Incremental Housing at the Receding Suburban Fringe
by
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SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARCHITECTURE
AT THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
FEBRUARY 2010

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Submitted to the Department of Architecture on January 14, 2010 in Partial Fulfillment of the Requirements for the Degree of Master of Architecture.

ABSTRACT

The years from 2005-2010 brought two major events that shook the basic assumptions underlying housing delivery in the United States of America. First, Hurricane Katrina and the catastrophic flooding of New Orleans that followed brought into stark focus the folly of decades of short-sighted land use policy and housing development that largely ignored environmental vulnerabilities. Second, a massive foreclosure crisis exposed the economic flaws of a housing delivery system that relies on reckless and unsustainable mortgage lending and borrowing to drive the construction and purchase of oversized, inefficient homes on the periphery of the suburban fringe.

This thesis proposes a new model for high-density, low-rise urban housing that provides an environmentally responsive infrastructural framework upon which homeowners can readily expand to suit their needs and desires. Such an incremental approach provides for more economically and environmentally efficient housing while encouraging formal and spatial diversity in the urban experience.

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INCREMENTAL HOUSING AT THE RECEDED SUBURBAN FRINGE

Zachary B. Lamb
2010
ACKNOWLEDGEMENTS

My sincere thanks to my thesis advisor, Adele Naude Santos, for her enthusiasm, patience, care, and knowledge. Thank you to my wonderful committee: Reinhart Goethert and James Wescoat for your generosity of time, knowledge, and spirit. Thank you Norihide Imagawa for your inspired and inspiring consultation on matters of structures and construction.

Seth Behrends, Tad Juscyk, Eliot Stulen, and Chris Taylor, thank you all so much for your help and advice in the waning hours. The generosity with which you lent your talents and time to my project were among the best parts of this entire process.

Thanks to my family for their unbelievable support and patience always and throughout.
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INTRODUCTION

The years from 2005-2010 brought two major events that shook the basic assumptions underlying housing delivery in the United States of America. First, Hurricane Katrina and the catastrophic flooding of New Orleans that followed brought into stark focus the folly of decades of land use policy and housing development practices that largely ignored environmental vulnerabilities. Second, a massive foreclosure crisis exposed the economic flaws of a housing delivery system that relies on reckless and unsustainable mortgage lending and borrowing to finance the construction and purchase of oversized and inefficient homes at the edges of urban regions.

This thesis proposes a new model for high-density, low-rise urban housing that provides an environmentally responsive infrastructural framework upon which homeowners can readily expand to suit their needs and desires. The scheme draws on models for cluster housing and incremental housing that have been developed over the last four decades in rapidly growing developing world cities. By reducing initial built space and relying on incremental growth and change guided by homeowners, the proposal seeks to provide safe and efficient housing that is responsive to the unique environmental vulnerabilities of eastern New Orleans. Balancing between formal/structural rigidity and openness/flexibility, the scheme seeks to create a flexible and diverse urbanism with a strong and legible form.
RESEARCH: Incremental Housing and Urbanism
Urbanity as Ecology

Ecological and biological systems have long been used both metaphorically to explain the complexity of the city and physically in the construction of (literal and symbolic) islands of stability within the changing urban landscape. Kevin Lynch's principles of environmental adaptability are largely drawn from evolutionary biology and population dynamics, the precursors to what has become the science of ecology. For instance, in describing the adaptive advantage conferred by "variety," Lynch says,

"The optimum condition for present and future survival is a distribution which peaks very closely about the characteristics ideally suited to present demands, but with a small percentage of individuals who vary widely from the norm." (Lynch, 20)

As interest in urban change and complexity have increased, so have ecological concepts of disturbance and change grown in complexity. While Lynch's treatment of evolutionary biology is almost entirely focused on the systems and rules governing adaptive processes, many theorists and designers concerned with urban change have, in recent decades, looked to ecological and biological systems, not only for their precision, but also for models of indeterminacy and emergence. Where ecology is primarily used as a metaphoric lens through which to view the complex interactions and exchanges that make up the contemporary city it allows for a view of the city that is systematic and precise yet mysterious and beyond complete comprehension. Both the systematic and the mysterious are on display in Sanford Kwinter's description of the city as "unfathomably complex" and "an autonomous adaptive organism, a vital ecology with a rich life of its own, one not amenable to mechanistic "overmapping" techniques of intervention and analysis." (Kwinter, 26)
Environmental Adaptability
Kevin Lynch, 1958

Modular

"standardized parts of one or more sizes, which may be linked together in a set way, but can in sum form very irregular total patterns" (Lynch, 19)

Lattice

"repeating plane or solid regular grid of dimensions, within which parts must fit" (Lynch, 19)

Variety

"The optimum condition for present and future survival is a distribution which peaks very closely about the characteristics ideally suited to present demands, but with a small percentage of individuals who vary widely from the norm." (Lynch, 20)

Over-capacity

"Extra space or over-capacity leaves room for future growth and change." Increased first cost of extra capacity and preservation of capacity until such a time as it is useful become the primary challenges. (Lynch, 20)

Growth Forms

Uses are arranged such that "each major activity occupies a wedge from center to periphery." (Lynch, 21)

A "mass may be strung out so that each activity has a place along the chain, and can grow sidewise without running over other uses." Zones of dynamic and intensive uses are interspersed with more mobile and less intensive uses. (Lynch, 21)

A "very intensive [urban] center which most requires renewal" circulates along a circular track, eventually returning to its origin and leaving a trail of variously degraded and renewed former centers. (Lynch, 21)
Illusions of Permanence in the Contemporary City

The discourse and projects relating to architecture and urban change have tended to fetishize the provisional nature of the contemporary city without particular regard for the trauma produced by such instability. As Arjun Appadurai says, “insofar as spatial arrangements – homes, habitations, streets, roads, construction of any type – are temporary, they produce anxiety.” (Appadurai, 47) In describing the life of the economically struggling classes of Bombay, Appadurai says, “A huge amount of their social energy and personal creativity is devoted to producing, if not the illusion, then the sense of permanence in the face of the temporary.” (ibid)

In the face of the uncertainty and change, the urban dweller seeks to counteract this unsettling through the “production of locality” as a means of creating some semblance of stability and identity. (ibid)

Similarly, in his 1958 essay, “Environmental Adaptability,” Kevin Lynch recognizes the need for stability in the face of urban change. After cataloguing various methods and forms of designing and planning for environmental adaptability, Lynch observes that, whereas “adaptable forms are likely to be ambiguous, unclear, shifting, discontinuous,” human beings, “have psychological requirements for some continuity and stability in our world, for structure, coherence and imageability. Without them, the organism breaks down.” (Lynch, 24)

Individuals as well as institutions of all size adopt a huge array of strategies to create the illusion or perception of permanence. Iconic, monumental, and historically referential architecture are all acting in the service of this need for permanence and stability. Similarly, the preservation of open space and the foregrounding of wild or natural ecological processes can be seen as another strategy for creating order out of the apparent chaos of the contemporary city.
Illusions of Permanence

Buildings

Monumental Form
Louisiana Superdome

Monumental Urban Structuring
Constructed wetlands as abstracted urban geometry

Production of Locality

Ornament and Customization
yourHOUSE
Ornament for New Orleans' shotgun house'

"Constructed Shallow Marsh Wetland" from
"Applicability of Constructed Wetlands for Army Installations"
US Army Corps of Engineers

Biological/Ecological Determinism
Constructed wetlands as functional organism
Incremental Building

As the populations in many cities in the developing nations of the “global south” have increased dramatically in recent decades, governments, international aid organizations, designers, and planners have struggled to develop new models of housing provision that can provide adequate, safe, and hygienic shelter. By the 1960’s, it had become abundantly clear that conventional modes of housing provision were inadequate to the task of meeting the enormous scale and dizzying pace of the urbanization challenge. Beginning in the early 1970’s, scholars and activists such as John Turner started to articulate and test new strategies for guiding urbanization and housing provision that treated housing not as a simple and discrete product to be provided, but as a “flexible, dynamic, incremental activity” that is deeply enmeshed with the social and economic processes of rapidly changing cultures. (Hamdi, 38) Turner saw housing as a social and economic process first and foremost and spoke of the need to create the “supportive shack” rather than the “oppressive house.” (Hamdi, 41)

These process-oriented housing strategies tended to shift the focus of projects from the delivery of a finished house to the initiation of a housing process as part of a full and abundant life of the housed. Such strategies shift design and economic responsibility from the initial design and construction phase into the ongoing life of the owners and their buildings. Since these strategies were first articulated, a broadening and deepening lexicon has evolved to describe particular approaches. The broad term, “incremental housing” can be used to describe anything from a “site and services” project that simply provides a defined lot with sewer, water, and electrical access to “core house” projects in which some small enclosure is provided and intended to serve as a starting point for future expansion, to nearly completed houses that leave some choices about finishes and internal partitions up to the discretion and budget of the owner.

Aranya Community Housing
Indore, India
Balakrishnan Doshi, 1989
(ArchNet)
Incremental Housing at Belapur
Belapur, India
Charles Correa, 1983
(Correa, 153)

Diagoon Experimental Housing
Delft, Netherlands
Herman Hertzberger, 1967
(Hertzberger, 74)

Incremental Housing
Mumbai, India
Filipe Balestra & Sara Goransson, 2009
(Archicentral)

Quinta Monroy
Iquique, Chile
Elemental, 2008
(Elemental)
During the same period that practitioners in international housing were rejecting ready-made walk up apartments and other forms of produced mass housing for developing world cities, a parallel revolution was underway within the architectural avant-garde. Though most modernists tended to adopt the Corbusian notion that buildings and houses in particular were to be perfected in form and function in the same way that industrially-produced consumer products and appliances were optimized, modernist theoretician and historian Sigfried Gideon spoke reverentially of the adaptable and expandable New England farmhouse saying:

"the American house is given a ground plan which can be enlarged whenever new social and economic conditions make it desirable... all these heavily timbered houses began as one and a half or (at most) two-story structures, with a single room on the ground floor. The next generation, with improving circumstances, enlarged this ancestral nucleus both horizontally and vertically. A new roof was spread over all these additions, quite asymmetrically." (285)

While Gideon's sentiments on the expandable American home are in accord with the underlying Modernist idea that buildings should clearly and rationally meet and reflect the purpose for which they are created, by the 1960's Modernism was largely consumed with the pursuit of material and formal purity. In keeping with the iconoclasm that characterized the cultural and political atmosphere of the era, young architects of the time such as Cedric Price and Archigram undertook a series of conceptual and built projects that shifted from formal purity to the expression of infrastructural efficiency and growth and change through time. In their 1966 document, "Choice and Control" Archigram's Peter Cook describes the designers task as defining a "conglomeration of systems, organizations, and technical apparatus that permit the choice of one response out of a number of alternatives." (Rosenberg, 30) He decried static architecture saying that “buildings with no capacity to change can only become slums or ancient monuments. (Rosenberg, 29) Cedric Price, in his "Anticipating the Unexpected," extends this focus on "anticipatory design" as a process that brings together the client's "delight in the unknown"
Incremental Housing in New Orleans’ Urban Vernacular

Shotgun house before expansion

After “camel back” expansion

New Orleans shotgun block growth forms

Traditional New Orleans houses have always readily accommodated growth and change. Typically additions have taken the form of additional floors and rooms added in the rear of the house, adding space while preserving the composition of a house’s street facade.
with the designer’s “awareness of time.” (Rosenberg, 31)

Whether through tartan grids or moveable trusses and gantries, many projects from this era set out to create an architecture that, as Zuk and Clark describe, “accept[s] new, outside elements which may not have existed at the time of the original inception,” by “predict[ing] a range of future changes which may occur.” (Rosenberg, 33) Though Archigram No. 8 praises indeterminacy and open endedness, they, like others in the architectural avant-garde, tended to focus on anticipation and prediction.

Where Archigram and Cedric Price sought to create flexible architectures through anticipation and mechanistic means, John Turner, John Habraken and others advocated flexibility through openness and indeterminacy. The latter attitude is reflected in Ebenezer Howard’s directive to “discover the minimum of organization that would secure the benefits of planning while leaving to individuals the greatest possible control over their own lives.” (Hamdi, 41)

Lars Lerup stakes out a third position; neither anticipatory nor wholly open. For Lerup, the design of housing is a process of “building the unfinished,” in which true flexibility can only be achieved through design decisions that inevitably “cut down on the dwellers’ alternatives and anchor their activity by being located in a specific place and time with particular properties.” (Lerup, 25) According to Lerup, “‘building the unfinished’... does not mean necessarily that the scaffold is unfinished in itself, but that it is only one component of a set, other components being the dwellers’ own props and doings (habits and actions). The physical comes alive through use.” (Lerup, 24)

Lerup’s notion of incrementalism, unlike that of Cedric Price and Archigram, is not bound up in the hopeless quest to anticipate and design for all possible user desires. Nor does he advocate a total dissolve into openness and ambiguity. Rather, he posits that design is the act of defining initial constraints within which future decisions will be played out.
Incremental Housing Typology

<table>
<thead>
<tr>
<th>Type</th>
<th>Growth Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serviced Lot</td>
<td>serviced space only</td>
</tr>
<tr>
<td>Foundation</td>
<td>framework</td>
</tr>
<tr>
<td>Perimeter Wall</td>
<td>framework</td>
</tr>
<tr>
<td>Sanitary Core</td>
<td>seed/core</td>
</tr>
<tr>
<td>Breuer Cairo</td>
<td>autonomous starter house</td>
</tr>
<tr>
<td>Katrina Cottge</td>
<td>framework (self-contained)</td>
</tr>
<tr>
<td>Mumbai</td>
<td>framework (interlocking voids)</td>
</tr>
<tr>
<td>Elemental Chile</td>
<td></td>
</tr>
</tbody>
</table>

Aggregation Strategies

- Serial
- Paired
- Serial _ party wall
- Interlocking
Growth and Overcapacity

Nabeel Hamdi says that flexible architectures, “have built-in capacities for change and pay a price for it for their indeterminacy in either energy or aesthetic compromise... to cope with uncertainty by increasing capacity in one or more ways.” (Hamdi, 62)

In the context of the project site in suburban New Orleans, unstable soils increase dramatically the cost of building foundations. Thus, expansion within or on top of the existing structure is likely to be more cost efficient than any model that requires the expansion of the building’s footprint. The overcapacity of space in the initial envelope that is required to allow for internal expansion has the added benefit of creating appealing high-ceilinged spaces and allowing for hot air to rise out of the habitable space of the room.

<table>
<thead>
<tr>
<th>Overcapacity</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oversize foundation and structure</td>
<td>Expansion away from flooding</td>
</tr>
<tr>
<td>Load bearing roof structure</td>
<td>No additional foundation requirements</td>
</tr>
<tr>
<td>Extra interior space</td>
<td>Continuous envelope</td>
</tr>
<tr>
<td>Increased energy use for space conditioning</td>
<td>Accessibility</td>
</tr>
<tr>
<td>“Space is cheap”</td>
<td>No additional foundation requirements</td>
</tr>
<tr>
<td>Expensive foundation work</td>
<td>Requires extra pilings, slabs, structural frames</td>
</tr>
</tbody>
</table>
Building as Instruction Manual
Architectural strategies for guiding incremental growth

Relative Flexibility of Various Structural Systems

- rcc frame with infill
- stick framing
- loadbearing masonry
- poured-in-place rcc
- vault
RESEARCH: Wetland Urbanism
Environmental Accounting

Estimated value of all ecosystem service provided by the earth (Costanza, 1997)

$16 - 54 trillion

Ecosystem Services

Planners and designers have long deployed ecological systems as urban infrastructure. In the 1870's, the Emerald Necklace in Boston was designed by Frederick Olmsted as a series of connected parks including ponds, wetlands, and dryland forests intended to address the hazardous and unsanitary conditions in the Muddy River through the use of passive, landscape treatment techniques. Similarly, the much cited case of Curitiba, Brazil, illustrates a use of urban green space and wetlands as flood control and water quality infrastructure for the city. (Tucci)

Such "green infrastructure" projects are based on the concept of "ecosystem services," wherein ecosystem functions can be assessed and manipulated according to their value to human health and safety. Ecosystem services as a concept is rooted in a neo-liberal definition of "environment" as "that which is common to all of us, the spatially-differentiated matrix of economic activity, an external presence whose dynamics affect us all." In this conceptual framework, the earth can be seen as "a very efficient, least-cost, provider of human life-support services." (Heynen, 117)

In recent decades, the field of environmental economics has sought to develop means of valuing ecosystem services and markets on which such services and the negative impacts thereto can be traded. By creating markets for ecosystem services, such efforts seek to find the lowest-cost solutions for creating the widest environmental and social welfare. In the United States, environmental markets have developed over the last two decades for the trading of the right to emit air pollutants such as sulfur dioxide, nitrous oxide, and carbon dioxide.
Evolution of Wetlands Perceptions

1. venue of terror
2. sacred object
3. machine / infrastructure
4. site of urbanization
Giving Form to Constructed Ecologies

As constructed ecologies have become more widely embraced for their functional, aesthetic, and evocative attributes, their form and image have been guided by an array of values. In the case of constructed wetlands, form has widely been determined by a blending of functionalist bio-determinism and romantic notions of returning to natural landscape states. The image of the constructed wetland as a sort of cyborg functional blending of the biological and the mechanistic is clearly demonstrated in the models of stormwater wetlands recommended by the U.S. Army Corps of Engineers for army installations.

In other cases, the margin between land and water has been used as a primary structuring principle for urban/suburban development patterns. In these cases, there is typically a near complete eradication of zones of ambiguity or transition and the binary relationship between land and water creates highly abstracted geometries.

Constructed wetlands can also be treated as architectural accessories, their geometry completely subordinated to or derived from that of surrounding buildings. The constructed stormwater wetland at Kieran Timberlake’s Sidwell Friends School building in Washington, DC and at Scharnauser Park are clear examples of this type.
Settlement - Wetland Interface

Settlement IN Wetlands

Dredge and Fill
Tampa Bay subdivision

Informal Wetland Settlement
Makoko, Lagos, Nigeria

Wetlands (constructed) IN Settlements

Stormwater Wetland
Scharnhorst Park, Germany

Constructed Wetland
Sidwell Friends School, Washington, DC

Settlement BY Wetlands

Mississippi River
natural levee settlement patterns

South Louisiana
delta finger linear development
Constructed Wetland Mechanics

A growing body of literature explores the "best practices" for constructing wetland ecologies as a means of treating and cleansing stormwater runoff from streets, roofs, roads, and parking lots. The parameters outlined in this literature could serve as a basis for rules for urban development.

Buffers and prohibitions are the primary mechanisms currently used to regulate the relationship between buildings and wetland landscapes. Urbanization and building practices can and should be guided by a more nuanced understanding of the specific biogeochemical processes responsible for a given wetland function.

**Stormwater Wetland Geometry**

- Minimum of 4% of watershed area
- Minimum length to width ratio 2:1
- Optimum size (for biodiversity)
- Long curvilinear edge surfaces
- 'Sediment forebays' disipate the energy of incoming stormwater
- Maximize flow path to maximize pollutant removal
Stormwater Wetland Depth Distribution

Building Interface

Body Interface

<table>
<thead>
<tr>
<th>ZONE</th>
<th>Forebays</th>
<th>Deep Pools</th>
<th>Shallow Water</th>
<th>Floodable Land</th>
<th>Upland</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of total area</td>
<td>10%</td>
<td>5 to 10%</td>
<td>40%</td>
<td>30 to 40%</td>
<td>5%</td>
</tr>
<tr>
<td>Depth</td>
<td>-2' to -4'</td>
<td>-2' to -4'</td>
<td>-5' to 1'</td>
<td>+5' to +2'</td>
<td>≥+2'</td>
</tr>
</tbody>
</table>

Buffers

- wildlife: 50' to 1000'
- N: 20' to 180'
- P: 10' to 110'
- sediment: 10' to 100'
RESEARCH: The Site
South Louisiana Land Loss
1950-2050 (estimated)

An Unstable Geography

As the Mississippi River formed and reformed its banks over the course of thousands of years, its sediment deposits formed distinct patterns in the soils and topography of the land that would become New Orleans. As is the case in many cities, lower, more flood-prone areas of former swampland in the center of the city became low-income neighborhoods. Given the extreme constraints of the city and the continued pressure of suburban development in the mid-twentieth century, middle class and upper middle class neighborhoods like those in New Orleans East, were developed on flood-prone former swampland.

Land subsidence, sea level rise, and coastal land loss are together conspiring to steadily increase the vulnerability of the always threatened city.

Post-Katrina repopulation patterns may signal the beginnings of a realignment of the city’s population to the historically-settled natural high ground.
Hurricane Katrina Flooding Depth

Post-Katrina Repopulation Rates (August 2008)
Greater New Orleans Community Data Center
Riparian Urbanism

The physical conditions of the city and its region are largely a function of the current and historic paths of the Mississippi River. The river's course has defined sedimentation patterns and topography, which in turn have been highly influential in determining the pace and form of urban development.

The development of New Orleans East, like most of the rest of the city is highly dependent on heavily engineered flood control systems of levees, detention basins, and pumping stations.
Suburban Development in the Bottom of the Bowl

Positioned between the Gulf Intracoastal Waterway and Lake Pontchartrain, New Orleans East is largely below sea level. Perversely, the areas with most of the suburban development are among the lowest and most flood prone. The Gentilly Ridge, the strip of relative high ground between the Gulf Intracoastal Waterway and Chef Menteur Highway, is largely uninhabited, occupied by low intensity industrial and wasteland uses.
Lake Forest Blvd.

I-10 Corridor

Morrison Rd.

Haynes Blvd.

Lake Pontchartrain

big box retail | multi-family residential

single-family | multi-family residential
New Orleans East Development History

For most of the history of New Orleans, the land that now constitutes New Orleans East was a sparsely populated region of lakeside fishing camps and citrus groves.

From the 1930's to the 1970's the development of the area was driven by ever-expanding transportation networks and drainage infrastructure. As oil prices drove huge expansions in Gulf of Mexico oil production and the city's population reached its historical peak in the 1960's, development in New Orleans East boomed. Many of the areas residents were members of an emerging African-American middle class fleeing the high density and high crime of more central neighborhoods. In the years after the Vietnam War, the area also became home to a vibrant Vietnamese refugee community. (Campanella, 51-59)

With the end of the oil boom years, development of the region slowed dramatically. Huge areas in the eastern extents of the area that were once slated for suburban development were sold to the government to serve as the core of the Bayou Sauvage National Wildlife Refuge, the nation's largest urban refuge. Today abandoned highway "cloverleaf" intersections and vacant suburban tract homes stand as testament to the environmentally naive, speculative development patterns that shaped the region.
New Orleans East Development History

Pre-1850
Gentilly Ridge Natural High Ground
Natural levee formed by a former course of the Mississippi River
Very little development

1930
Lakefront "Camp" Development
Navigation canals built
Passenger and freight rail service

1952
Levees and Canals
Large scale flood control infrastructure
Lakeshore airport
Suburban development along main roads

1965
Interstate 10
Residential and commercial development expands

1960s - 70s
Oil Boom
Residential and commercial development expands

Current

Oil Bust
Development stops abruptly
Bayou Sauvage National Wildlife Refuge, the nation's largest urban wildlife refuge, established on land once slated for development
Strategic Realignment

Though New Orleans East was among the neighborhoods most devastated by Hurricane Katrina, post-storm planning efforts for the area have seen political expediency win out over visionary leadership and long term sustainability. The failure of government institutions to provide the necessary leadership to reshape development patterns in the region to more rationally address increasing vulnerability clearly illustrates the wider disconnect between the vast spatial and temporal scale of environmental challenges and the short-term vision of political and economic institutions.

This thesis operates on the assumption that the economic and social devastation wrought by such unwise development will eventually drive a strategic realignment of settlement patterns in the region.
New Orleans East Development History

**Business as Usual**
- MR-GO canal closure
- Light rail corridor along Chef Menteur Highway

**Minimal Relocation**
- Relocation of population away from the lowest and most vulnerable areas
- Expansion of flood absorbing green space

**High Ground Concentration**
- Concentration of population on natural high ground
- Residential development in former industrial zone along canal
- Extension of major north-south roads into redevelopment zone
Shrinking City

While the flooding that followed Hurricane Katrina's landfall in New Orleans forced hundreds of thousands of the city's residents to relocate temporarily or permanently to other areas, the city has seen a steady population decline since its peak in the early 1960's. (GNOCDC)

The property damage wrought by the flooding of the city drove a dramatic increase in the costs of housing, hindering the ability of many residents to return to New Orleans. Thus, the city is facing the dual challenges of providing adequate safe and affordable housing while shifting settlement patterns to fit the new lower population demographic reality.
Smaller Families, Bigger Houses, Much Bigger Debt

Over the last 60 years, American housing has changed dramatically. Even as the average American family has reduced in size, the average house has nearly tripled in floor area. Underlying this dramatic increase in housing size and the material and energy waste accompanying it is a more than twenty-fold increase in the per capita mortgage debt of Americans. These trends and the housing and financial crisis that they brought on the nation in the late 2000's clearly point to the need for alternative housing delivery models.
Delta Cities

The environmental and economic vulnerability exposed by Hurricane Katrina's devastation of New Orleans are shared by many important cities around the globe. Access to transportation, water, and fertile soils have always served as powerful motivators for the growth of urban centers in and around river deltas.

Projected worldwide sea level rise caused by global climate change threatens to increase flooding and storm surges in these regions.
PROJECT: Urban Region Scale
New Orleans East Resettlement and Densification

New Orleans East has, since its initial development in the mid-20th century, been a low-density suburban landscape. The devastating flooding brought to the area by Hurricane Katrina has further reduced the population density in the area as repopulation has lagged behind other neighborhoods in the city.

The extreme cost of the flood protection infrastructure necessary to protect an area such as New Orleans East necessitates higher density settlement and wiser population distribution relative to environmental risk. If there is to be urban settlement in the area, as sea levels rise and storms increase in frequency and severity, settlement patterns must change. This scheme proposes a radical densification of the population of the area into a currently underdeveloped area of natural high ground located along the Gulf Intracoastal Waterway.
New Orleans East Resettlement and Densification

2005
- population: 96,000 people
- settled area: 3,700 ha
- density: 26 persons/ha

2009
- population: 57,600 people
- settled area: 3,700 ha
- density: 16 persons/ha

after the next storm
- population: 28,800 - 57,600 people
- settled area: 1070 ha
- density: 60-120 persons/ha

Proposed resettlement area
Almonaster Boulevard Land Use

The 1070 hectare area of natural high ground proposed as the resettlement site is surprisingly underdeveloped given the extreme lack of suitable, flood-safe land in the area. While the area was initially slated for industrial development, much of the land is idle or occupied by informal dumps and junkyards.

By removing from consideration lands that are below sea level, currently in use for industry or uses likely to require extensive environmental remediation, a lacy network of land emerges that would be available for the sort of high density residential development proposed in this scheme.
Prototypical Site

The prototypical site selected for the development of the scheme is a 40 hectare parcel in the western end of the strip of land lying between Almonaster Boulevard and the Gulf Intracoastal Waterway.

As in much of the wider South Louisiana region, land parcels in this area are typically long, thin, parcels shaped to maximize the number of parcels that can directly access the adjacent waterway. This *arpent* pattern manifests itself in the resettlement zone as a series of interlaced fingers of high and low land extending from the canal and from the roadway. The prototypical site features such a finger of land currently used as an informal automobile junkyard extending into the middle of the parcel.

The design proposal for the site features an incremental buildout that could accommodate the necessary densities to resettle 30-60% of the current population of New Orleans East in the resettlement zone along the canal.
Chef Menteur Hwy.
Anenapter Blvd.
4Qha
Levee
Gulf Intracoastal Waterway

Available for expansion
Likely sites of contamination
Below sea level
PROJECT: Site and Cluster Scale
Site Strategy

The proposed site buildout includes 1270 units on 830 lots. The development is organized into two fingers of clusters, one on either side of a ‘remediation’ park space on the site of a junkyard. The housing zones are flanked by and interpenetrated by wetland zones intended to absorb stormwater runoff, reducing pollution and flooding hazards on the site.

The area along Almonaster Boulevard is reserved for commercial and institutional uses. The area adjacent to the Gulf Intracoastal Waterway levee is reserved as a wetland buffer while the levee itself forms a linear park space and with a pedestrian path.
The urban layout of the scheme creates a series of layers:
1) The urban street front of live-work units along the main streets;
2) Clustered housing grouped around stormwater detention basins (a);
3) Fingers of row housing interspersed with wetland areas (b). A pedestrian path runs between the clusters and the wetland row housing.
Levee path along the Gulf Intracoastal Waterway
The Cluster

The basic urban unit of the scheme is the housing cluster, a group of fifteen to thirty lots grouped around a semi-public open space with parking and stormwater detention space. Each lot contains either one or two units within a wedge-shaped envelope.

Each clusters constitute a degraded megaform shaped by the demands of urban street orientation (low to the front within the clusters and high to the front on the major thoroughfares) and stormwater collection. Courtyards are carved into the initial megaform to ensure that the living spaces within the long, thin lots have access to natural light and airflow.

The clusters and the wetland housing rows are comprised of aggregations of four different unit types.

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**Cluster Form**  
Human-scale frontage and stormwater collection

**Courtyard and Access Subtraction**  
Provision of light, air, and access

**Housing Starting Condition**  
Mix of housing types, each with minimal initial structure
Incremental Buildout
Suggestive geometries and established structural order
provide guidance to buildout without undue formal constraint
The Cluster: Lineage

The model of high-density, low-rise housing grouped into clusters has been widely used in recent decades in the context of rapidly growing, developing world cities. The model is particularly useful because of it requires less linear infrastructure (roads, water and sewer lines, electric infrastructure) per unit of housing than a typical grid layout. It also creates a network of semi-public spaces within clusters that have a built-in constituency and are therefore more likely to be cared for.
Aerial view from main road, through clusters and wetland row housing to wetlands, levee, and canal beyond.
Cluster section

Wetland row housing section
Unit Breakdown

The proposed initial site buildout includes a mix of six different unit types. The varied starting conditions are intended to ensure that the area begins with some measure of economic, demographic, and visual diversity. The architectural and social richness of the urban fabric will deepen over time as each household shapes its physical environment to suit its needs.

<table>
<thead>
<tr>
<th>Starting Configuration</th>
<th>Number of Units</th>
<th>Initial Capacity</th>
<th>Buildout Capacity</th>
<th>Lot Access</th>
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<tbody>
<tr>
<td><strong>owner only</strong></td>
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<td></td>
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<tr>
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<td></td>
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<td></td>
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<tr>
<td>**owner</td>
<td>renter**</td>
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</tr>
<tr>
<td>1BR + 1BR</td>
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<td>2BR + 1BR</td>
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<td>1270</td>
<td>2400</td>
<td>4800</td>
<td></td>
</tr>
</tbody>
</table>
Lot Access and Parking

The lots within the proposed scheme vary in their access and parking conditions. The live-work units which line the main roads are accessed only from the front and have diagonal parking to allow for easy access to commercial space.

Some of the clustered lots have access only from the inside of the cluster. In these cases parking is available only along the street edge. In other cases, where multi-unit lots are included in the clusters, lots can be accessed from both inside the cluster and from the back side. Double access lots provide for additional parking both within the lot lines and in central parking areas in the interstitial spaces between and behind clusters.
Across a housing cluster
Wetland-housing interface
PROJECT: Unit Scale
Structural System

The structural system employed in the scheme is intended to provide a structurally, functionally, and formally unified base that supports and enables incremental growth guided by changing occupant needs and desires.

The basic structural units are precast concrete sections in “H” and “T” shapes. Spatial variation between the initial starting unit are achieved by combining and recombining the relatively few unique sections. The precast units stack and nest to maximize structural efficiency through shared party walls.
Precast structural sections

Light framed infill

Post-occupancy mezzanine floor insertion

Shared wall
Structure and Flexibility

While the precast structural units themselves are relatively rigid and inflexible, the configurations employed in the scheme are intended to maximize flexibility within the space created by the stacked and nested units.

In many instances, stacked precast units create double height spaces with an internal ledger cast into the unit to facilitate inexpensive and easy living space expansion via mezzanine insertion.

All of the walls within the units other than those created by the precast sections are designed to be light, non-load bearing, and moveable allowing for the placement of interior and exterior walls to suit the spatial and climatic needs of each unit and site.
Mezzanine insertion

Integration of potential expansion with initial structural framework

Incremental growth sections
Design for Thermal Comfort

The extreme heat and humidity that characterize the climate of south Louisiana present significant challenges in designing for high density urban environments that offer thermal comfort with low-energy input requirements. At each scale, from the individual unit to the wider urban strategy, the project is designed to minimize solar gain, maximize air movement, and otherwise increase thermal comfort in both indoor and outdoor living spaces.

**Mass**

Though south Louisiana does not enjoy wide diurnal temperature swings and therefore cannot take advantage of night cooling to the degree that buildings in hot-dry climates can, employing massive precast concrete sections for the structural unit of the project does ensure some degree of temperature dampening. Because the massive structure will heat up and cool down slowly, the energy demands of the units will be shifted to off peak times, saving energy and money for occupants. Party wall construction and substantial roof overhangs ensure that very little of the structure will be exposed to direct solar gain.

**Orientation**

Within the proposed urban layout, the vast majority of the living units are oriented to minimize their exposure to the East/West exposure that is most problematic for heat gain.

Sliding louvered panels on the light framed facades can be adjusted to fit changing solar conditions.
**Shading**

By structurally decoupling the light-framed transverse walls from the massive precast structures, the scheme ensures maximum flexibility in allowing occupants to shift wall and window positions to fit solar exposure conditions. Where a shallow porch or balcony space can provide shaded outdoor space, the transverse walls can simply be inset within the “H” structures.

**Courtyard**

Small courtyards inserted into the long narrow lots provide fixed points around which units are oriented, maximizing the opportunity for natural ventilation and daylighting within the living spaces. The overall wedge shape and generous ceiling heights employed for the living units encourages buoyancy-driven air flow.
Construction Details

Massive precast concrete units serve as the structural and spatial framework for the project. The units are stacked vertically and horizontally with bolted connections. These units create rough walls, floors and ceilings that can be upgraded as desired by homeowners.

When put in place, the precast units include the provision of space for services and utilities. In each configuration, utility service lines are shared between adjacent units and are “roughed in” in the middle of the long lot so as to serve front and back units and while not impeding unit growth and change.
Steel mending straps
bored connection
Steel reinforcing
Recast concrete frame 15cm thickness
Edger for adjacent precast concrete floor
Moisture barrier
Rigid foam insulation
Pre-cast concrete frame 15cm thickness
Ledge for adjacent precast concrete floor
Footer with keyed connection
Plumbing and electrical services
Channel cover board
Steel reinforcing
Pre-cast concrete frame 15cm thickness
Steel mending plate bolted joint
Cluster Units

The bulk of the units within the proposed layout are organized in clusters of 15 to 30 units around a semi-public courtyard space. Lot layouts range from the small core unit (C3) with a single 65 square meter unit to larger two unit layouts with up to 160 square meters of initial living space. All of the units are designed to easily accommodate expansion and change both within the initial envelope and outward to fill and expand the structural framework.
units: 2
starting size: 148m²
capacity: 3

easy buildout size: 184m²
capacity: 5
units: 2
starting size: 160m²
capacity: 5
easy buildout size: 190m²
capacity: 8
units: 1
starting size: 65m²
capacity: 2

easy buildout size: 125m²
capacity: 5
units: 2
starting size: 160m²
capacity: 4

easy buildout size: 235m²
capacity: 7
Live Work Units

The units along the main streets within the proposed area are designed to accommodate "live-work" units. These units are taller along the street front. They are laid out with commercial space in the front of the first floor and residential space above and behind that can be fully used without going into or through the commercial space.

Like the cluster units, the live-work units are designed with internal courtyards and provisions for user expansion within and above the initial structural framework.
1 2
ground

1 2
second

1 2
third

1 2

services
initial bedrooms
mezzanine
insert
work space
units: 1
starting size: 100m
capacity: 2

easy buildout size: 165m²
capacity: 5
units: 1
starting size: 125m
capacity: 2

easy buildout size: 205m
capacity: 5
Plans and Sections of Unit Type LW1

ground level

second level

third level
unit section A-A’ _ initial buildout

potential user expansion
Interior perspective through courtyard with inserted mezzanine floor
Cluster Units: ZCorps Model _ Rear

Precast Unit: ZCorps Model
Bibliography


