

## Resource Architecture – XXI World Congress of Architecture 22 to 26 July 2002 in Berlin

Forum 9 Urban Models in Dialogue

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### Towards Zero-Energy Urban Infrastructures

We all know that we are far away from achieving sustainability. But how far? A good place to begin the discussion starts with one of the most resource hungry regions in the world: **the USA**. The U.S. with only 6% of the world population consumes over 30% of the world energy resources (Resource: National Geography Institute). American cities and towns account for over 85% of national energy use. Land use planning and urban design affect negatively about 70% of that, or 56% of the nation's total energy use (Anderson, 1993), excluding resource infrastructures, national and worldwide facilities.

#### The current status?

The second half of the 20th century saw a tremendous infrastructure expansion into the American landscape, especially right after WW II. A surprising amount of this expansion had failed by century's end, and what were left were the remnants of thousands of post-industrial relics of infrastructures of every type.

Many left over structures are former bypassed highway urban relics, their economies devastated by the construction of the Interstate highway system several miles from their original "Mother" highways.

All kinds of resources are funneled through these industrial and urban systems without any concern about their origin, and about the destination of waste; the linear metabolism of these inputs and outputs are treated as largely unrelated.

#### Mobilization to where?

Today we have additional increased exurban growth, which is reshaping American landscapes and especially the coastlines. A new American amenities migration, one that rivals the exodus from the Frost belt to the Sun belt a generation ago, is transforming the Atlantic and Gulf shorelines. An estimated 41 million people — more than one in seven Americans — now try to reside in a county that abuts the western, eastern or southern seaboard. That number swells by several million when inland residents with second homes near the shore are included. An unprecedented influx of car-oriented residents is converting aid-back seasonal resort towns into sprawling year-round communities with burgeoning non-sustainable economies.

These coastal migrants are transforming seasonal resort towns that used to bustle for just a few summer months into sprawling, air-conditioned year-round communities. Up and down the coast, more car-oriented development is spreading for miles inland attracting new businesses to serve them. The average ecological footprint of an American uses 25 acres to support his or her

current life style. This corresponds to the size of 25 football fields put together. In comparison, the average Italian lives on a footprint 60 percent less, not to mention people living in developing countries!

As a summary, in these fast-growing "new urbanism economies" of the U.S., more and more car-oriented urban sprawl is being built at an uncontrolled phenomenal rate and density with little thought for future social or worldwide environmental impact.



Levittown, Buck County, PA, U.S.A.

## Power market

Today, the production of building markets is mostly conquered and democracy is being stripped of its power by transnational and decentralized business decisions. These kinds of structures depend always on a vast system of external supply lines to rural areas and manufacturing centers, facilitated by global transport and communications infrastructures. And global supply lines are still required for securing oil, coal and natural gas from the limited number of highly productive fields in production: the mining, shipping and processing of the raw material and its world-wide distribution has necessitated a vast network of logistics, aggressive military management, nowadays high-alert homeland security arrangements and strategic diplomatic agendas — as well as specialized economic systems. A majority of current and recent wars, regional and local armed conflicts are resource wars, in part or entirety. For perspective, consider global military budgets, which run at \$700-800 billion per year globally, around \$2 billion per day (According to the Stockholm Int'l Peace Research Institute, a figure combining internal and external expenditures on arms and the military) Consider a few comparative examples: With a billion dollars the solar industry would be able to build two to ten PV manufacturing plants, depending on technology type, producing products able to generate electricity cost competitively even on today's skewed energy playing fields. Such plants, once built, would be quickly replicated around the world, because unlike war option — where the returns will be measured in new generations of terrorists with horrifying weapons more effective than civilian airlines" (Jeremy Leggett. In: The Solar Revolution: Micro power and Security in the Changing World, REFOCUS Jan.-Febr.02, page 17)



## Urban Analysis and Policy Development

Unfortunately, it is often the same environmental tragedy: A lack of regional government planning fosters sprawl. For example in metros in the US Northeast and Midwest, dozens of local governments regulate development. The result is fragmented planning. Efforts by local and state governments to restrict sprawl are growing but have had limited impact. For example, Detroit Metro has 280 local governments; metropolitan New York has more than 560. Each of them can adopt their separate zoning and housing and land-use codes. These disparate interests work against regional planning and promote sprawl. One municipality can restrict growth, but if a neighboring town welcomes it, sprawl continues. Furthermore, in all these remnants of postwar industrial, urban and suburban areas, the poor fall out of the consumer society and are abandoned and isolated in the inner-city ghettos. In the last decades, thousands of manufacturers have moved away from the inner cities, taking valuable job opportunities and leaving behind environmentally hazardous sites. These sites are now expensive to clean up when abandoned, and the lenders may be held liable as a last resort.

This situation has created a lack of incentive for remediation of these sites, preventing poor inner-city communities from realizing meaningful economic opportunities. Now a large number of urban analysis based on GIS System statistics have challenged this as "environmental racism" and have correlated health, crime and suicide effects with lower economic status. If all this is left unchecked, the ecological and social problems of these dubious areas will increasingly dominate the human scene. It's unbearable, that the rich few can continue to turn their backs on the pollution and poverty of these infrastructures and operate in comfortable isolation from these seats of desolation in single-minded, gated-residential suburbs.

## Measuring progress towards sustainability?

Right now, the main pollutant of American urban infrastructures is absolutely **not** based on a Input-Output-Quantification using international Life-Cycle Analysis Methods:

New holistic urban planning concepts, regional scenario tools and eco-audit measures on an international competitive level (the big picture) are needed that integrate social and ecological responsibilities for open-minded, multifunctional urban spaces and urban growth and consumption management.

Measures should be readdressed to strengthen the participation of individuals and their sense of belonging to the city, to the neighborhood in which they work and live.

It is the individual commitment of everybody's city, which is absolutely central to achieving real sustainability.

A more precise transparent assessment is thus needed, with the aim to reduce the contribution of polluting infrastructures to various environmental problems, from a global scale (e.g.

greenhouse effect etc.) to a local one (waste production etc.). Statistics are the basic ingredients in the “**what if**” and “**if this**”, then that design and planning speculations with which the spatial problems of environmental structures are tackled.

Unfortunately many current institutional approaches to sustainability are propaganda based and not achievement based. It is not what ought to be done that counts but rather what is effective that is done.

Every city and every suburb and their various supporting infrastructures must be comprehended and managed in their evolutionary entirety as a circular self-contained, ecological long-living organism.

Their various elements and structures in different districts and neighborhoods must be interpreted and constantly updated as a complex system, that is characterized by flows as a continuous process of change, transformation and development.

It must be possible to overview, monitor and manage the constant changes in its use and appearance, as well as in technology, in order to ensure a minimum of disturbance and a maximum conservation of resources.

It is a global goal to reach sustainability, from a renewable energy technology, industrial innovation, total services and personal lifestyle point of view.

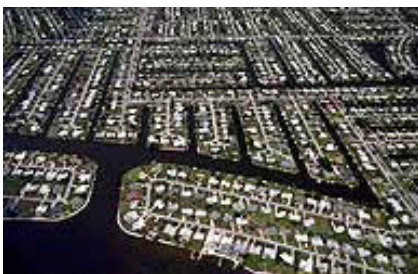
They also should foster a better understanding of urban systems through regional modeling, traffic and transport impact simulation, visualization and dissemination of alternative scenarios, to build democratic networks of experts and expertise, of international, national and regional companies and a multitude of committed citizens.

In most European cities transit investments complement, and are coordinated with major land use decision. For American Cities, only 5 % of home and work trips are made on public transit, and only 2 % of all urban travel (Warren, 1998). The tough reality is that American cities must begin to offer a radically better way of getting from “A to B” to reduce a significant amount of greenhouse gases.

For example, the Ecological Footprint method is particularly useful for this urban analysis task because it starts to quantify the biologically productive area necessary to provide the supplies of a given human population and infrastructure and to absorb its wastes.

The U.S.A. has the world’s largest research and development need addressing urban, energy, and climate change issues, the output of which greatly influences the availability and application of new urban infrastructure and building typologies, policies and master plan concepts towards future zero-energy-emission urban infrastructures.

Both conventional and renewable energy resources for living and working environments, transportation and community infrastructures have an uneven geographical distribution in the U.S. Similarly, the local social and environmental impacts of energy consumption and urban living vary greatly between locations in a wide array of climatic, cultural, geographic and political self-governed regions.



Sprawl on Florida's west coast.  
(Photo: SFWMD)

But behind these efforts of improvements within global networks is certainly an irony: Parallel to

these sustainability projects on earth the NASA and consortia are developing thousands of advances for living and working technology on the idea that ordinary people would someday live and work in solar fuel cells powered space communities.

The NASA's Space Shuttle, Life and Micro Gravity Sciences and Applications Program is one of these numerous steps in turning this scenario into reality. The private and state funds are much higher dedicated for these goals (including necessary military facilities), then the budget to minimize resource consumption and to make efficient long-term zero-emission living and working infrastructures on earth.

Looking at the big picture of our spaceship earth, we know that we need more than ever biophysical accounting systems and a faster progress in the application of modern scientific climatology to architectural and urban design in the 21<sup>st</sup> Century:

**Resources**

IPCC: "Climate Change 2001: Impacts, Adaptation and Vulnerability", <http://www.unep.ch/ipcc/>

Renewable Resource Data Center (U.S.) <http://re dc.nrel.gov/>