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

Site & Infrasturcture Planning Studio > Spring 2009
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SEKISUI HOUSE

Ecologic Oriented Development (EOD):

GOALS

- To create guidelines for ecologic site and infrastructure design that are derived from a set of site planning objectives

- To address explicit infrastructure principles (example: the use of ecology and natural systems for sewage treatment) and to translate them into design interventions in a variety of conditions, and multiple and scales.

- To create a flexible set of guidelines and typologies that account for site variability rather than providing a single plan.

Ecologic Oriented Development (EOD):
PROCESS

- ANALYSIS of Landscape Units, Mapping and Site Physiography

  Purpose: To establish typical landscape units as a basis for site and housing design.

- ABSTRACTION of Site Characteristics, Natural systems, Infrastructure, Transects

  Purpose: To generate common conditions, constraints, and opportunities for site development.

- FORMATION of Future Scenarios

  Purpose: To address what is unknowable 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' 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

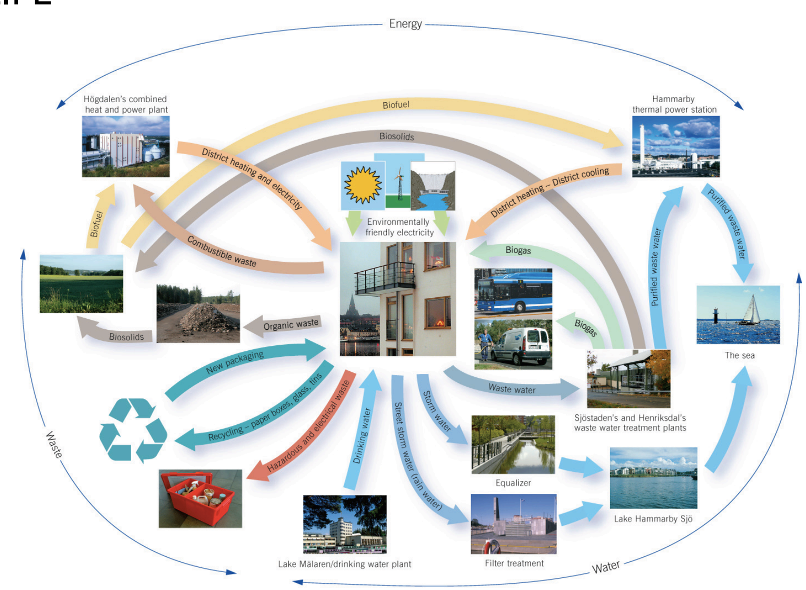
  Purpose: To create exemplary and ideal site typologies for each alternative technology.

- SYNTHESIS through 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)

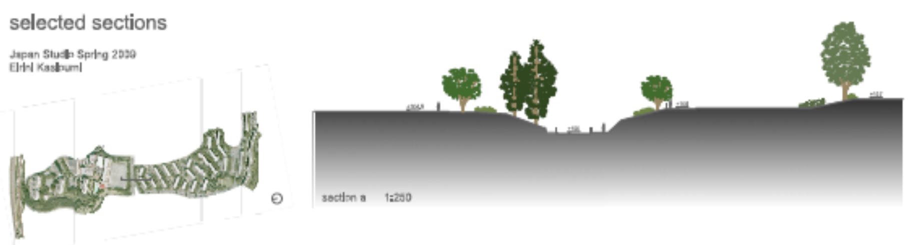
1. COMPLETE WASTE AND WATER CYCLES
2. INTEGRATED INFRASTRUCTURE SYSTEMS
3. DESIGN FOR EFFICIENT ENERGY USE AND GENERATION
4. MAXIMIZE ON-SITE FOOD PRODUCTION
5. ENHANCE MOBILITY AND CIRCULATION
6. RESTORE STREAMS & RIVERS
7. RE-ESTABLISH NATURAL HABITATS and WILDLIFE
8. INCORPORATE INNOVATIVE MATERIALS
9. PRESERVE CULTURE + HERITAGE
10. VALUE EQUITY, HEALTH, + HAPPINESS



Ecologic Oriented Development (EOD):

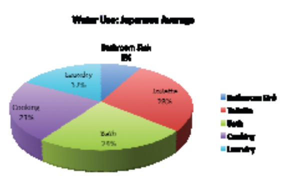
PROCESS
EXAMPLES

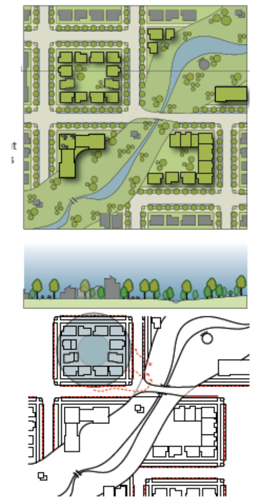
section 3a



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

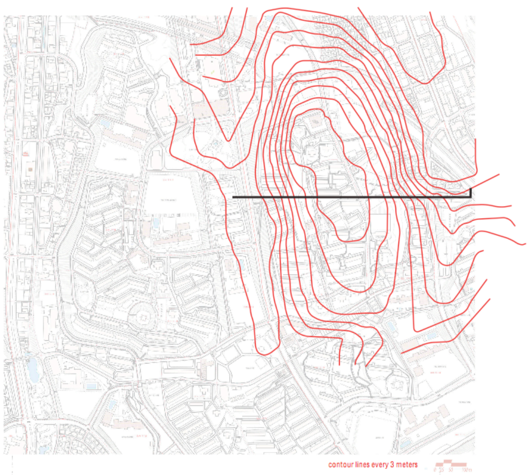


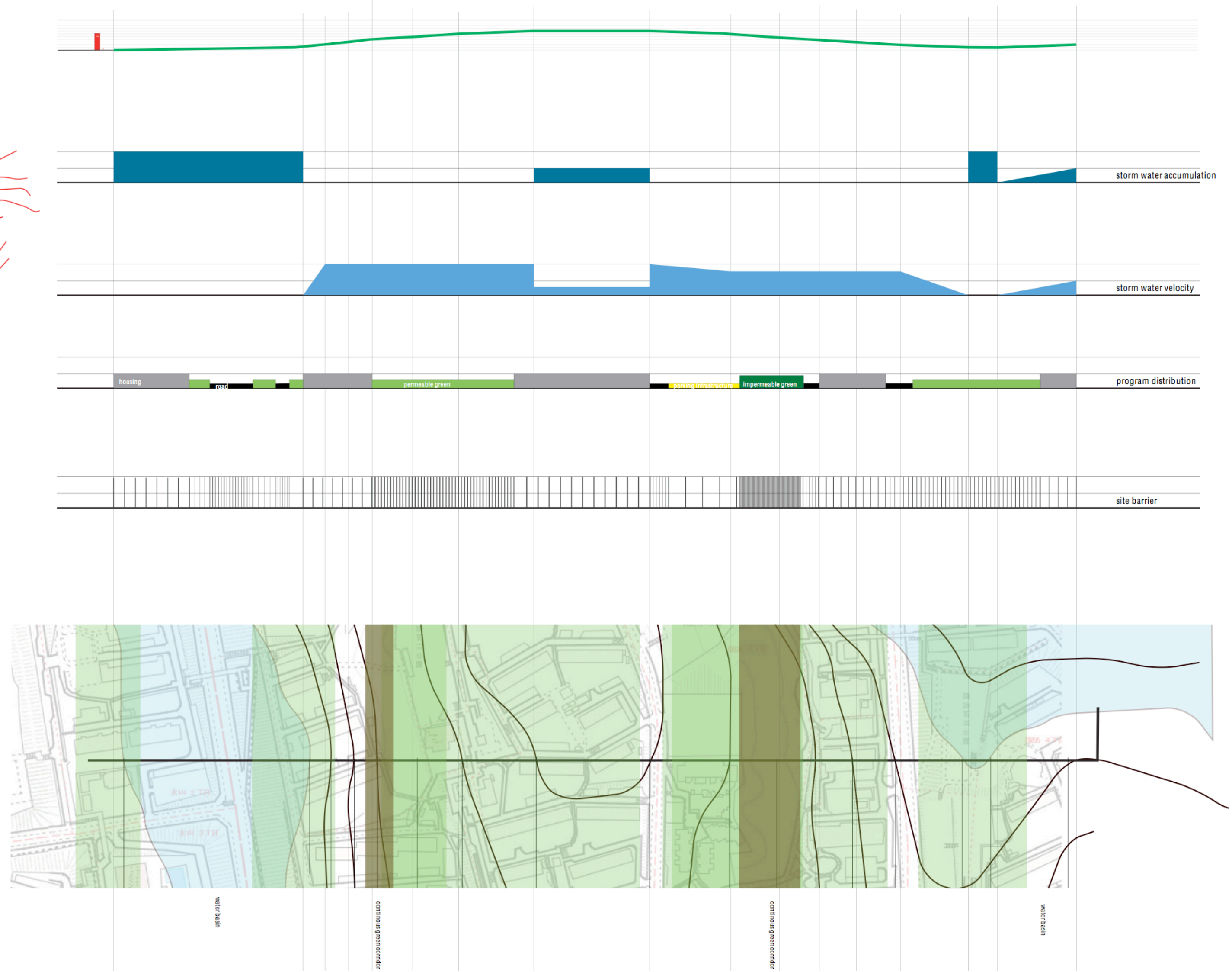


Ecologic Oriented Development (EOD):

Analysis and Abstractions

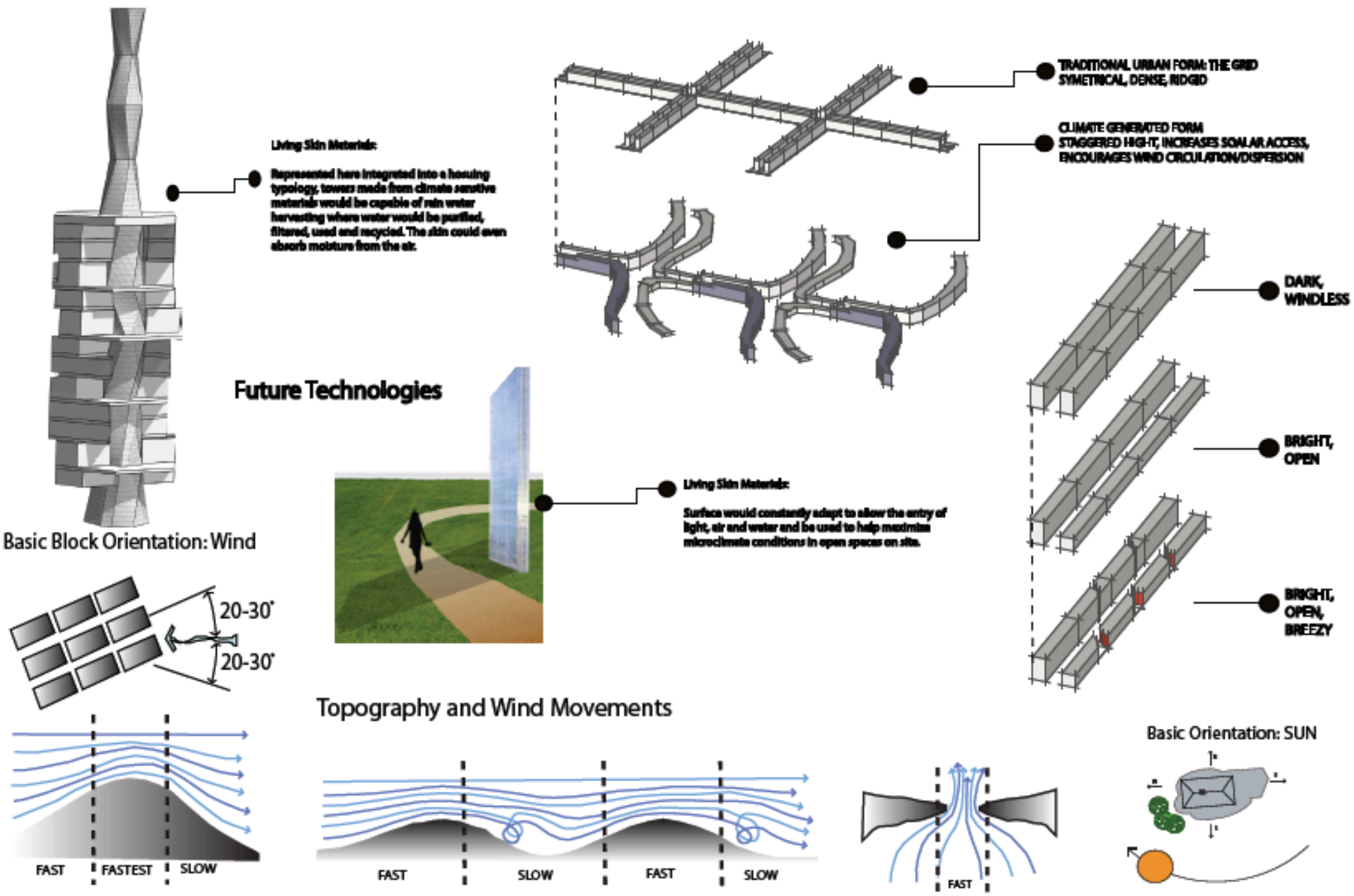
transects





Ecologic Oriented Development (EOD):

Alternative Approaches : climate mitigation



Ecologic Oriented Development (EOD):

Alternative Technologies Driven Typologies: Example - Greywater

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.
- Requires little maintenance.
- Surrounding natural habitat will reap bene t of water supply.
- 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 bene ts from green spaces and gathering places.
- Promotes communal ownership and care for surrounding habitat.
- Surrounding natural habitat will reap bene t 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.

HILLSIDE_TOWNS

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

Pros:

- Engergy consumptions for greywater movement are low.
- Community bene ts 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 bene t 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.
- Di culty adaptating 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 amedities of healthy lifestyles, i.e. fresh air, green spaces within urban context.
- 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 bene ting 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.

URBAN_PUBLIC SPACES

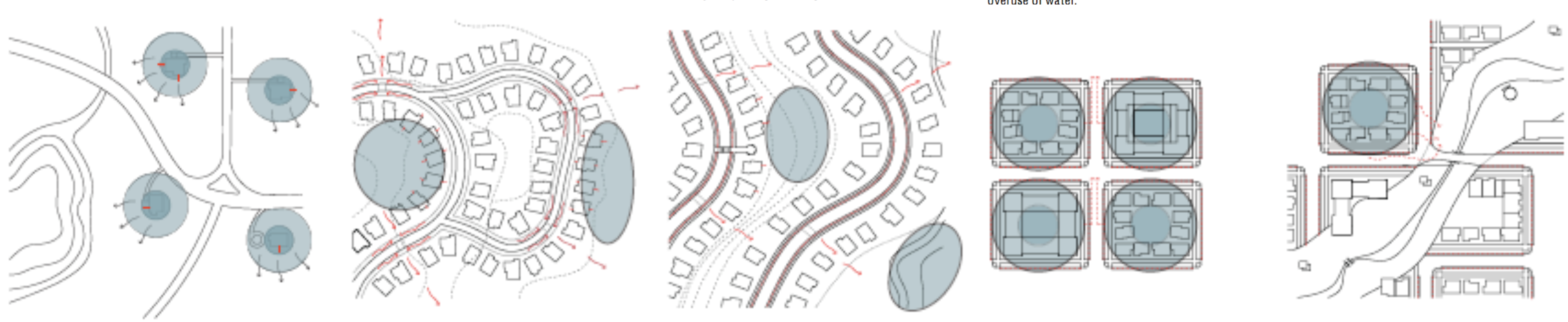
Greywater intervention: Used in public spaces to enhance our living environments before ultimately nourishing the natural habitat.

Pros:

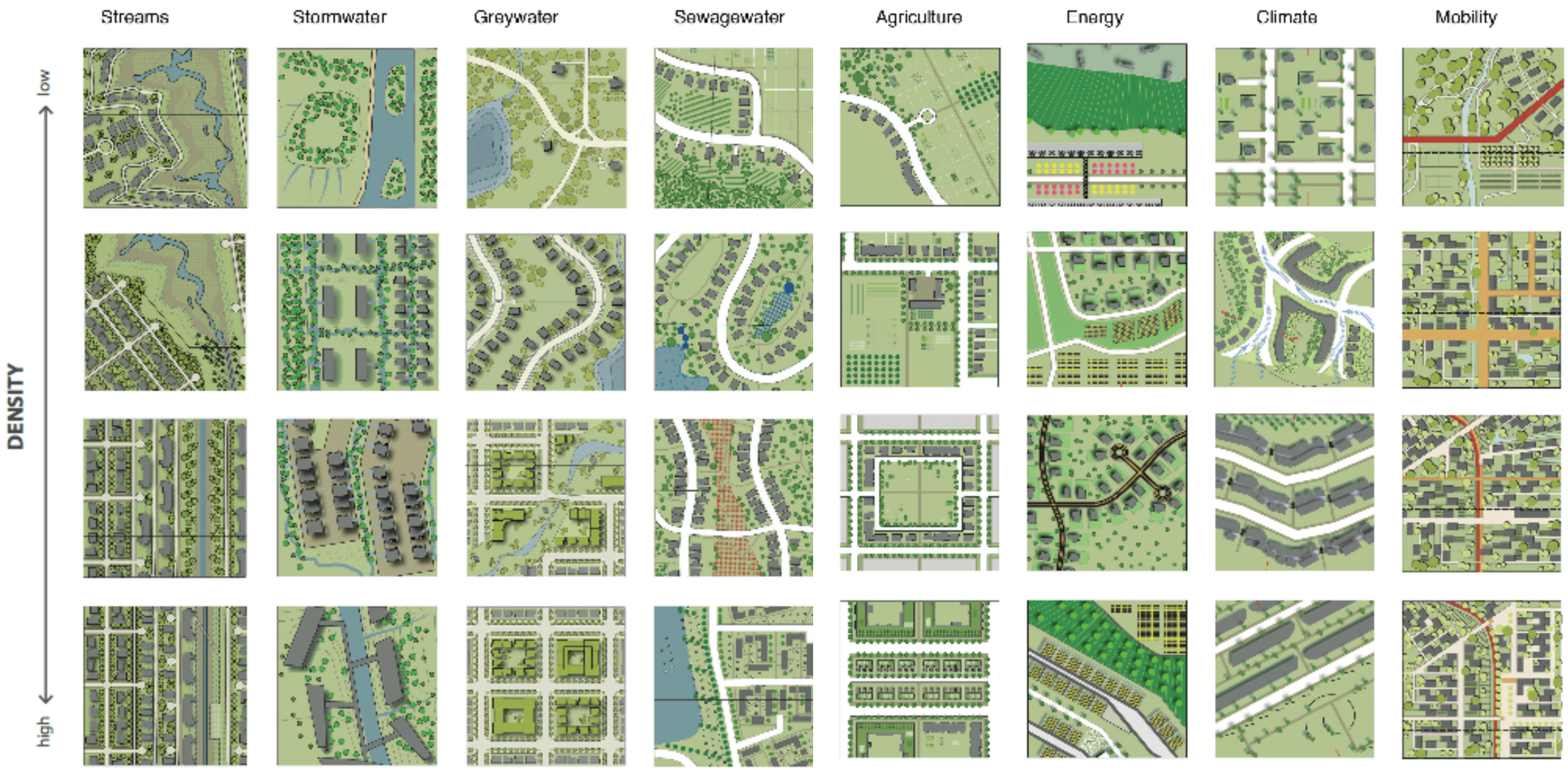
- Communities and general public bene t from green spaces and gathering places within an urban setting.
- Provides amedities of healthy lifestyles, i.e. fresh air.
- Promotes communal ownership and care for green spaces.
- Maintenance taken care of by the city.
- Demonstrates communal patterns of water 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 prior to reaching natural habitat.
- Di culty adaptating to changes in urban form.



Ecologic Oriented Development (EOD):
typologies matrix



Example:

Synthesis - Scalable Integrated Living Systems Module

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METRICS

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

HOUSEHOLD INPUT+OUTPUT

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

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

<u>water needs</u>
- 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

<u>opportunities for water reuse</u>

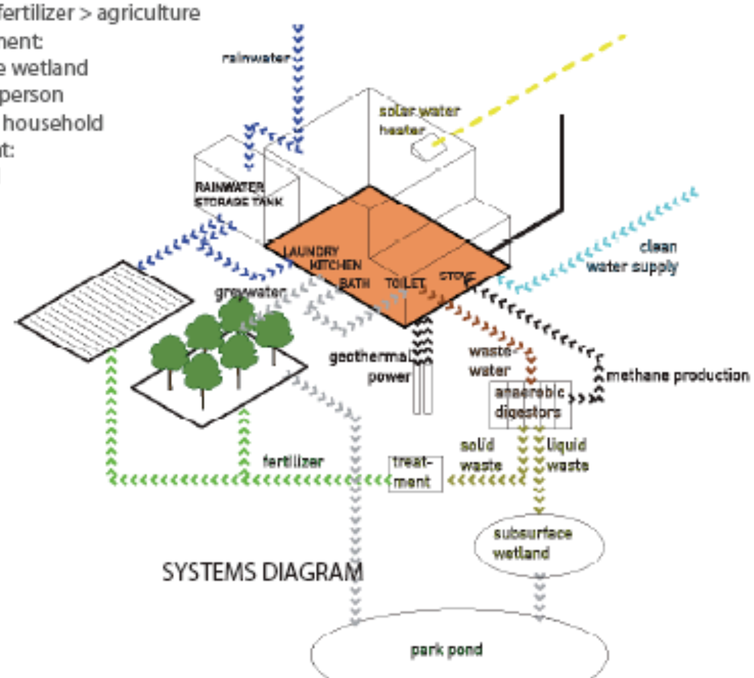
-Recycle water from bath & misc for toilet use
> water input reduction: 28%.
-Store rainwater for agriculture and laundry use
> water input reduction: 17%
-Total savings: 45%

-Total water input after savings: 25 m3

<u>Total water output after savings:</u>

-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

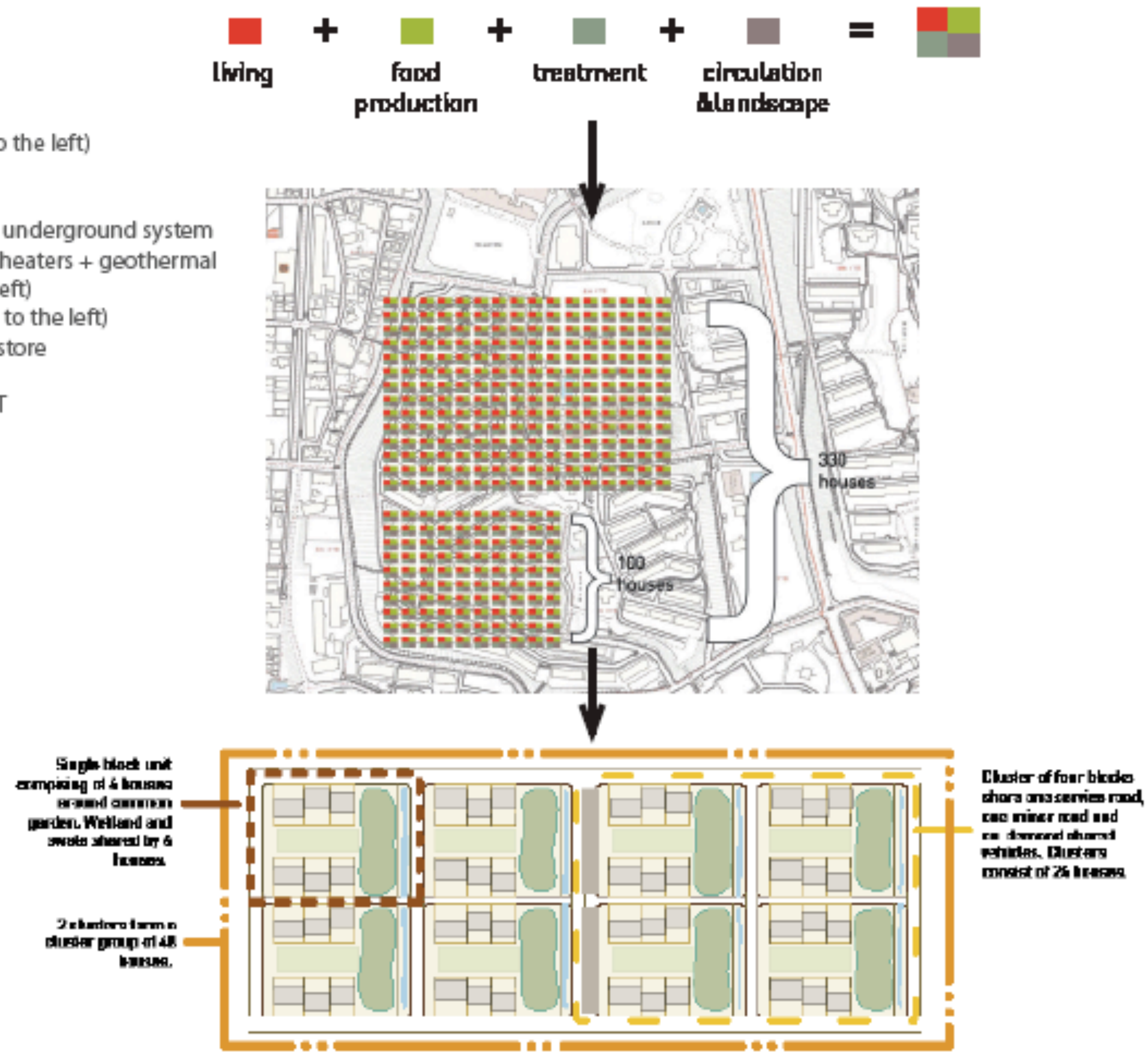
METRICS (CON'T)

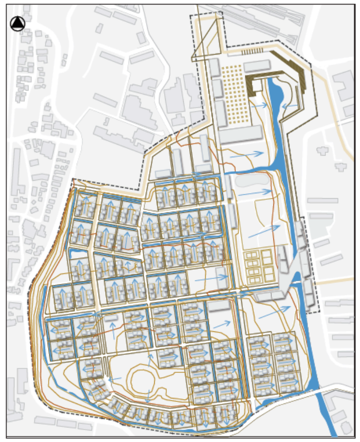
GREYWATER TREATMENT
- direct use in tree cultivation
- remaining: park pond (see diagram to the left)

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





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 neighborhod level.

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