Surge City

There is little need to question issues of climate change in principle, and the fact that this will enforce profound changes in design thinking. We all know the main components by now, and part of this knowledge is the unpredictability of rapid change in form, scope, and location.

Simon Atkinson
University of Texas at Austin

Charlton Lewis
University of Texas at Austin

THE CONTEXT

There is little need to question issues of climate change in principle, and the fact that this will enforce profound changes in design thinking. We all know the main components by now, and part of this knowledge is the unpredictability of rapid change in form, scope, and location. In other words, certain of the changes could be seen as the potential for an increased increment of sun, rain, or wind, but in many cases, particularly in the context of the American seaboards, it is the sudden and unexpected damaging force of nature which we have tended to both ignore, and to be weak in our response to these tragic circumstances. In a certain sense, we find ourselves a little like primitive humankind, where we are presented with choices regarding lifestyles that can adopt patterns of avoidance, anticipation, adjustment, etc. In this regard, it is interesting to note that one of the mainstays of anthropological inquiry was insight with regard to a society's ability to adapt to a given environment through materials, engineering, food production, and just plain common sense. It is strange that advanced American society has shown evidence of lacking such skills.

It is one thing to consider climate change with regard to a traditional culture and static population, but America displays a quite different condition. We continue to be faced with rapid immigration and population movements, where cities will house approximately 70% of the population by 2040. At the same time, many of these major growth points are along seaboards, where the vast majority of edge cities could be subject to tropical storms and hurricanes. In this regard, it is particularly interesting to note that when Katrina hit New Orleans, almost all damage and loss of life took place in the newer growth neighborhoods of the city, the French Quarter and Garden District remaining relatively untouched. Admittedly, part of this catastrophe, particularly devastating the 9th Ward, was a tragedy caused by human error in addition to the storm.[1]

THE RESPONSE

Response to our knowledge of this relationship of dense city population to increased climate change has brought no clear directives, and perhaps less sharing of intelligence. We may well find it ironic that America, seeing itself as perhaps the world leader, could be faced with a continuous pattern of coastal tragedies while the Dutch have had in place an entire system of coastal protection, food production, and location of preferred growth centers since the late 1960s[2] A crude analysis of American thinking could be as follows. Firstly, the predominate attitude has been to ignore, followed by short term emergency intervention, some attempts at appropriate infrastructure, but largely ineffective change, with perhaps reversion to original patterns of settlement similar to those found prior to the environmental disaster. This is a historic pattern that could be first picked up in the remarkable plan of Christopher Wren in 1666 for the rebuilding of London, where, however magnificent the grand renaissance strategy, politics dictated return to the status quo[3] The great Berkeley Oakland fire saw a similar depiction, almost the same house footprints emerged after the catastrophe.

In looking closer at New Orleans' 9th Ward, a number of issues become immediately apparent: federal intervention was not only ineffective but possibly damaging to the future opportunities of the devastated area; however illogical, people wished to return to their homes and felt a great sense of attachment; few had reasonable understandings of an appropriate, cost-effective architecture, street layout, provision of amenities, and future defense mechanisms against climate change. As such in this first example, one could argue that a lack of forward thinking in ignoring the high potential for climatic disaster, led to terrible loss of life, huge federal expenditure, and still very little effective action.

A second approach could be referred to more as a step back from the edge, protect nature, and concentrate growth in appropriate areas. A clear example of this is Tony Hiss and Rogert Yaro's 1996 proposal "A Region at Risk: A Third Regional Plan for the New York-New Jersey-Connecticut Metropolitan Area".[4] This displays a clear and progressive logic, which is that storms will take place and increase, and there need to be abundant areas to absorb this impact that are left in a natural state and become also the focus of recreation, forestry, and water protection. The water resources of the region need to be protected at all costs, population should be encouraged through the use of transit and other infrastructures to concentrate in more protected areas which could be referred to as the "going for the higher land" approach.

An equivalent approach and far more wide reaching can be found in the Thames Gateway strategy.[5] Here a vast area of East London and the Thames Estuary is considered in terms of a combination of barriers and natural ecology parks acting as floodgates on the one hand, with small grouped townships and rail infrastructure forming new economic growth points and linking back to the host city. Each of these is all well and good, but as we know, most of our cities are a fixture with clear historic grids, often ranging from the water's edge, and little ability to "step back from the edge".

A third approach could be seen as putting in extensive coastal barriers. In many cases this could clearly from an engineering point of view be the best answer in that not only, as was shown by the Dutch, do you get the benefit of

guaranteed protection, but also the ability to alter agricultural and fishing cultures, generate energy, and improve transportation linkages. Whereas there will probably be a need for some moves to this extent, particularly where major strategic facilities are vulnerable, it is unlikely that this will be an American answer.[6] One of the key differences between, say, the Scandinavian cities and the American cities is that the economic and physical structure of those cities allows deep investment in protection from negative environmental forces, whereas America does not appear to have either budgetary desire or capability to universally move in these directions. Furthermore, many cities do not lead themselves to developing such protective coastal strategies, and from the point of view of cost benefit analysis, it may well also not be the best mode of intervention. Where there is a greater chance of success, is often where this can demonstrate a relatively direct economic multiplier, so national investment is seen as being a stimulant to both the national and regional economy, as well as bringing benefit in its own right.

THE CORPUS CHRISTI CASE STUDY

Turning to a somewhat different picture, many of our coastal cities display a logical historic fabric that has stayed in place, and has functioned well, for over a century. They are memorable, developing a sense of belonging, are good places to live, have a full infrastructure of educational and cultural facilities, and people simply do not wish to leave them. At the same time, the increased tension, stimulated by the fact that they may face a situation that is beyond their control, could be stifling their fuller potential. The case study in hand, Corpus Christi in South Texas demonstrates many attractive values for life in the 21st century, possibly showing potential to meet the "Richard Florida test".[7]

Corpus is a city with abundant sunlight, fairly continuous wind gusts ranging up to 40 miles per hour, over thirty inches of rain per year, an international airport, a university, and excellent rail and freeway connections, as well as being part of a fertile agricultural region. The potential of its tourism industry for sea-based sports and activities, and nature refuges is enormous. Without the threat of natural catastrophe, one could find many arguments for concentrating future growth at that city, where to a large extent it could develop infrastructures that are locally based and self supporting, and overcome a "fringe city" psychology.

It is important to note that Corpus Christi, "the Sparkling City by the Sea", houses the fifth largest port in the nation, has a strong tourist and petrochemical industry and international airport, and is home to Texas A&M Corpus Christi University. With a metropolitan population of 469,134 in 2012, it is the eighth largest city in Texas.

How do we overcome this set of conflicting dilemmas, where there may well be considerable future potential for economic development and population expansion of mid-sized cities, only held back by the fact that they could become an overnight "war zone" with little opportunity for rapid bounce-back and recovery. The proposition is made to consider more rather than less growth in selected coastal city locations and that we should attract new populations and industries to these potentially vulnerable urban areas. This in turn could be the next revolution in regional economic strategy. If we leave alone for a moment the issue of global warming, we know that the

new pattern of a global society in the US has emerged as one of stimulating mega regions with good transit and infrastructure, close connection between a range of interconnected industries and intelligence hubs, and supported by research universities and think tank incubators. A difficulty facing these locations is often that they attract, as in the case of Austin, Texas, the brightest minds, serious growth demand, followed by rapid price inflation. A strong argument to support this proposition, therefore, is that "fringe cities" could have a price index infinitely lower than the larger metropolitan cities and a more equitable economic structure, important to Corpus Christi with a relatively poorer, Hispanic population. If, and of course it is a big if, a new pattern of economic and architectural intervention could bring about an infrastructure of robustness, then at the same time a high quality of life could be engendered that is affordable to a wider range of the population, bringing a more equitable society.

FEDERAL RESILIENT CITY STABILIZATION PROGRAM

It is visualized that the actions described would come under the auspices of a new federal act enfranchising the "Federal Resilient City Stabilization Program". This program will target cities underpinned by a combination of vulnerability on the one hand (Corpus Christi being assessed as the 9th most vulnerable city in the US), but economic and growth potential on the other. Other factors will clearly come into account, such as being the home of a significant university or other major public amenity; historic significance; importance in relationship to the state; concentrations of poverty and elderly, indicating low mobility in times of natural catastrophe. It is envisaged that to guarantee success the program would stretch to all aspects of natural catastrophe in relationship to cities, so would be enacted quite differently if there were issues of earthquakes or fire than the case study at hand. Here our concern the relationship between hurricanes and tropical storms and cities, as well as rising sea levels.

The program would be enacted through four major federal measures:

1. Vulnerability Interpretation
   This would be undertaken with federal aid and expertise providing an index of the particular characteristics of vulnerability in a given city, and providing the basis to the allocation of major federal funds. This could be applied to sea defenses, bridges, protection of a strategic facility, for example, but essentially is aimed to have a clear public understanding of where there could be danger to human life, scope for major pollution, or a breakdown of city systems.

2. The Resilient City Plan
   This plan develops a strategy for infrastructure intervention to alleviate potential threats, while at the same time helping launch the city to its next stage of economic development. This could include boardwalks, sea defense areas that could provide surge resilience, the implementation of new transit, development of locally-based agriculture, areas to absorb major growth, etc.

3. Federal Building Stabilization Program
   This program provides funding at the scale of buildings to provide reasonable protection against natural catastrophe. In the case of Corpus

Christi this would be an examination of all buildings with regards to their ability to resist a storm surge. Many of the more recent buildings, particularly in seaboard locations, such as hotels, are already built to more rigorous codes. It is foreseen that this would particularly address poverty areas where homes would need to be provided with stronger foundations, defensive walls and protective shutters. This program is not an absolute guarantee, but ensures there is a reasonable chance that all homes and commercial buildings within the city can better resist a storm.

4. Federal Tax Increment Financing and Enterprise Zone Mandate
   Further investment could be launched by a guarantee that all new commercial and residential development would be included in a tax increment finance program over a given number of years, and federal tax enterprise zone incentives would be provided to all new commercial developments. This might be seen as contradictory to attract new businesses to vulnerable zones, but the central aim of this component is to facilitate a potential growth spiral of relative attraction to a given city, which is also in most cases supported by the fact that the land and costs are lower than prime cities, and new buildings must reach defined performance standards.

In summary, the program provides substantial federal investment where needed to promote resilience, a pattern of federal money for stabilization, focused tax incentives, but the city must grow according to a clearly designated plan, as part of its forward thinking protection.

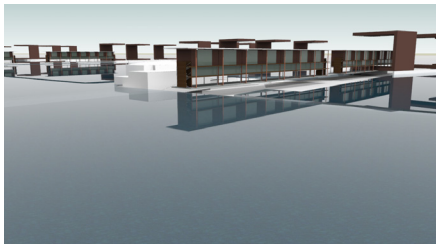
DESIGN INTERVENTIONS FOR CORPUS CHRISTI

It is assumed that the above federal incentives are in place. This has brought about extra protection to the port and bridges, and federal funds to establish a series of open land wedges that can absorb part of storm surges. Reference here is towards the core of the city, where five typologies are developed. Each moves outward from core, the general downtown area, in the development of typologies that adapt the most vulnerable landscapes and built form, and that also show the need to interplay a series of courses of action.

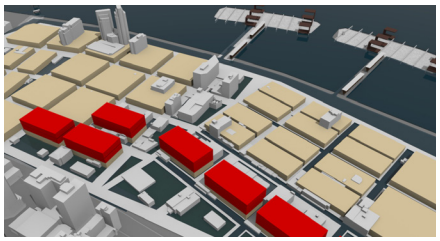
1. Living at the Edge
   A series of tee head piers currently range into the bay, forming a marina and tourist attraction. Here is seen the opportunity to bring further tourism to the core of the city by developing a series of architectural structures that combat a storm surge before it hits land. In case of catastrophe, all boats would have had time to move to sheltered locations, and the stark structure of piers would have a combination of robust structures breaking the tidal force, as well as buildings with built-in shuttering, but generally offering a "light" touch that in everyday life would be seen as an attractive location to experience. This is very much a tourist village, so it would be expected to be largely unoccupied at the time of catastrophe. (ref. fig. 01)

2. Watertown
   Watertown is the name of an existing district that forms the heart of Corpus Christi and is a mix of hotels, offices, and an older street fabric where the main street was originally the front street to the bay. Here, a careful inventory is made of all buildings to not only work out their current storm ability, but examine approaches to ground level where

1



2



3

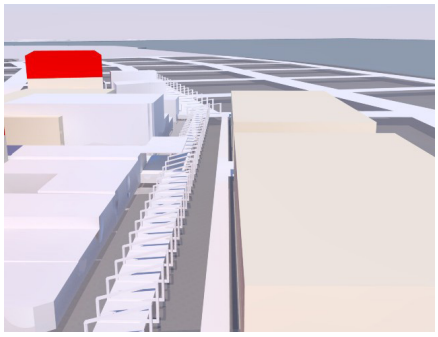


Figure 1: Marina structures front the downtown, providing interest and partial protection.

Figure 2: Watertown absorbs floods, facilitates surge resistant structures, and developes elevated walkways.

Figure 3: Elevated walkway providing interest, access above flood levels.

it is anticipated that Watertown would be flooded under major storm conditions. New buildings would be encouraged, and essentially vertically zoned with resilient design guidelines. In many cases the lower levels would be more porous, and the upper levels able to offer protection under all circumstances. The key to this area is that it is able to bounce back quickly so that offices and hotels have little down time after a storm. This also becomes the home of new circulatory systems, explained in the next typology, meaning that the area is accessible under most conditions as well as offering a new pattern of social spaces and sky bridges. (ref. fig. 02)

3. City Connect
This has two main components to it. The first is envisioned as a raised pedestrian network ranging through the downtown. The "city walk" links existing and planned retail and commercial centers with integrated decks and viewing platforms. It would help shade streets, interlink with transit stops, and range through to the tourist edge condition as described in (1) above. It is constructed of light weight steel and composite materials with detachable awnings. The second part is the reinstituting and extension of the city's that was abandoned in 1931. The advantages of streetcars are well known in changing the pattern of daily life, particularly where there is a concern for the movement of students, tourists and older citizens. Here, with federal incentives, the streetcar becomes a vital part of the city's safety as well as reducing its carbon footprint. All those living and working in more vulnerable areas can easily reach the special safety provisions that will be incorporated within the new city typology. This system using electrical cable connectors that can be easily serviced, and generated through natural energy systems from the high solar and wind capacity of the bay, is part of the city being able to start working again within a very short time period after a storm. (ref. fig. 03)

4. City Refuge
The one aspect that is often forgotten in context of hurricanes is that it is the first 24 hours that is central to the protection of life. City Refuge is an innovation where selected stops on the new streetcar system would offer dependable shelter and sustenance, while being community anchors and neighborhood centers in their daily life. They will be located in proximity to underserved and vulnerable population groups, providing both a social hub and a vital force in the resilience of the city. The design raises the building on a plinth with guaranteed structural protection and protected telecommunications. The refuge centers offer safety, food, medical supplies, and have built in water storage. Typically, refuge centers will also be points of communication, supply distribution, temporary power sources, and staging areas for emergency personnel: a "beacon in the landscape" that projects a sense of welcome and security. In their daily life, centers can be used as elder centers, child care, group and club meeting points, partly facilitated by their high level of accessibility from the streetcar system. (ref. fig. 04)

5. City Farm
Less vulnerable areas are designated for cooperative residential programs interrelated with a farm to market agenda. This is seen as a

robust urban farm, but operating on a semi-industrial scale, guaranteeing an affordable food supply in the daily life of the city, agricultural training programs, but supporting self-reliance at the time of an emergency. Here, experimental buildings provide affordable homes, as well as incubators for agricultural products, processing, and distribution.

In summary, this a combined federal and local strategy that anticipates general climate change, the need for the development of new economies and city population expansion, while providing a robust framework of a resistance. It can only work if there is a close interrelationship between the involvement of people at the scale of the city, a clear understanding of all involved, the strong support of the state, and the conviction by federal agencies that this will result in not only less dollars being spent by being proactive, but them being spent wisely. This design strategy is a belief that architecture can intervene in meaningful ways in pursuit of a high quality of everyday life in the city, while using technology to resist the worst human and physical outcomes of natural catastrophe.

4

Figure 4: Multi-purpose refuge at transit stop

ENDNOTES

1. Campanella, R. B*ienville's Dilemma: A Historical Geography of New Orleans*. 2008. Center for Louisiana Studies, University of Louisiana.
2. Kimmelman, M. "Going with the Flow." *New York Times*. February 13, 2013.
3. Hanson, J. "Order and Structure in Urban Design." *Ekistics*. Vol. 56.
4. Hiss, T. and Yaro, R. *A Region at Risk: A Third Regional Plan for the New York – New Jersey – Connecticut Metropolitan Area*. Island Press, 2966.
5. Farrell, T. *Master Plan for Thames Gateway Parkway*. 2008
6. Helmore, E. "Massive Barrier Plan to Save New York from Flooding" *The Telegraph*. November 2, 2012.
7. Florida, R. *The Rise of the Creative Class – Revisited*. Basic Books, 2012.