Architects, Waste, and Design Research
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ARCHITECTS, WASTE AND DESIGN RESEARCH

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As the world's population rapidly expands, the need for architects' engagement in the industrial and infrastructural realm becomes increasingly urgent. Yet, with the exception of a few cases, architects remain conspicuously absent from the conception, design, and implementation of such projects.

Klaus Leidorf, Tires, 2006

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WHY ARCHITECTS?

Today architects play a minor role in the design of industrial and infrastructural projects. Yet this was not always the case. The history of modern architecture, intricately tied to the rise of industrialization from the mid-18th century on, is rife with architects' contributions to the industrial realm. Innovative creations such as Thomas Pritchard's Iron Bridge at Coalbrookdale, England (1775–1779)—often cited as the first single-span cast-iron structure—purportedly set the stage for later developments, including Walter Gropius and Adolf Meyer's seemingly weightless Faguswerke factory in Alfeld on Leine, Germany (1911–1912), which is hailed as an embodiment of an early 20th-century industrial aesthetic.1 Likewise, across the Atlantic Ocean, Albert Kahn utilized reinforced concrete to design a series of wide-span automotive plants, ideal environments for the efficient assembly-line production, or Taylorization, for which Henry Ford's factories became known. These are but a few of the many architects who worked on industrial architecture alongside businessmen and engineers in the early 20th century.

In the years following World War II and as the global economy moved toward recovery in the 1950s and 1960s, architects continued their involvement with industrial projects. The United States saw architects such as Eero Saarinen and the firm Skidmore, Ownings & Merrill engaged in industrial work, notably with their contributions to the burgeoning industrial campus complex type. In Europe, architects such as Angelo Mangiarotti in Italy, Fritz Haller in Switzerland, and Norman Foster in England began enlisting prefabricated modular building systems, which allowed vast, flexible, open-span factories to accommodate a variety of manufacturing setups. These prefab systems, which could be erected more quickly and more economically than previous industrial buildings, became a widespread alternative to individually designed factories.

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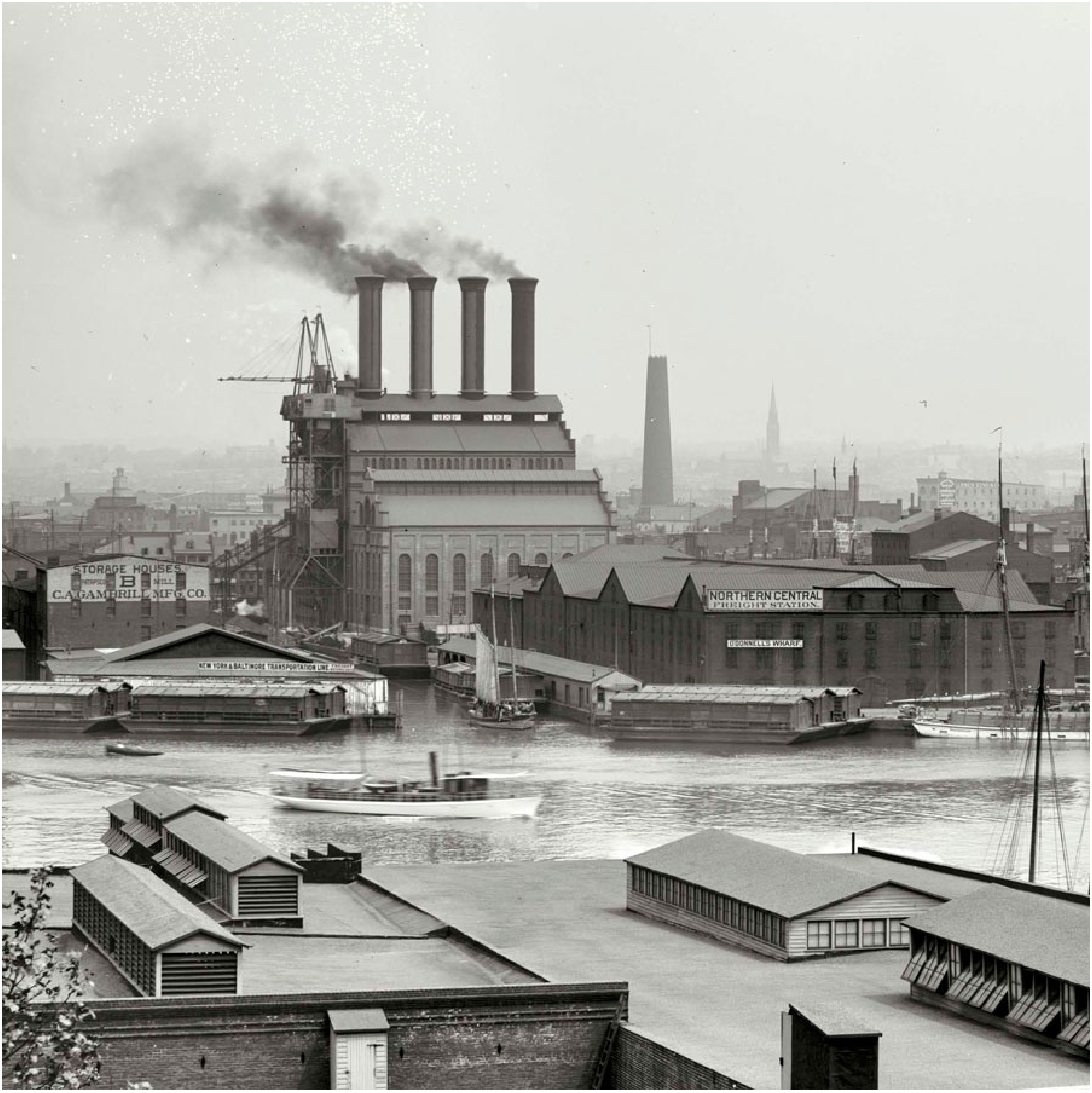

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Baltimore from Federal Hill, 1903

Not surprisingly, the building owners' desire to cut costs coupled with the efficiency of prefabricated modular systems to steadily eclipse the architect's role in industrial building design. Mass production and "industrialized systems" hastened the rapid construction of many different building types during this period. Simultaneously, seeing fewer opportunities for creativity in such "mundane" or "ugly" work, architects turned their attention away from industrial and infrastructural projects. Additionally, the growth of other disciplines gave rise to engineers and project managers, who legitimately claimed to be able to produce buildings rather than "design" them, further undermining the role of the architect.

Despite the shift to service- and knowledge-oriented industries in the latter 20th and early 21st centuries, a time marked by the emergence of widespread economic and ecological changes, architects' contributions to these building types have remained conspicuously absent. Yet this need not be the case. Architects bring much to the conception and creation of such projects, beginning with a holistic approach that extends beyond functionality to embrace the physical, social, and environmental issues that affect each project. By virtue of education and experience, architects hone the ability to devise creative spatial configurations to address real-world problems. Furthermore, architects are trained to design not just for the present, but for the future ways in which buildings may be used. This skill in particular figures prominently into our contemporary landscape, where in many cases a building's physical presence may long outlive its initial purpose. And, as numerous examples in our past and present demonstrate, such industrial buildings do not have to be ugly.

The past few decades saw a minor eruption in the adaptation of redundant existing industrial buildings and large-scale infrastructures for public use. Projects like the Tate Modern (England, Herzog & de Meuron) and the Hamburg Philharmonic (Germany, Herzog & de Meuron); the Rosario Museum of Contemporary Art (Argentina, Ermete de Lorenzi); the Zollverein Power Station (Germany, Rem Koolhaas's Office for Metropolitan Architecture, B.ll and Krabel); the High Line (United States, Diller Scofido + Renfro); the Contemporary Jewish Museum (United States, Studio Libeskind); and the Modern Museum of Malm. (Sweden, Tham & Videg.rd Arkitekter) have captured the public imagination and become new architectural touchstones. Note that many of these readapted structures exist in developed areas that have transformed from industrial to service societies (a cycle likely to repeat in the future). In addition, these projects involve not only the reuse of materials, but also a respect for the old while infusing the new. They are complex projects that encourage cultural interactions and multiple programs in spaces previously conceived for singular

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functions and occupied by only a few individuals.

These buildings and structures were initially created to serve a specific use; yet through architectural interventions, they have been successfully repurposed as cultural icons. Architects introduced unique skills and perspectives to these transformational projects, all largely well received. In turn, these adaptations have bolstered their architects' reputations. We believe that architects can add similar value to, and likewise benefit from, the design of industrial and infrastructural projects. In particular, we are focused on WtE facilities, which are much needed in both developing and developed societies.

Along with global population growth and increased urbanization comes an exponential rise in the production of solid waste. In 2012, urban populations generated roughly 1.3 billion tons of solid waste. By 2025, the World Bank estimates that this number will likely increase to 2.2 billion tons.2 How do we address this mounting volume of waste? This question becomes all the more pressing when we consider that landfills—currently (and historically) the most prevalent means of waste disposal—are quickly becoming less plausible due to space restrictions, environmental concerns, mandates to close existing sites, and legislation that prevents the creation of new landfills.

Waste-to-Energy facilities offer a proven and increasingly attractive solution for dealing with solid waste. Indeed, far from the pollution-spewing industrial behemoths of yore, WtE plants are an environmentally conscious option for coping with garbage. Strategically placed near or within urban areas, WtE plants can generate alternative energy for local use and eliminate the need to transport waste to rural areas or across state lines, thus reducing travel-related emissions. And as we will later discuss in detail, WtE infrastructure offers a range of beneficial possibilities for future development, including opportunities to develop hybrid programs that positively impact their communities. Such innovative arrangements are already in operation in Sweden, recognized as a leader in WtE use, as well as other countries.

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John McAslan + Partners, Olympic Energy Centres, London, England, 2012

WHY WASTE-TO-ENERGY?

There is little doubt that, as the world's population grows, local WtE infrastructure will be increasingly needed in cities. As densities increase and consumption patterns change, WtE will continue to emerge as an acceptable and affordable source of renewable energy alongside a portfolio of other sources, such as solar, wind, and biomass. As additional WtE infrastructure is conceived and constructed, architects' involvement will help ensure the best functional, social, and aesthetic results. Indeed, a handful of highprofile architects, including Bjarke Ingels and Zaha Hadid, have recently engaged in WtE projects, signaling a shift in thought regarding the desirability of and value generated by architects' involvement in such projects.

With these ideas in mind, we selected WtE facilities as a means to reengage architects and interdisciplinary design with industrial buildings and infrastructure. We conducted design research on novel and effective ways to rethink the relationship of architecture and waste—a (re)planned obsolescence.

THE WASTE MANAGEMENT HIERARCHY

The Waste Management Hierarchy is an internationally recognized ranking of the various waste management practices in the order from most to least preferred with respect to greenhouse gas emissions. Priority is given towards the prevention and reuse of waste followed by recycling, energy recovery, and disposal. Energy recovery from the combustion of Municipal Solid Waste (MSW) is a critical component to this hierarchy because it diverts and ultimately decreases the total volume of waste that would have otherwise been destined for landfills. The WtE Design Lab chose to narrow the focus of design speculation around the method combustion—as opposed to pyrolysis and gasification— because it is the most widely implemented. Ranked a tier above natural gas but just below solar photo voltaic, the energy produced by this renewable energy source has a reduced carbon emission record—as compared to petroleum and coal—by offsetting the need for energy from fossil fuel sources and reducing methane generation from landfills.

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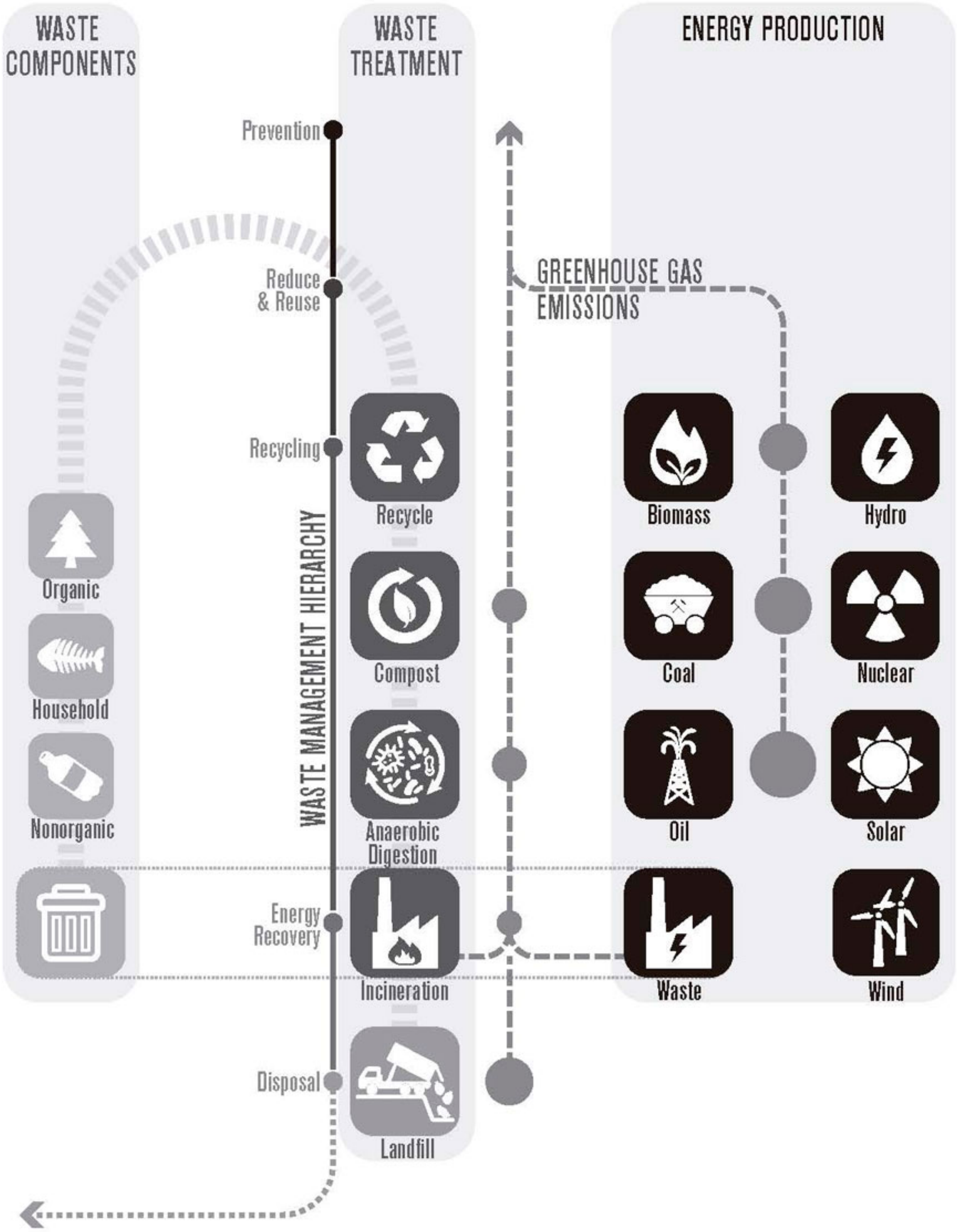

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Comparison of WtE facilities' greenhouse gas emissions to those of other energy generation technologies; the waste hierarchy including WtE energy recovery process; and landfill disposal practices ranked by greenhouse gas emissions.

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