Ecologic Oriented Development (EOD):
A Pattern Book for Site Planning

Site & Infrasturcture Planning Studio > Spring 2009

Massachusetts Institute of Technology
School of Architecture + Planning

Massachusetts Institute of Technology

SEKISUI HOUSE

Ecologic Oriented Development (EOD):
A Pattern Book for Site Planning

Site & Infrasturcture Planning Studio > Spring 2009
Massachusetts Institute of Technology
School of Architecture + Planning

Massachusetts Institute of Technology

SEKISUI HOUSE

Ecologic Oriented Development (EOD):
A Pattern Book For Site Planning

Department of Urban Studies and Planning
Department of Architecture
School of Architecture + Planning
Massachusetts Institute of Technology, Cambridge, MA

Sekisui House, Ltd.
Osaka, Japan

ACKNOWLEGEMENTS >

SEKISUI HOUSE LTD.

Sekisui House Studio Team:
Kenta Konishi, AJDW Architecture
Kazuki Ichikawa, AJDW Architecture
Kazuhiro Teranishi, AJDW Engineering

Sekisui House Staff:
Kazu Yoshimitsu, Vice President
Tetsuo Iku, Managing Director
Shinichi Doi, Director for MIT AJDW
Shima Kanno, Manager, Architecture
Hironori Fujiwara, Manager, Civil Engineering
Takahide Ono, Manager Architecture
Hitoshi Tominaga, Chief Landscape Architect
Kaori Miura, AJDW Architecture
Makoto Ochiai, AJDW Architecture

A special thanks to Sekisui House. Their generous support and hospitatlity has made this project possible.

STUDIO INSTRUCTORS

Eran Ben Joseph, Professor MIT
Deborah Morris, Teaching Assistant, MIT

Other Instructors:

Adèle Naudé Santos, Dean MIT
Shun Kanda, Professor MIT
Andrew Scott, Professor MIT
Sarah Snider, Teaching Assistant, MIT

STUDIO REVIEWERS

Stephen Benz, Principle Sasaki Associates
Alan Berger, Professor MIT
John de Monchaux, Professor MIT
Dennis Frenchman, Professor MIT
Amit Prothi, EDAW, PhD Candidate MIT
James Wescoat, Professor MIT

STUDIO MEMBERS

Benjamin Brandin
Gates Gooding
Debmalya Guha
Chris Horne
Eirini Kasioumi
Alex Keating
Christina Markel
Sole Mendez
Kristal Peters
Cristina Ungureanu

Our thanks to the members of Shun Kanda's Architecture Studio. Their diligent work, in parallel and in collaboration with our own, helped us redefine our understanding of planning methods.

CONTENTS >

PROJECT OVERVIEW >

INTRODUCTION

This book is the product of a long-term collaboration between Japan's Sekisui House and MIT School of Architecture and Planning formed to envision, design, and build prototypical sustainable residential communities for society in the years 2030-2050. The research represents the work of a joint project team of graduate students from the School's Architecture and Urban Planning Departments and staff members from Sekisui House working under the guidance of Dean Adèle Naudé Santos, Professor Eran Ben-Joseph, Professor Shun Kanda, and Professor Andrew Scott.

Sekisui House has a long history of building and developing high-quality homes and communities. A leader in innovation, Sekisui House partners with architects and universities in order to experiment and advance the technologies and practice of community design.

Japan's urban communities are facing a demographic and environmental crisis typical of many advanced and developing nations. A declining birthrate, a rapidly aging population, and changes in social habits have depopulated many of Japan's New Towns; this change has been accompanied with stigma and neglect, all representative of the relative inflexibility of the New Town form. Using Tama New Town in Japan as a reference, the project team is conducting studies on sustainable community design and ideal residential housing from a global perspective in order to accumulate new insights and technical expertise that can be utilized in future business. The hope is that this project will serve as a useful guideline on a global scale.

GOALS & OBJECTIVES

The Spring 2009 Site Planning Studio is a continuation of the Advanced Japan Design Workshop of Fall 2008. While the 2008 Workshop established the general parameters and frameworks for sustainable communities, the goal of the Site Planning Studio was to create a manual for Ecologic Oriented Development and infrastructure design that derives from the study area's typological conditions.

THE STUDY AREA:

During Japan's post-war economic miracle, a rapid influx of population into Tokyo led land prices to skyrocket, causing many to settle on the more affordable outskirts of the city, leading to a random, rapid urban sprawl. Tama New Town was planned in 1965 to attempt to ease this pressure by providing hundreds of thousands of housing in a master planned, pleasant sub-urban environment. Located just 20km outside Tokyo, Tama New Town became one of the largest housing developments in Japan. Four decades later, with significant changes in demographics, transportation, energy consumption, land use & infrastructure, life-styles and housing demand, Tama New Town faces acute challenges of continuity and transformation. Much of Japan's current housing, environmental and infrastructure problems are amplified and exemplified in Tama and in need of major shifts toward sustainable re-design and longer-range planning. Although a specific area in Tama is examined and used as a prototype, the project as a whole does not aim to explicitly develop a design and development solution for it.

INTENTIONS:

Rather than providing a single plan, the purpose of the manual is to create a flexible set of codes that account for site variability. It allows users to determine intervention points through condition resolution. This manual illustrates how stated explicit infrastructure objectives can be translated into design interventions in a variety of conditions and multiple scales. In addition to outlining techniques and intervention points, the manual also includes few permutations of how these techniques could be synthesized and employed at the neighborhood scale.

STUDIO PROCESS:

- Japan Visit
  Purpose: Site investigation and design charrette

- Analysis of Landscape Units, Mapping and Site Physiography
  Purpose: To establish typical landscape units and sections, as a basis for site and housing design.

- Abstraction of Site Characteristics, Natural systems, Infrastructure, Transects
  Purpose: To generate common conditions and evaluate constraints and opportunities for site infrastructure and building development.

- Formation of Future Scenarios
  Purpose: To address what is unknowable and define and assume future scenarios as a basis for design decisions.

- Development of Alternatives Approaches to Site and Infrastructure Technologies
  Purpose: To gain expertise of 'site scale' details and techniques that are crucial to the creation of ecologic development. These technologies included water management, climate mitigation, energy production, information technology, mobility, and agriculture.

- Creation of Technology Driven Schematic Site Plan Investigations
  Purpose: To create exemplary and ideal site typologies for each alternative technology.

- Assemblies and Synthesis of Neighborhood Site Plans
  Purpose: To utilize the developed typologies on a specific site and showcase possible permutations.

10 GUIDING PRINCIPLES FOR ECOLOGIC ORIENTED DEVELOPMENT (EOD)

As part of our overall approach to the project, the studio developed the following principles to guide design, planning, and development.

COMPLETE the WASTE and WATER CYCLE: Treat 100% of water and waste (sewer, gray water, storm water) on-site and at all scales. Viewing the cycle from pool to planet, these principles infiltrate buildings, eco-machines, and natural systems.

INTEGRATE INFRASTRUCTURE SYSTEMS: From embedded and ubiquitous digital technologies to EcoEngineering, infrastructure systems and buildings should enhance system flows and combine delivery methods.

DESIGN for EFFICIENT ENERGY: Utilize on-site renewable energy technologies in conjunction with site orientation and planning to maximize benefits of passive and climatic power conservation.

MAXIMIZE ON-SITE FOOD PRODUCTION: Increase self-reliance and local food production especially of fruits and vegetables.

ENHANCE MOBILITY & CIRCULATION: Use new modes of transportation that reduce energy consumption from local to regional, from personal to shared. Reshape and organize the circulation patterns to correspond to new travel modes and behavior.

RESTORE STREAMS & RIVERS: Enhance and rehabilitate existing waterways. Restore and protect the watershed integrity and enhance it by using technology.

RE-ESTABLISH HABITAT & WILDLIFE: Retain, construct and restore ecological matrices to support animal species, vegetation and topographical features. Conserve and protect existing features during construction. Connect local level networks to regional systems.

INCORPORATE INNOVATIVE MATERIALS: use building materials and site products (pavers, walls, etc) that reduce energy consumption (local materials) and have the potential to adapt to changes.

PRESERVE CULTURE & HERITAGE: Integrate local values through preservation, protection and integration into new building and landscape design.

VALUE EQUITY, HEALTH & HAPPINESS: Improve living and working environments for all demographic and age groups.

FUTURE SCENARIOS

ENVISION THE FUTURE

The world's economy, society, and technology are rapidly changing. Places like Tama New Town will be significantly different in 2050. Our studio attempted to anticipate some of these changes through an exploration of future scenarios. The shared assumptions that emerged from this process informed our designs and provided a collective framework with which to conceptualize the world of tomorrow. We considered several categories, including population, mobility, energy, social connections, work and education, family, nature/ecology, food, technology, and identity and culture. This section is a summary of those scenarios.

POPULATION

At first population will continue to grow, followed by a period of widespread overcrowding and social destabilization, and finally there will be a concerted effort to stabilize and reduce global population. Immigration pressures on Japan will continue to increase. Most of these immigrants, as well as the country's youth, will move to the cities, causing a shift in the urban-rural equilibrium.

MOBILITY

Energy will become more expensive, and long-distance commuting will decline. Low-tech tech travel will be more common, though personal vehicles will continue to exist. The individual demand for cars mixed with post-carbon city conditions will lead to new ways to move locally (car-sharing, biking, altered land use patterns that integrate activities).

Transit Oriented Development will be the dominant model for designing new communities or transforming existing ones. Train stations will become important spatial nodes. Assisted mobility machines will become more advanced, allowing people to remain active for longer.

ENERGY

We will use less energy per person and be more heavily dependent on renewable sources. Local generation will be more common, though there will still be a mix of centraland dispersed generation. Attempts to meet energy efficiency targets will produce a dual response of mega-structures as well as localized eco-villages where suitable. New transmission infrastructure and control systems will make us more energy efficient and enable consumers to customize and monitor their personal use. Other efforts to achieve more efficiency will include digitized monitoring, i.e. street lights that turn on with movement, better insulation techniques at the house level, and a return to the use of natural elements, i.e. topography and vegetation. Town energy committees will emerge to manage decentralized production and storage. There will be an increased use of combined heat and power generation (CHP). CHP will be steadily supported by geothermal energy. Solar collectors, wind, and geothermal energy will replace conventional systems. Biomass will not be used to generate energy (threatens food security).

SOCIAL CONNECTIONS

The connections between people will be increasingly defined through digital, social networking and increased time spent in physical proximity (more people working closer to home).

Despite its benefits, technologies to link people will feature many seams and visual disconnects (large projection screens that are not watched, vacant public facilities). New housing will cluster residents in a way that blurs the line between public and private spac e–communal living will be more common. The compactness of these areas and the mixture of uses including work, learn, and play places will promote connectivity between people and community. Increased migration will produce new relationships between neighbors and more mixed urban communities.

Beyond the home, "3rd place" amenities will create shared social space and that will be important urban assets that determine a city's attractiveness to mobile professionals.

WORK AND EDUCATION

More work will be done close to home, but not necessarily in the home. People will shift to a slightly lower standard of living in exchange for a slower work pace and more balanced life. Unemployment will be about the same as now, possibly higher. Markets will be more globalized, and places like Tama will not be able to insulate themselves from international business cycles. Life-long employment will disappear in Japan, replaced by a more western-style pattern of career changes.

In terms of education, curricula will be more focused on technology at the expense of liberal arts. On-line colleges will become more common while live-in colleges will become more of a luxury. Adult education and second careers/hobbies will be more prevalent.

FAMILY

Friends, caretakers, and acquaintances will become more primary in a person's life than family. Nannies, many of whom will be immigrants, will do much of the child-raising. Women will be fully integrated into the work force. Single-parent households, households without children, and non-conventional families, such as gay couples, will be more typical, while open marriages will become more common in cases where couples live together.

Life expectancy will increase, as will mobility in those now considered elderly, though the elderly will be increasingly isolated as their children are less likely to live nearby. Higher levels of neighborhood density will gradually replace some of the traditional functions of large families.

Beyond the physical community, people will have networks of friends and acquaintances spread across the globe.

NATURE/ECOLOGY

Environmental regulations and planning will be well developed, robust, and as pervasive as the building codes of the present day. Nature and ecology will be increasingly linked to global human rights. Fresh air, water, and uncontaminated land will be considered human rights and enforced in wealthy nations. The public will increasingly value preservation and "green space". Development will be more compact and dispersed.

Technologically, there will be significant advances in ecological restoration, waste and water recycling, and air purification. Water will become especially important due to worldwide scarcity.

Despite these pro-environmental trends, there is a strong risk of biodiversity decline and failure for wildlife conservation networks due to unpredicted shifts in species populations. It is possible that the reintegration of humans and nature might remain superficial as the natural systems needed to foster biodiversity and restoration may preclude human recreational and consumption.

FOOD

There will be severe shortages in world food supply and increased prices for imported foods. In response, more food will be grown locally, meaning there will be less product variety. Personal gardens will be more common, as well as community gardens, and these will supply somebasic items. Some of this work will be mechanized.

The total land needed for food production will decrease, while lab grown food will provide a larger share of the market. Meat consumption and mass production will decline as substitutes are introduced. People will cook at home more, though restaurants will still be popular urban amenities.

TECHNOLOGY

Smart cards and mobile devices will manage more aspects of our lives and become essential items to carry at all times. Exchanges will be increasingly automated. Digital access and information barriers will create new forms of gated communities. In terms of infrastructure management, robots will be used to monitor conditions like water contamination and power distribution.

Technology will not be highly visible unless it is at peripheral areas where energy production occurs (geothermal and wind production) or where industry operates. Housing will cluster to share technological improvements. Information technology will further enable decentralization and local clustering.

IDENTITY AND CULTURE

There will be an increase in entertainment and cultural activities in old cities, gentrification of historic centers, the marketing of places, and the competition between towns to become metropolises. We will see new forms to house cultural expression and preservation. Culture and transmission occurs primarily in neighborhoods and digitally.

ALTERNATIVE TECHNOLOGIES>

ALTERNATIVE TECHNOLOGIES > INTRODUCTION

TYPOLOGIES OF ALTERNATIVES APPROACHES TO SITE AND INFRASTRUCTURE PLANNING

Our design and planning approach avoids standardized solutions. It strives for experimentation, innovation, and above all site responsiveness. This approach provides choices that are ecological applicable to a range of conditions, accompanied by straightforward design details to address the possibilities of the site.

In order to expand the knowledge of 'site scale' details and techniques that are at the heart of a project's success or failure, we investigated particular areas of relevance to ecological oriented development. These included:

- Waste Water Systems
- Storm Water Systems
- Stream Restoration
- Energy Supply
- Food Production
- Climate Mitigation
- Mobility
- Information Technologies

Each topic was investigated in terms of its implication and possible adoption to the site. To test each element for possible development scenarios we developed conceptual site plan typologies based on singular technology criteria.

WATER BODY RESTORATION

by Cristina Ungureanu

WHAT IS 'DAYLIGHTING' ALL ABOUT?

The modern era has not been kind to its streams—we have polluted them, diverted them, confined them in concrete channels and pipes, filled their wetlands, and otherwise used and abused them. These habits are beginning to change. Laws and programs in many nations are producing measurable improvements in water quality. Policy makers, engineers, and builders increasingly recognize the value of maintaining natural drainage patterns and stream channels in new developments. In a subset of these places, people are regrading and revegetating abused stream channels to restore their functions and beauty.

Daylighting is perhaps the most radical expression of this change in attitudes and approaches to surface waters. The term describes projects that expose some or all of the flow of a previously covered river, creek, or stormwater drainage.

Daylighting projects expose waterways that were buried in culverts or pipes, covered by decks, or removed from view in one way or another. Daylighting re-establishes a waterway in its old channel where it is feasible, or in a new channel threaded between buildings, streets, parking lots, and playing fields now present on the land. Some daylighting projects recreate wetlands, ponds, marshes, and estuaries.

Daylighting is relatively new. The daylighting of Strawberry Creek in Berkeley, California, one of the earliest instances of this phenomenon, took place in 1984. In the past decade daylighting activity has increased steadily across the United States, and is even more widespread in parts of Europe. In city of Zürich, Switzerland, over nine miles of brooks and storm drains have been brought back to the surface since 1988.

BENEFITS OF DAYLIGHTING:

- Relieves choke points and flooding problems caused by under-capacity culverts
- Increases hydraulic capacity over that provided by a culvert
- Reduces runoff velocities—thus helping prevent erosion—as a result of channel meandering and the roughness of stream bottom and banks
- Replaces deteriorating culverts with an open drainage system that can be more easily monitored and repaired
- Diverts urban runoff from combined sewer systems before it mixes with sewage, reducing overflows and burdens on treatment plants
- Improves water quality by exposing water to air, sunlight, vegetation, and soil, all of which help neutralize pollutants
- Recreates aquatic habitat and improves fish passage
- Recreates valuable riparian habitat and corridors for wildlife movement
- Provides recreational amenities and creates or links urban greenways and paths for pedestrians and bicyclists
- Serves as an 'outdoor laboratory' for local schools
- Beautifies neighborhoods, serving as a focal point of a new park or neighborhood revitalization project
- Increases property values, benefits nearby businesses by creating an attractive amenity for the area
- Reconnects people to nature through the look, feel, and smell of open water and riparian vegetation, and through contact with aquatic and streamside creatures

DESIGN CHALLENGES:

- Stream restoration may require a significant amount of excavation and grading
- Pulling up a culvert and creating a new channel where none exists usually involves a high degree of earthmoving, planting and investment
- It may take some time, funds, and research to locate the water body's old channel or construct new channel and floodplain for it
- Designers may find that little to no room is available to introduce a significant vegetated riparian corridor to buffer the waterway
- It may prove necessary to build a hydraulic head to put a daylighted section of stream back into a pipe at its downstream end
- The water body must be carefully engineered into overall urban stormwater management system
- Restoration usually requires extra community education and outreach to help people visualize the potential, and to train citizens to respect the new ecological investment

WATER BODY RESTORATION _ daylighting basics

THE MANY FACES OF DAYLIGHTING

Daylighting has been carried out in an array of situations, from tiny creeks to wide rivers. Waterways can be 'liberated' on a number of landscapes: vacant land, former railyards, school properties, open space and playing fields in parks, farm fields, golf courses, parking lots, extended bridges and parking decks, brownfield sites, former and active lumber mills, residential backyards, commercial properties in downtowns, and minor or major arterial roadways.

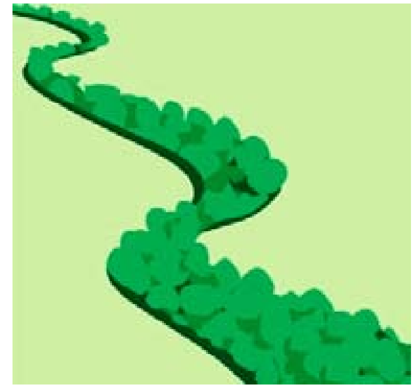
Daylighting often liberates streams from a culvert. A culvert is usually a metal or concrete pipe or arch culvert, or a concrete box culvert. However, daylighting can also be practiced in cases where streams have been covered by wide bridges and parking decks.

It is not necessary to restore the full flow of a waterway to the open air. Projects throughout the United States have sometimes restored only the partial base flow of a water body, and have kept large storm flows in existing or new culverts. Some projects have also introduced or restored a waterbody's ponds or wetlands.

Finally, daylighting projects vary widely in the degree to which they renaturalize a waterway. Most restore an earthen bottom, and rely on vegetation and woody material to stabilize sunken channels and bank soils. Projects such as these use locally-sourced rocks as stabilization material, and use other hard reinforcements sparingly.

Other projects end up confining the stream more rigidly. River banks in this scenario are reinforced with granite blocks, concrete walls, and/or concrete-bottomed channels, not vegetation. All such projects are in downtown locations with severely constrained corridors. While they may not provide some of the values of naturalized channels, they represent important improvements over previous conditions.

Not every hidden waterway can or should be daylighted. However, good design can create more opportunities for naturalization than commonly thought. Also, activism is necessary to stop waterways from being channelized and culverted in the first place. The diagrams on the right represent the functions naturalized streams can carry out. The benefits tend to increase as the level of naturalization increases.

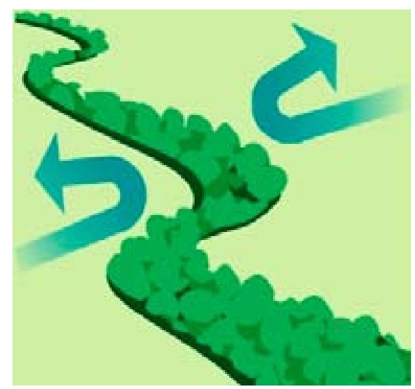


HABITAT

Daylit streams reinforce habitat. Habitat is the spatial structure of the environment which allows species to live, reproduce, feed, and move.

FILTER

Daylit streams allow for selective penetration of materials, energy, and organisms into various components of the ground: aquifers, soils, vegetation, and water bodies downstream.



BARRIER

Daylit streams also act as a stoppage of materials, energy and organisms that are ecologically unwanted or hazardous.

SOURCE

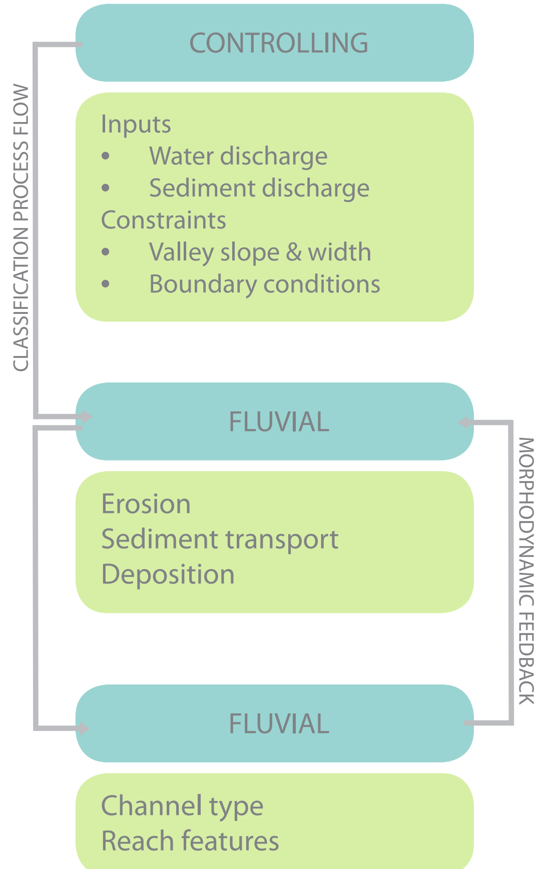
Daylit streams act as an ecological source of output materials, energy, and organisms. These outputs exceed inputs in this case.

CONDUIT

Daylit streams represent the ability of the ecological system to transport materials, energy, and organisms.

SINK

Restored water bodies alternatively provide a setting where input of water, energy, living organisms, and materials sometimes exceeds output.



Classifying water bodies: This chart represents a simple conceptualization of the relationship among controlling variables, fluvial processes, and fluvial forms (fluvial refers to a flowing water body like a stream or river). Most classification systems have concentrated on fluvial forms as the output products of a complex, dynamic system.

Diagram illustrates landforms and deposits produced within floodplains. These topographic features of floodplains are fostered by and suited to meandering streams. Splays and scrolls will be lost as fluvial channels are narrowed.

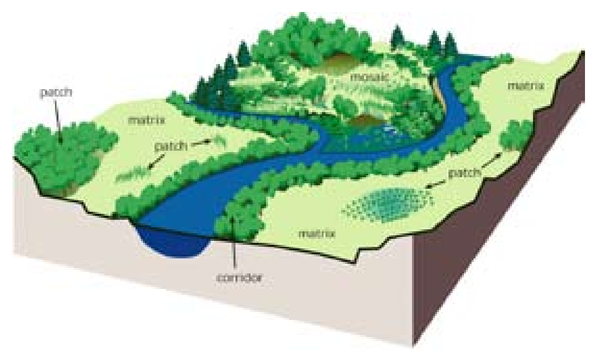


Diagram illustrates the spatial structure of stream ecology. Note that landscapes surrounding the stream can be described in terms of matrix, patch, corridor, and mosaic. All types perform relevant habitat functions.

WATER BODY RESTORATION _ typologies

A TYPOLOGICAL APPROACH

These typologies represent five different ways that daylighting can be integrated into city form. The typologies range from wide floodplains to narrow channels. They feature highly naturalized variations, as well as more rigid interventions.

The typologies are intended to be used as a palette of possible interventions that may be adapted to a number of different sites and integrated with other complementary city systems. For example, some typologies will emerge as better suited for the integration of greywater and runoff treatment systems. Other typologies may instead be more appropriate for community-building and social interaction, but not as ecologically integrative. As basic patterns, they therefore do not represent complete block or neighborhood plans.

GLOSSARY OF TERMS

Brushlayering: Brush layer planting consists of live woody plant material placed into the slope face along trenches excavated along slope contours. This technique is most applicable to areas subjected to cut or fill operations or areas that are highly disturbed and/or eroded. Layering provides the best technique to achieve soil reinforcement to resist potential shallow-seated landsliding events. Brush layers act as live fences to capture debris moving down the slope.

Deposition: A stream's sediment load is typically deposited, eroded, and redeposited many times in a stream channel. Sediments are deposited throughout the length of the stream as bars or floodplain deposits.

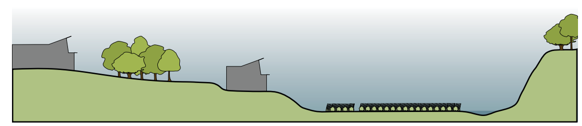
Erosion: Streams are one of the most effective surface agents that erode rock and sediment. In addition to eroding the bedrock and previously deposited sediments along its route, a stream constantly abrades and weathers the individual rock and soil particles carried by its water.

Floodplain: A level strip of land on the sides of a channel that consist of fine-grained silt and clay deposited during episodes of flooding. Higher ridges of sand and silt called natural levees are deposited near the edge of the channel. As the water spreads outward from the channel, it loses energy and carries less sediment.

Meanders: The course of a stream bed can be continuously affected by erosion on the outside of a curve and deposition on the inside. This process will transform a gentle curve into a hairpin-like meander. Meanders continuously change location as they swing back and forth across a valley or migrate downstream over time.

Reach: The length of channel uniform with respect to discharge, depth, area, and slope.

Vegetated geogrids: Useful for rebuilding very steep eroded streambanks or configuring new banks in stream realignment projects with slopes too steep for normal brushlayering. They offer a higher initial tolerance of velocity than traditional brushlayering techniques. Once the live cuttings become established, their root systems penetrate the grids and the entire system becomes cohesive.

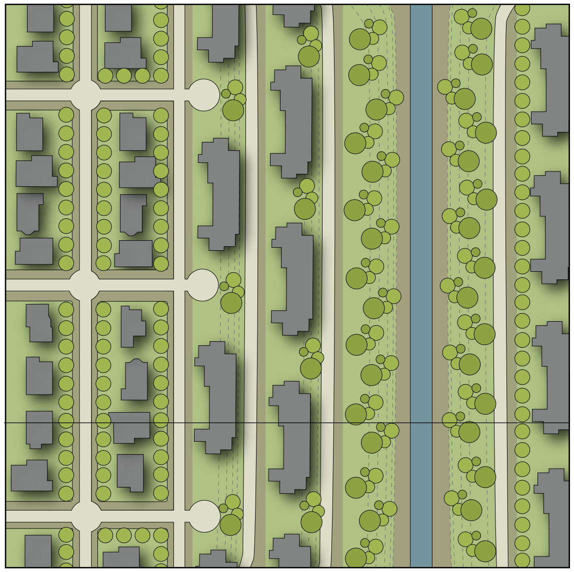


< Naturalized Floodplain Mid to Low Density Residential

Overview:
Here, daylighting has been accomplished by creating an extensive floodplain. A wetland system has been restored or introduced. Single-family housing is situated to overlook the channel, but development is located at a reasonable distance away from the floodplain. Slopes, especially those to the west, are naturally vegetated and highly stable.

Pros:
The extensive floodplain allows for stream meandering, there is more room for habitat and vegetation, channel can be programmed with pathways and decks for recreational purposes, predicted erosion of bank slopes is minimal, vegetated geogridding is likely unnecessary, topography forms valleys that can naturally funnel water down to the stream system.

Cons:
Requires a large amount of space, carving out a floodplain may require extensive earthwork, stream can lay dry for long periods of the year, surface water runoff through valleys may need extra cleaning and processing before entering the stream system.



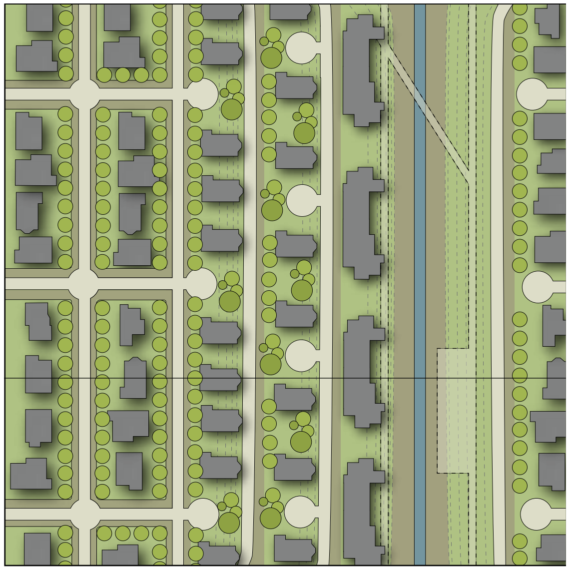
< Rigid Vegetated Channel Mid to High Density Residential

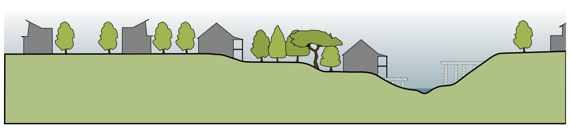
Overview:
The channel for this daylit stream is very narrow, and features relatively sleep slopes to the east and west. Its slopes are restrained and prevented from eroding using branchpacking and vegetated geogridding (instead of large boulders or concrete retaining walls). Development is situated close to the channel, and features condos, townhouses and single-family homes on smaller lots.

Pros:
Great views for nearby development, some land provided for habitat and habitat movement. Offers most biofiltration, remediation, and infrastructural benefits of any daylit stream.

Cons:
Less room for habitat and vegetation than that provided by a naturalized floodplain, slopes are more likely to erode, higher risk of situating housing next to channel, particularly in the event of a storm, less direct access for the public.

WATER BODY RESTORATION _ typologies



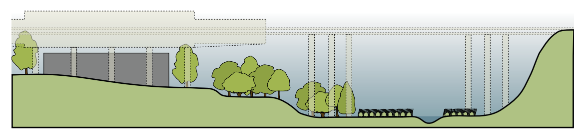


< Rigid Compacted Channel Mid to High Density Mixed Use

Overview:
This is the least naturalized iteration of daylighting typologies. The channel is straight and narrow. Instead biological materials, the slopes of the stream's banks are stabilized using more conventional techniques (retaining walls, large boulders). Mid to high density development is situated in close proximity to the stream bed. Elevated decks are inserted into the rockface of the slopes. Mixed use and commercial buildings are sited directly adjacent to the water's edge.

Pros:
Open access to the public via elevated decks and walkways, great views for businesses and high density living, and secure stream banks. Offers the most biofiltration, remediation, and infrastructural benefits of any daylit stream.

Cons:
Slope design requires some investment and the creation of new habitat. Habitat movement and stream meandering are limited, public cannot reach streamside.

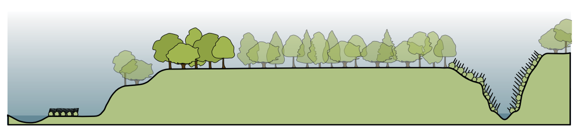


< Naturalized Floodplain High Density Infrastructure

Overview:
Daylighting has been accomplished by creating an extensive floodplain. Slopes, especially those to the west, are naturally vegetated and highly stable. A wetland system has been restored or introduced. Elevated high speed rail tracks and a train station are sited over the west bank. Underneath are large commercial, institutional and industrial structures. The pylons used to support the heavy elevated transportation infrastructure rest on the west bank among buildings, and within the floodplain.

Pros:
Extensive floodplain allows for stream meandering, more room for habitat and vegetation, predicted erosion of bank slopes is minimal, topography forms valleys that can naturally funnel water down to the stream system.

Cons:
Channel cannot be programmed for recreational purposes, habitat and vegetation receives limited light and may be deterred or inhibited by elevated infrastructure and its pylons. Requires extra space, and perhaps some heavy earthwork.



< Transition Zone

Overview:
It is important to think about how streams move from more to less naturalized iterations, or vice versa. The reach of the stream is changing, sometimes dramatically. Here, extensive geogridding and branchpacking is used where the channel narrows into its highly constrained form. The wetland or marsh system also stops here. Development is sited at a fair distance from the slopes of the channel, although the slopes to the north are less steep and much more secure than the slopes to the south.

Pros:
Geogridding and branchpacking offer natural, sustainable methods for preventing bank slopes from eroding when a stream must be placed in a rigid channel to allow for development. With these transitional techniques, cities have an assortment of approaches to choose from for their daylighting initiatives.

Cons:
Requires heavy investment and monitoring in transition zones, as they are the areas of highest risk.

WATER BODY RESTORATION _ intervention examined

NATURALIZED FLOODPLAIN
MID TO LOW DENSITY RESIDENTIAL

Daylighting allows for a unique intersection of marshland, wetland, riparian corridor, and mid to low density development. The extensive floodplain permits stream meandering and sedimentation discharge, which minimizes potential erosion to bank slopes.

NATURALIZED FLOODPLAIN
HIGH DENSITY INFRASTRUCTURE

Daylighting can be done on opportunistic sites, in previously unthought of ways. Here, a naturalized channel is depicted underneath an elevated train station/indoor arcade. The pylons used to support the infrastructure rest within the wetland that is part of the flood-plain.

WATER BODY RESTORATION _ procedures

FIVE RECOMMENDED STEPS:

Describe physical aspects of the watershed and characterize its hydrologic response.

Consider reach and associated constraints. Select a preliminary right-of-way for the restored stream channel corridor and find valley length and slope.

Determine the approximate bed material size distribution for the new channel. Like velocity and depth of the stream, bed sediment size in natural streams varies continuously in time and space.

Conduct a hydrologic and hydraulic analysis to select a design discharge or range of discharges. This is usually based on flood frequency, duration or downstream needs.

Predict stable platform type (straight, meandering, or braided). Braided streams are created when the discharge of water cannot transport its load. When there is a decrease in stream velocity, sediment is deposited on the channel floor creating bars. The bars separate the channel into several smaller channels creating a braided appearance.

Three approaches to achieving final design. There are variations of the final steps to a restoration design, after the first five steps described to the left are done.

Approach A		Approach B (Hey 1994)		Approach C (Fogg 1995)	
Task	**Tools**	**Task**	**Tools**	**Task**	**Tools**
Determine meander geometry and channel alignment.[1]	Empirical formulas for meander wavelength, and adaptation of measurements from predisturbed conditions or nearly undisturbed reaches.	Determine bed material discharge to be carried by design channel at design discharge, compute bed material sediment concentration.	Analyze measured data or use appropriate sediment transport function[2] and hydraulic properties of reach upstream from design reach.	Compute mean flow, width, depth, and slope at design discharge.[4]	Regime or hydraulic geometry formulas with regional coefficients.
Compute sinuosity, channel length, and slope.	Channel length = sinuosity X valley length. Channel slope= valley slope/ sinuosity.	Compute mean flow, width, depth, and slope at design discharge.[4]	Regime or hydraulic geometry formulas with regional coefficients, or analytical methods (e.g. White, et.al., 1982, or Copeland, 1994).[3]	Compute or estimate flow resistance coefficient at design discharge.	Appropriate relationship between depth, bed sediment size, and resistance coefficient, modified based on expected sinuosity and bank/berm vegetation.
Compute mean flow width and depth at design discharge.[4]	Regime or hydraulic geometry formulas with regional coefficients, and resistance equations or analytical methods (e.g. tractive stress, Ikeda and Izumi, 1990, or Chang, 1988).	Compute sinuosity and channel length.	Sinuosity = valley slope/ channel slope. Channel length= sinuosity x valley length.	Compute mean channel slope and depth required to pass design discharge.	Uniform flow equation (e.g. Manning, Chezy) continuity equation, and design channel cross-sectional shape; numerical water surface profile models may be used instead of uniform flow equation.
Compute riffle spacing (if gravel bed), and add detail to design.	Empirical formulas, observation of similar streams, habitat criteria.	Determine meander geometry and channel alignment.	Lay out a piece of string scaled to channel length on a map (or equivalent procedure) such that meander arc lengths vary from 4 to 9 channel widths.	Compute velocity or boundary sheer stress at design discharge.	Allowable velocity or shear stress criteria based on channel boundary materials.
Check channel stability and reiterate as needed.	Check stability.	Compute riffle spacing (if gravel bed), and add detail to design.	Empirical formulas, observation of similar streams, habitat criteria.	Compute sinuosity and channel length.	Sinuosity = valley slope/ channel slope. Channel length= sinuosity x valley length.
		Check channel stability and reiterate as needed.	Check stability.	Compute sinuosity and channel length.	Lay out a piece of string scaled to channel length on a map (or equivalent procedure) such that meander arc lengths vary from 4 to 9 channel widths.
				Check channel stability and reiterate as needed.	Check stability.

1 Assumes meandering planform would be stable. Sinuosity and arc-length are known.
2 Computation of sediment transport without calibration against measured data may give highly unreliable results for specific channel.
3 The two methods listed assume a straight channel. Adjustments would be needed to allow for effects of bends.
4 Mean flow width and depth at design discharge will give channel dimensions since design discharge is bankfull. In some situations channel may be increased to allow for freeboard. Regime and hydraulic geometry formulas should be examined to determine if they are mean width or top width.

Biologica Ambientale, 16 (n. 2, 2002)

WATER BODY RESTORATION _ metrics

DETERMINING CHANNEL DIMENSIONS

Determining channel dimensions involves determining average values for width and depth, which are themselves based on the imposed water and sediment discharge, bed sediment size, bank vegetation, resistance, and average bed slope.

Channel width must be less than the available corridor width, while depth is dependent on the upstream and downstream controlling elevations, resistance, and the elevation of the adjacent ground surface.

Key stream parameters to consider when designing a stream include bankfull width, bankfull depth, dominant sediment size, and channel gradient (Hogan and Ward 1997).

Bankfull width is used as the base unit when stream dimensions are being determined (Newbury et al. 1997). It is defined as the distance between the edges of a stream where vegetation begins to grow (Newbury et al. 1997) (Figure 6). Bankfull width is used to determine the spacing between cascades/riffles and pools in a cascade pool and riffle pool sequenced stream (Newbury et al. 1997).

Optimal pool to cascade/riffle spacing is typically 6 to 8 times the bankfull width (Newbury et al. 1997). Bankfull depth is the water surface elevation needed to fill the channel to the point in which water does not spill into the flood plain (Newbury et al. 1997).

Bankfull depth is an important parameter used to dete mine how much flow a stream can effectively handle (Newbury et al. 1997). Dominant stream bed material size (or sediment size) is important since certain sizes of stream bed materials are ideal for salmon spawning (Moyle and Cech 2004). The ideal stream bed material for cutthroat trout is gravel with a diameter ranging from 6- 102mm (Hogan and Ward 1997). Stream bed material smaller than this size, may be abrasive to fish eggs and damaging to gills (Moyle and Cech 2004).

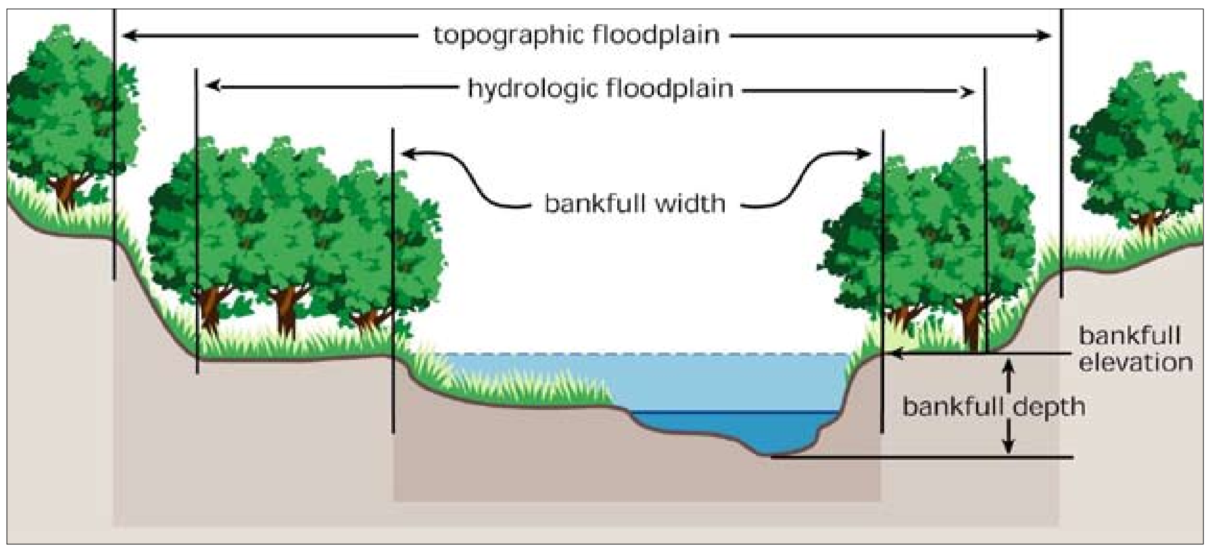
Channel gradient is important since it plays a significant role in stream velocity and discharge rate (Johnston and Slaney 1996). When designing the stream a channel gradient of less than approximately 4% will be used to maintain cascade pool or riffle pool stream morphology. A gradient of less than 4% is typical of cascade pool streams, while a gradient of less than 2% is typical of riffle pool streams (Hogan and Ward 1997).

Water does not have the tendency to flow in a straight line (Hunter 1991). This is why natural streams are often meandering and sinuous (Hunter 1991). Meandering streams increase the effective length of a channel and dissipates the force of the streams energy over long distances (Newbury et al. 1997). This increases stream stability (Newbury et al. 1997). In addition, strategically placing pools on the outside of stream bends will reduce the flow velocity which impacts a streams bank . This helps reduce erosion created by stream flow (Hunter 1991).

The average wavelength of meanders is 12 times the bankfull width and the average radius of curvature is 2.3 times the bankfull width (Leopold et al. 1964). Urban streams have the tendency to become channelized. This causes the stream to act as a straight and wide drainage ditch (Hunter 1991).

Channelization increases stream velocity, deepens stream beds through scouring, increases erosion, increases sedimentation, and induces downstream flooding (Hunter 1991). These adverse effects of channelization create unsuitable fish habitat (Hunter 1991). To prevent channelization and to design a stream similar to a natural stream, it will be important to vary the radius of curvature, meander length, and distances between pools and cascades/riffles (Newbury et al. 1997). This can be done through the use of a random generator.

Specific stream dimensions can be determined with the use of hydraulic equations which are discussed in the next section.



STREAM DESIGN HYDRAULIC EQUATIONS

One of the most commonly used equations in stream design is the Manning equation. The Manning equation is a semi-empirical equation which allows open channel flows to be simulated (Lencastre 1987). The Manning equation typically takes the following form (Lencastre 1987):

Equation: Q = AR(^2/3)S(^1/2)(1/n)

Where

Q, is flowrate in m3/s. Often this flow is taken for a given frequency of occurrence.
A, is the cross sectional area of the stream in meter squared.
S, is the channel bottom slope.
R, is the hydraulic radius of the channel (m), and can be defined as the channel area divided by the wetted perimeter.
n, is roughness coefficients which vary depending on the channel conditions. These coefficients are typically unitless.

REPRESENTATIVE REACHES

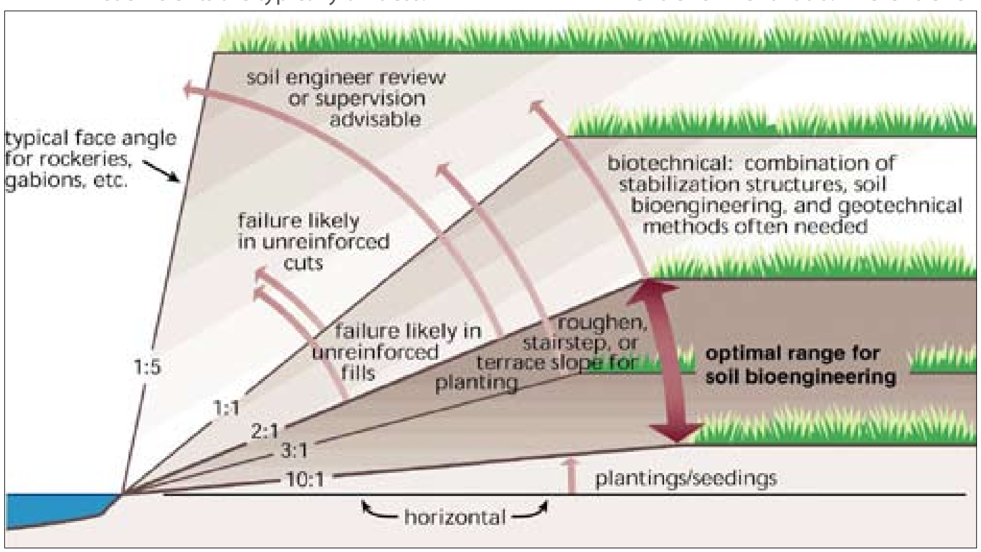
The reference reach is used to develop natural channel design criteria based upon measured morphological relations associated with the bankfull stage for a specific stable stream type. Specific data on stream channel dimension, pattern and profile are collected and presented by dimensionless ratios by stream type. The reference reach is a portion of a river segment that represents a stable channel within a particular valley morphology.

The morphological data needs to be collected to be used for extrapolation to disturbed or unstable reaches in similar valley types for the purposes of restoration, stream enhancement, stabilization, and stream naturalization schemes. Bankfull discharge and dimensions from streamgage stations for particular hydrophysiographic provinces are correlated with drainage area to develop regional curves for extrapolation to nongaged reaches.

Incision of the stream can be gauged by the Rosgen entrenchment ratio. The entrenchment ratio equals the width of the channel at twice the bankfull depth divided by the width of the channel at bankfull depth. The more active a floodplain, the higher this ratio will be. When this ratio falls below two, there is little chance the stream ever reaches its floodplain. When a channel becomes completely disconnected from its floodplain, the flows, velocities and shear stresses are always concentrated within the banks, and channel response becomes even more dynamic and acute.

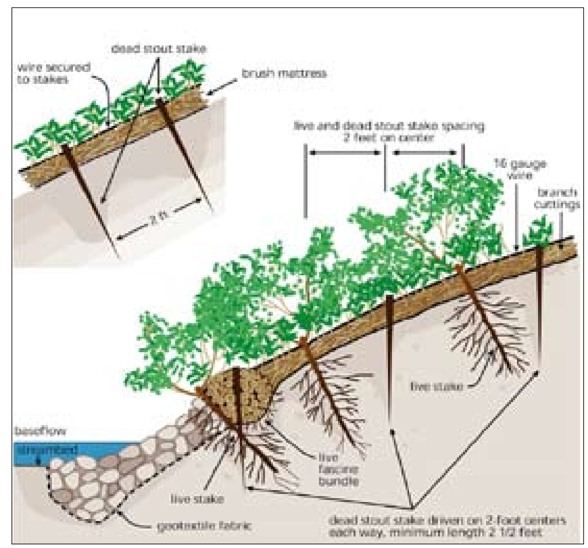
Incised channels are usually classified by Rosgen as F and G stream types. The table on the next page shows that except for the Plymouth cross-section, the areas of high velocity and shear stress are in reaches classified as F and G stream types. These are transitional stream types where active stream bank erosion and mass-wasting are feeding the stream high sediment loads. In time, when the channel has expanded sufficiently, these high sediment loads will become depositional features and promote development of a floodplain inside the existing channel.

Research conducted on Miller Creek offers bankfull depths,



Treatment of cuts and fills (left): Slope gradient is an important factor in determining appropriate restoration measures for streams and their banks.

Vegetated geogrids (right): Primarily used to minimize bank erosion. Similar to branchpacking, and useful for rebuilding very steep eroded streambanks or configuring new banks in stream realignment projects with slopes too steep for normal brushlayering.



WATER BODY RESTORATION _ metrics

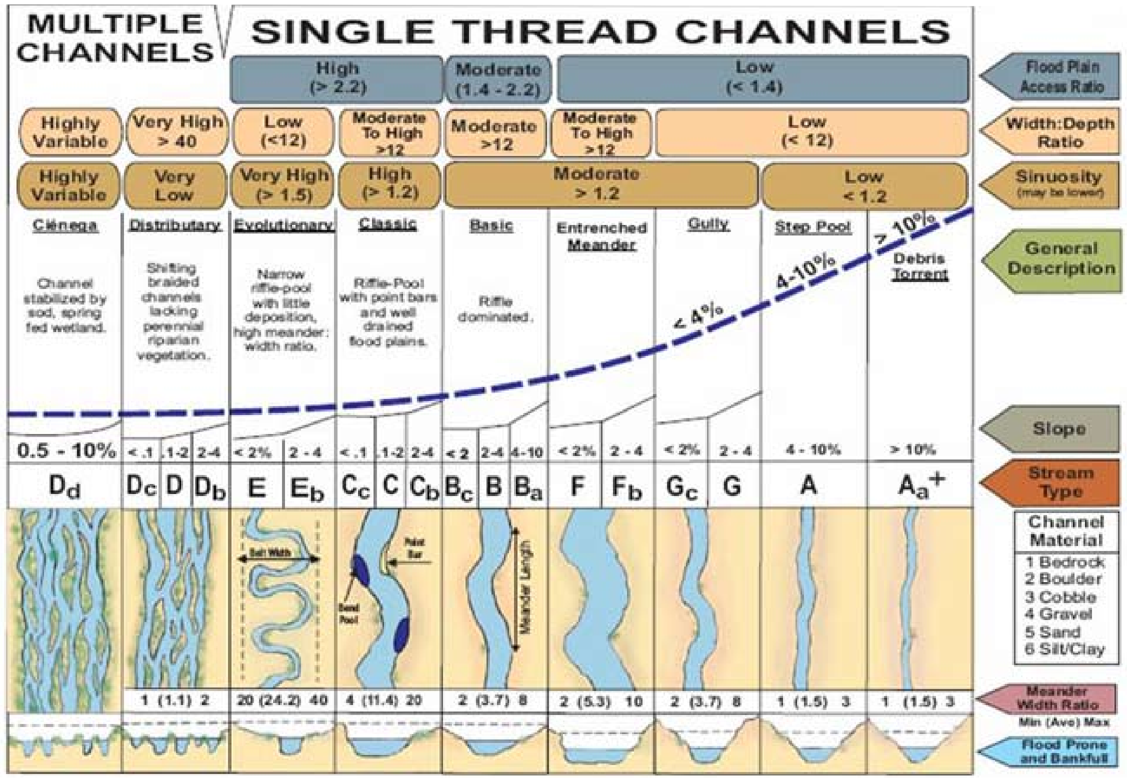
widths, ratios, and bed slopes for some representative reaches in its watershed. We can use these, plus our parameters for what we are designing for (fish habitat restoration, ecological riparian zone with significant buffer, and/or other criteria) to size the width of a stream, its meander width, and its floodplain width.

In the case of the Pine Valley Golf Course Tributary in the United States, the following was found to be useful information for application in Tama and other areas seeking water body restoration:

The tributary was once channelized and then piped through a residential area, resulting in narrow, deep trench flows and causing erosion through lateral migration. The removal of woody vegetation from the stream size accelerated erosion on this stream. Ultimately, the project called for constructing a new stable stream and floodplain at the elevation of the existing channel. The existing channel had a top width of 6-8m, and was widened to create a floodplain ranging from 12-25m wide with a meandering 3m wide bankfull channel in the bottom. The bankfull channel was meandered through the new floodplain increasing stream length from 270 to 310m.

In Cove Creek, also in the United States, the following was found: The restoration project called for construction of a 3-5m floodplain bench on the left bank and grading on both banks to allow vegetation to become established. Floodplain bench and banks were planted with a mix of native wetland plants, grasses, low growing shrubs and trees that can survive periodic inundation. Boulder cross vanes and root wads were installed to provide grade control, prevent future erosion in meander beds, and improve aquatic habitat. The project design called for constructing a new stable stream and floodplain, again at the elevation of the existing channel. The existing channel had a top width of 15-18m, and was widened to create a floodplain ranging from 25m to 28m wide with a bankfull channel in the bottom (14m).

Modified Rosgen Stream Classification System for Dryland Rivers



RIPARIAN BUFFER WIDTH

One of the first questions most landowners ask is: How wide does the riparian buffer need to be? Unfortunately, there is no one single "ideal" buffer width. The proper buffer width depends on site characteristics and the benefits expected from the buffer. In the Chesapeake Bay region, a buffer of 35 feet on each side of the stream is generally suggested to benefit the aquatic community, with the buffer expanding to 75 to 100 feet per side to produce water quality and wildlife benefits (Palone and Todd 1997). Other researchers have suggested different "rules of thumb" for determining the proper buffer width. Verry (1996), a hydrologist with the U.S. Forest Service in Minnesota, suggests that a proper width for riparian management is "the active 50-year floodplain plus the terrace slopes," or approximately 10 times the stream "bankfull" width plus 50 feet on either side (Verry 1996).

In the Pacific Northwest, a team of scientists known as the Federal Ecosystem Management Assessment Team (FEMAT) recommends buffer widths (per side) equal to the height of a "site-potential tree," or the average maximum possible tree height for that site (the average "site-potential tree" in the eastern U.S. is 110ft.) (O'Laughlin and Belt 1995). They suggest that many buffer functions (for example, providing shade, leaf litter, large woody debris, and stabilizing streambanks) are met with a buffer width of one site-potential tree height. However, others suggest that wildlife and water quality benefits require a wider buffer.

Stream size and stream order can also influence the size of the buffer needed. Headwater streams, for example, may not require the same degree of buffering as larger streams to provide the same benefit (Palone and Todd 1997). Buffer widths should also account for the goals of the landowner and the desired functions.

FINAL COMMENTS

We don't know the size of the culvert, the amount of water it transports on average, or the original width, depth, and meander ratio of the valley river/stream before culverting in the case of Tama. We can assume that this data is accessible in a real site design scenario, and we would base our spatial restoration parameters on these data.

For my own designs, assuming that we are developing a typology of stream restoration interventions, and not the perfect one for the Tama site, I sought a variety of floodplain widths along the restored stream trajectory (ranging from highly engineered concrete slopes and vegetated bottoms at 25m max width, to a highly natural floodplain that offers meandering possibilities, more space for wetland/hydrologic recycling, and room for retention pools – this reaches a 200m max width). I also sought a variety of vegetative geogridding and soils engineering can be done to control for slope erosion.

Water quality Objective	Buffer width (ft)	Considerations
Nutrient removal	15-200	Depends on hydrology, soils, loadings.
Sediment control	30-300	Depends on slope, soil type, sediment loadings.
Streambank stabilization	25-55	Choose deep-rooted species that readily resprout.
Flood control	25-200	Depends on stream order and flood patterns. Select sturdy flood-tolerant species.
Wildlife habitat	25-300	Depends on species of concern. Select native plant species for revegetation, particularly those that provide high value for food and shelter.
Aquatic habitat	60-110	Select native trees and shrubs for seasonal inputs of leaf litter and inputs of large woody debris.
Water temperature moderation	50-110	Depends on stream size and aspect, and the height, density, and crown size of the vegetation

Sample ranges of minimum widths for meeting buffer objectives.

STORMWATER MANAGEMENT

by Kristal Peters

Water is the most versatile element in nature. Water exists naturally as a solid (ice, snow, hail), liquid, or gas (vapor, steam). Its state is determined by existing climatic conditions. Frozen water retains the shape of its container, while liquid and gaseous water conform to the shape of its container only while contained. Stormwater management encompasses rainwater harvesting as well as runoff capture and treatment and must respond to water in all three forms.

OBJECTIVE

The primary objective is to harvest, treat and use stormwater for on-site household, industrial, commercial, agricultural and energy production purposes. This reduces

GOALS AND OBJECTIVES:

- Maximize on-site stormwater management.
- Integrate stormwater management components for capture, conveyance, filtration, storage, distribution and purification into building typology and site design.
- Integrate stormwater management components with those used for greywater and waste-water management, agricultural systems, energy production and information technology.
- Use more natural elements to manage stormwater to encourage biodiversity and the creation of micro-habitats for plants and animals.

OPPORTUNITIES :

- With new construction, there is the opportunity for new building and site design typologies.
- New topics for research and development related to stormwater management.
- Community members become active participants in their water management systems.
- Reintroduction of nature can enhance the environment and improve sense of wellbeing.
- Innovative use of stormwater improves local economy. New systems can be less expensive to build and maintain. More localized water management reduces costs of conveyance of water to and from central water treatment plants which themselves are expensive to operate. Localized water treatment can also create new job opportunities for the local community.

CHALLENGES :

- Retrofitting and redesign of existing buildings and infrastructure to allow for on-site stormwater management.
- Requires a social and cultural paradigm shift in approach to stormwater use and treatment.
- Micro-habitats require monitoring to ensure balance of symbiotic relationships between species.

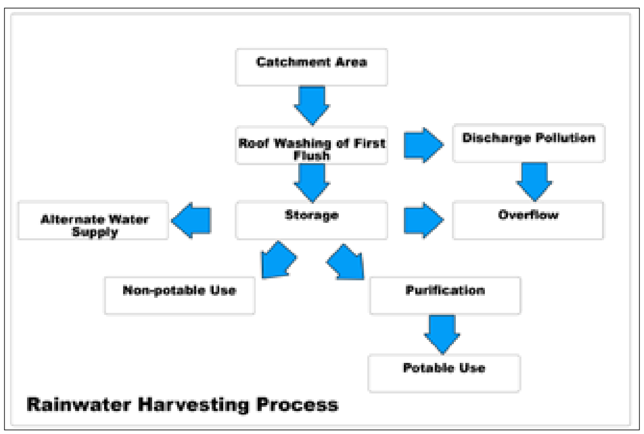
STORM WATER _ process and diagrams

Rainwater harvesting and stormwater catchment consists of 6 components:

- Catchment area which is the surface onto which rain falls directly.
- Conveyance conduits for moving water from one location to another.
- Filtration systems that clean the water and remove unwanted matter.
- Storage units.
- Distribution systems.
- Purification systems to make water potable. (Kinkade-Levario, 2007)[1]

A detailed site analysis to assess the limitations and opportunities of a locale must take place before beginning to design a stormwater management system. This site analysis should also identify primary and secondary areas for conservation or preservation (Debo, 2003).[2]

- Primary areas – not suitable for construction because of legal or physical constraints.
- Secondary areas – intangibly significant because of particular feature.



1. Kinkade-Levario, Heather. Design for Water: rainwater harvesting, stormwater catchment and alternate water use. Gabriola, British Columbia: New Society Publishers, 2007.
2. Debo, Thomas. Municipal Stormwater Management. Boca Raton: Lewis Publishers, 2003.

Stormwater management systems fall into one of two broad categories:
1. Rainwater harvesting systems
2. Stormwater catchment systems.

Rainwater harvesting systems capture rainwater from a particular catchment surface (oftentimes roofs) so that it can be stored and put to later use. Rainwater harvested from the roof is typically only mildly contaminated and with minimal treatment/disinfection it can be used within the home (mainly non-potable uses such as cleaning, flushing the toilet, or doing laundry). Rainwater harvesting systems are usually composed of the collection surface, gutter pipes, a first-wash filtering system, and cisterns or tanks for storage.

Stormwater is defined as any water that comes in contact with the ground. The goal of stormwater management systems are to:

- reduce erosion by sheet flow;
- reduce the amount of runoff entering drainage systems;
- prevent/reduce flooding by delaying the release of rainwater into main water channels;
- encourage percolation of rainwater into the ground.

Examples of stormwater management systems include swales, retention ponds, detention ponds, and wetlands.

STORM WATER _ typologies

Plateau and Slope>

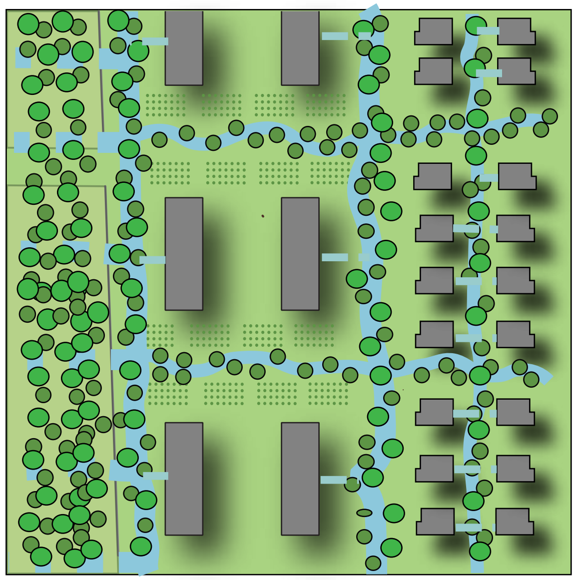
Rainfall is harvested from the roofs of the detached house units and stored in cisterns in the building. It is then used within the house and the greywater produced is collected and treated in a series of treatment tanks attached to the housing unit. Treated water is then channeled to a vegetated swale which separates one housing unit from another. On-site runoff is also directed towards this common swale for treatment and dispersion. Greywater from larger buildings is directed to a large vegetated swale that sits on the slope edge.

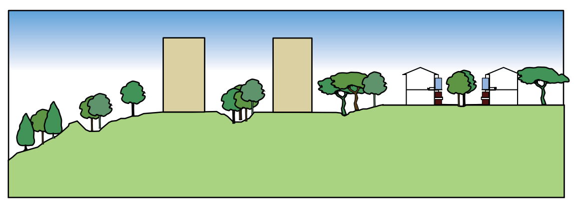
Pros:

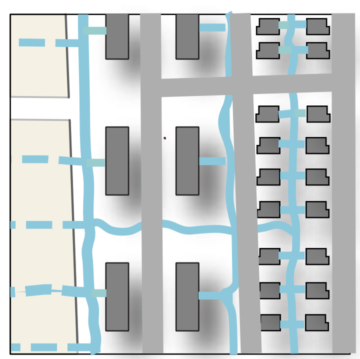
- On-site water collection, treatment, and disposal reduces the need for massive community scale infrastructure to handle the water load.
- Swales create a more natural environment in which runoff and greywater can be treated and dispersed. They may also function as a micro-habitat for plants and animals.
- The swale serves as a natural barrier between buildings/lots.
- Water receptacles are integrated into the form of the unit and complex.

Best Usage

- Suitable for steep slopes on which runoff may be difficult to control.







\/ Water Follies and Street Furniture

Street furniture is designed to serve both aesthetic and utilitarian purposes. These elements add to the visual fabric of the town, while at the same time they act as landmarks and public art.

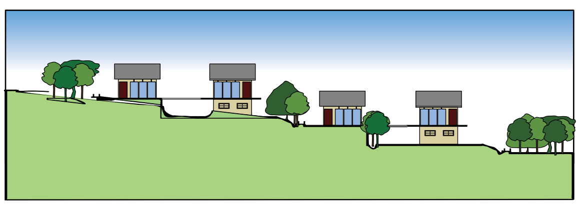
Pros:

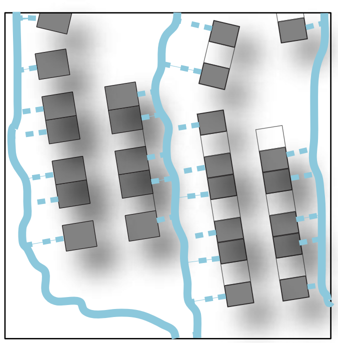
- These features add to the physical aesthetic character of the town. They activate public spaces and can be interactive.

Best Usage:

- Street lights with scuppers and hanging gardens are suitable along sidewalks, bridges, and footpaths. Bus shed/ transportation stops line transportation routes. Vertical troughs and water trails between buildings/lots to define boundaries. Ponds, water sculpture as landmark elements in plaza.

STORM WATER _ typologies





< Terraced Housing Clusters

This configuration consists of rows of housing units parallel to the contour lines with swales in between the rows. Residential units hug the contours of the slopes to form a series of terraces that descend into the lower slopes. Two units share a common deck area where harvested rainwater is stored. These decks create openings in the façade to allow for cross-ventilation between the units and the central corridor. Runoff and greywater from the upper slope is treated in lower swales adjacent to the site, thus mimicking the satoyama experience in the sense that excess from one lot is retained in the neighbor's lot.

Pros:

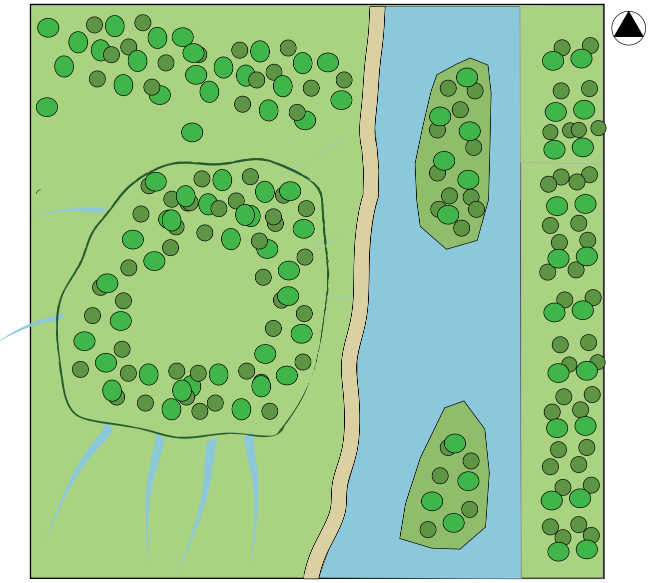
- Rainwater harvesting systems reduce the need for outdoor drainage to collect and channel water away from the site.
- Each unit harvests its own rainwater on the immediate site for household use.
- Water receptacles are integrated into the form of the unit and complex.

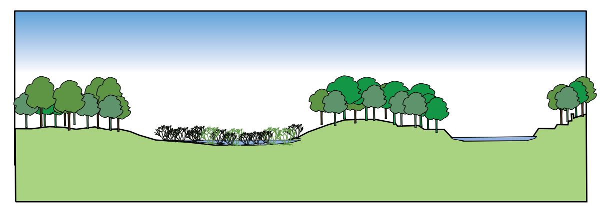
Cons:

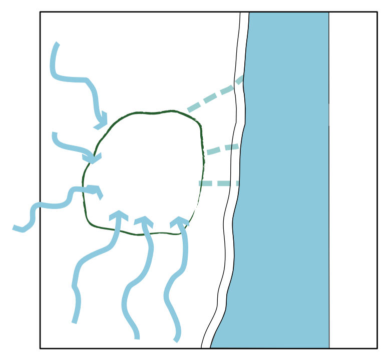
- Tenants are responsible for the maintenance of their own water collection and treatment system.

Best Usage

- This configuration works best in alternating rows and swales that run parallel to the slope.







< Wetland and Stream

The wetland is located next to the stream, and serves to treat runoff and greywater coming down the slopes. Flow is controlled through inlet and outlet valves and feeds into the stream.

Pros:

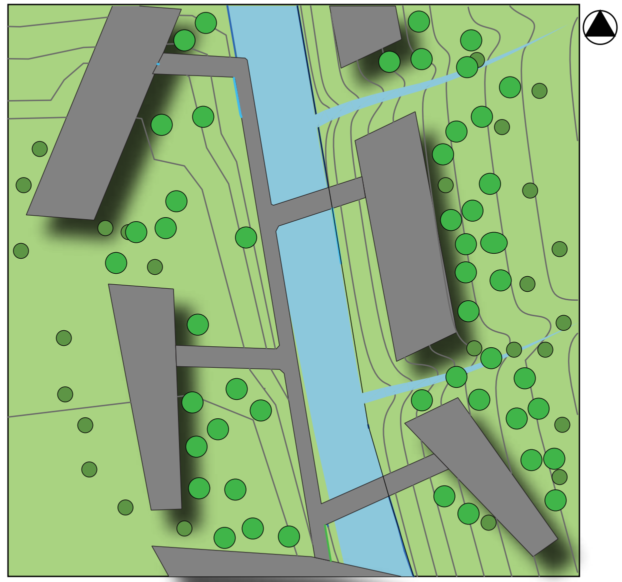
- Wetland retains, treats, and then slowly releases runoff and greywater.
- The wetland can serve as a habitat for wildlife, and so too can the vegetated earth mounds.

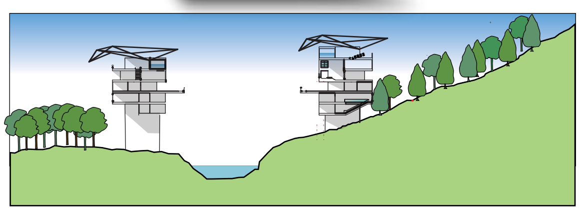
Cons:

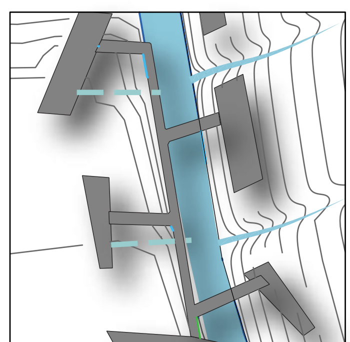
- Wetlands may require delicate maintenance to ensure continuous success as a natural water treatment system. Because of this, recreational activity should sometimes be restricted around the site.

Best Usage

- At the base of a slope where the gradient is very gentle or almost flat.







< Waterfront Development

The multi-use complex straddles the stream. Various activity spaces are suspended from an enormous structural system. The roof is comprised of a series of undulating panels with funnel openings to channel captured rainfall. Water cisterns are located on top of the suspended spaces to be used by tenants on site. The slope remains heavily vegetated to prevent erosion and encourage rainwater percolation.

Pros:

- Tenants are in close proximity to water (harvested rainfall and stream), and this fosters an intimate relationship between man and the natural elements.
- Water collection, conveyance, storage, treatment and disposal components are integrated seamlessly into form of building.

Cons:

- Positioning the building so close to the stream may make the building vulnerable to flooding.
- Care must be taken to ensure that tenants do not pollute water in stream.

Best Usage

- Sites with potential for new water-front developments.

STORM WATER _ metrics

ESTIMATING RAINWATER HARVEST

In order to design a rainwater harvesting system it is necessary to estimate the number of users as well as know the pattern of rainfall throughout the year. Graph1 shows the average amount of rainfall per month in Japan. The runoff coefficient is another important metric used to calculate rainwater harvesting potential. It is the measure of the ratio of stormwater that will not percolate into a surface. Table1 lists a number of surface types and their respective runoff coefficients.

For this project, rainfall harvest potential was calculated using the average monthly rainfall, the average roof surface area for each residential unit (75m3) and a runoff coefficient of 90%.

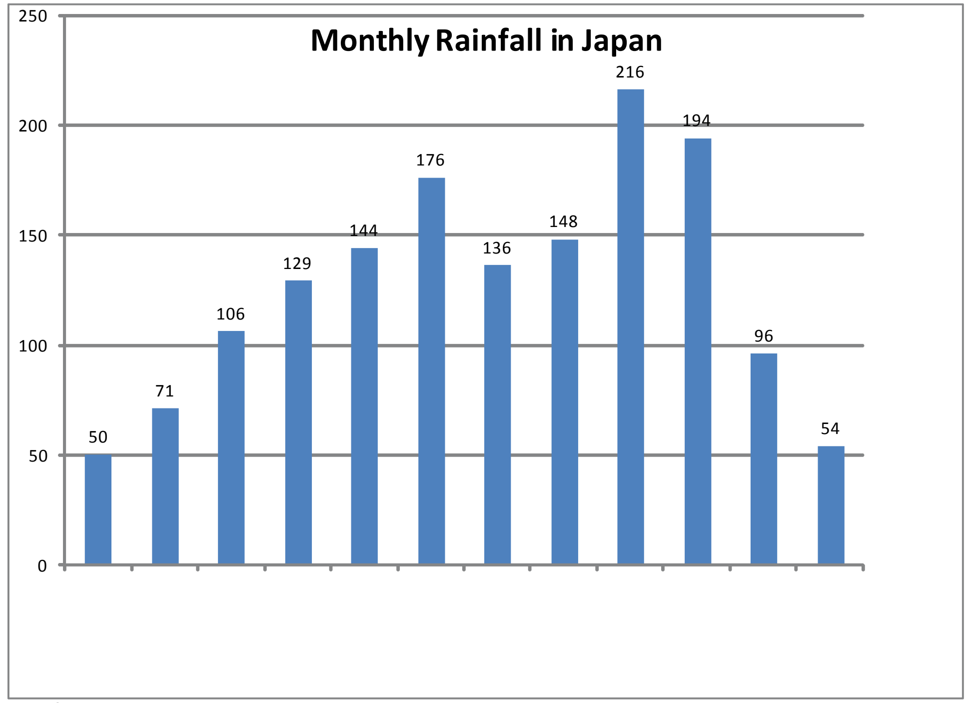
The formula is as follows:

monthly rainfall (in meters) x roof surface area (=75m3) x runoff coefficient (0.9)

Surface	Runoff Coefficient
Forested Area	0.059 – 0.2
Asphalt	0.7 – 0.95
Brick	0.7 – 0.85
Concrete	0.8 – 0.95
Shingle Roof	0.75 – 0.95

Materials and runoff coefficients

Table 1

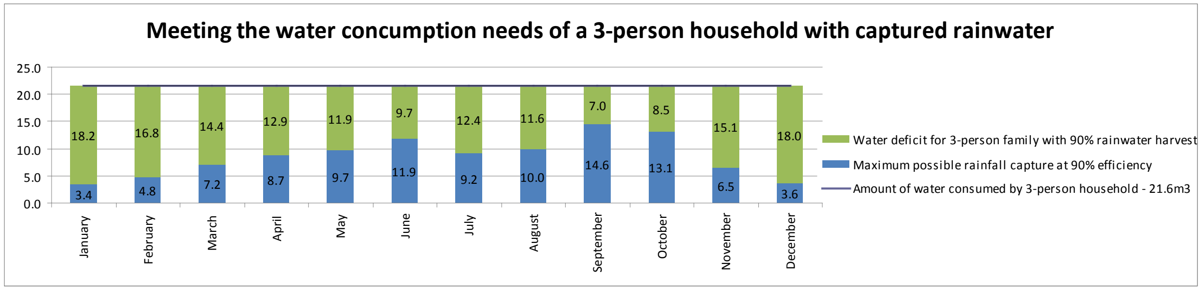


Graph 1

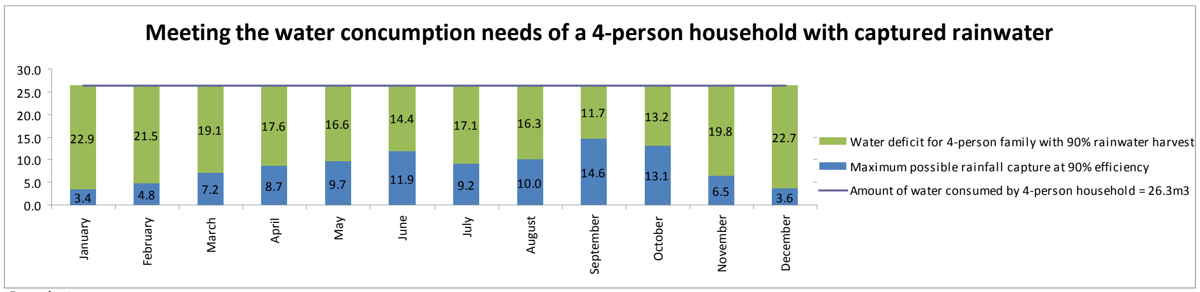
Month	Rainfall (m)	Individual Single Family Detached Volume capture with 75m² footprint (= 75m² x monthly rainfall)	Max. Possible Capture (Household volume x runoff coefficient (.9))	Deficit of needs of 4-person household (26.3 - max pasible capture)	Deficit of needs of 3-person household (21.6 - max pasible capture)
January	0.05	3.8	3.4	22.9	18.2
February	0.071	5.3	4.8	21.5	16.8
March	0.106	8.0	7.2	19.1	14.4
April	0.129	9.7	8.7	17.6	12.9
May	0.144	10.8	9.7	16.6	11.9
June	0.176	13.2	11.9	14.4	9.7
July	0.136	10.2	9.2	17.1	12.4
August	0.148	11.1	10.0	16.3	11.6
September	0.216	16.2	14.6	11.7	7.0
October	0.194	14.6	13.1	13.2	8.5
November	0.096	7.2	6.5	19.8	15.1
December	0.054	4.1	3.6	22.7	18.0

Tabulation of impact of captured rainfall per month

Table 2



Graph 2



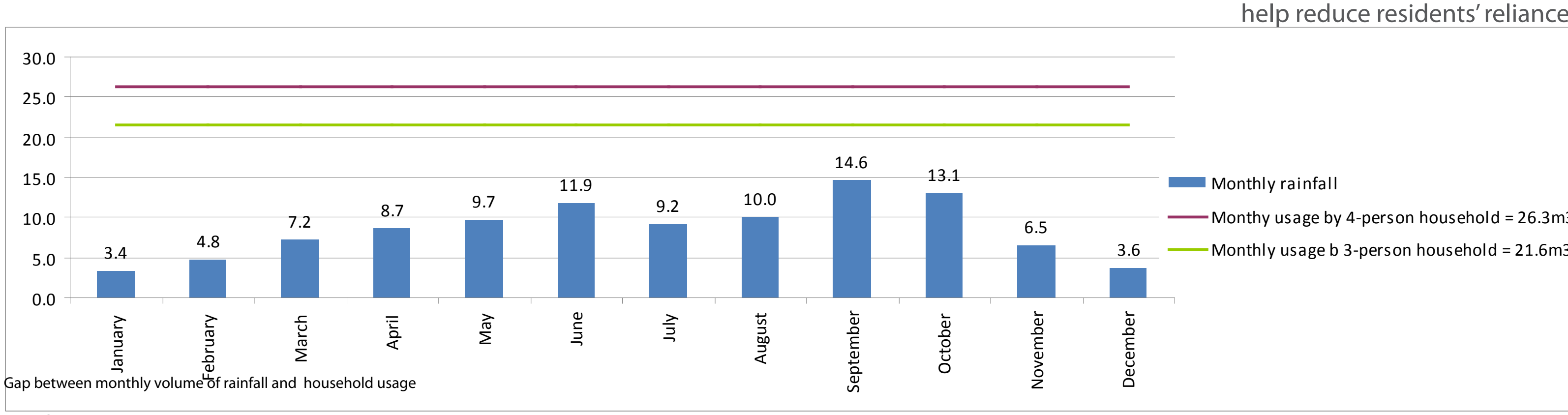
Graph 3

Based on the results of these calculations (see Graph2 and Graph3) it is clear that rain water harvesting alone will not yield enough water to meet the consumption demands of either a 3-person or a 4-person household.

For the 4-person household annual total deficit is 213m3 (67%) with a maximum deficit of 22.9m3 (87%) in January and a minimum deficit of 11.7m3 (44%) in September.

For the 3-person household the total annual deficit is 156.6m3 (60%) with a maximum deficit of 18.3m3 (84%) in January and a minimum deficit of 7m3 (32%) in September.

Therefore, given the current water consumption levels for 3- and 4-person households in Japan, the residents of Tama cannot entirely depend on rainfall to meet their demands. One possible solution to increase the amount of rainfall captured is to increase the rainfall capture area. Another option is to curb water consumption. If implemented together these two strategies can help reduce residents' reliance on piped water.



Graph 4

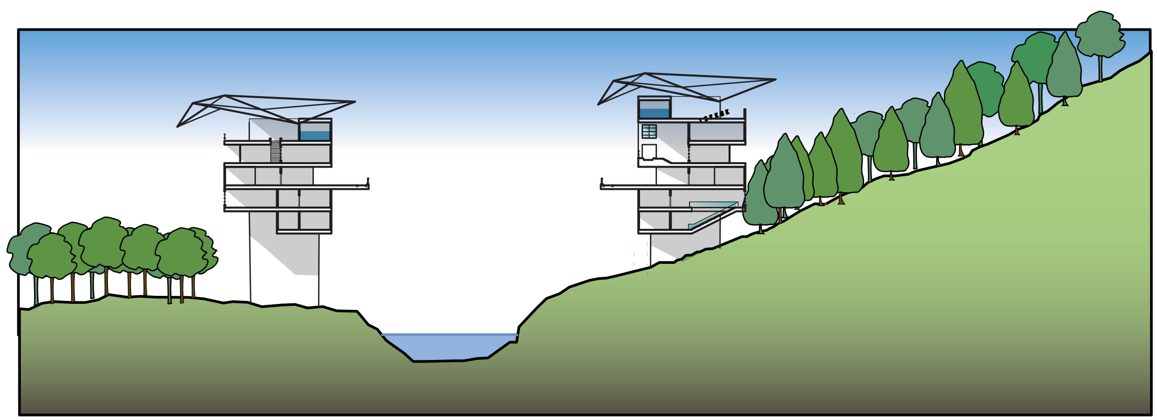
STORM WATER _ intervention examined

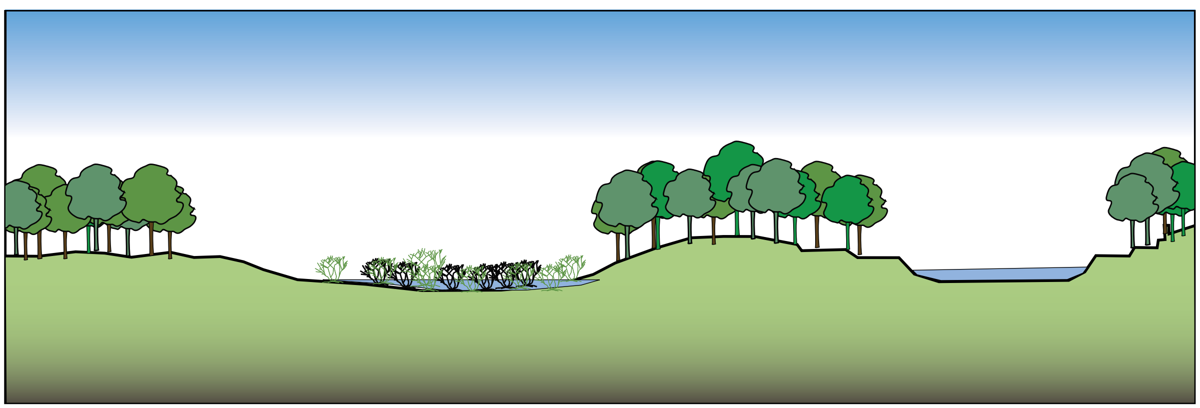
WATERFRONT DEVELOPMENTS

Waterfront developments use water as a central feature. They give people the opportunity to enjoy amenities and conveniences while remaining in close proximity to this natural element.

In this intervention, the buildings straddle the stream and activate both sides of the water course. Tenants and users can to observe the changes in the stream as it responds to changing conditions. After heavy rainfall the stream will swell and rise closer to the edges of the banks; in periods of low rainfall, the level of the stream will be very low; and any debris that is dumped in the stream will be highly visible by those are in close proximity.

This intervention does not propose that the stream's purpose is to absorb and take away the stormwater from the community. Instead the stream serves to absorb runoff that has either bypassed or surpassed the capacity of other stormwater collection systems (e.g. swales, retention ponds, detention ponds) .





WETLAND AND STREAM

In this scenario, the constructed wetland is adjacent to the stream but the two water bodies are completely separated from each other. Runoff is channeled towards and collected in the wetland. The wetland is a living system supporting plant and animal life. These organisms filter and clean the water that enters. After the runoff enters along one side of the wetland it moves slowly across the wetland while being slowly filtered and cleaned. Outflow from the wetland is through outlets leading towards the stream. Valves in the outlets allow for water to flow only from the wetland to the stream and not vice-versa.

In this system, the wetland's purpose is to remove particles and sediment picked up by the runoff, and to clean it to a reasonable level so that the water that is then released does not pollute the stream water.

The earth mound that separates the wetland from the stream can serve as a pedestrian walkway, care must be taken so that the edges of the mound do not become eroded.

GREYWATER

by Sole Mendez

WHAT IS GREYWATER?

The concept of "waste" water is disappearing. The reason is simple: we have no water to waste. Protecting water from pollution, and using it more sparingly, are the first steps in reducing waste. It is time, however, to take a step further by taking what was once considered a disposal problem: sewage; and re-imagining it as a solution to water shortage. We are able to "reclaim" our used water and use it once again..

Greywater is also known as sullage. It is the wastewater generated from dish washing, laundry and bathing, for example. It consists of all of the water waste of a household with the exception of toilet water which is called blackwater.

Fundamentally, the re-use of greywater requires a re-thinking of how we build today. The work begins within the building, separating the greywater from the sewer lines. This may seem like an architectural problem but it is also an infrustructural problem. Once separated from the sewage system greywater can be treated naturally or through treatment and can be integrated into gardens, parks and natural habitats.

GOALS AND OBJECTIVES:

- Efficient use of vital natural resources
- Minimizing use of non-renewable resources
- Nourish natural and manicured habitat
- Re-integrate nature into our lives through greywater re-use
- Use gravity as a means to move water
- Create design flexibility for optimal control
- Expose water consumption in order to forward a more ecologically conscious society
- Build competitive communities that will monitor and reward water consumption

CHALLENGES AND OPPORTUNITIES:

- Creating desired slopes to move greywater through gravity alone
- Ensuring water purification prior to exposure to public
- Control of water flow
- Use of greywater at disparate scales and densities
- Creating monitoring and controlling system to enforce healthy water consumptions
- Creating spaces activated by greywater and nature

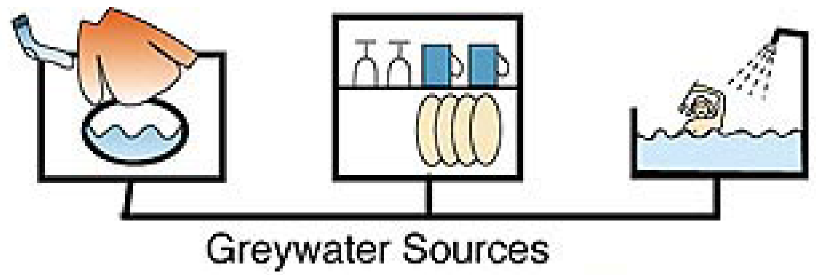
GREYWATER _ completing the cycle

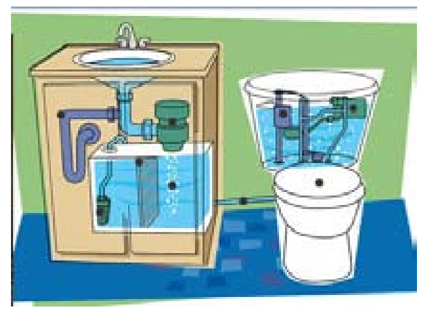
Returning water to nature

Water that comes from the bathtub, shower, sinks, laundry and dishwashers is known as greywater. Simple changes in plumbing-system design can allow greywater to be separated from black water and run into a treatment system for reuse. According to the Department of Housing and Urban Development's Partnership for Advancing Technology in Housing (PATH) Program, the initial cost of installing a greywater reuse system in a new home ranges from approximately $500-$2,500. The cost savings of such a system today equates to $5-$20 a month. Properly designed greywater systems have the potential to dramatically reduce reliance on freshwater, and to pay for themselves over a reasonable period of time.

Greywater is an important sustainable concept for several reasons. On average, in a household each person will use 80-100 gallons of water per day, today 50% of this can be reused. In a four person household approximately 73,000 gallons of freshwater can be saved each year; this is enough to provide drinking water for more than 300 thirsty people per year.

By using today's water consumption numbers we can determine approximately how much a community of any size will use. The goal is to learn how to mediate and decrease this amount in the future.

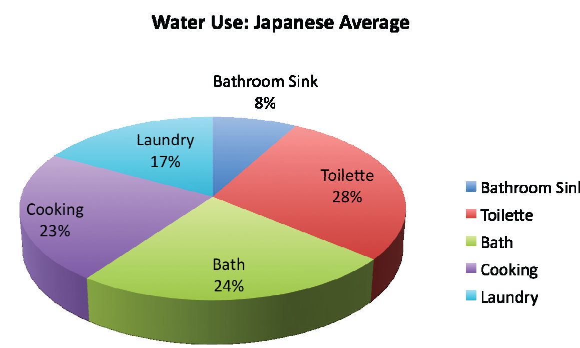




This simple method of greywater re-use occurs within the home of office. It connects the sink to the toilet to allow water to be used twice minimizing the consumption of fresh water supplies.

Average Japanese Household Water Use

Household Size	Water Use Per Month (m^3)
1	7.8 m^3
2	16.2 m^3
3	21.6 m^3
4	26.3 m^3
5	30.6 m^3
6	35.6 m^3



COLLECTIVE GREYWATER REUSE:

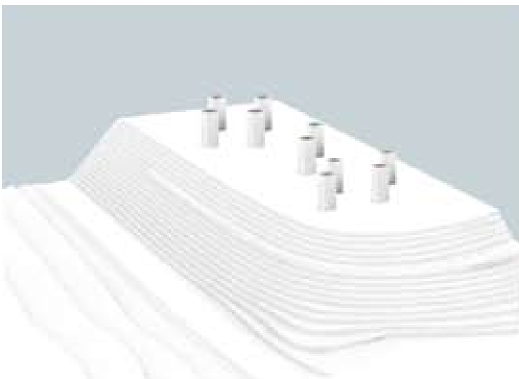
- Saves water
- Creates life
- Enriches living environments

SUGGESTED INTERVENTIONS FOR PLACEMAKING:

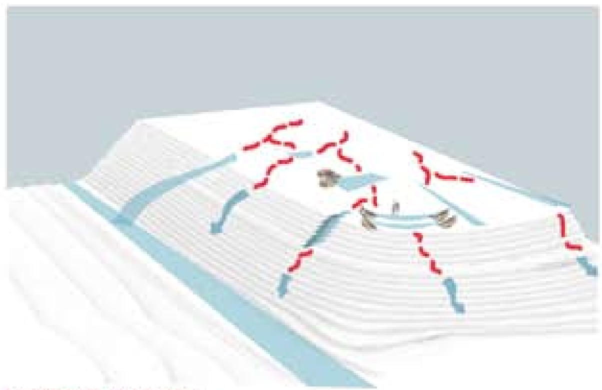
Community gardens - creating destinations and "third places"

Roads and sidewalks along steps - using visuals and sounds to connect with waterand nature

Irrigation - throughout and as path to natural setting and stream



LIFE-LESS



GREYWATER PATHS AND EXPOSURES

ENRICHED LIFE STYLES

BENEFITS OF GREYWATER RE-USE:

- Reduction of water waste
- Reduction of strain on septic tanks and treatment plants
- Nourishment for natural environment
- Reduction of urban heat island
- Re-integration of water into our living environments
- Provides education about how we live
- Increased awareness of our ecological footprints
- Community ownership and competitiveness for consumption of natural resources
- May lead to a more ecologically responsible society

INITIAL CONCEPTS IN THE CONTEXT OF TAMA:

The existing conditions in Suwa-Nagayama, as in the first image, are of tall buildings with vast open spaces in between. Despite the area for green spaces there is a distinct disconnect between the human living environment and the natural. The use of greywater not only nourishes the environment but enlivens the community spaces. By separating greywater and strategically exposing greywater piping at designed interventions, the community can enjoy the sites and sounds of water as well as monitor the areas consumption.

GREYWATER _typologies

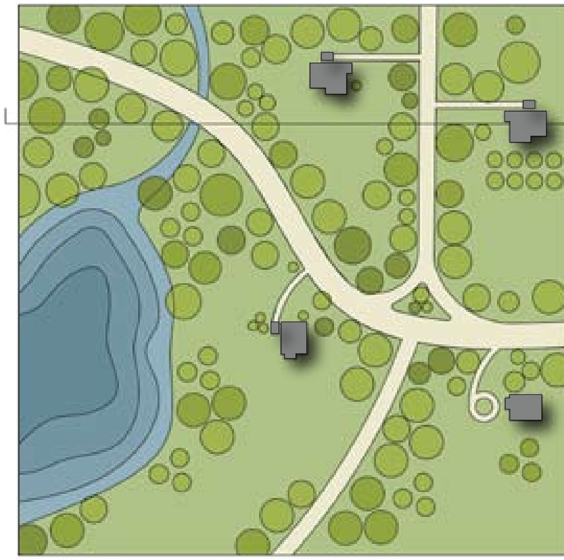
Greywater for all scales

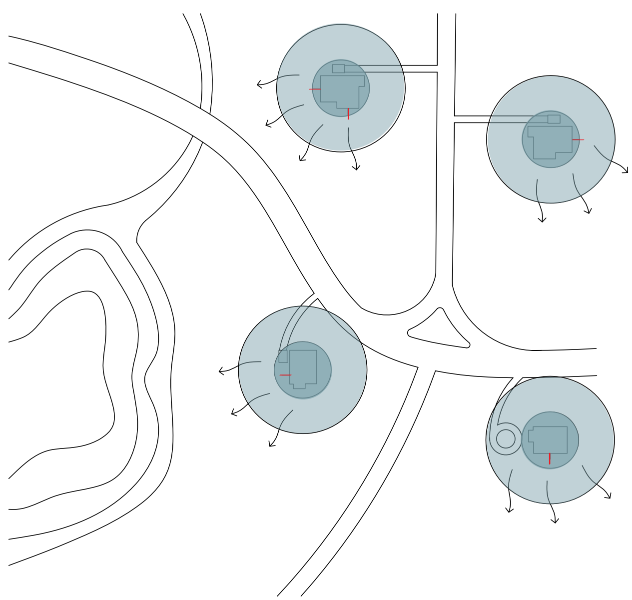
Goal: To demonstrate uses of greywater within a variety of urban forms

These typologies represent 5 different ways that greywater can be integrated into city form. They range in scale and usage from individual yards behind single family rural homes to intensive green roofs and courtyards on urban blocks. Furthermore, they range from individual use to communal use, whereby the exposure of greywater in the streets and in creative spaces for the community will also make the community more aware of their water consumption.

Certain ideals were maintained throughout these typologies, namely the use of gravity as a means of water movement and green systems of purification. It is possible, of course, to use energy to move greywater as well as purification systems to clean it; however, these typologies focus on the most cost efficient and natural methods of greywater re-use.

The ultimate goal may be to create a community that is conscious and sensitive to water consumption; eventually this may even lead to healthy competition among communities. The typologies are intended to be used as patterns of use that may be adapted to a variety of different sites and integrated with other complementary city systems.





< RURAL_INDIVIDUAL

Greywater intervention:

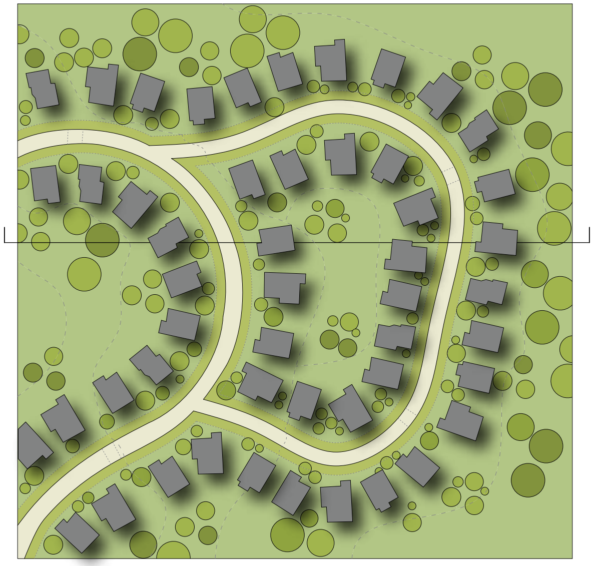
A singular process; exiting the building and immediately entering the natural habitat.

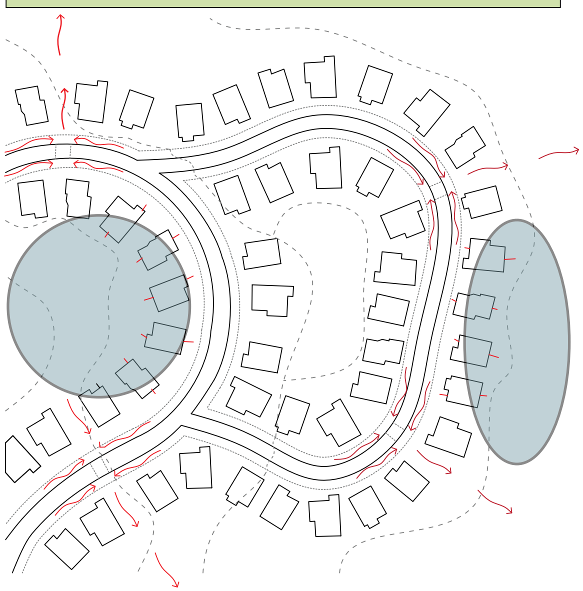
Pros:

- Applications of tested methods existing today.
- Requires minimal piping to allow water to exit house and surrounding areas.
- Surrounding natural habitat will reap benefit of water supply.
- Requires little maintenance.
- Adaptable to changes of urbanization

Cons:

- Physical disconnect from community.
- Maintenance work must be conducted by individual owners.





< SUBURBAN COMMUNITIES

Greywater intervention:
Greywater from individual residences is used for communal green spaces; i.e. community lawns, golf courses and natural habitats.

Pros:

- Tested method applied to communities.
- Requires little piping and maintenance.
- Community benefits from green spaces and gathering places.
- Promotes communal ownership and care for the surrounding habitat.
- Surrounding natural habitat will reap benefit of water supply.

Cons:

- Maintenance must be negotiated between private ownership and community.
- Community ownership and penalties for overuse of water.
- Less adaptable to changes in urban form.

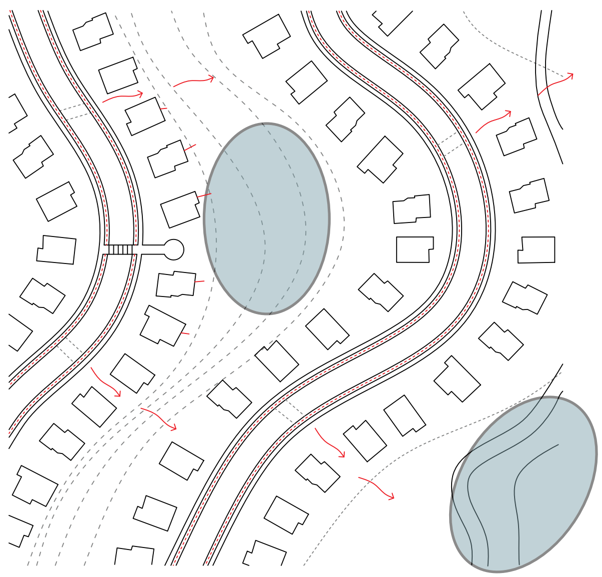
GREYWATER _ typologies

HILLSIDE_TOWNS >

Greywater intervention:
Due to its sloping nature and density, energy consumption can be reduced by using gravity to move the greywater.

Pros:
- Energy consumptions for greywater movement are low.
- Community benefits from green spaces and gathering places.
- Demonstrates communal patterns of water usage and collective ecological footprint.
- Promotes communal ownership and care for surrounding habitat.
- Maintenance to be taken care of by township.
- Surrounding natural habitat will reap benefit of water supply.

Cons:
- More manufactured methods of water circulation.
- Requires maintenance to ensure sanitation levels prior to contact with public.
- Community ownership and penalties for overuse of water.
- Difficulty adapting to changes in urban form.

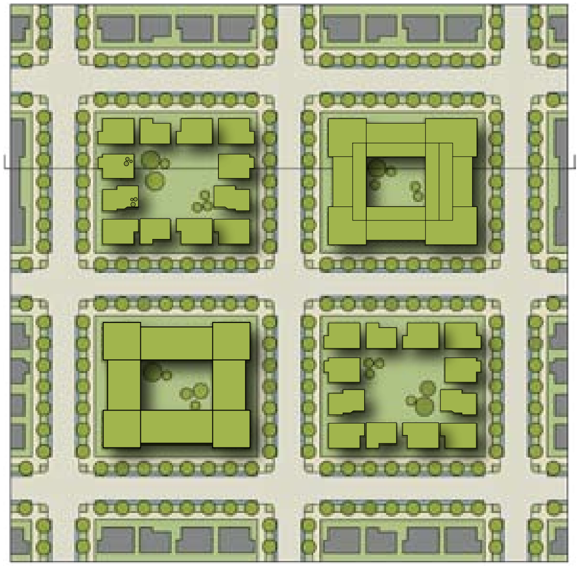


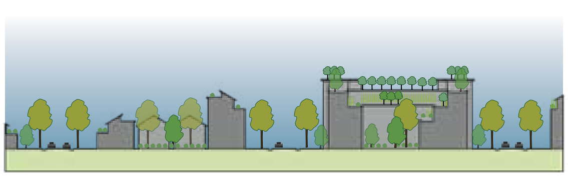
URBAN_COMMUNITIES >

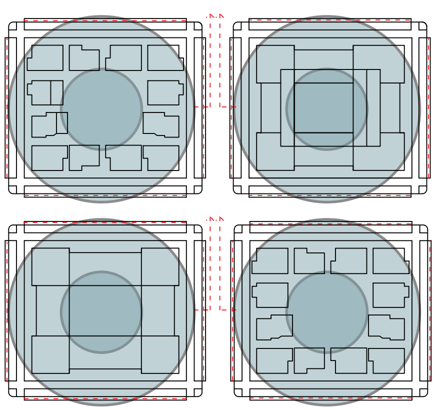
Greywater intervention:
High density and building forms allow for use of greywater for semi-private spaces; i.e. roof gardens and central courtyards.

Pros:
- Tested method applied to urban form at a community level.
- Provides amenities of healthy lifestyles
- Reduces energy waste by maintaining cooler building temperatures.
- Promotes communal ownership and care for green spaces.
- Demonstrates communal patterns of water usage and collective ecological footprint.
- May lead to ecologically competitive districts further benefiting the environment.

Cons:
- Piping required; greywater use is supplementary to larger system.
- Maintenance must be negotiated between private ownership and community.
- Community ownership and penalties for overuse of water.
- Difficulty adapting to changes in urban form.





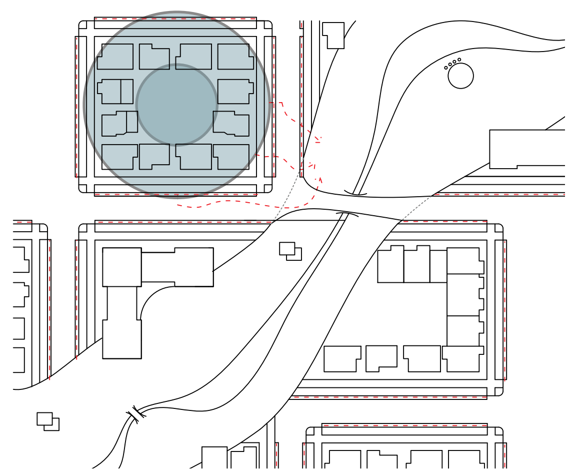


URBAN_PUBLIC SPACES >

Greywater intervention:
Used in public spaces to enhance our living environments before ultimately nourishing the natural habitat.

Pros:
- Communities and general public benefit from green spaces and gathering places within an urban setting.
- Provides amenities of healthy lifestyles.
- Promotes communal ownership and care for green spaces.
- Maintenance taken care of by the city.
- Demonstrates communal patterns of water usage and collective ecological footprint.

Cons:
- Requires maintenance to ensure sanitation levels prior to contact with public.
- Some piping required to incorporate greywater into urban designs.
- Difficulty adapting to changes in urban form.



GREYWATER _ re-greening the future

NOURISHING OUR GREEN SPACES

From the most rural to the most urban of sites greywater can be used to rehydrate and nourish the living plants and organisms around us. Not only does the natural environment reap the benefits of this vital resource but so do we. By using greywater to nourish green spaces we reconnect ourselves with nature and benefit from the spaces it creates around us. We may think of these spaces as parks typically, however greywater lends itself to more creative uses such as for roof gardens, terraces and courtyards as well as street canals and water ways.

COMMUNITY SPACES

Community gardens, parks and nature trails provide the opportunity to engage with nature, grow flowers and engage with the community during leisure hours. Greywater can become a central part of this environment. By exposing greywater throughout the community and linking it to pockets of green, and eventually a water body the community benefits from the sites and sounds of greywater re-use. In addition, the exposure to water consumption patters will help to educate the community about their water usage and likely abuse.

GREYWATER _ re-greening the future

FEEDING INTO THE LARGER SYSTEM:

Once purified through subsurface irrigation, greywater is safe to be integrated into the natural water systems. This allows the opportunity for us to feed the local and regional water bodies saving them from the possibility of drought. The re-use of greywater is beneficial both to the community and to the regional setting.

SEWAGE WATER

by Gates Gooding

SEWAGE TREATMENT ISSUES:
Treating our waste is a central, but often overlooked, function of the city. Current practices are energy intensive, inefficient and foster a climate of ignorance and apathy about how waste is treated.

THE FUTURE:
ONSITE ALTERNATIVE SEWAGE TREATMENT OPTIONS:
In recent years, a suite of new sewage treatment technologies have been developed. These technologies facilitate efficient, clean, and local-scale waste treatment. Treating sewage locally will change attitudes about and awareness of our waste streams, while creating opportunities for environmentally-friendly synergies. Two such examples are high-nutrient compost generation and methane capture for cooking.

GOALS AND OBJECTIVES:

- Explore onsite sewage treatment options and weigh relative benefits.
- Identify synergies in these systems, including environmental, economic and social relationships.
- Develop neighborhood typologies based on four different treatment options to illustrate systems' relationships to the visible built environment.

CHALLENGES AND OPPORTUNITIES:

- A culture of "don't ask don't tell" persists almost everywhere in the world, meaning that people are very averse to any "hands-on" approach to sewage treatment.
- Converting existing sewer systems to alternative options will be initially expensive, and will meet with resistance from officials who are already familiar with the way things are today.
- There are many innovative technologies available for treating sewage that are more energy efficient than what we currently use. These technologies bring with them the potential for diverse synergistic benefits.

SEWAGE WATER _ by the numbers

EXPLANATION

Future improvement in waste treatment systems require a cultural change regarding sewage. The toilet currently accounts for 28% of Japanese water use. The amount of water used to move waste is actually the majority of what flows through the system, and it has limiting effects on achievable efficiency levels.

In the future, improving the water-waste ratio in sewage systems will increase onsite treatment options, and at the same time, reduce the amount of energy required to separate the water back out. As with other green technologies, the key is to work toward efficient consumer behavior before trying to upgrade the infrastructure supplied.

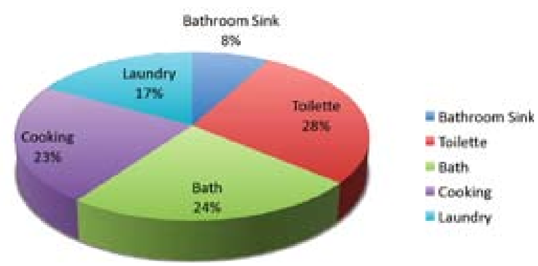
Average Household Water Use (Japan)

Household Size	Water Use Per Month (m^3)
1	7.8 m^3
2	16.2 m^3
3	21.6 m^3
4	26.3 m^3
5	30.6 m^3
6	35.6 m^3

Sewage Treatment Matrix

	Living Machine Tidal Flow Wetland	Living Machine Hybrid Flow Wetland	Horizontal Subsurface Flow Wetland	Vertical Subsurface Flow Wetland	Advanced Activated Sludge System (Conventional System)
Footprint to treat Japanese city of 10,000	99,677 m^2	365,483 m^2	830,645 m^2	219,290 m^2	49,838 m^2
Energy to treat Japanese city of 10,000	332 kWh/day	265 kWh/day	66 kWh/day	664 kWh/day	1329 kWh/day
Resulting effluent Quality	Tertiary	Tertiary	Secondary	Tertiary	Tertiary

Water Use (Japanese Average)

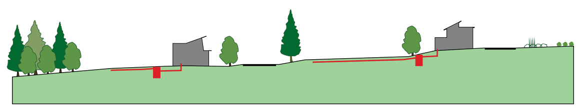


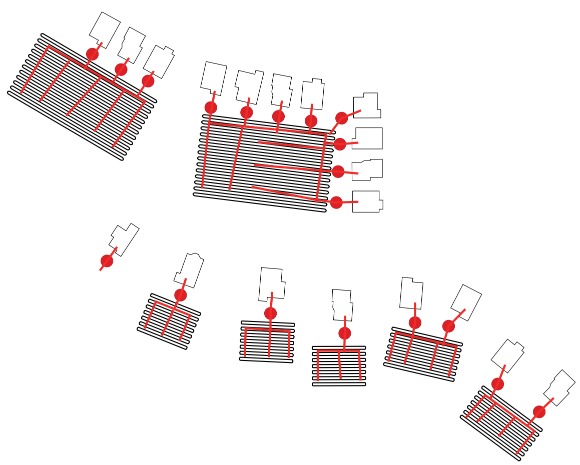
SEWAGE WATER _ typologies

ONSITE SEWAGE TREATMENT OPTIONS:

The following four typologies represent different options for onsite sewage treatment. Each is a varying mix of primary, secondary, and tertiary treatment mechanisms, and each has a specific spatial consequence. Some of these typologies can work together and might serve as a “menu” of sorts, where the specific development chooses a particular suite of options depending on local context and needs. These typologies are not exhaustive and only represent an introduction to the wealth of alternative treatment options that are available.

Each treatment option has spatially explicit development constraints. For instance, traditional septic systems require a large footprint depending on local soil types, which necessitate large lot sizes. Utilizing existing sewer systems constrains where buildings can be sited, and what envelopes are appropriate.





< Traditional Septic System:

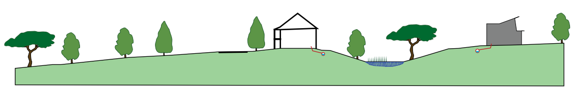
Single or small groups of houses are served individually with septic tanks and leach fields.

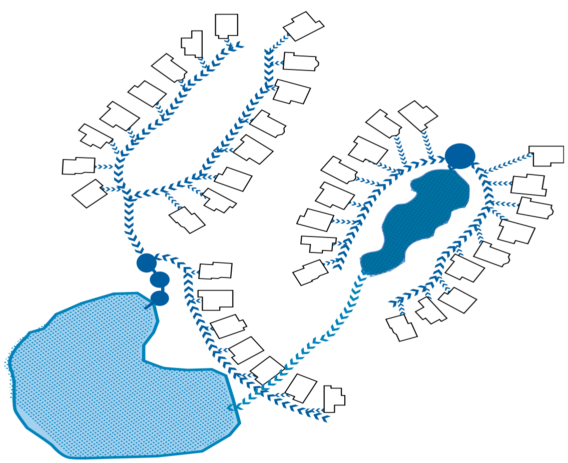
Pros:

- Simple system, minimal infrastructure investment.

Cons:

- Requires regular maintenance, limited capacity, large footprint.





< Living Machine/Wetland Mix:

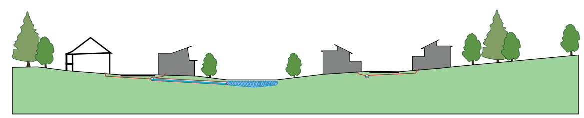
Groups of houses share living machines and a mix of wetland treatment options.

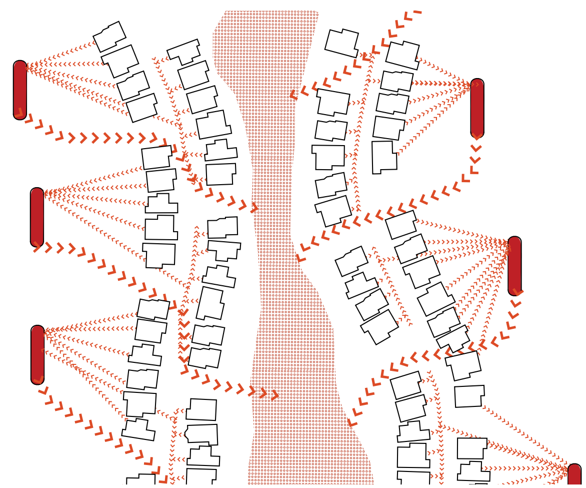
Pros:

- Living machines are small footprint systems, low energy, visual amenity from wetlands, potential environmental synergies.

Cons:

- More complex system, potentially high up-front costs.





< Biodigester/Vertical Flow Subsurface Wetland:

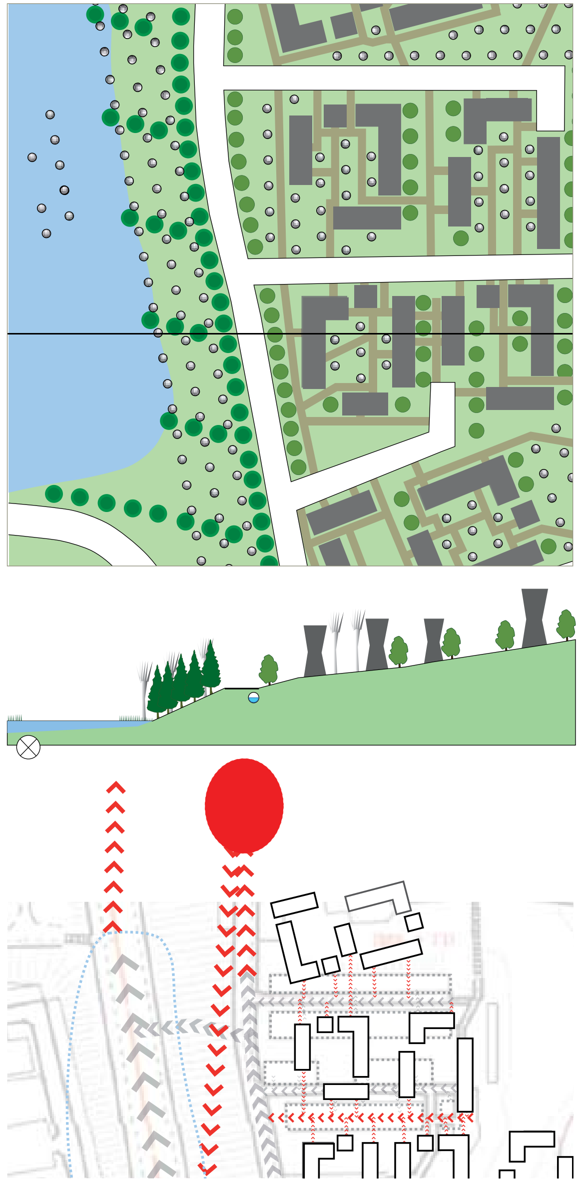
Biodigesters provide primary treatment, and secondary treatment occurs over an inhabitable and useable subsurface vertical-flow wetland area.

Pros:

- Biodigesters produce and capture methane; wetlands become an open space amenity.

Cons:

- Requires regular maintenance, higher startup cost, large footrpint.



sewage water

< Utilizing Existing Sewer Systems:

New development utilizes existing sewer where possible; area flow diverted to local conventional treatment system.

Pros:

- Lower costs, energy saving through reuse, better accountability from local treatment.

Cons:

- Perpetuation of inefficient technology, older infrastructure could bring deferred maintenance costs.

SEWAGE WATER _ intervention examined

SEWAGE TREATMENT VIGNETTE A

A couple strolls North along an existing road in Nagayama, Japan. The new buildings at right have been developed to conform to the existing sewer infrastructure, producing an urban form similar to what exists today. Water-collector towers are visible in the distance, drawing moisture from the air to create an addtional water supply.

SECTION:
Two building clusters utilize vertical-flow subsurface wetlands to achieve secondary treatment quality with no outside energy inputs.

SEWAGE TREATMENT VIGNETTE B

Looking West toward Mt. Fuji, an elderly Japanese couple enjoys their view of a tertiary treatment surface wetland in Tama New Town. This surface wetland represents the last treatment component of a living machine system. The living machine is visible at left, where contaminated water flows from one container to the next, becoming progressively cleaner. With this system, the effluent feeding the wetland is clean enough that the water can be enjoyed as a community ammenity.

sewage water

URBAN AGRICULTURE

by Christina Markel

THE VALUE OF LOCAL FOOD PRODUCTION

Food and energy security are of increasing concern all over the world. Japan in particular imports 60% of its food, which means that they are extremely food insecure, and that they use a lot of energy to import food. Urban agriculture mitigates these concerns and provide many additional benefits, some of which are listed to the right.

Japan has a great resource in its aging population. Many of these people do not want to work in office jobs any more, and may not be able to work full time, but they are not infirm. They can remain integrated into the community by participating in food production. This will provide not only a sense of pride and a valued connection to nature, but also a small income to compensate for the fact that many older people in Japan are no longer supported by their families.

Ecologically speaking, agriculture also provides the opportunity to make use of nutrients in waste streams.

BENEFITS OF URBAN AGRICULTURE:

- A productive landscape: Inputs yield outputs with physical and ecological benefits
- Reduced transportation costs and emissions
- Reduced end price
- Increased in-season food availability
- Connection with the seasons and the systems that sustain us
- Educational opportunities
- Health benefits: Better diet with fresh food, open space for exercise. Gardening as exercise and stress reduction from connection to nature
- Increased habitat for wild species
- Reduction of urban heat island
- Increased community connection and interaction

QUESTIONS AND ANSWERS:

- Who is going to farm?
  Everyone who wants to! Particularly retirees, school children, mothers, and professional farmers.
- What if someone doesn't want to farm?
  All plots should be designed with access for farmers other than the homeowner when necessary . This person could be a neighbor or a professional.
- Is this just a suburb?
  No. Suburbs are non-productive landscapes, while this model promotes production and community interation.

URBAN AGRICULTURE _ nutrient cycling

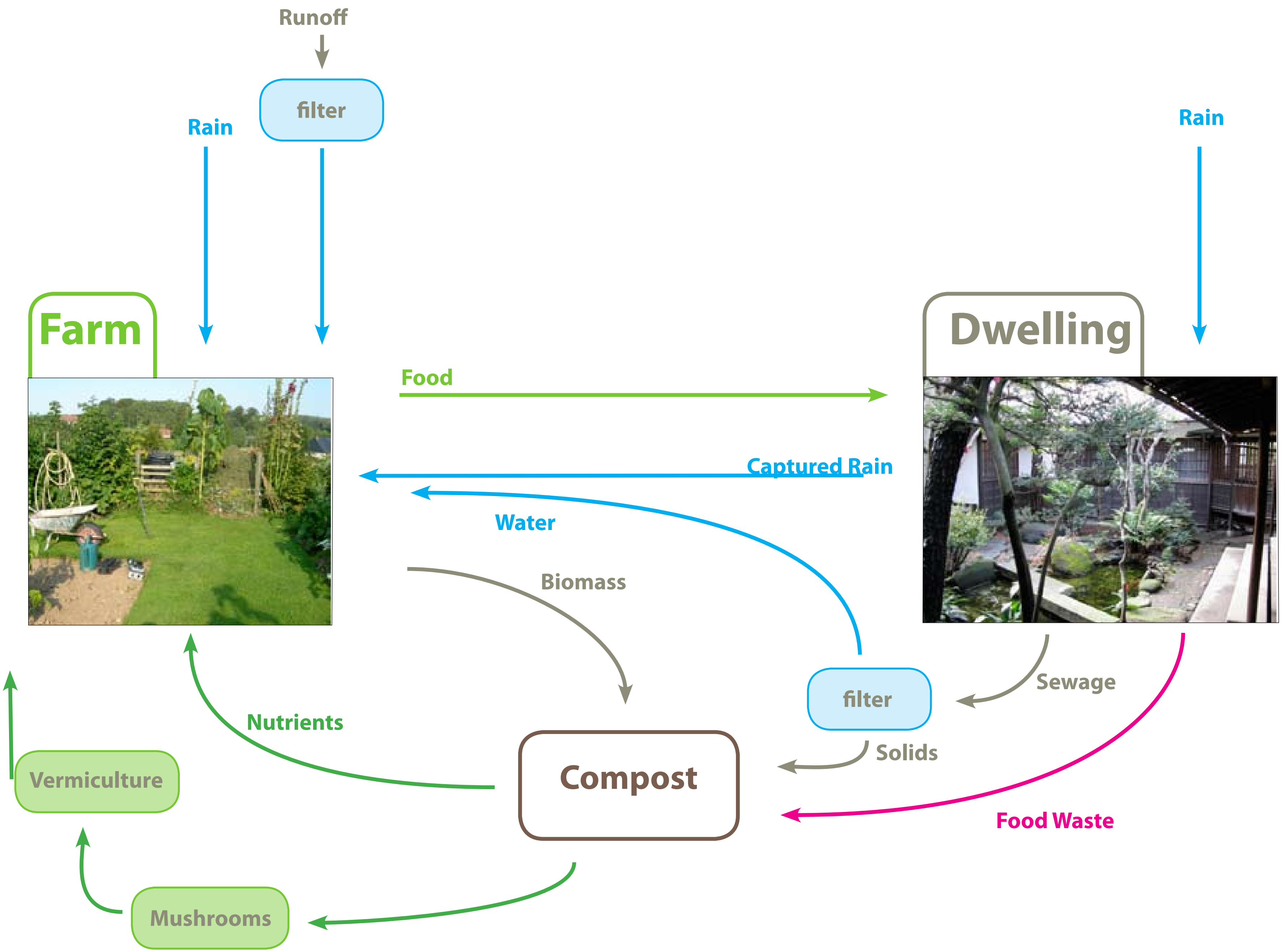
THERE IS NO "WASTE."

One of the major benefits to having agricultural area mixed in with urban areas is that the two can feed off of the outputs of each other without the need for complex transportation systems. The diagram to the right represents a fairly simple example of nutrient cycling, which is defined as, "All the processes by which nutrients are continuously transferred from one organism to another in an ecosystem."[1]

In this system there is no waste. All outputs are valued and used as inputs. Much of the nutrient recycling occurs through composting, which breaks biomass down and makes the nutrients in it available for uptake by plants, algae, and fungi. Mushrooms and worms are used as part of the composting process, which not only breaks outputs down but is an additional way to create value. Organic outputs from industries like breweries, organic textile mills, forestry, and livestock farms are also composted and recycled.

---

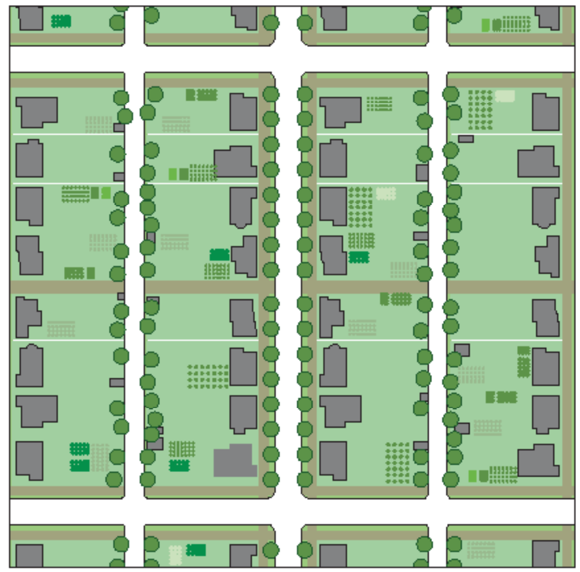
1 http://www.greenfacts.org/, May 2009.

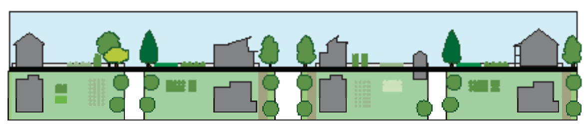

Runoff
filter
Rain
Rain
Farm
Dwelling
Food
Captured Rain
Water
Biomass
Sewage
filter
Solids
Nutrients
Compost
Food Waste
Vermiculture
Mushrooms

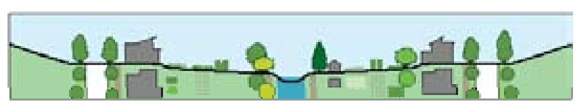
URBAN AGRICULTURE _typologies

WHAT ARE THESE?

These 5 typologies represent 5 different ways that agriculture can be integrated into city form. They range from individual yards behind single family homes, to intensive green roofs on multifamily or even commercial buildings. The typologies are intended to be used as patterns of use that may be adapted to a large number of different sites and integrated with other complementary city systems, like greywater, transportation, and community building, for example. As basic patterns, they therefore do not represent complete block or neighborhood plans.







< Productive Yards

Definition: These yards may vary in size, but essentially function as an allotment in your back yard. They are 250m2, which is large enough to produce a substantial yield, but small enough to farm in your time off.

These particular yards are designed with a back entrance, so someone else can farm them if the owner does not want to.

Pros:

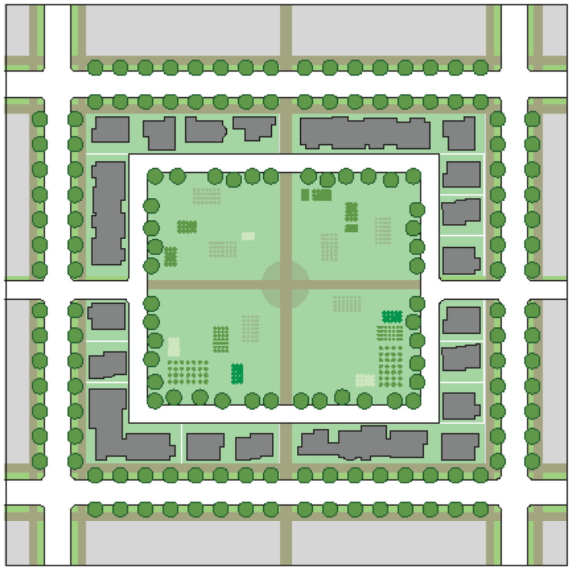
- If it is your yard, you can generally do what you like with it.
- Yards can accommodate significant production, and can be incorporated into a community gardening system or CSA.

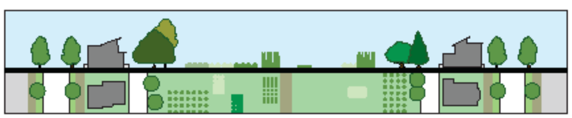
Cons:

- Often disconnected from community and underutilized.
- Generally require caretaking by the owner.

Best Usage:

- Yards are an amenity but may require a lot of maintenance and encourage wasteful landscaping.
- Not good for very dense areas.





< Community Garden

Definition: These are gardens in which each member has a private space for personal use, as well as access to shared space.

In this case, lots around the house are small, as is common in Japan, but houses are built around a community garden to which owners would have access.

Pros:

- May use vacant space, beautifies area, provides community focus and open space as well as room to grow crops.
- Beneficial impact on health.

Cons:

- Variable, generally not very high production.
- May appear messy in the winter.
- Limited space limites the number of participants.

Best Usage:

- Opportunity for reuse of vacant lots in urban areas. Provides a neighborhood amenity although it does not maximize food production.

URBAN AGRICULTURE _ typologies

< Allotments

Definition: Allotments are like Community Gardens, in which each member has a personal space to garden, but allotments tend to be larger (around 250m2) and are often located on the edge of town.

These allotments are located in a transition zone between neighborhood and forest, and offer shared community space.

Pros:

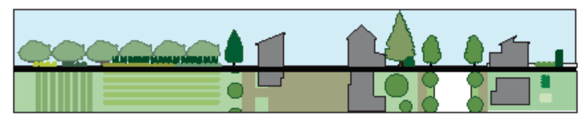
- Large enough to accommodate significant personal production, provide all the health and economic benefits of a private garden, with community access.

Cons:

- May be far from city center, production is for personal use only.

Best Usage:

- Good for larger-scale personal production.
- Significant amounts of food may be grown.



< Urban Farms

Definition: Urban farms are precisely that: farms in the city. They may be of varying sizes, from half a block to much larger. If available, farmers may cultivate neighboring plots as well as the main farm.

This urban farm is designed to be a community asset with public access, connections to the transportation grid, and a community center/farmyard facing the neighborhood.

Pros:

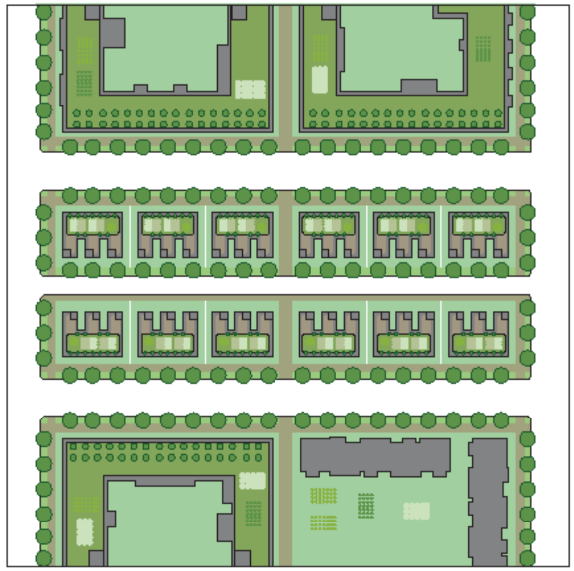
- Provides food for community, reduces food miles and transport costs, provides employment, community, and education.
- May be run for profit.

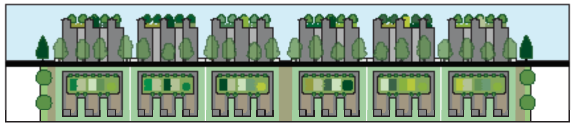
Cons:

- Would not facilitate large machinery.

Best Usage:

- Communities in which there is ample space available, as well as the necessary labour to farm the fields.





< Intensive Green Roofs

Definition: Intensive green roofs are those with soil depths that can accommodate larger plants, and even small trees.

These green roofs are designed as productive amenities for the people who live or work below them.

Pros:

- Provides thermal insulation, food, pleasant environment, education, visual asset, may simply raise topsoil up when building a new structure.

Cons:

- Resource intensive to build and maintain.
- Often don't permit public access.

Best Usage:

- Strategic applications, not to be installed everywhere.

URBAN AGRICULTURE _ intervention examined

PRODUCTIVE YARDS

Each home has its own rear yard for food production and horticulture. Each of the rear yards back onto a shared alley that also provides access for local farmers or neighbors who will use a yard that the owner doesn't want to take care of. In addition to the larger circulation system, each block is tied into the pedestrian and bike trail system.

COMMUNITY GARDEN

Community gardens provide the opportunity to engage with nature, grow food and flowers, and be a part of the community. They are also excellent educational resources. Plots may be arranged and sized dynamically according to the needs of the users.

URBAN AGRICULTURE _ by the numbers

HOW MUCH CAN YOU GROW?

Agricultural yields are difficult to predict, particularly at the community scale. The point is that people have the OPPORTUNITY to dig in the dirt and supplement their diets that way, not to figure out precise yields. The grocery store is not going to disappear, and people shouldn't necessarily grow all their own food in their back yard this close to Tokyo. Urban farms also vary by method od production and by farmer. That said, there are some useful guidelines available, which occasionally differ from one another:

- Japanese people eat 158 kg of fruit and veg per year, on average.
- A typical British allotment is 250 meters square- that's a pretty big yard, and that's how big the single family house yards and allotments are in the typologies above. It's big enough to grow a lot of stuff, but it won't take up all your time.
- 1 person can farm 500 meters square alone, but that's full-time, and produces food for market.
- In Cuba, they can grow 8-20 kilograms of food per meter squared per year, using organic intensive farming methods.
- All lots should be accessible to potential community farmers in case of owner disinterest.
- Bio-Intensive methods can provide a full diet to 20 people per hectare (That's 900 hectares for 18,000 people).
- Producing only fruit and veg for 18,000 people requires only 36 hectares (people eat a lot of meat, meat eats a lot of veg).
- Bio-intensive farming requires "double-digging" planting beds to a depth of 24 inches. That means turning all that soil over. Not of the faint of limb.
- Do-Nothing Farming, also known as Natural Farming, the Fukuoka Method, is an alternative farming method to chemical or traditional farming. Developed for 30 years by Masanobu Fukuoka of Japan, this method includes the use of crop rotation, minimal irrigation, no or reduced tillage, "seed balls," and allowing natural regulation of pests.
- The National Gardening Association estimated that a $70 investment would yield $500 in produce. U.S. Department of Agriculture yield estimates are even higher: Each $100 spent produces $1,000 to $1,700 worth of food.

1. Japan imports 60% of its food.
2. Japanese food expenditures: 18% of income
3. Rice represents 55% of Japanese produce, but 18% of food profits.
4. Japan is 90% self-sufficient in rice.

- Carbon footprint of food consumed per year (Netherlands- expect higher for Japan because of greater food imports) = 2800 kg
- Carbon footprint of heating, cooling, cooking, hot water in new 4 person house per year (UK) = 2600 kg

In 2008, the number of people growing vegetables increased 10 percent over previous years. The National Gardening Association (NGA) of the US anticipates that number will increase by 20 percent in 2009.

The NGA says a well-maintained food garden yields about 1/2 pound of produce per square foot of garden area over the course of the growing season, worth about $2 per pound. That means the average-size garden - 600 square feet (56 square meters)- can produce 300 pounds of produce worth $600. Minus the $70 most people spend on their garden each year, consumers can typically net $530 in food savings. Multiplied by the number of food gardeners in the country (36 million households), NGA estimates that American food gardeners are producing more than 21.6 billion dollars of produce a year.

RENEWABLE ENERGY

by Benjamin Brandin

WHAT IT IS AND WHY IT IS IMPORTANT

The term renewable energy references energy sources that will replenish themselves. These sources include solar power, wind flow, and tidal currents. Biomass, municipal solid waste, and geothermal energy represent some other sources of renewable power.

These technologies are extremely important as fossil fuel reserves taper off and oil and natural gas consumption accelerates with world economic growth. As nations vie for control of contested energy sources, scientists are pursuing renewable energy as our salvation.

HOW IT IS UNDERUTILIZED AND HOW TO/ WHY TAKE ADVANTAGE OF IT IN THE FUTURE

Most developed and developing nations still rely on fossil fuels for the majority of their energy supply. The scarcity of these natural resources makes a compelling case for increased investment in and reliance on renewable energy technologies.

GOAL AND BENEFITS:

- Goal: to examine various methods of integrating renewable energy sources into communities and landscapes that differ in topography.

- Benefits of renewable energy technologies:
  - If designed properly, renewable energy can supply most or, at times, all of a community's power.

  - Green energy frees communities from their dependence on fossil fuels, reducing their carbon footprint and total environmental impact.

  - It provides energy consumers a return on investment for up-front costs in the form of reduced or no energy bills.

CHALLENGES AND OPPORTUNITIES:

- Relative to cheaper alternatives, renewable energy sources must decrease in cost if they are to provide a greater portion of our energy supply.

- Until renewable energy technologies are improved to the point of providing energy as consistently as fossil fuels, relying on them as a steady power source may require supplementary energy inputs or cultural shifts in how we consume power.

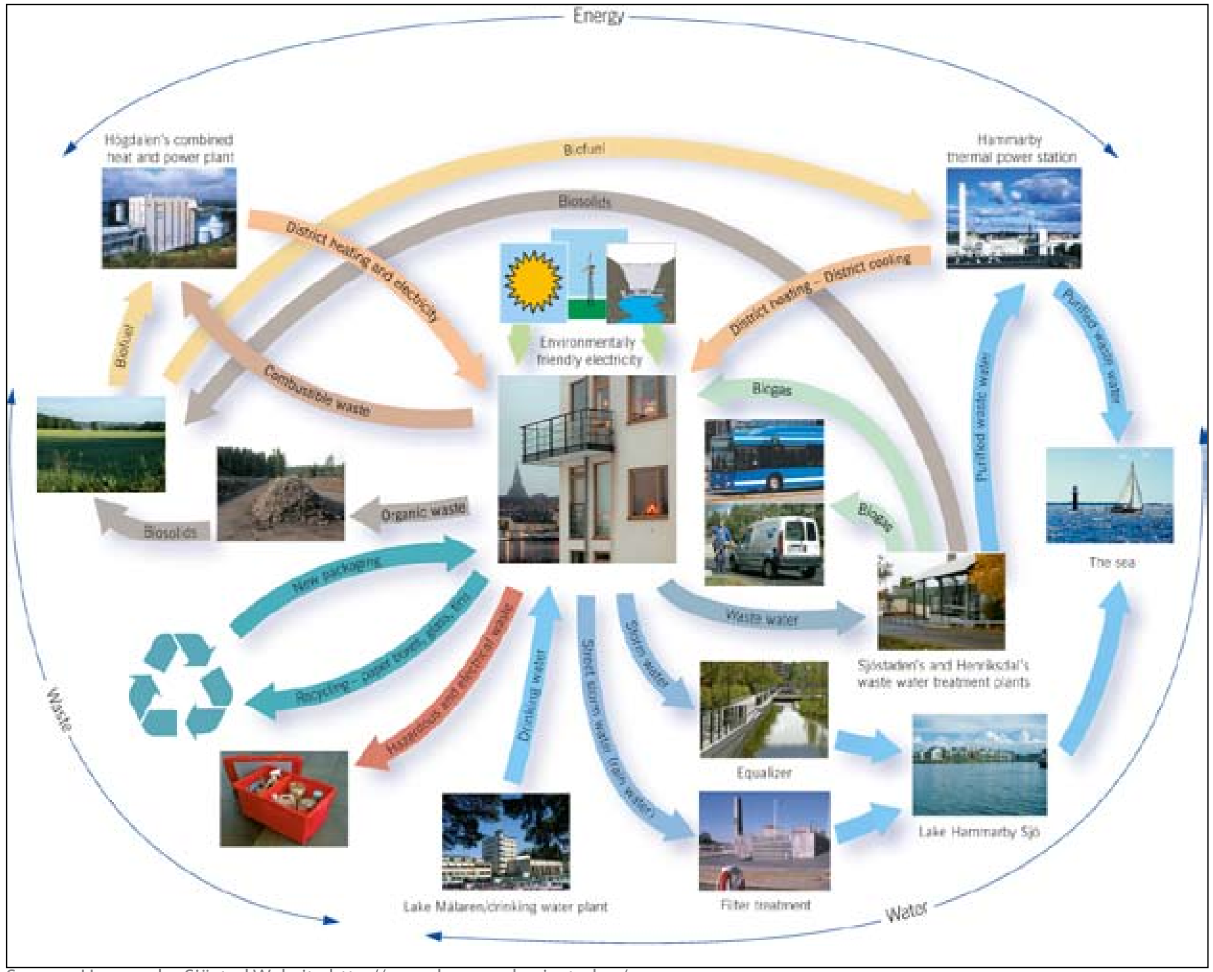
- Well-designed renewable energy systems can provide communities with varying degrees of energy independence, and in some cases they enable neighborhoods and cities to sell energy back to the grid. In these situations, the renewable energy system becomes a communal income source as well as an example of responsible environmental practice.

ENERGY _ process and diagrams

A Holistic Approach to Energy Consumption

In order to maximize gains from renewable energy sources, we must take a more holistic approach to power consumption. Such a strategy must balance energy inputs and outputs, and use resources more efficiently. Additionally, energy production centers should be located in closer proximity to the areas they serve to limit transmission loss.

The Hammarby Model was developed for Hammarby Sjöstad, a Stockholm neighborhood that has been redesigned as an environmentally responsible community. A selection of the neighborhood's buildings feature photovoltaic panels, but designers focused on developing a system that best suited Hammarby. The key elements of the district's energy efficient design include incinerating combustible waste to provide energy and heat to area homes, and capturing the heat from wastewater treatment to also heat homes. This approach represents a more effective and sensible method of incorporating renewable energy technologies into community design.



Source: Hammarby Sjöstad Website http://www.hammarbysjostad.se/

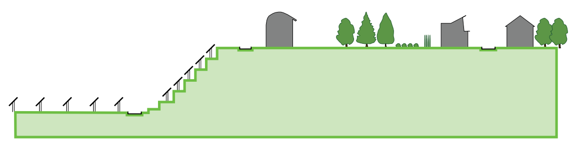
ENERGY_ typologies

FOUR RENEWABLE ENERGY APPLICATIONS

These four typologies represent different examples of how renewable energy options can be integrated into city form. This analysis focuses on different solar and wind energy applications. The typologies illustrate how solar farms can be built upon flat sites or places with engineered topographies, that wind farms require ample air flow and limited obstructions, and that further technological advances may enable designers to imbed renewable energy sources into urban infrastructure.

SOLAR FARMS

Establishing solar farms adjacent to the neighborhoods or towns they serve, and given adequate sun exposure, can often provide enough electric energy to power a small community. Depending on the size of the farm, excess energy can be sold back to utilities creating shared income for community members. Another benefit of sun farms is that they are highly adaptable to landscape. They can be built on flat sites or into sloped topography. Still, it is important that the photovolaic panels face south in order to maximize solar gain.



< Landscaped Sun Farms

Pros:

- Solar farms that utilize topography and open space liberate community members from having to install photovoltaic panels on their individual homes, thereby alleviating individual maintenance responsibilities.

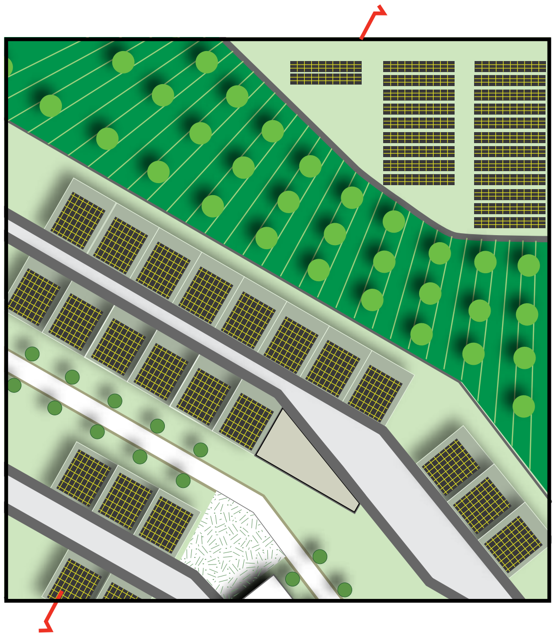
Cons:

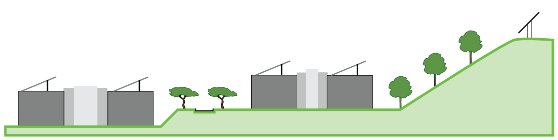
- Solar farms are very expensive to construct and can require large plots of land. For these reasons, most solar farms are developed by governments or utilities.

- There are also distribution issues to consider in siting a solar farm. Energy is lost as it is distributed across power lines to the user.

Best Usage:

- The best location for a solar farm are sites that possess significant south-facing flatlands or slopes that are located at the edge of a community, town, or city.





< Building into Topography

Pros:

- Building into slopes allows homes to be situated in accordance with topography. Rooftops become the solar farm. Free plateaus can also be used to site additional photovoltaic panels.

Cons:

- Designing integrated solar farms on top of housing units limits the amount of panels that can be connected. In this scenario, rooftops act as the available landscape for placing the pv panels if there is no free space where additional panels might be situated.

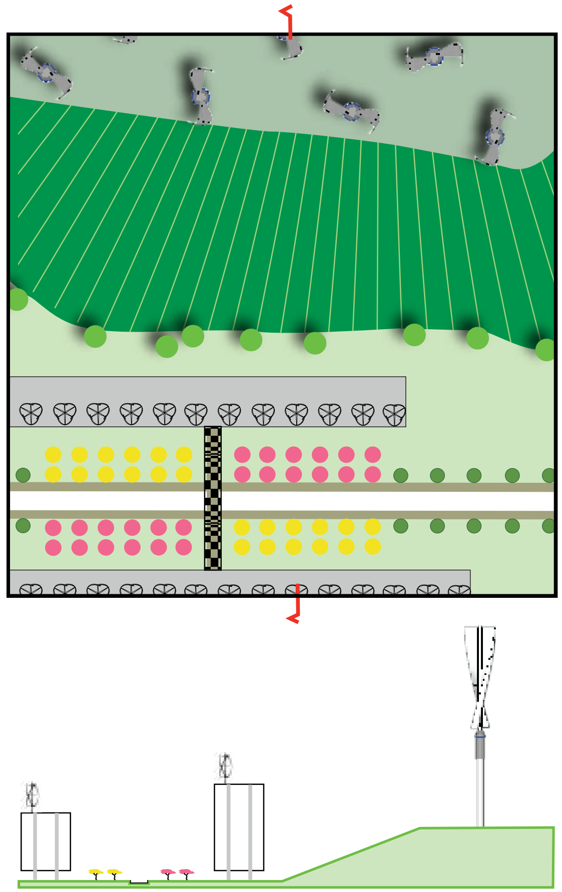
Best Usage:

- Placing pv panels on top of community buildings is the best option in places with limited free space and highly engineered topographies. The panels must be directed at the sun, and should track its movement throughout the day.

WIND ENERGY

In areas with high wind flow, turbines can generate large amounts of power. A 1-megawatt turbine with a capacity factor of 35% will produce about 3,066 MWh which averages to 0.35 MW. New, smaller wind turbines can be placed on most flattop building and landscapes that receive ample wind flow. They are quieter and more aesthetically pleasing than their larger counterparts.

The primary limitation of wind power generation is that turbines can only produce power if they capture air currents. Unless a community is designed as a wind farm, it is unlikely that small, randomly placed wind turbines could provide enough power to take it off the energy grid. Given dependable wind flow, supplementing smaller turbines with their towering equivalents could support a small community. Using wind power on the local scale could require an additional energy source such as solar power. Aside from the huge amounts of space they require, large wind turbines can also be very noisy.



< Wind Farms

Pros:

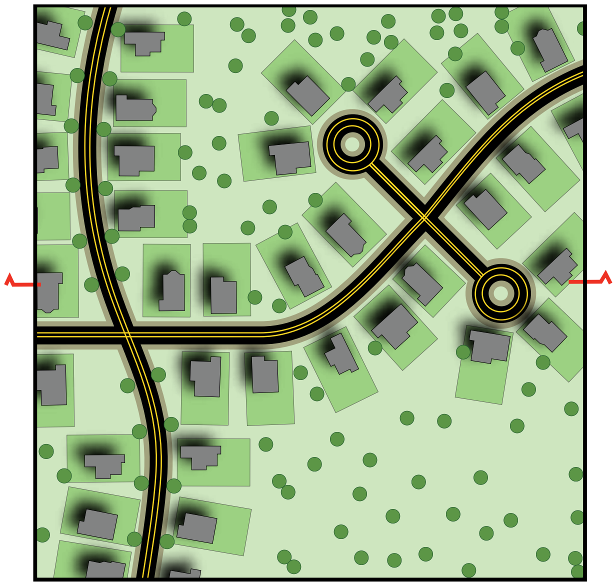
- In areas that experience high wind flow, air currents can be captured and converted into energy.

Cons:

- Irregular air currents make consistent wind capture difficult.
- Homes dotting the urban landscape increase the wind's 'working' ground level to the roof height of these homes. The effect of numerous rooftops impeding the wind flow increases turbulence and reduces the available energy delivered to turbines.

Best Usage:

- Unobstructed open spaces at the urban fringe represent the best sites for wind power generation.
- Hilly sites that experience high wind flow represent another optimal locale for a turbine farm. These locales should operate as corridors which funnel wind to the turbines.



< A Future Built on Renewable Infrastructure

Renewable energy sources will certainly play a central role in helping us meet our future energy needs. With technology advancing at an unprecedented rate, it is not too far-fetched to speculate that surfaces that currently contribute to environmental degradation could possibly supply the energy we use. What if photovoltaic technology was embedded into our road systems as displayed to the left? Could solar technology be perfected to such a degree that we could nullify the heat island effect created by concrete and power the cities of the future?

ENERGY _ intervention examined

HIGH DENSITY HOUSING ADJACENT TO A WIND FARM.

This mixed-use development is located in a flat area. The wind turbines in the distance are situated along the top of a hillside to maximize their exposure to air currents. The buildings' large size act as a wind barrier for inhabitants, but push wind around them and towards the turbines.

SOLAR/WIND FARM

This solar farm occupies flat open space at the urban fringe. Homes dot the hillsides and look upon the photovoltaic panels as a element of their landscape. Wind turbines cover the hillside taking advantage of air currents that flow over the sun farm and homes.

CLIMATE MITIGATION

by Debmalya Guha & Alexander Keating

UNDERSTANDING MICROCLIMATE:

One size does not fit all when it comes to human settlement and the natural environment in which we live. While the history of modern architecture and city planning is largely characterized by the assertion of human dominance over the natural world, this endeavour is increasingly understood as both naive and unsustainable. Before we can hope to reduce our energy dependence we must first understand that comfortable habitation can be attained through context sensitive site planning and architecture which reacts to the environmental conditions in which it is situated.

While "microclimate" can describe climatic conditions unique to an area as small as a few square feet, this section examines how different site planning options, as well as certain building technologies, can influence temperature, solar gain, wind dispersion, and comfort at the residential and neighborhood level.

GOALS AND OBJECTIVES:

- Utilize site planning layouts which allow for the maximization of local climate and best possible outcomes with regard to solar and wind access to residences.
- Utilize current and future technologies to influence microclimate through solar and wind access as well as humidity controls and innovative approaches to water harvesting.
- Utilize the ability of topography/vegetation to influence microclimate.
- Reduce overall heating/air conditioning energy needs.

CHALLENGES AND OPPORTUNITIES:

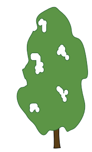
- The South facing dilemma:
  Certain density of housing development will make it difficult to orient each house optimally
- Spacing housing for optimal wind dispersion may limit use of more traditional community layouts.
- During redevelopment, priority should be given to minimizing the disruption of the existing, mature vegetation that is often present in aging developments.

CLIMATE MITIGATION_ process and diagrams

While individual passive/reactive housing design is fairly well understood and currently being implemented throughout the world, far less has been developed with respect to community design which best reacts to and controls local climate conditions at the neighborhood level. The technologies and principles to the right represent some basic building blocks on which this type of passive site planning practice might be advanced.

The section covers fundamental aspects of wind and solar behaviors as well as some alterations to urban form which will improve microclimate within the urban fabric. In addition, some speculation is offered as to how future building technologies might be employed to improve climatic conditions at the neighborhood level.

Wind-Stop Matrix

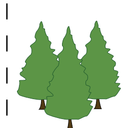


Open Wind Speed 20 mph/32.19 klh
Deciduous Tree 25-35% Density

H Distance From Windbreak	5H	10H	15H	20H	30H
Miles Per Hour	10	13	16	17	20
% of Open Wind Speed	50%	65%	80%	85%	100%

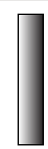
Open Wind Speed 20 mph/32.19 klh
Conifer Tree 40-60% Density

H Distance From Windbreak	5H	10H	15H	20H	30H
Miles Per Hour	6	10	12	15	19
% of Open Wind Speed	30%	50%	60%	75%	95%



Open Wind Speed 20 mph/32.19 klh
Multi Row 60-80% Density

H Distance From Windbreak	5H	10H	15H	20H	30H
Miles Per Hour	5	7	13	17	19
% of Open Wind Speed	25%	35%	65%	85%	95%

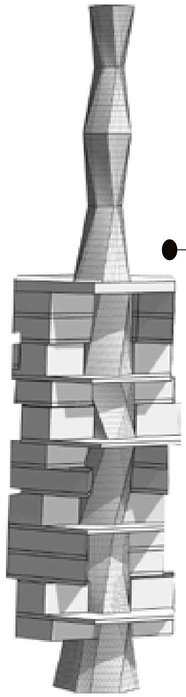


Open Wind Speed 20 mph/32.19 kph
Solid Fence 100% Density

H Distance From Windbreak	5H	10H	15H	20H	30H
Miles Per Hour	5	14	18	19	20
% of Open Wind Speed	25%	70%	90%	95%	100%

Microclimate and Passive Climate Mitigation

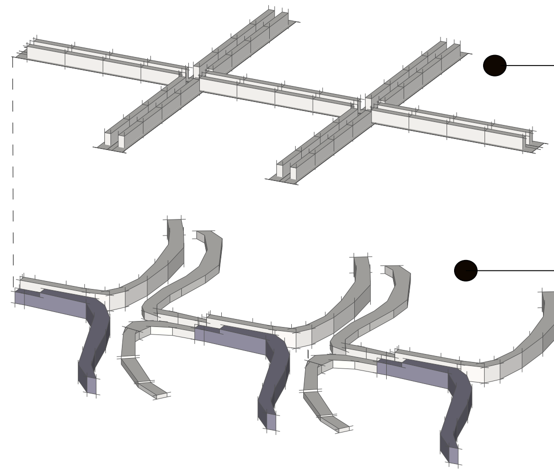
Technologies and Principles



Living Skin Materials:

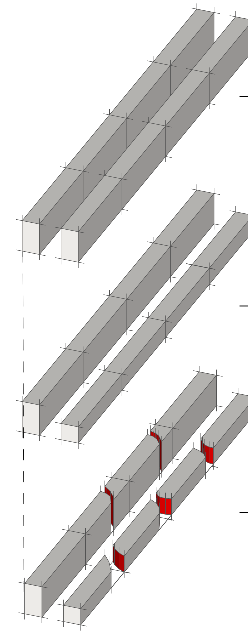
Represented here integrated into a hosuing typology, towers made from climate senstive materials would be capable of rain water harvesting where water would be purified, filtered, used and recycled. The skin could even absorb moisture from the air.

Altered Form



TRADITIONAL URBAN FORM: THE GRID
SYMETRICAL, DENSE, RIDGID

CLIMATE GENERATED FORM
STAGGERED HIGHT, INCREASES SOALAR ACCESS, ENCOURAGES WIND CIRCULATION/DISPERSION



DARK, WINDLESS

BRIGHT, OPEN

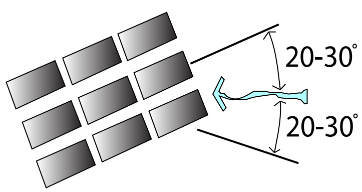
BRIGHT, OPEN, BREEZY

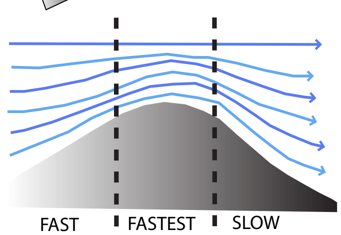
Future Technologies

Living Skin Materials:

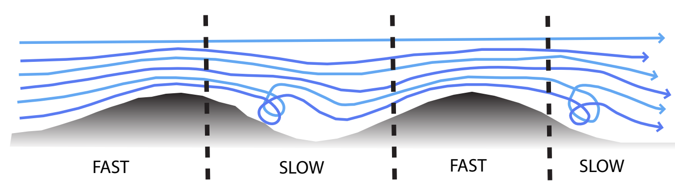
Surface would constantly adapt to allow the entry of light, air and water and be used to help maximize microclimate conditions in open spaces on site.

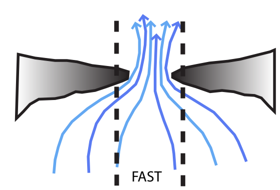
Basic Block Orientation: Wind



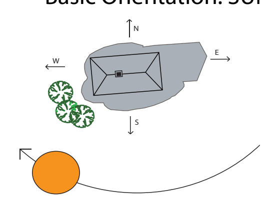


Topography and Wind Movements



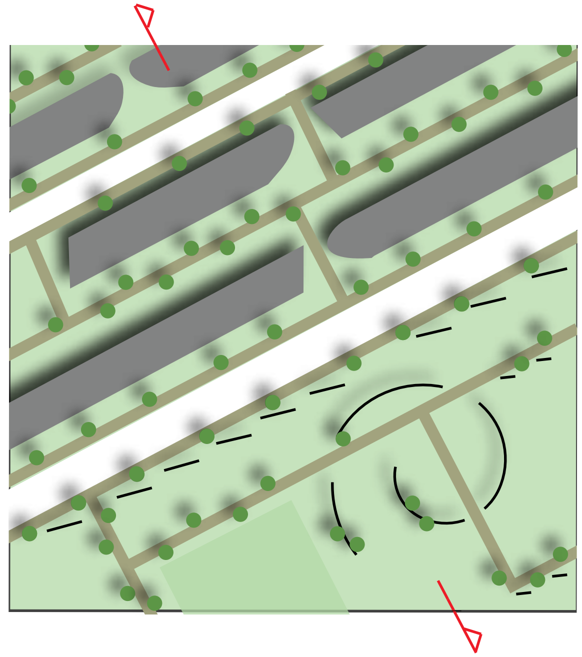


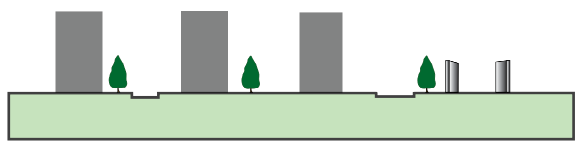
Basic Orientation: SUN



CLIMATE MITIGATION_ typologies

These typologies represent four ways that passive climate principles and technologies can be integrated into city form. The typologies address the siting of buildings within flat/plateau conditions, sloped or stepped zones, and open spaces. The typologies are intended to be used as patterns that may be adapted to various different sites and contexts, and rely on site neutral principles. As basic patterns, they do not represent complete block or neighborhood plans.





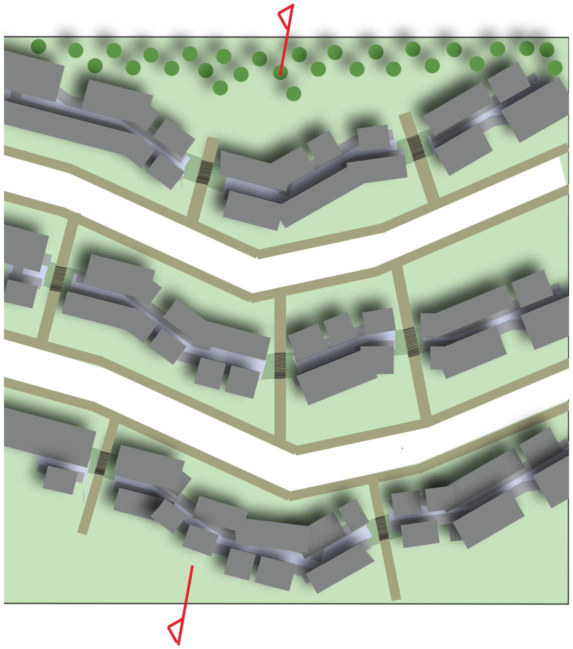
Microclimate and Open Space

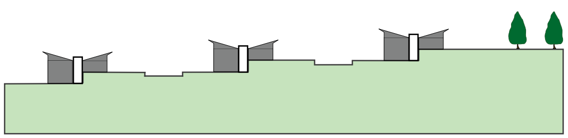
Pros:

- Buildings: South facing, with blocks perforated to allow air circulation. Overall orientation minimizes afternoon sun exposure, well promoting active breeze.
- Landscape: Utilizes dividers made of climate sensitive/living skin material to maximize micro-climate in open space/ along main street.

Cons:

- Dense buildings result in decreased winter sun exposure. Flat landscape negates natural solar/wind exposure advantages of siting on slope.





Stepped Housing, Sloped Site

Pros:

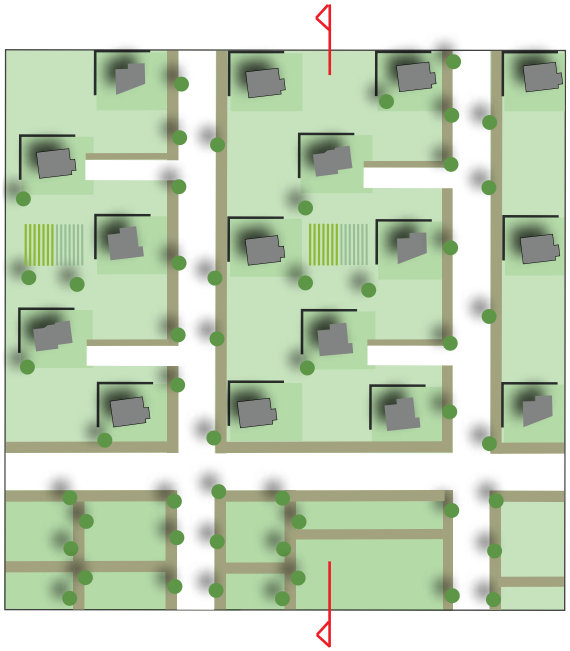
- Buildings: Partially south facing, with Blocks perforated to allow air circulation. Overall orientation minimizes afternoon sun exposure, well promoting active breeze.

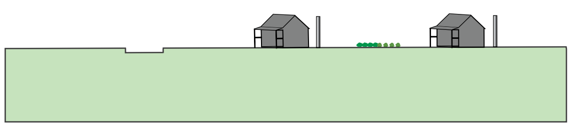
- Landscape: Utilizes stepping slope to insure upward breeze and sun exposure to all south facing facades. Evergreen trees to north minimize winter winds

Cons:

- Following natural contours results in loss of optimal orientation for each building footprint.

CLIMATE MITIGATION_ typologies





Staggered Housing, Flat Site

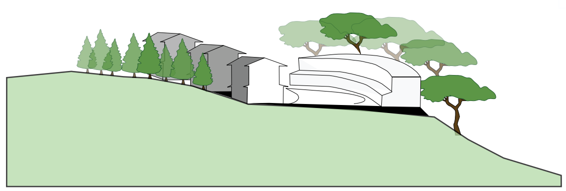
Pros:

- Buildings: All utilize optimal 5 degrees South-East orientation. Micro-Climate around each individual building is enhanced by two sided climate sensitive/ living skin fencing. Off-Set spacing allows for necessary distance between buildings to insure active wind movement.

- Landscape: Open space at south of housing block allows wind to reach full "open field" speeds. Off-set spacing insures wind and solar exposure for each building.

Cons:

- Need to off-set housing results in low density development.



Altered Form

Pros:

- Buildings: Oriented along east west axis have better solar and wind exposures. All streets are oriented in a diagonal relation with the summer wind which comes from the south. The built form acts as a funnel that captures the wind and helps to move it in favorable directions along the street.

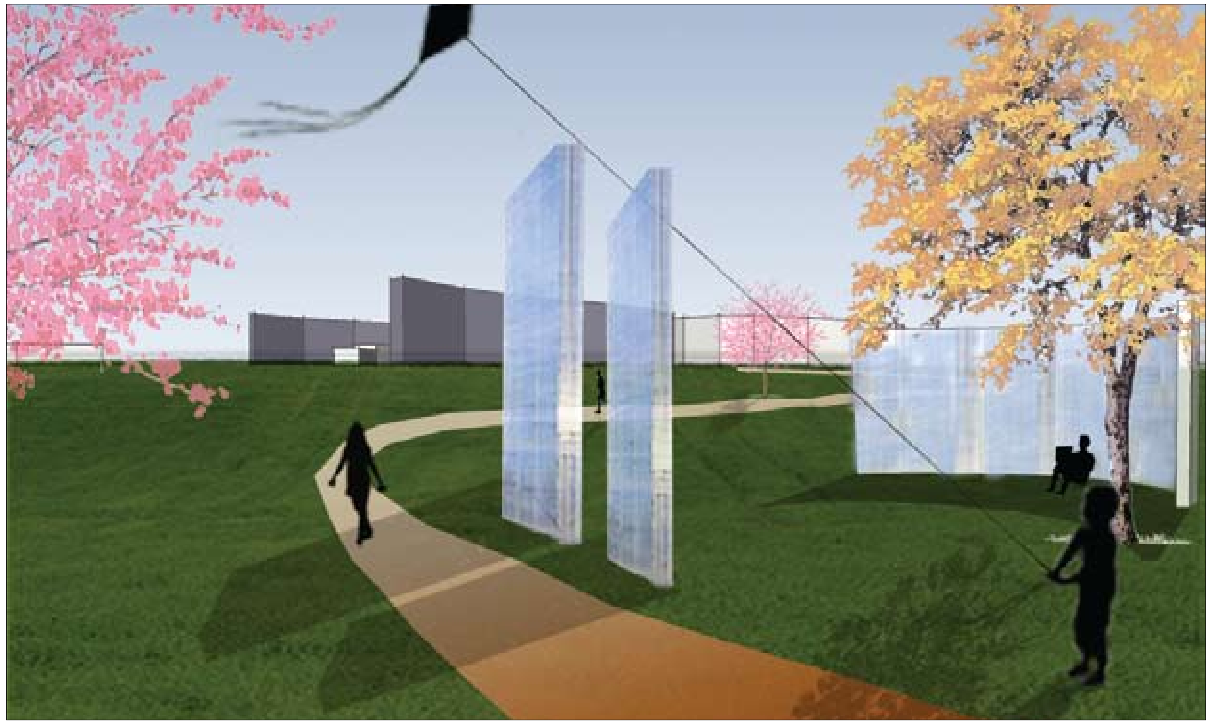
- Landscape: Evergreen trees in the north of the buildings protect from the cold north wind. The deciduous trees in the summer offers shade in summer, but also permits the sun in the winter.

Cons:

- Double loaded streets sometimes reduce solar gain. Ssufficient space between to streets for sun and wind results in low density.

CLIMATE MITIGATION _ intervention examined

In open space, climate sensitive "living skin" materials can be employed to provide shade, while still allowing the passage of wind. The open spaces themselves, parks and pathways are necessary to allow wind to recover to 'open field' speed after repeatedly being obstructed by built form. This insures better wind dispersion throughout housing blocks abutting these open spaces.



The altered block type shown here demonstrates changes to the urban form so that the topography is lower in the south to allow for consistent solar exposure as well as wind movement. In addition, the block structure is curved towards the optimal 30 degree off-set to prevailing winds, to increase the dispersion of cooling summer breezes.

MOBILITY

by Eirini Kasioumi

WHAT IS MOBILITY?

In the era of global interconnectedness, mobility is both the macro scale of international travel and exchange, and the everyday live-work movements. We have come to value easy, quick, and safe access to various amenities, yet many transportation options are unsustainable. The use of internal conbustion engines have increased global CO2 concentrations, and the exclusiveness of cars has divided many neighborhoods around the world, by imposing highways through city centers or by brutally separating pedestrian and vehicle movement.

Flexible forms of transportation can address everyday needs, at different scales, without burdening the environment. The "suburban" communities of the future will be places of experimentation; where access to natural amenities will be combined with low-profile non-polluting transportation. Transporation, rather than a necessary evil, will be an amenity, creating new community centers.

GOALS AND OBJECTIVES

- create a highly networked neighborhood for different types of mobility
- design a typology of "corridor" networks corresponding to neighborhood areas
- relate human mobilkity patterns to natural systems
- make use of rigid topographies by inhabiting the limits
- allow for flexibility in the evolution of transit systems

OPPORTUNITIES

- Recent research about new forms of transportation is expanding out understanding of mobility, including Mass Rapid Transit systems, neighborhood Group Transit systems, Personal Rapid Transit and Mobility-on-demand systems.
- In Japan, there already exists a culture of public transportation, proven by the heavy use of train within and between cities.
- In Japan, bicycles and more recently electric vehicles are very popular.
- In Tama, only 63% of households or 28% of people own a car, and cars are generally not used on an everyday basis.
- Many new forms of transportation are flexible and can easily adapt to existing infrastructure.

CHALLENGES

- As long as the cost of conventional cars and gas remains realtively low, it is difficult to achieve independance.
- The existing car supporting infrastructure is difficult to change.
- Investing in new forms of transportation is costly and requires new knowledge.

MOBILITY _ process and diagrams

ASSUMPTIONS FOR MOBILITY 2030

- Limited use of private cars
- Computerized public transpotation systems
- Shared mobility
- Bicycles for everyone
- Local group transit

WHERE DO THESE ASSUMPTIONS COME FROM?

INNOVATIVE TRANSPORTATION SYSTEMS

- Mobility-on-demand

i.e. CityCar, Media Lab

- Personal Rapid Transit

i.e. CyberCar vehicle, ULTra PRT system at Heathrow Airport

- Group Rapid Transit

i.e. Park Shuttle Transportation System

- Bus Rapid Transit
- Light Rail System
- Low Floor Light Rail Vehicles (Streetcars)
- Sensor Bicycles

(source: evtransportal.org)

RESEARCH TOWARDS NEW MOBILITY OPTIONS

Future trends:

- Shift from private automobile to multi-modal approach
- Combination of:

- high speed scheduled mass transit
- individualized on-demand short distance transport

Towards:

a more effective organisation of urban transport and more rational use of motorised traffic resulting in:

- less congestion and pollution
- safer driving
- higher quality of living
- enhanced integration with spatial development

(source: www.citymobil-project.eu)

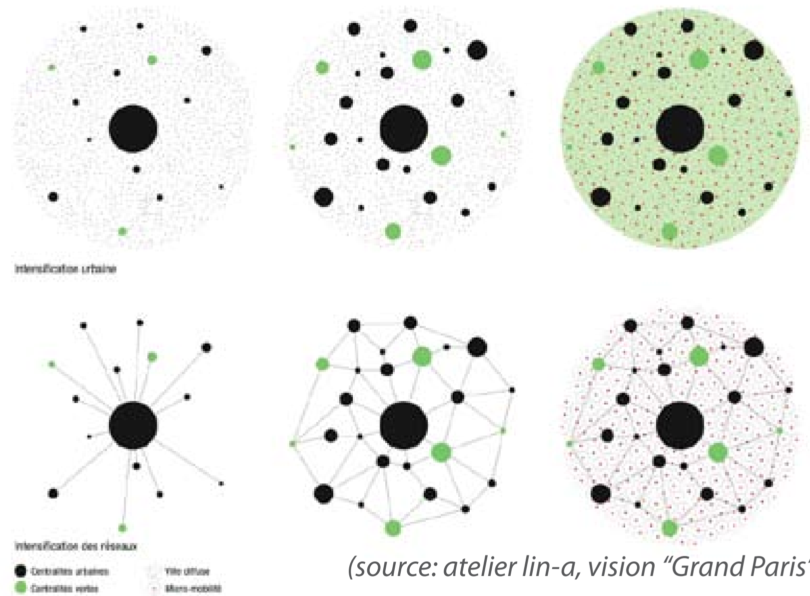
FUTURE “SUBURBAN” COMMUNITIES

The term “suburban” community needs to be redefined. The model of the future will exemplify proximity to nature as the reason that led people to suburbs in the first in a network of closely knit together mobility corridors.

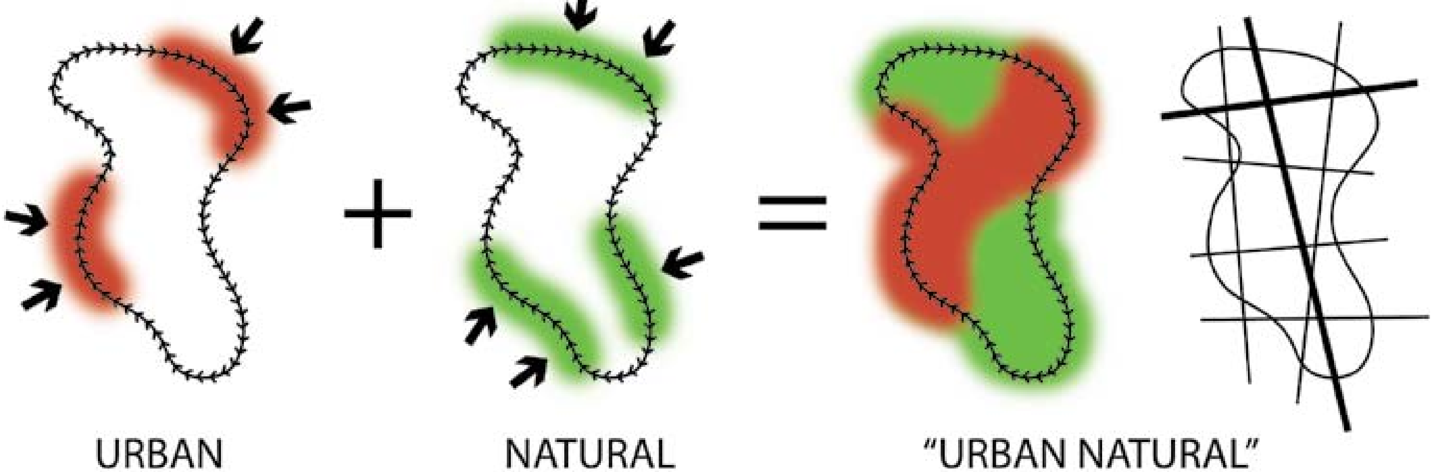
“suburban” =
connected + loose = urban + natural = ?

Goal:

plan mobility for an eco-friendly, durable, interconnected “suburban” community



(source: atelier lin-a, vision “Grand Paris”)



MOBILITY _ typologies

Goal

These four typologies represent community configurations when different *site conditions* are combined with *mobility options*.

Process

Transportation systems are predominantly designed on a scale much larger than the site level. A lightrail system usually serves many communities, a group rapid transit system requires a critical number of passengers to be viable, and choosing between i.e. bus and streetcar is related to community density. Access, safety, and economic viability play an important role; use of personal cars depends on alternatives of access to basic amenities by public transportation, and the price of vehicles, gas, electricity or tickets influences ownership and use decisions.

The following analysis:

- is based on the assumption that [suburban] communities are well connected to the central city by public transportation
- employs means of transportation that are expected to be more relevant in 2030 than now
- focuses on different site conditions, such as slopes and water, as a motivation for different transportation means.

Matrix

The different mobility typologies are a result of the combination of the following factors:

+/- *dense*: On the assumption of suburban neighborhoods mainly comprised of few-storey buildings, does density approach agricultural or urban area levels?

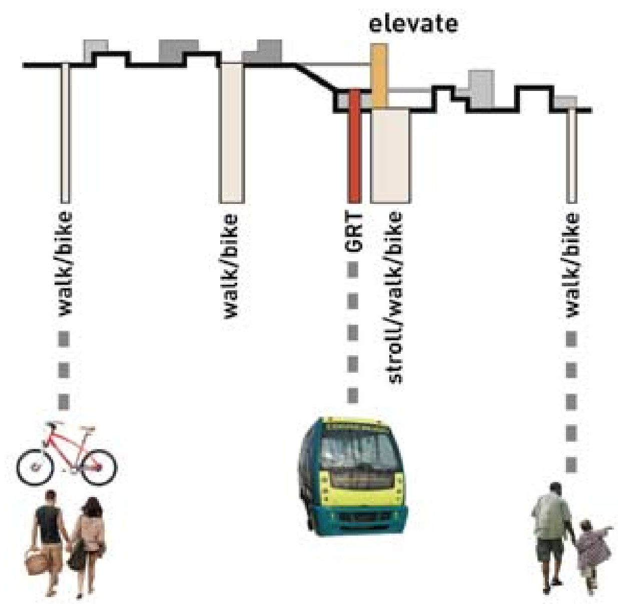
+/- *GRT*: Does group rapid transit such as small buses or streetcars consitute the main form of transportation that serves the community?

+/- *car*: Cars in 2030 will be very different from the cars of today, but will they even be there?

+/- *2-wheel*: Is the community layout friendly for vehicles such as bikes and scooters?

+/- *slope*: Does the site have slopes that create opportunities / limitations for mobility?

+/- *hierarchy*: Is the site layout hierarchical, i.e. defining specific corridors as arterials, collectors etc., or does it allow for a more free-flowing form of mobility?



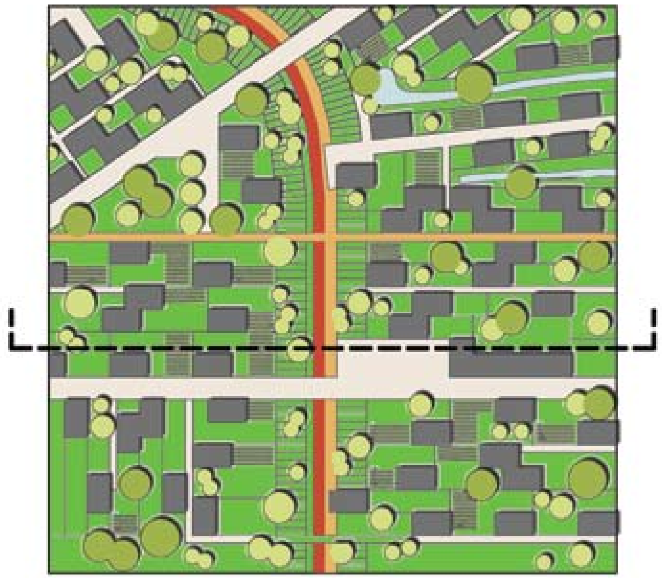
< LIVING ON THE SLOPE

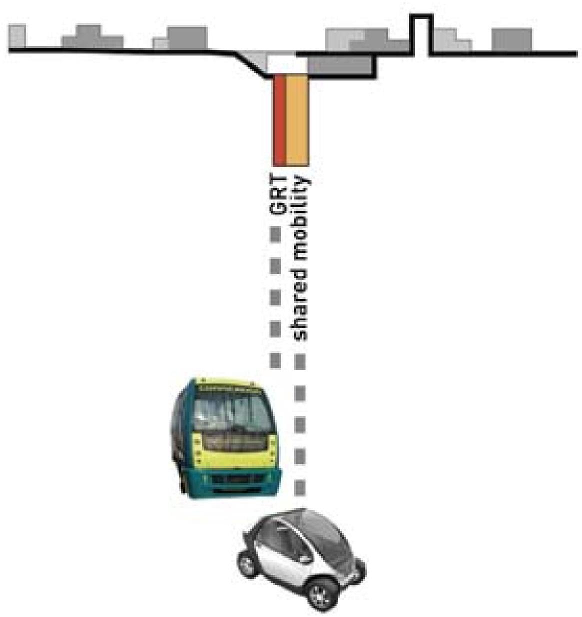
+ dense
+ GRT
- car
+ 2-wheel
+ slope
- hierarchy

Description:
Mobility is omnipresent and maximum connectivity is the moto. The steep slope, rather than being an obstacle to accessibility, serves as the container for the system of group transit, a small capacity bus that runs very frequently. The bus can be computerized to allow for flexible stopping and response to demand. Staircases and elevators connect the intermediate bus level to the upper and lower levels. Thewy are large enought to accomodate not only pedestrians but also flexible 2-wheel vehicles, such as scooters and bicycles. The community is laid out in walking distance from the group rapid transit.

Pros:
- Applicable to sites with existing slope conditions

Cons:
- Requires connection with a comprehensive system of public transportation





< TOPOGRAPHY DEFINES US

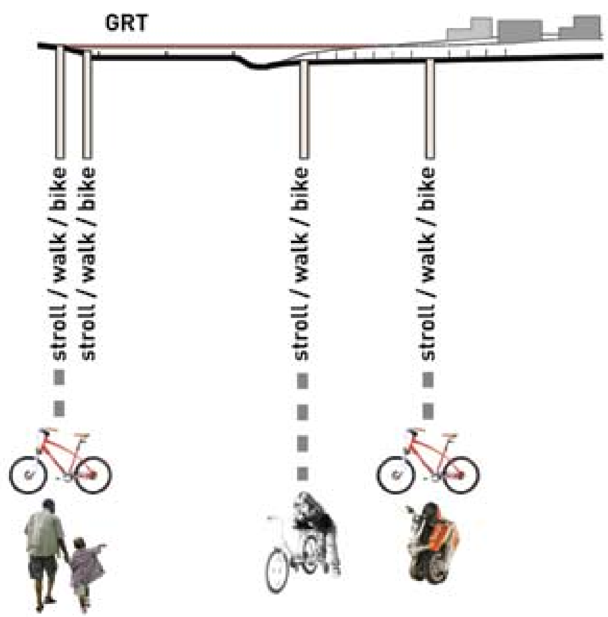
+ dense
+ GRT
+ car
+ 2-wheel
+ slope
+/- hierarchy

Description:
This typology reinterprets the current reality of Tama that encourages complete separation between pedestrians and vehicles by taking it to its extreme. In the light of the existence of both a system of Group Rapid Transit and of shared mobility system, these exclusive corridors are used to accomodate the new systems, which are much more flexible than conventional cars. If the need for them to move up the hill is reduced to minimum, then the up-the-slope residential areas can be more eficiently connected through their own system of pathways.

Pros:
- Allows for unimpeded movement on different levels

Cons:
- Separates mobility systems from each other

MOBILITY _ typologies



< MOVING ON THE EDGE

- dense
+ GRT
- car
+ 2-wheel
+ slope
+ hierarchy

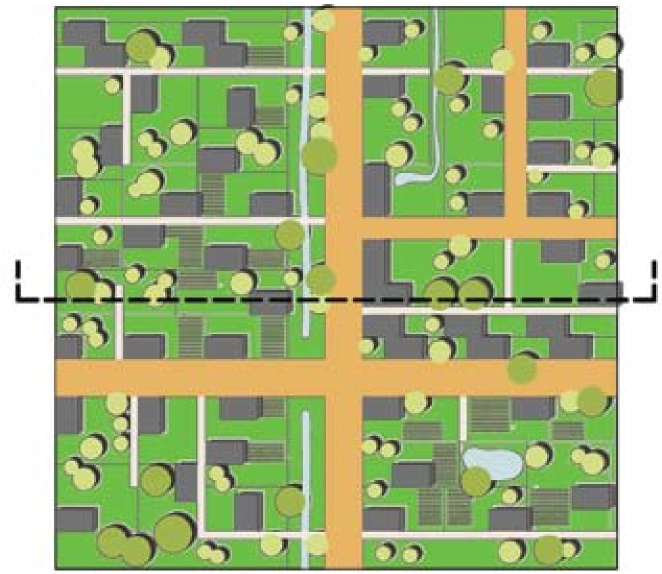
Description:
Space emphasizes natural elements, such as streams, and maximizes compatible adjacent activities. In the presence of a natural element, maximum space is allocated for uses adjacent to and compatible with it. These uses include recreation, sports and agriculture. Mobility in the form of a group transit system serves to connect commuities placed at a distance from the stream. At the same time it allows maximum access to the above amenities. A mobility corridor need not imply a hard-edge heavy infrastructure system that is incompatible with sensitive natural environments. Instead, mobility corridors can encourage an integrated view of human settelements with natural systems.

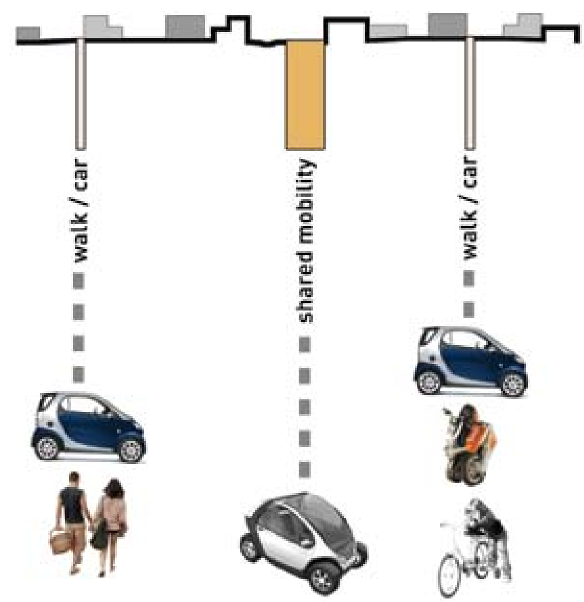
Pros:

- Full development of natural systems and recreation areas.

Cons:

- Communities are self-oriented.





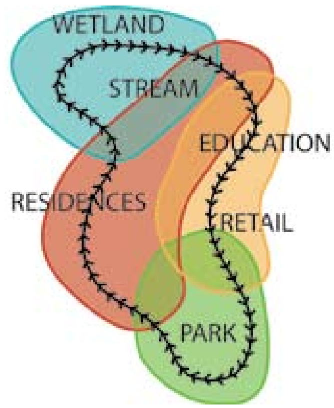
< FLAT HARMONY

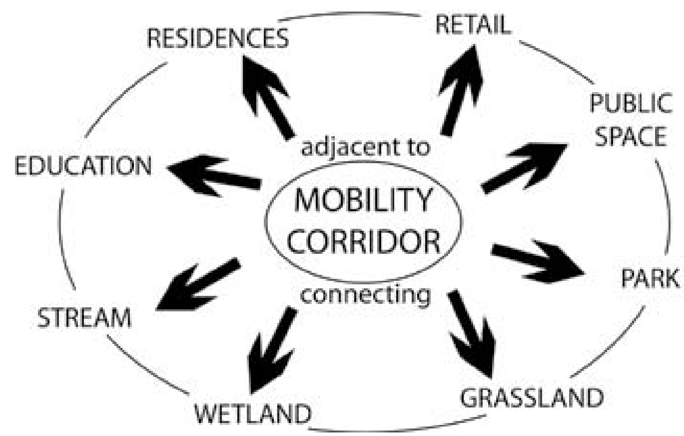
+/- dense
- GRT
+ car
+ 2-wheel
- slope
- hierarchy

Description:
The future car is lighter, smaller, and adaptable to different needs. Cars will be shared adaptable forms. They will be able to generate their own power, change in size to accommodate different users, and be an extension of the human body. In such a world cars can go everywhere without guilt. They will move in small or large corridors with the same ease, along with bicycles and pedestrians. The concept of the shared street is pushed to conceptually move away from the demonization of 4-wheels. Elements such as rainwater managementcan be easily integrated in the site planning.

Pros:
- Allows for flexibility

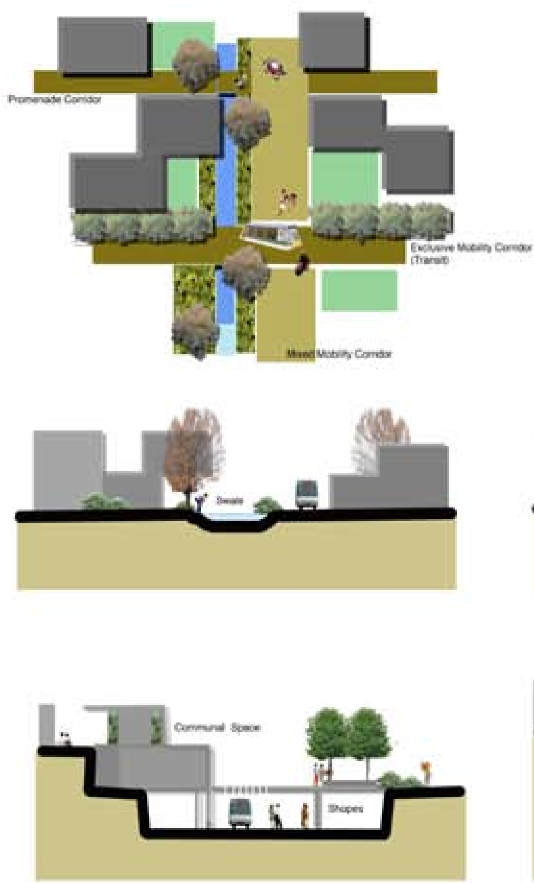
Cons:
- Mobility is self-reliant



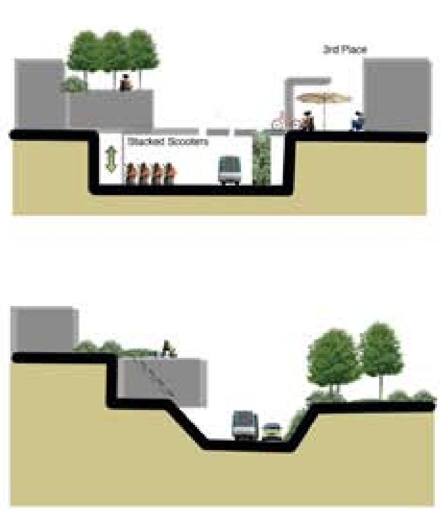


MOBILITY _ intervention examined

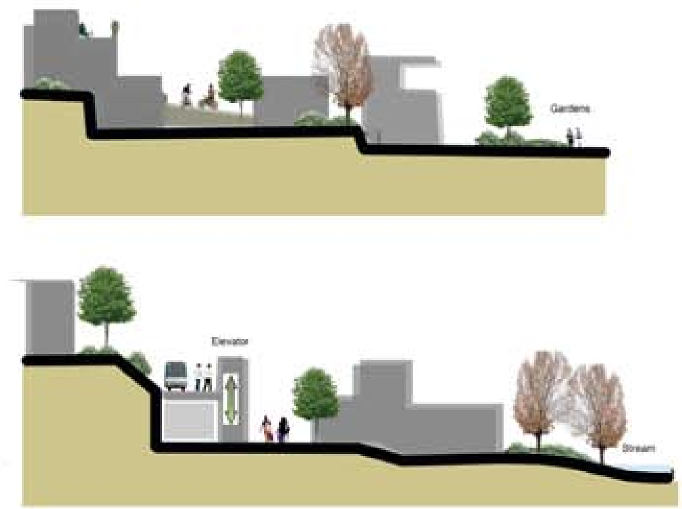
Mobility options in different conditions of topography and natural systems



Illustrative integrative plan



Introducing public amenities



Using the slope as an asset

INFORMATION TECHNOLOGY

by Chris Horne and Christina Markel

WHY IT MUST BE CONSIDERED?

Technology shapes our experience of place and community, and IT will be more influential in the future. Planning must extend its theory of space to include the digital.

Traditional design uses manipulation to "activate" space–IT provides a dynamic, real-time mechanism for organizing spatially-based activity. Conversely, virtual space, enabled by IT, can be used to enhance the design of physical space. These and other opportunities enrich conventionally planned spaces and eliminate design constraints.

GUIDING PRINCIPLES:

IT should enhance existing social dynamics and create new ones that promote convenience, health, happiness, and equity in the community. From a spatial point of view, IT can enhance well-functioning space, activate "dead" space, and free designers from traditional constraints. IT can serve the demands of practicality, pleasure, aesthetics, or nostalgia. IT should be responsive, easy to learn, and should add value to the community. Finally, digital networks cannot replace traditional low-tech networks of value such as person-to-person interaction; instead, IT should enhance and encourage the interpersonal experience.

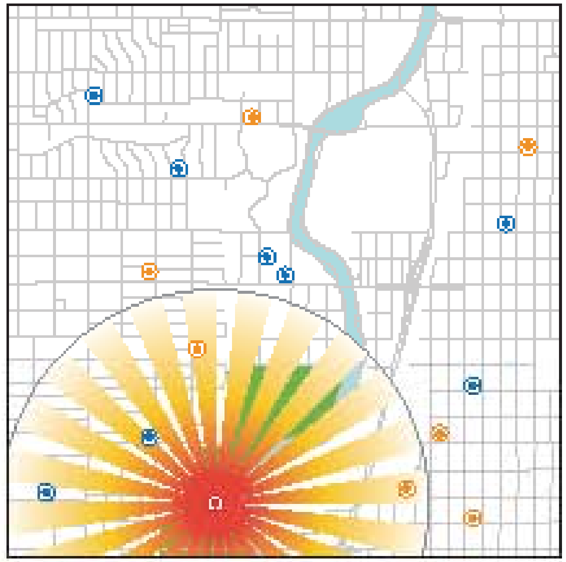
POSSIBLE BENEFITS OF IT:

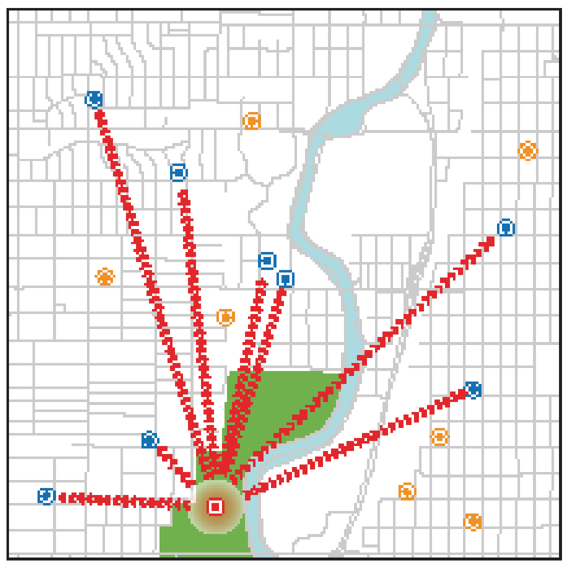
- Increased efficiency of space.
- Lower infrastructure costs for equivalent activity levels.
- Less material overhead.
- Immediate connection to history.
- Enhanced interactivity in design and planning process.
- More sophisticated marketing opportunities.
- Increased neighborhood safety.
- Easier to convene spontaneous events.
- Decrease in physical isolation.
- Easier to activate open, public space.
- Facilitates mobile-service elements.
- Programmable visual surfaces.

Information Technology _ typologies

WHAT ARE THESE?

Unlike the other typologies in this book, IT is non-physical. This section illustrates examples of the types of technologies that have the potential to alter the experience of space, the process of design, and the interaction between designers and the public. The technologies are meant to serve only as examples and reminders that IT and communications technology are permanent and pervasive fixtures of urban life that must be considered by architects and planners.

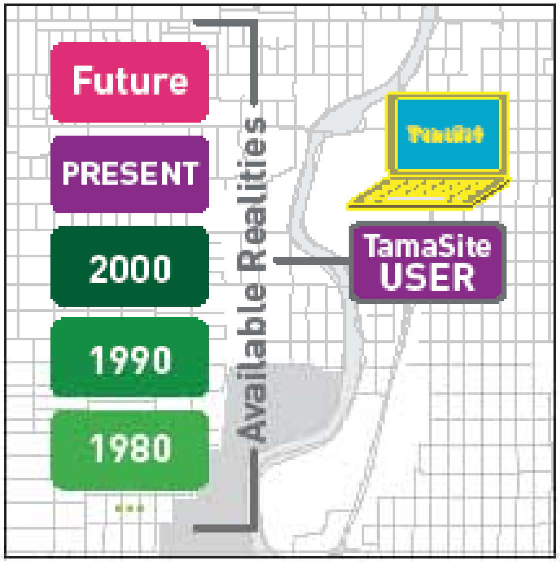




< TAMA NET

Features:

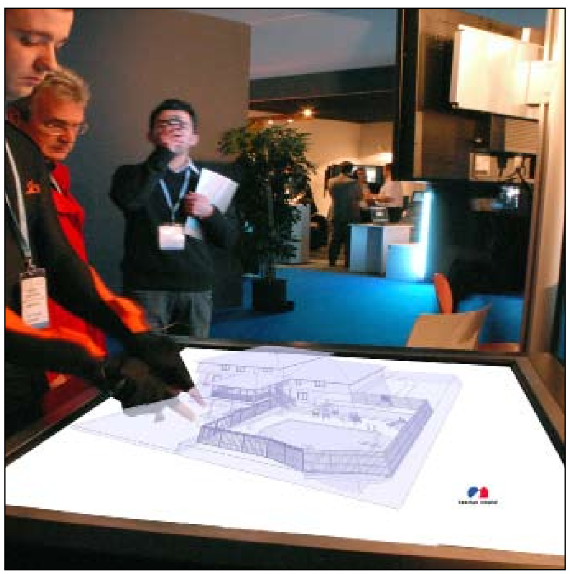
- Local network broadcasting by membership, contact list, or physical proximity.
- Tracks mobile elements, like the Tofu Lady!
- Provides real-time network to facilitate group meeting--casual game of cards in the park or impromptu town hall.
- Broadcast local news throughout the city onto personal digital devices.
- Medical emergencies would receive quick, local response through network transmissions.



< DIGITAL REAL-TIME CITY

Features:

- Regular archiving of the city's physical form so future residents can visit the city as it used to be in virtual reality.
- Intuitive, interactive design charrettes to aid public consultation in planning and design projects.
- Customizable houses, built by the buyer in a digital simulation using Seksui modules, can be tested virtually before buying.

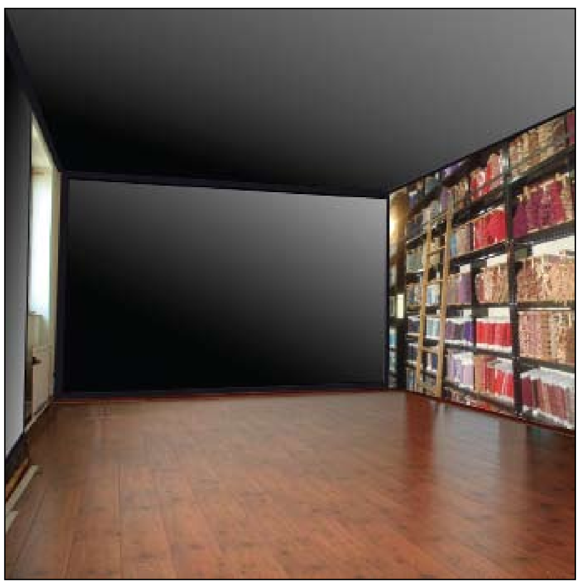


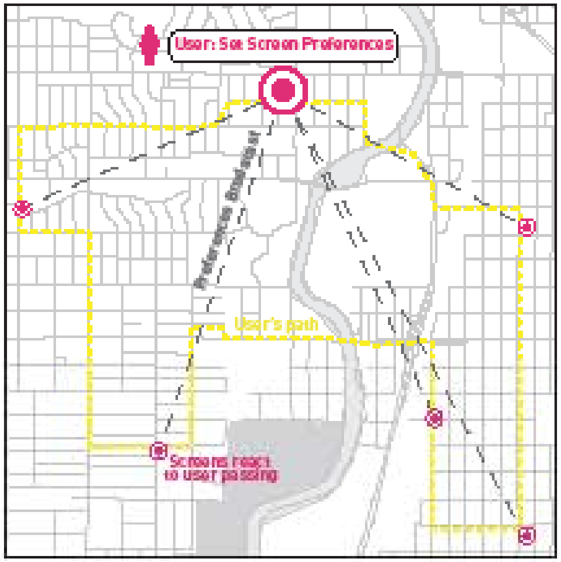
Information Technology_ typologies

< MULTI-USE SPACES

Features:

- Prop closets and screens create flexible spaces—daycare during the day, restaurant at night.
- Digital elements, such as a digital tennis court, can replace physical objects.





< RESPONSIVE SCREENS

Features:

- Surfaces have screens that are programmable and responsive to individual users.
- During a bad weather day, pull-down a screen in front of the window and reload the view you saw during a prior day.
- See streaming video of your hometown for travelers, or receive news updates.
- Content shifts as different users pass the same space.

SYNTHESIS > INTRODUCTION

SYNTHESIS - NEIGHBORHOOD SITE PLAN ASSEMBLIES

The studio developed three permutations of how the various typological approaches and techniques could be synthesized and employed at the neighborhood scale. Each team developed their own programmatic elements, selected the specific site to be developed, and the type of housing to be used. Some teams used current Sekisui House housing prototypes, others used a combination of buildings developed by the Japan Housing Architecture Studio that was conducted concurrently.

TYPOLOGY MATRIX


Agriculture
Energy
Climate
Mobility
low
DENSITY
high

THE LIVING COMMUNITY

SITE AND INFRASTRUCTURE DEVELOPMENT
FOR A COMMUNITY INTEGRATED IN ECOLOGY

Benjamin Brandin, Debmalya Guha
Sole Mendez, Cristina Ungureanu,

The Living Community reflects our collective intention to restore the relationship between urbanized environments and the land that we live on. We carry this concept throughout the design of our site from the regional scale to the streetscape. Our site development aims to create a community that will become more conscious of its individual and collective ecological footprint.

Connecting the community to its regional setting is at the core of our design. The site itself acts as an infrastructural component within the greater regional landscape. Biocorridors run through the site, essentially linking Suwa-Nagayama to larger scale habitats and ecologies.

Restoring a major stream from its currently culverted state reinforces our intentions to integrate our site within its regional context. Daylit waterbodies provide room for habitat growth and movement, as well as water filtration functions for the community and ecology at large. In addition, stream restoration creates a recreational and visual setting for the community to enjoy and celebrate.

GUIDING PRINCIPLES:

COMPLETING THE HYDROLOGICAL CYCLE
Through the use of retention ponds, street canals, and swales, we plan to collect, hold and direct water throughout the site. This collected water will in part be used to feed agriculture and natural habitat. These hydrological features will also be used for bioremediation of greywater and stormwater. In addition, this hydrological infrastructure reinforces the community's awareness of its relationship to natural systems.

PASSIVE HOUSING & CLIMACTIC POSITIONING
Retaining maximum southern exposure both for building placement and agriculture is central to our site design. Streets have been designed to open to the south to draw in and funnel summer wind through to the north. In addition, a barricade of trees has been installed to protect the site from unwanted winter winds emerging from the north.

AGRICULTURE AS LEARNING
The integration of agriculture into our community as a means to relearn how to manage the land around us is central to our design. The agricultural learning center at the southern end of our site is a means for community experimentation, learning and showcasing technological advances in small scale agricultural farming and individual/community-level urban gardening.

DENSITY PROGRESSION
The design emphasizes the need for a variety of lifestyles within one community. By drawing from the building scale and density of uses near the existing train station, we have created a neighborhood extension to this hub. We use natural boundaries to transition from high density and mixed uses to a lighter residential scale.

THIRD PLACE
The central spine acts as the major boulevard connecting the neighborhood to the two anchoring nodes: the commercial and mixed-use sector to the north, and the agriculture learning center to the south. The spine will act as the center of the community, within which everyday living will occur in tandem with temporal events and community festivities.

Benjamin Brandin, Debmalya Guha, Sole Mendez, Cristina Ungureanu

CONCEPTUAL DIAGRAMS

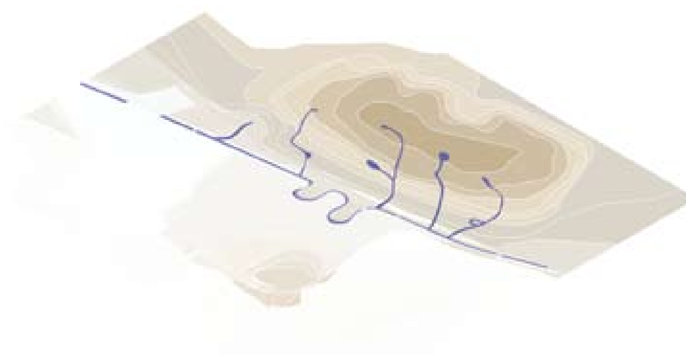
These six diagrams illustrate our guiding design principles as they have manifested themselves on our site in Suwa-Nagayama.

In keeping with our central goal of designing for a community integrated in ecology we have focused each of our design interventions to not only accommodate, but also enhance the area's natural environment. We envision that communities of the future will have a more acute awareness of their impressions upon their surrounding habitats and natural systems.

The design of our site includes highly refined reuse of water and intricate water movement patterns to facilitate the growth of green spaces and agriculture, as well as of the rehabilitated stream. The street system is designed for maximum air circulation and southern light exposure, which drives where buildings are positioned throughout the site. We anticipate smaller, more efficient transit models in the future. These will work in tande with the narrow, pedestrian-oriented road system we propose.

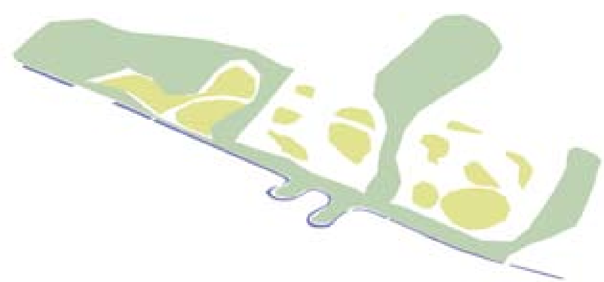
Topography

Our site design calls for selective earthwork and cut and fill operations. Land east of the central valley has remained generally unaltered, while the western region has been dramatically reshaped in order to create a larger community park and to make room for the stream restoration vital to our design.



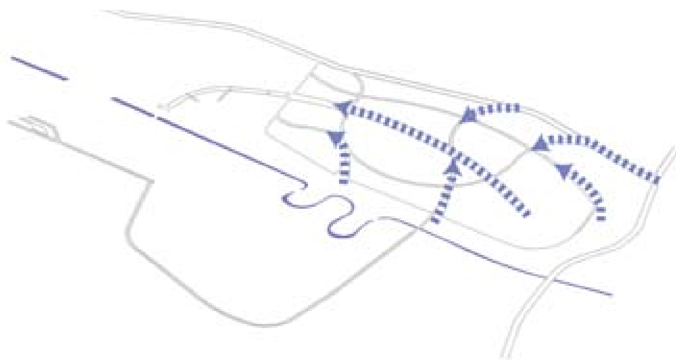
Hydrologic System

The rehabilitated stream is fed via a series of canals and swales on either side of the valley. These water bodies carry greywater and stormwater through the site. Canals run primarily along major right of ways, while swales are located in agricultural and open community areas.



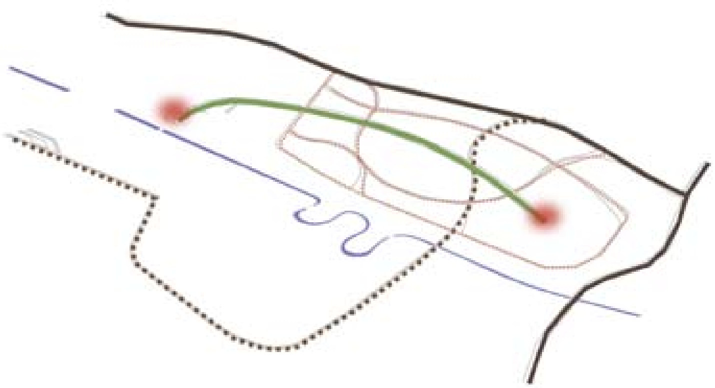
Greenspace Network

The site is comprised of a variety of green spaces that function at multiple scales. We include more natural and forested areas that connect to the regional site as well as recreational park spaces and agricultural plots.



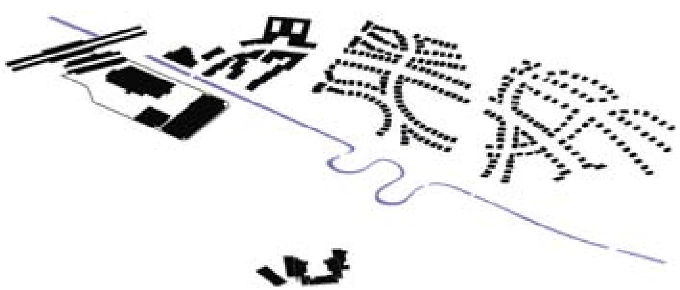
Windflow

Analysis of wind directions, temperatures and intensities has influenced the placement of roads and residences. We have intentionally designed roads to widen at the south in order to channel summer winds through our community. Winter winds will be blocked by evergreens and taller vegetation located to the north.



Mobility Network

The philosophy behind our road system is that narrow curvaceous roads lead to slower, pedestrian-oriented movement. The green boulevard is the spine of our community, connecting residents to the retail center and agriculture technology learning center.



Density Progression

Our site demonstrates a strong North-South density progression with the area around the train station designed to accommodate 4-5 story mixed-use buildings. The Living Community accommodates the need for multi-family buildings and single family homes. Further south, homes have larger plots of land.

THE LIVING COMMUNITY

Benjamin Brandin, Debmalya Guha, Sole Mendez, Cristina Ungureanu

Green Corridor Linking to Regional Ecological System

Mixed-Use High Density Residential

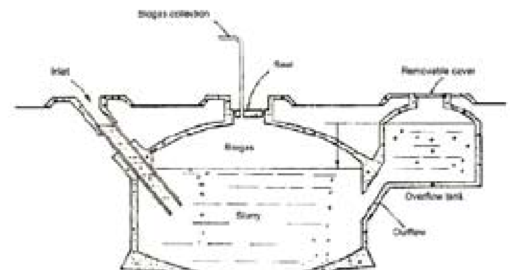
Multi and Single Family Units

Green Corridor Linking to Regional Ecological System

Shared Agricultural Area with Stormwater and Greywater Swale

Single Family Housing Units with Personal or Shared Allotments

Agriculture Technology Learning Center



Capacity of Biogas Plant (cu.m.)	No. of Persons maybe served	Quantity of Night soil (Kg)	No. of Persons
1	2--3	25	10--15
2	4--6	50	20--25
3	7--9	75	30--35
4	9--12	100	40--45
5	12--15	125	45--50
6	14-17	150	50--60

Source Department of Civil Engineering, Punjab Agricultural University, Ludhiana 141 004, Punjab, India

BIOGAS CAPTURING

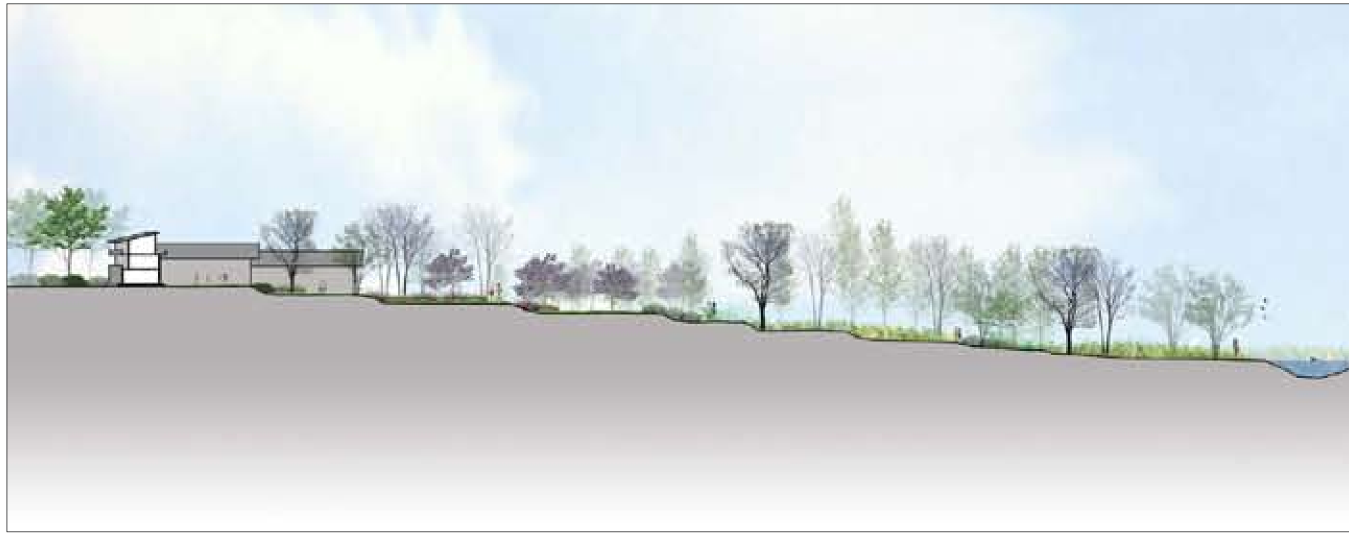
Our design integrates community level blackwater collection and processing for the production of biogas. Research shows that the sewage waste of approximately 15 persons (or nearly 6 families) could produce enough biogas to fuel the cooking needs of one conventional family. These collection and processing systems can be installed beneath landscape in an array of density settings. The plot represented above appears on our site, in various but similar forms, and is well-suited to this form of energy production.

THE LENGTH OF OUR SITE

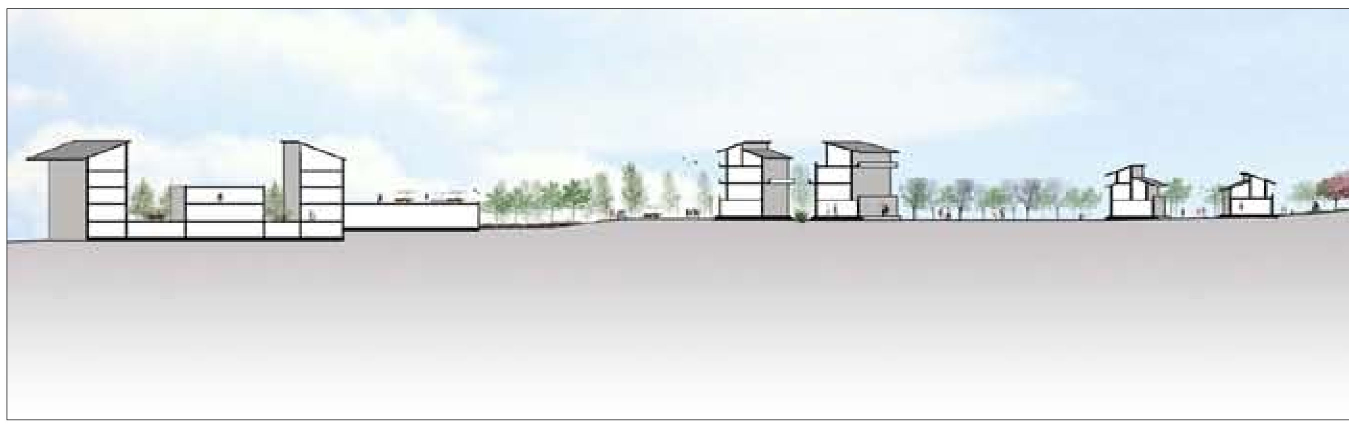
The following long sections running in cardinal directions on our site depict two important design considerations as they were manifested in our plan: stream restoration and density progression.

The first demonstrates the presence of the newly daylit stream and its relationship to the built environment that surrounds it. We have intentionally re-graded the landscape to the west of the stream to create a more sensitive slope and natural habitat. The residential corridor to the east gradually steps down the hillside. We intend for greywater and stormwater to flow via street canals and road-side swales, feeding the stream and green areas surrounding it. This will become the center of the community where everyday activities can take place, as well as larger community festivals.

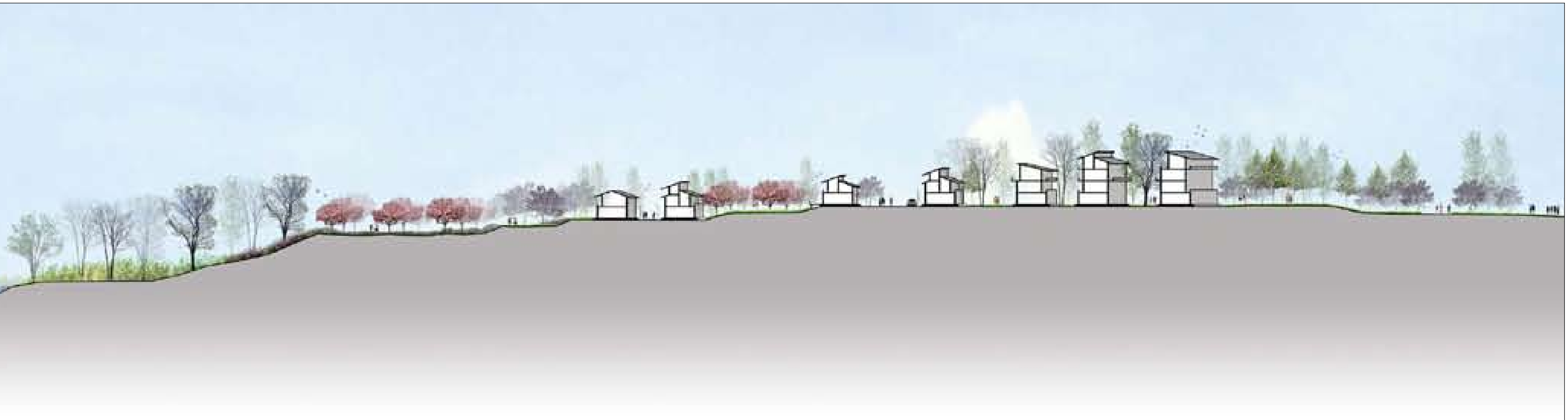
The second section depicts density progression through the neighborhood. Taller multi-purpose buildings are located near the train station and gradually step down to multi-family and, later, single family homes. The design is focused around clusters with agriculture plots in the center. Farthest South, the residences become more spread out, allowing room for more private ownership and potential expansion.

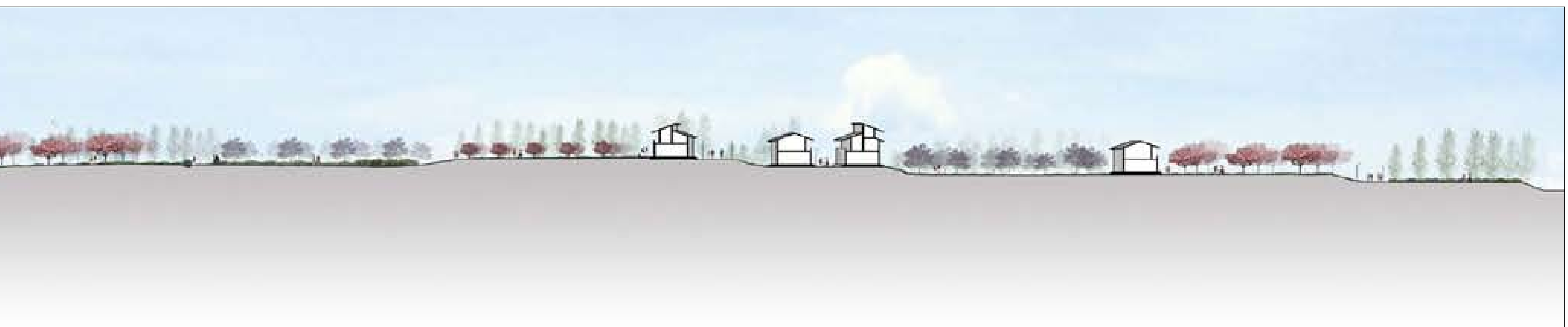


Section A: Daylit Stream; cut West to East



Section B: Density Progression; cut North to South





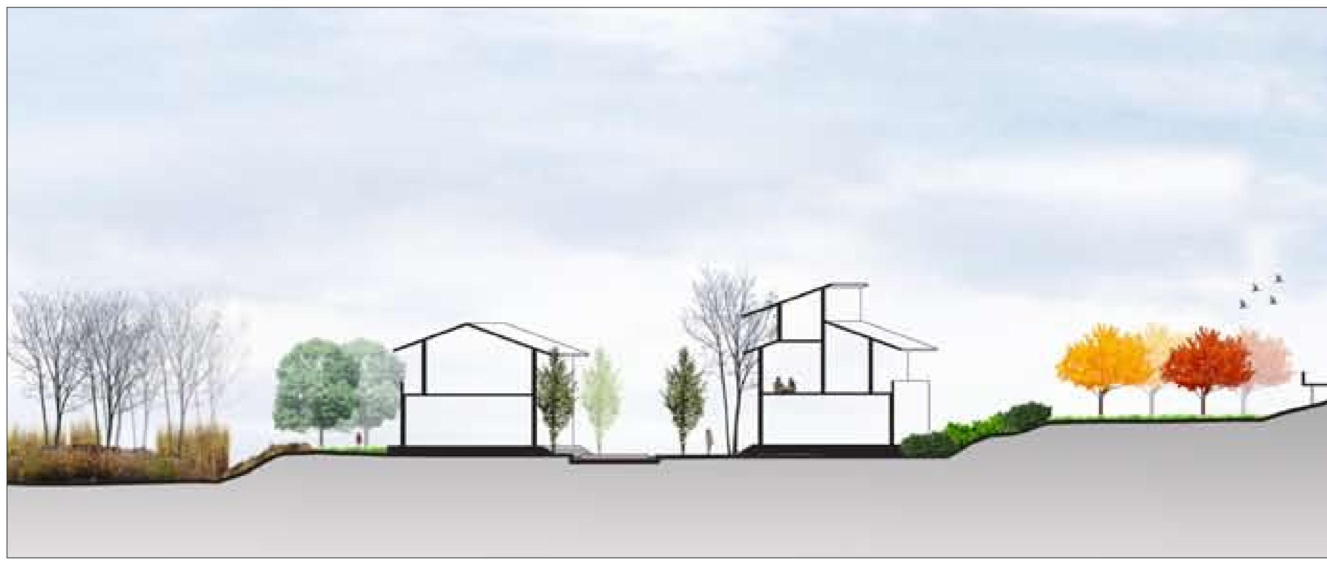
DETAILED DESIGN INTERVENTIONS

We have envisioned the daily activities of our site's inhabitants around the importance of integrated urban living with the natural environment. Whether by picking the orchards in our agriculture fields or by walking along the boulevard, residents will be constantly surrounded by green spaces that serve fundamental purposes for Tama's regional ecology. Furthermore, citizens will be reminded of their individual and collective water consumption through the presence of street canals and roadside swales.

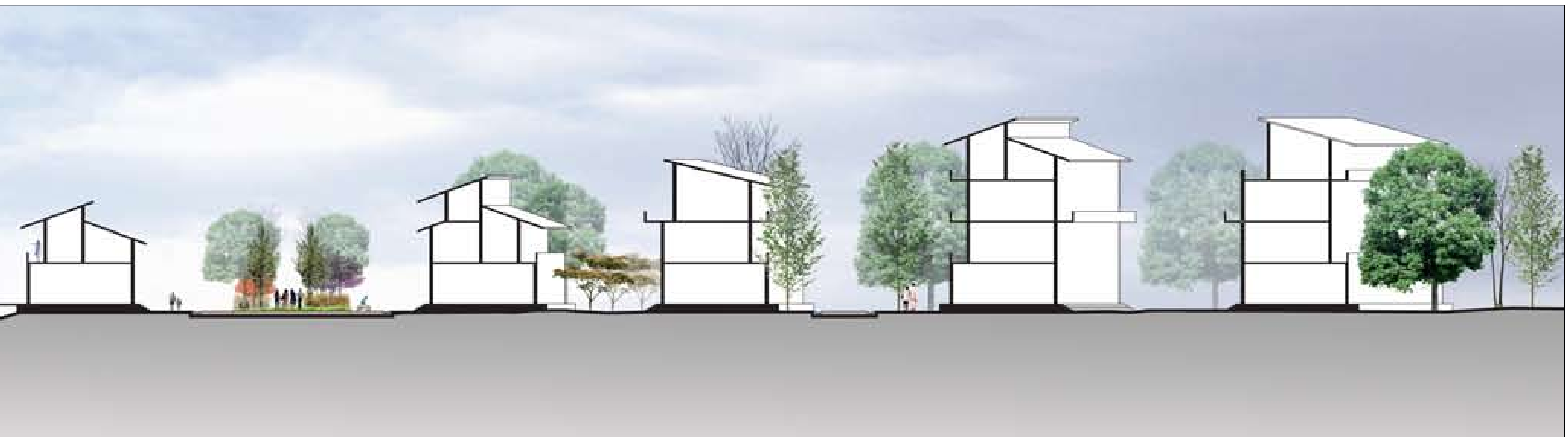
The first section depicts our vision for the Agriculture Technology Learning Center. This is meant to become a place where the community can gather to learn how the newest advances in technologies can help them monitor their own agriculture plots. The second section cuts through three typical streets in our community. At the center is the boulevard where we expect most traffic will occur. Each street will accommodate pedestrians, bicyclists and small motor vehicles.

The next pages more viscerally depict the Agriculture Technology Center, life on the central boulevard, and citizens as they meander through the wetlands of the daylit stream.

Section C: The Agriculture Technology Learning Center; cut South to North



Section D: Streetlife; cut West to East



Vignette A: The Agriculture Technology Learning Center

Vignette B: A View from the Wetlands

Vignette C: Life on the Boulevard

Benjamin Brandin, Debmalya Guha, Sole Mendez, Cristina Ungureanu

食とつながる街

Shoku to Tsunagaru Machi

[town connected with food]

Gates Gooding, Alex Keating,
Christina Markel

This site plan endeavors to synthesize principles and aspects of the various typologies and technologies explored in the earlier sections. Complementary models of community agriculture, passive climate mitigation, waste water and solid waste management are combined in order to produce a community in which infrastructure systems are lightweight, local, and integrated with the natural flows on the site.

Critical to this effort is the "day-lighting" of a stream that is currently covered over by a road running North-South in the center of the site, as well as the reforming of currently flat, 'plateau conditions' into a series of stepped slopes which share a central spine, draining water naturally through numerous small valleys.

Housing densities/typologies vary throughout the site, increasing density on South-facing slopes where microclimate conditions are optimal.

The train station located in the Northern-most section of the site plan provides the necessary driver to support limited retail, as well as the opportunity to increase future housing densities.

GOALS AND OBJECTIVES:

- Promote integrated and local infrastructure solutions that treat all waste and waters runoff on site
- Provide necessary agricultural land to significantly reduce the community's future reliance on food imports
- Reduce heating/cooling energy needs through optimal siting of houses in well sheltered, South-facing areas
- Create community and connection between housing developments with central placement of amenities such as a school, scenic wetland, community center, and farming center.

CHALLENGES AND OPPORTUNITIES:

- Sacrifices will be required when attempting to balance residential densities with the needs of agricultural land and open spaces.
- Prioritizing South-facing housing limits community layout options

食とつながる街

Shoku to Tsunagaru Machi

[town connected with food]

Gates Gooding, Alex Keating, Christina Markel

Train Station

Renewable Power

Natural Drainage and Greywater Processing

Shared Agricultural Area

Buildings based on prototypes developed by concurrent architecture class (Buck Sleeper)

Multi and Single Family Units

Multi and Single Family Units

Shared Agricultural Area

Buildings based on prototypes developed by concurrent architecture class (Wayne Higgins)

Courtyard housing

Shared Agricultural Area

食とつながる街 . Shoku to Tsunagaru Machi

Gates Gooding, Alex Keating, Christina Markel

Vignette D:
Looking North from the center of a medium density housing development of three - four story residential units, this image illustrates how forms of agriculture can be integrated into the community fabric.

Vignette E:
Illustrated here is the integration of a system of boardwalks and paths within the larger 'wetlands' area of the site that accompanies the central restored stream. On the right is the BioDigester which requires 4 cubic meters of volume per household served and in addition to treating the sites waste, can produce enough gas for all cooking on site.

Vignette D: Agrihabra

Vignette E: Processing Wetland

食とつながる街 . Shoku to Tsunagaru Machi

Gates Gooding, Alex Keating, Christina Markel

CONCEPT DIAGRAMS

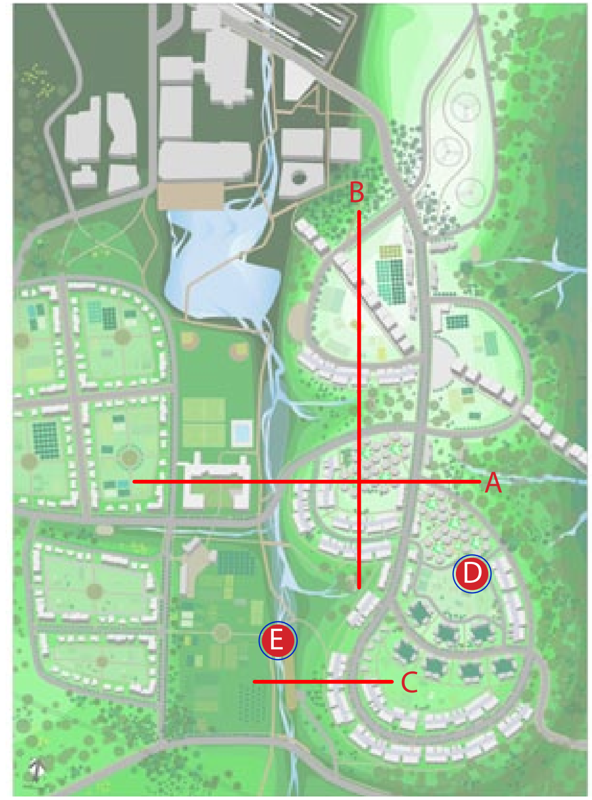
Organic Systems and Transportation:

This diagram displays the designated organic systems and agricultural land in relation to the transportation systems present on the site. The green circles represent the combined 10 hectares of farming land, a quantity capable of producing the total food (protein, fruit, vegetables) for 200 residents, or fruit and vegetables for 5,000 residents.

Sewer Diagram:

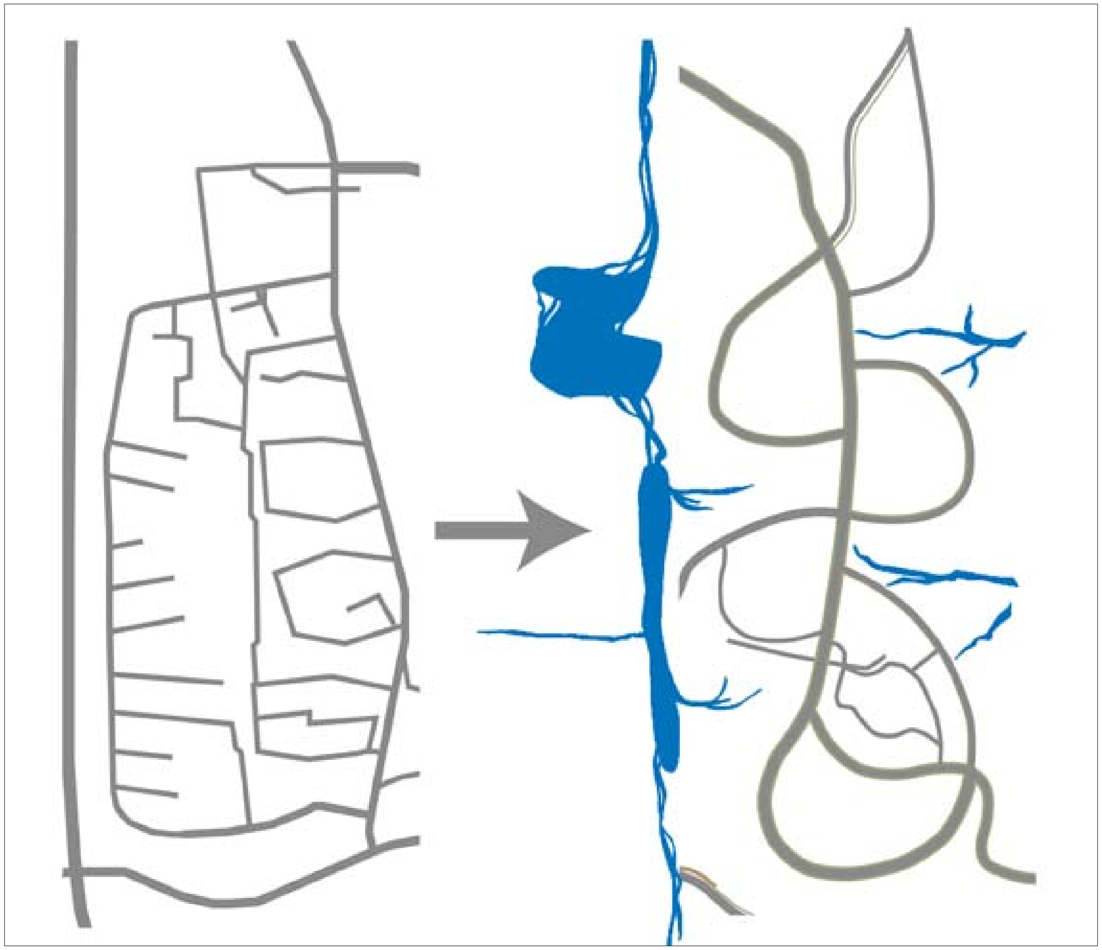
This diagram outlines the function of the sewer system operating on site. At its heart is the BioDigester, performing the primary treatment of all sewage before the sub-surface wetland leading down hill, South-North, performs secondary treatment.

Organic Systems and Transportation



Sections and Vignettes

Gates Gooding, Alex Keating, Christina Markel



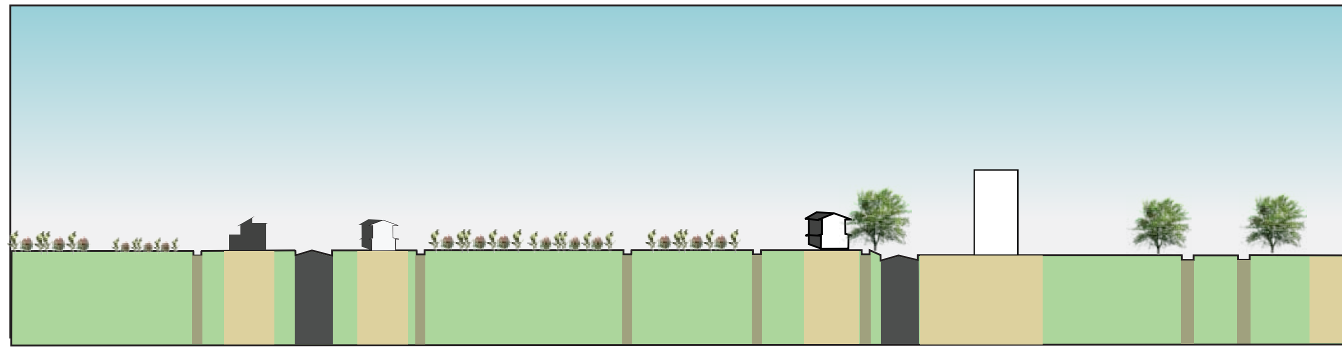
Site Transformation

Sewer Diagram

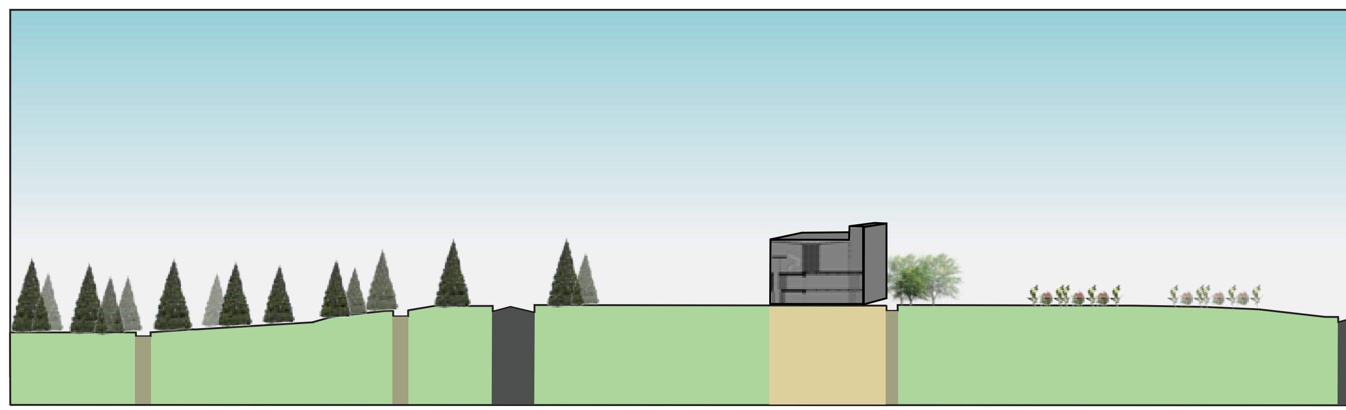
食とつながる街 . Shoku to Tsunagaru Machi

Gates Gooding, Alex Keating, Christina Markel

These sections represent crosscuts of the site's full length, running from West-East (A) and North-South (B). Illustrated here is the overall relationship between residential areas, their integrated agricultural lands, and more natural open spaces to the edges - especially in the north where evergreen tress are utilized to slow cool winter winds.



Section A



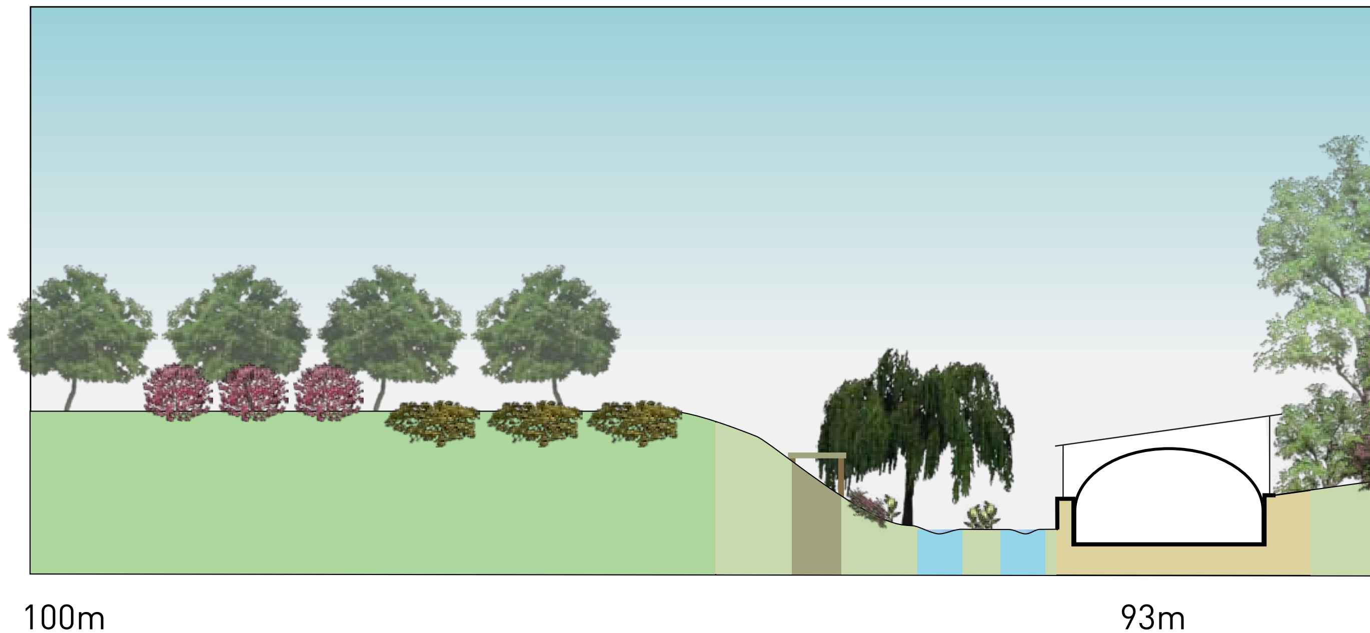
Section B

食とつながる街 . Shoku to Tsunagaru Machi

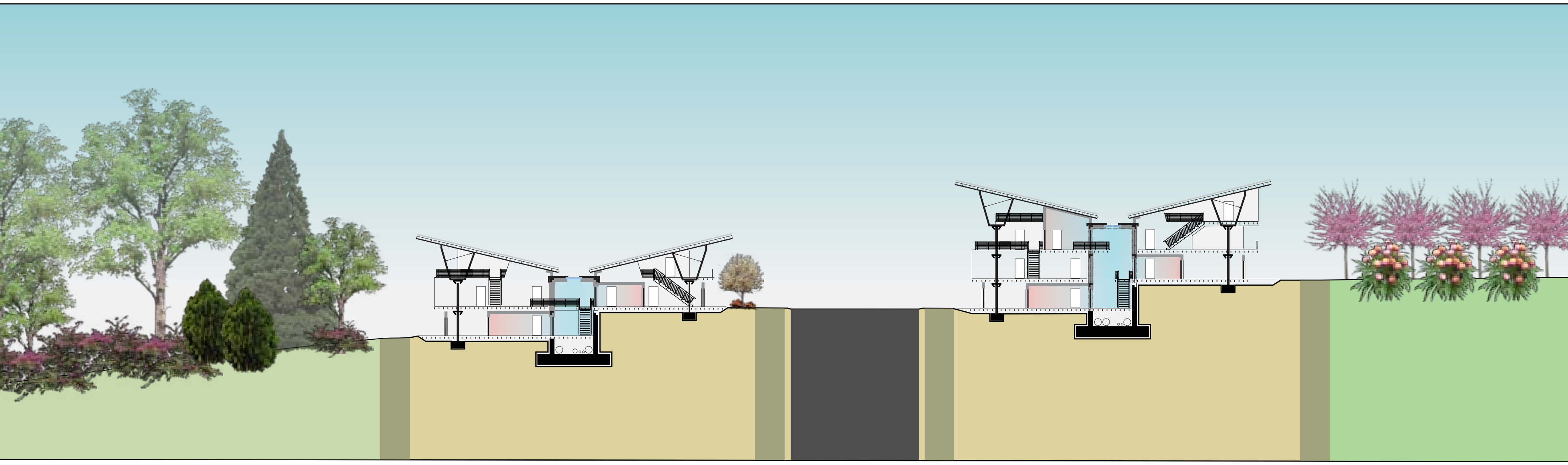
Gates Gooding, Alex Keating, Christina Markel

This larger section illustrates the stepped housing typology utilized in sloped conditions. Also, the relationship between this housing and the central stream/wetland area is displayed, including the BioDigester located just to the right of the wetland.

Section C



Gates Gooding, Alex Keating, Christina Markel



112m

食とつながる街 . Shoku to Tsunagaru Machi

Gates Gooding, Alex Keating, Christina Markel

Bento Machi 弁当街

SCALABLE INTEGRATED LIVING SYSTEMS MODULE

Chris Horne, Eirini Kasioumi, Kristal Peters

Project Goal:

Bento Machi is an experiment in modular design and the concept of ecological carrying capacity. Rather than beginning with contemporary consumer preferences or typical density patterns, we began with the idea that a site should be able to treat and recycle its own water, provide its own energy, produce its own food, and support low-CO_2 transportation. We took a modular approach to define our ecological unit and provide a means by which the town can achieve flexibility by adding or subtracting blocks.

Team : Chris Horne , Eirini Kasioumi , Kristal Peters

CONCEPT:

Community design based on a modular residential block scalable to serve public and town-scale functions. Modules are self-contained units managing rainwater run-off, gray water, wastewater, energy, and food production. Our design is meant to explore a site-level application of our modules, with necessary non-residential systems to support our intervention on the town scale.

PRINCIPLES:

- Carrying capacity: the built environment relies on natural systems, which have finite limits, so we must respect and understand these limits and design in accordance with them. Housing modules are based on the logic of system spatial requirements and imply an upward population limit for a given area.
- Flexibility: programmatic needs, demographics, and demand change drastically over time. An optimal design possesses the flexibility to adapt to these changes. Our housing modules can be added and linked into the transportation grid without significant difficulty.
- Spatial Definition and Optimal Movement: establish organizational structure in Tama using orienting elements such as place, path, node, axis/datum, and landmark, and connect these elements with a logical transportation network that follows topography.

Bento Machi 弁当街

Team : Chris Horne , Eirini Kasioumi , Kristal Peters

METRICS

TYPICAL HOUSEHOLD CHARACTERISTICS
- 3.5 persons
- 120-150 m2
- 30-35 m2 / person
- 2-storey
- footprint: 75 m2

HOUSEHOLD INPUT+OUTPUT

fruit&vegetable consumption
- 160 kg / person / year
  > 640 kg / household / year
- 20 m2 / person
  > 80 m2 / household

rainwater capture (75sq.m.)
- min: 4 m3 / month
- max: 16 m3 / month

water needs
- 1-1.5 m3 / day > 30-45 m3 / month
- let's take the worst scenario: 45 m3/month
- toilet: 28% = 12.6 m3 / month
- laundry 17% = 7.65 m3 / month
- kitchen 23% = 10.35 m3 / month
- bath 24% = 10.8 m3 / month
- misc 8% = 3.6 m3 / month

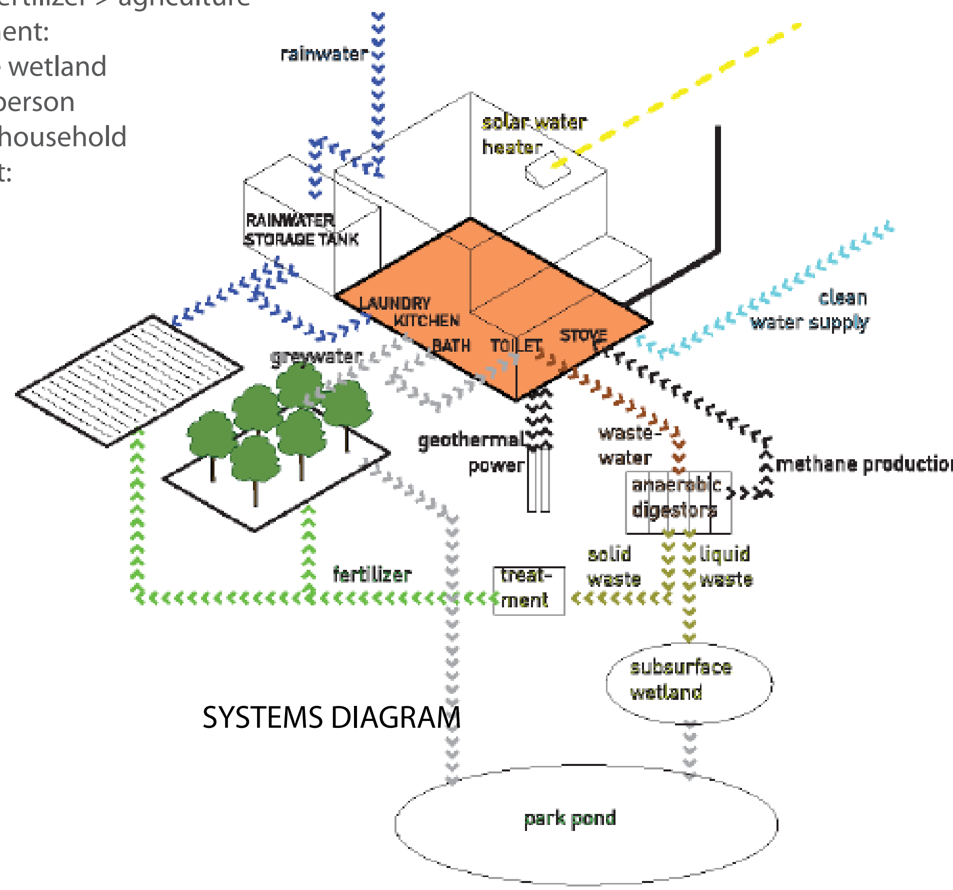
opportunities for water reuse

-Recycle water from bath & misc for toilet use
> water input reduction: 28%.
-Store rainwater for agriculture and laundry use
> water input reduction: 17%
-Total savings: 45%

-Total water input after savings: 25 m3

Total water output after savings:
-12.6 m3 blackwater
-18 m3 graywater

BROWN WATER TREATMENT
- primary treatment:
  anaerobic digestion
  - biproduct 1: methane > cooking
  - biproduct 2: solid waste > municipal service
    > fertilizer > agriculture
- seconadry treatment:
  subsurface wetland
  ~ 21 m2 / person
  > 85 m2 / household
- tertiary treatment:
  park pond



SYSTEMS DIAGRAM

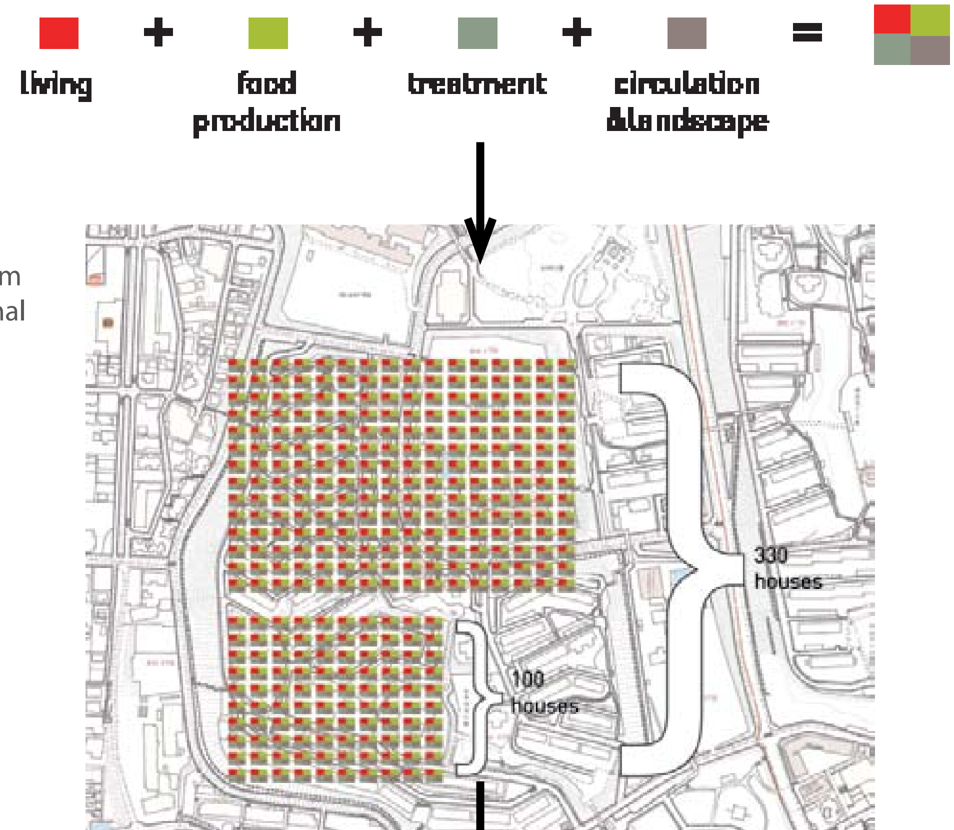
METRICS (CON'T)

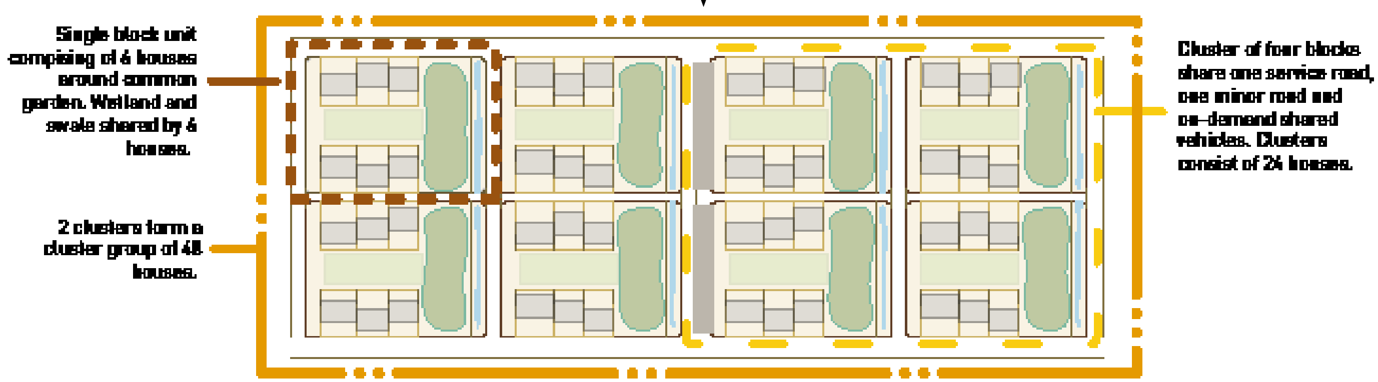
GREYWATER TREATMENT
- direct use in tree cultivation
- remaining: park pond (see diagram to the left)

OTHER HOUSE NEEDS
- heating: geothermal energy through underground system
- hot water and electricity: solar water heaters + geothermal
- gas for cooking: (see diagram to the left)
- fertilizer for agriculture: (see diagram to the left)
- other food (meat, fish): local grocery store

CUMULATIVE HOUSEHOLD FOOTPRINT
- building: 75 m2
- crop field: 80 m2
- subsurface wetland: 85 m2
- circulation / landscape: 60 m2
- total: 300 m2

PROPOSED COMMUNITY SIZE
-1,155 persons = 330 households



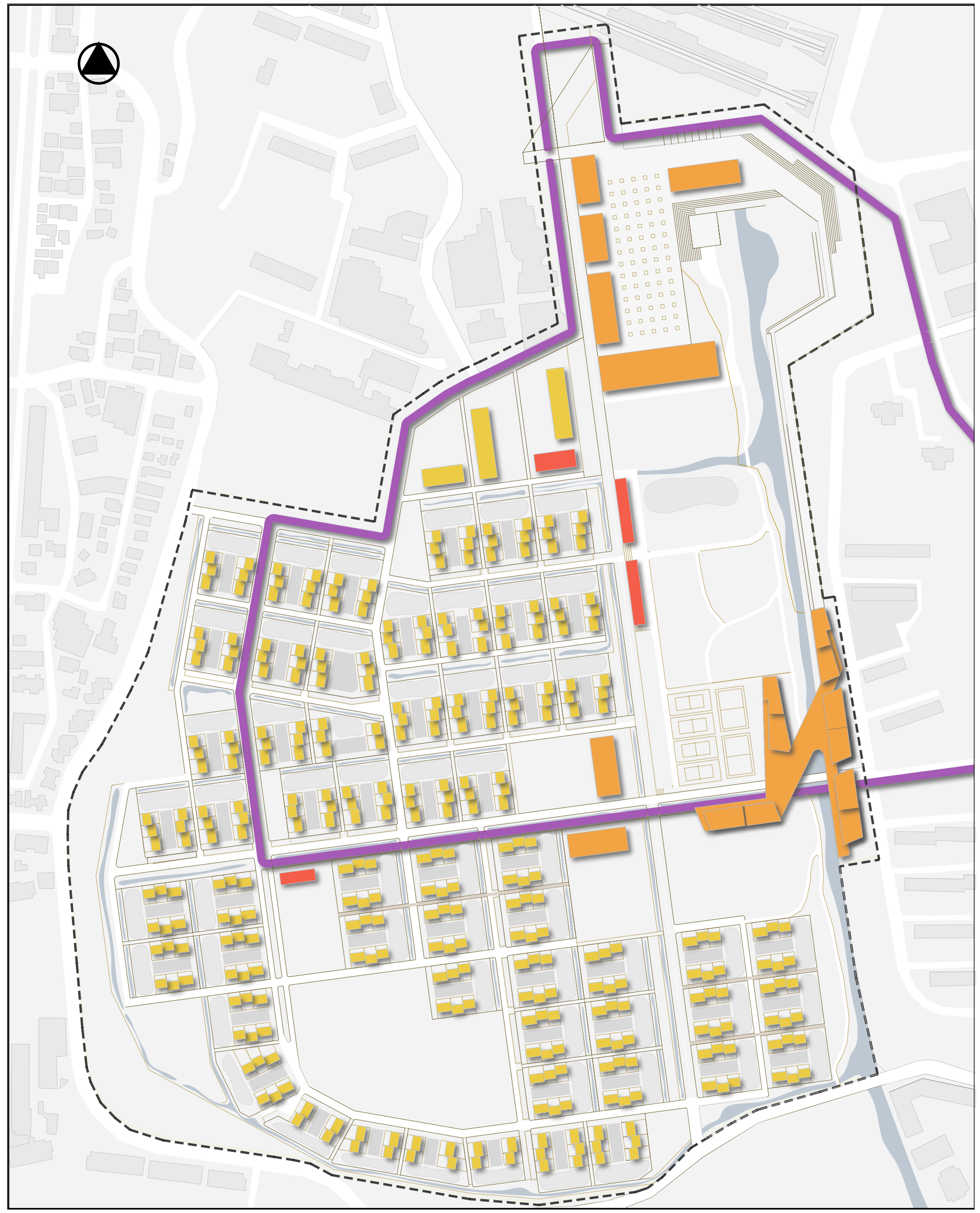


Water Run-Off

The block orientation is adapted to fit the existing topography with minor adjaustments, so that water naturally flows throught the site. Water is managed in several stages. Gravity moves surface rainwater along with treated gray and waste water through each block, terminating in a bioswale/retention pond. There water is allowed to filter into the ground. Excess waiter is collected into a larger neighborhood swale and eventually carried into the day-lighted stream. The swales, apart from serving as water collectors, consitute a neighborhood amenity, providing vegetated public space all-year round.

Program/ Circulation

Residential blocks flow are arranged all the way from the highest elevation down to the level of the river. Higher density houses are sited near the station. A north-south pedestrian central corridor forms the spine of the neighborhood. Institutional buildings (schools, public library, community center, center for environmental protection) are placed along the spine and the river, highlighting this zone as the main public space. Small commercial lots are also located along the central corridor and interspersed in the neighborhoods. The bus line connects Suwa and Nagayama and is designed so that no resident lives more than 500m from the bus.

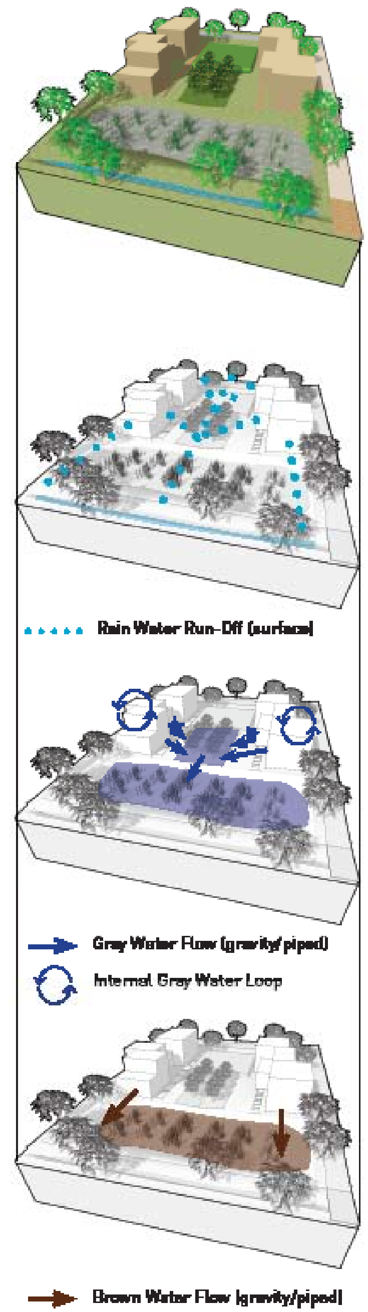


Residential
Institutional
Commercial
Bus Line

3 in 1 Water Management System

Each residential block is an integrated water management unit. The blocks slope slightly towards their interior, along with following the site topography as a whole. This allows the water to be used and treated on the block before the excess amount is collected at the neighborhhod level.

Thus, rainwater from roof tops is stored for usage in laundry, and the rest of surface rain water is directed through gravity to irrigate the collective agriculture. Gray water from the laundry and kitchen is partially reused in toilet flushing and the rest is employed for irrigation of non-earth level crops, such as trees. Finally, waste water is piped directly into a subsurface wetland, and after treatment it terminates in the bioswale/retention pond. The wastewater is clean by the time it reaches the swale, and there it is allowed, along with the excess gray and rain water, to filter into the ground.



Site Plan

Library
Medium-density Residential
Neighborhood Water Drainage
Light Retail
Citrus Groves
Bus Route
Athletics Fields
School
Environmental Education and Community Center
School
Light Retail
Daylighted Stream

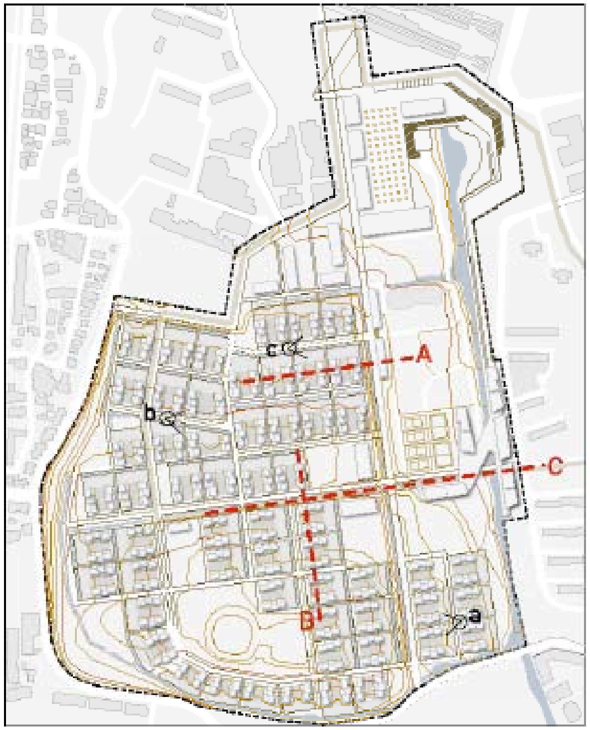
Bento Machi 弁当街

Team : Chris Horne , Eirini Kasioumi , Kristal Peters

Section A

Section B

Section C


A
B
C
a
b
c

NEIGHBORHOOD MODULE (vignette a)

The neighborhood module incorporates all the "bento" features. Wetland, earth crops and trees, along with paths for residents circulation constitue the heart of each residential block.

PRIMARY RESIDENTIAL STREET (vignette b)

Among the neighborhood modules, streets have two levels of hierarchy. Primary streets are for small cars, deliveries, emergency vehicles, and pedestrians. Pods of cars can be parked along the side with room to spare. Secondary streets are almost exclusively meant for bikes and pedestrians.

CAFE, STREAM, AND ORCHARD (vignette c)

Small commercial lots are accessible from the North-South pedestrian corridor and feature views opening to the agricultural fields and stream behind them. Many of these businesses are "third places", such as cafés and restaurants. The fields primarily serve the food needs of the businesses themselves, while providing surplus to the rest of the community.

Bento Machi 弁当街

Team : Chris Horne , Eirini Kasioumi , Kristal Peters

PROJECT PARTICIPANTS >

Eran Ben-Joseph
Professor of Landscape Architecture and Planning
Eran's research, teaching and publications are in the fields of urban and physical design, standards and regulations, site planning technologies and urban simulation. Eran has practiced as a landscape architect and urban planner in Europe, Asia, the Middle East and the US. He holds a PhD in Environmental Planning and Urban Design from UC Berkeley and a Master of Landscape Architecture form Chiba University in Japan.

Deborah Morris came to DUSP after working in intergovernmental affairs for the Downtown Alliance, Lower Manhattan's Business Improvement District. Deborah's professional and research interests are sustainable community design, urban design policy, food planning, and commercial revitalization. Deborah will complete her MCP in June 2009 and holds a BA from the University of Michigan in History and History of Art.

Benjamin Brandin completed his undergraduate degree in American Studies from the University of California, Berkeley. He then worked at Amnesty International USA where he focused on death penalty policy and legislation in California. He joined the City Design and Development group at M.I.T.'s Department of Urban Studies and Planning in the fall of 2008, and studies how environmentally conscious design and policy can improve conditions in low-income communities.

Gates Gooding came to DUSP after producing documentary films for several years. He completed his undergraduate studies at the University of Vermont and New York University, and is originally from Steamboat Springs, CO.

DebMalya Guha believes that the best way to prepare for the future is by designing it. At present he is studying Master of City Planning at MIT and concentrating on design and development of cities which are both ecologically and economically sustainable. His special interest lies in the sociological aspect of design, and strives to achieve a balance between tradition, regionalism and globalization. Before coming to MIT he had practiced as an architect in India for seven years in a firm that he cofounded.

Chris Horne grew up in Philadelphia and received a B.A. in Liberal Arts in 2005 from St. John's College in Santa Fe, NM. Combining his interest in law and policy as well as design, Chris began the MCP program at DUSP in the fall of 2008. His passion is for environmental management, landscape planning, and environmental design. At DUSP, his interests have led him to work on projects involving regional climate change adaptation, physical planning, and environmental management. When he is not working, he enjoys exploring parks and cities, reading "the classics", and eating vegetarian food.

Eirini Kasioumi grew up in Greece and holds a professional degree in Architecture from the National Technical University of Athens. After working in architectural firms for two years, she joined the City Design and Development group at MIT with an interest in the realm of interaction between policy decisions and city forms. She currently focuses on the relation of innovation with the responsiveness of urban design to ecological and social challenges, and on models for future development in transitional sites.

Alex Keating was born in Boston, Massachusetts. Before attending MIT's Department of Urban Studies and Planning, he spent a year working with the Massachusetts Department of Housing and Community Development. Alex received an MA Honors Degree in Politics from the University of Edinburgh, in Scotland, and while living abroad for over four years spent time throughout Europe as well as working in Rwanda with the World Food Program. At MIT, Alex specializes in International Development and Urban Planning.

Sole Mendez is an architect; she attained her professional degree in Architecture from the University of Notre Dame. Prior to attending MIT's Master of City Planning program she has worked for an architecture firm in New York City, done pro-bono work for Engineers Without Borders and has been working towards her licensure. She will graduate in May of 2010 and aspires to return to work in New York as an urban designer.

Christina Markel is fascinated by visual and visceral communication and is committed to forwarding sustainability. She is currently studying integrated ecological footprint reduction techniques, how to frame sustainability and engage the public in local change, and biological place preferences. Before joining the Master of City Planning program at MIT Christina got her BA in Art from Reed College, and a BFA from the The California College of the Arts in Graphic Design. Christina has been to more than 100 cities on 6 continents, and used to work as an Art Director in New York, where she made ads for IBM.

Kristal Peters is a native of the Republic of Trinidad and Tobago. She has a background in Architecture and her current focus is on agriculture economics, post-crisis relief, and international development. She is currently working on prototyping models for agriculture and post-crisis shelters. She has a strong wanderlust and enjoys planning trips in her free time.

Cristina Ungureanu came to MIT as a graduate of the University of California, Berkeley, where she studied African economic development and international politics. She was born in Bucharest, and lived in Vancouver for much of her life. Prior to interrogating ecological design and landscape planning, Cristina worked for the Metropolitan Transportation Agency in the San Francisco Bay Area, and sat on the City of Berkeley's Community Environmental Advisory Commission. Cristina is vegan and hosts a supercrust radio show called 'brain punch'.

RESOURCES >

RESOURCES >

Al Baz, Ismail, et al., *Efficient management of wastewater: its treatment and reuse in water-scarce countries*, Springer, 2008

American Society of Landscape Architects Foundation, *Landscape Planning for Energy Conservation*, 1977.

Da Rosa, Aldo Viera, *Fundamentals of Renewable Energy Processes*, San Diego Elsevier Academic Press, 2009

Darby, Stephen and David Sear, Eds., *River restoration: managing the uncertainty in restoring physical habitat*, Wiley, 2008

Davis, Allen P. *Stormwater Management for Smart Growth* / Allen P. Davis and Richard H. McCuen. New York : Springer Science, c2005.

Droege, Peter, *Urban Energy Transition: From Fossil Fuels to Renewable Power*, Elsevier, 2008

Dunnett, Nigel. *Rain gardens : Managing Water Sustainably In The Garden And Designed Landscape* / Nigel Dunnett and Andy Clayden. Portland, Or. : Timber Press, 2007.

Hyde, Richard, *Bioclimatic Housing: innovative designs for warm climates*, Earthscan, 2008

Johnson, Deborah G. and Jameson M. Wetmore, "Technology and Society: building our sociotechnical future", *Inside Technology*, The MIT Press, 2009

Kemp, Roger L., *Cities and Cars: a handbook of best practices*, McFarland & Co., 2007

Kinkade-Levario, Heather. *Design For Water : Rainwater Harvesting, Stormwater Catchment, And Alternate Water Reuse,* Gabriola, B.C. : New Society Publishers, c2007.

Ludwig, Art. *Create an Oasis with Greywater Choosing, Building and Using Greywater Systems* Revised and Expanded 5th Edition. Oasis Design, 2006.

Ludwig, Art. *Builder's Greywater Guide: Installation of Greywater Systems in New Construction and Remodeling*. Oasis Design, 1995-2006.

Per-Arne Malmqvist ... [et al.] Eds. *Strategic planning of sustainable urban water management* / IWA Pub., London, 2006.

Rosenlund, Hans, "Climatic design of Buildings using passive techniques", Building issues; v 10, 1, Lund University, 2001

Rutger de Graaf, Fransje Hooimeijer, Eds. *Urban Water In Japan*, Taylor & Francis, London c2008.

Unknown Author, "Biologia Ambientale", 16 (n. 2, 2002)

Viljoen, Andre, et al., *Continuous productive urban landscapes: Designing urban agriculture for sustainable cities,* Architectural Press, 2005, Oxford, Boston.

Department of Urban Studies and Planning
Department of Architecture
School of Architecture + Planning

Sekisui House, Ltd.
Osaka, Japan

Massachusetts Instiiute of Technology
Department of Urban Studies and Planning
77 Massachusetts Avenue, Cambridge, MA 02139
www.mit.edu