Turning Down the Global Thermostat

A veteran of green design has studied global warming and sees its cause--and possible solution--coming from the same unlikely source: **architects.**

By Christopher Hawthorne

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It would be tough to argue with the suggestion that the sustainable-design movement has made significant, even dramatic, strides over the last decade. For architects, for industry, for the media, and for the general public, green design has moved from the fringe to the mainstream. In Santa Fe, New Mexico, an architect named Edward Mazria is engaged in a personal crusade to convince the members of his own field that profession is dangerously out of touch with reality.

For Mazria the way the human race is changing the environment, specifically in terms of global warming, suggests nothing short of coming catastrophe. Already quantifiable results like melting ice caps, rising sea levels, and disappearing species, he says, should be enough to prove his case. He places both the blame and the responsibility for turning things around squarely on the shoulders of one profession: architects.

During the last year Mazria has studied the existing data and come to a startling conclusion: architects--together with the building industry--are responsible for just about half of America's energy consumption and half its greenhouse gas emissions, which are produced by burning coal, gasoline, and other fossil fuels. (Cars and trucks, by comparison, do roughly one-sixth as much damage.) Most scientists who've studied the issue will tell you that greenhouse gases trapped in the Earth's atmosphere lead to global warming--and that unchecked global warming is capable of causing everything from killer heat waves, withered crops, dying species, and melting ice caps to rising seas that would submerge most of the world's present-day coastline under water.

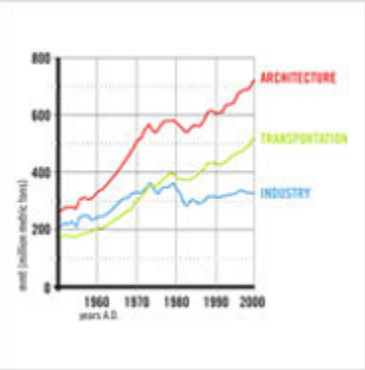
Mazria has produced a traveling multimedia presentation and a sort of white paper entitled "It's the Architecture, Stupid!", parts of which were published earlier this year in *Solar Today* magazine.

"This is the most important moment in the history of architecture," he says. "I want to get this news to people as quickly as possible to establish the threshold between knowing and not knowing--a doorway from this world to an entirely new world in architecture. If architects don't attack this, then the world doesn't have a chance."

Barely recognized in the 1970s, global warming is now undeniable. Since worldwide temperature measures began in 1867, the 15 hottest years have all been since 1980. Each of the top three has come in the last five years. Some scientists think average world temperatures will increase by ten degrees by 2100, a jump that would do almost unfathomable damage to the planet. Even the more conservative estimates of a rise between one and three degrees over that time promise changes, in the form of floods, drought, disease, and lost ecosystems.

U.S. Energy Consumption by Sector

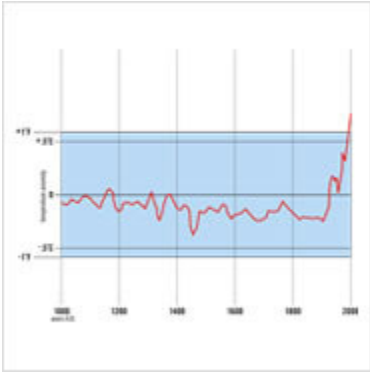
A reorganization of existing data--combining the energy required to run residential, commercial, and industrial buildings along with the embodied energy of industry-produced materials like carpet, tile, and hardware--exposes architecture as the hidden polluter.



U.S. CO2 Emissions by Sector

While levels of carbon dioxide emissions produced by industry remain steady, those produced

by architecture are soaring, signaling a pressing need for widespread change in the way architects design buildings.



Global Temperature Variation
Since 1900 average worldwide temperatures increased more than an entire degree--a statistic that Mazria sees as a call to action for architects.
Charts: Data from Ed Mazria; graphics by Criswell Lappin

Traditionally assessments of U.S. energy consumption have been broken down into four categories: industry, which consumes about 35 percent of the total each year; transportation, 27 percent; residential, 21 percent; and commercial, 17 percent. Significantly energy consumption usually tracks pretty closely with carbon dioxide production because most of the energy consumed is in the form of fossil fuels, which release greenhouse gases--primarily carbon dioxide, methane, and nitrous oxide. Thus a pie chart showing carbon dioxide divides along roughly the same ratios as one showing energy use. "In every study it's always broken down the same way," Mazria says, "so when you look at it and ask who the bad guy is--it's industry."

Mazria decided to redraw that pie chart with a separate slice just for architecture. He did this by combining the residential and commercial sectors, and then adding the portion of the industry sector that goes to the operation of industrial buildings and their construction. To get this last group of numbers Mazria used estimates of the so-called "embodied energy" of industrial buildings. A key statistic for anybody hoping to build in a sustainable way, embodied energy is a measure of the total energy required to produce a particular material or building component and get it to a building site. Mazria's new math brought the architectural sector to a whopping 48 percent of total U.S. energy consumption. A similar rearranging of the chart for carbon dioxide production left architecture with 46 percent of the total. "I rounded the numbers down," he says. "I want to be careful about my numbers because people are going to attack them."

Of all the suggestions out there for what the average citizen can do to combat global warming, few (if any) mention architecture. The list of suggested steps usually includes driving a fuel-efficient car, recycling, investing in clean energy sources like solar and wind power, and cutting back on electricity use at home and at the office. It would be profoundly refreshing to see just one list that suggested picking out a house or apartment building designed according to sustainable principles, when it's clear that that choice is more important--perhaps *six* times more important--than what kind of car

you drive. But is it fair to make architects responsible for the damage caused by the entire building industry? Mazria thinks so. He cites figures suggesting that architects design 77 percent of all nonresidential buildings, along with 70 percent of all multifamily and 25 percent of all single-family construction. And he argues that the percentage of architect-designed buildings is in fact higher than that because, as he writes, those figures "do not account for owner-supplied plans that were originally from architecture firms, designs by staff architects employed by building owners and developers, and single-family houses designed (but not stamped) by architects and interns."

In Mazria's mind, then, the architect is a perfectly legitimate new poster child for global warming: the leading part of the problem as well as, potentially, the solution. "Architects--and the government tends to forget this--specify every single material that goes into a building, from faucets to paint to carpet to wall materials to finishes to windows to roofing," he says. "Architects have the ability to change entire industries with the stroke of a pen. If we specify a material with low carbon dioxide emissions in its fabrication--say, floor tile, carpet, gypsum board--industry will respond. This is the American way. Architects are consumers; they're not always aware of the incredible power they have to change the way products are manufactured."

For Mazria the fact that architects are gatekeepers means that they control what he likes to call "the global thermostat." In that crucial role he sees signs of hope: "Because of the way design has always been taught in schools, I think architects tend to have a pretty highly tuned moral sense. And if architects understand the weight that's on their shoulders, they'll rally to do what they have to do."

He writes in his white paper: "We already know that buildings can be designed today to operate with less than half the energy of the average U.S. building at no additional cost. The design information needed to accomplish this is freely available."

Mazria has come up with a multipronged strategy to use architecture to attack the problem of global warming. He began to look at the five billion square feet of building space that goes up each year in this country, along with the additional five billion square feet of renovation, as a place where remarkable energy savings might be achieved. (See "Mazria's Equation") Indeed, if implemented along with one nonarchitectural change--that 20 percent of the country's energy be produced by renewable sources within 20 years--Mazria believes such changes would flatten out and even reverse the energy-use and greenhouse-gas curves. In all cases Mazria suggests that his targets be met not through prescription.

"That's the beauty of it," he maintains. "This is design with a capital *D*. Architects who don't want to see this as their problem will try to rationalize why they can't reach these goals--that it's a client problem, or it's an economic issue and clients don't want to spend the extra money. But it's simply a design problem--you can solve a design problem a thousand ways to not cost more. If you're an architect, just like you solve the functional problem and the budgetary problem, you must solve the environmental problem--and solve it by design." That holistic approach is one Mazria has put to use in the design of his own house, in the foothills east of Santa Fe, which he hopes to have practically off the grid by the end of the year, and in many of his firm's best-known projects--including the 173,000-square-foot Genoveva Chavez Community Center in Santa Fe, which uses significantly less energy per square foot than a typical building of its type.

In that sense the power of Mazria's approach is that--in an age of hysterical but convoluted statistics and greenwashing from the forces of industry--it delivers a clean, clear message: architects bear a greater burden of responsibility for environmental damage than the members of any other single profession. People like Greenwald and Howard may not be surprised to hear that, but you can bet that the man on the street--and pretty much every architect in America--will be. "When I tell groups of architects that so much responsibility lies on their shoulders, it's a little bit of disbelief," Mazria says. "Shock, even. But when you're an architect and you start to think about your role, and the kind of future you're leaving to your kids and grandkids, you start seeing everything differently. You have to. You start seeing every single building on every street differently--as a producer of emissions, as a symbol of inefficiency--as a *threat*."

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Mazria's Equation

Architect Ed Mazria has come up with a strategy to use architecture to attack the problem of global warming. He looks at the five billion square feet of building space that goes up each year in this country, along with the additional five billion square feet of renovation, as a place where remarkable energy savings could be achieved. His concrete proposals are as follows:

Incorporate information regarding the embodied energy in building materials into a federally sponsored, nationwide, AIA continuing-education program with the specific goal of reducing the embodied energy of building designs by 15 percent in the next five years.

-15%

Require that state and federal government renovation projects reduce the existing building's energy use to meet an energy-consumption performance standard of one-half the U.S. regional average for that building type.

-1/2

Require that all government building projects be designed to meet an energy-consumption performance standard of one-half the U.S. regional average for that building type. "This is a no-brainer," Mazria says. "It doesn't tax the economy, it doesn't cost anything, nobody loses a job because of it. If the states and the federal government do that, I guarantee every architect who does government work will know how to do it within a year. And if you start with state and federal governments then everybody else will follow." Mazria adds, "Initially architects' fees could be increased by a small percentage to cover the cost of compliance."

-1/2

Begin a federally funded program "to refine and transform building-simulation programs so they are user friendly, graphic in format, and seamlessly integrated with the CAD programs used currently by architecture firms." Fully developed to mesh with existing computer-modeling design programs, such software would revolutionize sustainable architecture, according to Mazria. "For example, you'd be designing a room and there'd be a flashing warning saying, There's not enough daylighting there. And you'd make a change, and as soon as you got enough daylighting the program would tell you graphically."

+SOFTWARE

Include in every "design studio" a requirement in the problems issued to students that architecture be designed to engage the environment in a way that significantly reduces or eliminates the need for fossil fuels. Offer computer-simulation and living systems courses to augment the design studio and provide students with a deep understanding of the principles involved in natural processes. Center a segment of state professional licensing exams on the design principles necessary to effect significant reductions in building energy consumption.

+SCHOOLS

If implemented along with one nonarchitectural change--that 20 percent of the country's energy be produced by renewable sources within 20 years--Mazria believes such changes would eventually flatten out and even reverse the energy-use and greenhouse-gas curves.

+20%

In all cases Mazria suggests that his targets should generally be met not through prescription ("Thou shalt use insulation at least ten inches thick and low-energy coated windows") or proscription ("Thou shalt never use redwood") but through pure design: siting, materials, and other strategies based in architecture more than a reliance on technology. When design cannot meet the targets, then renewable energies (i.e., solar, wind, geo-thermal) should be employed to make up the difference.

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http://www.metropolismag.com/html/content_1003/glo/index.html