Metabolic Planning and Design

(How Healthy Building Could be the Forerunner
of Healthy Businesses, Healthy Cities, and a Healthy Environment)

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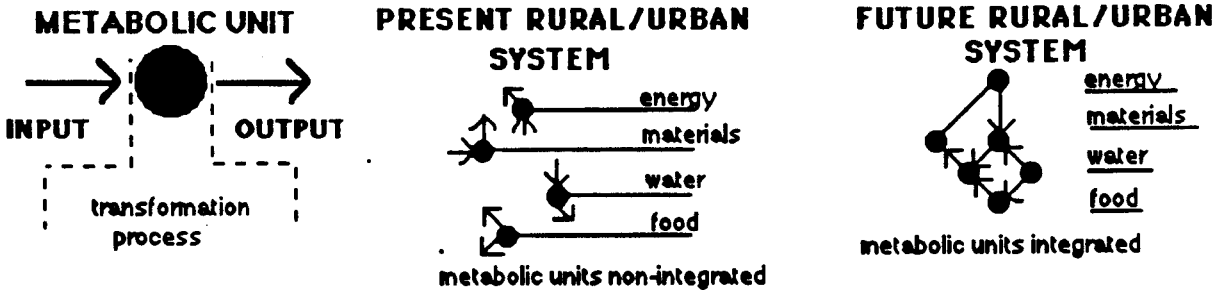
Now that we have moved beyond solar homes and embraced healthy homes which use solar as their basis, we are witnessing the emergence of a more encompassing approach which might prove more significant than the solar movement. "Healthy Building" could become the precursor of the kind of value based, healthy economy desperately needed to redirect our towns, cities, and regions toward a more sane and sustainable future. With our support and active promotion of these kinds of businesses we go beyond health in our living environments and delve into how our towns and cities relate to their immediate regions. Healthy businesses, for example, related to the home building market, involve the use of natural building materials, reuse of valuable organic and other "waste" materials, production of clean air and high quality water in our developments and communities, growth of non-chemically treated food hand-in-hand with native plant low energy and water landscapes, and, last but not least, the application of conservation and renewable energy technologies that take a region's total resource base into account in a multitude of overlapping scales.

I believe we are beginning to witness the symbiotic relationship between man and nature that builds not only a clean environment but, just as important, a healthy economy. These healthy businesses can be looked at, in essence, as the links that convert a region's raw materials into useful products. They can be looked at as metabolic units that have an input, a conversion process, and an output which in many ways begin to mimic healthy natural systems, especially when they are continually linked in chains so that the input required by one process is actually derived as the output (waste?) of another. In this way, the metabolic planning and design process not only prepares raw resources for human requirements, but also prepares the by-products from our own metabolic processes for use in the natural world.



In order to think more clearly about the many levels of how this new approach to community economics could place the designer/developer in a key role to link us back to the way a healthy world must actually work, let me cite a few examples from many that directly relate to our own professions. The first example is a materials related scenario. As you will see, the example that follows will grow out of the series of metabolic units described and connect directly to a solar based example.

Sulphur dioxide (SO2) is perhaps one of the most serious environmental health hazards facing modern society, and results primarily from burning high sulphur coal and other hydrocarbons producing acid rain. Sulphur, as we all know, can be collected out the precipitator stack of a coal plant. So far the justification for such procedures has been based almost exclusively on environmental rationale, not on the basis of metabolic unit economics (except by the Japanese). It happens that sulphur is not only a useful chemical in many industrial processes but also is proven to be quite useful in a number of applications in the building industry. When used with gypsum, sulphur becomes almost totally fireproof. Structurally, sulphur concrete is able to achieve a compressive strength of over 5000 psi, and an adhesive strength in the area of 30,000 psi. Additionally, sulphur can be sprayed for structural surface concrete applications or shells, foamed to form a reasonable insulation, and used as a natural pesticide to retard home insect infestation. In many areas of the world, sulphur is less expensive than concrete; it is also the 14th most available element in the world.

A sister material also derived from coal fired power plants is fly ash. Fly ash derived from a high calcium coal or, when mixed with the lime slag after it has been used in the sulphur precipitating process, produces a concrete with compression strengths tested able to exceed 12,000 psi. Both sulphur and fly ash require a fraction of the energy needed to produce portland cement. Not only have we succesfully used both sulphur and fly ash for building, but we are presently developing a method to foam fly ash using organic, renewable foams to produce a lightweight porous concrete. We are particulary interested in applying this technique for use as a porous paving to increase groundwater replenishment, the lack of which presents a serious condition in many parts of the U.S..

As we become more familiar with the processes behind each of these metabolic units due to their plethora of interconnection possibilities, we realize certain additional benefits from our interlinking and optimizing of regional resources. And, as we become more attuned to this way of thinking, we realize particular special attributes at the levels of community and regional economics at each level of integration.

In Texas, for example, it happens that one of our major coal veins lies below other valuable resources, including one of particular interest, zeolite. Among traditional uses, zeolite was used by some North American Indians in their sweat lodges as a remarkable heat storage material. Upon close examination, one realizes that zeolite's high heat storage capacity is based on its high absorption capacity for moisture and its ability to duplicate what is now referred to as the "hot potato effect." This describes a reaction in which moisture within a medium is unable to circulate due to convection, thus extending its heat retention capacity.

Perhaps an equally important attribute of zeolite is that it releases moisture at relatively low working temperatures (200-600 deg F). In our part of the country--the southwest --there is a high demand for refrigeration for many uses, particularly in the agricultural sector. Zeolite has been shown over the years to be a simple solar-based replacement for the absorption process within the refrigeration cycle and can produce sub-freezing temperatures when the medium goes through its absorption cycle in a closed loop system after being regenerated during the day using solar radiation. This use of zeolite introduces alternative refrigerants which may be a promising substitute for freon, which is directly linked to the depletion of the ozone layer.

My fascination is not only with any of these technologies in themselves, but rather with their synergistic potential to develop an ecologically-based regional economy, and with reversing a mindset that focuses on the negative aspects of economic and environmental problems instead of on their potentials. With this in mind, our office in Austin, Texas is gradually bringing together the expertise to offer regional economic development services based on the simple principles of metabolic planning and design. We are even developing some simple terminology, often borrowing from a multitude of disciplines, to guide our thinking. We have taken the principles of ecological land planning and, rather than concentrating our efforts purely on "no touch" conservation policies, are instead looking at the environment as a matrix of economic potentials of many types in combination with sound environmental principles. We refer to the first step of this effort as our **Regional Working Atlas Series** which identifies a series of resources that connect directly with the principal life support needs of the region's population and environment.

This mapping process results in identifying area resources that, in effect, are the basis for our point resources or metabolic units. The point resources (businesses, industries, research institutions, etc.) that represent applied use of a region's area resources are highlighted and supported through our development plan. We then go through a process in regional economics called network analysis in which the inputs and outputs of these metabolic units are studied to determine a series of issues, such as their present and potential impact on human needs (the regional marketplace).

At one level, one often finds the existing inputs and outputs among and between regional enterprises unorganized, providing an opportunity for better integration. At another level, we find certain obvious gaps that can be filled by introducing another industry or business to better connect the inputs and outputs of local businesses. This linking process relies on what we refer to as **gap industries** or **gap businesses**. And, at yet another level, we at times discover an absence of knowledge related to a high potential industrial/commercial enterprise that could exist due to demand and the existence of an available natural resource that has not been tapped. Due to the high multiplier effect resulting from the use of such a resource, potentially producing many secondary and tertiary business potentials within the region, we refer to this effort as the development of **trigger industries**.

As I have mentioned, there are many other examples that we could choose from; the possibilities are endless even within the materials sector. The fact that in Texas we are building structures now out of 50-80% straw left over as chaff from graineries-- a "waste" material --is further evidence of the ability to spawn new economic outlets, in this instance in the agricultural sector. Or the fact that we must look with equal creativity at our wastewater treatment processes as having economic development potential for certain crops, biomass production, or for use in our native plant landscapes. As principal architects, engineers, and planners of the Laredo Blueprint Farm in conjunction with the Texas Department of Agriculture and Commissioner Jim Hightower, we will be introducing many of these examples as demonstration components.

Finally, one of the most exciting potentials for new types of development and industrial parks is on the **urban fringe**, which could become the development economy of the future with potentially many more job and financial multipliers than exist today. As we move along to yet another echelon of development consciousness-- from solar energy to healthy buildings and businesses --we must remain cognizant of the original spirit of the solar days that helped to get us here together today: to weather the trials and tribulations and remain persistent. We must be willing to cross interdisciplinary bridges. In earlier days, we had to become technologists when we

were not; now, we might have to become planners and regional economists even though we are not. At the same time, we must be willing to become team builders and admit our deficiencies. We must go beyond pristine, hermetically sealed self-sufficient environments to a new level of ecological land planning and design in which there is a true partnership between man and nature, not simply a naive mimic of nature itself. Our mapping procedures now must become a basis for regional economic development as the first step in breaking down the artificial boundary between technology and nature that we have managed to create. It may be that the physical land planning efforts or even the individual homes that we have on our drawing boards today could be the keys to demonstrate how an entrepreneurial spirit can successfully be coupled with our ecological awareness.