The Square-Mile City: Environmental and Social Equity through Proximity

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Sarah Dunn Spring 2010 Research Studio
Master of Architecture Thesis Research
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PREMISE
This introductory chapter validates the theme of my proposal as a relevant response to the topic of this research seminar and studio. Historical and current issues are considered as a bases for emphasizing particular issues addressed that lead to interventions in at multiple regional and urban scales.
Proposing to relocate the world’s almost 1 billion water refugees to the great lakes/rust belt region of the United States raises many issues involving a multi-national and multi-cultural diaspora. Those of the most importance deal with socio-cultural identities, resource management, urban planning, land use, economics and social interactions among these displaced peoples. With super-high densities as a central theme, the topic of environmental justice becomes of the most relevance regarding such a large scale planning and design proposal. Historically, environmental racism has been used by those in power to leverage access to environmental resources while disenfranchising other racial and ethnic groups, which had been designated as “environmental others” or “environmental lepers” and forced to live in the most undesirable areas. The goal of this proposal is to consider the possibility of the city as neighborhood. This proposal results in a high-density compact city in which the various socio-economic classes exist within a “tight network” in order to allow equal access to resources. The intent is that the “fear of the unknown” and the “contempt for outsiders” will be reduced or eliminated when people from various backgrounds are afforded the opportunity to co-exists as neighbors, therefore allowing the exchange of resources and interactions on a level playing field. This project is the breaking of social barriers: the dismantling of the gated community, the smashing of the white picket fence, and the destruction of the ivory tower. The theme is equal access through approximation.
### Diasporas: Migratory (Voluntary) and Forced

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Group</th>
<th>Type</th>
<th>Reason</th>
<th>Scale</th>
<th>Re-location</th>
<th>Area</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Atlantic Slave Trade</td>
<td>1519 to 1867</td>
<td>Sub-Saharan Africans</td>
<td>Forced</td>
<td>Economic (Labor) + Socio-Racial</td>
<td>10,000,000+ people</td>
<td>The Americas</td>
<td>30,000,000 sq.km</td>
<td>3 ppl/sq.km*</td>
</tr>
<tr>
<td>The Indian Diaspora</td>
<td>c. 1875 to present</td>
<td>Asian East-Indians</td>
<td>Voluntary</td>
<td>Economic (Employment) + Social</td>
<td>25,000,000+ people</td>
<td>Global**</td>
<td>36,200,000 sq.km**</td>
<td>1.45 ppl/sq.km*</td>
</tr>
<tr>
<td>The Holocaust</td>
<td>1933 to 1945</td>
<td>Jewish</td>
<td>Forced</td>
<td>Political, Economic (Property), + Socio-Racial</td>
<td>9,000,000+ people</td>
<td>Non-Nazi Europe, the United States, and Israel**</td>
<td>19,334,000 sq.km***</td>
<td>2.15 ppl/sq.km*</td>
</tr>
<tr>
<td>Three Gorges Dam Project</td>
<td>1990s to 2007</td>
<td>Chinese</td>
<td>Forced</td>
<td>Economic (Energy)</td>
<td>1,240,000 people</td>
<td>Hubei Province, China</td>
<td>185,900 sq.km</td>
<td>6.67 ppl/sq.km</td>
</tr>
<tr>
<td>This Proposal</td>
<td>2010 to 2050</td>
<td>Global Water Refugees</td>
<td>Voluntary/Force</td>
<td>Survival</td>
<td>1,000,000,000 people</td>
<td>Great Lakes Region, United States</td>
<td>519,270 sq.km*** in*</td>
<td>1.926 ppl/sq.km*</td>
</tr>
</tbody>
</table>

*This density number only considers the approximated total number of slaves transplanted, with equal distribution, throughout the total land mass of the Americas (north, middle, and south America) excluding the land areas of Canada, Alaska and Greenland - the locations where slavery from the Atlantic slave trade is assumed to have been minimal or non-existent.

**27 countries contain the largest Indian populations, they include: the United Arab Emirates, Mauritius, Guyana, Suriname, Nepal, Malaysia, Myanmar, Saudi Arabia, Kuwait, Trinidad and Tobago, Singapore, Fiji, United States, United Kingdom, South Africa, Canada, Oman, France, Bahrain, Australia, Netherlands, New Zealand, Kenya, Tanzania, Uganda, Jamaica and Italy. The corresponding land area represents the total surface area of these 27 countries combined.

***Although the Jewish peoples of Nazi Germany were forced to scatter around the globe during the Nazi Germany regime, the most significant numbers found refuge in these locations. The area is the total combined surface area of these places.

****This is the total surface area of the land mass of the Great Lakes Basin according to the State of Michigan Department of Environmental Quality (DEQ): www.michigan.gov.
How many times have you heard someone say: “I wouldn’t dare go to that neighborhood!” or “They just happened to live on the wrong side of the tracks”? Almost every major city in the US, and arguably most major cities in the world, have a noticeable separation of the social classes into distinct neighborhoods or zones. These divisions usually result in a disparity of crime, economic resources, health and education - among other things - between the various socio-economic classes, with the poor and working classes always at the disadvantage. Usually these divisions occur with large artificial or natural infrastructures that delineate boundaries between neighborhoods. Although gentrification has been one step towards mixing the classes, it is often executed poorly and by simple displacement. What would happen if cities were no larger than a small neighborhood? If the janitor and the white-collared executive lived on the same block? Or better yet... SAME BUILDING!?!?! Would there be a better understanding between the two? Would there be more opportunities or contentment for the janitor who is able to lead a lifestyle similar to an accountant or a doctor? The goal of this project is to consider the possibilities of environmental and social equity for a dense city where everyone lives within a one-square mile zone. One of the principal ideas is the concept of access through approximation. This assumes that the factor of the “unknown” that exists when people live on opposite ends of the socio-economic spectrum - both geographically and via lifestyle opportunities - can be eliminated when equal interaction on a level playing field occurs on a daily basis: using the same parks, gyms and residential pools; having children that go to the same school; and use of the same community church. Those groups who have historically been seen as uninvolved in community issues will benefit from the actions of others who are able to navigate the political system, as any improvement to “the neighborhood” is advantageous for all. It is assumed that people will learn by exposure.
City of Chicago Neighborhood Statistics: one example of socio-economic disparities in a typical urban area
In many urban areas, the division between neighborhoods usually occurs at some large infrastructure such as railroad tracks and rail yards; rivers, streams and lakes; parks and large recreational areas, huge industrial areas, etc. These physical and geographical separations often serve as visual boundaries between socio-economic classes and different ethnicities. Although gentrification has greatly increased over the last few decades, allowing some mixing within certain metropolitan communities, there still exists a prevalent disparity between the white-collar executive and the blue-collar worker. This translates into their everyday lives both subtly and blatantly, affecting access to resources and manifested by unequal educational, economical, and public health and safety experiences. In an effort to remedy some of these divisions that can “naturally” occur just by geographical distance, a restructuring of the city itself must occur. A compact city which allow individuals from different classes to live and interact on a level playing field, reducing the notions of superiority and inferiority and restoring pride in one’s community. This does not suggest a utopian community, but rather emphasizes an equal access to both the good (education, economics, etc) and the bad (violence, pollution, etc).
REGIONAL STRATEGY
Based on the information and issues considered in the previous chapter, the first approach is to consider what interventions and strategies must occur at the regional level of the great lakes basin in order to facilitate specific goals for the development of the new cities and a new urbanism.
The strategy for the great lakes basin is to use a derivation of the Jeffersonian grid to appropriate land for the micro-cities and surrounding supportive agricultural infrastructure. The 100 square mile (10 mi. x 10 mi.) grid divisions can allow for up to 10% of their surface area to be devoted to the city and the remaining 90% or more will be given to farmland, ecology and other rural support systems.
Study #1: Clusters
“Clustered micro-cities ranging from 5-10 sq. mi.”
Study #2: Strands

“Stranded micro-cities ranging from 3 -5 sq. mi.”
Study #3: Points
“Point micro-cities exactly 1 sq. mi.”
Study #4: Aggregates
“Aggregated” micro-cities ranging from 7 - 10 sq.mi.
Upon exploring the various regional strategies for the placement of cities, the option that allowed for the best distribution of the population throughout the entire region was the point city system of 1 square mile. This system also eliminates the variations that can occur in the cluster, strand and aggregate arrangements, allowing for a consistency that can inform rules for geometry, circulation and proximities. Using this strategy, for every 100 square mile division of the regional grid, 1% of land area is devoted to the dense city, while 99% is reserved for agricultural infrastructure, ecological systems and other auxiliary services.
CITY STRATEGIES
This chapter investigates the formal requirements for the square mile city based on regional information in the previous chapter and explores possible solutions to reconcile the intent of the project at both the regional and urban scales.
great lakes and great lakes basin surface area facts:
9,402 miles of shoreline
295,200 sq. miles (total surface area of the basin)
94,710 sq. mi. (surface area of the 5 lakes)
200,490 sq. mi. (total land surface area in the basin)

If 1,000,000,000 people could be evenly distributed throughout the entire land surface area of the great lakes, the resulting density would be around 4,988 ppl/sq.mi., or 1,926 ppl/sq.km. However, in order to accommodate the proposal of one square mile “compact city neighborhoods”, the densities will be extremely higher.
Using the “compact-city” system of one 1 Square Mile city per 100 square miles of Great Lakes surface area, will generate a total of around 2000 cities (about 2005) with an area of 1 square mile. If just HALF of the 1,000,000,000 people are placed within these 2,000 cities, each city will have a density of about 250,000 per square mile.

QUESTION: How Tall Do these one-square mile cities need to be to house 250,000 people?

ANSWER: JUST CONSIDERING LIVING SPACE - IF EVERY PERSON IS ALLOTED 400 SQ. FT. OF SPACE

10’ x 40’ x 10’ = 4000 Cubic Feet/person.
250,000 people will therefore require 1,000,000,000 Cubic Feet

1 SQUARE MILE IS 27,878,400 SQUARE FEET

35% COVERAGE IS OPTIMAL, meaning that about one-third of the city will be covered with living structures leaving two-thirds of the city available for other programming such as business and commercial use. This will generate buildings with an average height of around 120 ft or 12-13 stories.
Currently, the relationship between urban, suburban and rural spaces in the US exists almost on a gradient, where urban centers as focal points for population and density, and these components gradually decrease as they transition to rural areas. Currently, metropolitan areas include the city proper as well as the surrounding suburbs, sharing some form of infrastructure (whether transportation, economic, or political) with that major city; rural areas, normally, are those too geographically distant to have these ties with a metropolitan area. With the influx one billion, and an agenda of environmental justice, this project will drastically redefine what is urban vs. suburban vs. rural: in fact, the cities will contain densities higher than have ever existed before, yet be the size of very small towns.
existing relationship

RURAL

SUBURBAN

URBAN

proposed relationship

LOW DENSITY

HIGH DENSITY

HIGH DENSITY
The diagram on the right shows the possible sectional relationships of the highly dense square mile cities to the low density rural areas in the great lakes water basin region. The positioning of one city per every 100 square mile division of the regional grid allows for a minimum distance of 1 mile between cities and roughly a 20 mile maximum distance.
CHICAGO:
-215 Neighborhoods
-77 Community
-234 Square Miles
-2,853,114 People
-12,645 Ppl/Sq.Mi.
-1,428 ft. Tallest Building
-3 to 5% Built Residential

SQUARE MILE CITY:
-1 Neighborhoods
-1 Community
-1 Square Mile
-250,000 People
-250,000 Ppl/Sq.Mi.
-150 ft. Tallest Building
-35% Built Residential
As the city is compressed, the assumption is that several possibilities become available: (1) there will be an optimized mixing of the various socio-economic classes, (2) this can thereby lead to decreasing the potential for disparities as they currently exist, based on neighborhood or community, (3) which will result in equal access to resources and more similar lifestyle experiences.
PRECEDENTS
The following three projects were used as informational tools to inform both the geometry and functionality of the square mile city. They deal with issues of organization of space and volume, extreme densities, and compactness. Interestingly, they are all theoretical projects spanning over 75 years. However, they are considered very innovative and provocative in their attempts to redefine The City.
Frank Lloyd Wright proposed Broadacre city in 1932 as an urban or suburban development concept. Broadacre City was the antithesis of a city and the apotheosis of the newly born suburbia, shaped through Wright's particular vision. It was both a planning statement and a socio-political scheme involving land appropriation and self-sustainability. With a proposed density of about 3000 persons per square mile, it is much less than the mega-density of 250,000 people per square mile attempted by my proposal. However, it does follow rules of transportation and organization that might successfully be applicable to the low-density areas surrounding the square mile cities. Ironically the proposed density of Broadacre city almost perfectly meets the density requirement of the 99% of remaining surface area in the great lakes basin as it will house the remaining 500,000,000 people. Because formal and organizational areas of the low density areas are not considered in detail, the most feasible and complimentary approach would be very similar to Wright's proposal as it would accommodate those individuals living in areas containing ecological systems and designated to provide agricultural support to the square-mile cities.
The Shimizu TRY 2004 Mega-City Pyramid is a proposed project for construction of a massive pyramid over Tokyo Bay in Japan. Similar to the intent of my proposal, this project was presented with hopes of relieving the stresses of alarming overpopulation in the world's most crowded city: Tokyo, Japan; this is the anticipated scenario for the great lakes basin region with the influx of a billion people. Housing 750,000 in a massive structure that has a total footprint of about 3 square miles, this project exactlly matches my proposed density of 250,000 per square mile. However at a height of roughly 2,200 ft, it does not compliment my desire for a low profile city of no more than 15 stories tall, as discussed and calculated in the previous chapter. The lessons learned from this project are more organizational in nature and demonstrate the possibility of successfully compacting large populations in a system of massive interconnected structures.
Greg Lynn’s proposal for a Stranded Sears Tower attempts to reformulate the image of the American monument by reconfiguring the existing dominant icon on the city skyline and their tall freestanding buildings. It establishes itself as a discrete and unified object within a continuous and homogeneous urban fabric. This project attempts to affiliate the structure of the tower with the heterogeneous particularities of its site while maintaining monumental status. Lynn states: “Buildings are no longer obelisks, but lean one upon the other, no longer suspicious of the other, like a statistical graph. This new architecture incarnates a system that has ceased to be competitive, but is compatible, where competition has disappeared for the benefit of corelations” This project reformulates the vertical bundle of tubes horizontally. The Sears Tower is at once single and multiple as if it were a strand: a collection of ‘fibres or filaments twisted, plaited or laid parallel to form a unit.’ This strand is both a system of interwoven filaments and a singularity capable of more twisting or plaing into a larger or more complex yarn, thread, rope or cordage. This concept was found to be of the most usefulness to the development of my project, in which the entire city could be viewed as one continuous, yet segmented, element integrated with the surrounding urban fabric. In a sense, the city itself becomes iconic and monumental.
Mainly considering Lynn’s proposal to inform the formal organization of space and volume in the square mile city, several prominent skyscrapers were diagrammed. These buildings, like most skyscrapers, are considered “cities within cities”, therefore it became important to consider the geometric and spatial possibilities that could occur once their vertical prominence was exchanged for a more integrated horizontality.
Diagramming the towers consisted of looking specifically at the major vertical circulation systems such as elevator cores, and the horizontally oriented public spaces such as sky lobbies, plazas and commercial areas. Once rotated to the horizontal, these spaces will provide more interesting systems of circulation and places of public gathering.
TEST SITES
This chapter shows the testing of the resultant densities and formal organizational strategies in two distinct geographical types within the Great Lakes basin region, which mainly consists of the United States’ midwest region. These two types are the post-industrial, partially abandoned, low density zones and the rural farmland areas. It is important to remember that the 15 most dense cities with populations over 250,000 persons will remain intact and not be transformed by this proposal.
Test Site #1: Rural Farmland - St. Mary’s, Ontario, Canada

This site is more or less representative of any farmland area within the great lakes basin region. It generally contains about 3-5 farmer homes in a one square mile area, and is perfect for testing the resultant geometry from my proposal’s intervention. Because it is a “blank slate” so to speak, with very few parameters, the rules for organization, although seemingly infinite, actually produce more or less a standard form based on the requirement to accommodate 250,000 individuals.
This figure ground series shows the relationships of built and open spaces based on a city made of strands sized to represent the dimensions of the Sears Tower. They are based on a 1,000 ft height (the actual tower is just over 1,400ft) and their widths are based on the base unit of the tower’s 75ft. structural bays and their grouping in threes - up to 225 feet - as well as their divisions into 25ft elements. The result produces a dense mesh over the city which is about 1/3 residential, 1/3 business and commercial, and 1/3 open space.
The options for integrating natural landscape and natural features into the mega-dense square mile city are: (a) Form a veritable green belt of roughly one block in width around each city. It would serve as a physical urban growth boundary and consist of a public park system. (b) Allow a less rigid and integrated natural boundary to surround the city and allow it to gradually engulf the urban border. (c) Provide natural features as “void fillers” that mesh through the entire urban landscape and become a separate continuous fabric that compliments the built structural form.
Because the size of the square mile city is just under that of Chicago’s Loop, a regional and local transportation system could be one that connects each city by either “looping” around it or connecting at either a corner or one side of the city.
There are essentially an infinite number of programmatic configurations that can occur in the square mile city. Almost every segment of the building mesh will be mixed use, allowing for a variety of intersections between program types.
Due to light and ventilation requirements, particular for residential units, and in order to ensure adequate housing for 250,000 people per city, the upper floors of most buildings will be devoted to living units.
It is important to note that the form of the city is not a literal extrusion of the figure ground plan but that the segments that form the building mesh shift in a response to a pushing and pulling in relationship to the ground plane. These moments allow for interesting formations of space and relationships between different programmatic uses.
This 3-dimensional zoom in of the square mile city massing better illustrates the intensity-density of the network of buildings.
These schematic sections illustrate one possibility for the relationship of the building envelopes to the ground plane. With the goal of an average height of roughly 150 ft for all of the structures - yet attempting a heterogenous experience as one traverses the square mile city - there is a pushing and pulling of the strands’ height and a distortion of the connectors to accommodate this transformation.
This project combines the geometry of convex polyhedrons, (cuboids or simply, rectangular boxes) which serve as the “void fillers”, with convex polytopes (prismatic polyhedrons) as the connecting elements. The results of these combinations yield interesting volumes and spaces. They have been listed as three categories: straight-throughs or bypasses, cul-de-sacs, and courtyards.
Cul-de-Sacs

Courtyards
Test Site #2: Post-Industrial City – Gary, IN, USA

This site shares similar characteristics to those of many small cities and large towns in the Great Lakes basin and Rust Belt region. Cities like Gary, Indiana were once thriving areas boistering with many manufacturing industries like steel mills. Detroit, Michigan, with its former bustling automobile industry is another example of how many cities in this region have become somewhat destitute or at least have experienced a decline after the departure of many industries. This project will serve to revitalize these cities by becoming integral centerpieces in these areas, connecting the large vacancies that exist while reacting to the existing housing. The square mile city in these post-industrial areas become a filling of the voids.
Here, the figure ground series illustrates where the placement of structures fills in “voids” such as vacant lots, parking lots, sections of some streets and parts of landscaped areas. With the addition of the connectors, the system starts to meander through residential neighborhoods, expanding and contracting in an interesting dialogue with the existing single family homes which remain undisturbed yet juxtaposed against the massive new square mile city.
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There are essentially an infinite number of programmatic configurations that can occur in the post-industrial square mile city - just as in the development of the cities in the rural farmland areas. Here however, the main restricting parameter will be where the “void filling” volumes can be placed in response to where existing housing is situated. Again, almost every segment of the building mesh will be mixed use, allowing for a variety of intersections between program types.
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REFERENCES

PREMISE:

DIASPORAS
Wikipedia.org. (various articles including, but not limited to “Diaspora”, “Atlantic Slave Trade”, “Indian Diaspora”, “Holocaust” and “Three Gorges Dam”)
All information on land areas was gathered from wikipedia.org world geographic statistical data.

CHICAGO NEIGHBORHOOD STATISTICS
www.chicagoatlas.areaprogress.com/2008/06/24/chicago-neighborhood-by-income/
POLLUTION: K. Mae Heussner/ Northwestern University Medill School of Journalism. Data provided by US EPA.
GRADUATION RATES: People’s Atlas of Chicago. 2008
www.chicagoatlas.areaprogress.com/2008/06/24/chicago-neighborhood-graduation-rates/

REGIONAL STRATEGIES
Information on geographical data (boundaries, land areas, water surface areas, etc) of the Great Lakes provided by the State of Michigan Department of Environment.