



Beyond Green Building & Codes: Seeing a Bigger Picture

*Our greatest responsibility
is to be good ancestors.*

- Dr. Jonas Salk

CAZREN & YCCA
Hassayampa Inn
Prescott, Arizona
December 5, 2009

David Eisenberg
Director
Development Center for Appropriate Technology

These notes are intended to approximate my remarks given on December 5th, 2009, but will no doubt stray somewhat from my actual comments because of memory and my desire to include things I may not have said but intended to. Also, because this is the way I like to share my Powerpoint presentations, and most of my presentations incorporate some slides and comments imported from previous presentations, there may be some variance from my actual remarks - hopefully not to the detriment of communicating these ideas, which is my purpose for doing this in the first place. The first few slides that follow are all just the title slide because I talked for a bit before starting to show my Powerpoint presentation..

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To add a couple of details about myself, I'm a native Tucsonan and a recovering contractor. I joined the US Green Building Council in 1997 and served on the Board of Directors from 2000 through 2005. I founded and still chair the USGBC Code Committee. The US Green Building Council held its annual Greenbuild Conference at the Convention Center in Phoenix a couple of weeks ago and drew almost 28,000 people and the Expo was sold out...in this economy. So clearly, while the rest of the building industry is struggling hugely, green building is one area that is still active.



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Being at the Convention Center in Phoenix reminded me of when the International Conference of Building Officials (ICBO) held its annual meeting and conference there in September of 1997 (ICBO was the organization of building officials in the Western U.S. - one of the three regional model code groups that eventually merged to form the International Code Council - the national organization of building officials today). I had been invited to be on a plenary panel by Bob Fowler, the man who initiated and led the consolidation effort. Bob had asked me to talk about our fairly new program, Building Sustainability into the Codes, in relation to the consolidation efforts. We were to each have 20 minutes for our presentation to an audience of perhaps a thousand building officials. I was intimidated by the size of the audience and who they were, so I'd prepared and rehearsed my twenty minute talk. As fate would have it, the session before ours ran halfway into our time and as they finished up, Bob informed the panelists that we'd only have ten minutes each. He said he hoped that would be okay, to which I replied "sure." And then, as I was to be the first speaker, went into a bit of a panic realizing that I didn't have time to turn a 20 minute talk into a ten minute talk and so I was just going to have to wing it. We went up and sat down as Bob introduced all the panelists and then introduced me and sat down. I got up and just launched into my talk. A short way in I remember thinking that it felt like the best talk I had ever given. It was just flowing. And then, a few minutes later, as I was finishing up a point, I realized that I had used my 10 minutes and needed to wrap up. At the same time, I realized that the ending that I had based on the other 10 minutes of material that I hadn't talked about and didn't have time to talk about. As I finished my point and tried to figure out what to say next, I heard myself talking. I remember thinking that I had better pay attention to this. What I said was something I had never thought before so we all got to hear it for the first time at the same time - even though it came out of my mouth.



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What I said was this:

"I want to ask you a question. What happens when someone comes into your jurisdiction wanting to do something crazy like build a house out of bales of straw, or use the dirt, the earth, for adobe or rammed earth, or cob - something you've never even heard of? Or maybe they want to use bamboo as a structural material. Or perhaps they want to harvest water off the roof and drink it, or put in a greywater system, or not have a sewer connection or septic system and use composting toilets. Or maybe they want to be off the electrical grid and have photovoltaic panels up on the roof and batteries. Or maybe, they're worried about electro-magnetic fields and don't want any electrical outlets in their bedrooms.

What goes through your mind when people come in seeking permission to do these things? My guess is that your first thought is 'These people need to be protected from themselves.' And your next thought is 'Not in my jurisdiction!' As the laughter died down, I continued, "I want you to think about what's really happening because it is extremely important. The vast majority of people who come in wanting to do these things have made a crucial discovery. They've realized that their lifestyle choices have consequences, many if not most of which are negative. Not negative for them, though. Negative for their children and grandchildren, and my children, and your children. These people are trying to take responsibility for the consequences of their choices. I asked, "Is there anyone in this room who thinks that's a bad thing? I don't think so. So what is your job as a building official? Is it to keep those people from pursuing that goal of taking responsibility for what they do? Or is it to help them find the way to do it well and safely?" And I said to myself, "Shut up and sit down!" I thanked them and sat down to great applause. I thought to myself, "I don't know where that came from but it was really good" and I wrote it down because I didn't want to forget it. Then I started thinking about what had just happened.



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I wondered how, in the last two minutes of a ten minute talk, I had somehow cut right through the resistance to these ideas and touched a majority of the people there - a room full of building officials. As I thought about it, I realized that the power came from a few sources. First, it was an absolutely authentic heart to heart message about what we all care about - what we are trying to protect, why we have codes. Then I realized that I had connected also because I knew what they cared about and how they thought about it. But I also realized that I had just asked them a bunch of questions. I hadn't told them anything. I had just spoken from the heart about what really mattered to me and I trusted that would also care and that they could understand it. And I acknowledged the importance of their work and invited them to a higher place from which to do it.

I have thought of that talk in Phoenix as finding the trailhead into the codes work, because it was the first time that I really got at a deep level that these were people who cared about safeguarding the public. That they were a caring community. And I saw that I wanted what they wanted and more, not less, because the last thing I want is people building unsafe buildings. But I had a much bigger field of view and a broader definition of the categories of risk and responsibility - I wanted a safe planet on which to build those buildings as well...

So all these years later, I'm still working to convey that message...

This is my
grandson Joe.
He turned 11 last month,
I'll be 61 next month.



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This is my grandson Joe. He just turned 11 last month. I'll be 61 next month. That 50 year separation in age makes it convenient to think about what the world will be like in 50 years, when Joe is my age.

Here's a question, on Joe's behalf:

Where in our current regulatory systems or decision-making processes is there explicit and continuous representation for the rights and welfare of our children's children?



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So here's a crucial question I'm asking on behalf of Joe and all the other children and grandchildren in the world. Where in our regulatory systems do we require explicit and continuous representation of the rights and welfare of future generations - our children and grandchildren and great grandchildren? It isn't there - and if we are going to take seriously our responsibility for safeguarding public health, safety and welfare from hazards attributed to the built environment, it needs to be part of everything we do.

A Few Other Questions:

Are we paying attention to comparative risks, considering cumulative harm, or recognizing global and system limits?

Can our regulatory frameworks respond to new or emergent risks in comprehensive, timely and appropriate ways?

Can they enable positive change or just aim to prevent specific negative outcomes?

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There are many questions that need much better answers than the ones I am observing even now as things have started shifting in the right direction. Our legal and regulatory structures are not designed for the modern world and the complexities and challenges we're facing today. We ignore system limits and the reality of cumulative harm, using cost-benefit analysis to allow infinite growth in harm as long as each increment of harm can be shown to have a larger increment of economic benefit. This is completely disconnected from scientific understanding of systems and limits and of the gigantic risks we are creating. The regulatory system we have now also does a better job of safeguarding the status quo than responding in a robust, timely and appropriate manner to new or emerging risks. And the focus on preventing harm leads to a negative view of change, resulting in the common situation that regulations tend to be as effective at keeping the best things from happening as the worst.

Critical (& No Longer Valid) Assumptions

- A stable and predictable climate.
- Adequate and affordable supplies of energy, water, food and other critical resources.
- The natural systems on Earth are robust enough to withstand whatever humans may choose to do.
- Current regulatory systems are adequate and sufficiently integrated to deal with emerging risks.

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There are crucial changes and serious problems that have yet to fully register in people's minds. The basic assumptions on which so many of our decisions and public policies are based are no longer valid and yet we proceed as though they are. These include the assumption that we will have a stable and predictable climate, that we will continue to have sufficient and affordable supplies of energy, water and other vital resources that we need, not just for building but for everything we do. We continue to act as though the natural systems on the planet, our life support systems, are robust enough to withstand whatever 7 or 8 or 9 billion human beings might choose to do. And in the building regulatory realm, we act as though the current systems we have in place to regulate what gets built are adequate to deal with the risks that are associated with the built environment and these larger, emerging problems. These are all seriously questionable assumptions today but we aren't acting as though this is the case. We are betting our future on them every day we don't react to what they tell us we must change.

It's Time to Wake Up and Get to Work

The real world is changing rapidly. We need to be changing in response. Change itself increases some kinds of risk. But the most dangerous thing we can do is keep doing what we've been doing...



The challenge now is to create an integrated, balanced, flexible, and responsive *regulatory system* that neither impedes needed changes nor compromises public health and safety.

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Although there are those who deny that there is anything wrong, the scientific evidence strongly suggests otherwise. Many changes in the world are startling and stark. Responding to those changes appropriately requires changing what we do and how we do it. Inherent in change is also risk. But looking at the evidence it is more and more clear that the most dangerous thing we can do is to keep doing what we've been doing. Part of that change needs to be in the building regulatory realm. And it needs to support the transition to more sustainable building and development not impeding it.

We All Want the Same Things

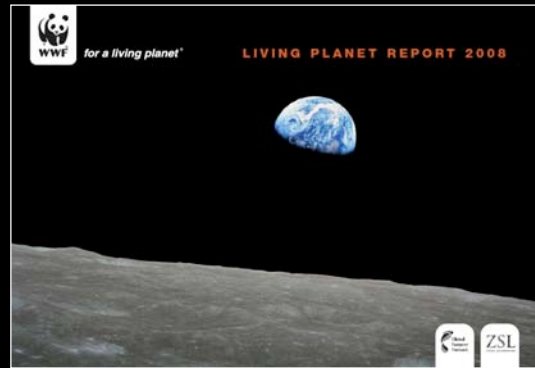
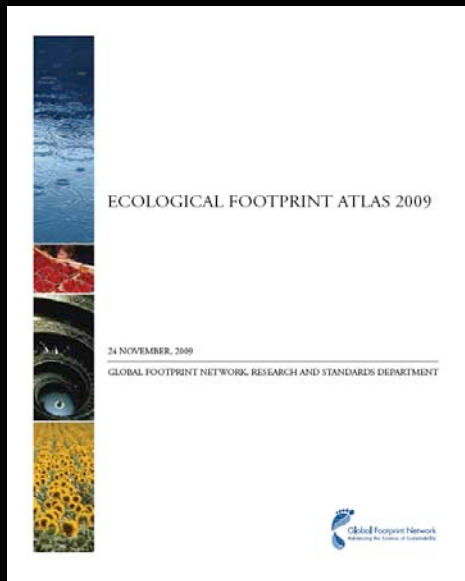
In most cases, the people making and enforcing rules governing the built environment want to do the right thing - but for long-term health, safety and public welfare, they don't yet know what that is. We may not know either, but that doesn't relieve us of our responsibility for our children—for the future.



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I learned long ago that most people involved in the whole spectrum of design and building and its regulation want the same things - safe buildings - and they want to do the right thing. In this field though, it is hard to know exactly what that is. But that doesn't relieve any of us of the responsibility for safeguarding the welfare of our children and their children.

Some Big-Picture Context

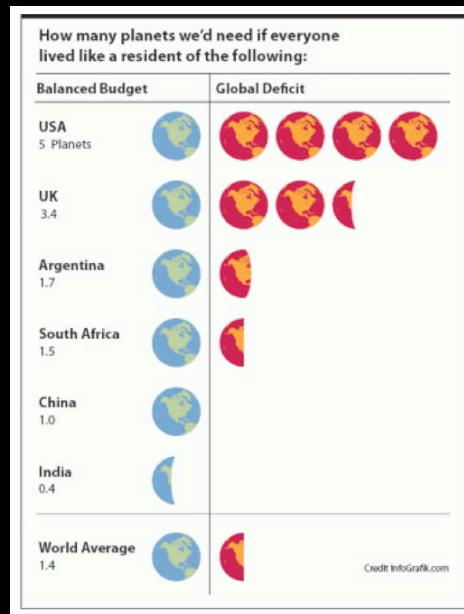


www.footprintnetwork.org

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There is a wonderful organization, The Global Footprint Network (website www.footprintnetwork.org), with a wealth of excellent information about this concept. One of the great things about this site and the organization is that everything they do is transparent - you can download their reports and the data on which they are based, their methodology is meticulously described, the quality of the information is also revealed - what's missing and what is of questionable accuracy - it's all open and available. They invite people to critique their methods, to help provide better information, and so on. These are two recent reports, the 2009 Ecological Footprint Atlas and the 2008 Living Planet Report.

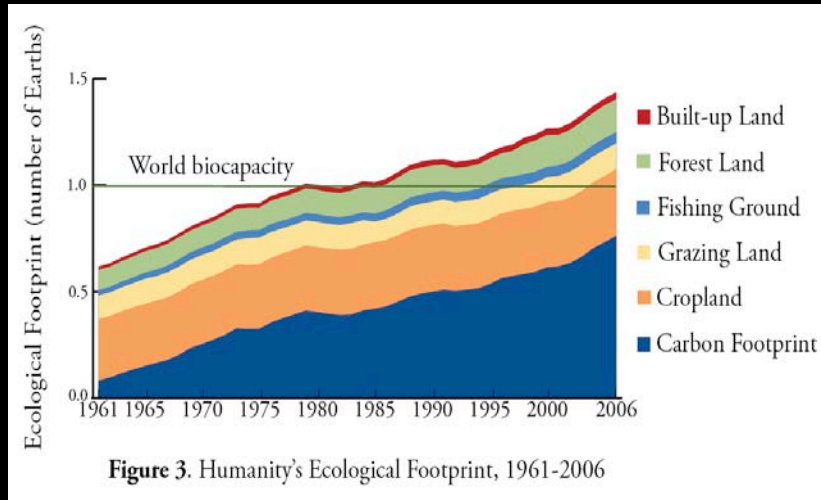
Big Question: How Many More Planets?



www.footprintnetwork.org

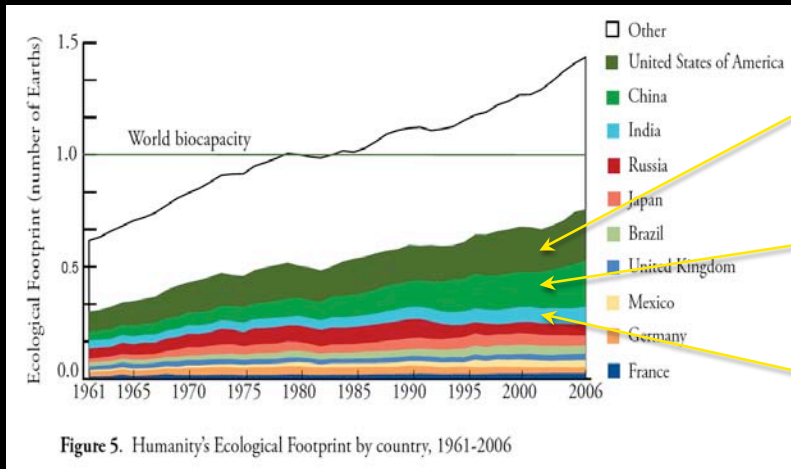
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An excellent way to understand what is happening on a planetary scale in terms of population, land, resources, pollution and nature is through a concept called ecological footprint. It is related to the concept of carrying capacity - that a certain piece of land could support a certain population or level of activity. Ecological footprint comes at it from the opposite direction, asking how much productive land it requires to provide the resources and deal with the pollution and waste of a given population, individual or activity. There is ample evidence that if everyone on the planet was consuming resources and producing waste and pollution at the rate of the average American, Canadian, Northern European, or Japanese citizen, we would need several more planets to support them. And extra planets are hard to find. This graphic shows that we are already in planetary overshoot - that is, that we are already using more of the earth's biological capacity than exists - meaning that we are degrading the ability of the earth to support us. So something needs to change. We have to change how we think and how we do just about everything.



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This graphic shows the global make up of the services that and resources that nature provides - and if you notice it is our energy and carbon footprint that is the largest and growing the fastest.



U.S.
308 million

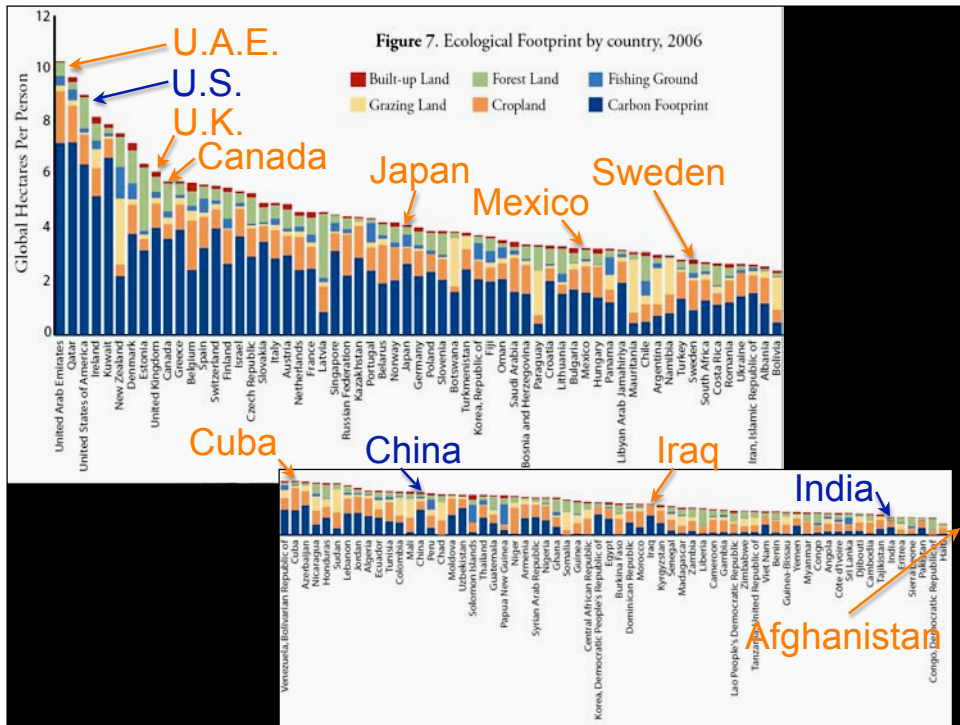
China
1.33 billion

India
1.16 billion

Total Per-Country Footprint for 10 Largest Countries

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This graphic shows that the total country footprint of the U.S. and China are about the same size, however China has more than four times as many people for that size footprint and India's footprint is smaller than ours and they have more than three times as many people.



This is from the 2009 Global Footprint Atlas showing different countries and the per capita (per person) average global footprint in various countries. As you can see the U.S. is number 3, behind the United Arab Emirates and Qatar - far exceeding our fair share of available bio-capacity. The UAE and Qatar may be higher per capita but we have a LOT more people. This frame of reference is invaluable to understand where we are and what is actually happening in the world. It is worth noting that Sweden with its very high standard of living, has a much smaller footprint than we do. Many statistics reveal that their actual quality of life, health and so forth are actually better than ours. The reason their footprint is smaller is that they have been working to lower it.

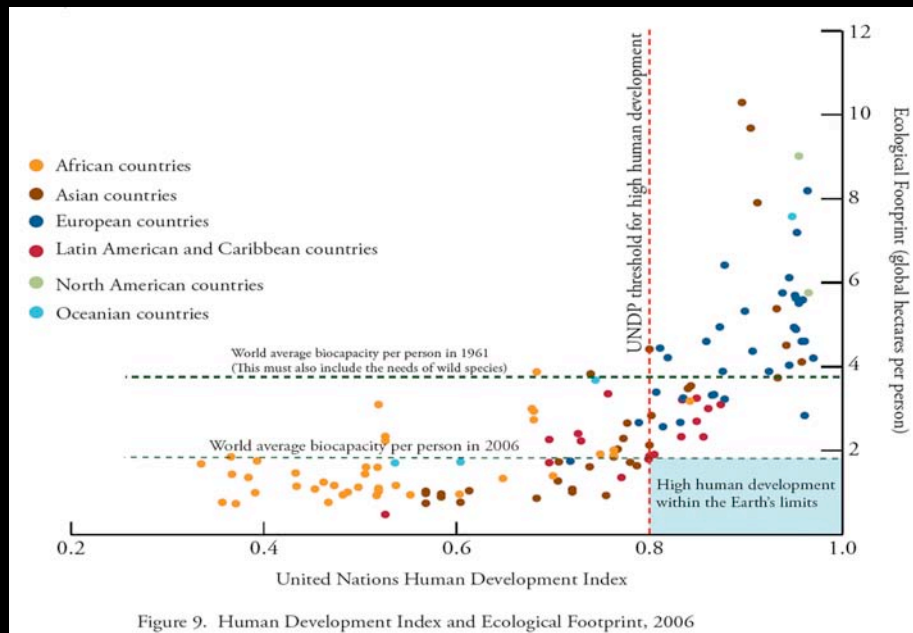


Figure 9. Human Development Index and Ecological Footprint, 2006

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This is a recent tool developed by the Global Footprint Network - combining ecological footprint on the vertical axis with the UN Human Development Index on the horizontal axis. The lower dashed horizontal line is the world average biocapacity in terms of productive land available per person in 2006, ignoring the needs of wild species. (The upper dashed horizontal line was the biocapacity in 1961. It was higher because there were fewer people and our impacts were smaller). The dashed vertical line is the threshold for decent human development - or you might say decent quality of life. So the little box in the lower-right-hand corner represents a good quality of life with a small ecological footprint - in other words, living well within our ecological means. The dots are countries. On the Global Footprint Network website you can find some of these graphics - some are animated over a thirty year period. If you hold the cursor over them when you are at the website you can see the names of the countries). Our goal should be to migrate everyone's lifestyle on the planet into that box - better quality of life with less stuff, recognizing that our welfare, wealth and health is not dependent on how much stuff we have.

In Dammam, Saudi Arabia...



This is a bit of an aside or diversion, but this is a picture of me last April in Dammam Saudi Arabia, at the City Council chambers speaking to about a hundred members of the Saudi Council of Engineers about these issues - showing a similar slide about ecological footprint and the UN Human Development Index. Brad Lancaster, who you can see seated on the stage, and I were invited by the U.S. State Department to go to Jordan and Saudi Arabia to speak about rainwater harvesting and water conservation and green building because Saudi Arabia was celebrating Earth Day for the second time this year.

I had the opportunity to ask some interesting questions of the audience there about their legacy - thinking about their children and grandchildren. I said that there were few people on the planet with a clearer understanding of the finite nature of petroleum and the vast array of valuable uses going well beyond just exploding it in our internal combustion engines or burning it for fuel. I said that it was what they had that was truly valuable to them and to the world. And given that it was also finite, why would they want to waste any of it, no matter how much they have?

...Continued...

In Dammam, Saudi Arabia...



...Continued...

I then said that I thought they were in a unique position in the world. I told them that we had been working with a group of Native American tribes in the Upper Midwestern U.S. and their organization, the Intertribal Council on Utility Policy (ICOUP) as they worked to develop tribally owned wind utilities. I pointed out that they refer to the Upper Midwestern U.S. as the "Saudi Arabia of wind power." I said, I've been here for four or five days now and the wind has never stopped blowing. I'm not sure that you aren't the Saudi Arabia of wind power. And the sun seems to shine a lot here too. Perhaps you're the Saudi Arabia of solar power as well. I suggested they think about the fact that they are uniquely situated - with the resources, money, and technical expertise to become the first country in the world completely running on renewable energy. And if they perfected that technology there, they could not only sell it but provide it to the developing world and begin to address the poverty and desperation that leads to terrorism and wars. I asked them to imagine doing that and to think about the potential to completely change how the rest of the world views their country. I said again that they alone were in a position to actually achieve that.

Gapminder.org



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The animations that are on the Global Footprint Network website were created using a tool that is now available to us all on a fantastic website, Gapminder.org - which contains a tool called Gapminder World. You can use it to create your own animations and graphic displays of information about world trends in resources, economics, human health and well being, population, and much more. You can even upload your own data and use these tools to display it. There are also some fantastic videos on this website of talks by Hans Rosling, a Swedish public health professor and authority, in which he describes both this tool and website and more importantly, the value and usefulness of looking at data in context. I highly recommend the one called Let My Dataset Change Your Mindset but there are others that are also wonderful.

Life After Cheap Energy & a Stable Climate

We can't rely on past assumptions. It's all changing and rapidly.

We need to be seeking a positive path to the Post-Peak Era we are entering, and...

We have available vastly greater and more accurate information about what's actually happening than ever before...however...

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Our awareness of the great changes taking place and of these emerging global realities requires us to act in new and different ways than we have in the past. We have to change our minds and how we think and behave. We have access to much better information and the ability to analyze it and see more clearly where we've come from, where we are, and we're heading. We now all need to become leaders in deeper change.

Our Challenge

"You cannot solve a problem from the same consciousness that created it. You must learn to see the world anew."

Albert Einstein

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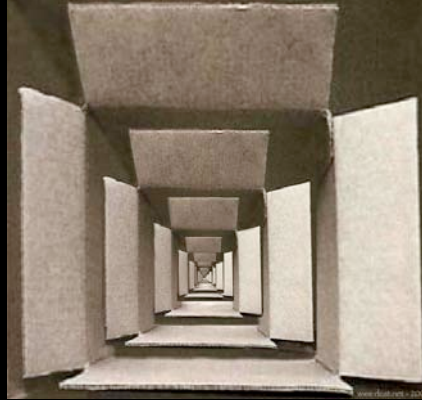
Einstein summed the problem up very well and concisely - you can't solve a problem with the same thinking that created it. One of the problems in the regulatory realm is that it is embedded almost totally at the level of the problem. We need systems that are designed to operate at least one level above that...higher if we can manage it.

As an aside that I didn't say in my talk in Prescott - I have a strong negative response to the widespread tendency to think that we need to dumb things down so people can deal with them. I think this is a self-fulfilling prophecy - what you get when you dumb things down is dumber things and dumber people - the exact opposite of what we need today. We need to raise our expectations, not lower them. And the constant chant on the part of industry and the corporate world in response to tighter regulations or performance standards is that it will be the end of life, or at least business, as we know it. I wonder when we went from being Ameri-cans to Ameri-can'ts...

This is an Ongoing Process...

We're told we need to think "outside the box" to deal with today's problems.

But it's a process -
expand your field of view,
get out of the box you're in
...into the next bigger box.



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People talk about the need to think outside the box - especially with all the daunting challenges we're facing today. My experience is that it is really an infinite series of boxes. We expand our thinking and understanding and climb into the next bigger box. No one has anything remotely like the whole picture of reality or truth, and that's okay. I love this image because it reminds me that I and everyone else always have a lot to learn - that our world view is always inherently both incomplete and inaccurate. Our job is to make the largest and most accurate map of reality that we can in our time here. We have to be willing to redraw your map constantly...

It's Always BOTH Details AND Big Picture

It's critical to know
your frame of reference -
are you working in the
details or big picture?
Past, present or future?

Shifting your focus back and
forth is the only way to keep
your work in perspective and
proportion: to see *both* the
things and the *relationships*
between them.



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To do that well, we also need to know whether we're working in the details or the big picture or some intermediate level, in the past, the present, the future, always trying to understand the context of our focus. Focus is an act of exclusion - you focus on something and by definition, you exclude everything else. If you don't know that, if you don't pay attention to that you get lost in the details or you lose sight of them. We all need to develop the habit of constantly shifting our focus and looking for the patterns and the spaces between things and their relationships. This is how we learn to keep things in perspective and proportion.

The Purpose of Building Codes

International Building Code (USA) - 2006 edition

101.3 ***The purpose of this code is to establish the minimum requirements to safeguard the public health, safety and general welfare through structural strength, means of egress facilities, stability, sanitation, adequate light and ventilation, energy conservation, and safety to life and property from fire and other hazards attributed to the built environment and to provide safety to fire fighters and emergency responders during emergency operations.***

Big Picture in White - Details in Blue

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Bringing this back to building codes - here is how I view the details and the big picture in codes. This is the purpose statement from the International Building Code (USA). The statement I've highlighted in white is the Big Picture. The rest is Detail. The purpose is to safeguard the public from hazards attributable to the built environment. It doesn't limit responsibility to only hazards that occur at the building site or to only hazards during the life of the building because the hazards attributable to the built environment begin far from the building site and often end far from it as well and they begin long before the building exists and extend far into the future.

What's Protected and What's at Risk...Now?



Modern building codes enable us to design and build structures that are safe for their occupants, making it seem that we've eliminated or greatly reduced the risks associated with buildings.

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Our modern building codes are extraordinarily good at enabling us to design and build buildings that rarely burn down, fall down, trap people in emergencies, expose them to raw sewage, electrocute them, let them fall from high places, suffocate them too quickly, and so forth. So we think we've eliminated or greatly reduced the risks associated with buildings.

What's Protected and What's at Risk...Now?

We've just moved those risks in space and time:
- away from the building site, and
- into the future.



What we've actually done is move those risks in space and time. We've moved them away from the building site out into all the natural systems on the planet - our life support systems, and from the present to our children and grandchildren and all the future generations of all the other species on whose welfare our welfare also depends.

Big Problems Hidden in Plain View

Looking at buildings through codes has been like looking through a microscope, with individual building-related risks filling the field of view.

Beyond this limited scope of concern are much greater generalized risks for everyone and future generations that can't be seen through that lens.



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Looking at buildings through building codes is like looking through a microscope. We can see some very real and important risks to people in and around buildings. But important as they are, in a real way, these risks exist at the smallest and most specific level and they completely fill our field of view. They're very important because they are risks to real people. But outside our field of view there are risks being created that are many orders of magnitude greater - generalized and distributed risks to billions of people that can't be seen through that lens.

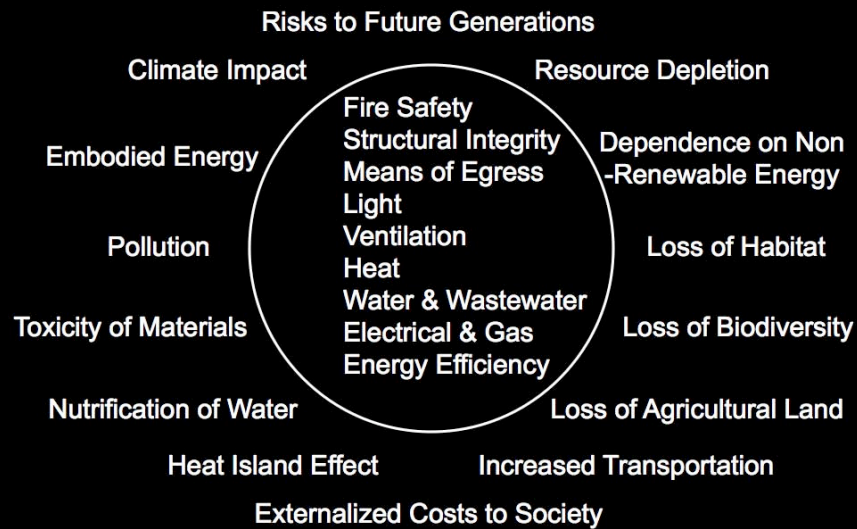
Risk - Through the Microscope of Codes...

Fire Safety
Structural Integrity
Means of Egress
Light
Ventilation
Heat
Water & Wastewater
Electrical & Gas
Energy Efficiency

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These are the categories of risk and responsibility laid out in the codes. This is the view through that microscope...

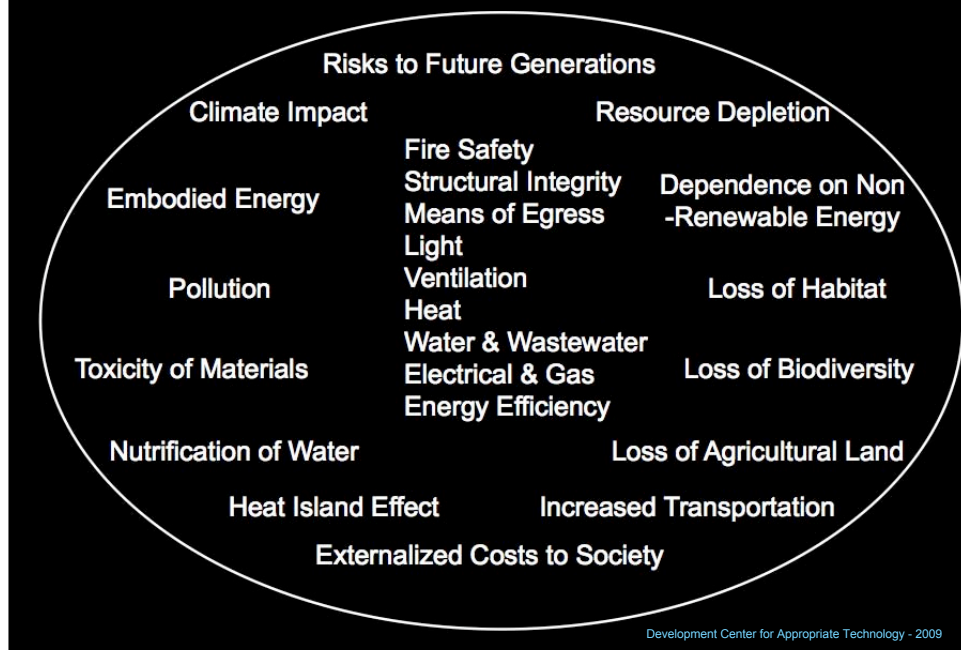
Risk - The Bigger Picture ...



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Here are some of the larger risks which are also attributable to the built environment and therefore part of the responsibility for safeguarding the public, most of which are currently unregulated.

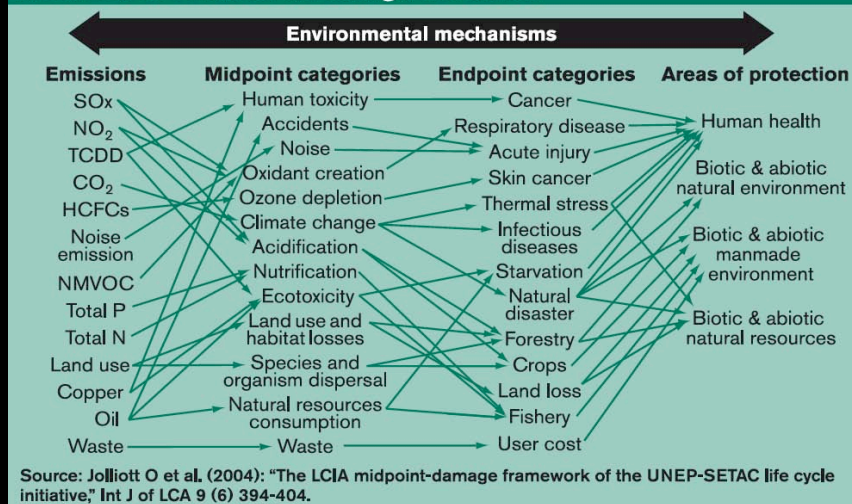
Risk - We Need to Balance them All...



It isn't either-or... we have to learn to address all these risks at the same time. What is needed is a more complete and balanced regulatory response to address and balance all these risks together. The real breakthrough in my thinking and my work came when I realized that I wanted everything that the building officials wanted and more, not less. We all want safe buildings, but we all NEED a safe planet for those buildings to exist on.

Huge Risks are Falling Through the Cracks...

Impact Assessment: Making the Connection from LCI to Entities Needing Protection



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This chart is of a Lifecycle Impact Assessment of the built environment showing some of the lifecycle impacts, risks and relationships that those of us concerned with sustainable building are trying to pay attention to and address. I don't expect you to be able to read all this or to understand all the relationships that are shown here. I don't claim to. But what is clear is that only some of these things are regulated at all and very few are regulated by building codes and standards. These risks are just as real as those covered by the codes, and they are to millions or even billions of people. Yet those who are trying to design and build to minimize all these kinds of impacts, while also dealing with the risks that the codes address - taking on more responsibility not less - often have a much harder time getting their projects approved than those projects that contribute the most to such hazards.

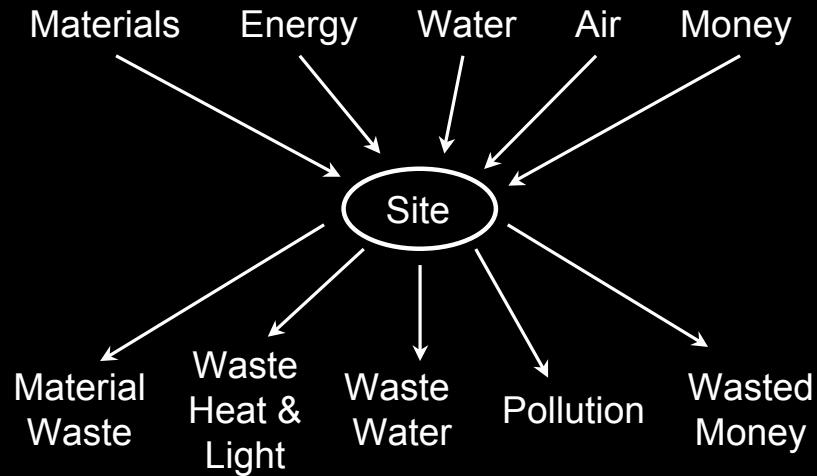
Acquisition of Resources through Demolition & Beyond



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When we think about the entire lifecycle of a building we can more easily see that the impact of a building project starts with the acquisition of resources and their transportation and processing and extends to the impacts of the building on the land and the infrastructure it requires. We need to consider the impacts of the construction process, the wastes generated, toxic chemicals used, the flow of resources through the building over its lifetime for repair, maintenance and refurbishing and for the services we demand of our buildings. And then we'd need to think of the impacts at the end of the life of the building and out into the future, and whether the materials are reusable, recyclable, toxic, or will just end up in the landfill. Then we can be conscious of the upstream and downstream impacts of the whole project starting far from the site and before the project starts to wherever those impacts eventually occur, including long after it is gone.

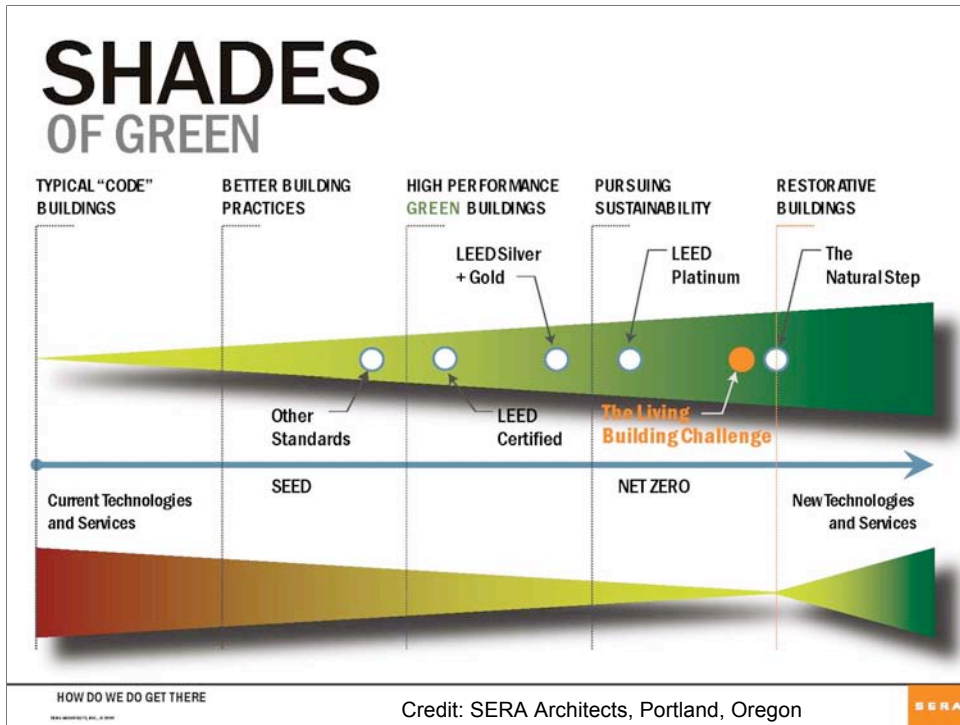
Lifecycle of Buildings - Think in Terms of Flow



Development Center for Appropriate Technology - 2009

I like to think of built projects not in terms of what they are made of, but instead, to think of them in terms of flow. You start at a specific project site and often take materials away from that site, and certainly bring materials to the site. So rather than thinking about them as objects, think about where things come from, what happens along the way, then what happens during use, and then at the end of their life or the life of the project.

My friend, the British Architect John F.C. Turner used a phrase in one of his books - either *Freedom to Build* or *Housing By People* - "Housing is a Verb." What he meant was that while we focus almost all of our attention on what houses and buildings ARE physically - what matters is what they DO for their occupants. What services they provide, what security and other benefits are derived from them. That is a hugely important insight into what is missing in how we think about the built environment.



It's vital to see what is happening as a continuous process of improvement – not a static situation. This is a graphic produced by SERA Architects in Portland, Oregon illustrating the continuum from typical mainstream practice to increasingly more sustainable practices and ultimately to a place beyond "net-zero" where our projects create more benefit than harm across the whole spectrum of their impacts during their lifetime. This diagram shows the movement toward higher performance and reduced harm to net beneficial projects. I prefer the term "regenerative" instead of restorative - like the way nature builds without creating waste or pollution or harm. In this diagram you can see the different levels from code-minimum conventional practice to various levels of LEED and then The Living Building Challenge and beyond that.

THE LIVING BUILDING

THE METAPHOR OF A FLOWER...

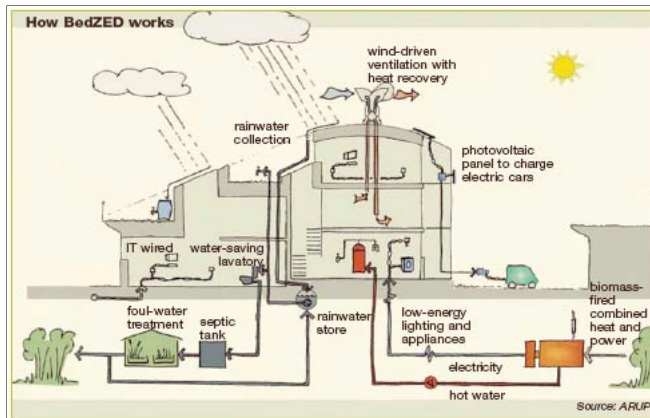
- HARVEST ALL ITS OWN ENERGY AND WATER
- ADAPTED TO CLIMATE AND SITE
- OPERATES POLLUTION FREE
- PROMOTES HEALTH AND WELL BEING
- COMPRISED OF INTEGRATED SYSTEMS
- IS BEAUTIFUL



HOW DO WE DO GET THERE

SERA

The Living Building Challenge is a set of 16 prerequisites - requirements - aimed at encouraging the creation of projects that go beyond net-zero in all areas. It includes site, energy, water, materials, and also beauty and inspiration and education. These are there because many of us believe that people don't take care of things they don't care about - they don't care for what they don't love - and people love beautiful buildings and so they last longer - which is much more sustainable.

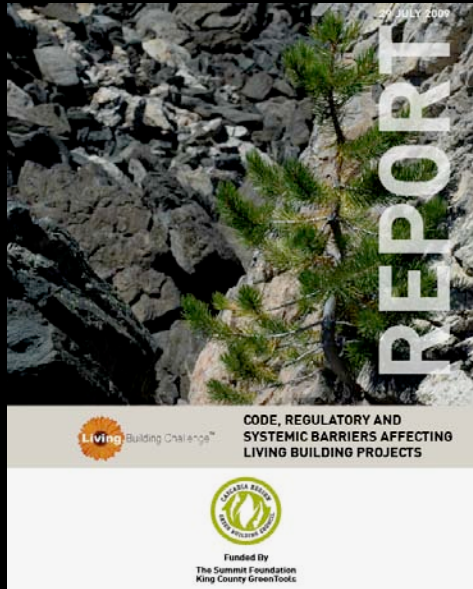


One Planet Living

www.bioregional.com
 The Beddington
 Zero Energy
 Development - UK



There are places where such projects are already built or being built - this is not pie in the sky - it can and is being done. There is great info on some of them at the One Planet Living website - www.bioregional.com -including about the BedZed project in the UK and others.



There's a new report from the Cascadia Region Green Building Council that looks at the whole spectrum of building regulatory issues related to green and deep green projects.

Available at: www.dcat.net & www.ilbi.org
& www.sustainable-alternatives.ca

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DCAT, my organization was hired by the Cascadia Region Green Building Council to produce a report on the code and regulatory barriers to Living Building Challenge projects. This report, which was published this summer, covers a wide range of regulatory issues in depth, and offers many recommendations, I won't going to go into detail about the report, but want to share a few insights.

Time to Create a Regulatory "System"

We need to design a fully-integrated regulatory system based on system principles and goals.

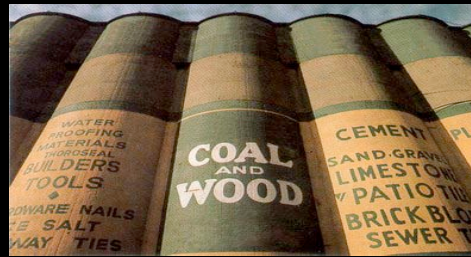
The first principle should be that buildings should first do no harm.

The ultimate goal must be a system designed to enable positive outcomes, not just prevent negative ones.

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The first is that we although we often call it a regulatory system, it isn't a system. It wasn't designed to be a system because it wasn't designed at all. What we have is an agglomeration of regulations and agencies that have essentially come about as reactions to persistent and serious failures and disasters. We need a real system a regulatory system for the built environment with system goals and principles. I've long said the first principle should be a sort of hippocratic corollary - that buildings should first do no harm. And the ultimate goal of this system must be positive outcomes, not just trying to prevent negative ones.

The Current Situation...



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A big part of the problem is the fragmentation of the regulatory realm for the built environment. We have a maze of regulatory organizations and entities, jurisdictional silos, and nested levels of responsibility and authority. There are gaps and overlaps. Where there are gaps the risks and hazards are externalized from the projects and systems being regulated to future generations and to the commons – in other words, to everyone including our children and grandchildren and to our commonly held resources and birthrights, like clean air and water, healthy and productive soil, vital and thriving oceans and all ecosystems. And, where there are overlaps, they don't typically give us more or better coverage – instead they tend to complicate everything, making change and true progress more difficult, as well as often having the effect of relieving each of the regulatory entities of full responsibility.

The Current Situation...



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Another pervasive problem in the regulatory paradigm is that because we don't get regulations until problems are large, serious and persistent, the main navigational tool in the regulatory realm is the rear-view mirror.

And since we rarely have preventive or precautionary regulatory structures with anticipatory capabilities built into them, we lose the chance to deal with new risks when they're small and manageable – or better yet – avoidable. Worse, emergent risks or new kinds of risk tend to be problematic for the regulators and so they are often reluctant to acknowledge them or respond to the need for change.

Representation for the Future and Nature

Create regulatory systems that assure continuous and explicit representation of future generations and of the commons—the natural systems our survival and well being are based upon.



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A huge problem, that I've pointed to a few times already needs to be explicitly mentioned - the need for continuous and explicit representation for the future and the commons in all regulatory processes. We need someone whose job it is to be the voice of the voiceless - those who can't speak for themselves. The absence of this has led to many of the problems we now face.

The Public Interest Is Not A Special Interest

Insure that the Public Interest is always adequately represented in all regulatory and standards development processes. Private interests are always well represented. As long as the Public Interest is treated as a special interest it can't be.



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Another big issue is that the public interest has come to be treated as just another special interest, competing with the array of private interests in nearly every regulatory, code or standard development process. The public interest is not a private interest and it is not merely equal to private interests and something to be bargained away. In the U.S. there is a national organization responsible for accrediting all the standards development organizations and processes - ANSI - the American National Standards Institute. The rules by which ANSI establishes and sanctions these processes divide participants into three main categories, "producers," "users" and "general." These may be subdivided further, but that is generally how they are described. None of the three categories are allowed to have a majority of voting members on any committee or standard development process. Government and those representing purely the public interest are usually placed in the general category. The interests of producers and users are often similar or aligned - usually they are financial interests of some form or other. Thus in effect, those representing the public interest in these processes, are, by design, always in the minority. The process is actually designed to ensure economic growth, not public welfare. There is much more to say about this, but it is a significant problem that must be addressed if we are to get regulations that safeguard us and the future.

Integrated Design Integrated into the Process

We know Integrated Design is key to the most cost-effective, high performing projects. We need an integrated approvals process to match.

We need plan reviewers and other regulators trained in integrated design to contribute their knowledge, concerns and perspective in the design development phase.



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Some of you may be aware of a design process called integrated design which in essence, brings all the key people in the design process together to craft the basic goals and criteria for a project and then to do the major design work together in real time - not in the traditional linear process where the architect draws the building and the engineers and other specialists then make everything fit into it. The result of this process when done well are projects that are very high performing at minimal cost increases and often at the same or lower first costs because of the savings available when all the key players are in the room making decisions with their collective experience and intelligence. The problem today is that we then hand off these intricately crafted designs, with all their interrelationships and interdependencies, to a linear regulatory process each part of which has the ability to disintegrate the design by not allowing or drastically changing some critical element, which has the effect of requiring the whole building or major parts or systems in it to be redesigned. We need to train plan reviewers in integrated design and then invite them into the design process - to the design charrettes where all these decisions are being made - to give the design team the benefit of the regulatory perspective and concerns and the regulators a clear understanding of what is trying to be accomplished.

Create a Fully Integrated Approvals Process

The integration of approvals processes must go beyond the building department to land use codes and utility regulation, and more.

The solutions we need are, of necessity, going to be place-based and community-based, relying on local knowledge, skills and resources, and tuned to local conditions.



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And ultimately we need to begin to create a system that extends beyond the building to land use and planning, as well as utility and transportation regulation. As we have less and less energy and resources to go around we are going to be building more place-based and community-based solutions to our needs. This will require better ability to use local resources, skills, and knowledge.

An Excellent Resource for Integration

The Sustainable Community Development Code from the Rocky Mountain Land Use Institute can serve as an excellent template for this integration.



www.law.du.edu/index.php/rmlui/sustainable-community-development-code

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There are some excellent resources in this shift. Many of us know about Smart Growth and similar efforts to address land use issues more responsibly and sustainably. The Rocky Mountain Land Use Institute at the University of Denver, has produced a draft Sustainable Community Development Code that puts this all together in a powerful and useful way. This is a framework for land use codes that move well beyond many of the limitations built into even the best current smart growth and other land use regulations - to incorporate and integrate many crucial sustainability requirements into workable codes. There is a huge amount of information and resources embedded in this document and I highly recommend it. It is downloadable at the url shown.

Codes are a Gate, Officials the Gatekeepers

For changes in the built environment, codes are the gate and code officials are the gatekeepers.

When officials begin to see their role as community resources for the best building, not just the building police preventing the worst, the gate opens.



Development Center for Appropriate Technology - 2009

For the built environment, codes are the gate to those changes and code officials are the gatekeepers. This is a crucial understanding of the role that this sector plays in enabling or undermining our ability to adapt to changing realities. We've found over the years that it's not only what is in the codes and standards that matters. You can have two communities side by side using exactly the same set of regulations and rules and the same in every significant way except that in one place doing innovative or more sustainable projects is easy and in the other it is nearly impossible. The difference is attitude and knowledge. But the key is that where building departments and officials have shifted from viewing their work as, essentially, police work - patrolling the bottom to make sure that no building falls below the minimum standards - to seeing themselves and their departments as community resources supporting the best building and development. From that point of view, you can both patrol the bottom and enable the best things to happen. From the policing mindset, it is very difficult to allow the innovative projects to flourish. When that shift happens, the gate opens as it has in many places across the country.

This is a New Starting Point

Demonstration & experimental projects striving for higher goals need a regulatory system supporting iterative processes, with appropriate review & monitoring providing real-time research results.

We need new partnerships to accelerate learning about how these systems work and fail in the real world, in a process designed to transform both practice and regulations.



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Among the things that needs to happen is that we need to develop ways to support innovation, demonstration, and experimentation - at scale in real projects, not in laboratories alone. We need to open the door to much more rapid change and we have the technology to do real-time monitoring of projects, providing feedback about what works and what isn't working. We need to be able to research why and how things fail and have the chance to improve them and try again - not be told that because that since a demonstration project didn't work perfectly we can't use those materials or systems again. We need a system that is designed for change and advancement that improves both practice and regulations at the same time.

Green the Whole Building Regulatory Realm

We need to work to get support for rebuilding the capacity and updating the building regulatory system to facilitate the green infrastructure and building projects using federal stimulus funds.

Otherwise, the most advanced and deeply green projects will likely be slowed down and possibly de-greened.

A big reason to support these projects is the greater local economic development impacts they will have...

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Finally, I would like to take a minute to urge us all to engage in the process of directing attention and resources to the need to invest in the greening of the regulatory system ahead of the green stimulus projects that are coming. This is both a technical capability and a staffing capacity issue and now is the perfect time, during the downturn for federal support to be directed to both hiring and training staff and working out new much more deeply integrated and comprehensive regulatory systems and relationships that can facilitate instead of impede the rapid and crucial shifts now needed in the built environment. If there were funds for mid to large jurisdictions to hire qualified people knowledgeable in sustainable practices and design and able to both support these projects through the system and also train other regulatory staff in these things, we could embed the needed knowledge and skill where it is most needed. If the funding was for, say, three years, then this new capability would be embedded in the system for long term benefit. This would be jobs and a high leverage strategy for change.

Green the Whole Building Regulatory Realm

The local economic benefit is not just from the jobs created or federal dollars spent locally.

In most communities between 70% and 80% of every dollar spent on energy immediately leaves the local economy. That's a huge economic drain.

Non-renewable energy and energy deficiency are enormously expensive. Local projects that save or generate energy are investments that pay huge local dividends in jobs, new businesses, and new tax-base while keeping more and more of that wealth in the local economy.

Development Center for Appropriate Technology - 2009

It is also crucial to understand the magnitude of the economic benefit and opportunity that exists for our communities if we begin to seriously support local energy efficiency and renewable energy projects. What most people don't know is that in most communities 70 to 90 cents of every dollar spent on energy immediately leaves the local economy. Studies around the country have determined that in most places the average is between 70 and 80 cents, but in rural areas and on Indian reservations the figure can be as high as 90 percent. Why do we talk about the cost of energy efficiency and renewable energy? These are not costs, they're investments. What we should be talking about is the cost of non-renewable energy and energy deficiency. Local projects that save or generate energy represent jobs, new businesses, taxes and more - real wealth that increasingly stays in the community.

A good though somewhat dated study documenting these figures is "Dollars From Sense: The Economic Benefits of Renewable Energy" at <http://www.nrel.gov/docs/legosti/fy97/20505.pdf>

The Same Goes for Appropriate Technology

AT is often defined as the lowest or simplest level of technology that can do the job well.

Appropriateness is related to where and for what purpose the technology is used, and the cultural, economic, and ecological context.

Truly appropriate technology doesn't make people or their communities dependent on systems over which they have no control.

This means technology that enhances the local capacity to meet local needs.

Development Center for Appropriate Technology - 2009

The name of my organization is the Development Center for Appropriate Technology. People ask what makes technology appropriate? A standard definition of appropriate technology is that it's the simplest or lowest level of technology that you can use to do well what needs to be done. I contrast that with our cultural bias that tells us that higher technology is always better, that we are obligated to always use the highest level of available technology we can afford, and that when new technology is introduced the old technology becomes obsolete and is no longer useful. The reason we care about the level of technology used is that higher levels of technology come with higher levels of unintended consequences, and at some point the consequences are not merely unknown, they're unknowable, especially in the time frame in which we must make our choices. For example, here is a ball point pen. Most of us can imagine, in the abstract, what it took to make it. But the reality is that I know absolutely nothing about the actual journey the molecules in this pen have taken to be here today in my hand. And that's just a pen, not a cell phone or the 20 tons of resources that it took to make my laptop computer, or a car or a house. So if anyone tells you that there is anyone anywhere who actually knows what is happening as a result of what we're doing, they are not to be trusted because they are delusional. No one knows...it isn't knowable. Appropriate technology isn't necessarily low tech. It's the right level of technology for what must be done, based on the specific use and real needs, circumstances, and resources. It can be high-tech or no-tech or anything in between. The best definition of appropriate technology came from John F.C. Turner who said, it is technology that doesn't make people or their communities dependent on systems over which they have no control. If we think about this seriously, it means technologies that enhance the local capacity to meet local needs - which is the true foundation for sustainability and for real security.

Responsibility for Unintended Consequences

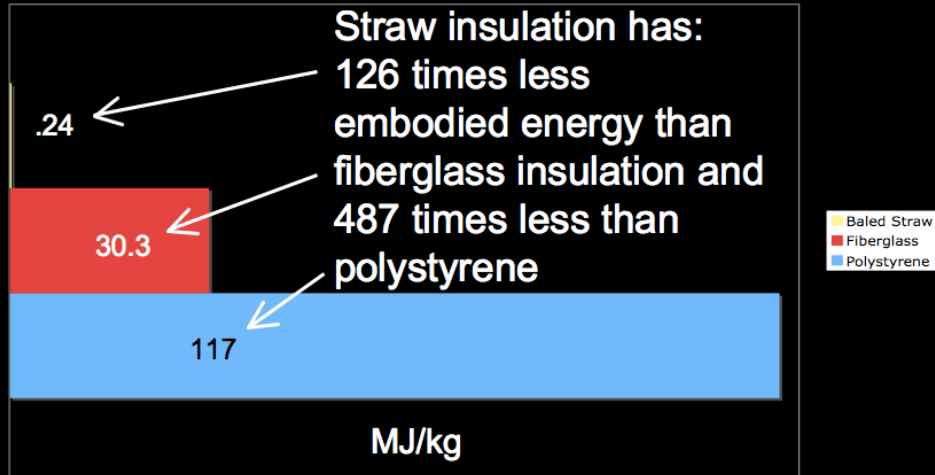
Thinking deeply about our choices of materials and systems can lead to a strong preference for doing things as locally as possible, as simply as possible, and doing as little as possible of those things that we know are harmful or about which our knowledge and understanding is limited.



Development Center for Appropriate Technology - 2009

Thinking about the issues of how little we know about the consequences of what we do can guide us to develop preferences for simpler, more local, more natural materials and systems and a more precautionary approach to our choices. I'm really interested in knowing as much as I can about the real consequences of my choices and decisions and actions.

Embodied Energy



Source: Centre for Building Performance Research, Victoria University of Wellington

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One of the reasons that using straw makes sense where it is available is that it provides excellent insulation. But another is that it is an agricultural by-product, the dried, dead stems of cereal grains such as (wheat, oats, barley, rice) after the seed heads have been harvested. And compared to other insulating materials, it has extremely low embodied energy. These materials all save energy during the operation of a building but some require a much greater investment of energy and have a larger carbon footprint.

Rethinking Long-Standing Assumptions

Traditional, non-industrial materials & building systems were rejected mostly because of labor-intensity not because they're inferior or dangerous.

Today, lack of support for research, testing, and the development of standards makes it hard to gain approval for their use. In some places, however, they continue to be used...



Development Center for Appropriate Technology - 2009

One of the important things to realize about traditional and non-industrial materials and building systems is that they have mostly been rejected not because they are inherently inferior but because they are labor-intensive. The industrial revolution, which continues to this day, has been about replacing labor - and skill - with resources and technology. Now we have more and more people with fewer resources to go around and we're still trying to de-labor and de-skill everything. Most of the traditional building materials and systems were being abandoned at the time modern codes and standards were developed so they aren't included. And they don't have a big industry like cement or steel to support the research and testing and development needed to bring them into codes, so it has been hard to use them. The buildings in this picture are in Yemen. They are 8 to 9 story tall buildings made of earth and in some cases stone, many of which are hundreds of years old and in continuous use. Yet we imagine that such materials can't be used for larger structures.

A Continuum of Natural Materials

Many natural building materials for wall systems have been based on mixtures of varying amounts of earth and natural fibers like straw. There is a continuum from mostly earth to mostly straw.

We've been helping support the development and acceptance of some of these materials, which range also from monolithic materials to blocks.

Development Center for Appropriate Technology - 2009

Natural and indigenous building materials have largely ranged along a continuum from solid stone or earth to various plant materials in differing mixtures. And they are also typically in two forms, either monolithic or modular like bricks or blocks or bales,

Monolithic Just Earth - Rammed Earth



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At the solid earth, monolithic end of the spectrum is rammed earth, essentially a rapid sedimentary process, like sedimentary rock. You build form work and then a layer of earth is put in and compacted, then another layer, and so forth. You can see the layers in this picture of a rammed earth house in Tucson, my hometown, that I supervised building. The earth in this building, which was all from the building site, was stabilized with about 4% portland cement because it was left exposed.

Modular, Just Earth - Compressed Earth Blocks



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The modular version is compressed earth blocks either made with simple hand-operated technology like the Cinva Ram (top right) or by machines designed to for more production. These blocks can also be made with stabilizers added when required or desired.

Modular Earth and Straw - Adobe



Mission San Xavier del Bac
completed in 1797, Tucson, Arizona

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Moving along the spectrum from earth to plant fiber, add some straw to the earth and you get adobe - an ancient building material. This is a cathedral outside Tucson which was finished in 1797 and is built primarily of adobe. In spite of its existence, for a time it was very difficult to get approval to build earthen buildings in Tucson until a modern standard was developed locally.

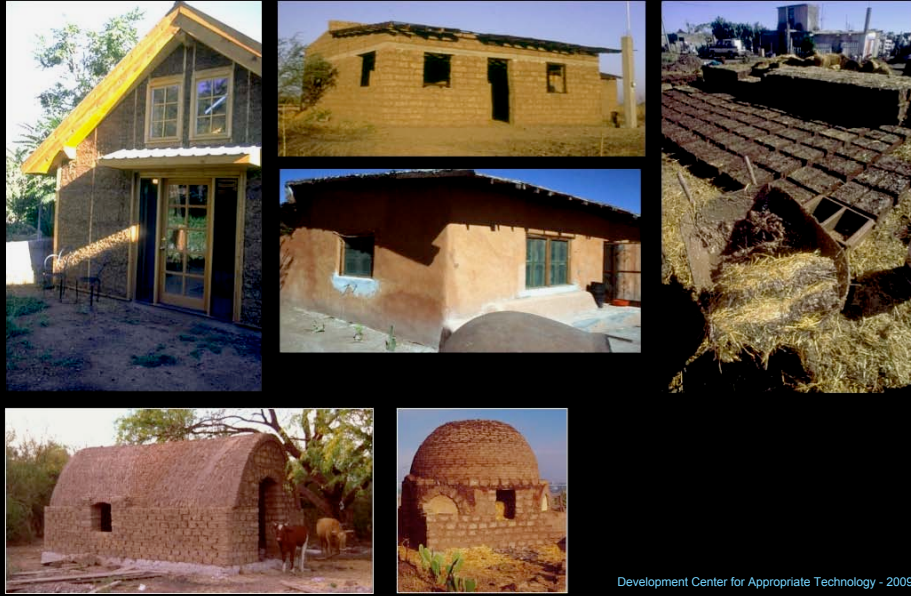
Monolithic Earth and Straw - Cob



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The monolithic version of this is cob - a free form way of building with a bit more long straw, plus sand and clay. This is a very old traditional way to build and there are tens of thousands of cob cottages in the UK many of which are hundreds of years old. They are typically plastered with lime plaster and some have thatched roofs like the one pictured here.

Monolithic or Modular - Light Straw-Clay



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Moving further along the spectrum toward greater plant material is light-clay or straw clay - another very old way of building walls. In the traditional way, this was a monolithic system, with the straw first coated with a clay slip and then compacted into forms like in the building in the upper left. Bill and Athena Steen at the Canelo Project in Arizona (www.caneloproject.com) have been experimenting with making straw-clay blocks which are like adobes but much lighter and less brittle than adobes. They have a good combination of insulation and mass and they are better seismically because they are lighter and more flexible. They usually are not used as load-bearing wall systems, often having a lightweight concrete framework supporting the roof.

Modular Just Straw - Straw Bale



www.caneloproject.com

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At the extreme plant fiber end of the spectrum is straw bale construction. This is a 1600 square meter office building in Ciudad Obregon Sonora Mexico for Save the Children. I will talk more about straw bale construction a bit later.

Self-Help Housing



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And it continues to provide excellent and very affordable shelter in the developing world, as in these houses in Mexico built by women and their families and friends for about \$500 USD.

Homes to Schools - Straw Bale Buildings - Reduce Cost, Energy Use and Offer Healthy Environment

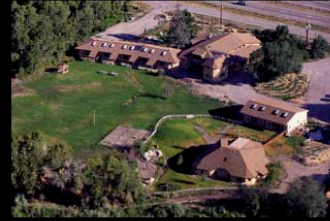


Photo © Hord Coplan Macht

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In the U.S., straw bale construction is being used for much more than just homes. There are schools, libraries, public, industrial and commercial buildings, wineries and more, being built with this system. And there are building codes in some states including Arizona, California, Colorado, Oregon, New Mexico, and Texas. In addition, straw bale building is growing in popularity in Canada, many parts of Europe, China, Australia, New Zealand, and parts of South America and Africa, among others.

Beauty is Essential



Development Center for Appropriate Technology - 2009

Beauty is important because we take care of things we love and don't tend to care for things we don't. There isn't much lovable about a lot of our modern buildings. And beauty is something that most modern materials and building systems fail to accommodate or accomplish easily or affordably. Putting the craft and art back into building is an important part of shifting toward more sustainable building practices.



An earth-plastered straw bale wall Passed the 1-hour ASTM E-119 Full-Scale Fire Test with Hose Stream Test, and a Cement/Lime Stucco-plastered bale wall passed the same 2-hour fire test.

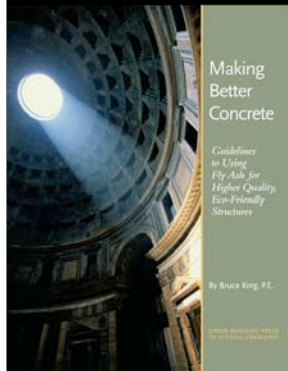


Test results are available at:
www.ecobuildnetwork.org as is an
online video about this testing at:
www.ecobuildnetwork.org/firemovie.htm

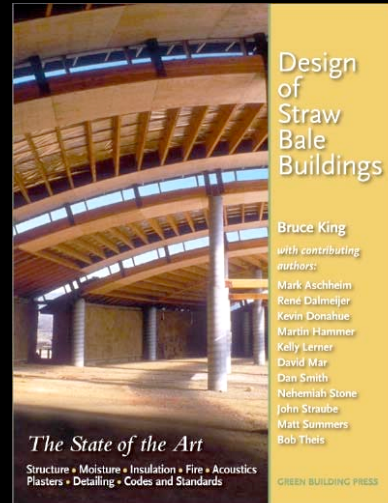
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We have been involved in carrying out a variety of structural and other tests of straw bale wall systems including fire testing. In the wall shown here, an earth-plastered bale wall assembly passed a one-hour ASTM E-119 Full Scale Fire Test with Hose Stream Test in an accredited testing laboratory in Texas. We know that were it not for an unsealed crack in the plaster on the exterior side of the wall, this wall likely could have passed the two hour test as its cement-plastered counterpart did during this same testing program. It is worth noting that here in Israel, a similar earth-plastered bale wall system passed the Israeli 3-hour fire test. Test results and a video of the testing we did can be found at the website of the Ecological Building Network (www.ecobuildnetwork.org).

Great Resources



Two excellent books:
***Making Better Concrete &
Design of Straw Bale Buildings***
at Green Building Press:
www.greenbuildingpress.com



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The best technical book currently available on straw bale construction is the *Design of Straw Bale Buildings* by Bruce King, which can be found at www.greenbuildingpress.com. This book is a compilation of the most current testing results and design information available at the time of its publication about 2 years ago - is well written and comprehensive. Bruce has also produced an excellent book on high volume fly ash concrete - a way to displace a lot of the portland cement in concrete with this waste product of burning coal.

Back to Earthen Building

Though there are some existing standards for earthen building in some countries, they are not widely used or recognized in many places. DCAT initiated a process to develop new U.S. standards to reverse the trend making earthen building illegal in developing countries.



New Zealand standards for both non- engineered and engineered earth buildings, and French standards for compressed earth blocks.

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Though there are some existing standards for earthen building, there have not been any international standards and most of the newer ones require a higher level of engineering and technology both in the testing of materials and in the building systems themselves than many people in developing countries can afford or have access to.

ASTM Earthen Building Standards

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INTERNATIONAL Designation: E 2392-05

Standard Guide for Design of Earthen Wall Building Systems¹

To: ASTM E60 Members
From: Bruce King, TG contact for E60.01.06
Subject: Revision to ASTM 2392-05
WK #: 16155

Rationale: The standard needs additions and revisions to make it reflective of worldwide engineering developments and research of the past 20 years. The addition of a new Appendix with diagrams is intended to respond in particular to market demand in developing countries, although it is also informative for and applicable to developed countries.

Please note that the Task Group has actively coordinated with international experts and stakeholders in developing the proposed revisions, and now respectfully submits the proposed revisions to ASTM E60.01 for Subcommittee ballot.

Technical Contact:
Bruce King, PE
Director, Ecological Building Network

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About 8 or 9 years ago, I started hearing from more and more people that earthen building was being made illegal in many developing countries because it was viewed as unsafe and a poverty material. At the same time, wealthy people in the U.S. and elsewhere were building beautiful buildings of adobe and rammed earth, though in many places they struggled to get their buildings approved by local building authorities. Knowing that these materials and building systems were in need of incremental improvement and better design and detailing, not abandonment, and that they usually had a much smaller environmental impact and provided greater comfort and beauty as well, I started thinking about what could be done. I thought if we could create new, appropriate standards for earthen building in the U.S., you could take those standards anywhere in the world and say "If these are inferior, unsafe building methods, why would the United States have just created new standards for them?" For five years I served as vice-chair of an ASTM (American Society for Testing and Materials - a standards organization) sub-committee on sustainability for buildings and led the effort to create such new standards. We had to stop doing that work because of lack of funding, but it has been resumed under the guidance of our colleague, Bruce King of the Ecological Building Network (www.ecobuildnetwork.org) and hopefully the new standard will be completed by the end of the year. It is hoped that shortly thereafter, work will begin to turn this into an ISO standard so it will be available internationally. This will be a huge step forward.

www.iccsafe.org/igcc/index.html

We're hoping to include an updated straw bale building code as an appendix chapter and reference the new Earthen Standard in the new International Green Construction Code.



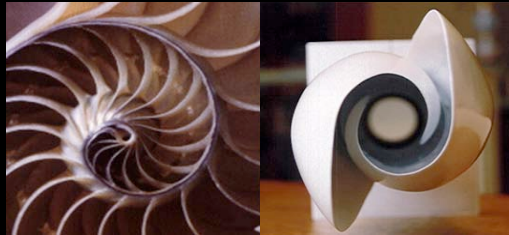
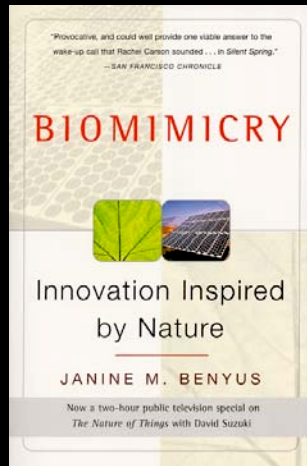
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I am on a new committee developing a green non-residential construction code to be part of the 2012 set of International Codes (U.S. codes, actually, of course). We have introduced a modified and updated version of the California straw bale construction code hoping to have it included possibly as an appendix chapter and also hope to be able to reference the new earthen building standard in this code as well.

Nature as Design Guide and Inspiration

www.biomimicry.net

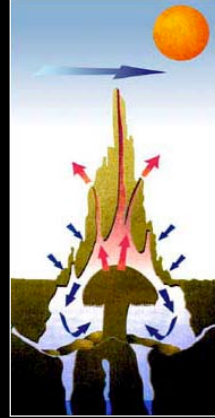
www.asknature.org



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And finally, I'd like to talk about the concept of biomimicry - studying and learning how natural systems work and how nature builds things. There is a wonderful book by Janine Benyus called Biomimicry and a couple of great websites - www.biomimicry.net and www.asknature.org which explore how people are learning from nature, not to manipulate it but to emulate the principles of natural systems to achieve benefits without the harm that so typically accompanies our human systems. The lizard shown here never drinks liquid water - it harvests water directly out of the air by virtue of the micro structure of its scales. And the termite mound in the lower right corner is equally amazing...

Natural Ventilation has a Natural History



Termite mounds maintain very tight temperature and humidity control with no mechanical equipment, design professionals or utility bills...

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These tiny insects, with tiny brains, build these large passively heated and cooled and ventilated structures that maintain tighter temperature and humidity control than most of our modern buildings and they do it with mud and no electricity, engineering professionals or equipment. We have much to learn and it is in this process of understanding and rethinking human systems to function in harmony with natural systems that the greatest hope lies for truly sustainable buildings.

Nature as Design Guide and Inspiration

“For too long we have judged our innovations by whether they are good for us, which has increasingly come to mean whether they are profitable. Now...we have to put what is good for life first, and trust that it will also be good for us. The new questions should be “Will it fit in?,” “Will it last?,” and “Is there a precedent for this in nature?” If so, the answers to the following questions will be yes:

Does it run on sunlight?
Does it use only the energy it needs?
Does it fit form to function?
Does it recycle everything?
Does it reward cooperation?
Does it bank on diversity?
Does it utilize local expertise?
Does it curb excess from within?
Does it tap the power of limits?
Is it beautiful?” - Janine Benyus



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From her book, Janine Benyus talks about what we have been focused on and the new questions we need to be asking. This is the essence of a new ethic of responsibility for how humans move forward and begin to design the systems and communities that will support us and all the future generations of all species - who will inherit the legacy of what we do now. Can we begin to develop the same kind of codes that nature uses? The ones that produced us and all the magnificent living systems around us? Shall we begin?

And, Finally, Remember...

The way to subvert the dominant paradigm
is to have more fun than they do...
and make sure they know it!



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And this may be the most critical piece in the puzzle of how we create the changes we need today- we need to nurture our spirits and find joy in the work...so remember, the way to subvert the dominant paradigm is to have more fun than they do and make sure they know it!



Thank you!