Street Life, Private Life: modeling the resource cost of supplying food in New York City

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Summary

Working through case studies at the scale of the individual consumer and home in typologically diverse locations in New York City, our research aims to bridge the gap in urban metabolic analysis of food systems between point of sale and waste stream. Our unique visualization and analysis also explores the interdependencies between spatial pressures driven by the high cost of land in New York City, and the material intensity of food supply.

Tracking Food Distribution in Spatial Terms

There is a wealth of recent work using GIS and other mapping techniques on food distribution in New York City (ie NYD Department of Health and Mental Hygiene, 2008-10; Conard and Ackerman/UDL, 2011). There is also excellent research on domestic waste gathered using GIS and smart tags (Trash/Track project, MIT Senseable Lab). We operate in the knowledge gap between these two research contexts. Our research takes the unique perspective that the spatial conditions under which people live offer an untapped source of information on the way food travels through the system and its resource cost in GHG emissions, primary energy cost and potential for waste creation. From package dimensions to delivery vehicle type, purchasing habits, home storage capacity and waste produced, the impact of the size, configuration and density of private domestic spaces on food efficiency augments existing studies and exposes a new set of parameters for decision making.

As a tool to be used in modeling urban metabolism, the use of visualization that foregrounds the urban spatial context can greatly accelerate the ability to make inferences and support intuitions, acting as a preliminary data filter within mathematical modeling practices. By visualizing resource flows as they interact with infrastructure, spatial configurations, and users of different types, we can assert a strong paradigmatic quality to our contextualized case-study based findings.

Background

Conventional wisdom tells us that cities arose in response to the surplus produced elsewhere: surplus gave rise to trade, trade gave rise to centralized marketplaces which in turn gave rise to cities. But the story could be told quite differently, as Edward Soya has done in his brief article *Putting Cities First*(Soya, 2008)*.* Soya argues that it was the rise of the cities, which motivated the creation of hinterland surplus. In other words, cities are not the flowerings of the hinterland's opulence and largess but instead, arose because they asserted their demands on the resources around them. In either scenario, it is clear that cities have never provided the basis for their own carrying capacity; their productive landscapes were always extraterritorial. This relationship is particularly important in projecting a more sustainable city/hinterland exchange: to what extent and under what conditions of consumption should the city inspire the hinterland to surplus production?

Furthermore, in the rhetoric of sustainability, there is a prevailing assumption that urban spaces are inherently efficient because they are more compact. This claim can be staked largely because the hinterland implicated has more than ever become subsumed in abstract supply chains and material flows. To insure its existence, the city regularizesresource volatility by re-scripting material flows. It deflects its spacesand spatial practices over time to the relative ease of resource delivery: changes in the city's physical form tracks the priority given to resource delivery relative to the other capital, political and individual forces that drive urban transformation.

In high-density cities such as New York City in which space is at a premium, the weight allocated to resource efficiency tends to pale in comparison to property value drivers. Resource flows in New York City, where we have focused our work, have been largely reconfigured to conform to spaces that prioritize property value maximization. This results in small living spaces: on citywide average, there is less than 50m2/capita of residential floor area (New York Property Tax Report, 2011). That number is even smaller in less affluent districts.

Using a palette of sustainability metrics within this dense city environment, our research interrogates the implications of scaling down food distribution to fit these small domestic spaces while serving growing demand.

Methodology and Case Studies

Working with a combination of mapped data flows/GIS and observed flows/open source geolocation (eg. Instagram, empirical data collection), the research presented in this paper aims to create new intelligence on the interface of food flows at macro and micro scales, and identify efficiencies and redundancies created by urban compaction. Placing tangible evidence and aggregated data in immediate contrast is a critical step to negotiate the vast variations in urban flows over time and to correct for the generalizations inherent to aggregated big data.

We have completed initial microscale mapping of food resource flows in four New York City households. These are typologically diverse: a low-rise converted townhouse in East Harlem; a 1950s high rise residential tower in West Harlem; a pre-war apartment house in Morningside Heights; and a converted industrial space in Williamsburg. The occupants of each case study apartment are also typologically different:a couple, a family with teenager, a single occupant and a group of roommates.

To contextualize our case study findings in the city's larger food resource flows, we have used data from public (NYC MTA, DCP, DOITT; US Census) and private (MapPLUTO, American Community Survey, ReferenceUSA) data sources. This GIS-formatted information is cross referenced with microscale mapping of human flows performed by research assistants using open source and prioprietary software as diverse as Instagram, AutoCAD, ArchGIS, Rhino and SolidWorks, among others.

Outcomes and Conclusion

Considerations of small apartment living strongly impact food resource intensity through size and quantity of packaging, frequency of shopping trips and the nature of both supply and waste infrastructure. Spaces allocated to the preparation and consumption of food also impact the lifestyle decisions made by apartment dwellers, and the resulting resource cost of eating. On-line shopping, prepared food, take-out and restaurant dining are one half of this equation; proximity to farmers' markets, CSAs, composting and recycling facilities and dedicated food consumption and preparation spaces are the other. By depicting the factors influencing the production of domestic waste in the food supply chain, and by measuring the "missing link" in larger infrastructural studies, our research represents a first step in creating a valuable knowledge base for regulating supply-side waste production in urban food supply chains.

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