Sustainable Design
Moving towards Integrated Design in a Disintegrated World
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Incorporating "sustainability" into school building projects, curriculum, and governing principles is now seen by many to be of increasing relevance and even more, a basic framework for understanding our relationship with life on this planet. If sustainability has yet to be identified as a specific objective in your education agenda it will, at the least, soon be seen as an issue worth investigating. In the process of thinking about and practicing sustainability – from a building perspective in this article - these two questions will need to be addressed:

How far do we take it?
How do we realize it?

How far do we take it?

Sustainability is a term used in almost any context these days. A corporation states they need to grow in order to sustain their business. A dam project in India is justified because it will create a more sustainable economy. These organizations are using the term correctly within a limited perspective. However, it is in the larger systems perspective that the term takes on its intended focus. Here's a straightforward way to understand its intended usage within the larger environmental perspective, "If something is sustainable, it means we can go on doing it indefinitely. If it isn't, we can't." Jonathon Porritt (former director of Friend's of the Earth).

How do we get our hands around that? It's actually pretty simple to get a general impression of some practice or product – whether its use is more or less sustainable than some alternative. We need to lift our heads out of our immediate sphere of action and follow the implications of the practice or product logically, what was needed to produce this product and what happens to it after you're done using it. Take water for example: Where does it come from? *Rain*. Can you drink the rain? If, *yes*, why aren't you drinking it from your roof? If, *no*, from where do you get it? *A well*. Where does the well get its water? *The rain*. If you can't drink the rain, what makes it clean in the well? *The earth*. What kind of earth is required to clean the water? *Healthy earth*. What makes the earth healthy? *Habitat – microbes, animals, plants in healthy diversity*. So it seems we need habitat to create fresh water. Not many of us think of this when we have readily available tap water but this is a critical relationship that we ignore at the expense of fresh water for our future.

Even Massachusetts, with 40 inches of rain per year has two towns that are building desalination plants - very expensive, and energy intensive – in an effort to compensate for failing groundwater supply. These towns have ignored the basic source of fresh water - not to mention, a free source - by paving over the local habitat. "Systems thinking" is not a difficult process but is does require asking some basic and linked questions. It is hard for us as a people to question basic assumptions and relationships. We assume others are

doing this thinking and we trust them to make good decisions. Respectively, they are not and they do not. Refer to the two towns in Massachusetts. They believe that technology is the answer, not a rethinking the basic assumptions of their water supply system. They are no different than you and me. We've been educated with the same limited and disconnected constructs and thinking process.

Even though thinking in systems seems like common sense - once you learn the knack and know what kind of questions to ask - it, in fact, does require a change in what we think important and value. Change in our thinking practice can happen by slow evolution or in spurts; with bursts of understanding supported by training or asking questions of experts. In general, as a society, we seem to be on the slow evolution track. In 2000 the U.S. Green Building Council officially launched the LEED® Green Building Rating System. It is a grading system that assigns points and assigns levels of performance to various criteria relating to our health and the health of the ecosystem. These points are grouped in general categories of energy and atmospheric pollutants; community issues; habitat; water quality and conservation; material resources; and the quality of our indoor environment including the issues of persistent toxics and pollutants. The purpose of this rating system is to put these issues in front of us as a grouped system. The LEED system grades a client and design team's willingness to reduce impact in these broad areas. It has been very successful in its impact on the marketplace. The danger is that users think that LEED helps create sustainable buildings. It does not. It helps people create buildings that have some features that lead toward a sustainable future. LEED is like a set of training wheels to help people move to higher levels of systems thinking. It is score card to gauge performance of those at an entry level of green design and those who are ready to ask questions such as, OK, I understand what LEED is about, what's the next level? Indeed, that's the question LEED is meant to inspire. This is the evolutionary beginning to deeper systems thinking. In fact, one can't really do a LEED building cost effectively without a reasonable level of integrated systems thinking. The last section of this article addresses a summary of this process.

So where to after LEED? One might think that we simply need to do better and set higher performance benchmarks. Instead of saving 30% of our energy use compared to an energy code, the next step may be achieving a 70% improvement. This is certainly an important improvement but is it sufficient to reach a sustainable condition? If we achieve 100% less bad as Bill McDonough says, have we achieved sustainability? The answer is; any approach that limits the damage is important but insufficient. It is essential that we begin to look at the earth and its life support systems not as mechanical constructs that we can manage by creating uniform conditions but as living and evolving systems of which we are in integral part. We need to participate with these systems on their own terms – meaning: it is essential for us to understand that we are a part of evolutionary patterns – birth, life, death, rebirth cycles. We are not above these patterns, nor below them, simply part of them. Until we learn how to swim in these conceptual waters we will continually find ourselves exhausted by kicking against the flow of life that - while damaged for our purposes - overall really isn't concerned whether we exist or not. It will fill in behind us just as water fills in behind our movement through it.

The next level beyond a simple mechanical view of sustainability is the concept of Restoration and Regeneration. This article is not meant to explore these. For now we'll let the following definitions suffice. When an organization is ready to think in terms of deeper systems approaches these concepts will be useful.

- **Restorative Design** – Approaching design in terms of using the activities of design and building to restore the capability of local natural systems to an entry state of self-organization and continual evolution.
- **Regenerative Design** – This design process acknowledges that humans are an integral part of nature. Human and natural systems – currently disparate systems in Western culture – need to be in alignment in order to achieve a state of continual and healthy evolution. The design process can and should catalyze this alignment.

How do we realize this?

To realize any movement towards a sustainable condition requires *change* – change from the conventional way of thinking and doing things. As Albert Einstein said, "Problems cannot be solved at the same level of awareness that created them."

Moving towards sustainability means that we need to move towards more complex system awareness. This way of approaching problems helps us address and make use of many more issues and systems than we typically address when working within a conventional framework.

For example, a conventional design process will have the architect design a building to meet typical functional and aesthetic requirements. The architect then sends the design to the mechanical and electrical engineer to make it comfortable and provide adequate light. In a systems design process – an integrative design process – the engineers, architect, and client are designing the building in a joint manner from the very beginning. Instead of simply adding more efficient equipment to the building - which alone can be costly - the engineer may alert the architect that the orientation and fenestration design of the building can alone save more energy than any level of equipment efficiency. Using daylight will further decrease energy costs and add greater quality of life to the building. Integrated decisions usually decrease the cost of the building while increasing its environmental performance.

While most architects and engineers feel they are "systems designers" by the nature of their work in delivering complex buildings – they usually are not. Sustainable design requires a different mindset or mental model. This model is able to look at systems in a more complex way. Instead of looking at just the physical elements of the building, the invisible connections between the elements need to be understood. These invisible connections and patterns, for example, may be manifest in the downstream impact of toxins in building materials, the multiple efficiency and cost relationships between the many variables in an HVAC system and the building envelope, or the impact on social systems due to logging practices or any raw material extraction. This level of analysis requires a rigorous level of enthusiastic and early engagement from the participants and

an understanding of tools used to make these evaluations. Since no one has all of this knowledge themselves, the role of the team takes on great importance; the role of questioning takes on an equal importance in order to elicit answers beyond the conventional.

For teams to embrace this process a different mindset or mental model is required; a mindset that has the desire to change the way things are done. A mental model that is open and willing drives the successful integration of green design.

A systems approach requires a collaborative approach. The very strength of the integrative approach has in it a potential weakness – it depends on collaboration from the key players – the client, architect, engineers, interior designers, landscape architects. Fostering and working within a collaborative framework is hard because we have been trained to be "experts". The client expects it and the design team members feel they need to exhibit it.

It is necessary to move from being 'experts' to being 'co-learners'. The basis of a systems approach is the establishment of a network of mutual learning. No one person can know all the issues that need to be addressed; collective knowledge is far greater than individual knowledge (Boecker). As Carol Franklin of the ecological landscape design firm Andropogon says, "To design ecosystems we need to deal with ego-systems." (Please see Environmental Building News for an excellent article on Integrated Design, November 2004 issue.)

By far, most successful green projects (i.e., projects that achieved the high environmental goals they originally set out to achieve, within budget) have done so, not because of adding technology and products to the building, but because they had the willingness to focus on the environmental issues – the invisible and critical connections – as essential to the success of the design. They had the willingness to ask many questions about the potential beneficial relationships between ALL the systems in the building, site and region and explore the many different ways to reach toward better ecological integration. The environmental concerns were not secondary, nor were they dominant, just an integral part of the design. The usual "right" answers were never assumed and they were always questioned.

It is the role of the client, should they wish to reach towards cost effective sustainable building solutions, to select design teams (or green building experts) with expertise in integrated design and the design process to optimize systems in a cost effective manner. Even more important than green expertise however is the willingness or attitude of the design team to learn new ways of looking at systems and the willingness to change their design process.

The following is a list of the essential aspects of an effective integrative design process

The Basic Elements of Integrated Design

1. Client (main decision maker) involvement in the design decision process

2. Select the right design team (ATTITUDE is critical – i.e., teachable)
3. Alignment of Expectations and Purposes between the stakeholders and design team
4. Goal Setting of environmental targets (if you can't measure it, you can't manage it)
5. Identify Champions or a Core Team (to hold these goals through the project)
6. Optimization of the design of systems (using evaluation tools and an iterative process in predesign and schematic design – after this it can get expensive to "add green technologies to a project that wasn't designed with these in mind from the beginning)
7. Follow through in Construction Process
8. Commission the project (make sure it performs the way it was designed to perform – just because it's built doesn't mean it works)
9. Maintenance and Monitoring (entropy happens – feedback is essential to maintain performance)

The process to incorporate sustainable thinking in any project is really not that difficult. The difficulty is accepting that the older conventional practices need to be reconsidered. Change is hard for humans. It is the process of changing that is actually the most exciting aspect of reaching towards sustainability. The technologies will always be improving in sometimes subtle and sometimes significant leaps. When we build in a sustainable manner it is the change of perspective, the change of heart, and a fundamental reawakening of an awareness of our relationships to the systems of life that makes all this worthwhile.

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