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Scaleable Integrated Living Systems Module

11.304J Site and Infrastruction Systems   Spring 2009   Massachusetts Institute of Technology

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.

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

GRAYWATER TREATMENT
- direct use in tree cultivation
- remaining: park pond (see above)

OTHER HOUSE NEEDS
- heating: geothermal energy through underground system
- hot water and electricity: solar water heaters + geothermal
- gas for cooking: see above
- fertilizer for agriculture: see above
- 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

living + food production + treatment + circulation &landscape =

330 houses

100 houses

Single block unit compising of 6 houses around common garden. Wetland and swale shared by 6 houses.

Cluster of four blocks share one service road, one minor road and on-demand shared vehicles. Clusters consist of 24 houses.

2 clusters form a cluster group of 48 houses.

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SEKISUI HOUSE

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