Sustainable urban village with vision:
A comprehensive proposal for an ecologically sensitive residential community

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Abstract

Sustainable community development is an important initiative directing 21st Century planning and design of urban environments. Design professionals have a critical role and responsibility in developing quality living environments that celebrates the dynamic ecological systems and creates places that endure.

The Sustainable Urban Village proposal was part of an interdisciplinary team collectively working on a National Affordable Family Housing Program (NAFH). The group received a grant from HUD to develop a proposal to study the feasibility of designing housing demonstration projects in several potential urban sites in the Pacific Northwestern region of the United States. The NAFH team focused its work on anti-sprawl measures and sustainable community development.

The Sustainable Urban Village is a site specific in-town study based upon the principles/processes of affordability and sustainability. The proposal integrates the unique qualities of a compact and cohesive village with the dynamic ecological systems on 67-acres site. The design of the village is based upon the ecological techniques to balance the community's vital air, water, land and energy systems. A strong sense of place is achieved through appropriate clustering of the development, ensuring optimum density of human, social/cultural, economic and environmental factors. The village's integrated sustainable patterns permeate the defining levels of its neighborhood, village, residential clusters and dwelling units.
1 Research and design methods: programming for sustainable development

Sustainable programming requires an integrated and holistic approach to understanding the unique on-site, human and environmental interrelationships and resources. The first procedural issue was to develop a working definition of sustainability. Through research and prior studies, sustainability was defined as those strategies that look at a site’s natural land, water, air and energy resources as integral aspects of the design (Vieria, 1993). It integrates natural systems with human patterns and celebrates continuity, uniqueness and placemaking (Early, 1993).

The Sustainable Village program is based upon these directives and related ecological modeling techniques which carefully balance on-site interchanges between the unique human and environmental systems. These interchanges were used as indicators of sustainable development and define the inherent qualities, carrying capacities, and required ecological footprint of this site (Wackernagel, 1996). This approach was used to model, measure and program a series of design strategies for the sustainable development as well as monitor the program’s future regenerative process. The various sets of design strategies were organized under five primary variables for achieving sustainability: human ecology, energy, land, water and air quality. These variables are best understood as highly interrelated cycles expressed in the systems diagram (figure 4). For detail discussion of design guidelines see my separate publication "Sustainable Urban Design Paradigm: Twenty five simple things to do to make an urban neighborhood sustainable," pp. 31-41, WIT Press, Ashurst, Southampton, UK., July, 2002.

2 Data and analysis procedures: ecological modelling of on-site variables

The Sustainable Urban village site is located in the city of Pullman, the site of Washington State University, in the Palouse region of eastern Washington. The population of Pullman is 25,000, including 17,000 university students. The regional climate has cold, wet winters and warm, dry summers. In addition to supporting a major university, the city’s economy serves the region’s rural communities and agricultural industries.

The village site is a very important land holding in the city which has close pedestrian proximity to the university and has a strong community context. The site is surrounded by a network of roads, residential housing (predominantly student population), commercial nodes, an industrial park and many neglected natural amenities. As defined, sustainability mandates balancing the community’s on-site ecological interchanges between human and environmental systems. In a separate study, the author and his collaborators modeled the whole community’s on-site ecological exchanges for the selected set of variables (air, water, land, and energy). This research and the resultant proposal was awarded a gold medal
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at the recent Habitat II conference in Istanbul, Turkey (IAA, 1996). The Pullman proposal is illustrated in (figure 1-5) and can be reviewed at <www.arch.edu/~sustain>.

In this earlier study, air exchanges were balanced by an extensive greenbelt and greenways program. It was estimated that the surrounding region and city would require a massive tree planting program and the existing one million trees would have to be augmented by an additional four million trees in order to balance the carbon dioxide-oxygen exchange in the whole city. The required trees and proposed greenbelt (or land-banking concept) would control sprawl, moderate the climate extremes, increase recreation and biodiversity. These green programs use indigenous landscaping which conserves water, reduces maintenance, and celebrates the uniqueness of the region. Currently, the community with university and public school students are planting some 30-50,000 trees per year.

For water, spring runoff would be impounded in balancing lakes and this would supplement the water needed in dry seasons, reduce spring flooding, filter eroded soil as well as improve water quality, fishing and recreation potential, and biodiversity. Within the context of this ecological model, strategies are also recommended for land (food/fiber) and energy. A shift to renewable resources, the substantial reductions in auto use and energy conservation of 40-60% in buildings were critical strategies for balancing the air (CO2 to O) exchange as well as the land and energy systems.

All the strategies were applied within an integrated set of scales, forming the human ecology or human-environmental patterns for the region, the overall city, the neighborhoods/districts, then the housing clusters and units. Many of the concepts and design strategies are derived from the author's research in proven sustainable principles used in vernacular and contemporary societies. By definition, vernacular developments have withstood the test of time and have celebrated substantial societal development without the use of non-renewable energies. Figures 1 to 4, below illustrate Pullman Sustainable Regenerative Proposal.

Fig. 1. Region & City

Fig. 2. District & Neighborhood
Fig. 3. Housing Densification and Cluster

The analysis of the ecological variables and required conservation measures for the overall city are illustrated in the following conceptual diagram and bar graph (Figures 4 and 5).

Fig. 4. Conceptual Diagram of the Ecological Systems

Fig. 5. Analysis of the Community's Human & Environmental Systems

3 Sustainable urban village

The Sustainable Urban Village applies this earlier city wide research to a specific site owned by the University. It focuses on integrating the concepts and strategies of this new development into an existing neighborhood, forming a cohesive village with defined greenways, diverse housing clusters, as well as, effective unit design to conserve resources and energy. The following is a summary of the Sustainable Village proposal (figures 6 – 11).
Design Integration of Human and Natural Communities: The integration of the village with the natural systems of the site, as well as the adjacent urban neighborhood and university facilities were important design goals. These essential functions and facilities were integrated with the general movement of the major pedestrian ways. Also, selected design strategies enhanced the indigenous qualities of the site (wetlands, natural habitats, view corridors, solar orientations, etc.).

Fig. 6. Village Plan with greenways & Neighborhood School
The village contains a hierarchy of central places interconnected by an effective pedestrian focused infrastructure. This infrastructure is expressed in community greenways and the clustering of activities to promote enjoyment and accessibility. Internally, the pedestrian priority walk/bikeways and transit nodes foster accessible connections to neighborhood facilities, parks, transit shelters, daycare, recycling and compost centers, and most importantly to a neighborhood school and the university. This College Hill neighborhood is in need of an elementary school and its proposed addition and 1/4 mile walking distance would eliminate the lost identity (and energy) caused by the extensive busing of the children to other schools. The neighborhood school would become an active center and its central geographic location is critical to the pedestrian priority concept, community sustainability and safety. Along the major walk/bikeways, pedestrian enhancements and connections to essential social spaces and village facilities are provided.

Clearly defined greenways and the accessible transit system throughout the development will substantially reduce the automobile use and its extensive consumption of non-renewable energy resources. Water conservation programs and gray water reuse would be implemented throughout the village. The successful resource management programs based on the 3R's (reduce, reuse and recycle) are integral parts of the community and their educational programs. The traditional garbage service is considered a community resource recovery process.

**Housing Quality, Community and Privacy:** In an urban environment where land prices and the cost of essential urban facilities and services are increasingly becoming unaffordable, higher density housing is needed to justify the economic and social use of community amenities. Also, clustered, higher density housing
is fundamentally important in reducing the many ills of sprawl. Clustering of attached housing and apartments around a semi-private garden is the prominent housing form in the village. This type of housing is far more economical and offers much higher densities without compromising the qualities associated with family living. When designed properly, clustering fosters a sense of place and intimacy within the user group. A variety of design strategies were used to increase the perception of user control and territoriality. These important features are given priority in the design of the clusters and units. The interior semi-private courtyards are defined by the housing units, creating a controlled space to protect group activities and encourage social interaction. The entries to the courtyards are defined by means of gateways and level changes combined with indigenous landscaping to convey the message of territorial integrity. The areas within the vicinity of the building entries, paths and adjacent yards are assigned to the residents so they can have direct control and surveillance over these areas. Children play areas and parking are within these defined zones to assist the residents in adopting a proprietary attitude. Surveillance over public open spaces, the street and walkways are further improved through careful articulation of the building facades with ample front porches and bay windows. These design elements convey the message of user influence and control of the public realm.

Fig. 9. Mixed use Bus Plaza
Fig. 10. Housing Cluster

Fig. 11. Dwelling Unit Section with Passive Strategies

The units are designed to reach a high level of energy conservation, optimizing the reduced use-reuse and recycle of renewable resources of sun, wind, water and food/fiber. Indigenous, low maintenance landscaping and permaculture are used instead of water consuming "lawns." Water is impounded in gardens and cisterns and used for landscaping and gardening. All brown
wastewater would be safely composted by the city and used for agriculture. Small family vegetable gardens would be encouraged adjacent to the homes within the residential clusters and in the green areas.

4 Significance and use of results: A sustainable design prototype and paradigm

Prototype: The Sustainable Urban Village and resultant implementing Design Guidelines have been an effective prototype for demonstrating the theory, quality and application of sustainable design to the community. The proposal was presented numerous times to the University and Community. After three invited presentations to the University administration, a Request for Proposals was developed which embodied many of the strategies of the Sustainable Village. The University agreed to lease the land at a reduced cost if the design-build teams would develop their proposal with many of the qualities and strategies presented. Finally, the selected firms were brought to campus for a full day workshop. At the administration's request, the proposal and findings were presented to the selected teams of professionals who were to submit design-build proposals for the site. The village proposal has been submitted but the estimated need for additional housing has temporarily diminished due to dramatic increased building in the private sector. The project awaits further university action.

Paradigm: The Sustainable Urban Village is based upon a shift in thinking – a holistic ecological paradigm that identifies and calculates the human-environmental exchanges required for sustainability. From these ecological modeling techniques, design strategies were generated to celebrate and balance the ecological exchanges while providing opportunities for renewal and creation of truly affordable and livable environments. These sustainable design strategies permeate various defining levels of the village integrating its natural amenities with its neighborhood context, residential clusters and dwelling units. This design/planning approach 'reverses the logic" of conventional design process used in the city. First, rather than beginning with the layout of streets and lots, the design process started with the ecological modeling and selected an effective set of proven strategies to balance on-site human and environmental systems. Secondly, the best and most sensitive land for parks, waterways, wetland and established greenways, view corridors and effective micro-climate optimization were identified. Third, pedestrian connections were made to community amenities on and off the site with walkways, bikeways and transit nodes. The centrality of pedestrian and bike networks and greenways interconnect activity centers, schools, and parks, reanimating place definition and activity nodes. These pedestrian priority strategies provide the fundamental links to and from the university, the surrounding neighborhood and its commercial nodes –diminishing reliance on the automobile and the magnitude of the sprawling resources they consume. Fourth, a diversity of housing types were clustered with the best solar orientation and views. The residential
clustering achieves effective densification adjacent to amenities and greenways and enhances opportunities for interpersonal relationships and family privacy. **Fifth**, the dwelling units were proposed to reach a high level of energy conservation, optimizing passive strategies that enhance the users appreciation in natural qualities of the village. **Finally**, the design provided for landscaped auto access and parking within the clusters, lowering speed with traffic diverters and pedestrian priority crossings.

The study and resultant proposal verifies the initial thesis - that design based upon affordable and sustainable principles can enhance both human and environmental qualities of a site while celebrating uniqueness, quality of life and place making.

**References**


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