Visualizing Urban Infrastructure Change

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In the city, time becomes visible. – Lewis Mumford

Before and After
In 1990, photographer Stefan Koppelkamm was traveling around East Germany shortly after the fall of the Berlin Wall but before German reunification had occurred. He witnessed cities that were seemingly frozen in time, as if World War II had never occurred. The public spaces, buildings, and streetscapes comprised an urban condition that was in stark contrast to that of the West. Recognizing this seminal period in the country’s history, he set out to visualize the ‘before’ and ‘after’, first in the period between 1990 and 1992 and then between 2001 and 2004. In both time periods, he set up his large format camera in the exact same place using the exact same camera settings to create a photographic record of urban change. The resulting project includes double photographs that illustrate the before and after of East German cities during a period of significant political upheaval.

Koppelkamm’s project was not an attempt to celebrate urban aesthetics, the typical aim of architectural and urban skyline photography, nor was it to attempt to document the change in social conditions as Soviet communism was being eclipsed by Western capitalism. Rather, his aim was to visualize the material changes that took place as cities in the German Democratic Republic were slowly absorbed into the unified German state. He sought out places that were pictorial and typical, scenes that were representative of the time and place in several different cities – Berlin, Dresden, Leipzig, Potsdam, Bautzen, Löbau, Görlitz, Erfurt, Halle, Halberstadt, Pirna, Zittau, and Weimar. The photographs document a mix of large and small changes that as a whole, have a startling effect on the everyday urban landscape. And in both time periods, he captured the calm of these cities rather than the frenetic activity. The lack of people in the images as well as the black-and-white format shifts the viewer’s gaze to the edifices, the surfaces, and the spaces that undergird, support, and define cities. In essence, Koppelkamm’s project is an ethnography of infrastructural change.

1 Mumford 1938, p. 4
2 Koppelkamm 2010
3 The phrase ‘ethnography of infrastructure’ is borrowed from Star 1999.
As one might expect, many of the photographs document the ‘improvements’ that took place in these cities over a very short period of time. Weathered buildings with broken windows and boarded up doorways give way to repaired and washed facades that celebrate the history of each city while anticipating more prosperous times ahead (Fig 1). The ubiquitous East German Trabants that lined the streets have been replaced with newer, flashier automobiles and an outdoor street culture with umbrellas and café tables for outdoor dining (Fig 2). Vacant lots give way to new buildings, graffiti and garbage is removed, and the cities are ordered and tidy. The changes suggest a cosmetic upgrade, a physical erasure of undesirable urban attributes that is afforded when the free market gains traction. But the changes do not always fit with such a linear view of urban development. In some of images, buildings have crept further into decay, suffering from the neglect, vandalism, and weathering that grinds at cities day in and day out (Fig 3). A skeleton of a new building-in-the-making has been torn down to make way for a temporary car park; graffiti, cracks, and grime envelop buildings; the text on the marquee of an abandon business fades further into obscurity; and plastic sheeting appears as a temporary replacement for window panes. These images remind us that urban development is an uneven process; certain spaces are improved while others are forgotten and left to rot.

Fig 1  Koppelkamm’s images of Leipzig in 1990 (top) and 2002 (bottom) (source: Koppelkamm 2010)
Koppelkamm’s project also reveals a key contradiction of urban infrastructure. Despite the massive upheaval of the German state in this period, the infrastructure itself has changed very little. Curb lines, train trestles, overhead guidewires, sidewalks, and building facades all continue to inscribe the shared spaces of the city. It is only in a handful of Koppelkamm’s images that the ‘after’ scene is wholly unrecognizable from the ‘before’. This is due in part to his choice of subjects; he consciously or unconsciously chose urban scenes that he thought would endure. But it also speaks to the obduracy of streets and buildings, courtyards and open spaces, suggesting that the skin of cities can be reworked drastically but the skeleton is much more resistant to widespread alteration. This was, of course, the intent of the original infrastructure builders, to create a foundation for urban development that would last for centuries. Anique Hommels notes, ‘Once in place, urban structures become fixed, obdurate, securely anchored in their own history and in the histories of the surrounding structures.’ As such, the images simultaneously reveal the malleability and stubbornness of urban infrastructure.

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4 Hommels 2005, p. 10
And of course, Koppelkamm’s project is far from a complete story of urban infrastructure change. His images illustrate the visible infrastructure changes in these cities in a period of political transformation but they do not provide an explanation for how and why these changes took place. Who is reworking the infrastructure and what do they hope to achieve? Why are some places given attention while other places are neglected? Koppelkamm’s project implies that the change in political structure is somehow connected to the change in the materiality of the cities, but it is left to the viewer to make these links between governance and materiality, politics and culture, before and after.

The Allure of Entropy
New York City is home to one of the most heralded projects of urban infrastructure regeneration in recent memory: the High Line. The public park is a 30- to 50-foot-wide path of greenery and walkways that wends its way through almost a mile and a half of the dense urban fabric on the western side of Manhattan. The first phase of the public park was opened to widespread acclaim in June 2009 and the second phase is scheduled to open in 2010. The High Line would be just another in a long line of successful urban greening projects except for one significant difference: it is built on an abandoned elevated railway two stories above street level.

The original High Line structure was used by freight trains from the 1930s to the 1980s but was subsequently abandoned as trucking became a more convenient means to transport goods into and out of the city. After being abandoned, the massive elevated structure was slated for demolition on several occasions but for various reasons, it avoided this seemingly

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5 For information on the park, see www.thehighline.org.
inevitable fate. In the late 1990s, neighboring residents recognized the potential to transform the High Line into a park that would provide greenspace in a highly built-up neighborhood. The abandoned rail structure became a catalyst for urban change, with a non-profit organization – the Friends of the High Line – navigating through the complex regulatory, economic, and social challenges with the help of influential individuals such as Mayor Michael Bloomberg, then-senator Hillary Rodham Clinton, and actor Edward Norton, as well as hundreds of engaged residents, designers, and municipal officials. The resulting park not only provides much needed open space for residents of lower Manhattan but has sparked the imaginations of urban residents and designers worldwide for repurposing the abandoned infrastructures of their cities to serve current needs.

The images of Joel Sternfeld are often mentioned as key to the High Line success story. In 2000, Sternfeld began taking photographs of the abandoned rail line because he was fascinated by the ability of nature to recolonize the industrial infrastructure. Twenty years of idleness created an opportunity for soil particles in the wind and rain to deposit on the structure and create an ad hoc substrate for grasses, plants, and trees to flourish. The vegetation creates a green strip of wild nature that threatens to overtake the city, slowly tearing down the industrial heritage of New York and returning Manhattan Island to its pre-human state. Adam Gopnik notes, ‘The High Line combines the appeal of those fantasies in which New York has returned to the wild with an almost Zen quality of measured, peaceful distance.’ In short, Sternfeld’s photographs illustrate the entropic forces of urban change: collapse, decay, decline, degeneration (Fig 4).

Like Koppelkamm’s images of East Germany, there are no people in Sternfeld’s images. This is not surprising since the elevated rail line was never intended for public access but solely for the movement of goods. The lack of humans, coupled with the elevation creates a mysteriously serene and quiet place only two stories above the hustle and bustle of the busy streets below. It is an urban space out of place, a laudable feat given that New York is one of the most celebrated cities of the world. Indeed, John Stilgoe refers to it as the ‘secret avenue of New York’. In this way, Sternfeld’s project resonates with those intrepid urban explorers who are intent on revealing the hidden, the neglected, the secret, and the underground of cities by frequenting, back alleyways, rooftops, sewers, and tunnels. And like Koppelkamm’s East Germany, the images of the High Line demonstrate the obduracy of urban infrastructure. Stilgoe writes, ‘its permanence two decades after its official abandonment advertises its engineering and manufacture.’

Sternfeld’s interest in urban nature also highlights the different seasons that envelop New York: the flowers and bright green colors of springtime, the sweltering hot summers with their harsh and unrepentant sunshine, the browns of autumn as the vegetation dies back and prepares for the cold, and the desolate gray winter when snow cover enshrouds the land. Sternfeld writes: ‘This is a true time landscape, a railroad ruin. The abandoned place is

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6 For a book-length thought experiment on how nature would retake the world if human populations were to vanish, see Weisman 2007.
7 Sternfeld 2009, p. 48
8 Sternfeld 2009, p. 45
9 In my current hometown, there are a plethora of authors who have written on this idea of the secret and hidden city. Titles include: Manchester: The Hidden History, Hidden Manchester, Underground Manchester: Secrets of the City Revealed, Hidden Treasures Manchester (Volume 1 and 2), and Below Manchester: Going Deeper Under the City.
10 Sternfeld 2009, p. 44
Fig 4  Two of Joel Sternfeld’s High Line images (source: Sternfeld 2009)
the place where seasonality resides.\textsuperscript{11} Moreover, the images reveal the hybrid character of cities by juxtaposing the weedy qualities of nature to reinhabit an unnatural industrial substrate. This layering of green on brown, living on inert, natural on industrial, reminds us that cities are a hybrid construction, injected through with nature in various guises.\textsuperscript{12} Sternfeld’s work is at the fringes of the eco-revelatory design approach of landscape architects, revealing the entropic forces that are continually at work to reclaim the city.\textsuperscript{13}

In the wake of the 9/11 attacks on the World Trade Center, Sternfeld recognized that his photos could provide a positive infrastructure corollary to the death and destruction wrought by the terrorists. He quickly assembled a book of images and the result was \textit{Walking the High Line}, an inspirational and permanent space in a city that was struggling to come to grips with uncertain future.\textsuperscript{14} And Sternfeld’s images bolstered the efforts by the neighborhood activists who wanted to preserve and redevelop this interstitial urban space. His photos made the invisible visible and with this visibility came a drive to transform the space into something that could be embraced by all: a greenspace in the sky. One of the co-founders of Friends of the High Line notes, ‘The weird thing is that the High Line is just a structure, it’s just metal in the air, but it becomes a site for everybody’s fantasies and projections’.\textsuperscript{15} By visualizing the High Line, Sternfeld catalyzed an ‘ecological imaginary’ that is latent in all infrastructure, both active and idle.\textsuperscript{16}

Ironically, Sternfeld would have preferred that the High Line, or at least parts of it, were left alone to continue their entropic journey of collapse, decay, degeneration, and destruction to serve as a contrast to the normalcy and order that is championed in the planned city. For him, the beauty of the High Line is its abandon, forgotten, and degraded qualities rather than its potential for rebirth. But his images had the inadvertent effect of rediscovering and reworking the rail line and in effect, erased what he valued about it. Perhaps the most revealing lesson of Sternfeld’s project is that entropy is for most people an undesirable process of urban change, one that needs to be fought against and resisted. Idleness is not an option in the contemporary city, only moving forward either through redevelopment or demolition.

\textbf{Rendering More Desirable Futures}

The imaginary potential of infrastructure that is afforded through visualization can be inadvertent, as in Sternfeld’s case, but it can also be deliberate. With the advent of computer-aided design and visualization tools such as Adobe Photoshop, it is now relatively easy for professionals and amateurs alike to render new and improved forms of urban infrastructure to engender public support for revitalized urban spaces. An example of the professional practice of rendering urban futures is Urban Advantage, a Berkeley, California design company whose website tagline is appropriately enough ‘envisioning urbanism’.\textsuperscript{17} The company specializes in ‘photo-realistic visualizations that make development visions palpably real and understandable’. Working for clients such as governments, non-profit organizations, and private developers, the designers use manipulated images to reveal the

\begin{thebibliography}{10}
\bibitem{11} Sternfeld 2009, p. 48
\bibitem{13} On eco-revelatory design, see Brown et al. 1998 and Eisenstein 2001.
\bibitem{14} The first edition of the book was published in 2002 and a second edition was published in 2009.
\bibitem{15} Quoted in Sternfeld 2009, p. 51
\bibitem{16} On ecological imaginaries, see Gandy 2006 and Murdoch 2006.
\bibitem{17} Urban Advantage 2010
\end{thebibliography}
potential revitalization of public spaces – notably streets, squares, and neighborhood centers. The images are used in planning documents, marketing literature, trade magazines, and formal presentations to illustrate the policy and design recommendations for urban development. They write, ‘We have the knowledge, technology, and sophistication to turn our built landscapes into hospitable, sustaining and beautiful places.’ Here, rendering is not an artistic endeavor but a form of education and imagination-building, where ‘seeing is the key to understanding’.

Urban Advantage visualizations begin with existing conditions, the typical car-dominated landscapes that are common in all US cities. The firm collaborates with urban design, transportation, and planning experts to add trees and greenery, awnings and street furniture, bicycle lanes and people that are seen as desirable. The future renderings are photo realistic so the viewer doesn’t really think of them as facsimiles but as very real near-future conditions (Figs 4-6). The power of these renderings comes from their ability to

Fig 5 A rendering by Urban Advantage showing the transformation of a residential streetscape in Kansas City, Missouri (source: Urban Advantage 2010)

18 Urban Advantage 2010
Fig 6  A rendering by Urban Advantage showing residential infill and a public square in Naples Park, Florida (source: Urban Advantage 2010)

Fig 7  A rendering by Urban Advantage illustrating transit-oriented, mixed-use development in Richardson, Texas (source: Urban Advantage 2010)
juxtapose the present and the future, the real and the imagined side by side. Like Koppelkamm’s images of East Germany, the renderings are presented in ‘before and after’ format, although in this case the ‘before’ is the present and the ‘after’ is the near future. The firm uses a series of time steps, either with a sequence of still images or using Flash animation, to reveal the transformation from undesirable to desirable, from sterile to vibrant, from ad hoc to intentional. And unlike Koppelkamm’s images, there is an explicit aim to visualize improvement and progress.

The imagined futures produced by Urban Advantage are not based in fantasy and artistic whim but are founded on the tenets of New Urbanism, Transit Oriented Development, and Traditional Neighborhood Design. They apply the lessons learned from urban neighborhoods of the late nineteenth and early twentieth centuries to tame the auto-dominated, suburban character of contemporary US cities. Using the grammar of form-based codes, the designers bring legality, clarity, and discipline to the unruly urban condition. Infrastructure is understood to be the key for creating cities that are compact, walkable, mixed-use, and completely thought through. As Annalisa Meyboom writes, ‘To design infrastructure is to design a built form that can be generative and directive: it has the potential to create place and suggest future growth.’ And the renderings serve double-duty, bringing the rules of ‘proper’ urban form to life while also reinforcing the urban expert as the ultimate arbiter of infrastructure provision. The visualizations solidify a single pathway for urban change by extending the dominance of the visual techniques of maps, plans, drawings, and renderings that have been used to envision infrastructure change for centuries. In this sense, visualization is an agenda setting activity that critiques the faults of twentieth-century planning (namely zoning) while continuing to rely on the advice of experts to define improved urban futures.

Rendering the future of cities is not confined to professional firms such as Urban Advantage. Because of the ubiquity and accessibility of digital visualization tools as well as the ability to share these results on the World Wide Web, visualizing infrastructure change has become an activity for a wide range of actors with varying political agendas. The availability of free online mapping tools such as Google Maps coupled with the ability to add user-generated images means that anyone with access to a digital camera and an Internet connection can participate in visualization activities. An example of this less formal process of visualization is the work of David Yoon. By day, Yoon is an art director at a Los Angeles ad agency, but in his free time, he travels around the city on a scooter, documenting the ‘autopia’ of contemporary Los Angeles with a consumer-grade digital camera. He then transforms these images at home into a ‘simple depiction of a fantastical, parallel-universe Los Angeles that no longer catered exclusively to cars’ and posts the reworked urban infrastructures on his blog, ‘Narrow Streets Los Angeles’. The series of before and after images on Yoon’s blog are simple but highly effective renderings for how Los Angeles streetscapes could have been different if the city were designed at a human scale (Figs 8-9). He shrinks streets from four lanes to one, encouraging facing buildings to interact with one another and suggesting how the city would appear without so much of its sprawling transportation infrastructure. With a few hours of work, he is able to tame the monstrous asphalt jungle that defines the Angeleno lifestyle. His project is an attempt ‘to explore the street and public realm through artistic practice’.

19 For example, see Calthorpe 1996, Duany et al. 2000, and Duany et al. 2010.
20 Meyboom 2009, p. 72
21 narrowstreetsla.blogspot.com
22 Pinder 2005, p. 387
Like Urban Advantage, Yoon uses serial images but his project is a comparison of ‘present-real’ to ‘present-fantasy’. And the present-fantasy images are not based on planning rules and best practices of urban design but rather on a simple desire for a more human-scaled city. He follows an ‘everyday urbanism’ approach to urban change, writing, ‘There’s a yearning for a more human scale out there, and a growing realization that hey, this world wasn’t created by some petulant, eight-armed Deus Urbanus but by people — ordinary people, struggling to make the best design decisions they could.’

Thus, Yoon’s project is more an activist fantasy, critiquing the creation of twentieth century urban experts and encouraging viewers to think about how their urban surroundings could be different.

**Reworking Infrastructure in the Twenty First Century**

Outside rare moments of creation or major transitions, infrastructures change too slowly for most of us to notice; the stately pace of infrastructural change is part of their reassuring stability. They exist, as it were, chiefly in historical time.

Paul Edwards

Infrastructure is history and it is also the future. All discussions about realizing more sustainable urban conditions are explicitly or implicitly tied to the need for a markedly

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24 Edwards 2003, p. 194
different relationship between urban residents and their material surroundings. As Timothy Moss writes, ‘Any efforts to make urban regions more sustainable will need to exploit the potential of infrastructure better, understanding and using technical networks as instruments of sustainable urban and regional development.’ Reworking infrastructure is a herculean task on par with the original period of heroic urban development that occurred in North America and Europe from the mid-nineteenth century to the 1970s. But there is a dissonance between the radical changes that are needed for cities to become more sustainable (however the term might be defined) and the obduracy of infrastructure networks that are embedded in the material and cultural urban fabric.

The practice of visualizing infrastructure change, as summarized in the above examples, will arguably be a central part of this agenda to rework urban infrastructure. Visualization highlights infrastructure as an ever-present presence in cities, lurking in the background of all urban activities as a silent and powerful non-human actor. It questions the taken-for-grantedness of infrastructure and makes the invisible visible, suggests that the ‘bones’ of the city are critical rather than commonplace and in need of scrutiny by a wide variety of actors. At the same time, visualization can reveal the tension between change and solidity, fluidity and immobility, resistance and surrender, ebb and flow. Temporally, it connects the past to the present as well as various imagined futures. It has the ability to bring to life the often dry and uninspiring narratives of sustainable development, green governance, citizen action, public-private partnerships, and so on. In this way, visualization is a form of urban intervention.

Koppelkamm’s images of East Germany demonstrate how infrastructure change can take place in a relatively short period of time. However, they also serve to remind us that these changes are uneven targeting some areas while bypassing others. Sternfeld’s photos of the High Line remind us that while infrastructure is obdurate, it is also in need of constant upkeep. Exposing the hidden and forgotten spaces of cities can be a catalyst for reinventing place. The New Urbanist renderings of Urban Advantage demonstrate the power of illustrating potential futures, that we have the knowledge to take underperforming urban spaces and turn them into vibrant and livable places. At the same time, they suggest the power of visualization to position experts as the agenda setters for sustainable urban futures. And Yoon’s Photoshop project to slim down the unruly streets of Los Angeles shows the activist potential for urban visualization, particularly with the accessibility of these tools to non-professionals. He brings a playfulness and imagination to urban change while revealing a deep concern for our material surroundings.

To be sure, the visual approach to highlighting infrastructure change is only one step in a larger process of pursuing more sustainable urban conditions. It does not propose a political structure to manage the complexities and enormity required for sweeping infrastructure change. And it cannot address what Mumford referred to as the ‘invisible city’ the underground, virtual, and otherwise out-of-sight networks that are an equally important part of urban metabolism. But it can help us recognize that infrastructure is not merely the structure ‘beneath’ or ‘below’ us but between and amongst us. In this way, it highlights the relational qualities of infrastructure, its ability to bring together the social and material, natural and constructed, real and imagined. It is part and parcel of the messiness and vitality

25 Moss 2001, p. 4. Also see Monstadt 2009.
26 See Pincetl 2010
27 Mumford 1961
of cities that comes out when we visualize infrastructure as a sociotechnical construct. Visualization practices bring the importance of infrastructure back to the forefront, wresting it from its ‘naturalized background, as ordinary and unremarkable to us as trees, daylight, and dirt’ into a topic of central political and cultural concern.

References


On urban mess, see Guy and Karvonen 2010.

Edwards 2003, p. 185


