Hearst Lecture: Gary Hack
Disruptive Changes and the Pattern of Cities

On April 6, 2016, Cal Poly's CAED hosted professor Gary Hack for the Hearst Lecture Series. Dr. Hack is former dean and Professor Emeritus of Urban Design at the University of Pennsylvania. He writes about and practices large scale urban design having prepared plans for over forty cities in the US and abroad. Among his many publications is the influencial Site Design, *co-authored with Kevin Lynch, his professional partner of many years. At Cal Poly, Dr. Hack spoke about the transformative moments in city history and their impact in form moments, calling for planners and designers to look more into the future in our work.*

Today I want to talk about the future, but I do so by first looking back, focusing on the moments in a city's long history when transformative change occurs. I am interested in this topic because I see a lot of cities planning and struggling to do things that have been on their agendas for many years. However, as planners, urban designers, and landscape architects, we need to be thinking about things that will be needed 10 to 15 years from now. I don't see many cities reinventing their future in the plans they are making.

There are reasons for that. It takes time for ideas to mature politically. It takes time to assemble resources to overcome opposition. It takes even longer to accomplish ambitious changes. But if the horizon is 10 to 15 years ahead, then changes being pursued based on current needs are likely to be largely out of date when they are completed. A while ago, working on the plan for New York City's West side waterfront, I discovered that there were several very large piers, including the 16-acre Pier 40, that had never been used for the passenger ships they were designed to serve. Pier 40 was built to accommodate the fast fading service between New York and England, but it took so long to build that it was completed about three years after the last passenger liner left port. Meanwhile, as these dinosaurs were being constructed New York was lagging behind in building the international airports that provided the future links across the Atlantic.

We run that risk in many of the plans we are pursuing today, just as the pace of change has accelerated. I find it instructive to look at how cities have coped with large changes in the past.

What was behind the transformative changes they needed to harness? How did they foresee change? What plans did they make? With answers to these questions in mind, I will move on to discuss the four major forces that we ought to pay attention to today because I think they will have transformative effects on our cities.

Three Cities, Three Transformative Moments

In 1850 Barcelona had just torn down its walls. Peace had come to that part of Europe, and they didn't need the walls for protection. Barcelona, some people would say, was the densest city in the Spain because it had lived within these walls for many years. It was a modestly sized city, and there was no overt indication that it was going to grow to be much larger. But if you look carefully at the map from that era, and with the benefit of hindsight, you realize that transformative change had already begun. Rail connections had been established with the rest of Europe and Barcelona was about to become a major point of entry to the continent and a prime location for manufacturing. This kind shift in the economic geography of a city is critical to its transformation.

Nine years later, Ildefons Cerdà would author the plan for the expansion of Barcelona.[1] Compare the new areas proposed in the plan to the size and density of the old city that was contained by the walls. In the vision for this plan they said: we need to think differently about the city, we need to lay it out for a different kind of way of life, plan it out for mixed use where people can have workshops and live on the same block as they work, create boulevards so that goods and people could move around the city. But they also decided they needed infrastructure in the

[1] Editor's note: See Urbano, J. 2015. The Cerdà Plan for Barcelona: A Model for City Planning. *FOCUS 12,* pp. 47-51.
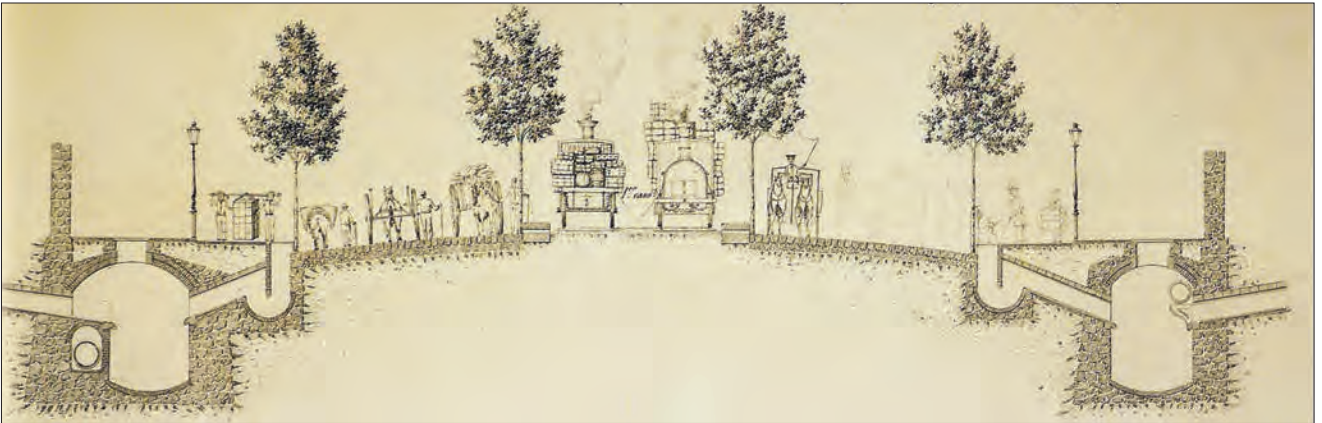
Figure 1: A typical section of a boulevard in Cerda's plan reveals his scientific approach to designing based on the water and public transportation systems.

ground at the time that people began building the workplaces and houses according to the plan. This may be the first city in the world that actually built the infrastructure in advance of development; most cities are perpetually playing catch-up. The new city's Eixample -literally "expansion district" in Catalan- was built on an armature of great new boulevards that are still adequate today. As is the underground infrastructure, and subways have been added to move residents efficiently to and through the area (Figure 1). Cerdà, an engineer by training, understood that the environment needed to be designed in three dimensions.

Of course, Barcelona has gone through several significant transformations since then, and it looks very different today. Now it is the most important and densest node in a network of cities, not a singular place. There are several well linked clusters of cities around Barcelona, some of which are becoming semi-independent places in their own right. After the expansions of

Figure 2: Barcelona's new infrastructures and global linkages are generating another transformation in city form, such as dynamic nodes around rapid train stations. (photo by G. Hack)

during the 19th and early 20th centuries, the decentralization of industries required different kinds of linkages, such as highways and trains. Today the city is experiencing a third transformation, with high-speed trains and a highway network connecting it to the rest of Europe. Street cars and the metro continue to be expanded, and with a new service economy dominating the central area, public transit has renewed importance. And with it, there has been a retreat away from building new roadways, with several long-planned expressway links being abandoned. The new connection points are the nodes where mass transit lines intersect (Figure 2). So, over the past century and a half, Barcelona has gone through three major transformations in its city form, each a reflection of economic shifts, technological possibilities and societal changes.

My second example is the city of Beijing, China; a very old settlement but also a very new city since almost all of what we see today has been built since 1916, and the most visible portions since 1990. Beijing's main city wall was torn down during China's cultural revolution in the 1970s. At the center of the city remains the walled Imperial City where the government with its ruling dynasties and their bureaucracies clustered. A dense network of *hutongs* —narrow streets or alleys– laced between the major streets that are more than a kilometer apart. In 1954, after the revolution, the city was reorganized in fundamental ways, to accommodate a new social system (Figure 3). Until then, Beijing had been a bureaucratic and an intellectual city, but the new government looked skeptically on such activities and decided to make the city a place for heavy industry. The fundamental unit of the city became the *danwei* that essencially is a a work distrcit that also provided a place to live, shop and all the necessities of everyday life within walls (Figure 4). The largest such new unit, the Shougang Steel Company occupied over 7 km^2 on the western edge of the city and included a new town of over 100,000 workers and their families. Universities and government ministries were also reconstituted in this form. New parts of the city were laid out with a 1-2 km grid of

streets, allocating the areas between to *danweis*. In 1983, the first time I was in Beijing, I visited the *danwei* with the second most important district heating company (Figure 4). Every person that worked there and their family members lived within that danwei which also provided schools, a clinic, and a commercial center. People rode bicycles within the danwei, and travelled by buses on their occasional trips to the center of Beijing or other larger shopping areas. So, in this case of Beijing, a deliberate transformation of the social system generated a whole new form and character for the city.

Since the early 2000s, Beijing is witnessing another transformation as China is becoming a state capitalist country and a new kind of city is being formed. The *danwei* were heavily supported by public money, with government-subsidized industries, infrastructure, and expensive services such as local hospitals. Many danwei are being dissolved, and the land of the work units are being sold, hoping to raise the capital to become efficient private enterprises. The changes in the regime have also brought changes in social attitudes, and today everybody wants to experience life beyond their danwei: going to schools elsewhere, using the university-based hospitals, or patronizing shopping centers rather than shop at their little local shops.

As Beijing's 2004 Master Plan reflects the emerging social system and economic model, the city needed, for the first time in it's history, a true downtown! In the past, a few large state-owned department stores offered all there was to be purchased, and a few specialist stores sold silk and teas and other goods, but there was never a dominant central business district because there were few non-governmental offices. So, the plan created two new CBD areas —one as the financial center, the second for corporate headquarters and offices– and Beijingers were forced to travel to do business (Figure 5). A metro system was built to connect it all together, as well as an expressway system to get vehicles into and around the city, modelled after Moscow's system of spokes and ring roads.

Currently, Beijing is going through another profound transformation as it is essentially merging with the city of Tianjin, about 100 km away, to form a conglomerate of 45 to 50 million people. A high-speed rail link has been created, new transport terminals, new business districts, and a whole new structure of settlement is occurring as a result of another deliberate shift in the social system. Figure 6 shows a new business node being built in Tianjin, 10 miles away from any existing commercial district.

The third example I want to explore is that of Los Angeles that, when established as a mission city in 1850 had one small center serving the surrounding agricultural plains. Although it was a desert, the plains were fertile as long as they had water. The first infrastructure to be built was small water canals and wheels
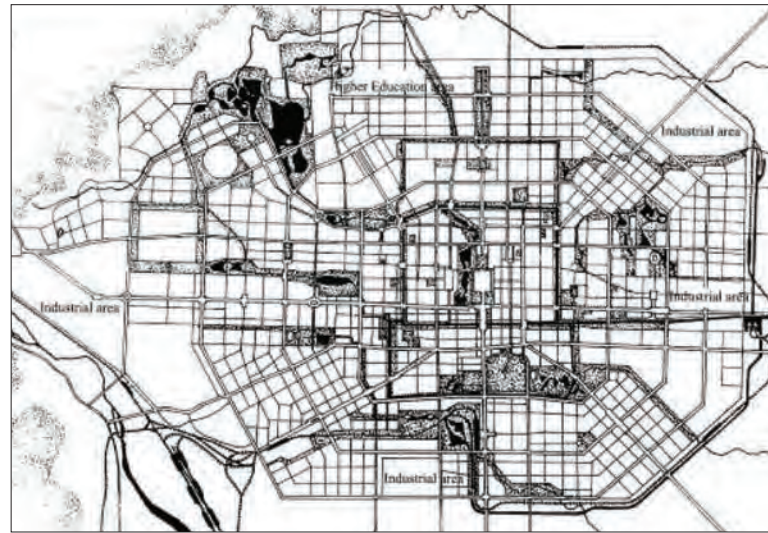

Figure 3: Beijing's 1954 master plan was meant to accommodate a new social system through a network of danwei. *Note the old Imperial City at the center.*
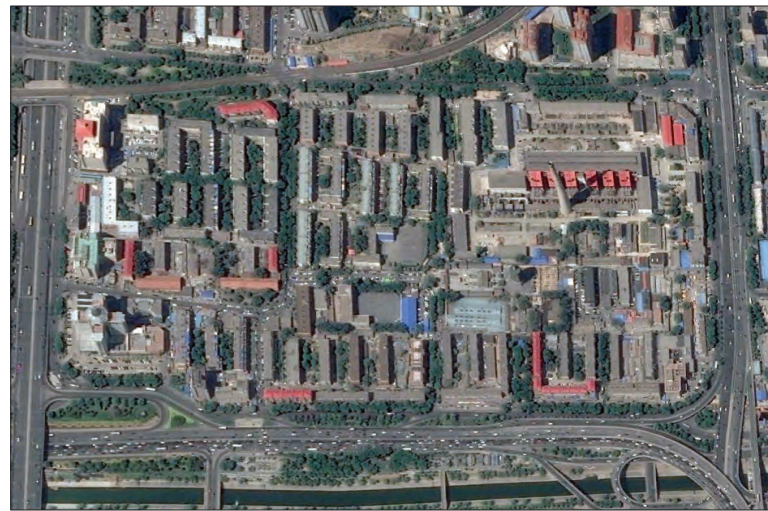

Figure 4: One of Beijing's danwei*, organized around the second most important heating companies and its workers. (Source: Google Earth)*

Figure 5: One of Beijing's new CBDs generated by the 2004 Master Plan reflecting China's new social and economic model. (photo by G. Hack)

Figure 6: A new business node being built in Tianjin, 10 miles from any existing commercial district. (photo by G. Hack)

to lift the water to the fields. By the 1860s, just as Barcelona had gone through its first major transformation, a series of events started to make Los Angeles a different city. One was the introduction of railways up and down the California coast as well as was the arrival of the transcontinental railways. If that was not enough to transform the city, it did give it, as in the case of Barcelona, the impulse to think a different scale and in connection to other markets. Los Angeles became a major land market fairly quickly. By 1880 land speculators began selling sites at the end of the railway for people from the east. From that moment, land development and marketing created the idea of Los Angeles as a paradise on the west coast with a perfect climate.

Major changes that would transform the city began with the discovery of oil in the city of Los Angeles. The discovery of oil
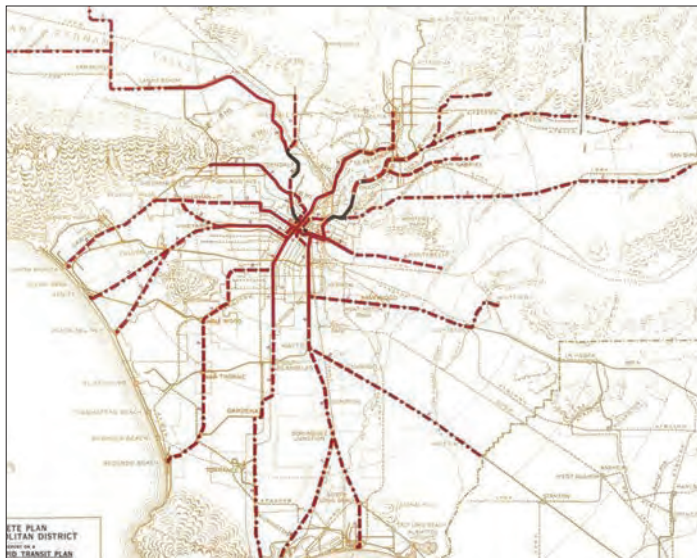
brought a great deal of capital into the city, and part of it was recycled for land development and building houses. By 1880 there were hundreds of oil wells all around Los Angeles, and created areas where no one wanted to live in, such South LA and Huntington Beach. As people preferred the valley, at a safe distance from them, electric railways were built to get people from the city further out where they lived. In the early part of the 20th century, Los Angeles had one of the largest streetcar systems in the world. It also accelerated the growth of the inland empire and over to the valley. During this period, growth filld the gaps between the small towns while expanding outward from the central core in Los Angeles. The expansion occurred mostly to the north and the east, away from the oil country.

The second major transformation in Los Angeles was the emergence of the movie industry in the 1920s and on. Why did it happen there? There are a lot of theories about it, but it was probably the intersection of capital and land. The oil industries brought capital for investment. The movie industry could not locate to the south of city because it needed a lot of flat lands. As each studio built its facilities further out, they created a demand for street cars initially, and then for highways. The highway network got laid out in only fifteen years, from 1925 to the end of WWII, as Los Angeles transformed itself into a regional city. Much happened after that in the way of shopping centers, expressways, a major grafting of these expressways onto the overall form of the city and, in the last few years, the addition of a metro system. Interestingly, the 1925 Rapid Transit plan and the 2015 Metro Plan look strikingly similar (Figures 6 a & b). Why did it take 70 years to build a metro? Well, because there were other forces at work, which I'll leave for you to discover.

So how to sum up these three brief histories? We can say that along the history of cities there have been essentially four

Figures 6 a & b: Los Angeles Transit Plan (1925) and Metro Plan (2015). (source: https://la.curbed.com)

major drivers of change: economic shifts, technology, social organization, and deliberate public policies. You have seen examples of all of them in the cities I have discussed. Will these changes force cities to look different 15 to 20 years from now? If we look closely, the changes are already afoot.

The City of Networked Work and Living

The internet already dominates most of our work and living, and it will increasingly continue to do so. The fact is, we want to live a connected life, using the internet in our work places, for our dialogues with other people, and ordering goods and services. The internet has become an important driver of innovation in cities, and it is already changing cities in a dramatic way even if their physical form does not adapt as quickly as needed. "Instant everything" is the driver of profound changes in cities. For example, 50% of the US workforce holds a job that is compatible with at least part-time telework, 41% of employees are required to be in contact outside work hours, and 70% of Americans check their smartphone at least every 6 minutes. These are profound societal, and we have just begun to recognize them. We are only beginning to think about what it means for cities. How should we be designing them differently? The new localism is the world brought to the home through the new technology in our hands.

The first set of changes is the need to redesign our streets to serve additional functions. Think about the streets of New York City when hundreds UPS trucks are all going out at the same time for their deliveries. Who thought about this when planning for traffic lights or designing streets, apartment buildings or houses? Where are deliveries stored and deposited if people aren't home? Isn't it possible to employ delivery vehicles that they don't overwhelm streets, as in much of Asia and Europe? And who would have thought, a couple of years ago, that we would have drones dropping parcels around the city, as Amazon is already starting to do? But private sector companies are usually first adopters, with public sector change lagging behind. And change generally occurs in two stages: first we use new technologies to do what we have always done more efficiently; then we rethink the very nature of what we are doing to optimize it assuming we have new technology.

This is precisely what is happening to work places. Figure 7 shows the lobby of the Ace Hotel in New York's Flatiron district, at the center of the city's tech district. The people working in the lobby are not staying at the hotel, they go there every day to work on their computers, meet and greet people they want to do business with, and make social connections. This is a new way of "net-working." I visited a library in Almere, Holland, at 10:00 AM and all of the tables were filled with people. I asked the librarian: "Who are all these people?" "They are working", she said. "What do you mean they are working?" She informed me

Figure 7: Lobby of New York's Ace Hotel as work space. (photo G. Hack)

that "they are running their businesses right there." This is what we are dealing with nowadays: 29% of American employees are freelancers these days, and while many work from home, they need places for easy connection, and above all need high speed internet connections. Of course, the freelancers include housekeepers or day-laborers who move from place to place, and many other work arrangements. But many of the new jobs are not the factories or the normal kinds we are used to planning and designing. They are libraries, coffee shops, university cafeterias, and even city parks, particularly those that offer free hot spots such as Paris.

There are also a growing number of shared office spaces of all kinds in every city. Companies and organizations offer freelancers a place to rent for a day or a month. Being able to share a hot desk with others they may or may not know, or have a place to meet with clients or print out files that are carried around on an external hard drive, or even share a common assistant to answer calls are the essentials many need. If you are in the catering business, you may not need a whole kitchen all the time, so there are shared kitchens you can rent only when you need to cook your food. Shared work places are now proliferating in cities throughout the world. It strikes me that we need to think about cities differently to account for this network of shared spaces.

When Nolli did his famous figure-ground map of Rome in 1748, he plotted all of the then-public spaces: streets, squares, churches, and other places open to people. If we were to do a Nolli map for today, what would it look like? Figure 8 shows a map by students from Columbia University showing all of the places in New York's Flatiron district where you can meet with other people to work or rent out a place, in what becomes the
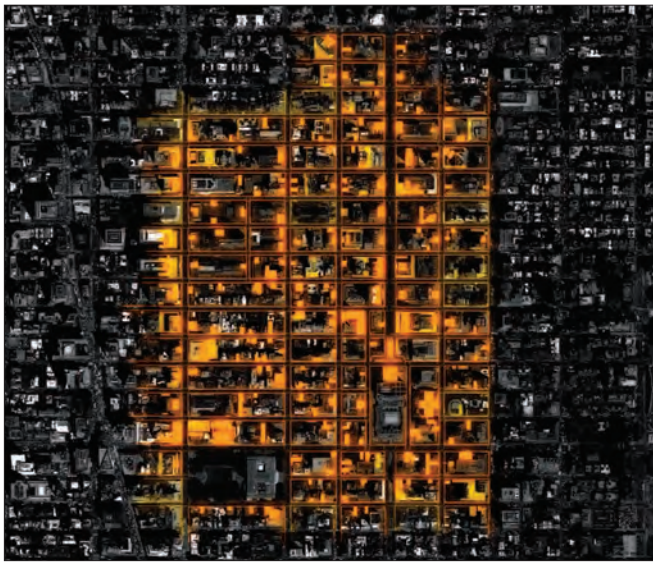
new network of shared workplaces in the city. Seen this way, new kinds of public infrastructure can be imagined.

For example, Boston has created a place through a public-private partnership in its Innovation District called the District Hall that is a hub for freelancers and small businesses (Figure 9). This is the place to meet with others if you are working in the neighborhood. It has cafes and a restaurant, meeting rooms, conference rooms, and large lounge spaces open to all. Similarly, the University of Pennsylvania has created the Pennovation Center, where faculty members can set up shop, have a hot desk, or rent a little bit of space to start a company, a business. These kinds of facilities are now an essential part of a city's infrastructure.

At a much larger scale, a prototype for innovative businesses may be found in Industry City in Brooklyn, New York (Figure 10). This waterfront area, with 6 million sq ft of formerly warehouse space has been converted into maker spaces of all kinds. For instance, there is a company that makes 3D printers that started with five people and has 500 employees, and as they grow, they take more spaces. There are common kitchens, meeting spaces outdoors and indoors, restaurants and other spaces that help create an ecology of innovation. New uses appear every day looking for spaces they can't find or afford elsewhere. When the Brooklyn Nets needed a new space for training, they adapted the roof of one of the warehouses into their training center, and the public can come to watch. The large warehouse structures have been linked together with common walkways to promote interchange, and the streets serving the area have been rethought as shared spaces where delivery trucks mix with people walking, on bicycles, or being dropped off by Uber cars. Figure 11 is a rendering of their new prototype street with walkways elevated a few feet so that trucks can be unloaded directly into buildings. Rethinking the nature of streets is fundamental in repositioning them in a city's future infrastructure.

Figure 8: New York's Flatiron District network of shared workplaces, a map produced by students from Columbia University.

Figure 9: Boston's District Hall, designed by Hacin + Associates, is a hub for freelancers and small businesses. (source: www.bginvestors.com)

Figure 10: The Industry City in Brooklyn, where 6 million sq ft of formerly ware-house space are been converted into maker spaces of all kinds. (source: https://technical.ly/brooklyn/2013/08/30/will-industry-city-be-the-next-navy-yard/

Figure 11: Concept for Industrial City. Elevated walkwyas so trucks can be unloaded directly into buildings.(source: courtesy Industry City)

Paris has been building live-work creative community spaces all around the city; one in each district. Chinese cities, such as Shanghai, have been implementing successful maker-places, and spaces for their creative classes. The Red City was a former steel company that has been converted for artistic pursuit and now boasts architecture firms, advertising agencies, and many related services besides coffee places and such. The KIC (Knowledge and Innovations Community) is being built *de novo* as a live-work place that encourages innovation (Figure 12). Located in Shanghai's university district with several institutions including Tongji University, one of China's oldest and most prestigious with more than 44,000 students, it is meant to be part of their larger innovation ecology. While much of the space is devoted to high tech R&D spaces, the area also includes shared work spaces, live-work housing, retail and cafes on the ground floor, places for fairs and expositions. In Hong Kong, the two buildings of the PMQ (Permanent Married Quarters) where married police officers used to live, were converted into maker-spaces with retail spaces on the ground level and a roof over the space between center of them, converted them into level, etc.

To support these types of initiativeswork, cities have built WIFI systems to make internet service ubiquitous and provide free public hotspots. In New York City, Google's new subsidiary Side-walk is installing free WIFI hotspots on the streets throughout Manhattan, with plans to expand further to cover much of the city. Many European cities have pioneered this, including Barce-lona with Smart Santander, and Paris in its public parks.

The City of Mobility

The second set of shifts that are changing cities are related to the new modes of mobility which, like the changes generated by the internet, they have been happening for a while. These changes are less related to increases in demand for movement, and more to a shift in the ownership and types of vehicles inhabiting the streets. Their impacts on the form of cities will be profound.

The shifts began with the growth of car sharing, continuing with ride hailing services such as Uber and ride sharing such as Lyft. And, of course, there are the bike renting services – which was pioneered in Paris— now virtually in every city. But the large change will be the result of the shift to autonomous vehicle services. What will the implication be? These services encourage people to leave their cars at home and, in very dense and expensive cities, not avoid owning a car, particularly if the city also offers a good public transportation system. In the future that system will probably be largely autonomous as well, operating on routes governed by demand, not fixed maps.

About twenty years ago, when I was Dean at Penn, several students came into my office asking for advice to start a car-share service. They wanted it to be non-profit and available for people in the downtown. Little did I know that five years later their Philly Car Share would have about 4,000 vehicles and be very successful. One of the things that they did was to look at how many vehicles each of their cars replaced, discovering that between eight and ten automobiles were ever given up or not purchased by regular users. Some people didn't buy cars because they didn't need them, some would leave their car at home when going to certain destinations, and others adapted their behaviour in other ways to use car sharing. For example, rather than purchasing a general-purpose road hog, you can get a small truck from your local car share if you need to pick up a sofa at IKEA, and if you want to have fun driving in the countryside you can get a convertible

These changes are causing significant impacts in cities, but the second generation of them is about linking mobility services up to mass transit systems. This is what Los Angeles' First Mile Strategic Plan is trying to do: coupling up all the pedestrian

Figure 12: In Shanghai, the Knowledge and Innovations Community is a high-tech R&D and live-work development next to a university district serving several institutions. (source: www.casestudies.uli.org)

Wilshire Normandie Station, Location 1
Wilshire Blvd. and S. Normandie Ave.

Components Used at Case Study Site

Crossings Enhancements and Connections
1. Continental crosswalks
2. Scramble crossings

Signage and Wayfinding
3. Medallion signage
4. Real-time signage, next train/bus
5. Curb-edge banding
6. Smart technologies

Safety & Comfort
7. Street furniture

Integrated Transit Access Solutions
8. Bike Share

M Metro Station Location
○ Visualization Location

EXTENDED STATION ZONE (Area 1)
5-Minute Walk / 2-Minute Bike

TRANSIT-FRIENDLY ZONE (Area 2)
10-Minute Walk / 5-Minute Bike

Figure 13: Page from Los Angeles's First Mile Strategic Plan, coupling pedestrian amenities and pathways in a mile radius around a transit station or from where you parked your car.

Figure 14: Driverless bus in Trikala, Greece. (photo by G. Hack)

amenities, pathways, transit stations and alternative mobilities that can take you that extra mile around a transit station or from where you parked your car (Figure 13). Of course, European countries are ahead of us in many ways. Many cities now offer electric car sharing at transit stations and bicycle garages and service centers at rail stations. European cities are also testing autonomous buses: Trikala, Greece and Amsterdam are already deploying small driverless buses that pick people up along regular streets and lines (Figure 14). Driverless trucks and delivery vehicles are likely to appear over the next few years.

Autonomous vehicles will have a profound impact on the efficiency of traffic and on the space that our cities dedicate to movement. Because all the driverless cars will be sharing the same centrally operated smart network, they will perform in a collective mobility and move in concert, safer, and efficiently. Because these vehicles are run with safe, smart collision avoidance systems, streets could be redesigned without curbs or physical barriers, allowing more flexible and dynamic spaces between buildings. Secondly, driverless cars will take up four times less space, even at high speeds, because they will be able to drive in concert and much closer, almost comparable to buses or trains. And if you imagine driverless vehicles that take more than one passenger, you get the picture. Most of our traffic problems will be solved!

Driverless cars will also have a profound effect on the physical space dedicated to parking in cities, and in how we deal with parking. In average, US cities offer eight parking spaces for every car! Why? You need a space for your car at your house, then you drive to the shopping center, and there is a space waiting for you; you drive your car to work, and there is another space there; you drive your children to school, and you have to park to pick them up, etc. If we add it all together, it comes out to be about eight spaces available for every car in the city.

But imagine if you could actually get rid of those privately-owned cars, hailing a vehicle when needed that drives you to your destination, dropping you off and then driving off to pick up another passenger. This would profoundly change the amount of parking we need, not to mention the number of cars circulating around blocks in search of a parking spot. But if you prefer to arrive at a destination in your own driverless vehicle, you won't need to park it, exiting the vehicle at the entrance to the garage, and watching it drive off to find a space You call it from wherever you are, and it will come to pick you up! It also means that parking can be done bumper to bumper, avoiding the need for all of that manoeuvring space.

We will have to think differently about the parking garages that remain and the future ones. In many US downtowns most buildings have 3 or 4-storey podiums dedicated to park-

ing; that can amount to about one third of the buildings' total square footage! Some of them had eight stories of parking! When we don't need all that space for parking, what will we do with it? We need to imagine of more productive uses for these spaces when they become obsolete and be sure that the floor to floor heights are adequate to convert them to inhabited spaces. Some people are starting to think differently about parking, and the Lincoln Road Parking facility in Miami Beach is a great example (Figure 15). There, a wonderful parking garage can also be used as an event space in the evenings and on weekends when the cars aren't there – a fine space for banquets, weddings, parties, or music. One key detail is that it was designed with tall floors so it could serve multiple purposes. Some of our existing parking structures might even be repurposed into markets or residential and office buildings.

I recommend the study Imaging the Driverless City by BIG – the Bjarke Ingels Group, for the Audi innovations program, exploring many of the possibilities presented by autonomous vehicles as I have been mentioning. Their dystopia is that streets will be flooded with vehicles since every moving lane could handle at least double their capacity if every vehicle can keep only a few feet behind the one ahead. They suggest that streets could be liberated by the lack of striped moving lanes and traffic signals which will be obsolete. Smart cars would need a smart infrastructure, with sensors embedded in the pavement generating a ubiquitous network of smart streets that would control and direct the smart cars. Besides, we already have the technology to allow electric cars to recharge themselves by passing over charging stations embedded in the roadway. Sensors can create lighted "halos", demarcating safe zones for pedestrians and bicycles so that they do not have to be physically separated from vehicles. You walk out into the street, and the vehicle senses that you are there and it stops or drives around you. It's as if you carry an aura around you that cars won't enter.

This means that driverless cars could actually liberate a lot of space in our cities that could be used as parks and other types of public functions. All of our efforts in the past have been in the opposite direction -- to create lanes for bicycles, zones for pedestrians, and regulated street crossing spaces; this completely reverses the logic. Figure 16 shows Potsdamer Platz in Berlin as the BIG team imagined it in the future. You could have a concert going on in the middle of the street and have cars still using the roadway along with pedestrians and bicycles. Spaces would constantly be changing, producing a fluid streetscape rather than a static infrastructure. Smart technologies and this plasticity would allow the future city to be dynamic, adapting to the life between the buildings. Whether this is really going to happen or not will depend on a

Figure 15: This parking structure in Miami, designed by Herzog & de Meuron, is also used as an event space in the evenings and weekends. (source: www.dssconsultants.com)

lot of things but we ought to be thinking about that, and every city in the US should be seriously looking at how it will need to change its environment as a result of driverless cars, car sharing, and other aspects of the new mobilities.

The City of Crowdsourcing

The third big change affecting cities is crowdsourcing, which will change in profound ways how capital is raised for urban development. This type of initiatives is happening in several

Figure 16: Imagined future for Potsdamer Platz, Berlin by BIG. Smart technologies creating a more fluid city where spaces can constantly change and adapt, allowing simultaneous events. (source http://audi-urban-future-initiative.com/blog/bjarke-ingels-group)

Figure 17: Bacata Complex in Bogota, under construction through crowd sourcing. (source: www.bdbacata.com)

Figure 18: Zaha Hadid's Galaxy complext in Beijing. Innovative design relying on hundreds of large and small investors. (source: http://ideasdesign.today)

Figure 19: The Hudson Yards, New York, the largest private real estate development in US history. (source: press release; http://www.hudsonyardsnewyork.com)

parts of the world and the United States. For instance, the BC Bacata Complex in Bogota, Colombia, is being constructed entirely with crowd sourced funds and it is almost entirely completed (Figure 17). It includes the two tallest buildings in Colombia —a 67 and a 56-story tower– with apartments, offices, a hotel, and retail. No new buildings had been built in that city for over 45 years, partly because there had been a lengthy two-front civil war: against insurgent guerillas and narcotraffickers. As nobody would lend money for buildings in downtown Bogota, the person behind the idea started a company to raise money through subscriptions. He realized that many people do not want to buy stock in real estate companies because they don't trust them, but they will buy a fraction of a building. If you can assure them of that will happen with the money, if it is being run by a trust, and if revenues are transparent, it can become an attractive investment. This system allowed him to raise $200 million from 3,800 investors to build the BC Bacata Complex.

Another good example is Beijing's high-profile Galaxy complex, designed by Zaha Hadid for SOHO, an innovative real estate company in China (Figure 18). It comprises of three buildings with a mix of offices and retail totaling more than 3 million square feet of gross floor area on a 12.5-acre site. How do they get money for projects like this? Banks shy away from lending for such innovative designs. The answer is that the buildings' leasable area was divided up and sold to many investors, big and small. The complex is owned by these buyers in condominium, they all own a physical portion of the building, and SOHO's management company deals with getting tenants and returning money to them every year. That's crowd sourcing and crowd sharing in financing.

But we don't have to look for examples that far away, just look at the exciting new Hudson Yards in New York City (Figure 19). With more than 18 million square feet of commercial and residential space, it is the is the largest private real estate development in US history and the largest single development in the city since the construction of Rockefeller Center. It includes 4,000 residences, a center for artistic invention, a 750-seat public school, and 14 acres of public open space. They needed $600 million to build a deck over the rail yards and raised that using the immigration law: you get a green card if you invest $500,000 in any of project in the US. That's how the construction of the deck was possible: they raised its entire cost through international crowdsourcing!

So how can you use the potential of crowd sharing and sourcing to help advance planning and city projects? In Bogota, after the success of the BC Bacata development, its leader, Rodrigo Nino, asked a team of planners and designers of which I was a member to help establish a crowdsourcing planning effort for

the whole city. The goal was to identify projects, both public and private, that people would like to see done, would support and possibly invest in. We created a platform called *Bogota - Mi Ciudad Ideal* (my ideal city) promoting bottom up urbanism, crowd sourcing and funding (Figure 20). The platform canvases people for ideas. It poses questions to them, such as which type of community project would they be willing to pay for. People submit all kinds of ideas, and the platform promotes a discussion, and you can get to a consensus. It goes across the board, and people surprised us. One of the most engaged discussions was about the graffiti that is ubiquitous in the city. They debated what good graffiti and bad graffiti was, and where in the city it should and should not be allowed. We hooked it up to a radio network that interviewed Rodrigo, myself, and others, while people were calling in, even from their cars, with ideas. Many ideas came out of this citywide debate and a number of projects were carried out as a result, including a new park in the city center.

Similarly, many crowdsourcing efforts have been going on in cities around the globe. In 2011, a non-profit launched the + Pool, a crowd-sourcing effort to build a 9,500 sq ft water-filtering floating pool for New York City. It has received support from the city and state agencies has had more than 5,000 individual and corporate donors and is in the final stages of design. The City of Boston is crowd-sourcing to solicit ideas from architects, planners, and the public in general for what could be done with the very unsuccessful City Hall Plaza that people have complained about for many years. Currently, they are in the process of making changes to it in part as a response to the ideas they received. Kansas City is crowd-sourcing to collect donations for various cultural institutions. In 2013, the *London As It Could Be Now* call for ideas allowed people to go on line, prioritize, and choose the project they supported. It resulted in the Thames Baths, a project to reintroduce swimming and pools along the river that has gained huge public endorsement. An initial 30-day Kickstarter campaign for pre-planning efforts raised 142,000 pounds from more than 1,200 backers, and funds continue to be raised through crowd-sourcing. I think that the reason why crowd-sourcing public projects have been successful is that people are giving money to specific projects that they support and want to see built. In case of private projects, crowd-sourcing allows people to be confident in their investment, knowing that they owe a piece of the building they invested in.

The City of Eco-Sustainability

Finally, I want to make a few comments on the issue of eco-sustainability and the changes it is generating in our cities. This is a better-known issue, but at least as important as the three previous drivers of change. The big priority is how to deal
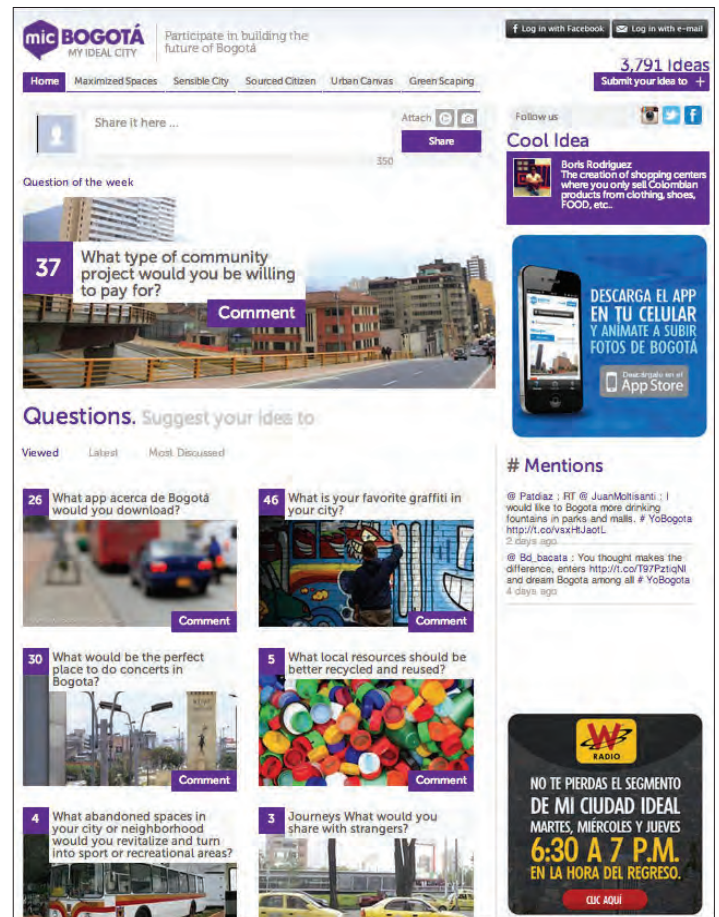

Figure 20: Crowdsourcing for planning ideas and public funding in Bogota, Colombia.

with the threats from sea level rise, extraordinary storms, and other types of natural disasters caused by climate change. We certainly need to plan and do things that reduce the threats of climate change over the long haul, but we also need some defences in the short run. Figure 21 illustrates how New York will be affected by sea level rise by 2100. Sealevel rise is an enormous challenge to cities by the ocean but also for those on bays, estuaries, rivers, and low-lying areas. There are many other challenges related to climate change too, such as increased potential for landslides.

One of the ideas being proposed around is to build habitat breakwaters and reefs along the coast to absorb the flood surges. But the reality is that nobody has ever done anything like it for this purpose, and we do not know if it is going to work. These types of ideas and the beautiful renderings illustrating them keep being put into plans as to something that we ought to be doing. Also, bay nourishment systems at a huge scale are going to be required to keep the salt-water marshes and other ecosystems alive. This is an area where uni-

versities have an incredibly important role by developing ideas and conducting experiments, putting together water specialists, oceanographers, engineers, climate scientists, engineers, planners, landscape architects, urban designers, architects, and so on. No one discipline has a corner on the knowledge and creativity that will be needed.

New Yorkers didn't really believe in the dangers of climate change until three years ago when the huge storm caused by Hurricane Sandy pushed 12 feet of water up the Hudson River and flooded a large fraction of lower Manhattan. The black areas you can see in Figure 22 were flooded and had no electricity for about two weeks, and all the subways were flooded. You can imagine what this does to a city, and the enormous amounts of remediation and reconstruction money it takes. Hurricane Sandy affected 13 states causing more than $65 billion in damages and economic costs. After Sandy, President Obama's HUD Rebuilding Task Force launched the Rebuild by Design, an innovative collaborative research and design competition that became a model for several cities. It led to the Rebuild by Design organization and its partnership with hundreds of cities across the globe.

Six projects across New York, New Jersey, and New York City received money through the Rebuild by Design competition, several resulting from consortiums between universities and private consultants. One of them includes creating a whole new level of open space that provides a barrier around Lower Manhattan. It would allow the space to be used as parks and

create a whole new system of access to the waterfront over the expressways along the edges of the city. Reconstructing boardwalks was in another proposal, not like in the past, but generating higher places as barriers that could provide open space, recreational opportunities with good access down to the water. Figures 23 ad 24 are from the Big U, one of the six selected projects, that provides a protective system along ten continuous miles of the low-lying topography in Lower Manhattan. The proposal includes parks and various community amenities, breaking the area into compartments that provide separate, independent flood-protection zones.

Another competition entry was the Hunts Point Lifelines, by our team at the University of Pennsylvania in association with Olin Landscape Architects and several advisors (Figure 25). Hunts Point is a small peninsula in the Bronx that serves as the hub of the entire food supply for 22 million people in the New York region. As the area is incredibly vulnerable to flooding, we can create a new barrier wall around it but then, once you get huge amounts of rainfall what do you do with the water that stays inside? The project proposes a waterfront greenway for residents; ways to store that water on site, absorbing it in plant materials and releasing when necessary; a marine transfer station to deliver vital foods; and tri-generation plant for low-cost, low-carbon cooling and an electricity micro grid for emergencies. But you can get the picture why eco-sustainability, and particularly climate change, will require big changes in our cities. Regarding the impacts we have to respond to, flooding and sea level changes seem to be the most urgent. And each of the vulnerable parts of our waterfronts requires a different strategy and a different type of project.

Figure 21: Screen shot of NYC flood hazard map in the year 2100. (source: New York City Department of City Planning)

Figure 22: Black-out areas in New York after Hurricane Sandy. (source: New York Magazine, Nov. 4, 2012; photo by Iwan Baan)

Figure 23: From the BIG U proposal for the Rebuild by Design Competition: the FDR Expressway, protective berm (short term) and cap with linear park. (source: www.rebuildbydesign.org)

Figure 24: From the BIG U proposal for the Rebuild by Design Competition: creation of new topographies around Manhattan. (source: www.rebuildbydesign.org)

Final Remarks

I discussed the transformative moments of history that result in changes to our cities, and four of the drivers that are currently generating fundamental changes in the way we think, plan and design our cities. In planning for a city, we have to think regarding that kind of infrastructure that is required by the new mobility and by the impacts of the new work and living network. We have to consider the potentials embedded in new arrangements such as like crowd sourcing and crown funding to engage the public, plan and raise resources. And we cannot survive without the research and hard work required for the needed eco-sustainability efforts. Every professional in the design fields has a role to play in re-conceptualizing the city

But those of us in the academy also have a special responsibility to lead the way in imaging future changes to the city. We can collaborate with public agencies and professional teams in carrying out pilot projects that test the viability of new approaches. We need to be responsible for the science and analytics behind possibilities, such as mobility systems and eco-urbanism. Through our projects, we can help the public and professional communities visualize possibilities, free of the constraints that politics and clients impose on them. We can especially use our creative skills to envision the communities of tomorrow, with all the technological, economic and ecological opportunities. This is not a time to be timid: our cities are changing before our eyes.

Figure 25: From the Hunts Point Lifelines report for the Rebuild by Design Competition, by Penn/Olin & others. (source: www.rebuildbydesign.org)