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Ecological Viability and Cybernetic of Ayllu

Leonardo Lavanderos [α] & Alejandro Malpartida [σ]

Abstract- **This paper introduces Ecological Viability, a new concept in Ecology. This concept is multidisciplinary and systemic in nature. The Ecotome concept is introduced in order to homologize it with the Ayllu (Quechua Aymara) and design the latter as a cybernetic system. The ultimate goal is to re-establish the Oikos that ecology and economics (exchange value chrematistics) have removed from the culture-nature relationship.**

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I. Frame

An organization is a type of community that defines its viability and determines the boundaries of the network of relationships or relational field because it is a relational system that recognizes and reproduces the relationships that make it viable, even without considering its origin or purpose. When we talk about borders, we're talking about the relationships that organize that field from its processes of agency (taking it over) and belonging (becoming a part of it), which constitute its territoriality. This implies that the community's complexity as a network of human relations is determined by what the culture recognizes as constitutive of its territoriality. At this point, it is necessary to distinguish two points of view on cultural identity and opposition. accumulation of exchange values.

On the other hand, we use the term opposition whenever culture constructs territoriality as a class: whether culture is different from/the same class as nature (but not a member). The current economy's position, which is strictly chrematistic, leads us to prioritize natural assets not as use-values but as a source of exchange value production. This is what makes the current ecologists a flagrant antinomy, as stated in the preceding paragraph, by considering belonging but valuing oppositely. A "Davosian school of ecology," to use a euphemism. When we talk about "Davosiana," we're talking about the World Economic Forum (WEF), a gathering of top international business and political leaders to discuss the world's most pressing issues, including climate change.

Thus, natural resources are exploited in accordance with the needs of the culture of agency or property, which have been determined a priori and generated politico-administratively. In the first chapter of his Politics, Aristotle distinguishes oikonomia from Oikos, which he defines as "A necessary and natural community, the very basis of existence, and, in the human case, "constituted for daily life," whose members eat the same bread and are warmed by the same fire" (Pol. I,2).

Thus, oikonomia is concerned with determining how to provide oneself with the use-values required for a good life. In contrast, Aristotle defines chrematistics, or "the art of acquisition," in two ways: one as a complement to oikonomia in the sense that it.

Concerning the arguments advanced, both ecologists' and current economists' concepts refer to chrematistic thinking, which is not relational. As a result, they develop classification systems based on a realistic-dualistic view of the world in its most naive form. They ignore the reciprocity of the human-nature/culture-nature relationship, as well as the development of the former in tandem with the latter. They, on the other hand, assign potentialities to the "non-human system" based on the "benefits" it can bring to human culture. Instead of responding to the "needs" freely manifested by the "sovereign consumer," these "benefits" respond to the needs of production and the reproduction of exchange values, which actively shape and reproduce these needs through advertising and merchandising (Galbraith, 1983).

Both of the aforementioned perspectives have political implications because, by dissociating and breaking the culture-nature relationship, they reduce the community's complexity to tradable objects, whether human or natural. In other words, they turn the condition of the community's relational viability into a commodity, making the human being the owner of nature. This is what we call colonization and epistemological extractivism, and it runs counter to all bioethics.

This paper is organized as follows: first, the uniqueness of culture-nature as a relationship is discussed. The Living Well (Suma Qamaa in Aymara, Sumak Kawsay in Quechua) is then explained as a relational culture-nature concept. Following all of these conceptualizations, the concept of Ecological Viability is used to finally propose a relational cybernetic model (Kawsay) of the ecotome such as that of Ayllu, freeing current Ecology from chrematistic concepts.

II. Bases of the Relational Conception of the Culture-Nature Unit

Cartesianism and the disjunct image of the human world concerning the so-called natural or, rather, in the objectivity of the subject. Objectivity allows the validation of arguments against the referent of experience, which tautologically corroborates the

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objectivity of the subject, which is certainly, a predicate of the object.

In the Eurocentric conception of this world, the relation as philosophy did not take place, for most of the scientific corpus, this is a given world of objects that demand the observer, who elucidates interactions, transactions, and coercions among other forms of action.

The relation as philosophy is intricately connected to the conception of experience as temporality and history. The principle of identity and the descriptions of the inherent character of objects held in science corresponds to a primary conception in the history of knowledge, that is, the substance, essence, and autonomous character of the real. (Malpartida and Lavanderos 2003).

The relational conception is immersed in the experience, in the situation and circumstance, there is no possibility of a historical experience. From this perspective, cognitive decolonization implies recovering concepts that allow such operation in semiotics, the Kawsay concept (Quechua) expresses it as relational and shared vital activity (culture-nature), with a communitarian idea. (Macas, 2010, p 25). Irreversibility arises then as a condition of experience and not only as a reformulation of the classical concepts in thermodynamics such as the non-linear thermo-dynamics of irreversible processes of I. Prigogine. From the relation, irreversibility is translated as the logic of history and this is so because it is the logic of the living, the idea of probability arises then from the irreversible and not the other way around, (Paci, 1954). For this reason, the notion of entropy does not find irreversibility because it is defined in the statistical domain, it is the most probable state and as probability, it is a predicate of the irreversible and not a condition.

In this scheme the irreversible to be such only requires novelty, process, emergence and is at the basis of the conception of systems. If any communication must enter into the relational space of human nature, and as such into the process of experiences and history, then reality emerges from that historical existential situation and is comprehensible and orderly only within that situation. The Sumak Kawsay as a relational concept Culture-Nature summarizes this fullness, communitarian, reciprocal, and solidary. (Tenesaca Caguana, 2013, p. 18).

According to Paci (op. cit.), the vice of traditional (popular) metaphysics is to consider the object itself as the substance of being and to isolate the world of "substance" from the world of "experience", thus reducing experience to the necessary, the timeless and the unique. To leave aside the relation and the emergent character of experience in all decision-making is to believe that scientific arguments are acontextual in their meaning, that the aprocessual and ahistorical is what characterizes the subject of the relationship and that this is the basis for its objective character and argumentative validation.

At this point it is worth asking what ideas we generate, from Eurocentrism, regarding the relationships for a given context, are they immutable images of a demanant world immersed in mechanical and clockwork determinism, or are they the possibilities that are cultivated from the historical understanding of cultural-natural processes?

The answer to these questions is the basis of the process of epistemological decolonization assumes the Judeo-Christian matrix that finds in the unity of the Greek "logos" the condemnation of polytheism and the legitimization of a single, monotheistic thought. The counterpart of the literate citizen is the pagan barbarian, a worshipper of other gods, that is, who lives outside the norms of civilization bases its explanations on the strengthening of the properties of the object to granting exchange value to support the decisions of financial capital.

a) The Concept of living well, Sumak Kawsay

Sumak The emergent of the words is Kawsay (Kichwa), or living well; Sumak, which refers to the good, the beautiful, the harmonious, and the perfect; and Kawsay, which means life and existence (Viteri, 2003). Sumak denotes not only a qualifier of goodness, but also, more clearly, fullness. With a communitarian idea that encompasses both spheres, Kawsay expresses the relational and shared vital activity, with other humans and with nature. It would then be "life in plenitude" (Macas, 2010, p 25): a perpetual collective construction with an ancestral foundation that is centered on community life. From the above definitions, and the systemic relational perspective, its translation could be interpreted, since Kichwa is a language whose words do not have a fixed meaning, but the interpretation that is made of it, as a *relational culture-nature vision whose viability is based on the process of agency and belonging as communion*. We wanted to arrive at this definition given that, according to the variety of meanings, Sumak Kawsay has been transformed into concepts, ambivalent, ethereal, and difficult to concretize; convergent or divergent according to the ideological and political use made of them. (Breton et al. 2014), consequently, Sumak Kawsay depends on the current of thought to which it belongs, which have been identified as socialist and statist, indigenist and "Pachamama" or ecologist and post-developmentalist (Breton, op cit.) This places Sumak Kawsay, according to how it is classified within these currents, in a different cultural frame of reference, which leads to contradictions and operational gaps for decision making.

Thus configured, the relationship expresses a character opposed to capitalist chrematisation and the cultural assumptions it entails. Sumak Kawsay is based

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on another rationality, on a relational vision of the world in which life in plenitude is based on the construction of an OIKOS of relations of reciprocity, solidarity, and cooperation. The basis is the relational viability of the culture-nature community.

b) Sumak allpa and Ecological Viability

From the Kichwa philosophy, the Sacha Runa Yachai is postulated, which can be defined as what guides them on their "long road to Sumak Allpa". This path is based on three principles: sumak allpa, sumak kawsay, and sumak kawsay riksina. Sumak Allpa is the principle that regulates the culture-nature relationship (...). The Sumak Kawsai orients the way of living of the community based on a relationality of reciprocity and collaboration which is nourished by the culture-nature relationship. The Sacha Kawsai Riksina is the system of knowledge to achieve a full life as a culture-nature relationship. It is the science of Sumak Kawsai, but "there is no Sumak Kawsai without Sumak Allpa" (Viteri, 1992 in Cubillo-Guevara, A., Hidalgo Capitán, A. 2016).

Based on the above, the Sacha Runa Yachai is an alternative conception to the Eurocentric vision of sustainable development since on the one hand, the concept of development does not exist in the Andean cosmovision (Viteri, 2000), and on the other hand, the Eurocentric, Judeo-Christian conception of sustainability is not relational.

It is also important to highlight the differences between production in the West and the Andean world (Sumak Kawsay); it is possible to compare Andean technology with that of the West in three of its physiognomies: To work is, in the West, "to make things, to produce"; in the Andean world it is "to raise life". The causal discourse is the basis for the design and construction of technology in the West, while Andean technology is guided by the culture-nature relationship and the process of life. That causal logic restricts the horizon of Western technology to the material, while the principle of the process of life originates the second dimension in Andean technology: the 'symbolic technology', visible in the rituals of production. This distinctive feature explains the particularity of the Andean technological discourse, based on "the metaphor"; the personification of the relationship between culture, nature, and work objects; the possible variety in the making and the symbolic language, to a relational thought.

c) The Concept of Relational Viability

Based on the Relational Theory, elaborated some years ago by authors Malpartida and Lavanderos, it is considered that *a viable system* is one that (...) solves its organizational conservation through a structural change strategy (Malpartida and Lavanderos 2005, Malpartida,1991, Malpartida and Lavanderos, 2000). Understanding as "organization" the whole set of relationships that configure its identity as such, a process in constant creation that implies the maintenance of its condition, its conservation, or its disintegration. We understand that, in this line of thought, what can vary is only the structure of relationships, as long as this supports or allow the organization to be carried out. Following the previous points, we will define the Viable Relational System (VRS) as a configuration of networks of relationships that have achieved a coherent coupling between its *−relational configuration* relational ability− and its *−material energetic system* sustainability−, in such a way that it does not put at risk the relationships that generate and sustain the emergence of its organization. From these definitions, we can homologate the Sacha Runa Yachai with the relational conception of systemic relational viability, the relationship between the Sumak Allpa and the Sumak Kaway would determine the sustainability or the patrimonial management of the material energetic resources to make viable the community network from the knowledge system or Sacha Kawsai Riksina. (Fig. N°1).

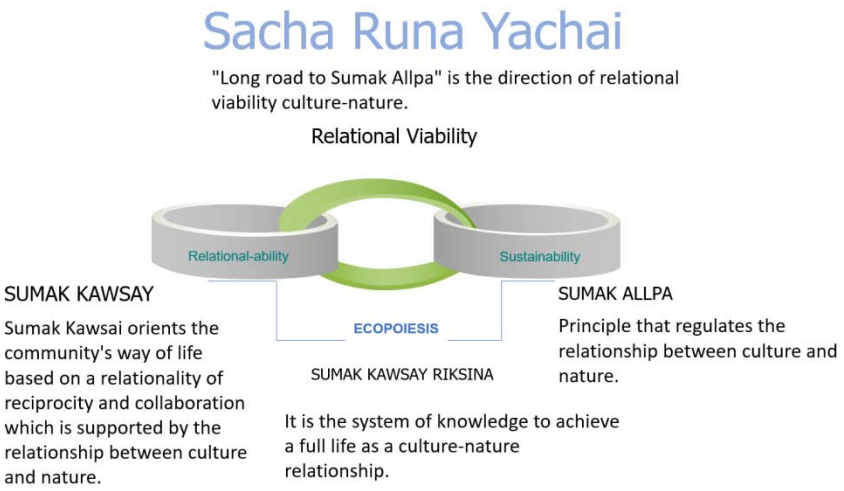


Figure 1

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III. Ecological Viability, from Ecosystem to Ecotome

One of the structural limitations of sustainable development is the imposition of regulations based on concepts that are currently confused or considered synonymous.

Environment and "entorno" must be distinguished as different (entorno is a Spanish word that means that which surrounds and remains). It does not have an English translation; however, it can be understood as what shapes the organism in its surroundings. The first is constituted by all the parameters that an observer distinguishes without considering the organism. Entorno is everything specified by the organism and is expressed by the behaviors emerging from the *organism-entorno* relationship; it is the current expression of this historical process.

While the environment does not refer to the relational unit, the latter is included in the domain of the latter. It has also been said that the entorno comprises historical processes. Thus, we do not speak of the evolution of the individual, the population, or the species, but rather of the evolution of the organism-entorno.

Access to the entorno of any organism, as observers, is not necessarily experienceable. We cannot distinguish the environment of a starfish or a T virus, we only know that these or other organisms discriminate something. In other words, through the relationships generated and from our viewpoint as observers we postulate that they respond to differences. To the extent that we can access the history of relationships, we can say that we are getting to know the organism-entorno system according to the conservation of its organization.

The entorno must be treated from a monistic conception, that is, as the product of a relationship in our case. In complex units, as is the case of the culture-nature relationship, the entorno is expressed through culture. It is culture as an organization of relationships and transformations that operates on a given environment "modeling" it into an *entorno* and recreating the relationships that finally define its identity as culture-entorno.

The generation of information, as part of the process of maintaining the organization of the organism-entorno unit, is directly oriented to the preservation of identity: idem, of group and ipse, of ecoreferentiality (Morin, 1980). This set of relationships, as part of our ontogeny, is expressed through behavior as a relationship. That is, decisions must be conservative of the sumak kaway-sumak allpa organization. On this basis, the organism that destroys its entorno destroys itself (ipse). For the same reason, financial capital, lacking a relational conception, proposes a development that avoids impacts on the community's entorno, that is, on its culture-nature relational system.

In the same way that the duality or dissociation of the organism from its environment cannot be accepted, it is inadmissible to try to explain the development of a society based on "relations that are internal to it" without reference to an entorno that is not only generated by the culture of that society, but at the same time makes the organization of that society possible.

The concept of the ecosystem as introduced by Tansley (1935) and later developed by Lindeman (1941), who only conceived it from a domain of energy exchanges, has derived from its original meaning into different meanings and partial meanings up to the present. For example, the confusion generated between the environmentalist and the ecosystemic point of view (Vallentyne, 1993) or when talking about natural and human ecosystems as different from each other. Moreover, for many ecologists, the idea of an ecosystem, instead of being an integrating concept, has been transformed into an "external object". For example, when in a scientific paper one can read: "The model proposed here derives how under these constraints competitive exclusion can give rise to diversity and neutrality. Furthermore, our model suggests that neutrality may not just be an assumption for mathematical tractability or a null model for understanding, but the general results of an adaptive process in a finite habitat with limited resources, much like the earth." Keymer et al. 2008.

The environmental movement of the last three decades has done nothing more than spoil the relational sense of ecology, transforming the environment into a thing susceptible to be put at a chrematized value, such as a tradable good. The use of utilitarian terminology has even been accepted in this field, such as the idea of ecosystem service, which, although it is said that it has nothing to do with the idea of the transaction for services, brings about the conceptual distortion that we have been pointing out, regarding the basic natural functions to the idea of service. So today we wake up to the fact that water is traded on Wall Street.

In this sense, we require a unity that makes it possible to dissolve the antinomies between social states and natural states, given that the concept of an ecosystem has been insufficient to address this dichotomy.

Taken as a system, we have pointed out that the ECOTOMO is the set of relationships capable of maintaining the organizational emergence (relational viability) of the complex Culture-nature unit, which at the same time can reorganize and reproduce itself (sustainability) in such a way that it resolves its energetic and informational sustainability along the Spatiotemporal axis. Malpartida and Lavanderos (1995, 2000).

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According to the above, we will define as *Ecological Viability* the process or set of processes that allow the organizational emergence of the Ecotome. We refer to Ecological by its root Oikos which, as we had mentioned before, is at the base of the definition of Community according to Aristotle (op. cit) however, it improves ostensibly with the Sumak Kawsay since the community is established as culture-nature relations. This forces the Ecologist to rethink the sense of current research, which due to its reductionist character does not include the culture-nature relationship.

a) The Ayllu ecotome and its relational cybernetics

Before designing the Ayllu ecotome, it is necessary to make explicit the concepts from which the design will be generated. For this, we will introduce the concept of variety not required (Lavanderos et al. 2019). A key concept in ecological viability has been variety, understood as the number of possible states of a system. Ashby's Law of Required Variety, Ashby, (1956, 1958), states that only variety can absorb variety. However, the above statement is only valid when formulated in the field of interactions, but it is not possible to sustain it when dealing with relationships, as in the case of human organizations. Thus, it is important to establish the difference between interaction and relationship, which will be key in the design of the Ayllu.

Relational viability operates based on the matching strategy between the relational plane and the energetic-material resource plane, Lavanderos and Massey, (2015). Along the same lines, the loss of resources in an organization depends on the introduction of "unrequired variety", i.e., those relationships that generate dissociation and loss of complexity, which bursts into decision making, generating a loss of organization. In this way, we could define the non-required variety as follows: "For a relational system, all forms of non-required variety generation are produced by destroying required variety." This is a fundamental difference with Asby, (Ashby, op. cit).

In the field of human organizations, unrequired variety assumes the form of a law, which can be exemplified as follows: Situated within an organization, connective diversity, which is what allows the exchange of variety, is weakened, or destroyed in its efficiency by introducing delays, impeding or generating resistance to the flow of data necessary to the process of decision and production. We could add, from the point of view of the theory of systems, that summative properties of the elements of the system would be introduced, which would spoil the emergence of the constitutive properties of the organization and, therefore, of the decision-making process related to its reproduction. This occurs every time a unit exchanges unrequired variety, which determines the loss of control of its output variability. As we have discussed above, the Eurocentric developmentalist formula in comparison with the proposals of living well generates a high degree of non-required variety that is almost impossible to control or diminish.

If we think of it from the point of view of a controlled system, in cybernetics we must generate variety in such a way that its design allows regulation and feedback that achieves the minimum required variety. This implies understanding that the correspondence between the generated variety and the minimum required variety does not have to be exact, necessary, or feasible, but rather; a variety with a minimum complexity is required for the regulator of a system. The areas of diversity that interact and need to be regulated correspond to a matching diversity in the system, the attenuation of the variety must be intelligently designed.

b) The Construction of the Ecotome

The ecotome, from our relational systemic vision, implies its conception as a network system of relationships, which are structured based on processes around its cosmovision. The basic relational unit is built on the relationship between a network and its reproductive process. All of which is expressed in the form of decision-making. In this way, a network legitimizes the form of its work concerning a process, which allows access to 1) the variety or number of distinguished steps or states; 2) to its variability or gap between observed and expected results; 3) to the connective diversity or relational structures established to carry out the process. Continuing with the above, the Ecotome can be modeled as a holored, which is co-formed from the coupling between the units of the sustainability and sustainability domains, in which the correction of the variety is not generated in the autonomic dynamics, but a spontaneous process of selection of alternatives (epigenesis). The Ecotome has the condition to replicate itself, within a recursive process ofrecalibration (stochastic), according to the strategic objective of the organization, to build subsystems of networks, which contribute to the organization from its operations and/or processes.

To achieve coherence between operation and administration, we need to fix the relationships between the knowledge network (administration) and the processes (operation), which is achieved through the art or culture of the network's work for these processes. This separates us from any conception of sustainable development and allows us to homologate with the relationship between Sumak Kawsay and Sumak Allpa.

With these concepts, the Ecotome can be studied or constructed based on 3 elements that are not generally thought of, these are the processes, the network that carries them out, and the culture or the "how they do it". In a second moment, it is necessary to

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consider how these 3 elements are related, which leads us to the definition of the Ecotome, for this, we have used the following concepts:

1. *Variety:* Number of states or distinctions declared to carry out a process.
2. *Variability:* Observed gap between expected and observed.
3. *Connective Diversity:* Quality of communication with other ecotomic units that are not directly involved in the process.

Accordingly, the process leading to the Ecotome modeling is conceptualized as follows (Fig. No. 2):

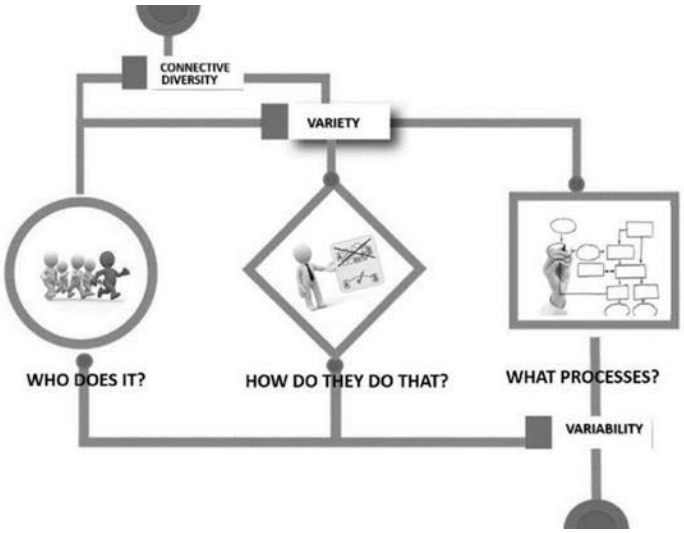


Fig. N°2: Ecotome model integrating Culture-Processes.

As indicated above, the model is generated from calibrations that, within the research process, go from the design to its formalization. Formally we would obtain a model like the following (Fig. N°3):

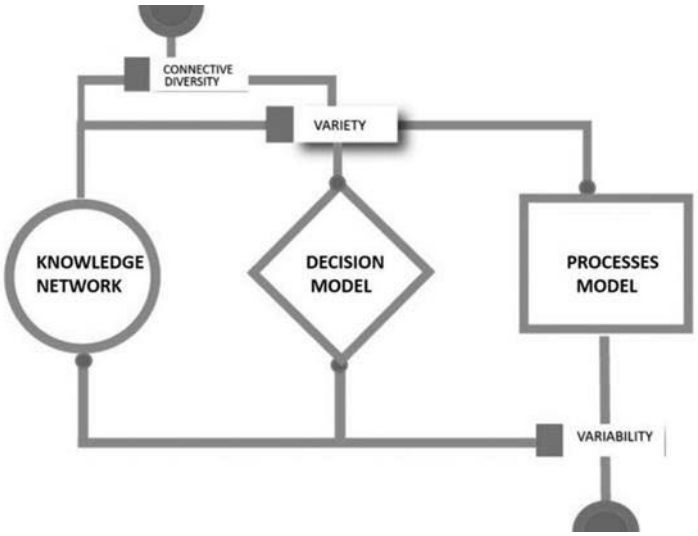


Fig. N°3: Ecotome model integrating Culture-Process as networks-decisions-processes.

The ecotome proposes that to reduce the variability of the processes involved in its management, the decision-making model of the knowledge network must be made explicit, to expose the behavior of the variables that account for the output of its process. This allows not only the control of these, but it also evidences the transparency of results for all the actors involved in its reproduction.

The ecotome allows the integration of the whole command area from the co-control of variety and variability. Likewise, the connective quality or diversity allows establishing the degree of collaboration with other areas, to be able to control the variety of the processes that reproduce it.

c) The Ayllu as Ecotome

According to the definition of Ecological Viability and the organizational cybernetics of Ecotomo, concerning defining a strategy of reproduction of the community organization as a coupling of sustainability

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(relationships) with sustainability (energetic-material resources) to produce in both contours the variety not required minimum the Ayllu would have the following basic characteristics:

1. A system of territorial organization in networks; as a basis of systematization of the economy to produce use-value; which operates from a logic of configurative culture-rituality and is hierarchically sustained by political authorities.
2. Spatiality as a fabric or territorial relational organization goes from a macro level, which is the control and management of vegetational floors - control of highlands and lowlands - to a complex spiral system that conceives the strategy of coupling between the Samak Kawsay and Samak Allpta.

The figure below represents the cybernetic model as follows (Fig. N°4):

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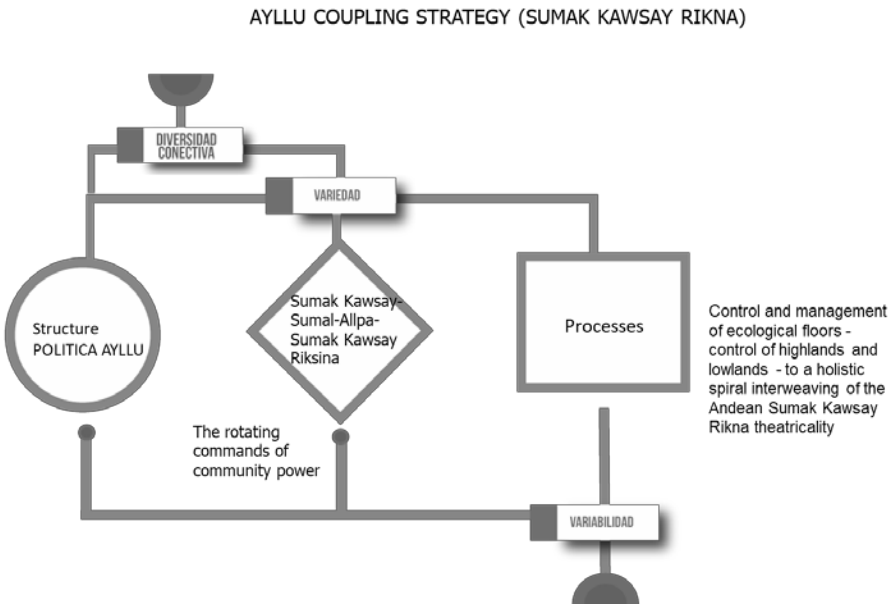


Fig. N°4: Model of Ayllu as Ecotome

IV. In Summary

It is essential to recognize the bases of a syncretism to which we belong, and which is continually denied, without which it is impossible to find viability, which implies at the same time not falling into nostalgic fetishism with "timeless" pretensions, such as the inclination of "cultural studies" to institutionalize the periphery in a fetishistic manner.

As a literal translation, Ayllu means family, but under the indigenous worldview, ayllu refers to a system of relationships beyond the family, that is, the community. "The ayllu is the fundamental basis of indigenous society, by which no positive activity will take place without the participation of the ayllukuna" (Calapucha, 2012, p46). In this sense, ecological viability makes the reproduction of the Ayllu which is expressed as "collective responsibility to ensure the welfare of the community and, therefore, family and individual welfare" (Kowii, 2009). Ecological viability will be linked to their Sacha Runa Yachai, which determines and sustains the family economy.

The Ayllu, from a political and chrematistic point of view, is a regime of land appropriation based on the simultaneity of common property and private possession, a generalized regime in the economic organization of the Inca Empire (Choque 2011). The individual (jaqi) in the Ayllu cannot own land; the land does not belong to him but to the Ayllu, which implies that he cannot accumulate exchange value by selling the land. Hence the impossibility of dividing the territory of the Ayllu into private properties and alienating it. But the individual can become a private possessor by belonging to the Ayllu, which leads to the production of use-value. It is from this community configuration that the individual must position himself in the art of economy and it is in this position where Non-Required Variety is produced, which, according to our relational vision, would be minimal given that it does not produce accumulation of exchange value since it would attempt against the Sacha Runa Yachai.

The Ayllu as Ecotomo is sustained as a condition in a heterarchical structure, which emerges as organized from at least four processes: *cohesion, coordination, communication, and conduction.* The heterarchy proposed here is one in which the members do not think of deciding one over the other, but of interacting. This form of participation can generate multiple ideas, advice, and help, so that the whole group functions correctly, and has the greatest freedom of

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action. Heterarchies are networks, often hierarchical, interconnected, and overlapping with individual components that belong and act simultaneously at multiple levels and with a dynamic that allows the governance and emergence of this whole set of interactions, which is what makes up the whole system.

The Ecosystem and its concepts detached from the culture-nature relational conception must obligatorily migrate to a viable relational system, whose bases are relations of cooperation and reciprocity based on heterarchical structures for finite material energetic resources. This is the basis of the ecotome that forces to return to the economy to reduce the production of the Unrequired Variety resulting from the chrematistic vision of the world. In conclusion, the ecotome finds its niche in the Ayllu as a relational conception, this allows changes and transformations from a cosmovision in which the territory of the community itself or Marka Uraqi, with the living well or Sumak Kaway; the sacralized territory or Pacha Uraqi, with the concept Sumak Allpta, fundamental concepts for a decolonized Science.

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