

A passionate argument for the necessity of functioning infrastructure

Deb Chachra's 'How Infrastructure Works' is a perfectly timed entreaty to rethink the systems that make modern life possible



Review by Annalee Newitz

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To understand what infrastructure is, advises engineer Deb Chachra, start with your commute. You drive on a road network, or take transit that's part of a larger public system, or simply disengage from your networked telecommunications by turning off your computer. As evening falls, you turn on the lights, whose power comes from the electrical grid. You cook dinner with piped-in gas from another grid; you drink water from the faucet that is just one of many nodes on a vast water system whose contents might come from three states away.

As Chachra explains in her essential book "[How Infrastructure Works: Inside the Systems That Shape Our World](#)," you are living in the lap of luxury without realizing it. All the difficult work of collecting fuel and water is taken care of invisibly, and you can traverse great distances — on the road or online — in very little time. The great gift of our infrastructure is that it gives us agency over our lives, liberating us from everyday drudgery. Chachra argues that access to the grid has become a political right; indeed, many local governments will not allow heat and water to be shut off, even when customers can't pay.

The problem is that when our infrastructure works, we never think about it. We don't vote on our infrastructure every two years, and we don't honor our utility workers as guardians of our lives, the way we do first responders. We forget the importance of maintaining and caring for it, leading to disasters like bridge collapses, blackouts and floods from overtopped dams. With climate change threatening many of our cities and towns, this needs to change, and fast.

Written in an engaging, personal style, "How Infrastructure Works" combines engineering history and science with Chachra's witty anecdotes about traveling to power plants and cities across the world. Reading it is like taking a stroll with a friend who knows exactly what every obscure marking on the street means: underground sewage pipes, century-old markers left by U.S. Geological Survey workers or buried electrical cables. But this book isn't a "how it works" manual to your city. Instead, it's a passionate argument for the political necessity of functioning infrastructure.

Chachra invites us to reexamine infrastructure, the better to appreciate it anew as a collective social project that unites us — but one that is in danger of falling apart from lack of care. Her book couldn't possibly arrive at a better time. Local governments and industries are figuring out how to implement Biden's Inflation Reduction Act, which represents our nation's biggest investment in infrastructure since the Great Depression. Everyone involved in that process, from policymakers to utility workers, should be reading this book for inspiration and practical suggestions.

We primarily perceive infrastructure in the form of what Chachra calls charismatic megastructures, monumental projects like the Hoover Dam or Niagara Falls and their hydroelectric plants. She writes about her favorite example, a pumped-storage hydroelectric power station in Wales nicknamed Electric Mountain. Built inside a hollowed-out mountain, it generates power when workers open a valve below a lake high on the peak. Draining through a vertical shaft, water falls on turbines to generate power and then flows out into a lake below. At night, when the community's power needs are low, the turbines flow backward, slurping the water back up to the top again. It's basically a giant self-renewing battery, and it's built to look beautiful, hidden as it is beneath the grassy slopes of a public park.

Electric Mountain is a perfect example of what energy generation might look like in a more sustainable world built on renewable energy. According to Chachra, however, moving away from fossil fuels is just one step. She contrasts Electric Mountain with Niagara Falls, whose beauty hides a disturbing history. To build the power plant reservoir there, the U.S. government used eminent domain to seize, and then flood, a third of the lands it had given to the Tuscarora Nation in a treaty. Though infrastructure is a public good, not everyone always benefits from it equally, and it often arrives at the expense of marginalized groups.

As we consider how to renew our nation's ailing water systems, Chachra warns, we must build to serve the broadest possible public. We can't set up systems that supply wealthy cities by destroying or polluting the regions where our least-powerful neighbors live. Along similar lines, she suggests that future electrical grids should be highly localized, able to federate or defederate from a larger national grid, so that there are no central failure points. Every community should have its own scaled-down version of Electric Mountain, designed to harvest whatever renewable energy works best for it: wind, solar, water or geothermal.

Perhaps the most valuable insight in this book is that good infrastructure is built for resilience, not optimization. Right now, many of us are in thrall to the idea that the best systems are always optimized. As Chachra explains, an optimized system may maximize profit, but profit should not be our motive in any system that sustains life and safety. Infrastructure should be redundant and full of slack, so that we always have backup power, extra water and alternate routes in our transit networks. She writes movingly about how planners should use caretaking as a model for development. Healthy infrastructure requires many workers to do routine, incremental maintenance. Sometimes they tend to systems that are only used occasionally, in times of extreme need. This may feel wasteful from a capitalist perspective, but it will feel vital when ice storms destroy the electrical grid.

Chachra emphasizes that we cannot make these changes to our infrastructure as individuals. This will be a collective project, spearheaded by governments and community organizations that are working for the public, not for profit. We have all the tools we need to survive the coming climate and energy crises. It's time to work together to use them.

How Infrastructure Works

Inside the Systems That Shape Our World

By Deb Chachra

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