

“LIVING IN REACH OF HUMANITY’S LIFE-SUPPORT SYSTEM”

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ABSTRACT:-

The paper addresses the state-of-knowledge of complex adaptive systems -- including their operation via cycles of innovation and coadaptation -- to sustain continuous, whole-system complexity and full-functionality. Emerging understanding of how humanity can live gratefully inside advanced adaptive systems (Planet Earth, ecosystems, cities, etc.). Strategies of Appreciative Inquiry – as the model for decision-making and strategic change -- that provide the data needed to live appreciatively, co-adapt with complexity, and thrive by living within complex systems. Explores the integrative management of energy, water, and food systems –WEF Security Nexus -- as the catalyst for living within complex systems; and how integrative management builds self-reliance and local eco-entrepreneurs essential to achieving the global goal of sustainability. Overview of Sustainable Communities Institute’s (SCI) application of knowledge about complex systems, living appreciatively, and AI strategies to help communities interconnect sustainability’s triple bottom line -- ecological, social and economic -- with appreciative system dynamics, to empower communities to thrive by living sustainably. How SCI facilitates an appreciation of ecological systems as primary human supports, infrastructural systems as secondary supports, and the built-environment as tertiary supports; and sustainable development as a synergy of the three to sustain full-functionality of the complex system upon which we rely. Overview of SCI projects including ones focused on optimizing the WEF Security Nexus and others focused on enhancing the ability of a key system – e.g., food system -- to catalyze community change to thrive in the current context of accelerating system change. Concludes with a discussion of new potential unleashed by integrative managing the WEF Security Nexus and the three levels of human supports as the catalyst for living sustainably; tools for assessing the degree to which this change is occurring, and adaptive processes for facilitating the emergence of community self-reliance and the ability to thrive during the current turbulent time of

complex system change.

KEYWORDS:-

Complexity; Appreciative system; Appreciative Inquiry ; WEF Security Nexus; Self-reliance; Eco-entrepreneurship; Thriving; Life support system; Food system; Emergence.

1. Systems and Complexity:-

Living within humanity's life support system is about learning to live within Planet Earth as a complex adaptive system [1]. It is also about learning to live as what Erich Jantsch called an appreciative system that realizes humanity is the key "unique device for concerning reality in whose shaping.....(he or she) is actively and creatively participating" [2]. Living within SystemsTM means that humanity lives within systems that are diverse in nature yet highly interconnected in functionality. These include static systems; and those that are dynamic and sustain themselves through regeneration and change over time. It also includes systems that are simple in their interconnectivity of parts and behaviours; and complex adaptive systems that are sophisticated in number and depth of interconnections, highly dependent on these interconnections for functionality, and dependent on co-adaptation of parts and behaviors to sustain full-functionality [3]. For about 70 years, human consciousness has been evolving from a mechanistic view to a complexity-science understanding of systems, including complex adaptive systems that operate through cycles of innovation and coadaptation, and depend on deep connections to sustain complexity, continued health and full functionality of the system and its subsystems. This 70-year evolution is nicely summarized in the Complexity Map [4], Figure 1.

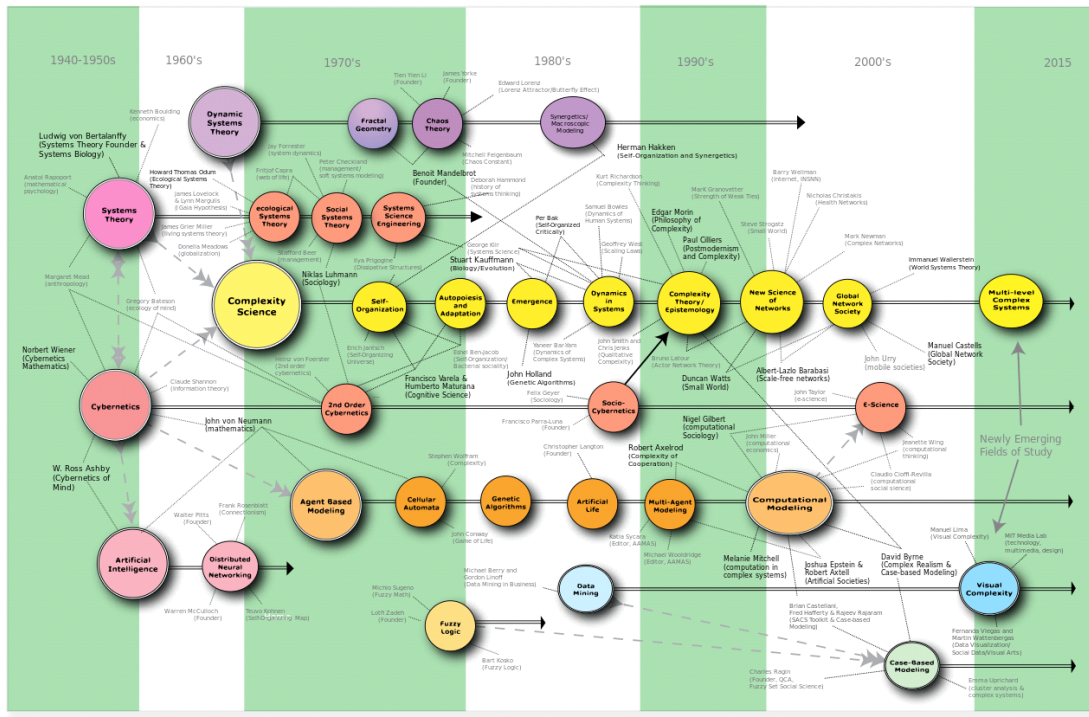


fig. 1

2. How Complex Adaptive Systems Work:-

Complexity-science tells us that to live within humanity's life-support system we must appreciate and help sustain system complexity. We contend herein that to do so, we must first understand the dynamics through which complex systems function. While the list could be exhaustive, we see the following as essential to understanding how complex adaptive systems work. First, they function through interconnected life-cycle flows and sustain themselves through whole-system renewal. Second, they function through deep Interconnections or parts and interrelated behaviours. Third, they function through the co-adaptation of parts and relationships within the system, its subsystems and with other complex systems with which it is co-adapting. Fourth, complex adaptive systems function as systems within systems (systems and subsystems). Fifth, they progress to deeper interconnectivity and fine-tuned relationships. Sixth, complex adaptive systems self-organize, self-regulate, and self-manage within limits; but cease to fully self-

organize, self-regulate, and self-manage when conditions change profoundly from those within which they co-adapted. Seventh, these systems behave profoundly different within the conditions within which they co-adapted, than they operate outside these conditions: within the co-adapted conditions they will tend to operate in dynamic equilibrium with all parts continuing to co-adapt and with fairly predictable behaviours; but outside co-adapted conditions they can shift into a dissipative or emergency mode of operation. In this mode, the complex adaptive system can change profoundly and unpredictably as it co-adapts with the new conditions. Based on resident complexity of the system and its ability to co-adopt, emergence to this new co-adapted system could be at a higher level or a lower level of complexity, bio capacity and whole-system functionality.

3. Planet Earth as Complex System:-

The current understanding of complex adaptive systems is that the Universe has progressed through two major transformations [5]. The first -- physical complexification -- transformed the Universe from a cosmic soup into the physical complexity of stellar clouds, stars, planets, galaxies, and other components of the physically complex Universe. The second -- ecological complexification -- transformed Planet Earth from a grey orb into a bioregional complex planet and highly productive living systems. This ecologically transformed Planet Earth has the immense complexity and deep interconnections needed to harvest something as low in energy as photons of light, concentrate this energy via living system processes, and use this energy to transform a grey planet into one teeming with life. This ecologically transformed planet also developed the complexity needed to sustain the life-support systems upon which humanity and other life-forms depend for survival. This includes continuous and non-interrupted regeneration of the clean air we breathe, clean water we drink, and productive soils in which we grow food and fibre. And in reality, humanity really has no other way to produce these resources. Non-living systems introduced by humanity to provide these essential resources do so with a net loss, rather than full-regeneration, of humanity's life-support system.

4. Living within Complex Systems™:-

If humanity is to live within its basic life support system we must plan, design and operate our human systems (energy, transportation, water and wastewater, food production, manufacturing, communities) to partner in nature's regenerative systems. We must appreciate that truly thriving into the future depends on sustaining the complex, coadapted and regenerative systems that transformed Earth from a gray planet to an ecologically productive one. We must, in short, play a co-adapted role in helping sustain the highly productive resource- and life-renewing systems that sustain the complexity needed to convert something as low in energy as photons of light into living systems that concentrate this energy biochemically and use this concentrated energy to create bioregional diversity, and to continuously regenerate living systems at higher levels of complexity, organization, integration, and productivity. We must appreciate that if humanity fails to allow the complex system to sustain its complexity and co-adaptedness and if we make decisions that push Planet Earth beyond its dynamic equilibrium and ability to co-adapt at the rate of system change, the complex adapted system upon which we depend will shift from a regenerative state to a degenerative one. The system will renew itself but at a less complex and less co-adapted level. It will be less able to sustain its co-adapted complexity and bio capacity.

Since we have no other way to renew the bio capacity previously provided by this complex primary life-support a system, the contention herein is that humanity has no path to sustainability except to appreciate and collaborate deeply with regenerative and life-sustaining ecological systems, i.e., the be a system that lives appreciatively in the complex system it helps create [6]. We must realize that not only ecological systems but also human-created systems including cities and software that learn are complex systems, rather than simple ones. We must understand that for centuries, humanity has been replacing ecological systems with "novel" landscapes that lack the co-adapted complexity needed to fully-regenerate and sustain complex system functionality and productivity [7]. We must realize that there is a current and profound need to develop the "complexity knowledge system" needed to stop replacing Planet Earth's complex co-

adapted ecosystems with novel landscapes. We need to also learn to manage, plan and design local, regional and global landscapes, including their ecological, hybrid and novel subsystem so as to reverse the trend from degenerating systems into a new trend of helping systems emerge to a higher level of regeneration and functionality.

5. Facilitating Community Shifts to Living within System TM:-

To begin transitioning to Living within systems, communities must understand that different economic and community strategies vary significantly in their ability to help sustain system complexity, co-adaptation, and ability to deeply inter-connect within the complex local, regional and global system. Communities must also appreciate the embedded nature of humanity's three-level support system: 1) complex adaptive natural systems as primary human supports, 2) urban, rural and community development systems and infrastructure as secondary human supports and 3) built-environment as a tertiary human support system. Communities must shift to decisions that appreciate complex adaptive systems; design infrastructural systems to positively interconnect with these complex systems. And communities must construct and operate built-environments with the complexity needed to transform the current aggregate of ecological, hybrid and novel systems into fully-regenerating systems. By so doing, they can reverse the trend from degenerating complexity and reactivate the emergence of higher levels of complexity, regeneration, co-adaptation, and full-system functionality and productivity.

Communities must also plan, design and operate their infrastructural systems -- energy, transportation, water and wastewater, food production, manufacturing, communities – in ways that appreciate, and collaborate with, nature's regenerative systems. By so doing, they can begin to transform built-environments into complex and highly-productive integrated water-wastewater-energy-food-building-landscape systems [8]. The first step to achieving this transformation is for communities to embrace Appreciative Inquiry [9] as a model for decision-making and for strategic change that can provide the community with information needed to live appreciatively, co-adapt with complexity, and thrive by living within their complex regenerative systems.

6. Living within Systems TM as a Pathway to Building Resilience, Self-Reliance, and a New Economy [10]:-

There is a growing awareness of the increasing at-risk status of communities. Various movements, such as the Transition Movement, seeks to help communities move beyond this at-risk condition by building an understanding of how, in this period of rapid change, communities can transform themselves for greater resilience [11] and to become anti-fragile [12]. Others speak of how this change is building a profoundly different new economy. Whereas the old economy focused on growth via processes that converted resources to waste, and that tended to reduce complexity, the new economy seeks to increase resource efficiency and reduce waste and offers potential to increase system complexity and co-adaptation. Bill Mckibben speaks of this new economy in terms that embrace sustainability, resilience, self-reliance, and ant fragility, and refers to this new economy as a “deep economy” [13]. In this deep economy, regions build prosperity through self-reliance. They produce their own food, energy, production systems, quality of life, and human satisfaction.

The Sustainable Communities Institute (SCI) takes a deep economy approach as it helps communities appreciate their complex local and regional systems, integrate with this complexity, and grow their local and regional economies within the life-cycle flows of the complex system. SCI sees this as the most viable pathway for communities to move beyond their at-risk condition and to truly thrive. SCI helps communities understand how, in this period of rapid change, they can transform themselves by learning to appreciate their three levels of human support systems (ecological, infrastructural, and built-environment) as nested sub-sets of a deeply interconnected life-support system. SCI helps communities integrative manage this three-level human support system. At the most basic level, communities learn to integrate decisions to enhance the performance of the complex system upon which they depend. Then they learn how to co-manage and integrate their infrastructural systems (for energy, water, wastewater, transportation, health, social, communication, etc.) with each other and with the complex system so as to enhance the ability of the community and residents to thrive now

and into the future. Communities also learn how to build their self-reliance and to facilitate the emergence of a new generation of local eco-entrepreneurs essential to thriving. In short, SCI applies knowledge about complex systems, living appreciatively, and appreciative inquiry to help communities sustain their continuous full-system functionality; and thereby thrive within sustainability's triple bottom line (ecological, social, economic) by living appreciably within the complex system upon which they depend. The Sustainable Community Institute also helps communities build resilience and, beyond resilience to truly thrive. SCI believes that to thrive, communities must become self-reliant and regenerative. SCI also sees global and national systems beginning to collapse because these systems are unsustainable in the new economy of increasing efficiency of resource utilization and decreasing waste generation.

7. Managing the Water, Energy, and Food Security Nexus (WEF Nexus):-

Most recently, humanity has been building its appreciation of the deep interconnections of three key systems -- water, energy and food – and the past failure to effectively manage the three as a major reason for humanity currently being at-risk. The importance of these interconnected and co-adapted systems is reflected in the rapidly growing references to, and concerns about, the Water, Energy and Food Security Nexus [14, 15]. The Sustainable Communities Institute sees co-management of these three key systems as essential to a sustainable future. We help communities become appreciative systems [16] that integrative co-manage their energy, water, and food systems in ways that can transform the community to living within the complex system upon which it depends. In terms of the three-level human support system -- ecological, infrastructural, and built-environment – [17] SCI helps communities embrace complexity to deeply interconnect ecological, infrastructural and development systems, and replace siloes decision environments (e.g., municipal departments) with more integrative whole-system management and collaborative decision-making strategies.

8. SCI Projects as BMP for Living within Systems by Managing the WEF Security Nexus:-

The Sustainable Communities Institute pursues six principles to help transform communities. The first principle is to live within systems. The second is to optimize whole-system performance. The third is to build whole-system knowledge. The fourth principle is to build shared-consciousness and a collective-will to be sustainable. The fifth is to collaborate among local and global entities. And the sixth principle is to build full-spectrum capitals. Each of the following SCI projects pursues these principles and seeks to help a specific community thrive by becoming more self-reliant; optimizing its water, energy and food security nexus; growing the community's local economic multiplier [18]; building the local food system as the major spend for which they can become self-reliant and catalyse community change.

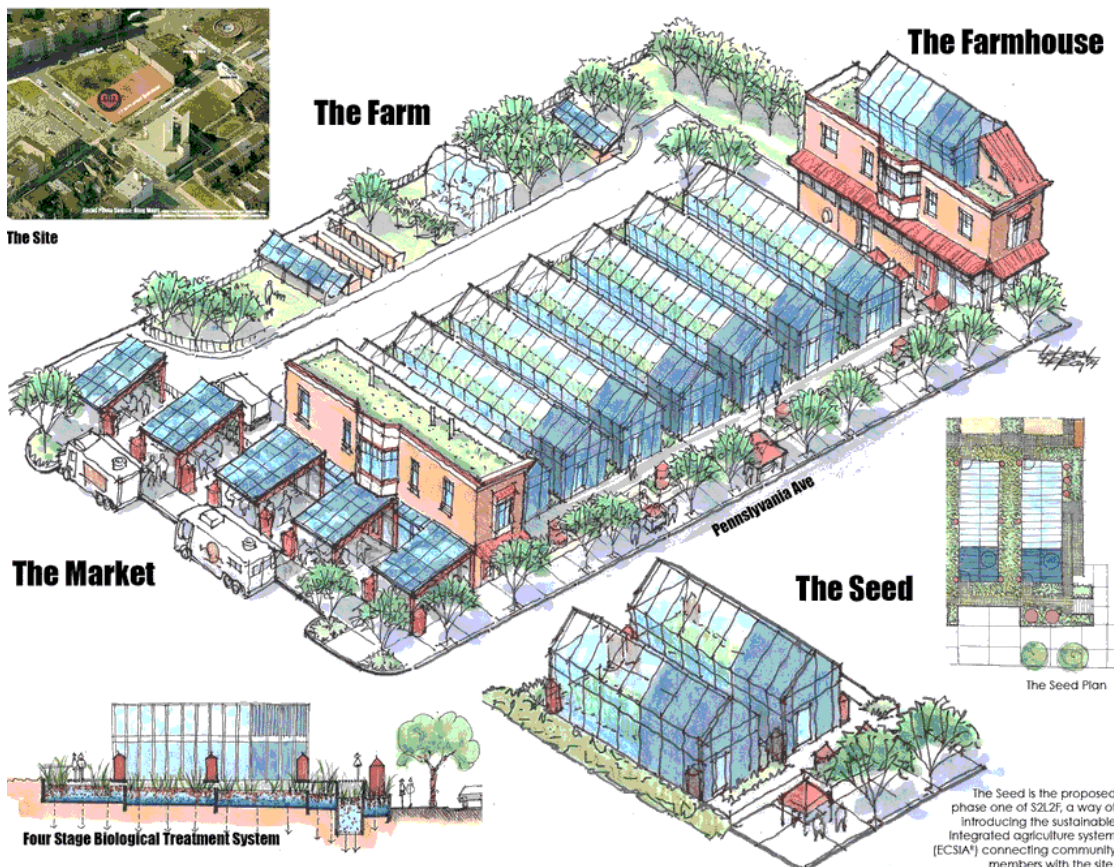
Each of these projects also grows from SCI's commitment to building a network of Sustainable Living and Growing Centres TM (SLGC) that co-manage food, water, and energy in ways that synergize people, place, and prosperity. The heart of each SLGC is the Environmentally Controlled Sustainable Integrated Agriculture (ECSIA®) system that produces more food than traditional farming practices. It produces fresh, healthy, organic food in a system that conserves water and reduces waste. It can provide quality food, economic opportunity, efficient energy, water, land and resource use, and enhanced ability to thrive.

8.1 Baltimore Urban Farmstead Initiative (S2L2F):-

The Baltimore Urban Farmstead Initiative, Figure 2, was submitted to the Baltimore Growing Green Initiative, a competition that aimed to transform vacant lots in Baltimore through projects that benefit neighbourhoods and communities while also treating storm runoff. The design competition, sponsored by the Mayor's Office, the U.S. Environmental Protection Agency (EPA), and the Chesapeake Bay Trust, was part of the Growing Green Initiative (GGI), a City-led effort to use sustainable, innovative, and cost-effective practices. The site is just under an acre of vacant and underutilized land, currently under the care of Strength to Love II (New born Community of Faith) through the Adopt-A-Lot program. The site is close to important community partners – Martha's Place and Jubilee Arts -- both under the umbrella of New born Holistic Ministries (NHM). The tar-

geted partners for the Strength to Love II Farm are the residents of Martha's Place as the first "farmers" who will be managing and training on the initial ECSIA® system. The project goals are to develop a ½ acre prototype urban farmstead as food production, preparation, and distribution hub; to supply major portions of the food needs for Martha's Place; to create micro-business opportunities; and to transform a vacant property into a fully-functional and integrated system. The food produced will be consumed at Martha's Place and Jubilee Arts. The S2L2F begins with the seed that demonstrates the projects potential to empower community residents to become the change agents needed to provide new hope and the foundation to rebuild a local economy that benefits the community first. It is a triple bottom line approach addressing people (community), environment (water cleaning) and economics (microbusinesses).

Baltimore Growing Green Initiative



The Seed is the proposed phase one of S2L2F, a way of introducing the sustainable integrated agriculture system (ECSIA®) connecting community members with the site.

fig. 2 Baltimore Growing Green Initiative.

8.2 Cintas Muncie Maker Hub, Muncie, Indiana:-

This project, Figure 3, is the proposed second-life strategy for an 83,000SF abandoned building that formerly housed a uniform cleaning company. Building on the long tradition in Muncie of local food production, fermentation, food canning, and water management, this project creates local self-reliance and new economic hub for the community and for the East Central Indiana region. The project is planned as a place for growing eco-entrepreneurs in renewable energy, fermentation arts, building arts, fine arts, etc. It is also seen as a repair and DIY hub, local preservation and restoration trigger, and eco-entrepreneurship incubator. The proposal also takes advantage of Muncie as the national home for model aircraft aeronautics; and the potential to be the national maker space for custom and prototype model aircraft, drones, boats, and automobiles. The Maker Hub project is proposed as an educational trigger, with a mission to grow new local eco-entrepreneurs by providing opportunities, supports, and programs. The hub could also include training for high school students to become new economy eco-entrepreneurs. The Maker Hub project is also proposed as a neighbourhood economic development catalyst, and as a community resilience and self-reliance trigger. It was also envisioned as the launch project for the proposed Muncie Maker District. The Maker District proposal sought to re-energize the connection of downtown Muncie with the nearby White River Greenway and Ball State University beyond.

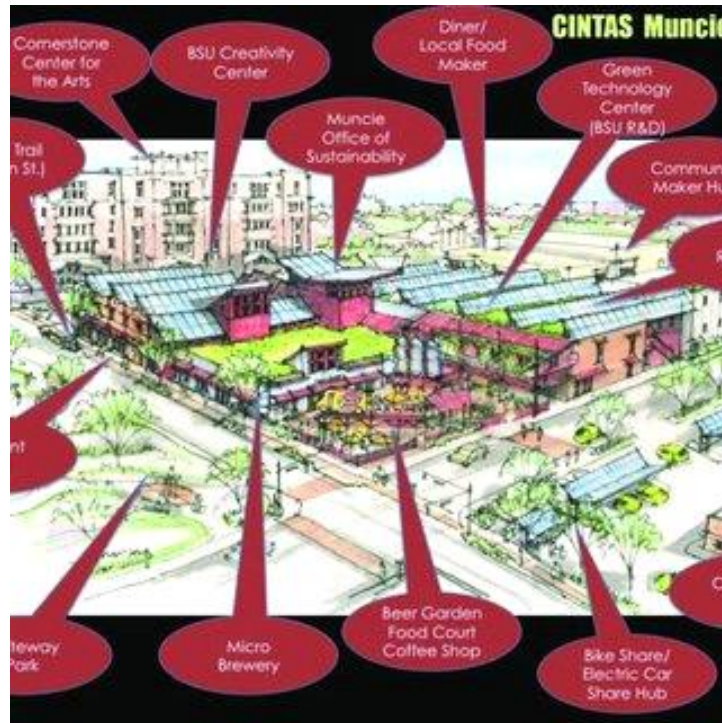


fig. 3 Cintas Muncie Maker Hub, Muncie, Indiana.

9. Living within Humanity's Life-Support System as Complexity and Productivity Catalyst:-

In closing, this paper proposes living within humanity's life-support system as a strategy for triggering the emergence of new system potential. We contend that this new potential can be unleashed as a community integratively manages the water, energy, and food security nexus in ways that sustain the continuous and non-interrupted full-functionality of the complex system upon which the community depends to thrive. We see potential also emerging from co-management of the three levels of human supports as a catalyst for living sustainably. We see this new potential further promoted by co-adapting urban and community development processes and re-provisioning the community in ways that build community self-reliance and the ability to thrive. We call for the implementation of a program of whole-system diagnostics that assess the degree to which decisions promote continuous and non-interrupted functionality of the complex

system and ability of the community to thrive now and into the future; and for these assessments to be used to adjust future decisions to enhance whole-system performance. We see co-management of key systems, community re-provisioning, whole-system diagnostics and learning from these diagnostics how to co-adapting decisions as crucial elements in a process for a community to learn how to live within humanity's life-support system so as to build community resilience, and beyond resilience to thrive now and into the future.

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