Co-creation of Sharable Visions among Diverse Stakeholders for Complex Social-Ecological System Management

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The context and the content of environmental knowledge as a fundamental block or our social organization remains rather elusive. For the most part the contextual characteristics of knowledge within our social, historical and evolutionary organization of our societies is difficult to grab, conceptualize and operationalize within our every-day social construction of reality. The apparent oddity of this proposition becomes clearer when we are asked to define the context of our social knowledge in relation to information as we perceive it within our contemporary environmental challenges and within our sociocultural and sociotechnical boundaries.

One of the arguments in this study is that knowledge, at least in the content and context of information-intensive and information-driven social-ecological realities, represents a stand-alone complex adaptive system of relationships and associations. Such a complex adaptive knowledge system (CAKS) can self-organize, evolve, and transform its roles and functioning well beyond the boundaries and limitation of its constituent biophysical realities and social system organization within which it functions. It is our proposition that, while indeed such coupled social-ecological systems might have a significant influence on the structure and functioning of the knowledge system itself, they only do so by acting as one of the fundamental forces and drivers of the knowledge system. It is thus apparent that such social-ecological self-organizing knowledge system represents and critically depends upon our shared vision and social perception of reality.

This study investigates the structural characteristics of socially-integrated environmental knowledge. The CAKS' functioning follows the ways in which such knowledge is acquired, represented and acted upon. In turn, it depends on the ways we organize and structure knowledge in our social-ecological interactions and in our collective mental models. Environmental knowledge as a primal social construct is influenced by the ways we interact with our natural environment; our core and intrinsic set of values; our norms; our institutional arrangements; our social learning capabilities, and; the level and degree of our scientific understanding of the functions of our natural world and ecosystems. Knowledge is thus more than mere information processing. It integrates and embeds both qualitative and quantitative characteristics. Such characteristics in turn allow us to assign value and evaluate judgments, impose hierarchies and systemic structures, and interface them with ways to link knowledge to collective action, behavior and mental modes of functioning. Parts of our knowledge systems exist within our core social organizations and institutional structures, but other parts are well integrated within our cultural, sociological, psychological and socioeconomic composition of our local societies.

Social narratives represent one of the primary pathways in which we construct and represent our collective knowledge in our social interactions. They often take the form of formal and

structured narrative storylines with cohesive meaning. Such is the case of formal institutional roles and arrangements. Similarly, often they can be a part of our informal system of social interactions such as discourses and other form of dialogical (multi-way) interactions. Narratives represent a dominant form in the ways we learn, make decisions and socially interact within and across our organized groups and communities.

If we were to study the structure and characteristics of CAKS in our local societies, is therefore paramount to investigate the role of social narratives in the construction, representation and communication of environmental knowledge in social settings and situations. As knowledge structures and systems themselves represent latent social concepts and thus, cannot be directly assessed, we need to use social narratives as heuristic tools for methodologically tapping into our knowledge systems.

Graph structures and networks extracted through latent semantic analysis often reveal a host of associative, non-causal relationships in environmental knowledge structures and mental representations. These are, more often than not, hidden within our discourses and mental inferences. Knowledge-relevant associative mechanisms and relationships are not necessarily product of intentional mechanistic forces, but rather represent structures and forms of a normative mental dimension. Such normative function of environmental knowledge include for example, associations that emerge as direct or indirect implications of our dispositions (attitudes, beliefs, norms and intensions) rather than intentional and purposely constructed associations. Therefore, semantic network analysis allow us to reveal a number of "hidden" or dormant relationships that while playing a paramount role in our inferences, they rarely render themselves subject to direct quantitative or qualitative inferential measurement and assessment.

Inferential explorations such as these can go beyond the nominal inference of our statistical quantitative and psychometric methods and tools of measurement. The semantic inference enables investigative inquiries and statistically robust testing of both the relative prevalence of concepts or grouped categorizations of such concepts in our mental models, and of the relative degree of associative similarities present in our shared or collective discourse. By doing so, we often discover that the strength and resistance of knowledge and ideas matters in our socially constructed modes of reality. Furthermore, we discover how the elements and structure of our environmental knowledge is constructed and functions as a system. Exploring and investigating the compositional magnitude and prevalence of knowledge elements and domains can explain what is important (and perhaps how important it is) in our social-ecological knowledge systems. Be as important as it may, such exploration tells us little about the structural characteristics and the dynamics of the system of these relationships in influencing social functioning and collective decision making. For the latter, one needs to look on how the presence and functioning of different structural and associative mechanisms of knowledge systems have an impact on the systemic social-ecological behavior of our knowledge systems as a whole. Fundamental social science questions related to the structure and functioning of our social systems goes beyond

simply enumerating and accounting of factors and variants of knowledge composition; it requires the investigation of some form of knowledge engineering complexity of such knowledge system.

In many instances latent semantic analysis reveals the presence and structural dynamics of our environmental knowledge inference and. In other words, scale abstractions of the semantic system contains within it the associative and structural properties of all lower-level scales embedded within the system. In investigative analyses of social-ecological systems and their relationships scale considerations are extremely important and can affect the outcome of our analysis.

Five of the most important or useful properties in semantic network analysis of social-ecological knowledge systems are found to be: (a) the ability to explore inferential and associative complexity; (b) semantic isomorphism; (c) normative explorations of social-ecological knowledge structure; (d) exploring associative similarities related to systemic functioning of knowledge, and (e) scale invariance properties.