

# Sustainable Development: Science Must Precede Public Policy

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**Abstract—** *A suggested approach for the development of sustainable communities will be briefly explored in this paper. It will consider the problem of sustainable development, a brief discussion of methodology, the public policy issue, and a suitable conclusion. The first precept of sustainable development is to “do no harm”. The approach herein taken bears this injunction in mind, as it incorporates the cutting-edge technique of Ecological Footprint Analysis accompanied by the underpinning theoretical construct of A Unified Field Theory of Adapted Space, which is a new idea not previously seen in the literature. This research recognizes that there may be drawbacks to the approach offered, such as the absence of national statistical data sets. However, this approach seeks to employ techniques that offer the possibility of insight, and which has the capability to quantify biophysical goods consumption, while equating such consumption with appropriated eco-logical carrying capacity of land equivalents. This approach also offers the potential of developing a practical and scale variable approach to concretizing sustainable development in the lives of ordinary people.*

**Index Terms—** *Adapted Space, Carrying Capacity, Biophysical Goods, Ecological Footprint, Photo-voltaic (PV), Sustainable Development.*

## 1. INTRODUCTION

THIS work explores sustainable development from the perspective of first principles. The approach taken incorporates the assessment technique known as Ecological Footprint Analysis, (Rees, W. & Wackernagel, M. 1994) and the underpinning theoretical construct of A Unified Field Theory of Adapted Space, (Cotner, D. M., Doctoral Dissertation, The American Institute of Urban and Regional Affairs, 1998). There will be more about this later in the article. To understand Sustainable Development, it is essential to understand how real people use real space in real time, (Whyte, W. “The Social Life of Small Urban Spaces” 1988). This new theory, attempts to answer basic questions concerning people’s use of space and their patterns of resource utilization over time. Thus, population groups or societies are empowered to determine their own ordering of developmental priorities, as they seek to make development sustainable.

Consequently, the technique of Ecological Footprinting invites everyone to the table. It says here is the biophysical goods budget that is available, so how do we want to utilize it? Simultaneously, A Unified Field Theory of Adapted Space gives explanation to both the individual and collective behaviors that generate sustainable development activities and the consequent character and morphology of a given human settlement.

This research builds upon the work of Dr. William Rees and Dr. Mathis Wackernagel who were the first to formulate the paradigm of the Ecological Footprint. The next step in configuring a model for sustainable development is to consider an underlying theoretical mechanism that explains why and how people organize their environmental space for the various purposes of everyday living. This underlying construct is known as, A Unified Field Theory of Adapted Space and this is first time that this idea has been articulated in any journal. This theoretical construct is rooted in the concept of Sequent Occupance, as developed by Derwent Whittlesey (1929). Sequent Occupance analyzes the ways in which a culture uses a place or a region in its own way. A Unified Field Theory of Adapted Space builds on this work and that of William H. Whyte (1988) to gain definitive answers concerning how real people use real space in real time for daily human purposes, and by extension, their acquisition and consumption of biophysical goods from the Earth’s ecosphere and geosphere.

A Unified Field Theory of Adapted Space considers the elements of population (size, distribution, and dynamics), spatial occupance (contemporary and sequent human use), and individuals who adapt space for daily living requirements. When bound to Ecological Footprint Analysis, there emerges for the first time, a powerful analytical suite that can determine the requirements for sustainable development at local, regional, national, and global scales. Such a construct looks afresh at the ideas of Landscape Ecology, Sequent Occupance, and the spatial behavior of people. This theory recombines these ideas into a unified perspective. Such recombination allows complex problems of sustainable development, the solutions of which can now be attempted with far greater confidence, than has heretofore been possible. Much work remains to be done,

Manuscript received March 11, 2007.

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because as sustainable development has evolved from its early beginnings it has drifted from its original theoretical foundations, risking its reputation for relevance. Thus, a deviation from original focus on the interconnections that link complex ecological, social, and economic systems has emerged.

## 2. THE PROBLEM

Human culture and the societies of which it is composed are now in conflict with the planet, because ecological footprints now greatly exceed the ecological productivity contained within the boundaries of nation states, as they are known today. It is now clear that humankind has entered a period of consequences not heretofore experienced. These consequences are the result of the volume and the rate of resource consumption by a world population that is growing very rapidly, which is exerting great pressure on the ecological carrying capacity of the Earth's biosphere. Because these consequences play into sustainable development, a complex problem is presented to policy makers. In this context, they should be afforded every opportunity to understand and to buy into what the science of sustainable development offers to them when decision-making is required on such matters. This of course can be fraught with certain difficulties because of the complexity of the science and the often-encountered resistance to the science on the part of policy makers. For example, Upton Sinclair once said "... It is difficult to get a man to understand something when his salary depends upon his not understanding it..." This is often what happens, but with persistence, this mindset can be changed. Consequently, as policy makers become more comfortable with data developed from ecological footprint analysis, they will regard this type of data as indispensable to their work, as formulators of environmental and developmental policy, thus avoiding the problem as stated by Upton Sinclair. At least, this is the hope.

Are there yet problems with which to contend? Yes, there are some, which are bound up in the availability of both historic and current demographic, economic, and trade data (national data sets). This research recognizes that there may be limitations to the approach as herein offered because of possible data voids. However, the approach taken to the problem, seeks to employ techniques that can quantify and explain biophysical goods consumption, equating such consumption to ecological carrying capacity of ecologically productive land equivalents. This approach is heavily data dependent, as can be seen in the table below. If there are potential limitations to the approach taken, it is in this area and the availability of national data sets that are current or reasonably current, which will mitigate the computational burden. Otherwise, significant

primary data gathering through fieldwork must be undertaken. In this regard, much credit must be given to Dr. Mathis Warkernagel and his Global Footprint Network. The data developed by this footprint network holds profoundly negative implications for the furtherance of Globalization, as both a phenomenon and as an instrument of world economic policy. The Global Footprint Network puts the matter into proper perspective, as can be seen in the table below. This table reflects the complexity represented by the interaction between population, ecosystems, and economics, which goes to the heart of Sustainable Development and the creation of livable human communities.

### ECOLOGICAL FOOTPRINT AND BIOCAPACITY DATA-2003

Place	Population (Millions)	Total Ecological Footprint (global ha/person)	Total Biocapacity (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

(Source: Courtesy of Global Footprint Network 2006: Ecological Footprints and Biocapacity)

## 3. DISCUSSION

The work of Rees and Wackernagel provides the environmental accounting tool, Ecological Footprint Analysis. This technique allows the researcher/analyst to assess the ecological impact of biophysical goods consumption by a study population, while "A Unified Field theory of adapted space" combined with this accounting tool rounds out the suggested construct for sustainable human communities. While ecological footprint analysis provides the quantitative methodology, a unified field theory of adapted space facilitates a new underlying insight into the dynamics of biophysical resource consumption by a given population of human beings. The final part of this construct is the factor of "Public Policy". The formation and promulgation of public policy is most often the realm of elected officials. Moreover, they form this policy with the resources that they have at hand, with which they are familiar. They often engage in policy formation dealing with Sustainable development without benefit of the underpinning Science of Sustainable Development and in some cases ignore it altogether. However, with careful analysis and

planning this sometime failing may be avoided. A Unified Field Theory of Adapted Space considers the elements of population (its size and distribution), spatial occupance (both contemporary and sequent human use), the individual's need to adapt space for daily living, and human purposes which are essential for the experience of place. This construct facilitates more fully, our understanding of how people in a particular place modify space to meet their particular needs. When linked to Ecological Footprint Analysis, there is for the first time, a powerful analytical suite for determining the requirements for sustainability generally and sustainable communities specifically. Thus, how a human settlement, regardless its size and its behavior modifies space over time, as well as the pattern and nature of its consumption of biophysical goods (food, fuel, and fiber), such behavior will determine whether or not a place, and its population are sustainable. The tools and ideas that are used to calculate and assess the sustainability of a human settlement are suggested to be Ecological Footprint Analysis and A Unified Field Theory of Adapted Space, as earlier set forth. Further, that the work of this research would be remiss if it did not take up the subject of energy, which is a critical component of what makes a community, city, region, or state sustainable, as well as livable.

Just as there can be no human settlement without water, so it must follow, that without energy, human communities are neither possible nor are they sustainable in the twenty-first century. It also follows, that this energy must be available, affordable, and sustainable. Such energy must also be carbon-free, to the extent that this feasible. As energy supply becomes increasingly problematic for human settlements, the limits of growth will be tested. This growing reality will greatly influence how people adapt space for a variety of human purposes.

As technology evolves, communities may not remain 100% dependent upon a centralized power grid, but rather have available to them, an onsite bundle of renewable and thus sustainable energy sources, and the technologies to utilize such energy sources. These may include Photovoltaic Cells, the Wind, Methane Generators, and Proton Exchange Membrane Fuel Cells. It should be noted in this regard, that Germany has become a leader in renewable energy technologies. It is the world leader in the manufacture and sale of photovoltaics. For example, Germany's photovoltaic market grew 53% to 837 megawatts in 2005, which corresponds to a 57% world market share. This market level is eight times larger than the market share held by the United States. By comparison, beyond Germany, even Japan's 14% PV growth took it to only 292 megawatts, (Future Pundit: "Rapid Growth In Photovoltaics Demand Driven by Germany," 2006). This article may be found at

[www.futurepundit.com/archives/003363.html](http://www.futurepundit.com/archives/003363.html)

#### 4. THE PUBLIC POLICY ISSUE

Once policy makers embrace the science of sustainable development, and when ecological foot-printing becomes an integral component of the planning process, these agents of government will find many reasons to brand the programmatic elements of sustainable development as their own. Early program elements such as sustainable tourism should be viewed as a bridge to a more enduring local, regional, and national, sustainability. At this time, however, more extended sustainable development initiatives have yet to emerge. Smaller nations must take special care, as policy-makers act, under the rubric of Sustainable Development. Countries that have recently emerge from a watershed of national upheaval, such as the Republics of Serbia and Montenegro must take special care, because of their unique risk exposure to the pressures of globalization, which has its own set of imperatives and which often conflict with the needs and concerns of smaller nations. First principles should be "do no harm" which strongly suggests caution in the formation of national development policy.

#### *A Brief Account of Sustainable Communities*

The United Nation's recent 2006 report for sustainable development in both Serbia and Montenegro is probably the most extensive report on sustainability for this part of the former Yugoslavia that has yet been written. However, the contents of these reports do not represent an answer to the question of facilitating the creation and maintenance of sustainable communities in this part of Europe. The "Assessment of Development" reports for Serbia and Montenegro address only the following areas:

1. Introduction to the work of the report.
2. National Challenges and Strategies.
3. UNDP in Yugoslavia.
4. Assessment of Development Results.
5. Management of UNDP Assistance, and
6. Conclusions, Lessons, & Recommendations.

To make this information useful in the support of a stratagem or strategies for sustainable communities, one must examine human communities both before and since the onset of the industrial revolution and the arrival of the modern nation state in the Balkans. Historically, Montenegro has been a land of kings, tribal allegiances, trade, revolution, resistance, subsistence agriculture, and national aspirations. However, in the opening decade of the twenty-first century, the more formalized issue of the sustainability of communities and the nation have become paramount, in contrast to the social,

cultural, political, and economic issues of past centuries. People must now ponder, how does a small and compelling culture navigate a rapidly globalizing world? This is neither an easy or straightforward question to answer. Recently, however, the government of Montenegro let it be known that its stratagem for a sustainable Montenegro will be via Sustainable Tourism. As a matter of policy, sustainable tourism and sustainable communities have now been wed. This can be a fruitful approach, if and only if, it leads to a more broadly based approach to sustainable development. It must be locally based and at the same time aligned with regional and global sustainable development goals, as far as that may prove to be feasible, and which is in the best interests of the people of Montenegro.

The government of Montenegro now believes that sustainable tourism in Central and Northern Montenegro, as initially focused on the Durmitor Region, is the way forward in the confrontation of poverty, unemployment, environmental protection and/or degradation issues, (UN Development Program Report (UNDP) and Ministry of Tourism, "The Economy and Environment for Sustainable Development in Northern and Central Montenegro, 2004, 2005, 2006"). Tourism, sustainable or otherwise, tends not to be a value added activity. It is very much akin to a special form of resource extraction. As such, it can be subject to the vagaries of globalizing economic cycles. Thus, when tourism is good it is very good, when it is not, those dependent upon it are not. Because Montenegro is a relatively small country, tourism, even sustainable tourism, contains within it, the very real seeds of risk that can transform an authentic culture into an ersatz cultural theme park. This must be rigorously guarded against.

### 5. CONCLUSION

The issue of sustainable development has become a contemporary public imperative. For much of the former Yugoslavia, the efforts of Montenegro, which have been aimed at sustainable development, may point the way forward for all, provided Sustainable Tourism leads to a more enduring mechanism that will facilitate sustainable communities. However, the there are always unintended consequences that may derive from Sustainable Tourism. What then lies beyond sustainable tourism? The key to what lies beyond may be the factor of Smallness. Smallness in this context refers to a population that has endured, and which occupies a geographically diminutive physical region that is unique. It is population capable of progressively engaging, with minimal bureaucracy, developmental initiatives that will lead to sustainable/livable communities. With a population of approximately 630,548 persons, within an area of 13,938 kilometers, Montenegro meets the definition of smallness. Thus, by being

comparatively small, Montenegro possesses the potential to be nimble, resilient, and ingenious, which are first principles of authentic sustainable development, as it was originally envisioned, rather than the bureaucratized exercise of governmental power that it has somehow become today. Therefore, to successfully concretize these qualities, leaders must stress localized development that is doable and which can be easily aligned with wider scale sustainable development initiatives. The temptation to revert to the old Soviet-style approach may be comfortable for some and in like manner, they should not swallow completely, the so-called "Free-Market Model". However, without a national ecological footprint accounting program long-term sustainable development and creation of livable communities will be greatly inhibited, regard-less the direction policy makers may decide to take. In closing, it will be the reader's job to agree or disagree with the contents of this paper, its style and findings, which are perfectly acceptable, so long as a constructive dialogue emerges in the wake of this very brief but hopefully, evocative work.

### ACKNOWLEDGMENT

The author would like to acknowledge the following individuals for their help, encouragement, and assistance in the development of this paper:

1. Professor Veljko Milutinovic of the University of Belgrade.
2. The Late Dr. Troyt York who passed away this year and who was for many years the driving force and president of The American Institute of Urban and Regional Affairs.
3. Those professionals, academics, and scholars who took the time to constructively review this paper.

### 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] 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* 38 (1), 25-45.
- [3] Lenzen, Manfred, Mathis Wackernagel, Diana Deumling, Bonnie Lauck, 2005. „The Ecological Footprint of Victoria," ISA University of Sydney, Global Footprint Network, EPA Victoria.
- [4] Loh, J. and Wackernagel, M. (ed.), 2004 Living Planet Report 2004. Gland, Switzerland, World-Wide Fund for Nature International (WWF), Global Footprint Network, UNEP World Conservation Monitoring Centre, Gland Switzerland.
- [5] Luck, M., Jenerette, G. D., Wu, J., Grimm, N., 2001. „The urban funnel model and the spatially heterogeneous Ecological Footprint", *Ecosystems* 4, 782-796.
- [6] Rees, W.E. and Wackernagel, M., 1999. "Monetary Analysis: Turning a Blind Eye on Sustainability", *Ecological Economics* 29, 47-52. August 2004).
- [7] 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.
- [8] Rees, W. E. 2003. "Understanding Urban Ecosystems: An Ecological Economics Perspective", Chapter in Alan Berkowitz et al. eds., *Understanding Urban Ecosystems*. New York: Springer-Verlag.
- [9] Wackernagel, Mathis, 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.
- [10] 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.
- [11] 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.