Hjertelia:
Self Nurturing City

Keywords: care, share, self sustain, resilient cities, biodiversity, ecological building

A. TERRITORIAL CONSIDERATIONS
1. METABOLIC VITALITIES

According to the latest report released this year on August 9 from The Intergovernmental Panel on Climate Change[1], scientists are observing unprecedented and even irreversible climate changes that have already been set in motion. Limiting climate change demands strong and continuous reductions in greenhouse gas emissions from human activities. This feat requires solidarity, innovative solutions, and sustained action to support climate resilient growth while fostering environments for a livable future.

We believe that nurturing development rooted in principles of Care for the environment and each other, Sharing of available resources and amenities, and Self Sustaining life through closed consumption loops will prove central in the years ahead. The Self-Nurturing City proposal will rely on renewable energy, renewable and recycled construction materials with a low emergy footprint. The design offers closed consumption loops to promote resilient, local production and a circular economy that is considerate of the impact of industrial grade agriculture and non-native crop production.

2. INCLUSIVE VITALITIES

Studies show an 83% urban population ratio in Norway, with 41% of the population between 25-54 years old and a growth rate of only 12 births per 1000 population[2]. Families with children tend to have two, so a typical family size would include 4 members.

As seen in Figure 1., we studied housing typologies in Oslo and Hønefoss as well as other cities in Norway, prior to taking any design decisions. Based on the rate of urbanization and population growth as well as existing demographics, we developed housing typologies that follow successful living paradigms, but in addition, promote inclusive narratives across scales and generations, and offer new forms of participatory democracy.

B. URBAN DESIGN

Intelligent urban planning which celebrates and conserves bio diversity, is aligned with the surrounding natural environment and favors the existing weather conditions over heavily conditioned spaces provides a healthy paradigm that preserves and nurtures our planet.

1. CARE
1.1 CONNECTION TO ENVIRONMENT

Caring for natural environments and repairing vulnerable landscapes requires the cultivation of synergies with context and surroundings. In this proposal, vehicle traffic is restricted to bus and single lane vehicle thoroughfare connecting the district to neighboring communities. Speeds are reduced via a natural cobblestone road, minimizing vehicle traffic, and supporting pedestrian movement.

Permeable, soft pathways of packed earth are created to facilitate light pedestrian mobility in all other areas, such as what would be needed for strollers, bikes, or wheelchairs. These soft pathways are oriented in the North-South axis, located between the buildings, and connecting to neighborhood plazas and urban nodes. The North-South paths are flanked by deciduous street trees, especially the Norwegian Birch, a tall and slender tree that will provide shade

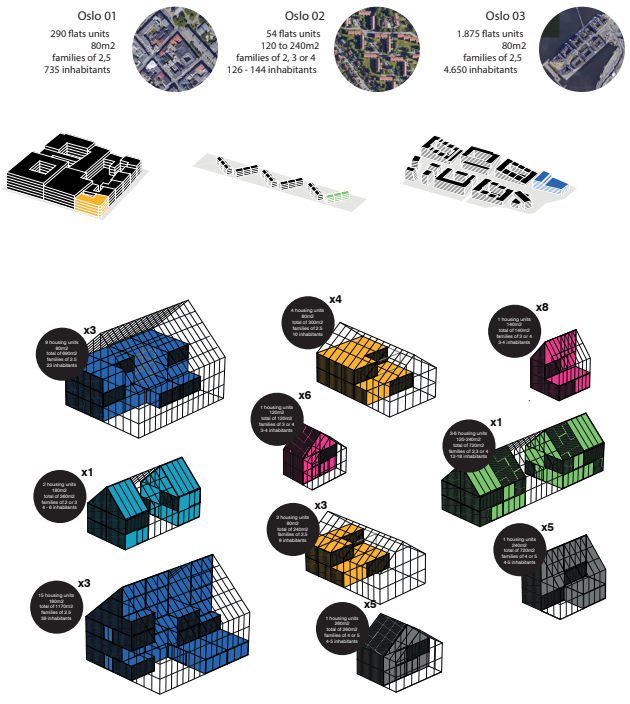

Figure 1. Studies of housing typologies in Oslo and Hønefoss (top). Proposed housing typologies for Hjertelia (bottom). Housing clusters incorporate residential types noted in studies and adjust them to densities and co living principles compatible with Hjertelia.

for the streets in summer and allow precious sunlight through during winter.

1.2 BIODIVERSITY

Site specific studies related to indigenous plant and animal life were carried out in advance of design. The urban section in Figure 2. was then designed to care for vulnerable flora and fauna, respecting their contexts and celebrating their presence. Existing forestlands were preserved to sustain microhabitats for indigenous trees, which in turn house a variety of birds, squirrels, chipmunks and other small animals. Local herbs, grasses and flowers are planted in neighborhood plazas, supporting life for bees and butterflies. Cultivated ponds create quiet places for contemplation and connection to nature, while offering a home for beavers, dragonflies, ducks and a watering hole for the more shy animals like wolves, moose, deer and foxes.

1.3 ECOLOGICAL PRODUCTIVITY

This proposal offers a sensitive and site-specific architecture which preserves a substantial amount of existing agricultural plots and balances developed areas with permaculture gardens.

These open-air urban gardens are located within neighborhood plazas encircled by the built environments. Replacing key Norwegian oil imports such as rapeseed, sunflowers and some types of berries, the permaculture beds are also ornamented with local wild herbs and flowers. Such herbs and flowers sustain honeybee hives and provide valuable organic honey and by-products.

With the intention of conserving existing forestlands and micro ecologies, trees are preserved on site and forest range is untouched. The site fringes are populated with carefully tended forest agriculture; the planting is resilient to the local climate and flourishes even with the region-specific daylighting constraints.

2. SHARE

2.1 INCLUSION AND ACCESSIBILITY

This proposal showcases design choices which support sharing with, and caring for, one another's neighbor. Residents decide on the layout of their apartments as well as shared common areas within the protected greenhouse spaces.

Inclusion and shared access grow from design principles in which community social spaces and workspaces are cultivated to encourage common use and interaction. Minimal private interior spaces and personal access decks are balanced out with lively work and productions spaces, including fablabs and makerspaces, coworking offices and workshops. This paradigm shows how human, social, environmental, and economic needs can be met in a symbiotic way that reduces the human footprint and enriches daily life while accommodating urban densification.

2.2 WELLBEING

Shared living allows for infrastructure which promotes health and well being through flexible use of common spaces and shared use of luxury spaces. The Self Nurturing City proposal encourages community participation and decision making related to shared spaces within a greenhouse complex. From sunken fireplaces to saunas and yoga and dance studios, each complex incorporates amenities favored by residents.

Healthy social spaces exist within a gradient of private interior to local exterior and urban public spaces. Interior facilities align with the needs of inhabitants related to services, production, craft, health and much more, and are accessible on the ground floor to locals in neighboring complexes. Neighborhood plazas encircled by housing complexes offer shared social and activity spaces including playgrounds, performance spaces and outdoor sports. The urban fabric offers 3 urban scale plazas along the cobblestone road and market hall which are in turn flanked by local commercial spaces including restaurants, cafes, local boutiques and crafts and much more.

Figure 2. An urban section designed for nurturing nature and promoting healthy connections to the environment.

2.3 MOBILITY AND SAFETY

Shared mobility infrastructure is implemented within the urban limits of the proposal. Broad and rectilinear pathways of packed earth facilitate pedestrian access. Three electric bicycle sharing stations are located at Southeast, Southwest and Central North ends of the project. There is an electric car sharing station on the perimeter of the district, connecting Hjertelia with Hønefoss. Vehicle access is obstructed beyond this point, except for connections through to nearby communities. Two bus stops at the city limits allow for public transportation.

Co living spaces also promote trust and safety, as residents grow familiar with each other and assimilate new members into the community. Strangers are easily identified and co ownership limits access of nonresidents within housing complexes.

3. SELF SUSTAIN

3.1 CLOSED CONSUMPTION LOOPS

The Self Nurturing City intends to close the organic waste loop by collecting and storing organic waste beneath the housing podiums for composting. The produced compost is then distributed throughout the greenhouse orchards and rooftop gardens as natural and organic fertilizers to support plant and vegetable growth.

The average annual rainfall of approximately 966 mm per year[3] is collected and stored beneath the housing podiums. These reservoirs are purified and pumped into housing units for consumption, and the resulting grey water is transferred to the large plant beds, which cleanse and take up nutrients in the wastewater and convert it to fruit and vegetables. This greenhouse system closes the loop for local recycling of sewage waste, so there is no need for connection to a municipal sewer.

A hydropower plant taking advantage of the Hønefossen waterfall on the Begna river will be the main energy provider, using a renewable and passive energy source. Supplementary energy needs will be supported by renewable energy produced from wind farms located in Vestlandet (under 100 km distance) and Kvinesheia (under 300 km). Heating and cooling needs are reduced through intelligent design and thermodynamic strategies, sequestering heat in cold months, and privileging cross ventilation and atrium cooling flows in warm months.

3.2 0KM FOOD

According to the Food and Agriculture Organization of the United Nations, Norway imports more than half of its food needs, and the government offsets this demand by heavily subsidizing agriculture.[4] 90-99% of the food energy consumed in Norway comes from crops that are not native to that region[5], including agricultural staples such as soybeans and wheat, vegetable oils including rapeseed, mustard oil, vegetable waxes and beeswax, tree nuts, tropical fruits, grapes and berries and cocoa.

As shown in Figure 3., The Self Nurturing City proposal includes a boost of domestic growth for several of these staples through innovative production strategies. Using existing domestic orchard farms such as those in Vestland, Telemark, Viken, and Rogaland counties as inspiration, this proposal will house greenhouse orchards of fruits and berries on the ground floor of housing complexes. Nut trees and hardier fruits such as apples will be cultivated through forest gardens, and vegetable oils such as rapeseed will be produced through permaculture gardens in parallel with a diversity of flora to support beehives. Permaculture gardens are intended to also create dynamic and lively green spaces in between the housing complexes. Rooftop gardens will house staple vegetable production, including tomatoes, cucumbers, leafy greens and many root vegetables.

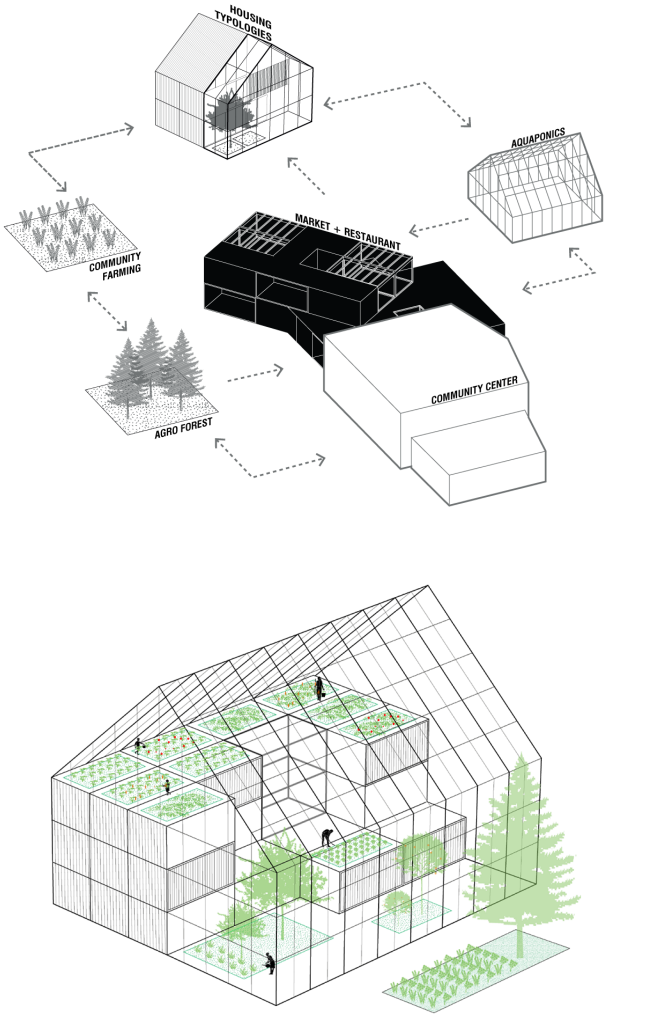

Figure 3. Farm to Table local production and consumption of typically imported agricultural staples (Top). 0 km food production types within and around a single housing complex (Bottom).

Production will also take place at an industrial scale, with 4 vertical aquaponic greenhouses offering produce to the local market throughout the year. cross ventilation and atrium cooling flows in warm months.

3.3 ECOLOGICAL ENVELOPES

At an urban scale, all buildings are oriented direct south to optimize solar gains and sustain growth. Buildings are placed with a minimum of 12m distance back to front, to ensure solar capture. Building alignment and spacing are optimized to enhance East and West.

Taking advantage of the existing slope, the buildings are partially submerged, housing water and organic waste collection within the slope, and residential units facing south with direct access from streets. Buildings consist of a massing surrounded by a glass shell - the greenhouse. The greenhouse insulates the inner massing, creating a warmer climate and sheltered “outdoor space” from the northern winter. In warmer months, the glass roof and entrances are mechanically opened, facilitating natural air ventilation and passive cooling.

Material sourcing were carefully considered in this proposal. Wood, the primary material for cladding and all interior partitioning as well as non-load bearing glass dividers is sourced from locally sourced from BTA, only 45 km away. Slightly further at approximately 60 km, glass is sourced from the Norwegian producer Oslo Glass. To reduce the ecological footprint of the necessary metal structure, recycled aluminum is used instead of steel, and is sourced from Hydro Norsk Aluminum, a leading industrial company committed to a sustainable future.

Considering construction costs and future maintenance complications, all housing complexes are built from prefabricated timber units with intelligent joinery systems which minimize metal bolting and joints. Each unit is 4 x 3 x 4 meters to fit within available timber lengths.

4. DESIGN FOR A TIME OF UNCERTAINTY

The proposal of The Self Nurturing City occurred in a constrained amount of time, so the programming and development of a design solution can be overwhelmed by more complex problems. Still, for any given design it is possible to determine what represents the known and unknowable conditions and projections, and to recognize how such limited knowledge impacts the quality of design decisions.

In our approach, we rooted the design process in fundamental principles of a livable future: Care, Share and Self Sustain.

ENDNOTES

1. United Nations, “The Intergovernmental Panel on Climate Change Climate Report”, Climate Action, accessed September 16, 2021, https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/
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4. Food and Agriculture Organization of the United Nations, “Norway” FAO, accessed July 18, 2021, http://www.fao.org/3/y4325e/y4325e0a.htm.
5. Crop Trust, “Country: Norway”, Global Crop Diversity Trust, accessed July 20, 2021, https://www.croptrust.org/country/norway

Figure 4. Greenhouses oriented South to benefit from optimal solar gain. Building thermodynamics reduce heating and cooling needs.