502.131.1; 711.438
Original scientific paper

LIVABLE HUMAN COMMUNITIES

A Sustainability Narrative

Douglas M. Cotner

This paper will explore the subject of "Livable Human Communities" as the product of "Sustainable Development", which is rooted in the "Science of Sustainability". Public policy to facilitate Livable Human Communities will also be examined, with recommendations proffered, which are science based, within the context of a sustainable development paradigm, which is reliant upon the "Ecological Footprint" and "A Unified Field Theory of Adapted Space", for policy formation purposes.

Key words: Ecological Footprint, Livable Human Communities, Paradigm, Public Policy, Science of Sustainability, Sustainable Development

INTRODUCTION

All men by nature desire to know.

Aristotle, *Metaphysics*

Livable Human Communities, Sustainable Development, and Public Policy are inextricably linked. Linkage flows from Sustainable-Development-Science. This science informs the Public Policy Environment, where all stakeholders exercise input rights. Policy makers use stakeholder input, which forms feedback loops to establish, and then adjust development laws, rules, and regulations. From complex feedback loops policy officials learn how they can help to make available, development funding, and other assistance to stakeholders. Funding then creates an opportunity-environment, which then encourages the development of Livable Human Communities.

Theory and practical thinking suggests that, for a human community to be livable, certain fundamentals must first be in place. These include a mix of both tangible and intangible elements. However, human communities that are experienced as livable are firstly places where people feel safe in their persons and their property. Secondly, livable places feature a civil society that is open and transparent, where there is a significant level of local autonomy in decision-making. Finally, there must be access to the opportunities of education, leisure, housing, and employment, within a context of equity, and fairness.

Livable Human Communities must meet myriad human needs on a daily basis. Some physical, and some based in the individuals' perception of the quality of the physical environment within which daily life unfolds.

A good example of this sensibility is the Village Green, formerly Baldwin Hills Village. This was the signature housing and multiple-use project designed for the City of Los Angeles by the great American Architect and Town Planner, Clarence Stein (1935-1942). It featured a "Superblock" within which a variety of housing was built. Motor vehicles were kept at the periphery. This was a design feature, created to protect pedestrians and children from vehicular conflicts. Daily shopping, entertainment, public schools, recreation, and leisure opportunities were developed within and along the edges of the Superblock.

The significance of Baldwin Hills Village is, that prior to World War II, Los Angeles City officials, architects, and town planners, determined that this concept of Clarence Stein would guide future urban development for the City Los Angeles. However, the war intervened and plans were shelved for the duration, 1941-1945. By 1946, the model for city and regional development (automobile-based sprawl) was set, and would become the template for the "Built-Environment" from 1946 onward. The development paradigm, as expressed by Baldwin Hills Village of 1942, would be rapidly marginalized by government officials and private sector development interests, and just as quickly forgotten in the post-war years. Figure 1 will give the reader a sense of both the design and appearance of this livable human community.

The Transit Village is a densely populated mixed use community, which is well served by high quality transit and rail systems. This type of "village" makes it convenient to work, live, and pursue leisure, without the burden of automobile ownership. Absent the automobile in one's life, a person is liberated to ride transit and take up leisurely walking in order to enjoy pleasantly designed visual environments. Transit Villages also have active, stimulating, and strong neighborhood centers that focus around transit and local businesses.

Transit Villages are becoming more popular, because they offer the prospect of richer quality of life for all, making this form of urban-spatial organization, a livable human community-type. The examples cited represent human communities that are designed and built to a livable scale, with regard to the everyday needs of its users.

The Village Green-Formerly Baldwin Hills Village

Figure 1: Baldwin Hills Village as it exists today. The Superblock contrasts sharply with the surrounding area. To the right, a portion of this livable community, as seen from ground level. The white arrows mark the "Superblock".

Figure 2: America takes a page from European City and Transportation Planning. These images are of a transit village project, which is located in Portland, Oregon, USA.

The Transit Village is a densely populated mixed use community, which is well served by high quality transit and rail systems. This type of "village" makes it convenient to work, live, and pursue leisure, without the burden of automobile ownership. Absent the automobile in one's life, a person is liberated to ride transit and take up leisurely walking in order to enjoy pleasantly designed visual environments. Transit Villages also have active, stimulating, and strong neighborhood centers that focus around transit and local businesses.

Transit Villages are becoming more popular, because they offer the prospect of richer quality of life for all, making this form of urban-spatial organization, a livable human community-type. The examples cited represent human communities that are designed and built to a livable scale, with regard to the everyday needs of its users.

SUSTAINABLE DEVELOPMENT SCIENCE

Science is but a perversion of itself unless it has as its ultimate goal the betterment of humanity.

Nikola Tesla

In the rush by many, to put sustainable development solutions into place, the science-of-sustainability was pushed to the margins of their thinking. The term sustainable development was appropriated, minus what the science was telling them. The need for sustainable development became clouded in many minds, forgetting the concept of Sustainable Development. It should be restated, that the concept of Sustainable Development was born of a pervasive awareness that national-failures to sustain economic development and manage natural and human-made environments threaten to overwhelm all of our communities. Further, that development cannot subsist on a deteriorating resource base. The resource base cannot be improved or protected when growth leaves out of account the costs of environmental degradation, destruction, and misappropriation.

The overarching goal of sustainable development is to maintain our community populations and institutions across future generations without degrading the carrying capacity and utility or our capital stocks, essential infrastructure and the human living environment. The primary measures of sustainability are structural and functional

integrity, intergenerational capacity, and continuity.

The Science-of-Sustainability establishes the foundation upon which all "Sustainable Development" activities must be based. Before undertaking a Sustainable Development activity or initiative for a village, town, city, county, state, region, or nation, their Ecological Footprints must be calculated, and analyzed. The Ecological Footprint, therefore, is a resource accounting tool used to address underlying sustainability questions. William Rees (University of British Columbia) States in this regard that,

...resource prices are misleading, because they tell us little about the condition of essential natural capital stocks or the preferences of future generations.[1]

It measures the extent to which humanity is using nature's resources faster than they can regenerate, which is known as "Overshoot". William Rees (University of British Columbia) States that, Overshoot is defined as, "growth beyond an area's ecological carrying capacity, leading to crash" (Catton). "Overshoot" is a defining factor for resource use, which is kept out of the account in mainstream free-market economic thought.

The factor of "Overshoot" informs objective analysis, in contrast to standard free-market economics, which cannot hope to cope with a progressively degraded biosphere and geosphere. Overshoot recognizes implicitly, that natural, biological systems renew in circular flows in their biophysical dynamics. Human-Made systems, on the other hand, are linear in nature, and ecologically blind to the environment.

Further, that "Overshoot" is the root cause of the most serious of environmental problems threatening life on Earth in our time. These problems include rising food prices, fisheries collapse, world climate change, diminishing forests, and the degrading of biological diversity.

The Ecological Footprint illustrates who uses how much of which ecological resource, with populations defined either geographically or socially. Moreover, it shows to what degree humans have come to dominate the biosphere,

Ecological Overshoot

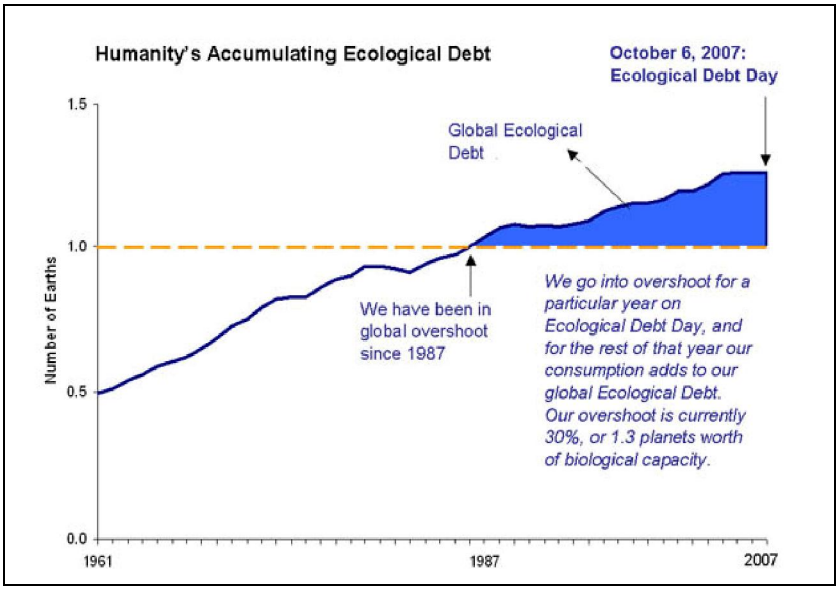

Figure 3: Ecological Debt Day Representation (Courtesy of the Global Footprint Network)

at the expense of wild species. Moreover, the Ecological Footprint clarifies the relationship of resource use to equity, by explicitly tying individuals' and a groups' activities to ecological demands. Knowing and understanding these connections help decision makers to more accurately and equitably shape policy in support of social and environmental justice.

Ecological Footprint Analysis invites citizen involvement in the development of their community, because it graphically lays out the amount of bio-physical goods each person of a particular population is consuming, expressed as a consumption-resource availability budget. This includes resources available locally, and those resources consumed from somewhere else. The question a given community then begins to ask is, "How can we all have great lives, while consuming less of nature's biophysical goods"? An example of the output of Ecological Footprint Analysis is presented in Table 1.

The calculations reflected in the numbers in the summary table below, start with a very simple equation. A great deal is owed to Professor William Rees and Dr. Mathis Wackernagel for their innovation of the idea of the Ecological Footprint at the University of British Columbia, Canada. Developed by Rees and Wackernagel, this simple but powerful

Ecological Footprint And Biocapacity Data-2003

Table 1: Ecological Footprint Tabulation, (Courtesy of Global Footprint Network 2006: Ecological Footprints and Biocapacity). Ha = hectares, 1 Hectare=2.471 English acres.

Place	Population (Millions)	Total Ecological Footprint (Global ha/person)	Total Bio-Capacity (Global ha/person)	Ecological Deficit (-) or Reserve (+) global ha/person)
World	6,301.5	2.2	1.8	-0.5
High Income Countries	955.6	6.4	3.3	-3.1
Middle Income Countries	3,011.7	1.9	2.1	0.2
Low Income Countries	2,303.1	0.8	0.7	-0.1
Serbia & Montenegro	10.5	2.3	0.8	-1.5

Irreversible Linear Throughput

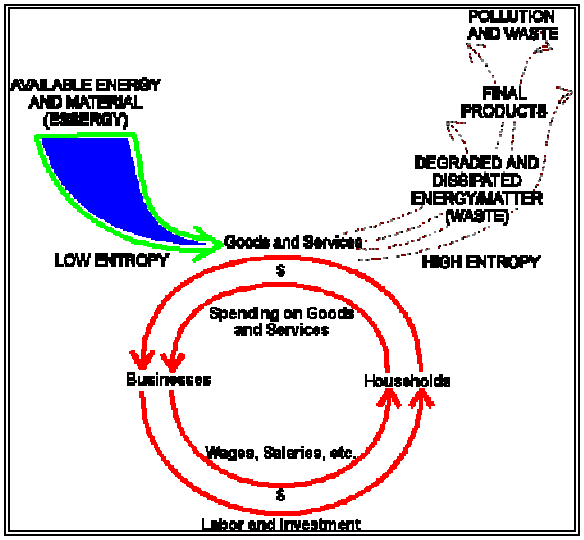

Figure 3: The linear throughput of low-entropy energy and matter (upper part of diagram) sustains the economy and drive the Circular flows of exchange value, lower part of diagram), yet is invisible to conventional economic analysis, (William E. Rees, University of British Columbia).

equation can be stated as,

$ef = \sum aa_i$
$i = 1 \text{ to } n$

Where: ef ⟶ Per-capita footprint.

$\sum$ ⟶ Summation.

aa_i ⟶ All ecosystem areas appropriated.

n ⟶ All items purchased in an annual shopping basket of consumption goods and services.

The Ecological Footprint of the average person ('ef') is calculated by adding up all of the ecosystem areas appropriated (aai) by all purchased items (n) in his or her annual shopping basket or consumption goods and services. The ecological footprint (EFp) of a study population can now be obtained by multiplying the average per-capita footprint by population size (N) as follows: EFp = N (ef), Wakernagel and Rees, "Our Ecological Footprint", 1996. Therefore, before sustainable development initiatives aimed at the "Built-Environment" can proceed, the Ecological Footprint of a particular population must be calculated and analyzed.

It is at this level of analysis that the birth of a sustainable and livable human community, may or may not begin. At this point, it is instructive to consider the importance of "Linear Throughput" as seen in Figure 3.

As the basis for a Livable Human Community, one must consider the mechanism of "Linear Throughput" This mechanism controls the throughput of low-entropy energy and matter, which sustains and drives the Circular flows of exchange value, yet is invisible to conventional economic analysis (William E. Rees, University of British Columbia). We see in this mechanism the laws of "Thermodynamics" at work. By acknowledging and understanding the role of Linear Throughput in human settlements, the basis on which old and new human settlements must operate, provide guidance for both energy and materials use. This understanding informs what is meant by what is often referred to as Sustainable Development.

It is instructive to note, that the idea of Sustainable Development is not a new idea, as some would choose to believe. It is in fact, an idea, which can be seen, for example, in the many villages found throughout Europe and England. Such places are often cited, as comfortable and easy places in which to live. The following is a spatial organizing scheme after Chisholm, 1968.

This simplified model of sustainability, demonstrates that there are certain basics in sustainable development that must not be forgotten, as one moves up the complexity scale of the Built-Environment. In this regard, the details may change, but basic principles of Sustainable Development, leading to a livable human community remain.

To this point, Trevor Rowley states in "Villages

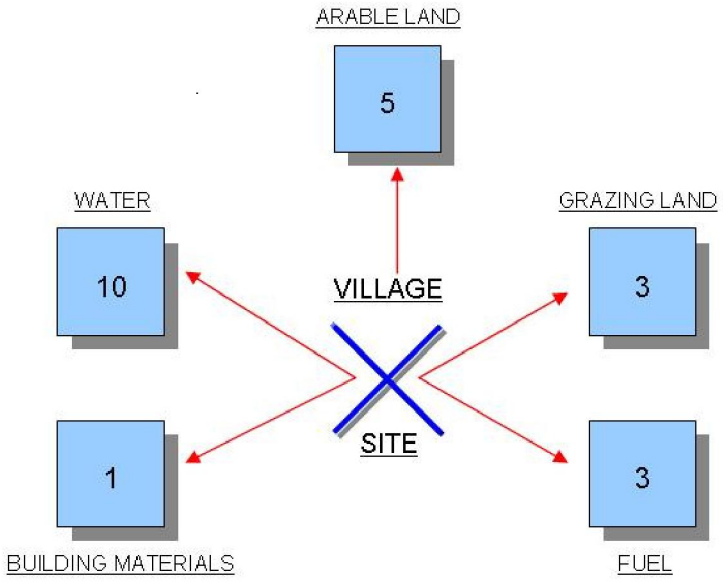

Figure 4: Village location. This diagram shows the five basic elements in a primitive village Economy. The numbers assigned to each of the above elements represent a notional weighting which reflects, the relative importance of each in the siting of a human settlement. Thus according to this model, it is far more important to be close to a source of potable water than a source of building material. The figures may be considered hypothetical and will vary in space and time (after Chisholm 1968).

in the Landscape",

It is not possible to examine a village in isolation from its surrounding fields, woods, commons, and streams. Thus, we should always be aware that we are examining only a part of a much larger matrix, and that we cannot hope to understand a settlement without relating it to its economic hinterland.[2]

Thus, the villages of which Rowley refers, were sustainable within a basic paradigm, because the people who lived, worked, and played with these places, derived their daily sustenance needs for food, fuel, and fiber from the geographical area that made up the village and its commons. Consequently, very little was imported from elsewhere to meet daily sustenance needs. However, as the world changed around them, guiding principles were abandoned, and ultimately forgotten by the leaders of the industrial age and beyond. Only in latter decades of the 20th century were these forgotten principles of organic urban design, siting, urban form, adapted space, and appropriate economics rediscovered.

A UNIFIED FIELD THEORY OF ADAPTED SPACE

As to methods, there may be a million and then some, but principles are few. The man who grasps principles can successfully select his own methods, ignoring principles, is sure to have trouble.

Ralph Waldo Emerson

A Unified Field Theory of Adapted Space is a recombinant theoretical construct, because it seeks to unify the micro and macro scales of human settlement and activity.

This construct examines afresh, the antecedent geographical and urban planning ideas of "Sequent Occupance" (Whittlesey, 1929 and Meyer, 1935), "Landscape Ecology" (Barrows, 1922), "Culture History" (Sauer, 1925), and the "Spatial Adaptation Behavior" (Whyte, 1980) of humans, as human and cultural modifiers of the humanized environments of place and of environment. A Unified Field Theory of Adapted space also seeks to cognitively capture and make intellectually apprehendable, the impact of cultural inflections of people on discrete places (people acting on space, and space acting upon people) within a regional context, which resulted in a "Unified Paradigm".

A Unified Field Theory of Adapted Space underpins the Ecological Footprint of people and their consequent importance for the sustainability of human and other biophysical communities, as interacting elements within the biosphere and geosphere. Ecological Footprints which are functions of the consumption of biophysical goods, and represent the dynamics of how, why, and the means by with people adapt or modify real space on Earth, to meet their physical, emotional, and intellectual needs. These needs, it is known, lead to the consumption of many things; among them are the basics of food, fuel, and fiber. Thus, an understanding of how real people adapt real space in real time begins to emerge.

A Unified Field Theory of Adapted Space is a recombinant theoretical construct because it unifies the micro and macro scales of human settlement and spatial modification activity.

Ultimately, A Unified Field Theory of Adapted Space suggests that we must go beyond just the Ecological Footprint, if there is to be a successful understanding of complex man-land interactions. Thus, this analysis, leads to solutions of the great human and associated environmental problems, now confronting us. These problems include those of population (its growth and distribution), natural resources adequacy, livable living space, transportation, clean air and water, genetically modified foods, and sustainable energy availability and its use.

The notion of "Adapted Space" and the theory to support such an idea, evolved over a number of years from 1989 onwards. The goal of this research was to explore and test such an idea. The fieldwork for this research took place principally in the United States, with additional research that was carried out in Southern Mexico and Central Asia. This research endeavored to answer basic questions concerning how and why people (environmental-users) and groups of people (institutions) modified space for personal and collective purposes, and at what scale, and the consequent environmental impacts.

The work of William H. Whyte was most helpful in the visual documentation of real people in real time, adapting and modifying real space for both individual and group purposes in meeting specific user-needs. Before Whyte's seminal work, "The Social Life of Small Urban Spaces" (1980), an understanding of the mechanisms of spatial adaptation was not widely known or understood.

Whyte demonstrated with his unique research method that people are constantly adapting small spaces and the functional linkages between them to meet their needs for a livable environment. Time-lapse photography was utilized throughout New York City to visually confirm complex human activity on a daily basis. Study of thousands of rolls of film revealed answers to questions about spatial use that city planners had sought for many years. A careful study of Whyte's work was contributory influence on the development of "A Unified Field Theory of Adapted Space".

PUBLIC POLICY

It is difficult to get a man to understand something when his job depends on not understanding it.

Upton Sinclair

The schematic in Figure 5 can be likened to a wiring diagram. It makes concrete the process by which sustainable and livable human communities meet the needs of people and environment. It specifically addresses public policy within the context of alternative scenarios for sustainable development.

This schematic has been designed to facilitate the concrete exploration of planning, implementation, and public policy formation.

Axiomatically, Science must precede public policy formation. However, it often proceeds in the reverse order. Public policy concerning Sustainable Development and Livable Human Communities must be in accord. Policy if properly formulated benefits all stakeholders with regard to a particular problem or issue. However, for effective policy to become reality, it requires of a given society, openness, transparency, and democratic institutions. There must, therefore, be a balance between the public good and private greed, concerning the use of space, resources, and the application of economics.

We, you and I, live in the world, which is a truth that each of us must confront, concerning the important questions facing our communities, and whether or not to attempt change. Once this mind-set is engaged, then practical policies can be informed, based on empirical evidence, scientifically assessed. Abstraction must be eschewed in the cause of practical public decision-making. Likewise, public policy formation should not make a fetish of the practical aspects of the policy formation process, but enfold within its corpus of thought, well reasoned arguments, with a suitable ethical foundation.

To this point, Christian Barry and Sanjay Reddy in "Public Policy Analysis Today and Tomorrow", August 25th, 2005 state that:

If we adequately appreciate the simple truth, we will be led to deliberate differently about public policy and institutional design. We will insist equally on the necessity of practicality and the importance of morality in practical reasoning. The reasoning style of deliberation is nothing other that public policy analysis correctly done.[3]

Regardless the school of public policy analysis to which one subscribes, the first requirement, as previously indicated, is a civil society that values openness and transparency. A Policy-Formation "Milieu" must be created, which is non-threatening. This will be a milieu, designed to draw into the policy-formation environment, all relevant stakeholders. This will assure that grassroots, practical policies, designed promote the implementation of Sustainable Development, and which, will lead to insightful design and development decisions, in the cause of "Livable Human Communities".

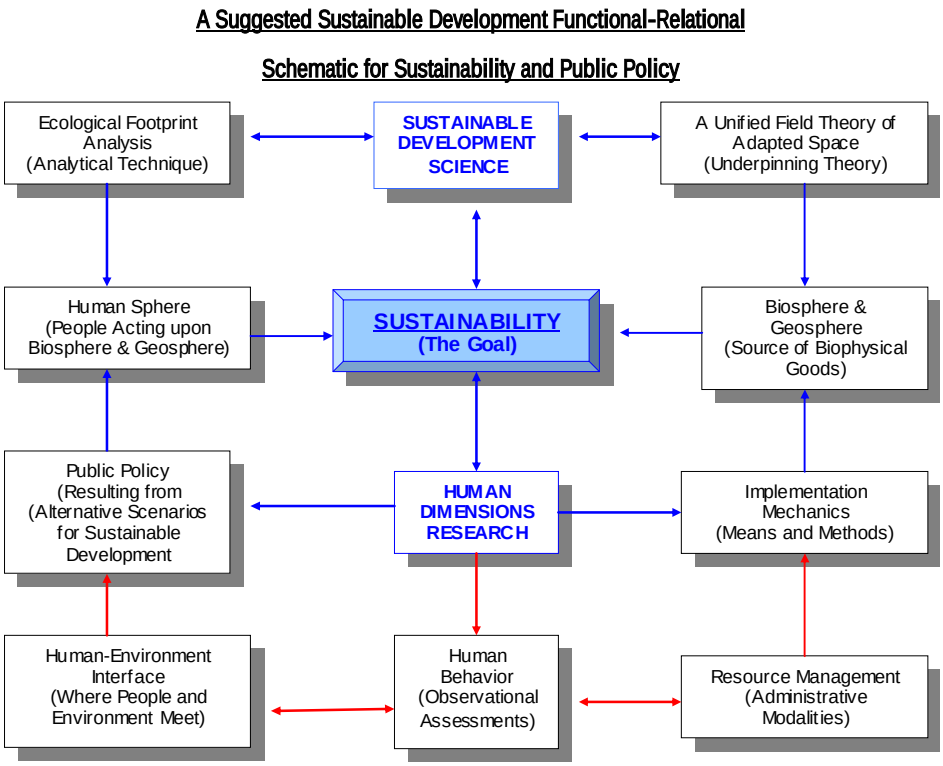

Figure 5: Theory, Mechanics, Applications, and Public Policy for Sustainability.

CONCLUSION

We must not be afraid of dreaming the seemingly impossible if we want the seemingly impossible to become a reality.

Vaclav Havel

Sustainable Development and Livable Human Communities, as proffered is this paper are inextricably linked. Ecological Footprint Analysis and a Unified Field Theory of Adapted Space offer a dynamically powerful analytical suite for assessing and solving Sustainable Development Problems.

It recognizes that the overarching goal of Sustainable Development is to maintain our community populations and institutions across future generations, without degrading the carrying capacity and utility or our capital stocks, essential infrastructure and the human living environment.

Therefore, before sustainable development initiatives aimed at the built-environment can proceed, the Ecological Footprint of a particular population must be calculated and analyzed. It is at this level of analysis that the birth of a sustainable and livable human community begins. Consequently, the public policies that flow from this understanding make livable human communities a practical reality. Finally, the following, admittedly, homespun maxim of the author is offered as follows: "If the project, initiative or development project will not improve the lives of ordinary people by a single crust of bread, the proposed project or development initiative must be returned to the drawing-board".

ACKNOWLEDGMENTS

I would like to thank Dr. Pavle Anđus, School of Biology-University of Belgrade, who brought my research to the attention of the Institute of Architecture and Urban & Regional Planning of Serbia. I would be ungrateful indeed, if I did not also thank Professor Veljko Milutinović, Department of Computer Engineering-School of Electrical Engineering-University of Belgrade, for his continuing interest in my research.

END NOTES:

[1] Wackernegel, Mathis and William Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth*, 1996. New Society Publishers (Gabriola Island, B.C. Canada VOR 1X0, p. 45.

[2] Rowley, Trevor, *Villages in the Landscape*- (Archaeology in the Field Series) 1978. J. M. Dent& Sons Ltd. (London, Toronto, Melbourne), pp. 26-27.

[3] Barry, Christian (Senior Research Fellow, Centre for Applied Philosophy and Public Ethics) and Sanjay Reddy (Assistant Professor

of Economics, Barnard College at Columbia University), *Public Policy Analysis Today and Tomorrow*, August 25th, 2005.

FIGURES:

Figure 1: Village Green, formerly Baldwin Hills Village.

Figure 2: Transit Village, Portland, Oregon USA.

Figure 3: Linear Ecological Throughput by Dr. William Rees.

Figure 4: Basic Village Spatial Scheme, After Chisholm, 1968.

Figure 5: A Suggested Sustainable Development Functional Relational Schematic for Sustainability.

TABLES

Table 1: Ecological Footprint And Biocapacity Data-2003.

References

[1] Barrett, J., Vallack, H., Jones, A., Haq G., 2002. A material flow analysis and Ecological Footprint of York. Stockholm, Stockholm Environment Institute.

[2] Catton, W. (18 August, 1986). Carrying capacity and the limits to freedom. Paper prepared for Social Ecology Session 1, XI World Congress of Sociology. New Delhi, India.

[3] Haberl, H. Erb, K. Krausmann, F. 2001. How to calculate and interpret ecological footprints for long periods of time: The case of Austria 1926-1995. Ecological Economics, Vol. 38 (1), pp. 25-45.

[4] Lenzen, Manfred, Mathis Wackernagel, Diana Deumling, Bonnie Lauck, 2005. The Ecological Footprint of Victoria. ISA University of Sydney, Global Footprint Network. EPA Victoria.

[5] Loh, J. and Wackernagel, M. (ed.), 2004 Living Planet Report 2004. Gland, Switzerland, Worldwide Fund for Nature International (WWF), Global Footprint Network, UNEP World Conservation Monitoring Centre, Gland Switzerland.

[6] Luck, M., Jenerette, G. D., Wu, J., Grimm, N., 2001. The urban funnel model and the spatially heterogeneous Ecological Footprint. Ecosystems, Vol. (4) pp. 782-796.

[7] Rees, W.E. and Wackernagel, M., 1999. Monetary Analysis: Turning a Blind Eye on Sustainability. Ecological Economics, Vol. 29, pp. 47-52. August 2004).

[8] Rees, W.E. 2006. Ecological Footprints and Bio-Capacity: Essential Elements in Sustainability Assessment. Chapter 9 in Jo Dewulf and Herman Van Langenhove (eds). Renewables-Based Technology: Sustainability Assessment, pp. 207-226. Chichester, UK: John Wiley and Sons.

[9] Rees, W. E. 2003. Understanding Urban Ecosystems: An Ecological Economics Perspective. Chapter in Alan Berkowitz et al. Eds. Under-standing Urban Ecosystems. New York: Springer-Verlag.

[10] Wackernagel, Mathis, Dan Moran, Sahm White, Michael Murray, 2004, Ecological Footprint Accounts for Advancing Sustainability: Measurng Human Demand on Nature. Chapter 12 in Phil Lawn (editor) 2005.

[11] Mathis Wackernagel, Dan Moran, Sahm White, Michael Murray, 2004, Ecological Footprint Accounts for Advancing Sustainability: Measuring Human Demand on Nature, Chapter 12 in Phil Lawn (editor) 2005. Sustainable Development Indicators and Public Policy: Assessing the Policy-Guiding Value of Sustainable Development Indicators. Edward Elgar.

[12] Wackernagel, M., Ecological Footprint and Appropriated Carrying Capacity: A Tool for Planning Toward Sustainability. 1994. Ph.D. Thesis. School of Community and Regional Planning. The University of British Columbia.