ENERGY COLLECTIVES: TOWARDS A SELF-SUSTAINING NEIGHBORHOOD
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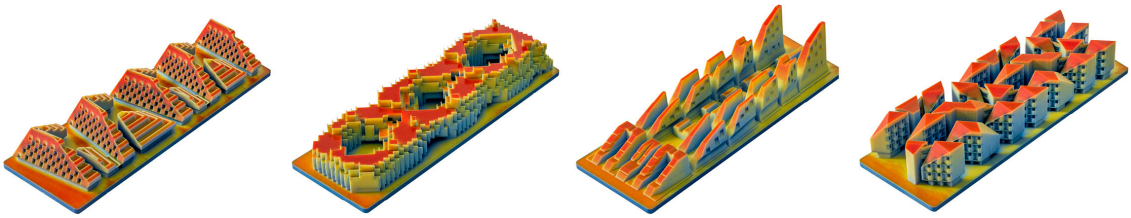

City block housing proposals mapping yearly solar radiation - IDC funded studios. Blough & Giostra, 2019-21

Abstract: Our seminar and design studio call for radical new models of inhabitation, production, and protection of vital ecosystems by pairing objective environmental analysis with speculative architectural scenarios. A model for a self-sufficient settlement located on the city's periphery will integrate overlapping scales of production and conservation. Animated by new modes of co-living, working and shared resources, it will provide a roadmap for future growth of the city and its environs.

Form: Energy performance in buildings is form dependent—addressing resource scarcity and environmental degradation demands a new design aesthetic and formal approach based on ecological inputs and necessity.

Funded by the Institute of Design and Construction in 2019-21, our recent series of undergraduate research studios investigates the relationship between the building form and energy performance, using form-finding algorithms based on solar radiation to shape mid-rise housing typologies for New York City. The work was structured to explore how solar design principles (active and passive) paired with formal models can supplant the reliance on mechanical systems and achieve comparable results in terms of energy performance and visual comfort. The research attempts to recast the ongoing debate on sustainability from a preeminently architectural position. Its overarching ambition is to identify a specific, measurable relationship between geometry—the traditional domain of the architect—and energy use along with GHG emissions. Our proposal for 2022 Course Development Prize seeks to extend the scope of this research to the periphery of the city, investigating radical new models of inhabitation, production, and protection of vital ecosystems. A focus on the design of self-sufficient settlements will encompass overlapping scales of production and conservation infrastructures.

Scope: Food, Energy, Water and Waste (FEW^2) are four vital infrastructures that will have to be radically redefined in order to effectively tackle the climate and energy crisis.

Modern cities are the result of a fundamental separation of places of consumption and remote places of production, where surpluses of food, energy, water and waste are created to support city development enabled by vast supply chains. The impact of cities on places that support them are reaching extraordinary proportions and threatening a drastic reduction of bio-diversity, air and water quality, and the depletion of natural resources. We have outsourced our dirty functions to locations as far away as the countryside and as close as the city's periphery, sacrificing large areas of land that disproportionally affect low-income and minority communities.

The studio calls for responsibly reintegrating co-production activities within the city, taking advantage of on-site renewables in parallel with the development of collective dwelling settlements. Co-live and work programs can be supported by harnessing sustainable resources such as solar energy production (electricity and hot water), organic farming (food production and composting), and water collection (retention and reuse). Distributed energy micro-generation, for instance, offers thermal gains and reduced line losses without the air pollution, noise, and visual impact associated with

centralized models. Buildings can transform into resilient micro-power plants and car charging stations, empty lots and warehouses into farm collectives, parks and plazas into flood areas and stormwater storage, and kitchens into social hubs and compost depots. Implicit in this notion is that architecture should reclaim a central role in organizing these infrastructures. What conflicts and symbiotic relationships emerge from these different networks, spaces and processes? What types of novel building forms and social organizations will result from the provocation of hybridizing co-production programs with those of multi-family dwelling?

Scale: Systems such as on-site energy generation, food production and co-housing each requires a discrete scale of application based on the needs and populations of the settlement and its neighbors.

Over the next few years, all new construction in the EU will have to be nearly Zero Energy Building, with a target of carbon neutrality by 2050 (The Green Deal, Climate Law). Because of specific scales associated to energy production, the traditional size of building lots in the city is not sufficiently large to achieve the Zero Energy mandate. Similarly, current levels of food production and waste processing practices cannot sustain population densities of cities like New York without devastating consequences for the environment. In short, the new energy paradigm calls into question the very premise of the city—its high density. The studio offers an alternative to the 19th century city and suggests a less dense “middle-scale” that seeks novel and sustainable integrated models. These questions come into deeper focus in a post-COVID world, where many are choosing to work remotely (at least part-time) and electing to live farther away from the city center and cultural centers. How do we balance the collective opportunities that spatial proximity offers such as knowledge sharing, diversity, and social capital (15-minute city concept) with the potential for new settlement patterns outside of the city center? How do we responsibly manage the land in lower density development to protect and enhance productive ecosystems?

Work Plan: We are currently researching site locations in and around southern cities such as Atlanta, GA and Austin, TX to be determined before the fall of 2022. Both of these regions are actively grappling with smart growth strategies, pressing needs for increasing density with affordable housing, along with sustainable land use and resource management.

An elective seminar (semester #1) will be taught to research the relevant components of the settlement and produce specific data on the qualities, dimensions, applications, scales and outputs of each system. A set of “graphic standards” and diagrams will be produced to create the parameters for informed design thinking as a foundation for the studio (semester #2). All work for both semesters will be done in student teams organized by research topic. Components, systems and applications to be studied in semester #1 include: farming and greenhouses (hydroponics, composting, farmer’s markets, greenspace and wildlife corridors), power generation (photovoltaics, solar thermal and geothermal), water collection (filtration, storm water retention and water reuse), co-housing and collective living models (existing suburban housing models, post-familial households, internal organizational models, shared kitchens and co-working spaces), electric vehicle charging stations (spacing for cars and mopeds, charging points and energy usage). Opportunities for hybridizing systems will also be studied e.g., greenhouse plus heat capture and hydroponics plus aquaponics.

The studio (semester #2) will be divided into “practices” where three scales will be introduced to investigate the energy and organizational implications of the different formal strategies: siting and settlement morphology (infrastructure, site planning and land use), building mass and solar capture (building form and solar optimization), building organization and collective models (building program and social space). Each practice will be paired with a software workshop to teach analysis and simulation tools (arcGIS, Grasshopper, Ladybug and Honeybee) along with a class lecture and readings to create historical, cultural and technological context for the research (utopian settlements, eco-villages and housing cooperatives). Our research is also supported by an exchange program between Pratt and Politecnico di Milano (Department of Construction Engineering) to share content

and technical expertise such as environmental analysis applications/workshops and design parameters for passive/active solar systems.

Selected Readings

Energy, Form and Environment

Barber, Daniel. “Experimental Dwellings”. *A House in the Sun: Modern Architecture and Solar Energy in the Cold War,* 2016

Baker, N., Steemers, K. *Energy and Environment in Architecture: A Technical Design Guide*, 2000

Fernández-Galiano, Luis. “Thermal Space in Architecture”. *Fire and Memory: On Architecture and Energy,* 2000

Kim, Janette. *The Underdome Guide to Energy Reform*, 2015

Knowles, Ralph. *Energy and Form: An Ecological Approach to Urban Growth,* 1972

Lechner, N. *Heating, Cooling, Lighting: Sustainable Design Methods for Architects*, 2015

Menti, P., Gadola, R., Hoger, C. “Energy Follows Form: Design Parameters & Energy Use”. *Detail Green*, 2001

Olgyay, V., Lyndon D. *Design with Climate: Bioclimatic Approach to Architectural Regionalism,* 2015

Probst, M., Roecker, C. “Integration Possibilities in the Building Envelope”. *Solar Energy Systems in Architecture*, SHC, 2012

La Roche, Pablo. “Solar Geometry”. *Carbon-Neutral Architectural Design*, 2017

Housing, Collectives and Sustainable Cities

Chermayeff, S., Alexander, C. “Anatomy of Urbanism”; “Anatomy of Privacy”. *Community and Privacy*, 1963

Berger, Alan. “Landscape, Urbanism and Waste”. *Drosscape: Wasting Land in Urban America*, 2017

Fuller, Buckminster, Snyder, Jaime. "The Future". *Ideas and Integrities*, 2009

Hayden, Dolores. “Edge City, Heart City, Drop City”, *Seven American Utopias*, 1976

Lynch, Kevin. “A Place of Utopia”. *Good City Form,* 1981

Maak, Niklas. “After the House, Beyond the Nuclear Family”; “Transformations of Privacy”. *Living Complex: From Zombie City to the New Communal*, 2015

McLaren, D., Agyeman,J. “Co-Production in the Conventional Economy”; “Growing Together or Growing Apart”. *Sharing Cities: A Case for Truly Smart and Sustainable Cities*, 2015

Moussavi, Farshid. “Residing 1922-2012”. *The Function of Style,* 2012

Otto, Frei, and Berthold Burkhardt. *Occupying and Connecting: Thoughts on Territories and Spheres of Influence with Particular Reference to Human Settlement,* 2009

Per Fernandez, A., Mozas, J., Ollero, A. *10 Stories of Collective Housing*, 2013

Rudofsky, Bernard. *Architecture Without Architects*. New York: MoMA, 1964.

de Sola-Molales, Ignasi. “Terrain Vague”. *Anyplace*, 1995