.

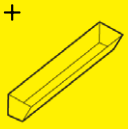
PUMP
Recommended for high-flow use. Factor in pressure, flow and electricity use.

O

SHEET METAL PANELS
Run seams toward gutters for better drainage.

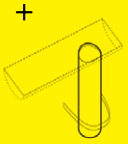
VINYL
Vinyl fabric with metal grommets
For accordion, fold and sew thin rods into crease.

\+



GUTTER
Roundstyle or K-style gutter.
Slope 1/16" per foot.

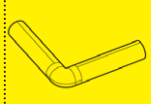
\+



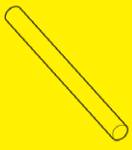
DOWNSPOUT
3" Plain Round downspout.
Use straps/brackets to secure.

RAIN CHAIN
Rain chain is an alternative to a downspout.
For vertical use only.

DOWNSPOUT ELBOW
3" Plain round elbow or flexible accordion elbow

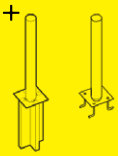


WATER CONDUIT
3" Purple PVC pipes.
Label as non-potable.



STRUCTURE
1-1/4" aluminum or stainless steel pipes [cut to desired lengths]

\+



GROUND CONNECTIONS
a. Connect to existing foundation.
b. New foundation, use plate, anchor bolts and concrete pour.

Kit of Parts: SoftwareToolkit

Software refers to the policies and practices adopted by neighbors to maintain, operate and develop a shared rainwater harvesting system.

Several social negotiations need to happen at the start, to initiate operations and maintain a running system. (Chances for later expansions are also critical but require modifying software to translate and mediate between commons).

We began software development using Elinor Ostrom's design guidelines for commoning as inspiration. A toolkit of social negotiation guidelines for shared resource management was developed and included as a critical component in the public programming. **The toolkit is designed to spark interest and dialog between neighbors exploring ways to modify their properties for common interest, including creating water reserves and producing shared social space.**

Complementary to hacking hardware into a physical and inhabitable space, different scales of social negotiation – software –will need to be addressed in order for a collective initiative to exist within existing structures. **From networked systems to single instances, these are the policies and regulations that would need to be addressed for this model to succeed:**

Educational

For commoning to succeed, it is crucial to fill gaps of information at various scales –including rainwater harvesting technical support, resources for collectivization alternatives and the Hazel zoning logic.

Technical support & Alternative models**.** From a homeowner's standpoint, there were many limitations including not knowing about available resources and how to acquire these. There was a good understanding of the drought conditions and the necessary cutbacks on water use, however when it came to adopting these measures, there was an informational gap on how to procure existing rebates. **Although there are an increasing amount of resources online for rainwater harvesting, many homeowners do not rely on the internet or do not know where to go.** In addition, many online resources are only in English, therefore offering different translations can help alleviate this gap of information.

Hazel**. Once Hazel zoning logic is adopted, the recommendation is to make zoning information accessible to homeowners.** Although the tool is being designed to be used by professionals, some general information on types of hydrologic zones, should be readily available to homeowners. To leave private property owners out of this discussion can only profit centralized infrastructures. For examples, zoning information should be indicated on Zimas –the online zoning map for City of Los Angeles –with descriptions of Hydrologic Zones including best management practices for each zone. In terms of city-wide adoption, building and construction inspectors should be well-versed in best management practices and associated permit processes in order to streamline their approval and construction.

Urban form / Zoning and Building Code

For the urban common model to be recognized by the city, it needs to re-negotiate some urban form compliances in terms of building code. **Regarding set back requirements, there should be a code exemption made for water collection devices so that it is not mislabeled as a violation of setback provisions.** More than a code exemption, the system should also either not require a permit or be an over-the-counter permit process to facilitate its setup associated costs. For systems being installed during new construction or retrofits,

the allocation of setback area and system installation could also be recognized by environmental and social agencies such as LEED (Leadership in Energy and Environmental Design) in their water focused credit point system[27] and SEED Network (Social Economic Environmental Design Network) as a further incentive of its application. If networking happens around an alleyway, there would need to be a way to streamline alleyway access between neighbors and the city to modify the right of way as a social space through co-investment. **Collaborative alleyway projects could align with existing greenway/green alley projects[28] for greater opportunities of public-private partnerships.**

Water Safety / Policies

Existing policies curb water re-use possibilities for health reasons. Although this is for a common good, **we recommend certain policies to be softened in order to maximize water collection and water quality during rainy season through the summer months.**[29] For long-term banking, rain water detention time and treatment policies need to be revised to accommodate longer drier periods. Stretching detention time can be beneficial in maximizing amount of water especially in potable grade containers –UV resistant and mesh protected to prevent algae blooms and mosquito-breeding.

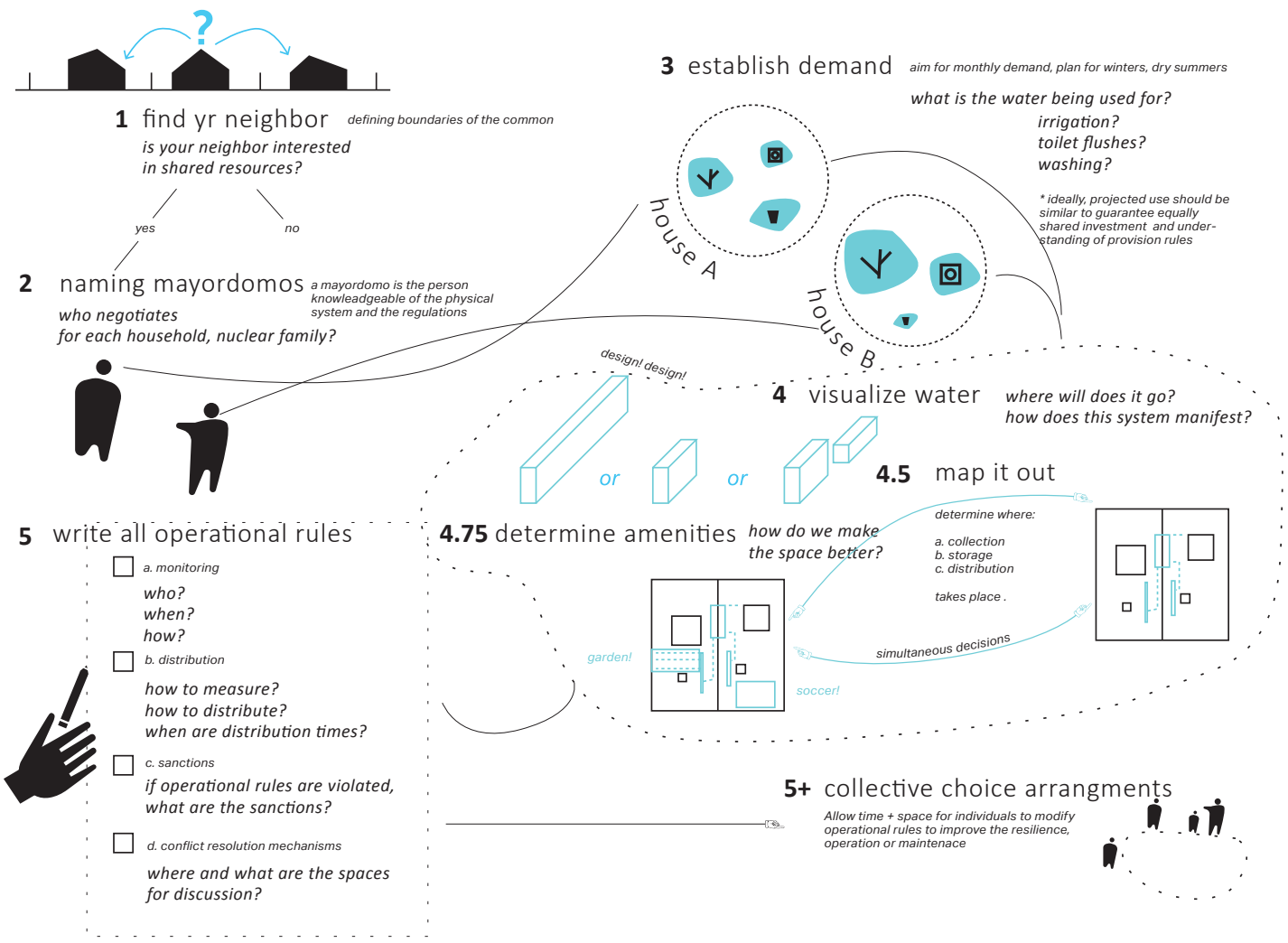
Treatment standards for potable water are extremely high, however definition for rain water should include uses like washing, toilet flushing and irrigation. Down the line, **we recommend streamlining filtration practices as to include rain water as a potential supply source for semi-potable use such as showering and washing –not drinking.**

Improving building material quality would lead to better conditions for retrofitting rain water harvesting catchments. **A continuous problem in areas in Los Angeles is that low construction standards lead to poor surface conditions for catchment areas, thus requiring more of an upfront cost from home-owners to improve to quality standards.** This practice is evident in roof and gutter requirements. Asphalt roofing and ceramic tiles should be discouraged or required to include coating levels to reduce pollutants and debris collected in pores. Gutters are also overlooked in residential construction and discourage rain water collection retrofits. Many houses were built without gutters and as such, homeowners have to pay upfront for gutter installation when retrofitting. Having ready built gutters and approved roofing surfaces –we recommend metal –can greatly benefit the homeowner in the long run.

Act of Commoning / Managing and Negotiation

Urban Common Models redefine negotiations between neighbors. In order to overcome preconceived notions of private property, neighbors will have to renegotiate their boundaries in order to (a) maximize water capture and (b) create an enjoyable space. Elinor Ostrom's Design Principles were used as a framework for a neighbor tool-kit including (a) Negotiation steps for shared rain water harvesting and (b) Operational Rules. At a property level this can jump-start conversations of a hyper-local governance over water.

In order for an urban common model to succeed –especially if it will expand –it needs the recognition of existing political structures. At a smaller scale, governance recognition is not imperative, however at a larger scale, a networked block or neighborhood will need to re-define its relationship to local governance including neighborhood councils, council districts and more importantly with Los Angeles Department of Water and Power (LADWP), Bureau of Sanitation, Department of Building and Safety (LADBS) and Department of Public Works (DPW).



In terms of property transfer, although properties will not be expected to receive a land grant from the government –like acequias—there are other options recommended: (a) if a commoning structure wants to be left with the property, the system should be leveraged as a "water right" within property deed, or (b) if the commoning structure is to be dismantled, components should allow for its de-installation and re-location with other neighbors or (c) remove it all together.

Another opportunity in hyper-local commoning software is the local organization networks that can allow for its perpetuation. If urban common models are attractive, **a hyper local community organization can help to distribute knowledge, information and operational aid.** Creating local networks could be volunteer based or be a job opportunity especially regarding hardware installation and maintenance tasks. Social networks that can leverage a commoning practice would benefit homeowner's access to information as well as serve as mediators for the community. In some cases, piggybacking on existing community non-profits –especially those focused on environmental and social justice –could leverage an existing community network and governance recognition.

Design Scenarios: Recombinant Variations of the Toolkit

Using the kit of parts reconfigured in a variety of ways, possible programs include: farming and gardening, washing clothes, workspaces, patios, basketball courts, impromptu soccer matches, jungle gyms and spaces to hang out.

Using an ad-hoc approach, seemingly utilitarian components can now serve multiple purposes for the residents and in return create social spaces

where they and their neighbors can host parties, produce trades, garage sales, mechanic shops, after-school playspace and more. The main purpose by addressing a domestic scale is to integrate daily routine with water and redefine the background of daily life.

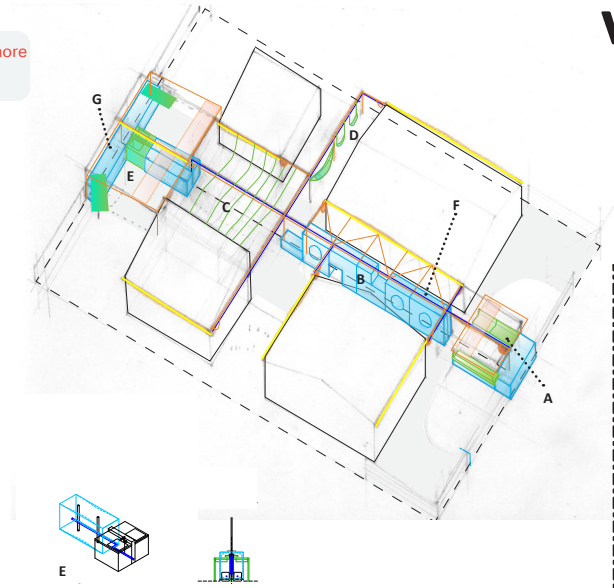
v1.0

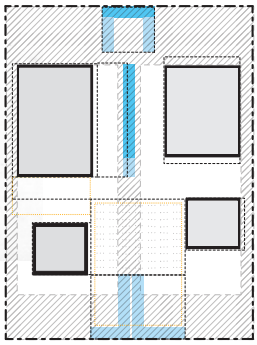
i wish we had more space to hang

Hang-o-mat

Neighbors have been talking about starting to collect water for washing clothes. Both women of neighborhood households are frustrated with laundry-mats and decide to create a shared washing space. They create a shared air-drying rack coupled with a facing washing station, where they gossip over the counter while folding their clothes. In the front yard, seating cisterns with a roof extension make a shaded patio while they wait for their clothes to dry.

A FRONT PATIO
B PLAYGROUND
C HANGING WIRES
D HAMMOCK STRUCTURE
E WASHING NODE
F SHARED CISTERN
G DISTRIBUTION CISTERN



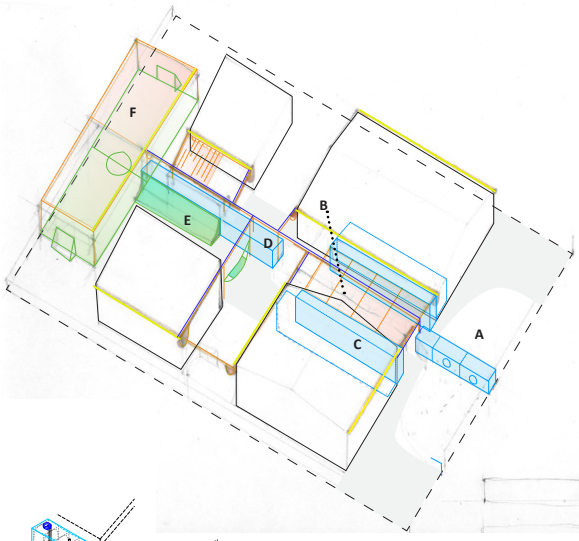


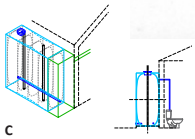
you should come out and play

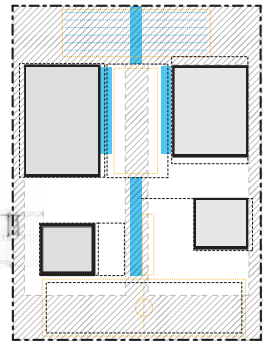
Playscape

Neighbors both have children who are friends. Parents want to maximize water for toilet flushing and create a playful yard space for their children. They decide to create a playful composition of fence cisterns—secured in place with structural posts—that allows children to weave in and out. Some skate ramps use the cisterns as structural support. By creating tall cisterns in some parts, they have opened the space in the rear yard for a shared mini-soccer field who everyone in the block comes to play at. Eventually they build out a shading system over the field to provide shade in the summer; they also calculated they could increase their catchment with it.

A LAWN
B SOFT ROOF
C DISTRIBUTION CISTERNS
D SHARED CISTERN
E LEAN RAMP
F SHARED FIELD





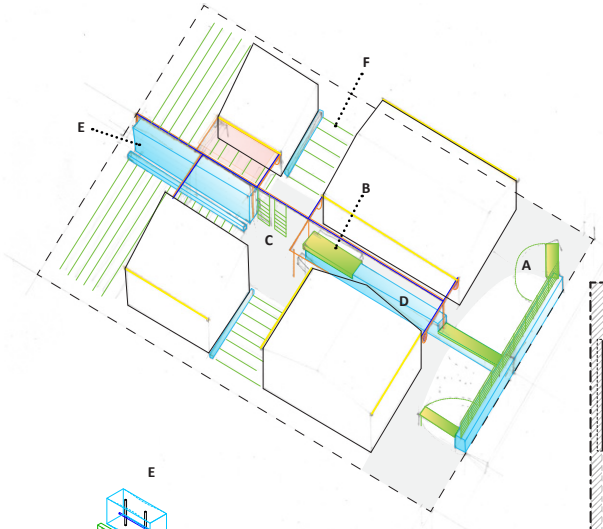


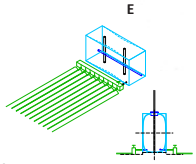
let's grow our food

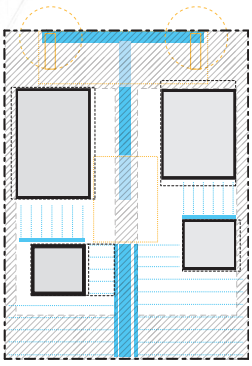
Farmfields

Neighbors are focused in developing a farm-focused yard space. They have optimized their storage space for drip irrigation, maximized their plant beds coupled with vertical gardening support trellises and hanging vertical burlap sacks, created supplementary space for picnics and turned their front yard for weekend produce trading.

A PRODUCE TRADE
B PICNIC
C HANGING PLANTERS
D SHARED CISTERN
E DISTRIBUTION CISTERN
F DRIP IRRIGATION NETWORK

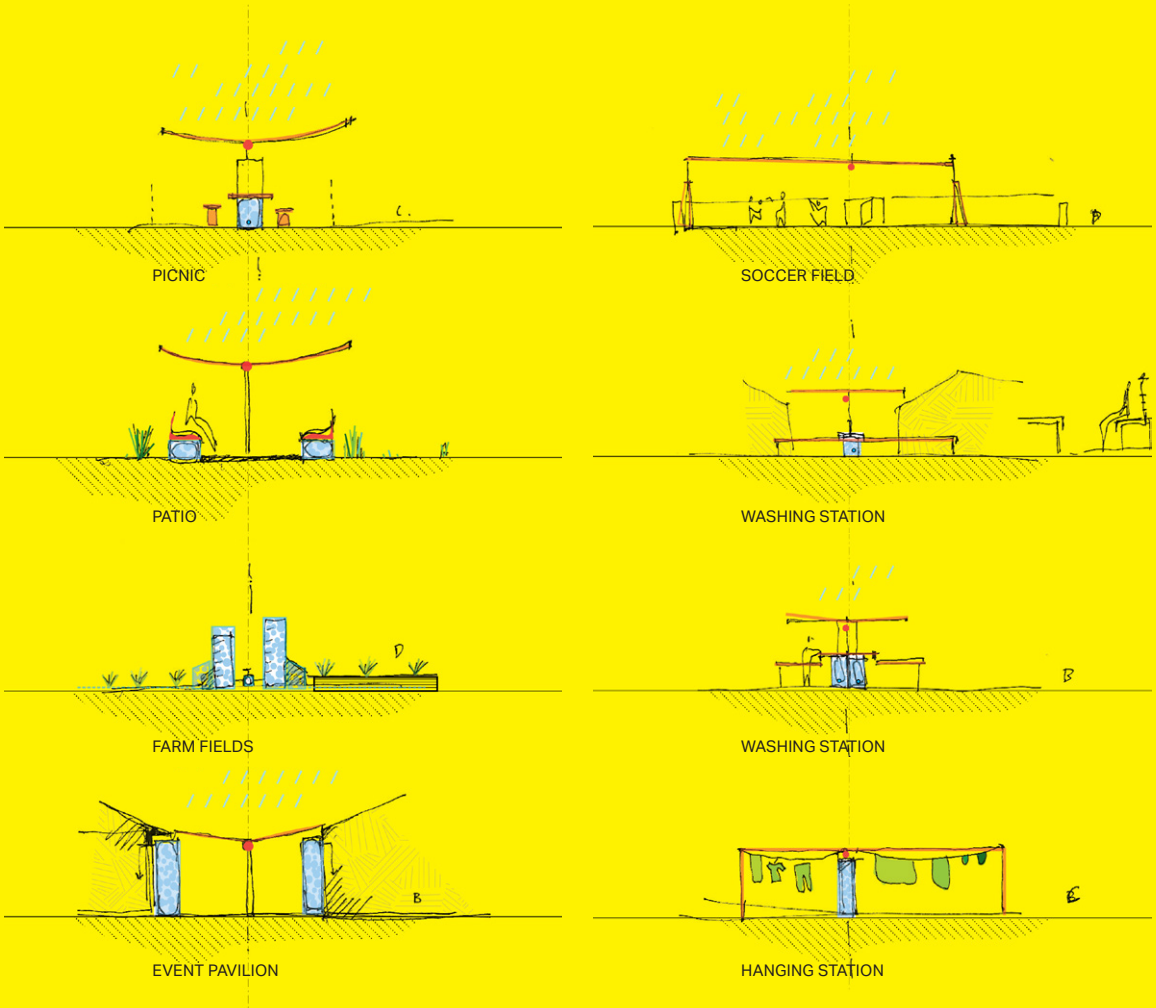






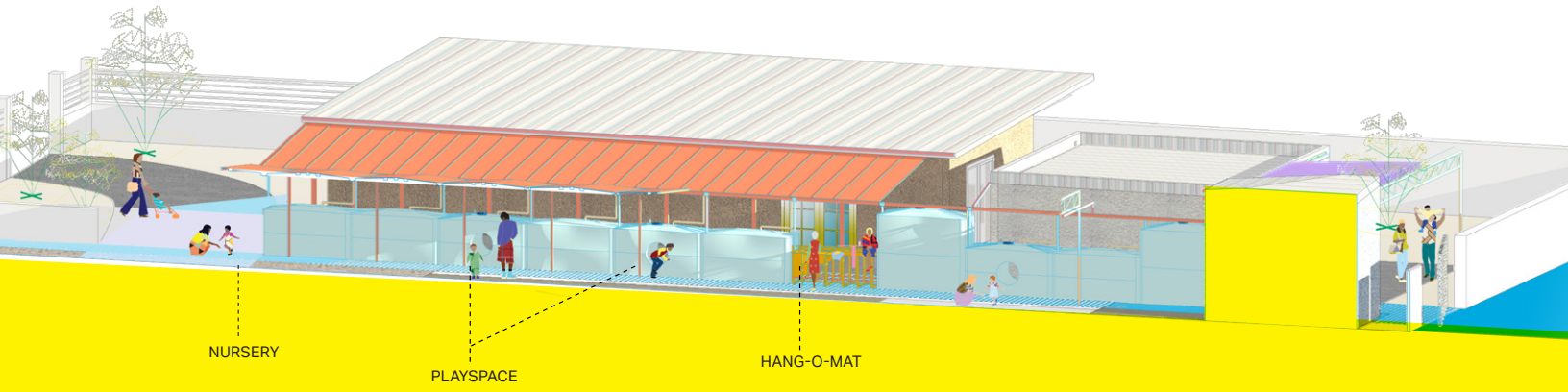
v2.0

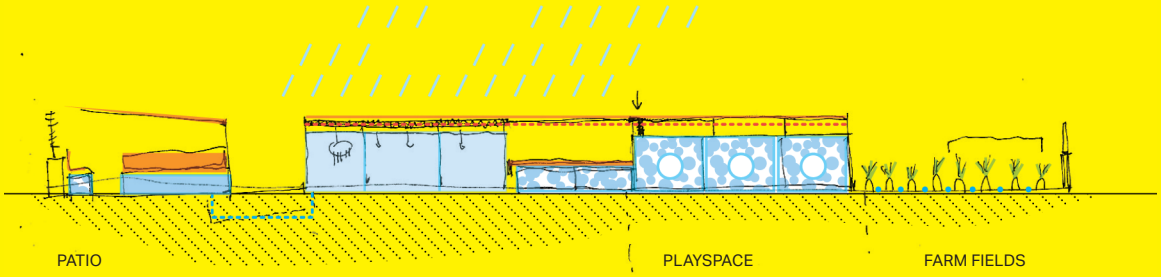
Playscape
Hang-o-mat
Farmfields

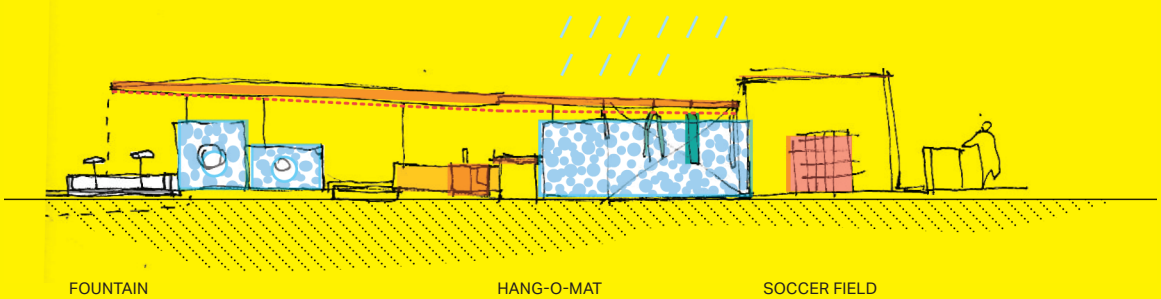


v2.0

Playscape
Hang-o-mat
Farmfields

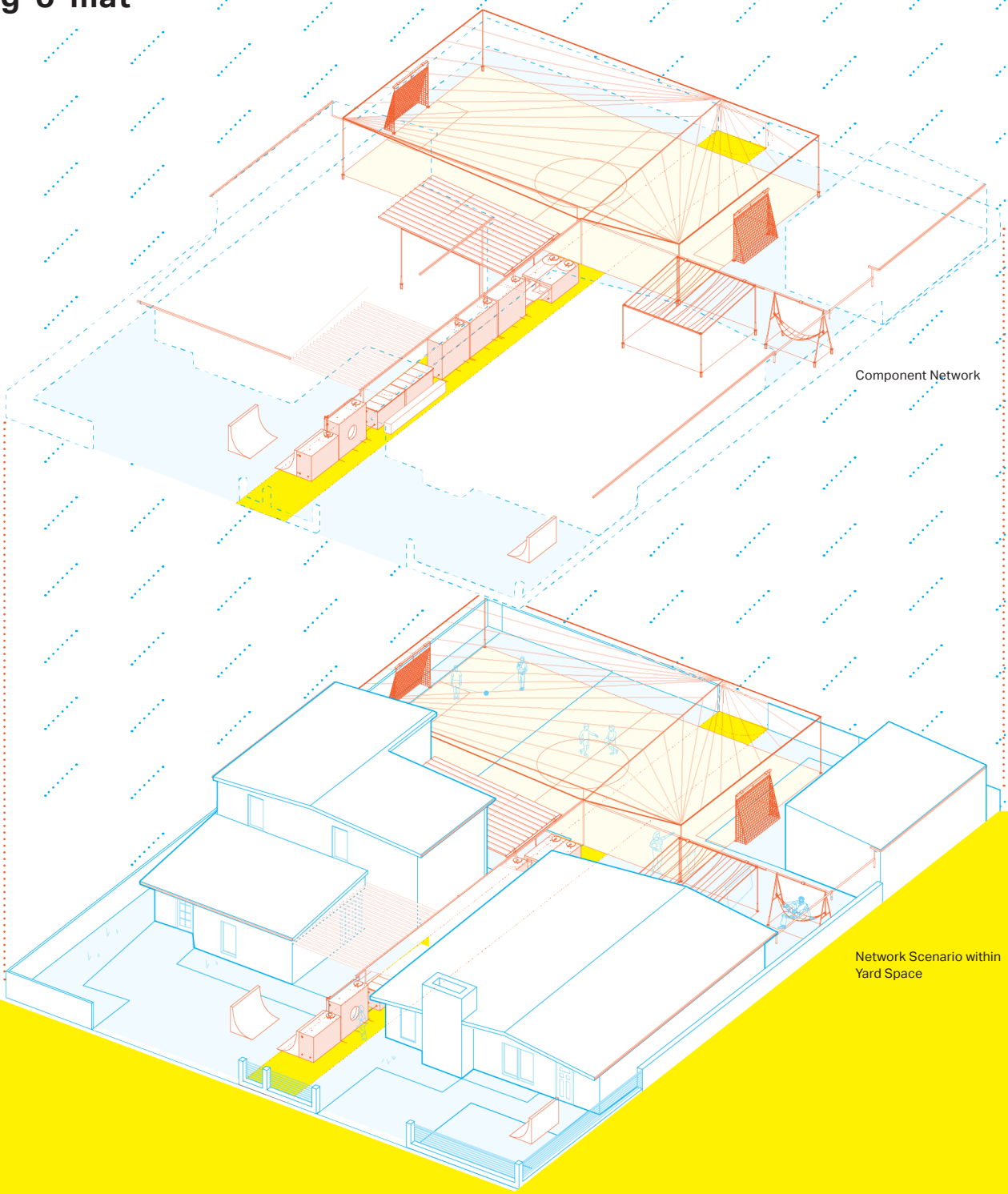






v3.0

Playscape
Hang-o-mat



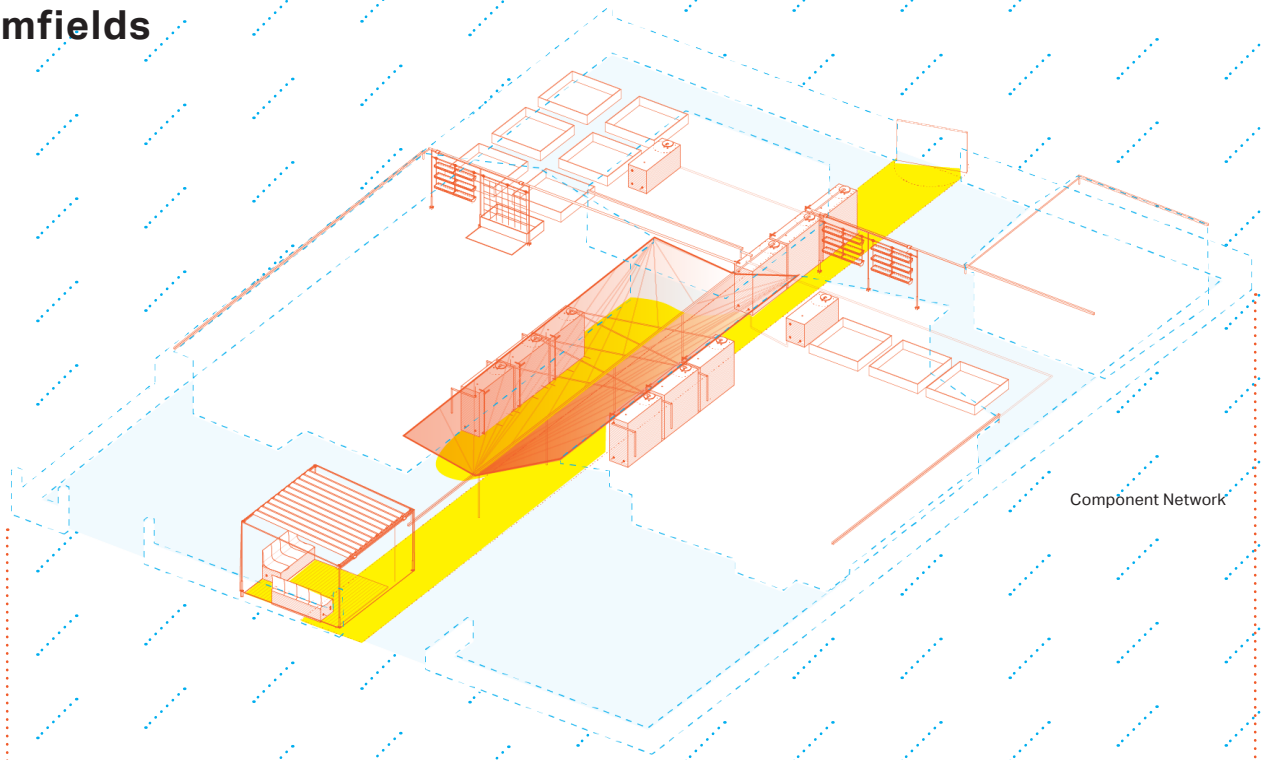
Component Network

Network Scenario within Yard Space

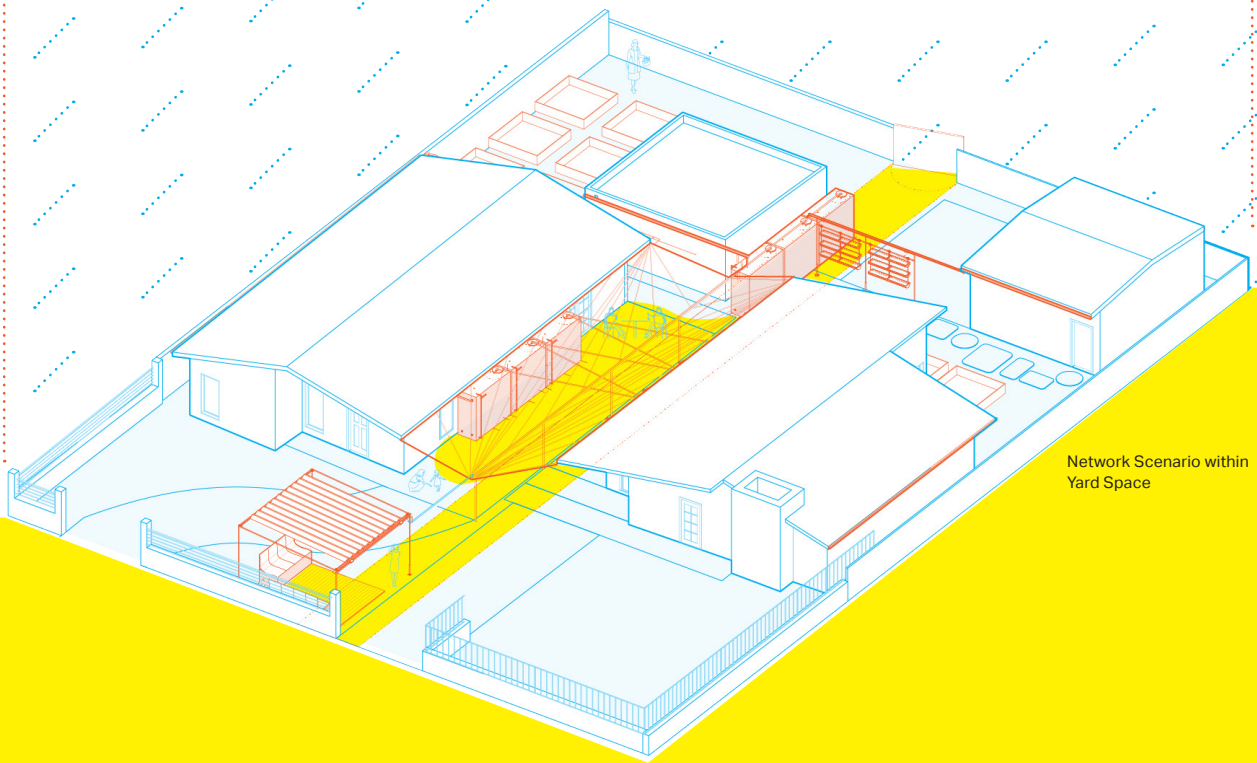
* Not all house pairing need to be optimized for the same distribution and water use. However socially, there should some overlap into the types of spaces they want to produce to maximize square footage of social production.

v3.0

Hang-o-mat Farmfields

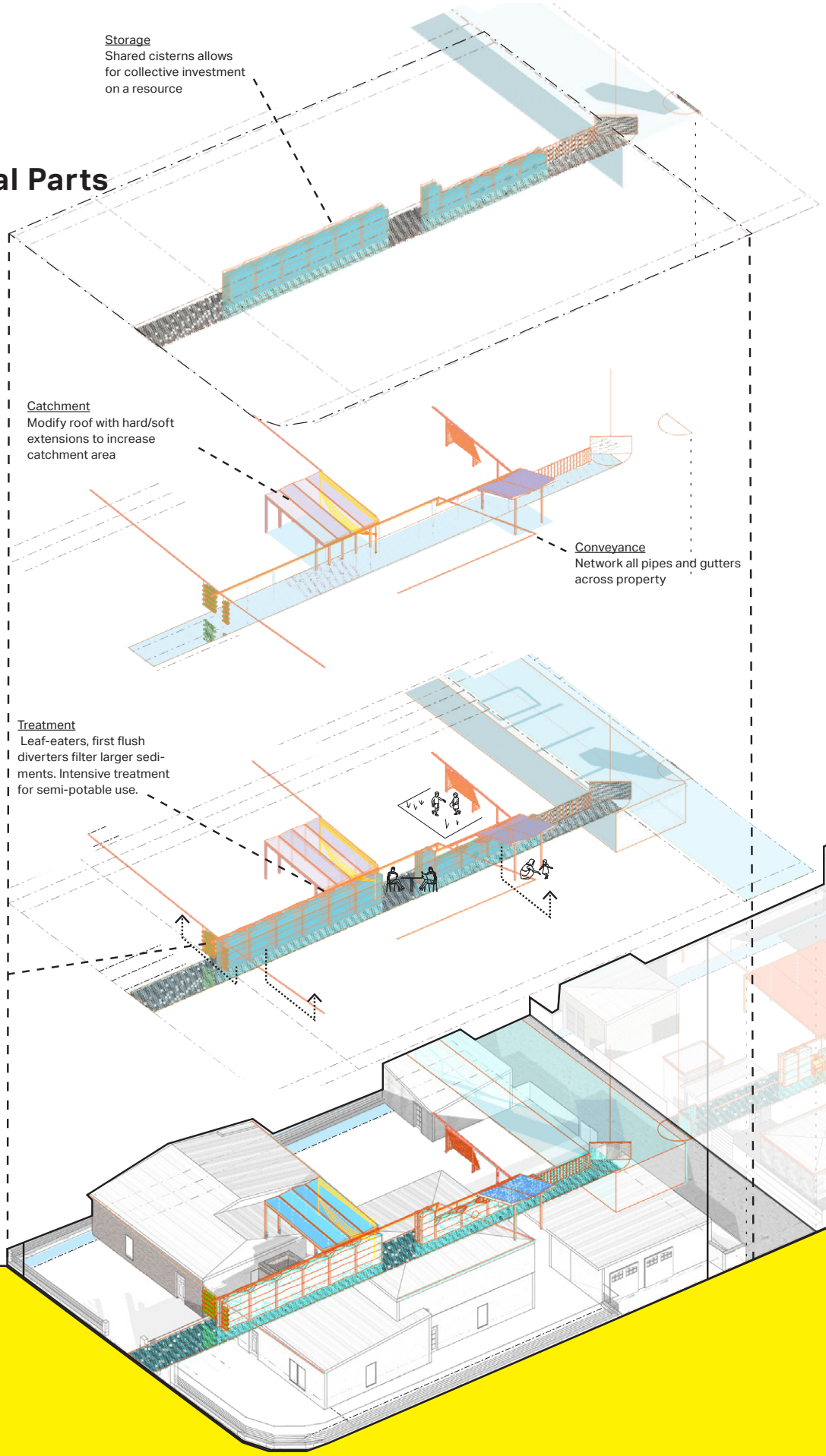


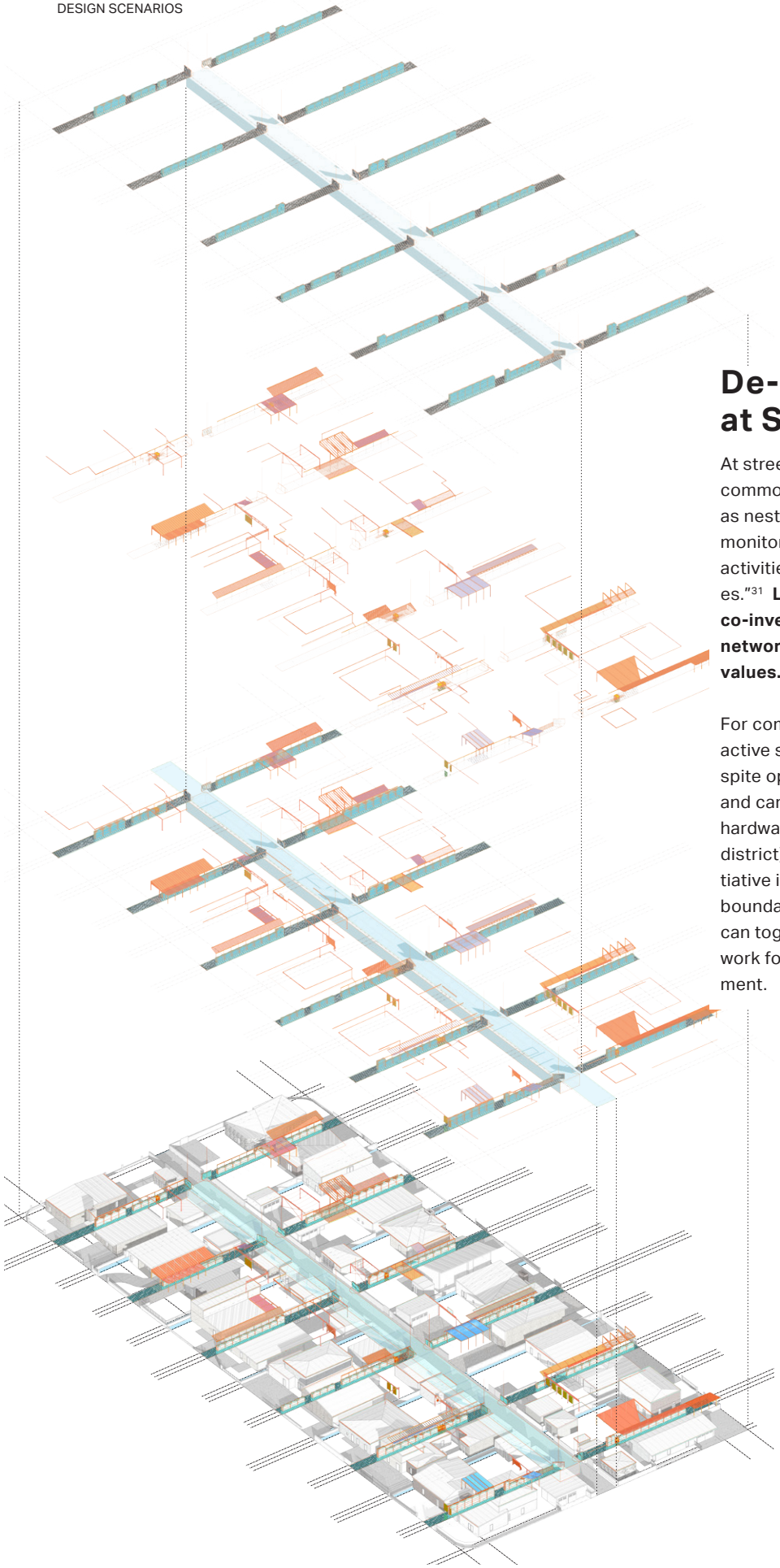
Component Network



Network Scenario within Yard Space

Operational Parts

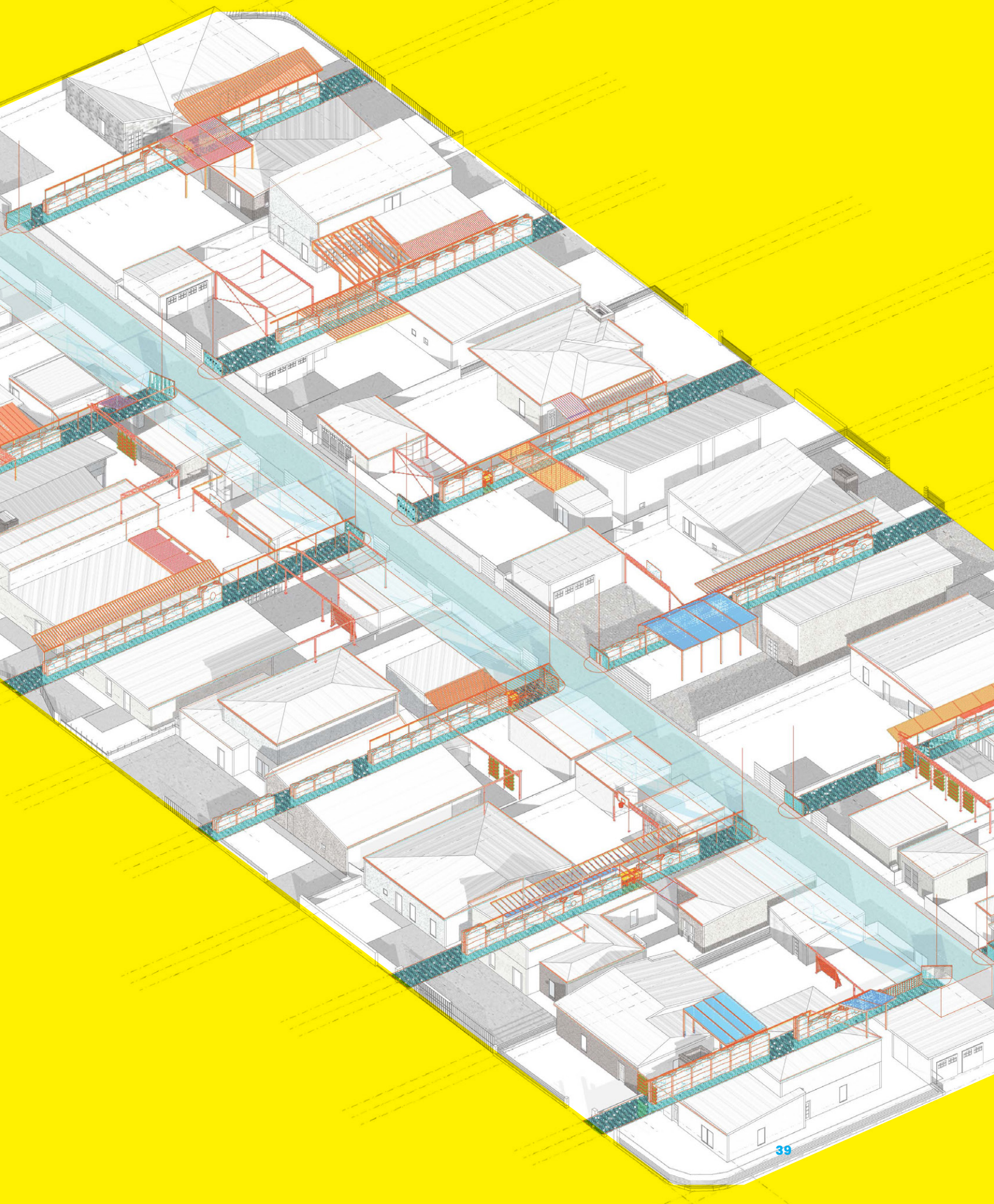




De-laminated at Street-Block scale

At street block or even neighborhoods, multiple layers of commoning are needed similar to what Ostrom refers to as nested enterprises, where "appropriation, provision, monitoring, enforcement, conflict resolution and governance activities are organized in multiple layers of nested enterprises."[31] **Larger scale expansion presents opportunities for co-investment and opportunities for a greater commoning network –sharing information, resources and operational values.**

For commoning to be successful it would need to have an active street presence and avoid bureaucratic growth. Despite opportunities for growth, governance will be complex, and can only potentially grow to city block scale from a hardware standpoint and up to a neighborhood (or council district) scale from a software standpoint, assuming the initiative is coupling with existing non-profits and governance boundaries. However a network of communal enterprises can together share information and provide a solid framework for recognition and adequate urban resource management.



Project Outcomes

What would LA get out of encouraging commoning?

With commoning, Los Angeles is gaining an alternative supply model to water that empowers citizens to maximize their domestic landscape into a productive catchment area.

De-centralized local water supply model

It promotes a de-centralized hyper-local approach for water reserves thus, decreases needed imports from the aqueducts. If the program were to expand to all HZ 3 Single Family Residences in Pacoima and Arleta— 4902 m^2 of area— we could capture 30,000,000 GAL in a 1" rain event. That is equivalent to
The model is highly replicable and common given its building and housing typology. If the model were to expand to all single family residential land use in the Tujunga watershed, it can address 43% of the lower watershed land use for example.[30]

In a 1" rain event, within
Pacoima / Arleta HZ3 + Single Family Residences,

30,000,000
Gal Collected

300,000
Water days

900,000
Emergency days

390000
kWh Saved Energy

270,000
Dollars Saved

Decrease in energy and carbon emissions associated with imported water

Activist strategy for rain water rights

It is an activist strategy, where citizens can take part of a great environmental and social movement. More importantly it takes a firm stance on rain water rights. The urban common model is a citizen-led model seeking environmental justice through claiming rain rights. It helps to keep checks and balances on centralized institutions from commodifying water and environmental injustice.

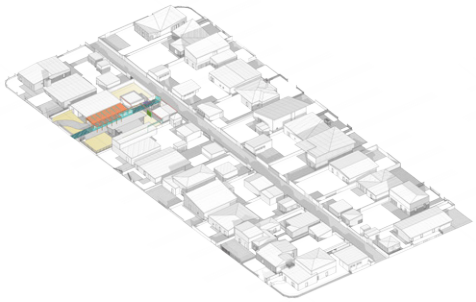
Reduce downstream flooding

Smarter capture upstream will reduce downstream storm water flooding especially in intensive rain events. There would be less water saturating the storm pipe network and improve streetscape conditions during rain events. A collaborative effort between upstream and downstream commoning users would start to address watershed thinking on a larger scale.

Co-investment programs

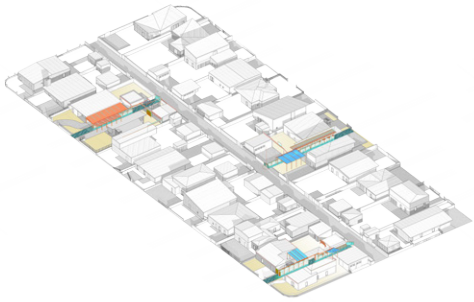
Pending an aggregation of domestic scale commons, there are more opportunities for multi-benefits as well as a larger scale understanding of watershed thinking.

YEAR 1



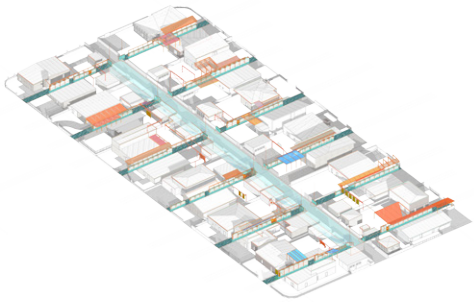
13 000 GAL OFFSET
130 WATER DAYS
390 POTABLE WATER DAYS
170 KWH OFFSET
117 DOLLARS SAVED

YEAR 3



40 000 GAL OFFSET
400 WATER DAYS
1200 POTABLE WATER DAYS
520 KWH OFFSET
360 DOLLARS SAVED

YEAR 10



156 000 GAL OFFSET
1700 WATER DAYS
4700 POTABLE WATER DAYS
2000 KWH OFFSET
1400 DOLLARS SAVED

GAL BASED ON DATA 2010 YEAR

100 GAL / PERSON	USGS
33 GAL / PERSON	
0.013 KWH / GAL	PACIFIC INSTITUTE
6.77 $ /HCF	LADWP

What would residents get out of adopting commoning?

Some of the benefits are

+ Homeowners will be able to create a supplementary water reserve.

+ Less money on utility bills – water + electricity

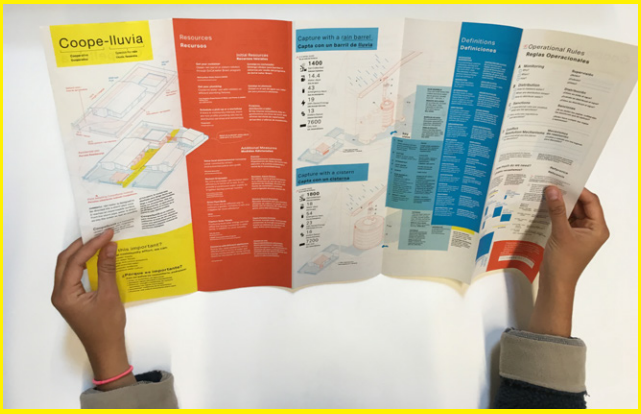
+ Less reliance on city grid, emergency reserves

+ Increase community resilience

+ Amenities in park poor areas

+ Emphasize conscious water culture, accountability of water use

Disseminating the Idea



Tools for facilitating commoning

The bi-lingual—Spanish and English—toolkit-as-brochure works as a low-tech educational solution to (a) address existing information gaps between home-owners and physical resources available and (b) start a conversation of shared rain water models.

The pamphlet's primary goal is to serve as a guide to initiate conversations between neighbors. It is a double sided accordion fold (14" x 25" sheet ino a 14" x 5" pamphlet) with the following sections:

a. Overview of the urban common model –named Coopellu via. Includes –software—negotiation steps, operational rules and—hardware—shopping list.
b. Comparison of existing rebate programs (rain barrel and cistern): what capture ability and their components.
c. Resources for acquiring rain water rebates, other water-saving practices, strategies to optimize resource use and contacts to local non-profits
d. Reference information including definitions, domestic water demand numbers,

Endnotes

1 Hall, Alex et al. " Twenty First Century Precipitation Changes over the Los Angeles Region." American Meteorological Society. University of California, Los Angeles. Los Angeles, California. Published Online January 21 2015. Accessed Online. <http://journals.ametsoc.org/doi/10.1175/JCLI-D-14-00316.1>

2 Cohen, Ronnie, Barry Nelson, and Gary Wolff. 2004. Energy Down the Drain: The Hidden Costs of California's Water Supply. Environmental, Oakland: Pacific Institute.p.2

3 Cohen, Ronnie, Barry Nelson, and Gary Wolff. 2004. Energy Down the Drain: The Hidden Costs of California's Water Supply p.1

4 Milly, P.C.D., Julio Betancourt, Robert Hirsch, Falkenmark Malin, Kundezewicz W Zbigniew, Dennis Lettenmaier, and Ronald Stouffer. 2008. "Stationarity is Dead: Whither Water Management?" Science p.573

5Metropolitan Water District of Southern California, Final Report of the Blue Ribbon Committee, 12 April 2011. In Arnold, Peter and Hadley. Fall 2013. BOOM: A Journal of California. Accessed Online. < http://www.boomcalifornia.com/2013/10/water-scarcity-as-design-opportunity/>

6 DAC's are defined by the annual income that is less than 80 percent of the statewide annual median household income, this correspond to household incomes lower than $48,706. Issues in DAC's include lower access to park space. See Integrated Regional Water Management Plan Greater Los Angeles County. 2015. Prepared by the Leadership Committee of the Greater Los Angeles County Integrated Regional Water Management Region. 2013 UPDATE (Approved February 2014).p.2-62.

7 See more on the evolution of commoning in Berge, Erling. 2 August 2011. "Editorial: Governing the Commons for two decades: a complex story." International Journal of the Commons.

8 The commons is based on **res comunis omnium** defined as "'thing of the (entire) community', the common heritage of all humankind, not subject to the appropriation by or sovereignty ..." See Fellmeth, Aaron X., and Maurice Horowitz. 2011. Guide to Latin in International Law. Oxford: Ox¬ford University Press. Accessed November 2015. <http://www.oxfordreference.com/view/10.1093/acref/9780195369380.001.0001/acref-9780195369380-e-1816>

9 See adjacent design guidelines. For more information on her work, see more in Ostrom, Elinor. 2000. "Reformulating the Commons." Swiss Political Science Review, 29-52.

10 See Shiva, Vandana. 2002. Water Wars: Privatization, pollution and profit. Delhi: India Research Press.

11 Several architects and designers are revisiting concepts of the commons, initiatives like "Make_Shift City" in Berlin or "Designing Urban Commons" in London or Atelier d'Architecture Autogérée (AAA) R-Urban project in Paris are all examples of some of ongoing explorations that focus on public space. See Ferguson, Francesca. 2014. "Renegotiating the Urban Commons." In Make_Shift City, by Urban Drift Projects, 14-17. Berlin: Jovis. See more examples and critique on Mimi Zeiger's The Interventionist's Toolkit series of Places Journal on Zeiger, Mimi. 2011. "The Interventionist's Toolkit" Places Journal. September. Accessed December 3, 2015. https://placesjournal.org/article/the-interventionists-toolkit-our-cities-ourselves/.

12 See Appendix Case Studies.

13 Ostrom, Elinor. 2000. "Reformulating the Commons." Swiss Political Science Review, 29-52.p.40

14 A mayordom@ is the day-to-day caretaker of the system and enforces regulations, The commissioner is responsible for checking in with mayordom@ and assisting negotiations for labor and improvements. Keeps rules and documents available. For more information on acequias, see The Acequia Institute Online <http://www.acequiainstitute.org/ > or New Mexico Acequia Commission <http://www.lasacequias.org/>

15 For more information on common case-studies see appendix Case Studies.

16 See Section 2 on Urban Water Challenges faced in Los Angeles.

17 The River Project.2008. Tujunga/Pacoima Watershed Plan. P.1-3 Accessed Online. http://www.tujungawash.org/

18 Arleta-Pacoima Community Plan. Accessed Online www.lacity.org/PLN

19 See more at Arleta – Pacoima Open Space Vision Plan . Sept. 29 2014. Creative Open Space - Los Angeles (COSLA) with the City of Los Angeles Department of Recreation and Parks.

20 See more at Pacoima Urban Greening Vision Plan. 2011. Pacoima Beautiful with LA Mas, Creative Open Space Los Angeles. Accessed Online. <http://www.pacoimabeautiful.org/sites/pacoimabeautiful.org/files/160321%20Greening%20Vision%20Plan%20w%20Appendix%20small.pdf>

21 See more at Pacoima Wash Vision Plan. Pacoima Wash Initiative Partners.

22 Confirmed by dialogues with home-owners and some local non-profits. As for the reasons for not installing, some homeowners claim they were glad to have them but don't know how to install them, or were waiting on some extra cash for gutter installation.

23 See more in Rojas, James Thomas. "The enacted environment—the creation of "place" by Mexicans and Mexican Americans in East Los Angeles Accessed Online. < http://hdl.handle.net/1721.1/13918> p.24

24 See more in Rojas, James. July 15 2013. "Latino Urbanism: Transforming the Suburbs." Builipedia.com. Accessed Online. < http://buildipedia.com/aec-pros/urban-planning/latino-urbanism-transforming-the-suburbs>

25 See more about "yardas" in Rojas, James Thomas. "The enacted environment—the creation of "place" by Mexicans and Mexican Americans in East Los Angeles Accessed Online. < http://hdl.handle.net/1721.1/13918> p.62

26 Rasquache is in Nahuatl origin, referring to an attitude that was lower class or improvised claimed by the Chicano population as a way to codify all Chicano cultural production theatre, literature, and visual art. Scholar and cultural critic Tomás Ybarra-Frausto's theorization of rasquachismo as a set of aesthetic practices that adopt an oppositional stance to dominant culture (often DIY) and articulate a Chicano identity. For more information on the definition of Rasquache, See Ybarra-Fausto, Tomás. "Rasquachismo: a Chicano sensibility." In Chicano aesthetics : Rasquachismo, 5-8. Exh. cat., Pheonix, Ariz. : MARS, Movimiento Artiscico del Rio Salado, 1989.

26 LEED v4 has a section deveoted to water efficiency including outdoor use reduction, indoor water use reduction, building-level water metering, cooling tower water use and water metering. Potentially the system can address the outdoor and indoor water reduction credits. For credit checklist refer to LEED v4 for BD+C: New Construction and Major Renovation.

27 Green Alley demonstration projects such as the Avalon Green Alley Way Network, can serve as a model for private to public integration. See < https://www.tpl.org/green-alleys> and the Trust for Public Land's other projects for more information.

28 See appendix climate data for a visualization of the yearly and seasonal variation of water collection.

29 Ostrom, Elinor. 2000. "Reformulating the Commons." Swiss Political Science Review, 29-52.p.40

30 Project, The River. 2008. "Tujunga/Pacoima Watershed Plan." Online Report, Los Angeles. http://www.theriverproject.org/tujungawash/plan.html.

Appendix

a. **Global Commoning Precedents**
Historical and contemporary global commoning examples of shared resource management that promote a distribution of tools, access to data, governance methods and physical resources. Case studies were plotted and mapped into a 4-axis chart to map the management methods—from direct allocation to process creation— and common-pool resource—from data driven to tangible resource. The examples are meant to be a survey of different operational and process possibilities that all engage in creating access to resources. The chart shows that most commoning examples are focused on negotiation of physical resources rather than data and rely on visibility as strategy.

b. Water Strategy Precedents
Catalogues historical and contemporary strategies of water management that promote a sustainable and equitable allocation in addressing the following water issues: water quality, water quantity, water access and water culture. Precedents were mapped on a 4-axis chart to the issue being addressed—is the problem social or technical—and map strategies implemented—from direct physical allocation to data-driven analysis. The examples are meant to be a survey of distinguished smart-water strategies in different contexts and addressing different issues, however the mapping shows the degree of centralization—therefore governance—behind each of the strategies. The more centralized strategies address problems at a planning level merging governance and technicalities but do not address personal social level.

c. Climate Data

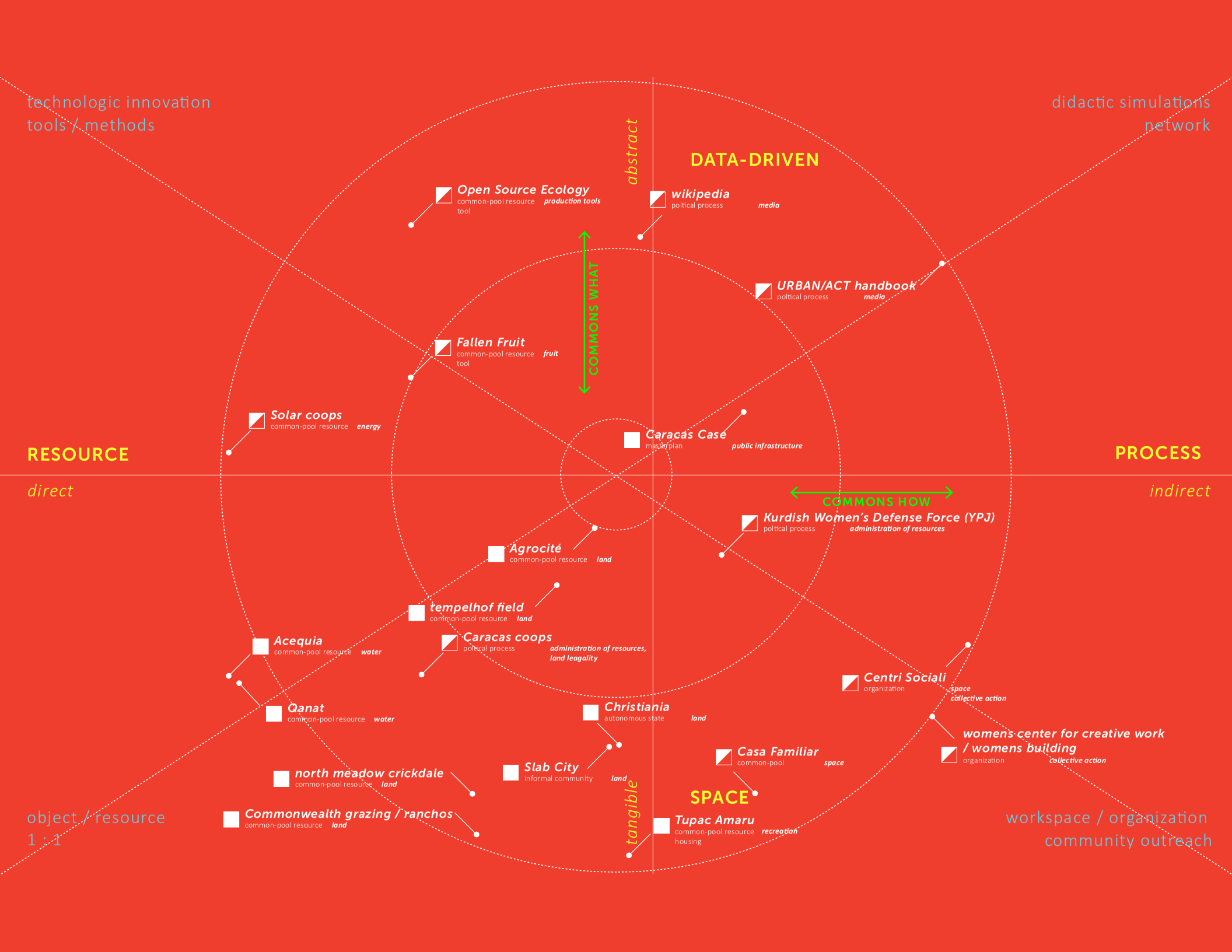
The following diagrams shows a visualization of raw data in terms of the amount of water that could be collected in between two single family residences within the fence area (3′ x 5′ are the dimensions being used as a base for the volume of water). The data is shown for (a) 30 year normal, (b) for the month of January 2010 and (c) in three consecutive days of rain for that one month. This scenario is tested for a wet winter scenario to understand how to size the storage according to seasons.

d. Process Notes

These diagrams illustrate the design process and different iterations of the project strategy.

e. Annotated Bibliography

f. Acknowledgements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network
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DATA-DRIVEN
Open Source Ecology
common-pool resource
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production tools
wikipedia
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COMMONS WHAT
Fallen Fruit
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tool
fruit
Solar coops
common-pool resource
energy
RESOURCE
Caracas Case
masterplan
public infrastructure
PROCESS
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indirect
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Kurdish Women's Defense Force (YPJ)
poltical process
administration of resources
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tempelhof field
common-pool resource
land
Acequia
common-pool resource
water
Caracas coops
poltical process
administration of resources,
land leagality
Centri Sociali
organization
space
collective action
Qanat
common-pool resource
water
Christiania
autonomous state
land
womens center for creative work
/ womens building
organization
collective action
Casa Familiar
common-pool
space
north meadow crickdale
common-pool resource
land
Slab City
informal community
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SPACE
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land
Tupac Amaru
common-pool resource
housing
recreation
object / resource
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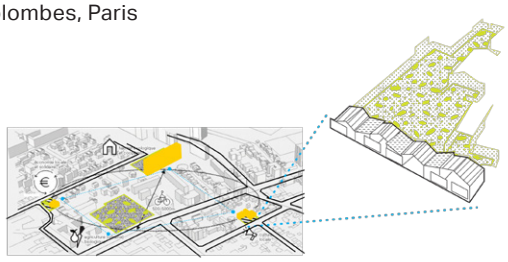
workspace / organization
community outreach

Tempelhof Feld

Raumlabour
Tempelhof Airport Field / Berlin, Germany, 2008-ongoing

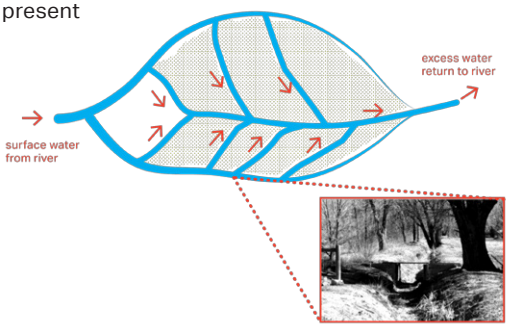
R-Urban

Agrocite, Recyclab, EcoHab
R-URBAN, Atelier d'Architecture de Autogeree
Colombes, Paris



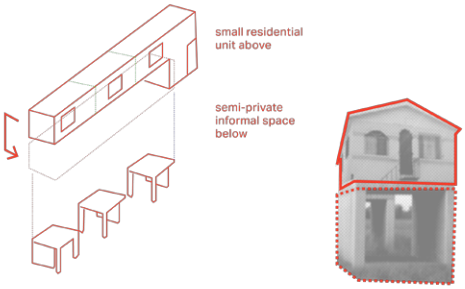
Acequias

New Mexico, Spanish colonial
to present



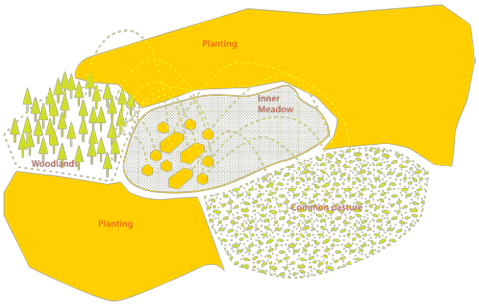
Casa Familiar

Casa Familiar / Estudio Teddy Cruz
San Diego CA



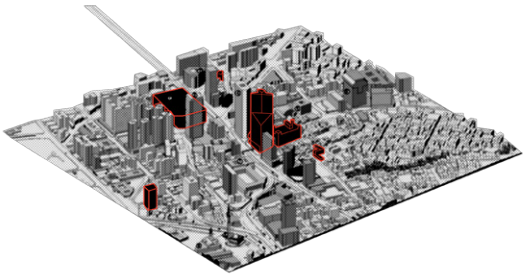
Commonwealth

English Commonwealth



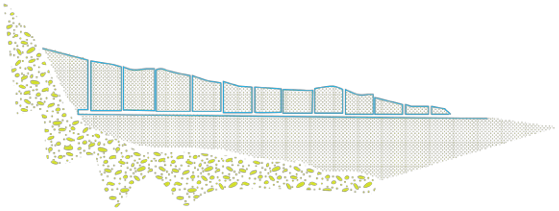
Caracas CASE

Casa Familiar / Estudio Teddy Cruz
San Diego CA



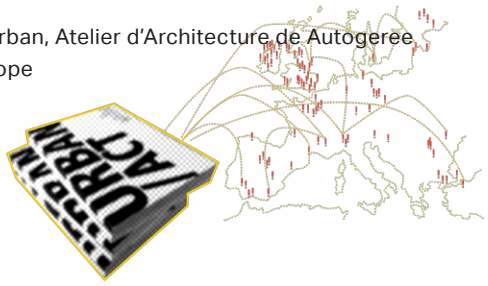
Qanats

Middle East



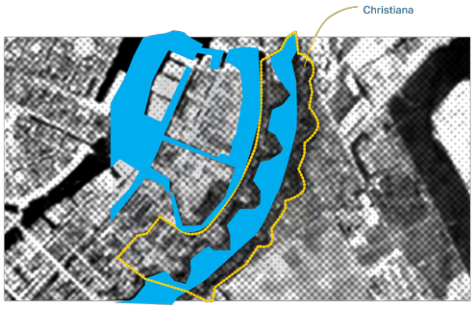
URBAN / ACT

R-Urban, Atelier d'Architecture de Autogeree
Europe



Christiania

Copenhagen, Denmark

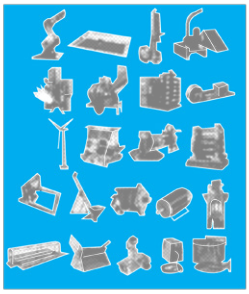


abc of incremental housing

Alejando Aravena / Elemental
Chile

Open Source Ecology

USA, Internet

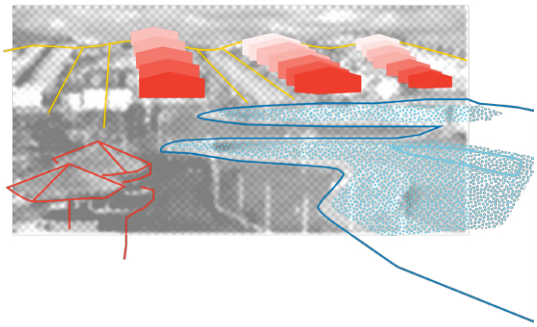


Kurdish Women's Defense Force/ Rojava

Rojava cantons in Northwest Syria

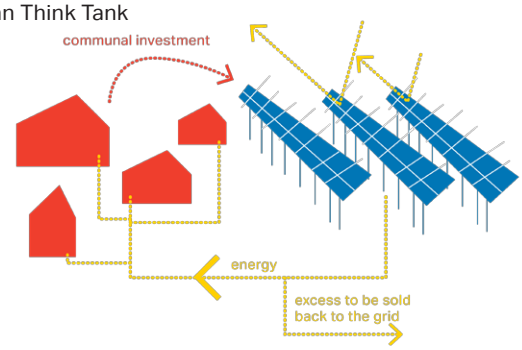
Tupac Amaru

Alto Comedero, in the outskirts of Salta, Argentina



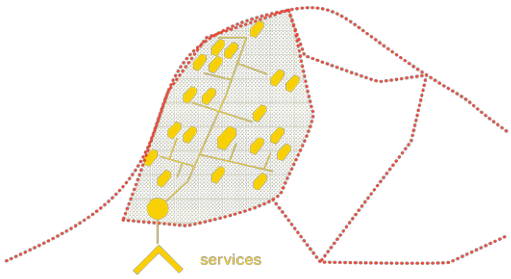
Solar Cooperatives

Khayelitsha township, Cape Town
Urban Think Tank



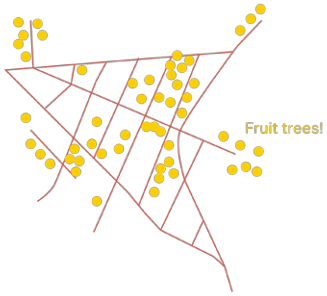
Caracas Cooperativas

San Agustin comuna / Urban Think Tank



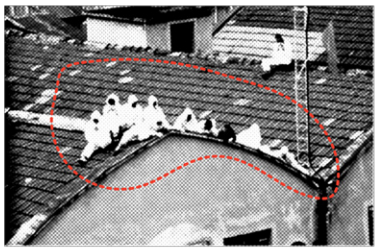
Fallen Fruit

Los Angeles



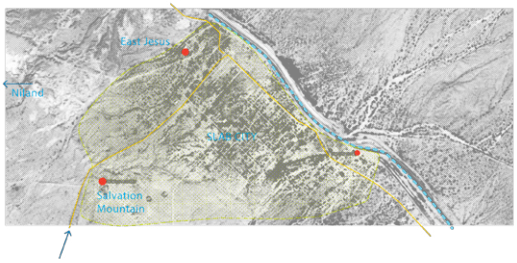
Centri Sociali

Around Italy



Slab City

Niland, CA



Woman's Building / Women's Center for Creative Work

Los Angeles

Wikipedia

Internet

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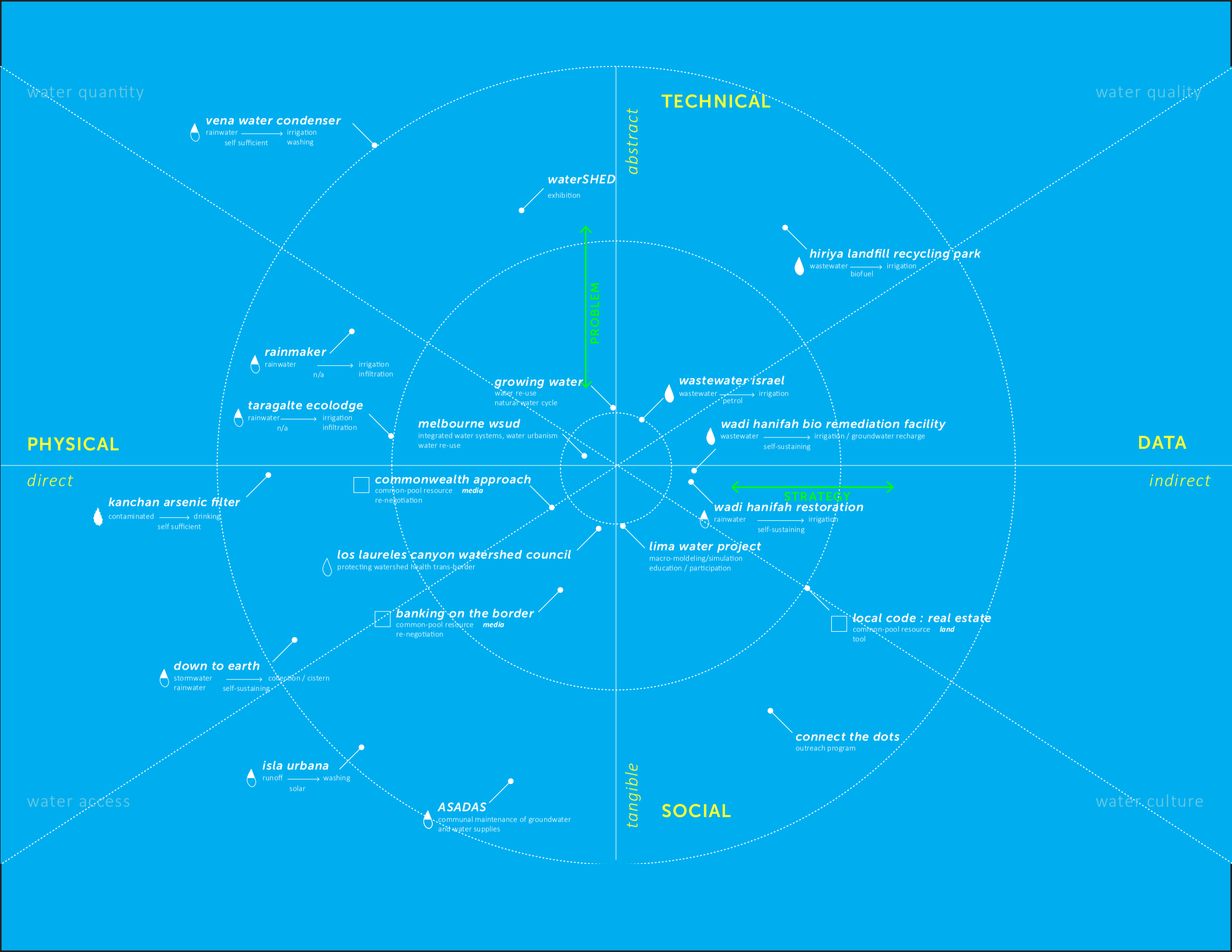
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self sufficient
washing
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exhibition
hiriya landfill recycling park
wastewater → irrigation
biofuel
rainmaker
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growing water
water re-use
natural water cycle
wastewater israel
wastewater → irrigation
petrol
taragalte ecolodge
rainwater → irrigation
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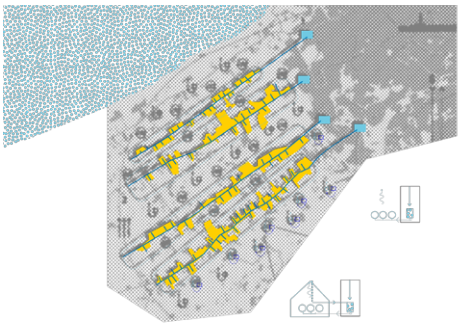
infiltration
melbourne wsud
integrated water systems, water urbanism
water re-use
wadi hanifah bio remediation facility
wastewater → irrigation / groundwater recharge
self-sustaining
kanchan arsenic filter
contaminated → drinking
self sufficient
commonwealth approach
common-pool resource media
re-negotiation
wadi hanifah restoration
rainwater → irrigation
self-sustaining
lima water project
macro-moldeling/simulation
education / participation
los laureles canyon watershed council
protecting watershed health trans-border
banking on the border
common-pool resource media
re-negotiation
local code : real estate
common-pool resource land
tool
down to earth
stormwater
rainwater
self-sustaining
collection / cistern
connect the dots
outreach program
isla urbana
runoff → washing
solar
ASADAS
communal maintenance of groundwater
and water supplies

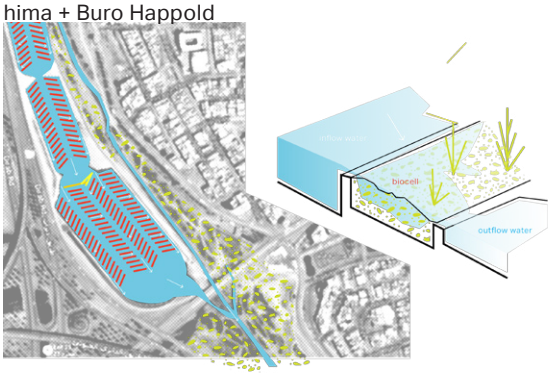
Rainmaker -

SMAQ, Urban Agriculture Casablanca, Future Megacities program of the German Federal Ministry of education and Research.



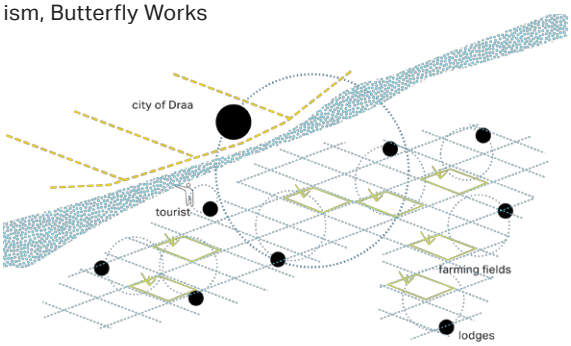
Wadi Hanifah

Wadi Hanifah Bioremediation Facility / Moriyama & Teshima + Buro Happold



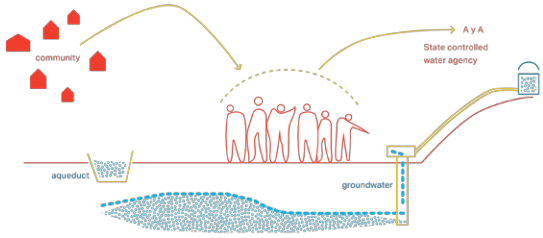
Taragalte Ecolodge

Bureau EAST + Liat Margolis, Moroccan Ministry of Tourism, Butterfly Works



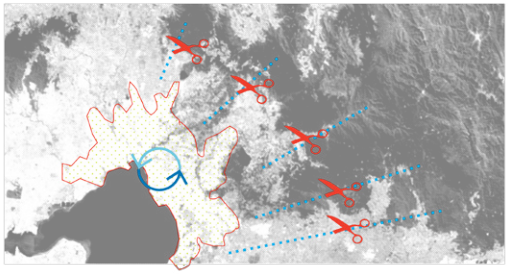
ASADAS

Costa Rica, Aqueductos y Alcantarillados (AyA)



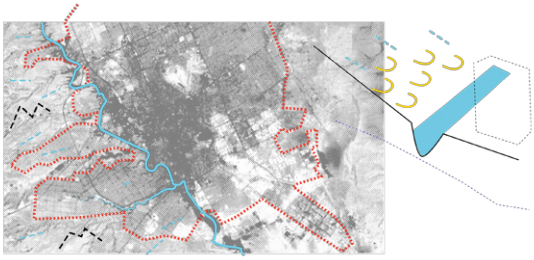
Melbourne

Water Sensitive Urban Design Guidelines / Inner Melbourne Action Plan, City of Melbourne, Melbourne Water Melbourne, Australia



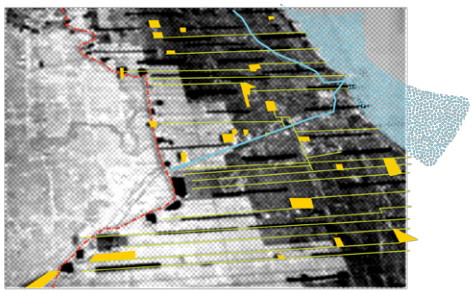
Wadi Hanifah

Moriyama & Teshima + Buro Happold
Riyadh, Saudi Arabia



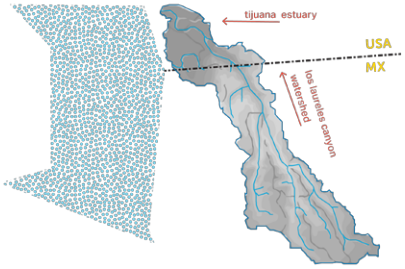
Growing Water

Urban Lab
Chicago, USA



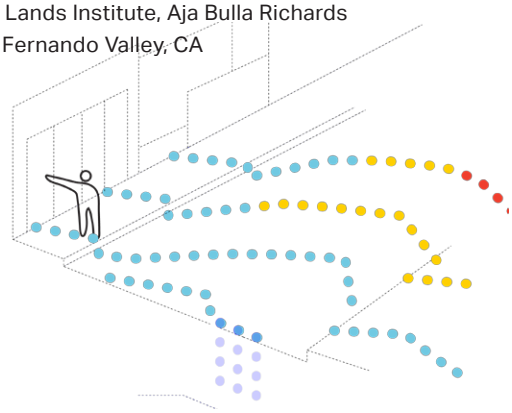
Los Laureles

Teddy Cruz + Oscar Romo
Los Laureles, Tijuana, Mexico



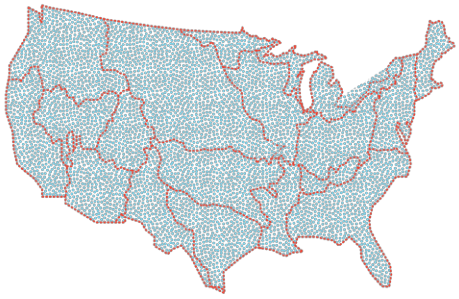
Connect the Dots

Arid Lands Institute, Aja Bulla Richards
San Fernando Valley, CA



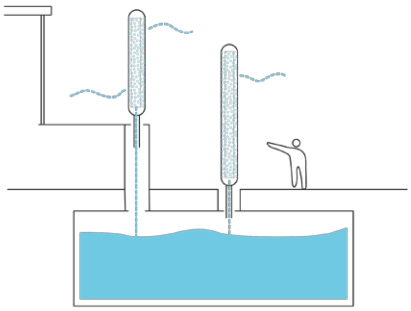
Commonwealth Approach

Laurel McSherry and Rob Holmes
USA



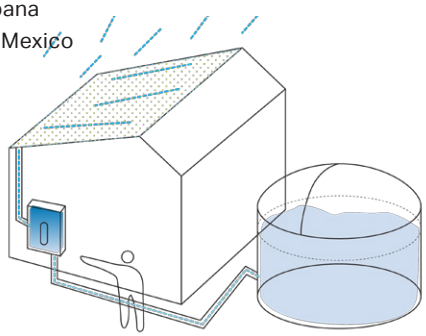
Vena Water Condenser

ORE Design + Technology
Sana'a, Yemen



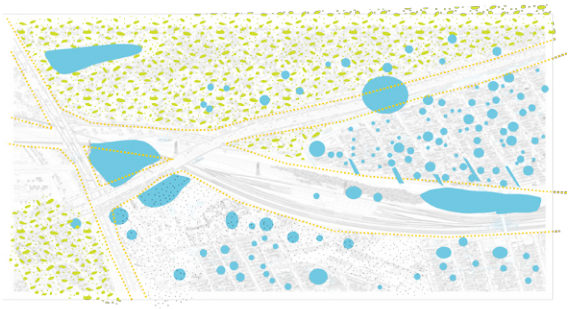
Isla Urbana

NGO Isla Urbana
Mexico City, Mexico



waterSHED

waterSHED / LOHA, Architecture and Design Museum
Chinatown, Atwater Village and Frogtown, Los Angeles CA

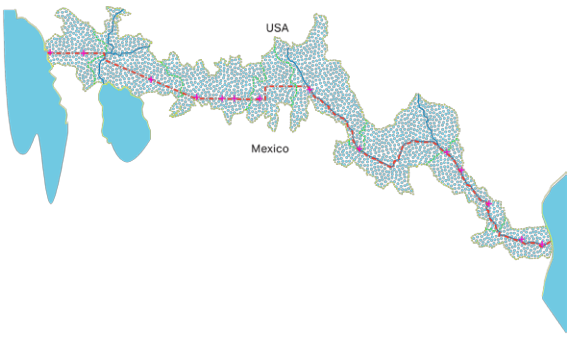


Local Code

Nicholas de Monchaux & collaborators
Major USA cities with city-owned abandoned lots: New York, Los Angeles, Chicago & Washington DC

Banking on the Border

LATERAL Office
USA-Mexico Border



Lima Water Project

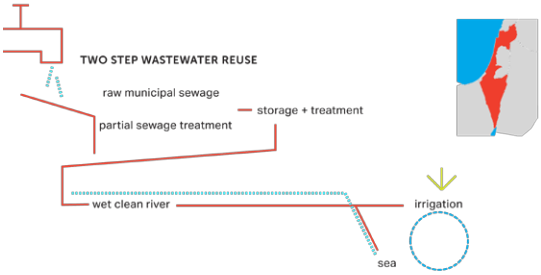
Future Megacities, German Federal Ministry of Education and Research (BMBF)

Kanchan Arsenic Filter

Global Water & Sanitation, Nepal's Environment and Public Health Organization (ENPHO) and Rural Water Supply and Sanitation Support Programme (RWSSSP)
Terai Region, Nepal

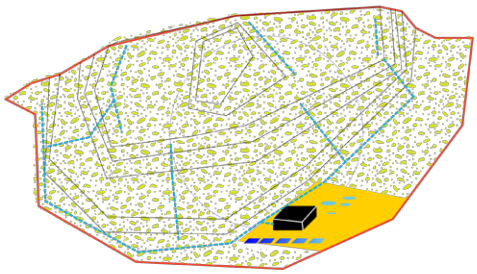
Wastewater Treatment

Jewish National Fund (JNF) and Mekorot
State of Israel



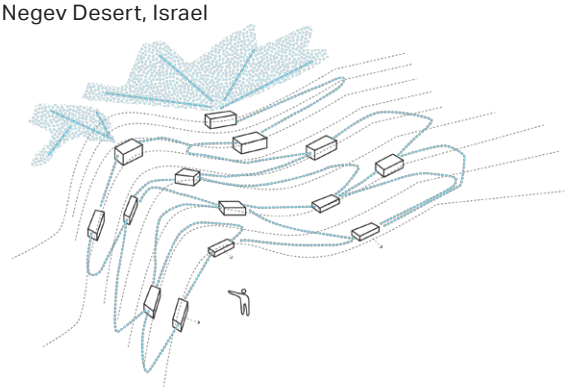
Hiriya Landfill Recycling

Latz+Partners, Weinstein Vaadia Architects, Ayala Water & Ecology
Tel Aviv, Israel



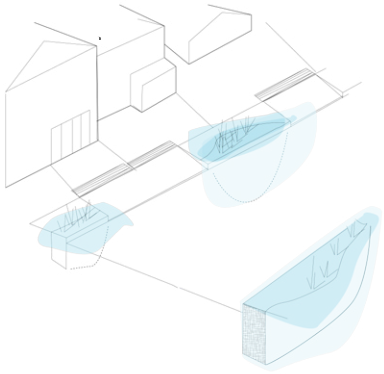
Down to Earth

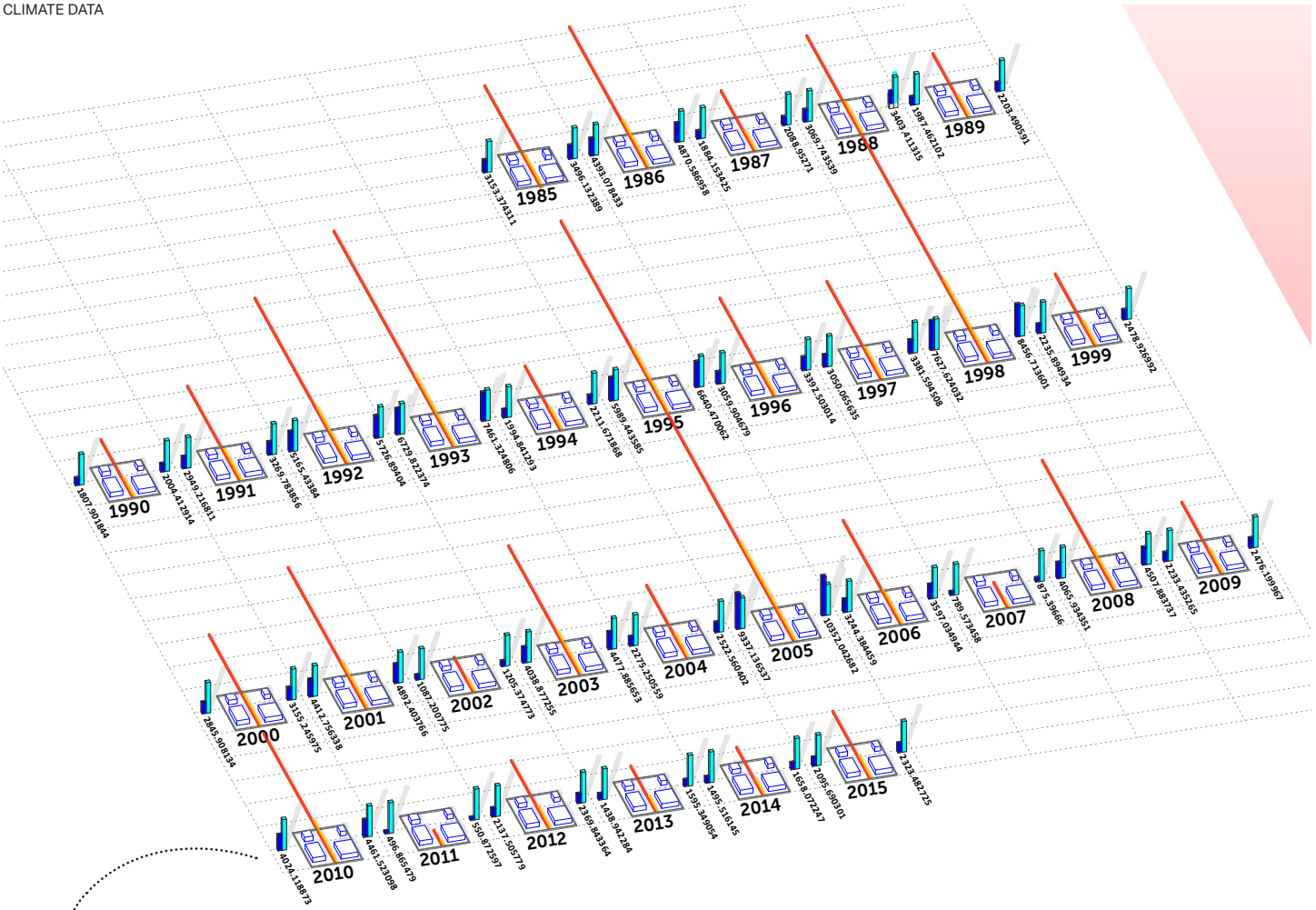
Ruth Kedar
Negev Desert, Israel



Elmer Ave

Council for Watershed Health,Treepeople
Elmer Ave, Sun Valley, Los Angeles.

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496.865479
560.872597
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1658.072247
2095.690101
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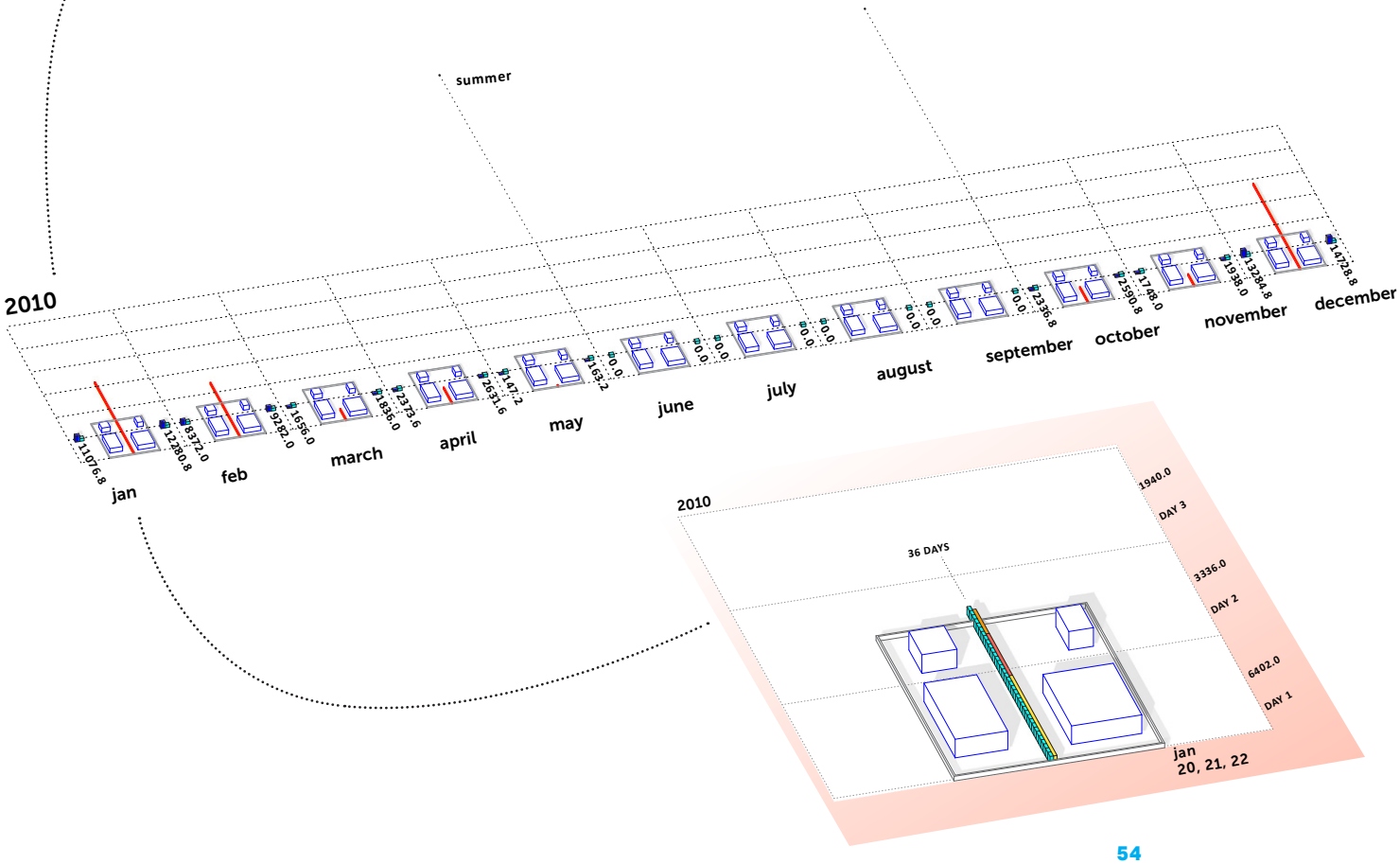
summer
2010
jan
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march
april
may
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november
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11076.8
12280.8
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9782.0
11656.0
11896.0
23273.6
26931.6
14747.2
7163.2
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2336.8
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1749.0
1938.0
3284.8
14728.8
2010
36 DAYS
1940.0
DAY 3
3336.0
DAY 2
6402.0
DAY 1
jan
20, 21, 22

what might the process of an urban water commons look like?

a.gather data

social data / field work

tease interest for collective water management

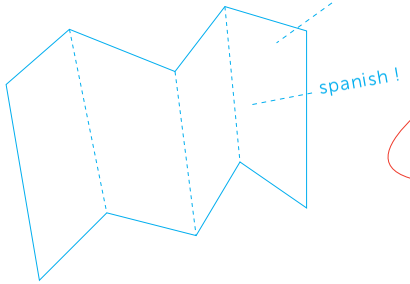
speculate on possibilities

evaluate hardware options and configurations

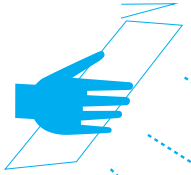
b.make a pamphlet

* physical retrofits
* social negotiations
* facts

*programs / organizations
*contacts



c.distribute pamphlet



community leaders
promote!

community members
single family !

landowners
multi-family targets!

interest is high!

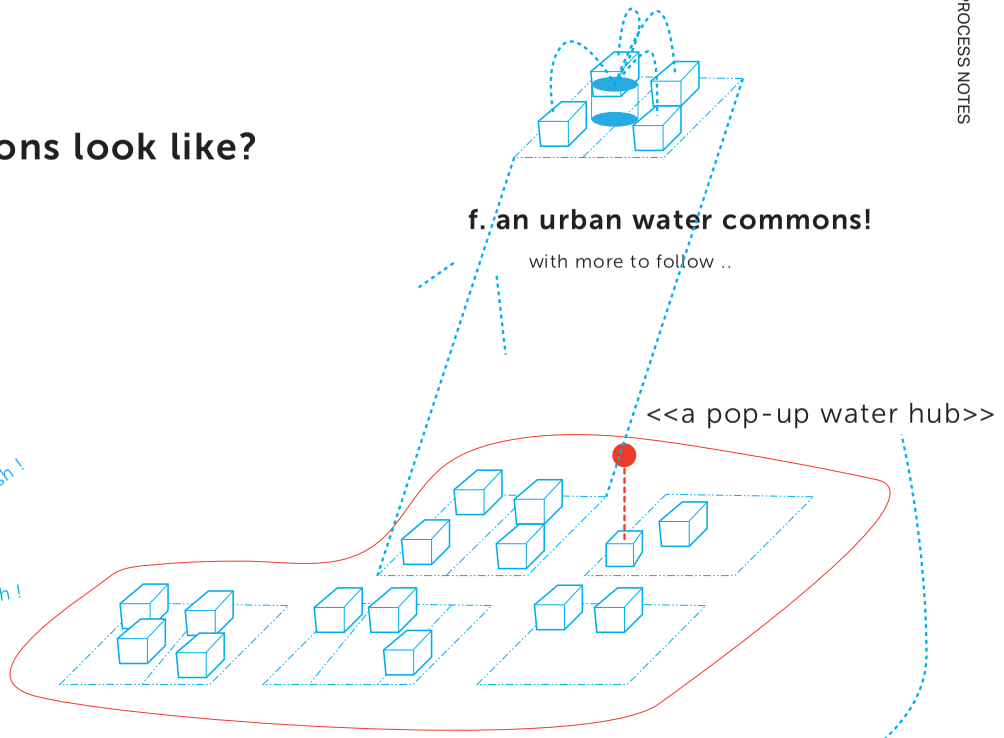
interest is low :(

d."post-delivery" organization

interest was high, pamphlet was targeted to as advetisement for more collective workshops?

d."post-delivery" evaluation

interest was low, pamphlet was targeted to spark long-term interest: propose other possibilities



f. an urban water commons!

with more to follow ..

<<a pop-up water hub>>

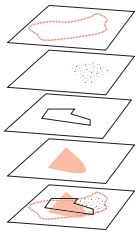
locate nearby or within the interested community, allow for spontaneous interaction by other neighbors

e. free ! design services

tailor specifically to the property owner : to work in conjunction with the collective system.

a book / shelf material

designing a process



START

suitability analysis

"ground truthing"

area of interest

In the remote-sensing field, the term ***"ground truthing"*** is used to describe the process of verifying a satellite image with what is already known about the location on the ground. *

field verify data

experiential mapping

fact finding !

data not in computers

-_-

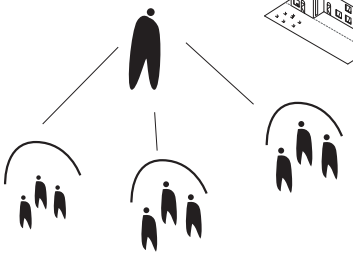
non-participant observation

observation + documentation

participant observation

talk with community

engage community leaders



how to discern what are communal values?

hardware analysis

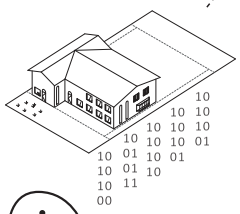
understanding hardware retrofits

engaging expert organizations

Is there a way to collaborate?

running calculations

based on residential typologies



= $

correlating numbers for economic incentive

Is this relevant?

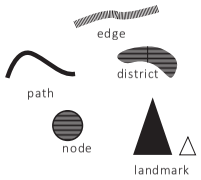
How to faciliate a participatory spatial justice?

In the broadest sense, spatial (in)justice refers to an intentional and focused emphasis on the spatial or geographical aspects of justice and injustice. As a starting point, this involves the fair and equitable distribution in space of socially valued resources and the opportunities to use them.

See Ed Soja's ***The city and spatial justice***.

<lynch city>

Using five elements to distinguish mental mapping of the city. See The Image of the City by Kevin Lynch.



<situationist city>

using ***psychogeography***

"the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals." **

how to draw a boundary?.

A who is interested in commoning?

B where is the "site"?

C what are the conditions of commoning? physical retrofits? social negotiations?

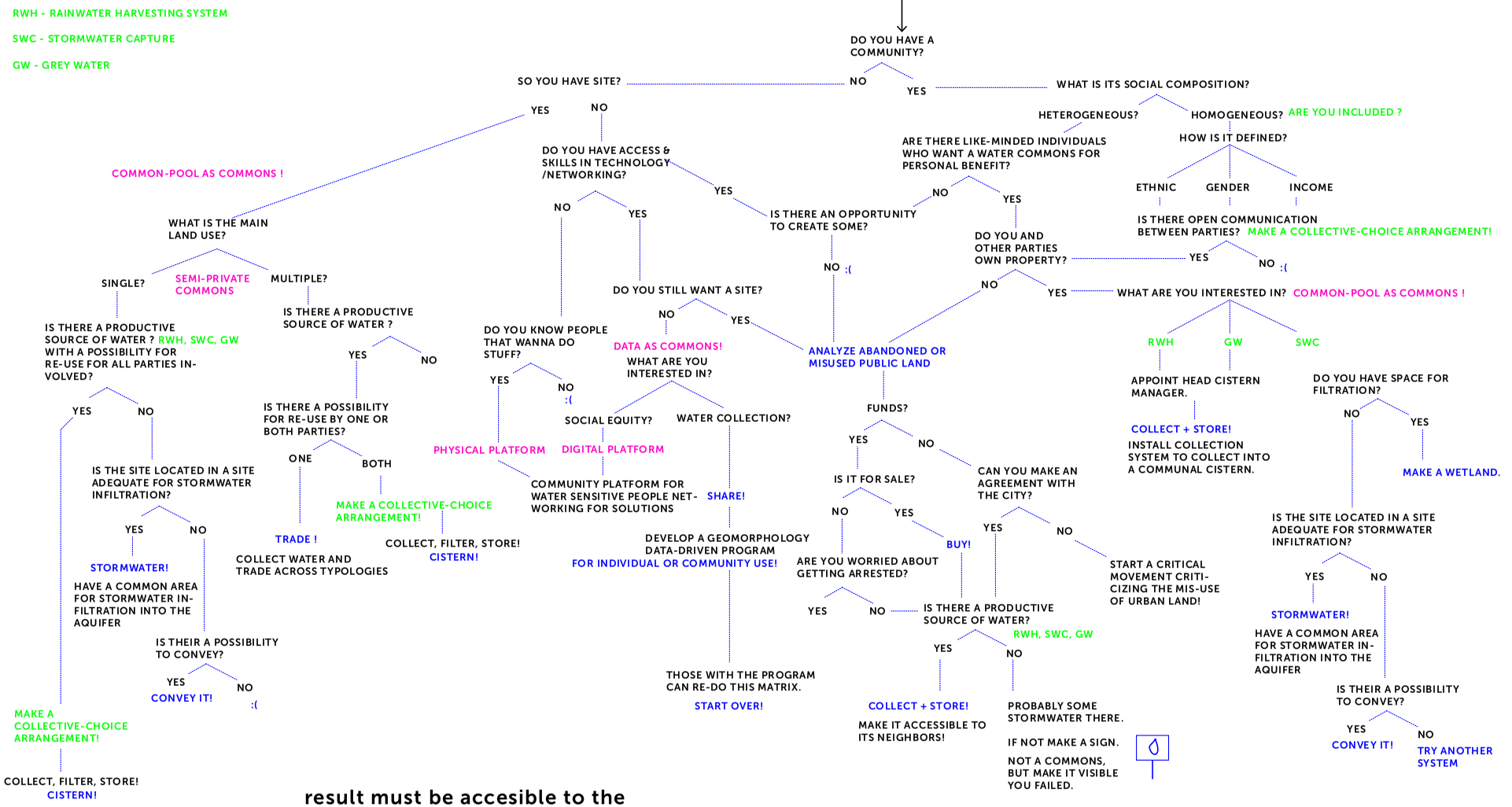
* See Vajjhala, Shalini P. "'Ground Truthing' Policy: Using Participatory Map-Making to Connect Citizens and Decision Makers." Resources. Summer 2006. p14-18
** See Debord, Guy-Ernest, "Introduction to a Critique of Urban Geography" 1955. Online. http://library.nothingness.org/articles/SI/en/display/2 Accessed Feb. 2016

CAN A WATER COMMONS EVOLVE IN _____ ?

RWH - RAINWATER HARVESTING SYSTEM

SWC - STORMWATER CAPTURE

GW - GREY WATER



result must be accesible to the parties of the commons (inclusive or exclusive)

*A collective choice agreement is per Elinor Ostrom's Design Principles.

Annotated Bibliography

The commons theory

Berge, Erling. 2 August 2011. "Editorial: Governing the Commons for two decades: a complex story." *International Journal of the Commons.* p160-187.
A secondary source looking back at the evolution of the commons as defined by Hardin in the "Tragedy of Commons" in 1968 and consequently as defined by Elinor Orstrom in "Governing the Commons" in 1990 in relation to complexity. This editorial situates the contemporary definitions of the commons.

Ferguson, Francesca. 2014. "From Austerity to Audacity: Interview with Fran Tonkiss." *Uncube.* Vol. 20. Berlin: Uncube. 22-25. www.uncubemagazine.com.
An interview with Fran Tonkiss on the development of commons as a concept within urban form and what are the limitations and opportunities that need to be addressed in a design field to further the concept.

Ferguson, Francesca. 2014. "Renegotiating the Urban Commons." In *Make_Shift City*, by Urban Drift Projects, 14-17. Berlin: Jovis.
The introduction to the book. Ferguson proposes looking at the commons as a way to renegotiate the city from private land ownership. The commons becomes the alternative in the public/private dichotomy and opportunities to democratize the spaces of the city and rethinking the economy of means.

Hardin, Garett. 13 December 1968. "The Tragedy of the Commons." *Science,* p. 1243-1248.
An article exploring the social dilemma of the notions of the commons. According to Hardin the commons is defined as the un-regulated shared resource and defined by the morality of each individual. The tragedy is the negative feedback of un-regulation that can only lead to over-exploitation.

Hardt, Michael, and Antonio Negri. 2009. "The Becoming-Prince of the Multitude." *ArtForum*, October: 178-9.
An essay on the concept of commons from an artist perspective. Argues for commons as a political process therefore relevant to the art community as a way to create performance, art and value in the concept.

Lefebvre, Henri. 1974. *The Production of Space.* Malden: Blackwell Publishing. Translated Smith-Nicholson, Donald. 1991.
Fundamental book on the relationship between space and its manifestation through an analysis on the theory and practice of spatial theory using several cultural and artistic episotomologies including art, architecture and philosophy. Focused particularly on Lefebvre's definition of social space as the outcome of an ongoing epistemological process.

Ostrom, Elinor. 2000. "Reformulating the Commons." *Swiss Political Science Review*, 29-52.
An article exploring the design principles behind the common-pool resource. Ostrom's work evaluates several case studies of successful and unsuccessful commons to distill a series of guidelines that define and allow for the management of a common-pool resource.

Stavrides, Stavros. 2016. *Common Space: The City as Commons.* London: Zed Books.
A book examining how commons exist within spatial production by examining from the history of public housing to contemporary protest movements. Stavrides argues for space-as-commons first and secondly as a means for social relations. He also pushes forth the success of commons based on its potential to expand.

Wall, Derek. 2014. *The Commons in History: Culture, Conflict and Ecology.* Cambridge: MIT Press.
Overview of the commons through history from jointly owned land and other resources to current debates in sustainability. It uses applied history of the Hardin and Ostrom arguments as well as presenting historical case studies and their relation into understanding sustainability. Wall argues not to view the commons as tragedy or solution but as a way of property ownership as a way to understand sustainability as co-ownership.

Common Case Studies

Angelil, Marc, and Hehl, Rainer.2013. *Collectivize! Essays on the Political economy of Urban Form Vol.2* Berlin: Ruby Press.
A small book exploring collectivities through a compilation of essays on different geo-political case-studies. Establishes the city as a major collective project composed of "hardware" as urban form and "software" as the social order. Applies this perspective to case studies in the Zionist movement, Robert Owen's New Harmony and Pyonyans's radical ideology.

Brillembourg, Alfredo, Feireiss, Kristin, and Klumpner, Hubert. 2005. *Informal City: Caracas Case*. Munich: Prestel Verlag.
A book documenting research about the city fabric throughout Caracas focusing specifically on informal settlements. Examination includes the mega trends of urbanization globalization and informalization and their manifestations in the city of Caracas through seemingly mundane rituals that rely on the informality of public space and social production. Several informal practices are studied first-hand.

De Angelis, Massimo.2013. "Plan C&D: Commons & Democracy." *Collectivize! Essays on the Political economy of Urban Form Vol.2* Berlin: Ruby Press.
Essay on an argument of socio-political strategy plans following the economic crisis. De Angelis argues that the crisis is not only economic but a crisis of social stability. Plan C&D refers to the Commons and Democracy as the next strategic plans. C & D lie at the basis of communal functioning and the democratic square of representation.

McGuirk, Justin. 2015. *Radical Cities: Across Latin America in Search of a New Architecture*. London: Verso Books.
A compilation of case studies of radical settlements throughout Latin America that position architecture and urbanism as a tool for social, economic and political change. These case studies are forms of spatial and architectural activism, where space and form is dictating new socio-political relations. Some of the examples includes Tupac Amaru in Jujuy, Argentina, Ted Cruz and the watershed issues between US-Mexico Tijuana border, social housing PREVI in Peru, informal settlements in Rio de Janeiro and Caracas, and Colombia's unorthodox approach to social urbanism.

Nicholas-Le Strat, Pascal. 2008. "Interstitial Multiplicity." *Le-Commun.* June 1. Accessed November 2, 2015 <http://www.le-commun.fr/index.php?page=interstitial-multiplicity.>
An article looking at the political dimension of the interstice within the city grid. The interstice is defined as a leftover within the survey of the urban grid that because of its lack of accountability can be a tool for subversion and reform.

Nicholas-Le Strat, Pascal. *Interstitial Multiplicity, URBAN/ACT (Handbook for alternative practice).* edited by Atelier d'Architecture Autogeree, 2007. Translated by Millay Hyatt
As part of the Atelier d'Architecture de Autogeree, the project focuses on dissemination of the practice through publications that allow for an open communication of their practice. Their intent is disseminate in order to create a network in between cities as a way to expand the communal network of experiments.

Wilk, Eva. 2014. "Case Study: R-Urban." *Uncube.* Vol. 20. no. Urban Commons. Berlin. 18-21. www.uncubemagazine.com.
An account on the R-Urban project in Colombes, France. Its original intent, and how it has grown to work closely with the government as well as create a third type of space within city fabric.

Zeiger, Mimi. 2011. "The Interventionist's Toolkit: 3." *Places Journal*. September. Accessed December 3, 2015. https://placesjournal.org/article/the-interventionists-toolkit-our-cities-ourselves/.
A 4 part series of articles exploring experiments, interventions or tactical urbanisms happening within the design field as a response to urban form. Criticizes the democratization of space as not being enough to address greater problems of the urban environment.

Water Strategies

Arellano, Estevan. n.d. "Acequias-The Way of the Water." *New Mexico History.* Accessed November 2015. <http://newmexicohistory.org/people/acequias-the-way-of-the-water>
First-hand account of the practice of an acequia and its history relating to New Mexico's land and culture. This account describes how an acequia works, the people and systems involved for its operation based on second hand accounts of history and first hand observations and talking to the people in New Mexico.

Chaouni, Aziza, and Liat Margolis. 2015. *Out of Water: Design Solutions for Arid Regions.* Basel: Birkenhauser.
A book as the culmination of a body of research, projects, texts and case studies on the ideas of water scarcity and desertification. The case studies were explored through a certain methodology and taxonomy.

Chaouni, Aziza, and Liat Margolis. 2010. Out of Water: Innovative Technologies. Accessed October 2015. <http://aridlands.org/discover/video/excavating-innovation-2010-aziza-chaouni-liat-margolispart-1-out-waterinnovative>
A lecture on several projects developed by Aziza Chaouni and Liat Margolis talking about their book and exhibition that was composed of several toilets as a way to expose the water management system. Also goes into talking about several case studies and presents a couple of their projects dealing with water and the role of eco-tourism as a new typology for the co-evolution of human habitation and their natural resources.

Lorcan O'Herlihy Architects. 2015. WATERshed. Los Angeles, CA: A + D Architecture and Design Museum. Exhibition
An exhibition that looks into the role of water and housing as an opportunity for hybrid program in the future of Los Angeles. LOHA studies the role of water and transportation infrastructure and the collection storage and distribution of rainwater systems in relationship to housing needs in the area in between Chinatown, Atwater Village and Frogtown. This hydrid can produce new typologies of residence that propose new infrastructure networks.

Water/Resource Theory

Hanemann, W.M. 2006. "The economic conception of water." In *Water Crisis: Myth or Reality?*, by Peter P. Rogers, M. Ramon Llamas and Luis Martinez Cortina, 61-91. London: Taylor & Francis plc.
An essay on the economics behind water management and perception. Haneman talks about the perception of value in water and how this affects its management from an economic theory perspective.

Kim, Janette, and Carver, Eric. 2015. *The Underdome Guide to Energy Reform.* New York: Princeton Architectural Press.
The book focuses on energy as a resource that has a spatial systems logic. The book looks at energy through four different frameworks: power, lifestyle, territory and risk. Within each of these, they examine the typologies of energy supply, consumption and waste to understand the spatial index of energy. Looked at also as a case study for representation and systems thinking approach.

Shiva, Vandana. 2002. *Water Wars: Privatization, pollution and profit.* Delhi: India Research Press.
A book section which argues for a water democracy. Shiva argues that the global corporations have an increasing control of water resources. Corporate control of resources has been facilitated by the global institutions of World Trade Organization and World Bank through liberalization policies. Increasing commodification of water affects its access in terms of social equity.

Water Policy

Cohen, Ronnie, Barry Nelson, and Gary Wolff. 2004. *Energy Down the Drain: The Hidden Costs of California's Water Supply.* Environmental, Oakland: Pacific Institute.
A report looking at the water-energy nexus in California's water infrastructures. The report focuses on presenting the cost of using energy-intensive processes to move water and what that means to the environment. It also looks at providing solutions to decrease the amount of power consumption.

Fellmeth, Aaron X., and Maurice Horowitz. 2011. *Guide to Latin in International Law.* Oxford: Oxford University Press. Accessed November 2015.
<http://www.oxfordreference.com/view/10.1093/acref/9780195369380.001.0001/acref-9780195369380-e-1816.>
A report on the use of latin in law making. Used only to make a reference on the concept of commons related to its history.

Powell, John Wesley. 1879. *Report on the Lands of the Arid Region of the United States with a More detailed Account of the Lands of Utah.* Survey, Washington: Government Printing Office.
A report by John Wesley Powell to Congress with a series of measures and recommendations on how to reform the settlement of the West based on observations of the geographic context and the need for irrigation. Introduces the idea of the communal settlements within the Western United States as well as a radical approach to reconfigure the surveys based on the watershed.

Wong, T.H.F., and M.L. Eadie. 2009. "The Water Sensitive City: Principles for Practice." *Water Science & Technology* 673-682.
Report on defining Water Sensitive Urban Design as an approach to environmental conscious city-making. Argues for Water Sensitive Urban Design as an integrated approach to city planning and building design. In order to make an impact on how to use water, WSUD can help to address problems with natural water cycles and water re-use.

Climate Change

IPCC. 2007. "Climate Change 2007: Synthesis Report." In *Contribution of Working Groups I, II and III to the Fourth Assessement Report of the Intergovernmental Panel on Climate Change.* Edited by R.K. Pachuari and A. Reisinger. Geneva: IPCC.
Report by the IPCC validating the definition, observations, trends and causes of climate change at a global scale in comparison to observations since end of 1800s. The 2007 report focuses on elaborating on the causes (industry sectors, regions) that have exacerbated this process and looks into the regional scale impacts of these changes. The synthesis report is a summarized version of the greater study but it also offers recommendations on strategies for mitigation and adaptation at a global and regional scale.

—. 2013. "Summary for Policymakers." *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment REport of Intergovernmental Panel on Climate Change.* Edited by T.F. Stocker, D. Qin, M. Plattner, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley. New York. Cambridge.: IPCC.
Report by the IPCC validating the definition, observations and trends of climate change at a global scale in comparison to observations since end of 1800s. The 2013 report focuses on summarizing the scientific facts of climate change and how these might influence Global Policymakers in macro-decisions. This summary does not go into detail on recommendations or causes.

Kolbert, Elizabeth. April 25 2005. "The Climate of Man-I." *The New Yorker.* p.56-71
Kolbert, Elizabeth. May 2 2005. "The Climate of Man-II." *The New Yorker.* p.64-73
Kolbert, Elizabeth. May 9 2005. "The Climate of Man-III." *The New Yorker.* p.52-63
A three part article focusing on different perspectives of climate change, on the management causes, the effects, scientific observations and concerned group of people directly impacted from these changes. The first part focuses on the effects of climate change in the Arctic countries and extend to most of the cryosphere. The second part focuses on the effects and observations in arid regions and civilizations specifically in the Middle East and what is known as 'the curse of Akkad'. The third part looks at the possibilities to help mitigate and adapt to the changes.

Milly, P.C.D., Julio Betancourt, Robert Hirsch, Falkenmark Malin, Kundezewicz W Zbigniew, Dennis Lettenmaier, and Ronald Stouffer. 2008. "Stationarity is Dead: Whither Water Management?" *Science*. p.573-574.
Article explaining the concept of stationarity and its relationship to the design of water infrastructure. Argues that stationarity is an impediment to development of a resilient environment. The limitations of stationarity are clear in a changing environment, therefore infrastructure needs to be rethought.

Los Angeles/Policy

Integrated Regional Water Management Plan Greater Los Angeles County. 2015. Prepared by the Leadership Committee of the Greater Los Angeles County Integrated Regional Water Management Region. 2013 UPDATE (Approved February 2014).
County-wide water management plan including strategic contexts and plans for the following subregions: North Santa Monica Bay, South Bay, Upper Los Angeles River, Lower San Gabriel and Lower Los Angeles River, Upper San Gabriel River and Rio Hondo.

Los Angeles / West

Chase, John Leighton, Crawford, Margaret, and Kaliski, John. 2008. *Everyday Urbanism.* New York: The Monacelli Press.
A compilation of essays, studies and research projects that examine the threshold of public and private space through the activation of occupancy. Most contributions look at Los Angeles as a case study of everydayness through mundane typologies, informal public commerce and eclectic signage. The book's goal is to show that there is value in daily routine and neighborhood activity that supports greater ideas of the social and political framework of the urban fabric.

Else, John, and Linda Harrar. 1997. *Cadillac Desert: Water and the Transformation of Nature.* United States: Columbia TriStar Television. PBS HomeVideo
A 4 part documentary on the history of Water in the West. The first (3) chapters are based on Marc Reisner's Cadillac Desert.

Hawthorne, Christopher. December 6 2014. "'Latino Urbanism' Influences a Los Angeles in Flux." *LA Times.* Accessed Online. < http://www.latimes.com/entertainment/arts/la-et-cm-latino-immigration-architecture-20141206-story.html>
Contemporary architectural and urban critic, Hawthorne analyzes evidence of 'Latino Urbanism' and how this is influencing Los Angeles in defining a new urbanism while recognizing that 50% of the population in the city is Latino, thus making it a demographic majority. Notes clear influence from decades of ad-hoc practices of Latino immigrants as well as the direct influence from Latin American urban planning. Includes James Rojas' observations as well as some residents practices.

Kim, Sojin. February 24 2015. "On Fences, Plazas and Latino Urbanism: A Conversation with James Rojas." *Smithsonian Center for Folklife and Cultural Heritage.* Accessed Online. < http://www.folklife.si.edu/talkstory/2015/on-fences-plazas-and-latino-urbanism-a-conversation-with-james-rojas/>
An interview with James Rojas about Latino Urbanism, its roots, meaning and examples in Los Angeles, urban typologies and informal practices.

Reed, Chris, and Nina-Marie Lister. 2014. *Projective Ecologies.* New York: Harvard University Graduate School of Design. Actar Publishers.
The book looks at the idea of an ecology from a landscape urbanism perspective. A very interesting section by David Fletcher looking specifically at the ecology of the LA River and its watershed as a non-static but also productive man-made ecology.

Reisner, Marc. 1993. *Cadillac Desert.* New York: Penguin Books.
A secondary account on the history of the West focusing on the myths, politics and management of water since the first explorers from Spain, then the Mormons and eventually the Americans. Looks at the how the policies of the East mutated in the West, and how the expansion of the cities (Southern California) gave way to the Bureau of Reclamation and its stretching aqueducts.

Rojas, James. July 15 2013. "Latino Urbanism: Transforming the Suburbs." Builipedia.com. Accessed Online. < http://buildipedia.com/aec-pros/urban-planning/latino-urbanism-transforming-the-suburbs>
Case study analysis of how Latino urbanism changes the behavior and space of the American suburb through ad-hoc and informal occurrences. Some case studies include food trucks, graffiti and fences.

Rojas, James Thomas. "The enacted environment—the creation of "place" by Mexicans and Mexican Americans in East Los Angeles Accessed Online. < http://hdl.handle.net/1721.1/13918>
Master's thesis examining how residents of East Los Angeles use their front yards and streets to create a sense of "place." By focusing on how cultural heritage affects the use of space into an "enacted" environment. Rojas uses first hand experiences of growing up in East Los Angeles as well as many ethnographic study approaches into understanding public and private space and its occupancy.

Sherman, Roger. 2010. *L.A. Under the influence: The Hidden Logic of Urban Property.* Minneapolis: University of Minnesota Press.
A book evaluating the forces behind property and its engagement of visual form in an urban environment. Sherman focuses on LA as a case study. He argues LA as a palimpsest of zoning, code, bundle of rights and its effect on streetscape through street signage, land use and ownership and the hidden relationships.

Soja, Edward W. 2014. *My Los Angeles: from Urban Restructuring to Regional Urbanization.* Berkeley: University of California Press.
A book that examines urban development and change of Los Angeles over the last forty years. By looking at the urban restructuring, deindustrialization and re-industrialization, the globalization of capital and the formation of the New Economy, Soja examines Los Angeles as an urban type for concepts of new regionalism. Analyzing Los Angeles through different lenses of economic labor and capital, Soja overlays spatiality to the complex power shifts.

Stegner, Wallace. 1992. *Beyond the Hundreth Meridian: John Wesley Powell and the Second Opening of the West.* New York: Penguin Books.
A secondary account on the history of the West focusing on the journey of John Wesley Powell, an American scientist, natural historian and environmentalist that explored the West, and attempted to change the politics, land tenure and water management through the publication of Powell's report.

Suisman, Doug. 2014. *Los Angeles Boulevard: Eight X-Rays of the Body Public.* China: ORO Editions.
The original edition published in 1990 looks at the history and the development of the boulevard from the foot trails to the street car to the automobile in Los Angeles.

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