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Stewarding Aliveness in a Troubled Earth System

Petra Kuenkel
Co-founder and Executive Director, Collective Leadership Institute, Germany;
Member of the Executive Committee, Club of Rome

Sandra Waddock
Professor of Management, Galligan Chair of Strategy, and Carroll School Scholar of Corporate Responsibility, Boston College's Carroll School of Management, USA;
Councilor, SDG Transformations Forum

Abstract

The state of the world suggests we are at a crossroad—the next 15 to 20 years will have a decisive impact—more than in any period before—on the conditions of life on Earth. Rising awareness about the urgency of dealing with climate change is symptomatic of an increasing concern for the future of humanity and our life support system. Most approaches to solving the global challenges, however, stay within a framework of thinking that calls for technical and administrative solutions only. The questions regarding the underlying conceptual foundation of how transformations are approached are seldom asked. Yet, if—as many scientists predict—humanity needs to rise up to our capacity for a stewardship approach to stabilize the trajectories of our planet, it becomes clear that we need to become more humble partners of life's potential to renew and replenish. This article argues that understanding what gives life to systems can become a guiding force for approaching the large systems change we so deeply need. It explores the conceptual foundations for principles that govern socio-ecological systems in support of what the authors term 'systems aliveness': the capability of small and larger systems to gain resilience, regenerate and maintain their vitality in mutual consistency with other systems. The idea is that the capacity to create the transformative change such as that envisioned by aspirational goals like the United Nations' Sustainable Development Goals (SDGs) can be enhanced by understanding such principles, and translating them into the design and implementation of collective action. The paper draws from multiple, interdisciplinary sources to build the conceptual scaffolding and the academic support for the six principles: intentional generativity, mutually consistent wholeness, permeable containment, emergent novelty, contextual interconnectedness with requisite diversity, and proprioceptive consciousness (Kuenkel, 2019; Waddock & Kuenkel, 2019). We argue that applying these six principles to transformation initiatives potentially provides a pathway to a new civilization with human and ecological flourishing.

1. Stewarding Aliveness in a Troubled Earth System

The state of the world suggests we are at a crossroad—the next 15 to 20 years will have a decisive impact—more than in any period before—on the conditions of life on Earth.

Rising awareness about the urgency of dealing with climate change is symptomatic of an increasing concern for the future of humanity and our life support system. The climate crisis has made its way into the headlines of international news agencies. But the many related and interdependent sustainability issues such as water scarcity, deforestation, ocean pollution, topsoil erosion, and growing inequality, among many others, only slowly gain the attention they require. They are often labelled as intractable or 'wicked problems' (Churchman, 1967; Rittel & Webber, 1973; Waddock et al., 2015).

Addressing such issues has been articulated by the United Nations' *Sustainable Development Goals* (SDGs, 2017) in the 17 aspirational goals for the world to achieve by 2030. However, most approaches to solving the global challenges stay within a framework of thinking that calls for technical and administrative solutions only. The questions regarding the underlying conceptual foundation of how transformations are being approached, are seldom asked. Yet, if—as many scientists predict—we need to rise up to our capacity for a stewardship approach to stabilize the trajectories of our planet (Steffen et al., 2018) we need to become more humble partners of life's potential to renew and replenish.

This article argues that understanding what gives life to socio-ecological systems can become a guiding force for approaching the large systems change we so deeply need. It explores the conceptual foundations for principles that govern socio-ecological systems in support of, what the authors term *'systems aliveness': the capability of small and larger systems to gain resilience, regenerate and maintain their vitality in mutual consistency with other systems.*

The idea is that the capacity to create the transformative change such as that envisioned by aspirational goals like the United Nations' Sustainable Development Goals (SDGs) can be enhanced by understanding such principles, and translating them into the design and implementation of collective action. In developing these principles, we draw from multiple, interdisciplinary sources that build the conceptual scaffolding and the scientific support for widening the understanding of what helps systems into aliveness (Kuenkel, 2019; Waddock & Kuenkel, 2019). Applying these six principles to transformation initiatives potentially provides a pathway to a new civilization with human and ecological flourishing.

2. Understanding Systems Aliveness

Fundamentally, the SDGs (and the largest systems change initiatives) can be interpreted as an attempt to shift dysfunctional patterns of activity in human and socio-ecological systems towards more functional, more flourishing—or alive—patterns that work better for all, including living beings other than humans (Cooperrider, 1990; Cooperrider & Whitney, 2005; Bushe, 2011; Kuenkel, 2019). Most actors busy with the practice of managing change, however, understandably focus on the technical content of transformations only—be it reducing CO_2 emissions, creating legislation around climate-friendly behavior, or measuring of ecological footprints. While these tangible outcomes are important, the sole focus on technical solutions misses out on an incredibly important lever for change. Conceptually, but

often with little awareness, all technical solutions involve strategic interventions that help shift dysfunctional patterns of interactions—between people and between people and nature. They allow the system in change to become more alive (Kuenkel, 2019) by contributing to resilience, regeneration, and vitality of the parts and the whole. Systems aliveness (Kuenkel, 2019; Weber, 2016) or what Weber (2013) calls 'enlivenment' is arguably at the foundation of successful transformative change. More generally, successful systems—in the sense of sustainability—exhibit many features of aliveness.

A system is here defined as a set of interrelated elements that constitute a whole with structural or agreed upon boundaries, embedded in a larger whole. Depending on the level of focus, a system can be a geographical area, an ecosystem, an organization, or a nation-state. To understand how to achieve transformative change at scale, we need to understand how healthy systems operate.

Moreover, we need to understand what creates, maintains, or regenerates aliveness in systems. We can learn from natural systems such as forests or thriving ecosystems, and also from socially cohesive and well-functioning human systems. They all display certain mutually supportive characteristics that work together. It is time actors in transformative change made use of this knowledge to bring about the large systems change needed.

Systems aliveness can be defined as the capability of a system—small or large—to develop a sufficient degree of vitality and resilience as well as the ability to maintain and renew these in collaboration and interaction with other systems. Systems aliveness is always relational and interdependent. It emerges in mutual consistency with smaller and larger systems. With reference to a pattern approach, *systems aliveness* refers to a recognizable patterned process of *transformations* as well as a recognizable patterned outcome—*sustainability*. In human systems 'aliveness' is often palpable as generating vibrancy (Ritchie-Dunham & Pruitt, 2014), energy, and excitement about possibilities among participants.

In transformative large systems change that aims at 'alive' socio-ecological systems, the change ahead needs to be mirrored in the willingness to engage productively with different stakeholders to solve issues of common concern (Kuenkel, 2015). When the probability of contributing to 'systems aliveness' emerges, it helps actors to engage in the multitude of actions, activities, and initiatives necessary to effect such change.

This article looks at what would help us become aware of aliveness in systems and how we can become stewards of increasing systems aliveness. It argues that understanding principles of 'what gives life' to living systems, can inspire strategies for successful large system transformations.

However, large system change is composed of many smaller systems changes. By definition it has breadth and depth (Waddell et al., 2105). Breadth means it takes place at scale in emergent processes that can only be planned to a certain degree. It is inherently complex, occurring across multiple interconnected systems, sectors, or geographies and involving multiple actors. Depth means that it demands change at multiple levels of analysis,

altering relationships, assumptions, and activities of different actors and subsystems in fundamental ways (Waddell et al., 2105). Such change can at best be guided by vision or normative frameworks (e.g., the SDGs or COP21 agenda), or, as this article argues, it can be collectively stewarded using the occurrence of systems aliveness as guidance.

The scale, scope, and complexity of the current troubled Earth (Folke et al., 2010; Chapin et al., 2011) suggest that any attempts towards transformative change takes place in contexts that tend to be emergent, co-evolutionary, non-linear, multi-party, and inherently unpredictable in their outcomes since different parts of complex adaptive systems are interdependent, constantly in flux (dynamic), and interactive (e.g. Allen, 2000; Choi et al., 2001; Waddock et al., 2015).

From this conceptual background, it seems clear that in large system transformation efforts, numerous different actors are likely to take initiatives all presumably aimed at dealing with the problems, some of which will be coordinated and others not, and some of which will succeed and others not. In order to increase the likelihood of success, this paper argues that we need a better understanding of the foundational principles of 'what gives life' to systems. Such principles, which constitute a pattern of relational interaction, can help actors bring what architect Christopher Alexander (1979, 1999) called the 'quality without a name' to transformative system change and to ideas about how to develop flourishing socio-ecological systems more generally.

For an understanding of the relational nature of the principles, we render the concept of patterns crucial. 'Patterns of aliveness' are here defined as compositions of life-enhancing, interacting, relational mesh works of mental or physical structure in systems of any size, embedded in larger systems, in a transient, temporary state of dynamic balance at the edge of continuously emerging change. They are characterized and influenced by the quality of relational interaction between subsystem or systems properties that enhance the system's overall capability to stay alive, grow further, generate new life, and live in mutual consistency with larger systems.

This article argues that understanding aliveness and its patterned composition is central to conceptualizing transformative change in complex adaptive systems. Among the major roots of the intellectual foundation for principles of systems aliveness is Alexander's (1979, 1999) pattern language, which gives 'life' to architectural forms. Alexander's ideas are extended by Finidori and colleagues (2015) to pattern language 4.0, which explicitly applies the notion of pattern language to systemic change. Jane Jacobs' (1961) seminal urban studies work, *The Death and Life of Cities*, emphasizes what lives life in urban design. Work on the 'web of life' by physicist Fritjof Capra (1995, Capra & Luisi, 2014), Maturana and Varela's Santiago theory of Cognition (1987; 1991), Weber's (2013) integration of economic and biological systems theory that frames the concept of 'enlivenment,' and Swanson & Miller's (2009) explanation of living systems theory, among other sources identified below, are also major intellectual roots for the principles. Table 1 summarizes the principles and identifies the main sources used to develop them.

Table 1. Sources for System Aliveness Principles and Human System Characteristics
Source: Adapted from Waddock & Kuenkel, 2019.

Living Systems Principle	**Definition**	**Source(s) Used**
1) Intentional Generativity	Purpose or the urge that living systems have to continue into the future, including the capacity of natural systems to renew, replenish, and restore themselves in the process of staying resilient. Purpose or intentionality combined with generativity is a central aspect of living systems at all levels of complexity	Alexander (1979, 1999) Ericson (1953) Finidori et al. (2015) Fullerton (2015) Gleick (1987) Jacobs (1961) Jones (2014) Lorenz (1963) Maturana & Varela (1991) McDonough & Braungart (2010) Swanson (2009) Waddock et al. (2015) Weber (2013, 2016)
2) Permeable Containment	Systems need to have 'sufficient' definitional boundaries or 'enclosures' to create some sort of meaningful identity, in combination with a degree of openness to new inputs and outputs that allow for change and development because living systems need inputs of energy and other resources, while wastes sometimes need to be released to other systems (where they become new resources for that system), through permeable, but not completely open barriers.	Alexander (1979, 1999) Ashby (2011) Capra & Luisi (2014) Fullerton (2015) Jacobs (1961) Prigogine (1996)
3) Emerging Novelty	The capacity of systems to change and evolve as situationally appropriate, by growing, becoming more complex, developing new properties, or declining, changing and adapting through innovations, enabling forms of learning, invention, and similar processes that create novelty or innovation.	Capra & Luisi (2014) Fullerton (2015) Gilligan (1982) Holling (1973) Jacobs (2002) Kauffman (1995, 2016) Kohlberg (1976) Lovelock & Sahtouris (2000) Schrödinger (1992) Torbert et al. (2004) Weber (2013, 2016) Wilber (1998a, 2017)

4) Contextual Interconnectedness and Requisite Diversity	Different elements in any system are integrally and inextricably linked in symbiotic, interdependent, and dynamic relationships, recognizing the communication networks and feedback loops in living systems that enable the system to change and evolve in the process of emerging novelty. Sufficient variety of types, uses, sizes, and levels of entities enable constant (re-)balancing, renewal, regeneration, change, and dynamism, while maintaining system identity (permeable containment) over time.	Ashby (2011) Boisot & McKelvey (2011) Capra (1995) Capra & Luisi (2014) Folke, Holling & Perrings (1996) Fullerton (2015) Holling (1973) Jacobs (1961) Kuenkel (2015, 2016) Maturana & Varela (1987) Maurana & Varela (1991) Schrödinger (1944) Weber (2013)
5) Mutually Enhancing Wholeness	Living systems are integrated entities constituted of identifiable yet nested 'wholes' or holons (Koestler, 1968) that provide coherence and orientation, or mutual consistency (Sahtouris & Lovelock, 2000). Systems must be considered as wholes because they cannot be fully understood by being fragmented into their parts.	Alexander (1979, 1999, 2002) Ashby (2011) Bohm (1980) Fullerton (2015) Jacobs (1961) Koestler (1968) Lipton & Bhaerman (2009) Sahtouris & Lovelock (2000) Swanson & Miller (2009) Weber (2013) Wilber (1998a,b, 2017)
6) Proprioceptive Consciousness	The ability of humans to become aware of the emergence, evolution, and interdependence of systems in which they are embedded and to be aware of and reflect upon the self and the system as changes are made in the deliberate hope of improvement	Bohm (1980) Wilber (1998b) Wilber et al. (2008) Richards (2001) Kohlberg (1967, 1973) Kegan (1994) Meadows et al. (1972) Meadows (1999) Capra & Luisi (2014)

Basically, since 'life' is a biological process, we believe that the principles identified are integral to natural systems—and as the work on architecture and urban studies suggests, they can also be applied to the human systems on which large systems change focuses. We base our conceptual approach to an understanding of systems aliveness on the following propositions drawn from the literature sources displayed in Table 1.

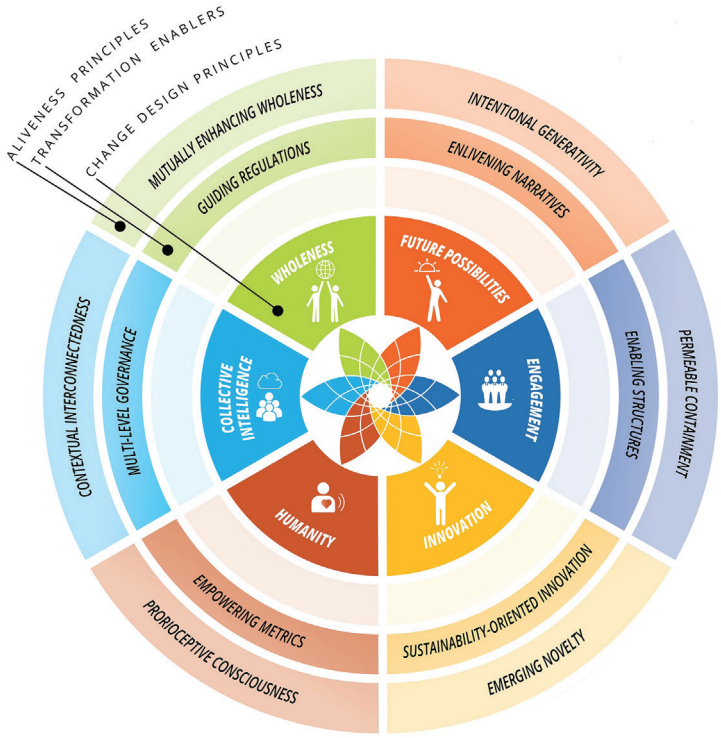
- The degree of aliveness in a living system is the result of a pattern of mutually supportive and reinforcing properties creating feedback-loops of communication in contextual interconnectedness. The emergence and the degree of aliveness come about as a result of this relational interdependency—in space, in interaction, in movement, in consciousness—in the form of patterned connectivity. This interconnectedness means that in a very real way the principles are linked and can only be teased apart conceptually.
- Systems aliveness is a consequence of living and non-living properties of systems in responsive interaction with each other. It rests on diversity in complementarity and reciprocity. Even under the most severe conditions of destruction, life has the inherent capacity to reconstruct 'patterns of aliveness.'
- Systems aliveness is also a result of a growing connectivity between fractals of patterns, which connect subsystems with each other and nested systems within larger systems. It rests on processes in dynamic balance that allow for creative and agile responses to disturbances and strive for perfection while never entirely reaching it.
- Human beings, like the rest of nature, are in the constant pursuit of 'patterns of aliveness'. They can sense or recognize 'aliveness' and consciously enhance it. The individual sense of aliveness and the overall aliveness of a human system are connected and can be consciously co-created.
- Systems aliveness can be recognized as the quality of a patterned composition of mental or physical structures in natural or human systems. The emergence of such a structure follows certain organizing principles. Human beings can steward systems aliveness.

3. Principles Enhancing Systems Aliveness

Principles can be thought of as fundamental truths or propositions that underlie beliefs, behaviors, or reasoning. Among other things, principles exemplify how natural phenomena work, and provide guidance about what is desirable and positive in a system, governing policies and objectives. Recent work has posited that there are six core principles for what 'gives life' to socio-ecological systems (Kuenkel, 2019; Waddock & Kuenkel, 2019), drawn from a wide variety of disciplines. These principles are: intentional generativity (purpose), permeable containment (boundedness), emerging novelty (novelty), contextual interconnectedness and requisite diversity (connectedness and diversity), mutually enhancing wholeness (wholeness), and proprioceptive consciousness (consciousness). In what follows we provide a sense of the intellectual foundations from which these principles are derived and suggest how they might be applied in the case of large-scale transformation efforts.

The interrelatedness between the principles and the applied strategies is captured in the stewardship architecture in Fig. 1.

Figure 1: The Stewardship Architecture (Source: Kuenkel, 2019)



These principles seem equally important and support each other. That said, they may or may not be inclusive of all possible characteristics that give life to systems, but they do represent a synthesis of major writings on different explications of 'aliveness'. They draw together what we believe are the central characteristics that observers and change makers of any flourishing system or systems change process need to understand and build into transformational change initiatives and that characterize healthy socio-ecological systems. While they may overlap and interact, there is enough differentiation among them to justify presenting them as six distinct principles.

3.1. Systems Aliveness Principle 1: Intentional Generativity

The first principle for what gives life its *intentional generativity* or the urge that living systems have to continue into the future, including the capacity of natural systems to renew, replenish, and restore themselves in the process of staying resilient. Purpose or intentionality

combined with generativity is a central aspect of living systems at all levels of complexity. For the design of transformative change in human systems, the principle of *intentional generativity* means to tap into the human desire to shape a better future collectively in communities of different scales. The human desire to shape future collectively is invigorated by focusing on *future possibilities* and emphasizing new images, ideas, and symbols that change the way people think and act (Bushe, 2011).

3.1.1. The Conceptual Background of Intentional Generativity

Intentional generativity or purpose is implied in the fundamentals of biological understandings that place self-production or *autopoiesis* (self-creation) (Maturana & Varela, 1991) at the heart of what aliveness or 'enlivenment' means (Weber, 2013, p. 30). This self-production, basically 'purpose' or a drive to continue to exist or reproduce (Swanson, 2009), is the very essence of what it means to be alive. Weber claims that this drive means that all living entities have intentionality that creates meaningfulness around the entity's existence (Weber, 2013, p. 30; also, 2015, p. 14; also, Swanson, 2009). This intentionality includes a relational aspect among living entities. 'Natural systems thrive because they are regenerative,' following what McDonough & Braungart (2010) call a 'waste equals food' approach, where nothing is wasted. The centrality of meaning in the drive for aliveness and care for the future (Erickson, 1953) suggests the fundamental role of intentionality or purpose in creating generative or flourishing systems—even when that purpose is simply to create more life. This principle is central to life's capacity to co-create, rehabilitate, and maintain the aliveness of systems.

3.1.2. *Intentional Generativity* in the Design of Transformative Large Systems Change: Creating Enlivening Narratives

Large systems change—such as dealing with the climate crisis—requires new ways of thinking and acting. Generativity in this context means replacing restrictive and prescriptive approaches to change with purpose seeking approaches, behaviors and activities (Finidori et al., 2015) to arrive at more open, creative, and imaginative (generative) outcomes (e.g. Dutton, 2003). In large systems change, this principle translates into supporting purposeful and self-organized change with *enlivening narratives* that invigorate the capacity of people to generate positive futures collectively. The emerging discourse on recalibrating the world economy as one in service of life can be seen as enacting the principle of *intentional generativity*. Current examples of enlivening narratives include e.g. the human responsibility to 'further life-enhancing structures and patterns' in the Potsdam Manifesto (Dürr et al., 2005); Korten's concept of an 'Earth Community' (Korten, 2007); and the 'well-being' approach (Organisation for Economic Co-operation and Development [OECD], 2015). Other examples are the concept of the 'regenerative economy' (Fullerton, 2015); the concept of the 'blue economy' (Pauli, 2010); the B-Team's 'Great Transformation' approach,* and the 'Meadows Memorandum' (WellbeingEconomy, 2017).

As Fullerton (2015, p. 42) points out in discussing 'regenerative capitalism,' intentionality or purpose-seeking emphasizes more open-ended, ideal-oriented and organic processes that

* Source http://bteam.org/

guide but do not prescribe activities. When powerfully developed in human systems, the principles of *intentional generativity* form a sort of 'glue' or 'attractor' in a complex system that keeps initiatives and activities generally heading in the desired direction (e.g., Lorenz, 1963; Gleick, 1987; Waddock et al., 2015). Hence, attending to the principle of *intentional generativity* and translating it into enlivening narratives and methodologies that support people to collectively shape future allows for creative, emergent (generative) approaches that move systems towards greater functionality over time (Finidori et al., 2015). It is important to note, however, that living systems generativity is contained by living systems forming boundaries around systems and subsystems, which leads to the second principle.

3.2. Systems Aliveness Principle 2: Permeable Containment

The second principle of *permeable containment* means that systems need to have 'sufficient' definitional boundaries or 'enclosures' to create some sort of meaningful identity, in combination with a degree of openness to new inputs and outputs that allow for energetic exchange. That is, living systems need inputs of energy and other resources, while wastes sometimes need to be released to other systems (where they become new resources for that system in the 'waste equals food' framing of McDonough & Braungart [2010]), through permeable, but not completely open barriers. *Permeable containment* holds generativity in check to help maintain the identity of the system, while still allowing necessary change to occur. For the design of transformative change in human interaction systems, this principle means that it is important to engage the human desire for belonging, identity, meaning-making exchange and fruitful collaboration. Participation and *engagement* of stakeholders as a way of ensuring that change processes become effective because this fosters a sense of ownership and identification with envisaged outcomes.

3.2.1. The Conceptual Background of *Permeable Containment*

Containment describes a space with an identifiable boundary and internal relational interaction. Alexander's (1979, 1999) pattern language approach describes structures and patterns in their relationships or what Alexander called 'centers' of design elements that foster aliveness. Alexander argued that aliveness is a quality that can be generated step by step, by incorporating one pattern, and related network linkages, at a time, into different wholes. This incorporation creates an evolutionary or unfolding process, 'one pattern at a time,' very similar to the processes of emergence and co-evolution in natural systems (Capra & Luisi, 2014). These interactive processes give qualities of 'life and spirit' to places that have them (Alexander, 1979, p. 134). The notion of community suggests what is meant by permeable containment: despite the fact that the term 'community' implies a certain sense of identity or containment, it is still possible for participants to enter and leave. Activist and urbanist Jane Jacobs argued that the idea of identity or containment, which she called 'centering,' is a core element of successful and vibrant parks (Jacobs, 1961; similarly, Alexander, 1979, 1999). Swanson's living systems theory (2009) also identifies permeable containment as the core (see also Ashby, 2011, p. 2020), for it is at the edges or boundaries of identifiable systems where new information, ideas, energy, and life forms are input and are exchanged outwardly (also Capra & Luisi, 2014). At the edge of the 'container' is what Fullerton (2015) calls 'edge

effect abundancy.' Inputs into permeably contained systems provide new energy and outputs allow excess energy to be dissipated and developed into new structures (Prigogine, 1996).

3.2.2. *Permeable Containment* in the Design of Transformative Large Systems Change: Growing Networks for Enabling Structures and Processes

If climate change continues at the current rate, it seems predictable there will be more economically and environmentally induced migrations; water scarcity may lead to wars, environmental destruction to health hazards, and subsequently to social unrest (Hanjra and Qureshi, 2010; KPMG, 2012; Rockström et al., 2009; Vörösmarty et al., 2000). Many experts see the current societal, economic and institutional structures as dysfunctional and warn of the dangers for natural and human systems (Armitage et al., 2009; Daily, 1997; Folke, 2006). Structures created by humans, such as institutions, laws, procedures, incentive systems, or others, are forms of 'containment' that can be more or less supportive of systems aliveness. For example, the slow pace of the implementation of the minimal climate agreement reached in Paris in 2016 is partly due to economic structures and partly due to mental structures that deny climate change as a reality (Stern, 2008). It is complicated by the structural set-up of nation-states, which can be seen as a form of containment currently prioritizing internal interests at the expense of the whole (Biermann, 2014). Yet, structures as such are not the problem if they do not impede learning and adaptation. Hence, containment in the form of structures and processes needs to be renewed, shifted, changed, adjusted, or maintained to serve systems aliveness.

In the context of large systems change, it is also important to recognize the coherence and identity of existing (nested and interactive) structures when changes are attempted. Change agents need to ensure that such change allows for new identifiable or contained systems to be developed, while simultaneously recognizing the embeddedness of old systems. In large systems change the principle of *permeable containment* translates into the need to acknowledge organizational or community identity, manage reliable and transparent step-by-step transformation processes, ensure inclusivity in decision-making between different societal stakeholders, and foster multi-stakeholder collaborations (Kuenkel et al., 2011; Pattberg et al., 2012).

New forms of organizing collaborative change, from combating biodiversity loss to the reduction of plastic waste, in increasingly local to global networks across societal stakeholders or academic disciplines, are forming around certain perceived collective identities. They can be seen as meta-structures (Waddell, 2010) that build different forms of containment more suitable to overall systems aliveness. Networks can influence outdated institutional arrangements and create change systems geared at addressing complex sustainability challenges such as water scarcity, biodiversity loss or renewable energy. Shifting large systems towards aliveness requires attention to structures that hold dysfunctionality in place and the establishment of new structures and identities that allow for new patterns of interaction for systems aliveness. Conducive structures and processes alone, however, are not enough to enhance aliveness in systems. Permeable containment as a principle is therefore tightly linked to the next principle, emergent novelty.

3.3. Systems Aliveness Principle 3: Emerging Novelty

> *"Innovation does not happen in isolation. Rather, it is socially constructed and built on encounters, conversations and exchange of ideas."*

Emerging novelty is defined here as the capacity of systems to change and evolve as situationally appropriate, by growing, becoming more complex, developing new properties, or declining. 'Alive' systems are constantly changing and adapting through innovations, enabling forms of learning, invention, and similar processes that create novelty or innovation. Life, while maintaining its permeable containment, is constantly creating the new (and, in some sense, destroying the old), both in terms of pathways or how things happen. Humans involved in systems change accomplish similar objectives by deliberately creating a climate for *innovation* in organizations or in the social realm (Stamm, & Trifilova, 2009). New ideas—new memes—help to frame a new story on which people can act (Waddock, 2015; Blackmore, 2000). Emotionally compelling goals that are not too rigidly defined can unlock inventiveness in organizations and social change (Kuenkel, 2017). For the design of transformative change in human interaction systems, this principle means that change processes need to be built on the human desire to venture into the unknown and create new pathways.

3.3.1. The Conceptual Background of *Emerging Novelty*

Weber (2016) argues that life or 'enlivenment' is fundamentally creative, emergently self-constructing ever more complexity and creating novelty and new pathways (p. 81). Capra & Luisi (2014) further note that living systems are highly adaptive, manifesting endlessly new creative forms that, because of complexity, are not predictable. Permeable containment as discussed above allows for new energetic inputs or positive entropy, as well as negentropy or negative entropy (Schrödinger, 1992), while these inputs may lead to perturbations (Maturana, & Varela, 1991) that eventually change the system's structure. Living systems create 'experiments' with novelty that keep the whole intact while enhancing resilience (Holling, 1973). The principle of *emerging novelty* suggests a new understanding of 'growth.' Life always wants, in a sense, to create new life and maintain conditions that enable the system to flourish (see intentional generativity, above). Growth, then, might be considered an essential aspect of aliveness or vitality, however, it is not 'growth' as commonly understood, i.e., getting bigger, on which nature relies. 'Growth' in nature takes the form of abundance, manifested as greater complexity with more diversity of life forms (Weber, 2013), and ever-greater interconnectedness in thriving systems (see the next principle).

3.3.2. *Emerging Novelty* in the Design of Transformative Large Systems Change: Encouraging Sustainability-oriented Innovation

Innovation drives the growth of organizations and the development of societies. Prototyping new ideas, testing their relevance, and building the financial and organizational infrastructure to apply them are paramount. In large system change, *emerging novelty* means

that change agents need to recognize the need to avoid too much stasis. This recognition mirrors the current discourse on innovation for sustainability and the rise of the methodology of design thinking (Liedtka & Ogilvie, 2011), which acknowledges that innovation does not happen in isolation. Rather, it is socially constructed and built on encounters, conversations and exchange of ideas (Stamm, 2008).

Innovation for sustainability is an evolving process requiring challenging existing knowledge, learning together, reframing reality, and understanding something new. More recently, public sector actors are using various kinds of 'innovation labs' in regional and developmental planning (e.g., Carsensen & Bason, 2012), combining experimental methods with stakeholder consultation and collaboration. Creating 'aliveness' in systems in change contexts can mean fostering change from all parts of the system, creating opportunities for experimentation, and allowing new patterns of interaction to emerge and stabilize. It also means recognizing that disruption and innovation are likely to be constants. For change agents in complex systems the idea of constant change means that invigorating a zest for novelty and fostering the ability to recover from disturbances are essential to transform human societies and overcome global challenges. More practically, the process of setting goals, identifying indicators, and monitoring results must include unexpected emerging novelty and should not depend on the idea that a stable state can ultimately be reached. *Emerging novelty*, however, not only rests on relational interaction, but is also embedded in a constant communication flow, which leads to the next principle.

3.4. Systems Aliveness Principle 4: Contextual Interconnectedness and Requisite Diversity

Contextual interconnectedness means recognizing life's vast communication network that engenders constant interaction, reflection, and reaction in endless reciprocal feedback-loops that benefit from requisite variety and complexity in diversity. Different elements in any system are integrally and inextricably linked in symbiotic, interdependent, and dynamic relationships. Contextual interconnectedness is a form of balancing process that helps provide both stability and change to a living system. For the design of transformative change in human interaction systems, this principle means that systems aliveness requires diversity and variety in change endeavors, coupled with multilateral communication that engenders networks of networks in dialogue. Relationship building through meaningful conversations leverages *collective intelligence* and subsequently invigorates networks for change.

3.4.1. The Conceptual Background of *Contextual Interconnectedness*

Vital living systems are contextually interconnected in that they are comprised of inextricably related, interdependent parts that generate sufficient emerging novelty and diversity to permit adaptation to the constant internal and external change characteristic of living systems. Indeed, science now tells us that at the quantum level all is connected (e.g., Capra, 1995; Capra & Luisi, 2014; Weber, 2013). Life is a highly interconnected network of constant communication and interaction, with recursive feedback-loops (Weber, 2016) in a constant co-emergent and adaptive process in which different aspects of a system are

'entangled' with others (Capra, 1995; Capra & Luisi, 2014). Contextual interconnectedness recognizes the inherent complexity yet the holistic nature of the world around us, including physical systems in the quantum sense (Capra & Luisi, 2014), as well as social systems and organizations.

Contextual interconnectedness suggests that humans need to live in harmony with nature's opportunities and constraints (c.f., Fullerton, 2015), recognizing that we are embedded in and interdependent with, rather than dominating over, other living beings, nature, and the 'nonliving' world. Similarly, Weber (2013) with his concept of 'Enlivenment,' a wordplay on the notion of human 'Enlightenment,' integrally links humans to and embeds them in nature, rather than separating humankind from the rest of the world, suggesting a path for system change initiatives that operate in harmony with natural dynamics. Yet at the core of interconnectedness is requisite diversity, which like requisite variety (Ashby, 2011), emphasizes the need in healthy systems for a sufficient variety of types, uses, sizes, and levels of entities in a system. This diversity enables constant (re)balancing, renewal, regeneration, i.e., change and dynamism, while maintaining the system identity (permeable containment) over time.

Requisite diversity, a combination of Ashby's and Jacobs' terminology, is a central element of vital systems, particularly as it allows for systemic resilience combined with stability (Holling, 1973; Folke et al., 1996). Healthy and vibrant systems and initiatives provide enough diversity among their interconnected elements that disturbing one or two elements will not result in what Maturana & Varela (1987) term 'disruptive perturbation' or systemic collapse. Requisite or a sufficient amount of diversity is, in a sense, a shield for a system that provides resilience and continued flourishing even in the face of setbacks and obstacles. *Contextual interconnectedness* suggests that relationships and dialogue are a core aspect of what it means to be alive (Wheatley, 1999), and possibly particularly what it means to be human.

3.4.2. *Contextual Interconnectedness* in the Design of Transformative Large Systems Change: Establishing Multi-level, Multi-stakeholder Governance

Like successful urban settings and architecture, nature, Weber (2013) argues, deals in abundance, diversity, that is, a form of wildness that is contained yet paradoxically not contained. Such abundance does not have the 'efficiency' that seems important in today's businesses, economic institutions, and societies. Flourishing natural systems, including human ones, have variety, diversity, and 'wasted' resources, i.e., abundance and diversity. From a large system change perspective, based on this principle, change efforts are likely to be more successful if they incorporate more diverse elements, different levels, and different types of action and initiatives. It has been widely acknowledged that the urgency and the multiplicity of sustainability challenges demand collective action at multiple levels of the global society (Folke, 2006; Raskin, 2016; Rockström et al., 2009; Steffen et al., 2007; Kuenkel, 2019). Multi-stakeholder collaboration and dialogues could become new forms of governance that could advance as complementary to the formally existing global structures (Bäckstrand, 2006; Biermann, 2014; Lodge, 2007; Boström et al. 2015).

Interconnectedness is intensely reflected in the emergent discourse and practice of multi-stakeholder initiatives around issues of common concern, for example, water, food security, and climate change, among SDGs. Ansell and Gash (2012) explored the emerging concept of 'collaborative governance', defining it as 'a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative and that aims to make or implement public policy or manage public programs or assets' (p. 544). Such approaches often provide new pathways that move beyond negotiations between opposing societal groups. The emergent discourse on governance systems indicates that human progress in the Anthropocene (Steffen, Crutzen, & McNeill, 2007) requires multi-level, multi-issue, and multi-stakeholder dialogic and collaborative spaces in which the variety of socially constructed realities can be explored and harvested for a constructive future. They need to negotiate between the interest of the part and the interest of the whole, which leads to the next principle.

"What gives life to systems emphasizes wholeness, not fragmentation."

3.5. Systems Aliveness Principle 5: Mutually Enhancing Wholeness

Mutually enhancing wholeness means that living systems are integrated entities constituted of identifiable yet both parallel and nested 'wholes' or holons (Koestler, 1968) supporting each other. These wholes at multiple levels provide identity, coherence, and orientation, or mutual consistency (Sahtouris and Lovelock, 2000). Both the architect Alexander (2002) and the quantum physicist Bohm (1980) argue that aliveness emerges from an underlying wholeness (in Bohm's term the 'implicate order') and (in Alexander's term) the degree of life in a certain space that mirrors this wholeness. Living systems must be considered as wholes because they cannot be fully understood by being fragmented into their parts. For the design of transformative change in human interaction systems, this principle means that change processes need to foster the human capability to relate to a larger system or bigger stories—to the next level *wholeness*—and engage the willingness to contribute to the world's development beyond the individual interest. The global agreement on the 17 SDGs is one indicator that shows leveraging this capability is possible.

3.5.1. The Conceptual Background of *Mutually Enhancing Wholeness*

The principle of mutually consistent wholeness argues that living systems need to be considered as purposive open systems (Swanson, 2009, p. 143) holistically, and understood as subsystems nested within (or operating dynamically and interactively with) and complementary to other (sub)systems (Swanson, 2009, pp. 42-43). Swanson (2009, p. 143) further argues that living systems theory's core contention is that forms of hierarchy and differentiation occur among system elements that co-creatively emerge higher level and more complex living systems. What gives life to systems emphasizes wholeness, not fragmentation (Fullerton, 2015; Weber, 2013; Alexander, 1979; Jacobs, 1961). This primacy of the whole (Fullerton, 2013) is why Alexander (1979) and Jacobs (1961) focused on whole entities in their respective architectural and urban studies work—buildings, communities, or

neighborhoods, not simply the constituent parts that build on and encompass other related parts in nested fashion. Though Alexander (1979) argues that the components of a given pattern language can be added in a step-by-step process to generate the whole, the key is that multiple interacting parts need to be integrated systemically for the 'whole' to give evidence of life.

Similarly, Weber (2013, p. 32) argues that 'The individual can only exist if the whole exists, and the whole can only exist if individuals are allowed to exist,' in the relationship that ecologists call 'interbeing' (Weber, 2013, p. 37). There are synergistic, symbiotic, and epigenetic (co-evolutionary) (Lipton & Bhaerman, 2009) reasons why biological systems thrive as a whole and why they cannot be dismantled into their component parts and retain their vitality. Such thinking is reflective of the African expression of *Ubuntu*, 'I am because we are,' which means that the individual cannot exist independently of the other or the whole community. Alexander discusses pattern language applied to architecture, stating 'Life comes from the particular details of the way centers in the wholeness cohere to form a unity, the way they interact, and interlock, and influence each other' (Alexander, 2002, p. 106). The key to 'life' is that the parts of a given pattern come to be integrated into a whole, though Alexander indicates that 'the wholeness comes first; everything else follows' (Alexander, 2002, p. 106; also Bohm, 1980).

3.5.2. *Mutually Enhancing Wholeness* in the Design of Transformative Large Systems Change: Developing Guiding Regulations & Balancing Resource Allocations

The awareness of the entire system is especially important in large systems change initiatives where the dynamics are such that interactions and outcomes cannot be controlled or predicted. Designing transformative change in such systems, however, requires going beyond methodologies for participatory involvement. Change agents need to look at properties of large systems that have a decisive impact on behavioral change. At the level of the whole system (even though this will be composed of layers, such as communities, national entities and global structures) it is important to look at how regulations and resource allocations can safeguard or rehabilitate overall systems aliveness (Capra & Mattei, 2015). For example, resource allocations in the form of investment strategies geared to safeguard sustainability would be oriented strictly towards long-term goals with equal allocations to structural support for transformative social and economic change (Bozesan, 2016), direct investments in climate friendly infrastructure, and sustainability related international cooperation.

Guiding regulations often require decisive action at the policy level, such as the decision to phase out combustion vehicles, close down nuclear energy plants, or introduce new economic paradigms such as the Circular Economy (CE) (Ghisellini et al., 2016). Increasingly important are voluntary regulations, such as voluntary social and environmental standards that create a form of soft law guidance rather than formal mandate. Examples are the global Equator Principles (Wright & Rwabizambuga, 2006), sustainable seafood and forestry standards (Anders & Caswell, 2009; Higman, 2013), and the OECD guidelines for multinational companies (Ferenschild, 2002), which are government approved non-binding recommendations to multinational corporations on how to operate in a responsible way.

Voluntary regulations can have an enormous impact in establishing awareness of the need for whole systems aliveness. They also engender networks of action and reflection that provide the ground for accelerated transformation to sustainability. Regulations work best in concert with *enabling structures* such as reliable administrative procedures, self-organized stewarding entities, or broad-scale transformation networks. Even the best regulations and the most responsible resource allocations require feedback systems that engender learning and reflection, which leads to the last principle.

3.6. Systems Aliveness Principle 6: Proprioceptive Consciousness

In developing the six principles, we debated whether a principle related to consciousness could apply to all living systems, or only to the human realm. We decided to take a broader view and follow Maturana and Varela (1991) by approaching consciousness and the related capacity of cognition as a general property of living systems, and not only as a result of human thought. Human consciousness is the most complex manifestation of this general property, and thus significantly impacts evolving reality, especially in the Era of the Anthropocene. Hence, the sixth principle of proprioceptive consciousness refers to the essential role of cognition in the process of life and the ability of life to become aware of its emergence, evolution and interdependence. For the design of transformative change in human interaction systems, it means attending to the presence of *humanity* as the most profound sense organ for aliveness in self and others and to foster encounter, reflection and mindfulness as well as feedback mechanisms that enhance awareness.

3.6.1. The Conceptual Background of *Proprioceptive Consciousness*

The Santiago Theory of Cognition (Maturana and Varela, 1991) suggests that cognition, as a function of consciousness, is involved in the self-generation and self-perpetuation of living systems (see also Capra, 1995). It includes perception (recognition), emotion (meaning or sense-making), and behavior (agency). Maturana and Varela argue that all living systems are cognitive systems and that the process of life is a process of cognition, saying that the organizing activity of living systems at all levels of life is a continuous mental, or learning, activity (Maturana and Varela, 1987). In their view, the structure of reality, that is, the world people perceive, is created through cognition and in turn structures cognition—living organisms recognize structural patterns and co-create them. The organizing activity of living systems at all levels of life can be seen as a continuous mental or learning activity, so that life and cognition are inseparable (Maturana & Varela, 1987).

Learning also defines the existence of the mind; it occurs in each system capable of forming feedback loops, and feedback loops are found in the simplest organisms capable of perception and thus of cognition. Physicist David Bohm (1980, p. 75) described the related capability of the human mind as a conscious form of proprioception, that is, an ability to observe thought while simultaneously thinking and acting, for which he suggested dialogue as an important methodology. In the context of systems and system change, Bohm's idea suggests that greater awareness of and reflection on the implications and consequences of human action and thinking are needed to deal with systemic challenges like climate change

and sustainability. Such reflective practice can broaden human awareness and generate greater openness to opportunities, as well as the capacity to take what Wilber (1998; Wilber et al., 2008) calls a multi-perspectival (multiple perspectives) approach to systems and situations, assessing them without judgment and with compassion for the individual and the whole (Richards, 2001). The principle of proprioceptive consciousness is central to life's capacity to maintain patterns of aliveness.

3.6.2. *Proprioceptive Consciousness* in the Design of Transformative Large Systems Change: Co-designing Empowering Metrics

For large systems change, it is important to remember Maturana and Varela's proposition (1991) that whatever happens in a system is determined by causal relationships, described as structural determination. In their view, the actual course of change in a system is influenced or determined by its structure, rather than only by direct influence of its environment, which is an important realization for the transformation to sustainability. This view mirrors situations in which possibilities for changes in human thinking and behavior exist, yet are constrained by existing historical and deeply embedded structures in thinking, organizing, and acting that need to be acknowledged. As Göpel argues (2016) mind-shifts are possible; humankind can break free from negative path dependencies and choose new pathways, albeit on the backdrop of existing structures of thinking. In a sense, the collaborative approaches of transformative large system change are testimony to a leap towards post-conventional development (Kohlberg, 1973, 1976; Kegan, 1994) among many change agents. Taking self-reflective positions, understanding the numerous points of view and perspectives, can contribute to changing mental models (Senge, 1990) and subsequently paradigms (Meadows, 1999). Yet, what holds mental structures in place, globally, and also in societies and institutions, are often metrics—the various forms of measurements of what is defined as progress. The types of metrics and the way they operate, however, can have an enormous influence on large systems change. If introduced and unquestioned over time, metrics can develop their own dynamic and cause damage to systems, especially if what is measured does not contribute to systems aliveness. The most obvious example is the Gross Domestic Product (GDP), an increasingly criticized but still widely-unquestioned measurement, that guides global development in the wrong direction, for example, by including the costs of alleviating environmental damages (such as oil spills) as part of an economy's growth (Costanza et al., 2014).

We argue that metrics in large systems change need to serve their original purpose, that is to foster awareness and reflective consciousness, which often requires changing both *what* is measured and *how* it is measured. The famous Club of Rome report, '*Limits to Growth*' (Meadows et al., 1972) drew on facts, figures, and predictions, suggesting that metrics could contribute to a rising awareness that current economic expansion and growth paradigms could not be sustained. There is a growing discourse on sustainability metrics and how they can support sustainable development. Sustainability metrics reflect the inherent complexity of the societies, geology, and biology with which they engage (Hezri and Dovers, 2006; Moldan et al., 2012) and move the application of metrics towards a more integrated worldview that has systems aliveness at its core. Examples of early attempts to change metrics in favor of more live-giving qualities are the OECD Better Life Index (Mizobuchi, 2004), the Gross

National Happiness Index,* the Genuine Progress Indicator,† and the more traditional Human Development Index.‡ Also, in the emerging attempts to find ways of monitoring SDG implementation at multiple levels of the global society bottom-up approaches involving many societal stakeholders are on its way (Rickels et al., 2016). For the design of transformative change in large systems, it is therefore important to look at which forms of measurements support systems aliveness, raise awareness of patterns of aliveness and empower people to act towards sustainability.

4. Towards Transformation Literacy in Large System Change

In describing the principles that enhance systems aliveness in their togetherness and illustrating them with examples of how they can be applied in large systems change, we have made an attempt to show that transformative change initiatives can be related to life's organizing principles. Moreover, we argue, those change initiatives must more consciously contribute to systems aliveness by attending to all six principles when designing and implementing change. Fig. 1 shows the relation of the principles with each other and Table 2 explains the ways they manifest in transformative large system change, as discussed above.

Table 2: The Systems Aliveness Principles and their Application in Transformative Systems Change (Source: adapted from Kuenkel, 2019)

Systems Aliveness Principles	**Application in the Design of Transformative Systems Change**	**Exemplary Guiding Questions**
1) Intentional Generativity Invigorating the human capability to collectively shape the future.	**Creating Enlivening Narratives:** Foster stories of possibilities; create future narratives that inspire minds and hearts for sustainability.	How do we build resonance for transformative change? How do we invigorate the capacity to shape the future collectively?
2) Permeable Containment Engaging the human desire for belonging, meaning-making exchange and structured collaboration.	**Growing Networks for Enabling Structures and Processes:** Build dynamic networks; co-create structures that enhance self-organization; revisit and adjust institutional arrangements.	How can we bring stakeholders together in a climate of collective action? How can we leverage the potential of networks for dynamic change?

* For more details, see the following source: http://www.grossnationalhappiness.com/nine-domains/.

† For more details, see the following source http://rprogress.org/sustainability_indicators/genuine_progress_indicator.htm.

‡ For more details, see the following source http://hdr.undp.org/en/content/human-development-index-hdi.

3) Emerging Novelty Building change on the human desire to venture into the unknown and create new pathways.	**Encouraging Sustainability-oriented Innovation:** Allocate space and support for prototyping technological and social innovations; foster and amplify pioneering advances for sustainability.	How do we accelerate the discovery of new pathways? How do we nurture emerging potential and foster pioneering approaches?
4) Contextual Interconnectedness and Requisite Diversity Leveraging the human capability to thrive on diversity and act in networks of networks in dialogue.	**Establishing Multi-level, multi-issue governance:** Establish new and contextually relevant forms of collective sense-making and collective co-creation in multiple stakeholder settings.	How do we establish structured dialogue and negotiate future pathways? How do we leverage multiple perspectives and expertise?
5) Mutually Enhancing Wholeness Tapping into the human desire to contribute to improving life and the capability to engage with a bigger picture or the whole system.	**Developing Guiding Regulations and Balancing Resource Allocations:** Set both voluntary and binding rules. Reallocate resources to sustainability.	How do we co-develop and agree on behavioral guidance? How do we manage the flow of resources? How do we ensure impact at scale?
6) Proprioceptive Consciousness Raising the human capability for reflection in action and the respect for the integrity of all life.	**Co-designing Empowering Metrics:** Create awareness of reality and future pathways; develop and co-design metric-based feedback systems for iterative learning.	How do we raise awareness for change? How do we develop meaningful and participatory measurements of progress?

The crucial insight from the development of these systems aliveness principles is that life seems to operate with the principles never in isolation from each other. Rather life operates in a dynamic balance like an orchestra, giving at times more attention to one set of instruments and at other times to other instruments, but never losing sight of the overall flow of the pattern. In contrast, human beings seem to focus on some manifestations of the six principles obsessively while losing sight of others. The invention and utilization of nuclear energy is a breath-taking example of a novelty created and further advanced in ignorance of all other

principles. It took disasters like Chernobyl and Fukushima to bring awareness back to some of the other principles.

"Working towards system aliveness is a continuous task."

The result of imbalance between the principles is always compromised or reduced systems aliveness that requires emergency action to get the system—often barely—back on track. Climate change and the transgression of planetary boundaries are examples that show how far the lack of human awareness—which can be interpreted as the absence of the principle of *proprioceptive consciousness*—of its impact on planetary aliveness has already progressed. It demonstrates how urgently, what Meadows (1999) called a paradigm shift, is needed in seeing the 'nature of reality.' Indeed, Meadows, an author of *Limits to Growth* by the Club of Rome (1972), argued that system transformation efforts demand finding leverage points, the most potent of which are shifts of mindsets and even the ability to transcend mindsets (Meadows, 1999). She noted that 'paradigms are sources of systems. From them and from shared social agreements about the nature of reality, come system goals and information flows,' as well as the policy shifts and other mechanisms of transformation she identified (Meadows, 1999, p. 18).

"System change necessarily occurs in the context of seeing humanity and the planet as a vast living—and alive—collaborative system."

The key factor in Meadows' insight is that how humans see reality—what the mindset of observers is—is central to human agency, because such mindsets inform feelings, thinking, and acting. That is why raising awareness and collective reflection—manifestations of aliveness principle #6—are so important for sustainability transformations. Capra and Luisi (2014) argue similarly that an understanding of life processes, such as what we have tried to articulate above, could be deeply informative as a conscious guide to transformative change.

In transformative systems a change in mindsets would mean shifting away, for example, from seeing SDG implementation or navigating the climate crisis as mere technical implementation challenges. It would mean acknowledging that the core underlying purpose of the SDGs or of staying below 1.5 degrees and within the Planetary Boundaries would mean continuously asking the question what kind of action, rule, incentive, campaign or change effort helps the creation, or sometimes rehabilitation, of aliveness in socio-ecological systems. Working towards system aliveness is a continuous task. In this context, the concept of collective stewardship (Kuenkel, 2019) assumes a new meaning. Co-creating, rehabilitating or maintaining systems aliveness should become the core management task in organizational, social and large system change. This imperative can be captured as a form of 'stewarding co-evolutionary patterns of aliveness' (Kuenkel, 2017; Waddock & Kuenkel, 2019), and would accelerate what Schneidewind (2013) calls 'transformative literacy'—the

capacity of multiple actors to better understand the features and dynamics of societal change processes and more effectively design transformative change.

There are no silver bullets when we take these life principles into account. They do, however, help us look at global transformation efforts through lenses of biology, physics, systems thinking, architecture, and urban studies, among others, to identify the characteristics that give life to systems so that they can be incorporated into change efforts. System change, we believe, necessarily occurs in the context of seeing humanity and the planet as a vast living—and alive—collaborative system. This system needs to function much better than in the past to avoid the planetary collapse predicted so many times. It needs to bring aliveness, i.e., 'what gives life' into the center of attention and incorporate these principles explicitly into change initiatives.

Authors Contact Information
Petra Kuenkel – *Email: petra.kuenkel@collectiveleadership.com*
Sandra Waddock – *Email: waddock@bc.edu*

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