

# **An Approach of Organizations and Management: Systemic Ethics, Democracy and Sustainability.**

## **Associations for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages - ARMSADA -**

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**Abstract**

To survive all living systems have *“to eat and not to be eaten”*. But, soon or late, every one is eaten (<http://tinyurl.com/surviepbafscet>). To partly escape from the dilemma of the predator-prey game, in which *“who wins loses”*, the predator must, as the prey, enter into an Association for the **Reciprocal and Mutual Sharing of Advantages and DisAdvantages** (ARMSADA) -like a lichen or a cell, which both are an organism and an ecosystem-. Every ARMSADA emerges when all partners simultaneously lose the ability to kill the others. In the new Whole everything which is an advantage for a partner is a disadvantage for the others (<http://tinyurl.com/pbsustdev>). They are merged together *“for the best and for the worst”*. *“The benefits are only for their Wholeness”* which get new “abilities” (<http://tinyurl.com/andesymbiosis>) -like the cell, which, with the help of a virus, emerged from a mat of Monera (<http://tinyurl.com/pbcellorigin>). In their new endophysiotope the *“Parceners”* are all interdependent. Through the iteration of the process of ARMSADAs' emerging, each new more-and-more complex “system-of-systems” is more-and-more independent of its ecoexotope (<http://tinyurl.com/phylogtagmotaphology>). The endophysiotope of a *i* level of organisation is the ecoexotope of previous *i-n* levels. Due to the parceners half-autonomy, abilities of the previous levels are lost while simultaneously new ones are gained:

**Associations**  
**for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages**  
**ARMSADA**  
<http://armsada.eu>

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3b. **Health and Social Sciences, Education and Scholarship: Methods for integrating ethics into Scientific and Technical Research Programs or Development Projects** (*Feeding the world, Access to food and water, Zero sum*).

3c. **Pragmatism: participatory decision methods and the democratisation of science and technology.** (*Governance and Democracy, Accountability, a Systemic view*).

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References

## **Associations for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages ARMSADA**

### **Abstract**

To survive all living systems have *“to eat and not to be eaten”*. But, soon or late, every one is eaten (<http://tinyurl.com/surviepbafscet>). To partly escape from the dilemma of the predator-prey game, *in which “who wins loses”*, the predator must, as the prey, enter into an Association for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages (ARMSADA) -like a lichen or a cell, which both are an organism and an ecosystem-. Every ARMSADA emerges when all partners simultaneously lose the ability to kill the others. In the new Whole everything which is an advantage for a partner is a disadvantage for the others (<http://tinyurl.com/pbsustdev>). They are merged together *“for the best and for the worst”*. *“The benefits are only for their Wholeness”* which get new “abilities” (<http://tinyurl.com/andesymbiosis>) -like the cell, which, with the help of a virus, emerged from a mat of Monera (<http://tinyurl.com/pbcellorigin>). In their new endophysiotope the *“Parceners”* are all interdependent. Through the iteration of the process of ARMSADAs' emerging, each new more-and-more complex “system-of-systems” is more-and-more independent of its ecoexotope (<http://tinyurl.com/phylotagmotaphology>). The endophysiotope of a *i* level of organisation is the ecoexotope of previous *i-n* levels. Due to the parceners half-autonomy, abilities of the previous levels are lost while simultaneously new ones are gained: *“The Whole is both less and more than the sum of its parts”* (<http://tinyurl.com/anlea05pau>).

BALANCING individualism/merging individualities into collective neo-individualism, the process of ARMSADA rising has allowed the EMERGENCE of new life forms. This *“only one way”* of evolution allows the EXAPTATION of new endophysiotoxes more-and-more independent of their previous ecoexotopes. There are never advantages without disadvantages. *“To survive that is to turn disadvantages into advantages and to avoid turning advantages into disadvantages.”* From the simplicity of the Monera to the complexity of the cell and the hyper-complexity of the lichen, the blueprint of each new system-of-systems has preserved the ancient footprints of the previous life forms. The life gauge invariance explains the scaling invariance of growth processes, the Law of which is independent of the organisations levels. The ecological, economical, educational or societal artefacts of the Man endangered species must be built according to the way of ARMSADA: *“nobody must be a permanent winner”, “everybody alternatively is a winner and a loser”, “transparency is necessary to allow the mutual and reciprocal sharing of advantages and disadvantages”*.

## Introduction

Every living system (a cell, an ecosystem) is a wholeness [1], made of actors with their interdependent links (Figure 1). The stability and resiliency of the system while facing to changes of its internal medium (its endophysiotope, from Greek: *endo* internal, *tope* space-time, *physio* of functioning) and its external surrounding (its ecoexotope, from Greek: *exo* external, *tope* space-time, *eco* of inhabitation)<sup>1</sup>, depends on the number of actors and on the percolation process of their interactions (Figure 2).

What sort of governance [9, 10, 12] does allow the sustainability?

### 1. What is an ARMSADA?

In a forest, insects larvae (caterpillars of butterflies) -predators-, eat tree leaves -preys-.

An ecosystem is a food chain with interactions between predators and preys:

***“To survive that is: to eat and not to be eaten.”***

#### 1a. Forestry and Sustainability.

Mankind is a predator like each caterpillars species. Societies “eat” trees to make paper for communication and education, but can be also key actors through planting new trees species. Cutting or planting peculiar species, agroengineers can increase or decrease the forest biodiversity. Treating with insecticides, they change the intensity of the food relationship between predators and preys.

How to predict the result of that Management [7]?

What are the laws of functioning? (Table 1)

##### **1a1. BioDiversity is the result of past steady-states.**

The interdependence between predators and preys can be measured by the local estimations of the diversity and quantity of the eating caterpillars species, of the diversity and quantity of the eaten trees species, and of the intensity of their leaves damages (Figure 3).

##### **1a2. Environmental Impact and Critical Capability of Man Impact.**

When a species is eradicated from a forest, that will be a good or a bad news for the ecosystem survival, depending on the actors diversity. The consequences of the possible changes may be predicted only if, and depending where we are, the number of the trees species are known beforehand. If we do not know the wholeness state no action can be foresighted as good or bad.

##### **1a3. Hosting Capacity of an ecoexotope/Capacity to be Hosted of an endophysiotope.**

The forest, the wholeness, is an ecoexotope of survival for the endophysiotoxes of its actors: the predators and preys species. It is limited -qualitatively, in the number of species, -quantitatively, in their density, -in the space (depending on the soil and the climate), and -through the time (the soil, climate and actors are changing). Its “*hosting capacity*” must be shared between all the previous or new actors. This sharing depends on the “*capacity to be hosted*” of all the actors. The forest itself, as a wholeness, is the endophysiotope of the forest organism which is an ecosystem made from the juxtaposition and embedding of lower levels of organisation: cells into organisms, organisms into the forest, and the forest into the Earth biosphere (Figure 5).

The same goes for the production of economic goods. An enterprise -liberal or not-, is *eating* stuffs or enterprises to make products. The “*food*” is limited and must be shared between the competing enterprises (Figure 6). To survive each one needs “*not to be eaten*” by others. The number of key actors, juxtaposed and embedded into the enterprises and which/who must be shared is limited as well as the number of products and consumers.

Nowadays, Education and Health are “goods” which are sold like other ones!

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<sup>1</sup> From the ecological and economical points of view [1, 2, 4], *ecoexotope* and *endophysiotope* are preferred versus surrounding, environment, medium, in situ or in vitro,... , because due to the dynamics of balance and integration, **an ecoexotope of a system may be the endophysiotope of another one** (Figure 5).

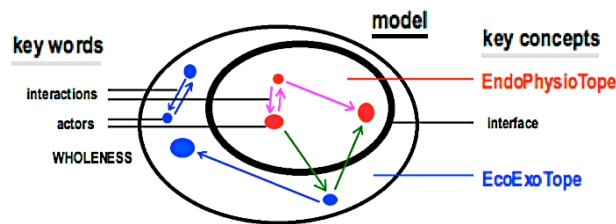


Figure 1. A System is always made of 3 kinds of sub-Systems: the actors, their networks of interactions, their Wholeness.

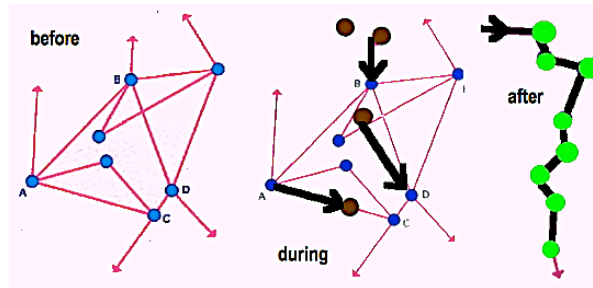


Figure 2. Percolation Dynamics.

The final structure of a network of interaction (in red) into a system (Figure 1) is the result of a metamorphosis: -partners (in blue) of the initial network (*before*) are lost, -new partners (in brown) are integrated *during* the transition phase, -at the end of the process (*after*) the conserved ancient partners and the new ones are all transformed (in green) to make a new network.

Percolation is a qualitative completion process: “*La Nature a horreur des places vides* !“. Into an ecoexotope, if a place is empty (freed or created), it is immediately inhabited (depending on the delays due to the interaction between the hosting capacity and the capacity to be hosted). Just like in neurones networks, modelling can use different quantitative laws, depending on contingency and resiliency (Table 2).

“*The Wholeness is both more and less than the sum of its parts*“.

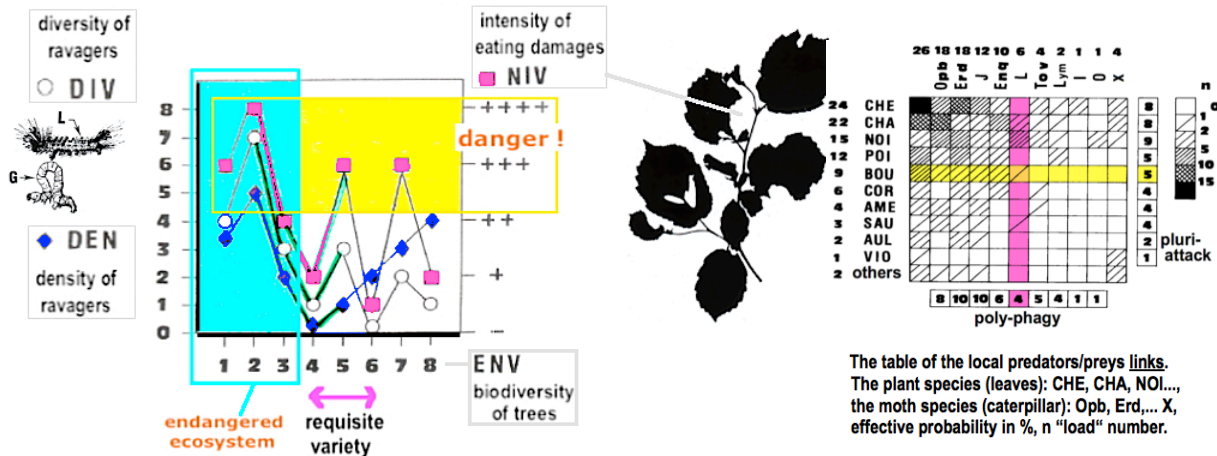


Figure 3. Survival requires a precise balance: “*meden agan*“<sup>2</sup>.

The survival of a wood of deciduous tree species [5] is limited by the intensity of the leaves damages (**NIV**) due to the diversity (**DIV**) and density (**DEN**) of ravagers -butterflies caterpillars (G, L)-. Over a threshold of damages (**danger!**) the wholeness is **endangered**. The least damages are located into a **window of biodiversity** (**ENV**) -in term of the number of the different species- which represents a kind of requisite variety -in number of different actors-. The local **links** (**poly-phagy** and **pluri-attack**) are known globally. Different qualitative associations of species (Figure 2) are allowed in that quantitative “**requisite variety window**“ which is both a place-time of great quiteness (4 and 6) and of great danger (5). In the quiteness states every change (diversity decrease or increase) is always deleterious. In the great danger states every change is always beneficial for the Wholeness. Out of the window, both the decrease or increase of diversity are deleterious.

“*The Whole is both more and less than the sum of its parts*“.

2 Ancient Greek: “*nothing too much, nothing too less, only just that is necessary*“.

### 1b. Emergence: *community capacity building of living systems, “less is more and more is less”.*

Each ecoexotope is structured with food chains in which all plant and animal endophysiotoxes have their places. There is no survival outside of a food chain: to have a place is a great advantage, your life form can exist! But “*there are never advantages without disadvantages*”; “*soon or late every living being is eaten, Man is not an exception*”. The local biodiversity is the result of the global network of interactions between all the interactive species. (Figures 4, 5, 6)

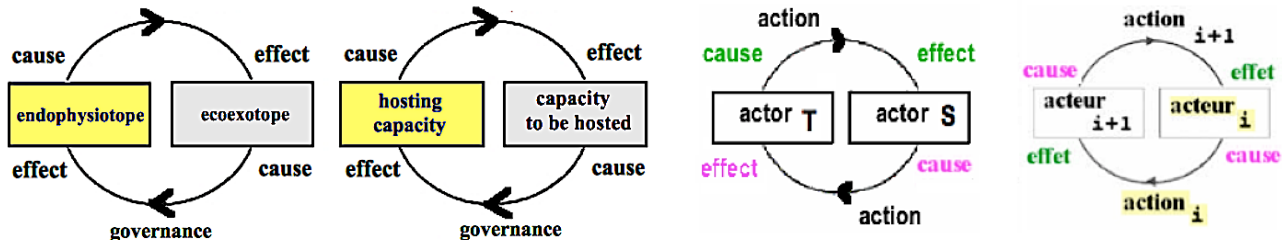


Figure 4. The Systemic Constructal Law: interaction and networks modelling. Causality is circular: “*InterAction is Construction & Construction is InterAction.*” [9].

“*Each living system-of-systems is integrated into an ecoexotope within which it is more adapted to the network of interactions than other systems-of-systems are.*”

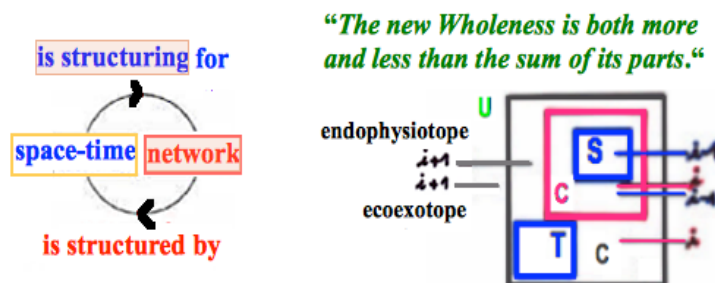
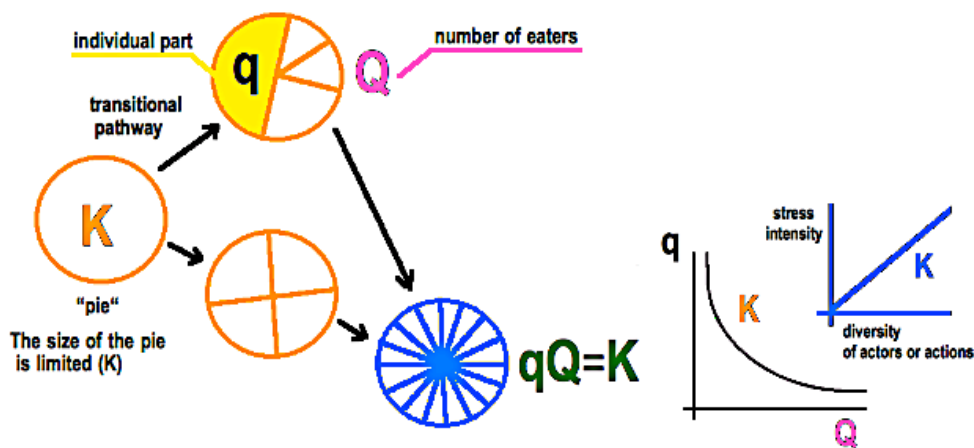


Figure 5. The juxtaposition and encasement process of embodiment of adjacent levels of organisation.

Adjacent levels:  $i$ ,  $i-1$  (inferior),  $i+1$  (superior). For example:  $T$ , invading virus ( $i-1$ ) of a whole cell  $C$  ( $i+1$ );  $S$ , invading virus ( $i-1$ ) of a cell compartment  $C$  ( $i$ );  $U$ , endophysiotope of the organism ( $i+2$ ) which is the ecoexotope of survival of the endophysiotope of the cell ( $i+1$ ). Or in societal structures:  $T$ , teacher;  $S$ , student;  $C$ , student group of the class  $C$ . The health of the whole  $C$  depends both on the health of all the parcerers *endophysiotoxes* ( $C$ ,  $S$ ,  $T$ ) and on their *ecoexotopes* of survival, at every scale ( $U$ ,  $C$ ,  $C$ ,  $S$ ,  $T$ ).



#### Variety/diversity and capital.

$K$  global "capital",  $q$  local capital,  $Q$  number of actors  
 $K$  "capital",  $q$  consumption at a time,  $Q$  number of available consumptions  
 $K$  global consumable food/good,  $q$  quality,  $Q$  quantity

Figure 6. The sharing of a limited hosting capacity.<sup>3</sup>

The Earth is limited: “all the water on the Earth is only a drop on a pebble“, and it is mainly salt water.

<sup>3</sup> *hosting capacity* is preferred to carrying capacity in the sense of interaction and balance with *capacity to be hosted*



*“To survive that is to eat and not to be eaten.”,  
“To survive that is to turn disadvantages into advantages and to avoid advantages turning into disadvantages.”*

### **1b1. A Lichen is an EcoSystem with a food chain.**

The Lichens can survive in extremely hard ecoexotopes, where no other life form can. A lichen is built with the body of a Fungus species. A population of cells of an algal species is encased into it. They cannot be cultivated separately, if one dies so does the other one. The Fungus offers the Alga mineral nourishment and its endophysiotope as a home. That is a great advantage for the Alga which is protected against predators and against the variations of salts and water in the ecoexotope.

The Fungus must consume a part of its matter and energy to allow the survival of the Alga. That is a great disadvantage. But an advantage is always paid back with a disadvantage. Soon or late the fungal filaments eat the algal cells, like men eat their domestic animals or cultivated plants. That is now a great disadvantage for the Alga and a great advantage for the Fungus. Both are eating the matter and energy of the other one, each one may survive only if the other one does survive first. In the Whole, all that is an advantage for a partner is a disadvantage for the other one, and reciprocally. Both are alternatively winner and loser. Only the Whole is a winner.

### **1b2. A Cell is an EcoSystem just like the System-Of-Systems of the Lichen.**

Into a plant cell (as an algal cell), like into a Lichen, a compartment -the chloroplast- is making organic matter. An other compartment -the mitochondrion- is a consumer (like a Fungus). It is a predator-prey relationship, like in a Lichen or in a forest. The mitochondrion eats the sugars synthesised by the chloroplast. Doing so, it produces wastes -water, carbon dioxide-, the raw materials for the chloroplast! Inversely, the chloroplast produces oxygen, the raw material for the mitochondrion! An other compartment -the peroxisome- recycles into water the toxic peroxide wastes produced by the mitochondria and chloroplasts. Compartments of Monera origins, chloroplasts, mitochondria and peroxisomes are juxtaposed and encased into another -also of Monera origin-: the hyaloplasm. It is an endosyncenosis (ceno: to meet and merge, syn: into a system, endo: with a new organisation), a new System-Of-Systems -*“e pluribus unum”*- that merges step by step through ARMSADA sprouting. Just like into the Lichen, all that is an advantage for a partner is a disadvantage for the others. All mutually merge *“for the best and for the worst”*.

The wastes are reciprocally recycled. All the products and by-products are shared mutually. Each one may survive only if all the others survive first: *“in varietate concordia”*. Through their mutual and reciprocal interaction the parcerers survive in a half-autonomy that renders them more independent of the ecoexotope: *“unus pro omnibus, omnes pro uno”*. They all share both the internal dangers of their new ecoexotope -the endophysiotope of the cell- and the external dangers of their ancient ecoexotope -always the cell one-. More-and-more dependent for their collective sharing of dangers into the cell, they become more-and-more independent of their ancient ecoexotope, which is always that of their new Whole -the cell- which is a resilient system *“sustainable for all the partners since because sustained by each one”* [6, 14] .

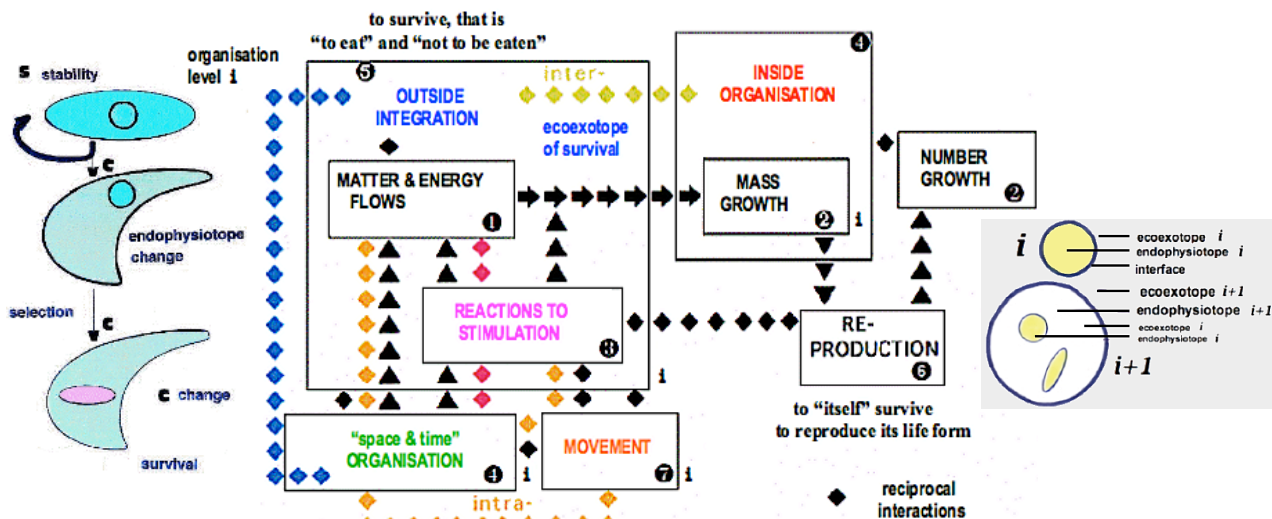
### **1b3. The Living Systems Periodic Table. [13]**

Soon or late, because the hosting capacity of every ecoexotope is limited, a lot of the living lineages die. The making of an ARMSADA is the process of re-creation of a new blueprint with which the life passes through the processes of extinction. The Life restarts towards a new phylogenetic diversification thanks to a new "origin", -a next "stump"- . Only this resilience process allows to create a *“capacity to be welcome”* for the new endophysiotope. The evolution always implies the simultaneous production of new twigs (“fission”) and the coalescence of former ones (“fusion”) -like the growth of a coral reef-: *“unus pro omnibus, omnes pro uno”/“un pour tous, tous pour un”/“one for all, all for one”*! That process is re-creation. Systems-Of-Systems emerged through the juxtaposition and embedment of previous free ones. These are now inseparable parts of a new organism's body, which is durable because they are sustaining it.

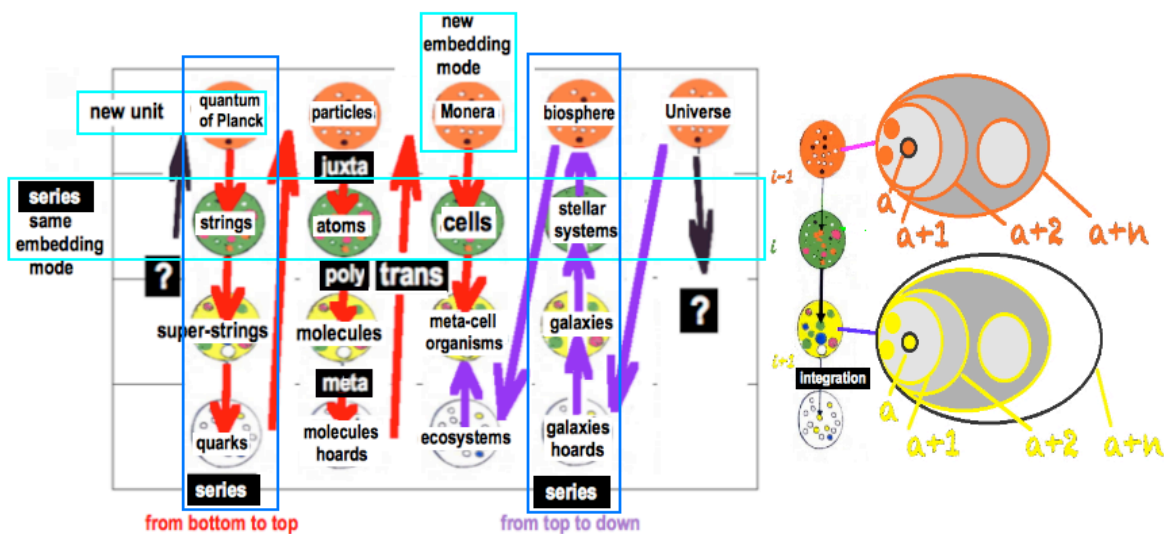


**Ecology is the economy of limitations:** “no gains without costs”, “never advantages without disadvantages”. Jumping to an emerging level of organisation allows a qualitative gain compared to the quantitative one that actors obtain when moving within the organisational state of a level (Figure 8). Economy and Policy must learn to practice as Nature does (Tables 1, 2).

At all the levels, the emergence of new organisations always runs with juxtapositions and embodiments (Figure 5) -through a percolation process (Figure 2)- of only a few previous systems.



**Figure 7. The gauge invariance of living systems:**  
the 7 all mutually necessary and sufficient capacities to be alive. [8, 13]



**Figure 8. The periodic table of the living systems' steps of organisation.**

Each adjacent superior level of organisation emerges from the merging of inferior levels into an ARMSADA. All levels (...  $i-1$ ,  $i$ ,  $i+1$  ...) own the all mutually necessary and sufficient 7 capacities (Figure 7). Each level is a system-of-systems. Into a level, to be robust and resilient each subsystem must emerge from the merging into an ARMSADA of adjacent, embedded and juxtaposed actors. For example:  $a$  a human,  $a+1$  a family,  $a+2$  a clan (a family of families),  $a+3$  a society (a clan of clans), ...,  $a+n$  humankind (a society of societies of societies) -only  $a+n$  is a gauge invariant level whereas a species and others (same coloured) are sub-systems-; or:  $a$  a worker,  $a+1$  a team (of workers),  $a+2$  an enterprise (a team of teams),  $a+3$  a holding, ...,  $a+n$  humankind (the world economic network). With only one rule: “to survive that is to eat and not to be eaten” and only one law: “systemic crises promotes new steps emerging through the merging of previous ones into an ARMSADA.” [10, 17]

The new Whole is both more and less than the sum of its parts [6, 7, 9]. It merges through the simultaneous metamorphoses of the parts into the Whole. But each host maintains its identity into the *Wholeness* of which it is a *Parcener* [10, 11, 13]. Each one's partial autonomy is allowed through the maintenance of individual and collective boundaries. Interfaces structure the spatiotemporal integration and the half-autonomy of the endophysiotoxes of the partners into the endophysiotope of their Whole, and of the Whole into the ecoexotope of its survival (Figures 1, 4, 5). Each living system (Figure 8) is a system-of-systems (Figure 1) which is built-in with the 7 all mutually necessary and sufficient capacities (Figure 7).

### 1c. Systems of Systems, Wholeness Growth and Development Sustainability.

Symbiosis is not a “win-win” association. It is an association for reciprocal and mutual sharing of profits and losses, not for mutual benefits. Together the partners are surviving in conditions in which no one is able to survive alone. But the mutual survival depends on reciprocal limitations. ARMSADA is *“a unity through diversity”* that had been allowing the survival of all living systems (Figure 8) for billions of years. Each partner survived only because all the other ones survived first. The growth of each one is limited by the growth of all the others [6, 8, 13]. The survival is possible without growth. Growing is only a way to acquire new capabilities, to jump to new steps of organisation. To face the ecoexotopes changes, endophysiotoxes had been interconnected together into new wholes. That increased the capacity of their new ecoexotope to host their new endophysiotope which had a better *“capacity to be a guest”* [9, 14] .

*“The development of a Wholeness is sustainable if sustained by all the parceners”.*

*“The development of an endophysiotope is durable if sustainable for the ecoexotope.”*

Table 1. The message of Ecology.

1- **“completion”**: whatever the level of organisation, good and poor places (EcoExoTopes) exist for every form of living systems (EndoPhysioTopes). **Each one is inhabited. If one is empty it is immediately completed.** The survival needs to inhabit a freed place or to create its new place into the previous living networks. (Figure 2)

2- **“limitations”**: the distribution of species, or *“systems-of-species”*, is limited by barriers and unfavourable ecoexotopes. *The “hosting capacity”* of each ecoexotope is limited, as well as the *“capacity to be hosted”* of each endophysiotope is. And the interactions are limited too. (Figures 4, 5)

3- **“co-limitation”**: no population increases without limit, whatever its level of organisation“. (Figure 8)  
The growth is limited by the **limited mutual fitting** between the hosting capacity of the ecoexotope and the capacity to be hosted of the endophysiotope.

4- **“self-limitation”**: overexploited populations can collapse, whatever their level of organisation.  
The over-increase of the hosting capacity by Man and for Man alone results in the extinction of biodiversity.

5- **“meden agan”**: communities can rebound from limited disturbances. Each endophysiotope can survive between 2 functional limits of its ecoexotope: deficiency and excess. (Figure 3)

6- **“diversity”**: communities can exist in several stable configurations. Diverse interactions between the hosting capacity and the capacity to be hosted build the nest of several steady-states. (Figure 3)

7- **“convergence”**: a same steady-state may be obtained by several ways.

8- **“e pluribus unum”**: the duration and sustainability of a system-of-systems depends on keystone sub-systems.

Man is a keystone species for the agrosystems. [5, 16, 17]

9- **“recycling first”**: Matter and energy are limited. Natural systems (cells, organisms, EcoSystems...) must recycle materials. The sustainability is the result of a permanent recycling inside and between food chains.

10- **“systemic constructal fitting”**: climates change, ecoexotopes change, communities change, endophysiotoxes change. Changes are both overlapping and in a loop. The changes of the hosting capacity, in quality or in quantity, particularly due to recycling, are controlling the growth and constrained changes in the functional, spatial and temporal organisation of the capacity to be hosted. That is itself feedback controlling the growth and the development: *“(hosting capacity)x(capacity to be hosted)=k”*. (Figures 6, 7)

11- **“co-evolution”**: natural systems are products of Evolution. Local changes of the hosting capacity can lead to global changes of the capacity to be hosted. The development of a wholeness is durable only if sustainable for the “system-of-systems” and all its actors, as well as sustained by all its sub-systems. [14, 15, 17]

Growth must not impair the durable survivals of the organisms that are sharing the same ecoexotope. For having destroyed a lot of ARMSADAs only for his own benefit, and at a short term, Man is an endangered species. Through his for-himself-only increase of the hosting capacity of the ecoexotope, he increases the violence between all the species that were sharing it with him. He should rather have to increase his capacity to be hosted, his “*capacity to be a guest*”.

## 2. Why are ARMSADAS so robust, resilient and universal ?

From parasitism to mutualism. The nodes of Legumes.

At the beginning, a population of a Rhizobium species invades the root of a Legume plant, detected at a distance through chemicals that it is releasing into the soil -the ecoexotope that is shared by the endophysiotoxes of both the plant and bacteria-. Free into the soil, the bacteria are saprophytic. But, invading the plant, they **metamorphose** into a parasitic form that survives into the plant, eating it. The plant endophysiotoxe is their new ecoexotope of survival. Soon or late, the bacterial infection thread is stopped into the invaded cells by a sequestration membrane.

- 1- “**convergence**”: several ways -more or less long, more or less effective- can achieve the same result.
- 2- “**contingency**”: the acquisitions of skills and the expression of competencies are limited by boundaries, barriers and adverse situations. (Table 1)
- 3- “**emergence**”: only stressful emergency situations are situations of emergence of new structures and functions.
- 4- “**solidarity**”: the good and bad choices that are for everyone are also those for their links and for the whole. Each one's growth is limited by that of all the other ones.  
*“For one to survive, the other one(s) must survive first.”*
- 5- “**resiliency**”: the resilience capacity is due to indispensable keystone actors and situations (networkings), but those can be identified only when they disappear!
- 6- “**recycling**”: recycling trans-disciplinary methods is a method of governance.
- 7- “**systemic constructal law**”: if the *capacity of hosting* or the *capacity to be hosted* changes, **reciprocally** the capacity to be hosted and the capacity of hosting must change.  
To fit, the governance must also change and vice versa. (Figure 4)
- 8- “**e pluribus unum**”: only the establishment of ARMSADA allows the emergence “*for the best and for the worst*” of “*a sustained and sustainable governance*”, because it is “*sustainable for everybody and sustained by everyone*”, due to the transparency of the advantages and disadvantages flows.
- 9- “**coevolution**”: ecological, economical and educational systems-of-systems and systems of governance all result from a systemic interactive coevolution;  
*“interaction is construction, construction is interaction”*. (Figures 4, 5)
- 10- “**meden agan**”: “*over the bounds, there are no more limitations.*”  
Mutual survival depends on reciprocal limitations. (Table 1)
- 11- “**meden agan**”: “*no power can grow without limits*”.

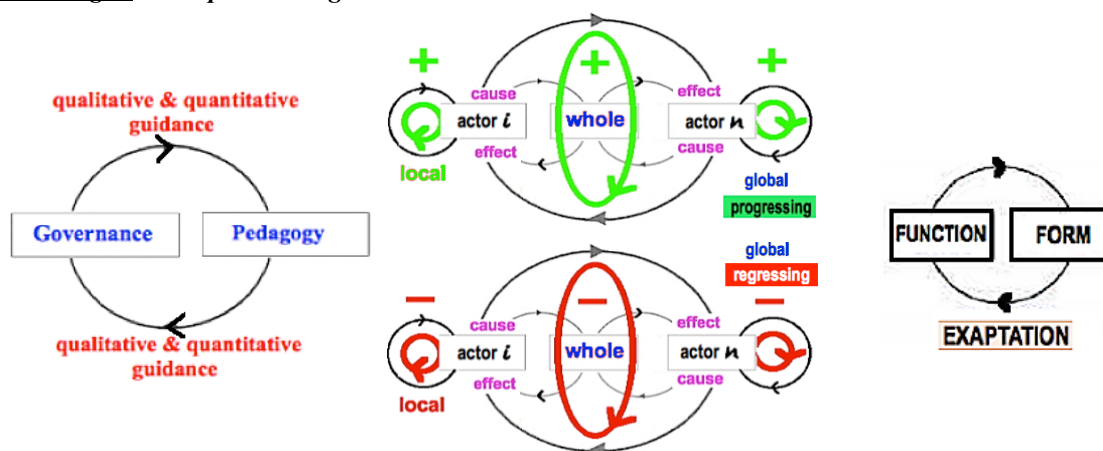


Table 2. The message of the pedagogy of Societal and Environmental Governance.  
The robustness of Life Artefacts through its local and global Societal and Environmental bioDiversity.

**Another metamorphosis** takes place. The plant cell and its hosted bacteria, *as a whole*, may synthesise new molecules that none of the 2 partners may produce alone. That emerging capacity directs the interactions between them in such a way that the bacteria are now collectively subdued to the plant. The plant cells and the bacterial population are *mutually* able to survive together because **the two metamorphose together** in a new entity. In the node, the bacterial part is able to fix atmospheric nitrogen (what the free bacteria could not do) to synthesise nitrogen sources used by the plant cells. But, *reciprocally*, to dispose of these sources, the plant cells *must first* allow the survival of the bacterial invaders that are now partners.

Quantifying ecologic sustainability evidenced that *reciprocal rewards* stabilize co-operation and promote networks evolution. Economic and politic networks must do the same. To survive, Man -with Man's subsystems (Figure 8)- must be a symbiotic species not a parasitic one!

#### **2a. The role of antibiotics in animal production: more-and-more drug resistant species.**

First inhabitants of the Earth, the Monera are the more diverse life forms. Through water they can move everywhere. They share, as a common ecoexotope, the endophysiotoxes of all the living species, without food chain barriers. Man uses antibiotics to kill those livings that can eat his plants and animals, as well as himself [2], and to increase animal food production.

Antibiotics have unexpected side effects outside the Man's biome [1, 17] :

- Wild's biome species may be favoured and turned into invaders.
- Man's biome species may be freed of predators that were regulating their growth.
- New consumers may rise in food chains because of a new availability of food.
- New bacteria species may invade Man's plants or animals and Man.
- To survive, bacteria species **become resistant** to chemicals.
- **Soon or late, the resistance is transferred** between species of the Wild's biome and from species of the Wild's biome to species of the Man's one, thus increasing the death of useful domesticated species. **Soon or late, the advantage of chemicals turns into a disadvantage.**

*"In the economy of Nature, if any one species does not become modified and improved in a corresponding degree with its competitors, it will be exterminated."* Charles Darwin.

Resistant to all the available antibiotics, bacteria are surviving best in hospitals where a lot of antibiotics are used. New wild antibiotics-resistant invaders can infect all the Man's biome species. Every new pesticide, herbicide, fungicide or insecticide can not kill all living beings; soon or late it selects rare resistant ones. *"What does not kill them makes them stronger."* [12]. For the survival of their Whole, all the parceners in all ARMSADAs are struggling together against Man [17] .

#### **2b. Food Safety, Environment & Sustainability.**

With animal flours Man increases the milk and meat productions of the cattle. But the cow paunch food chains do not start with vegetables consumers. Previously complementary partners are now competitors. To eliminate the competition between them, and for his advantage, Man kills them with toxics [2]. To increase the hosting capacity -for himself only-, Man increases the violence between species previously associated in an ARMSADA. All the members of the food chains suffer this violence. As the final consumer of numerous food chains, Man accumulates dangers: noxious heavy metals, radioactive mutagen substances, bacterial or viral infections, prions diseases.

*" Man is the enemy of Man! "*

Treating forests with insecticides -in the same way as he treats with antibiotics the intestinal ecosystem of the cows-, Man disadvantages some and favours others, for only his short-term profit. He often destroys dynamic balances of inconveniences sharing which exist since hundreds millions years. Changing links within the networks of the relations of survival, moving these balances -which differ from an ecosystem to another- in an unpredictable and irreversible way, he threatens both their survival and his!

## 2c. Growth and Development Ethics.

Unfortunately the politics and economists argue only in the short term to be reelected and to accumulate as quickly as possible the biggest profit: "always more", forgetting the teaching of the Stoics: *"To act accordingly to the Nature, accordingly to the processes the Nature reveals to the Men. To act with the Nature, accordingly to the laws of Nature."*! The climatic changes, the AIDS epidemics, the "mad cow" disease, the tuberculosis are there to remind us that the Earth and the Nature existed before Men. *"Wise is the one who knows his limits!"*

ARMSADAs allow to increase the hosting capacity of the ecoexotope. This increase results from an increase of the capacity of integration through a metamorphosis of the organisation. The growth -in mass or number- of individuals, raw materials or social benefits allows the development (acquisition of new capacities). Another stage of development allows another type of growth. And so on... Step by step, by cycling through amplifying loops: *"interaction is construction, construction is interaction"* (Figure 4), *"a threshold of growth is a requisite for development, a threshold of development is a requisite for growth"* (systemic constructal law).

The appearance of an ARMSADA depends on the ecological, economical and genetical history of every actor, on its place in the system, on the global context and on its local fate (butterfly effect): *"a balanced mutual semi-autonomy is established between the actors through the loss, for each one, of its capacity to destroy the others"*. Partners form a new biological, economic, and political system: an indivisible Wholeness of a higher level of organisation [10, 11, 13] .

*"Growth is only a transient way to development."*

## 3. From Knowledge to Practice? How to do it?

The material, intellectual, emotional and spiritual features -**The human culture**- which characterize a population (a local sub-sub-system) or a nation (a global sub-system) can not replace **the economy** (firstly a local sub-system, but more-and-more a global one). But the economics practices must be morally (at least locally) and legally (locally and globally) regulated, to model them for our survival.

The ecological -local and global- conditions, *"to survive that is to eat and not to be eaten"*, must command the choice of ecological, economical, political -but non-uniform (needfulness of requisite variety)- solutions. That is the capacities of the actors in the compromise, in the semi-autonomy, which will pull the realisation of granted local sub-solutions and a *"unity through diversity"* global solution. What will be sustainable and long-lasting only if constantly supported by all the actors.

### 3a. Environment Management & Sustainability.

In the Mediterranean agri-pastoral system -stemming from the Neolithic revolution- the direct action of the shepherd on its herd keeps pace with the power of the master who exploits natural resources and orders his servants work. "By God will", Man is called **to subdue** the nature! The horticultural *systemic approach* of the Asian civilisations excludes that direct action for an **indirect sharing of assistance** to Nature forces.

The human conception of Nature is the basis of the herself Mankind connection.

The violence of interactions imposes on the Livings an initiative of quality, which choice depends on the variety of possibles and thus on the quantity. Whatever the level of organisation, the growth (the quantity) precedes the development (the acquisition of new qualities): *"quantity is the requisite of quality."* Quantity and quality are *mutually limited* and inseparable, their product is constant (Figure 6). Quality falls with the number: it is necessary to lose quality to arrive at a new quality. *"There are never advantages without disadvantages."* Neither sharing nor union have a fair solution for all, but they can balance each other. (Table 1)

There is never an infinitely divisible reality which exchange between actors would allow a transfer with a suitable choice of respective utilities and compensatory modalities.

***“For a system, the development may last only if sustainable for its ecoexotope and sustainable-and-sustained for the other systems sharing that same ecoexotope”*** [16, 17]. There may be several balances, but none equivalent or exchangeable (Figures 3, 6).

The labor co-operatives and the mutual insurance companies, which build the social solidarity economy, connect their economic growth to both the collective interest and the individual respect. They propose another mode of governance and wealth distribution: profits, if there are, belong at first to the whole which redistributes them mutually to the actors and to the whole.

This ***corporate social responsibility cannot go without an environmental responsibility.***

### **3b. Health and Social Sciences, Education and Scholarship.**

For the most highly-rated Universities the pressure of the selective entry is enormous. Only a “driving” behaviour from the teachers, through a very “active” “local and global” coaching of the students, with a very strong workload of training for both and a “supervised” autonomy of the students, permits to optimise the success of each one [15, 16].

***“A place for each one and each one at her/his place.”***

A continuous “quality control”, both internal -of the parts (the students, the teachers)- and external -of the whole-, permits to optimise the success of all the partners. Nothing is obtained without big **mutual (global) and reciprocal (local)** efforts. *“The student has the teachers he deserves and reversely so does the teacher.”* The set up of ***an ARMSADA is the “synallagmatic” deal*** that allows the best successes for the partners and the Whole. The teaching of first degree school teachers must develop their use of the systemic approach [15] .

The local advance in knowledge, skills and attitudes will ensure the world fate of the next generation. More numerous acculturated people give no respect to the concept of ***“mutual and reciprocal rights and duties”***. There is no other thought than to focus on education! Democracy is inconceivable without a strong education of those who participate in it. The industrial education has crushed the virtues of effort and the respect for work; education bases which allowed the master to meet the students needs.

Our permissive society has valued efforts in profitable areas (sports, media) but has totally depreciated efforts in unprofitable ones, “services”! Education is the first societal service! The Self-Equal-Opportunity -“Everyone is entitled to the same societal services and has to respect them.”- was confused with the Illusory-Individual-Equality -“Everyone can win (the Lottery)”-.

***“Starving stomach has no ear!”: “The first need is to eat and not to be eaten”.***

A welcoming feeding and healthcare system is the requisite to a welcoming educational system. Both are inseparable. Unfortunately, Health, Education and Environment managements are considered as economic goods governed by the law of supply and demand, and not as societal services collectively governed, that is to say: “mutually, for the advantages, and reciprocally, for the disadvantages”, within the framework of an ethics of Societal and Environmental Responsibility.

### **3c. Pragmatism.**

In all the best ranking nations, China in Asia, Finland in Europe, the education system does not merely learn to learn, but first to respect not only the right to know but the duty to know. A strong educational system makes a strong State and vice versa (Table 2). The difficulty is “finding a balance”, with preparatory classes as well as upgrading and re-orientation classes: **a sufficient requisite variety** so that everyone may find a place according to her/his abilities and motivations.

#### **3c1. We need to restore in-between structures.**

We must first make efforts in advocating the acquisition of knowledge and giving respect for those who want to acquire it, as well as those who can help to its acquisition. The solution is the same as in sports: many levels of orientation and re-orientation, with their own outlets and rewards. What was formerly the education system in France! Beware it will no longer remain only the extremes: the industrial high level competitions, which give people money -regardless of the cost of the training- and the others, which does not earn money.



### 3c2. **Variety is the heart of any civilisation.**

Many people are not satisfied with the “ready-to-wear”. Education, just like Health, can not be satisfied by the “ready-to-think”, or the “ready-to-heal”. But many people do not have enough money for better “individual-made” solutions. Maybe “ready-made” solutions are useful for a lot of people but they are neither factors of progress nor of success. Progress is always at the margins, in the “hobby crafts”. Nature creates new life forms from “the crafty pottering” of ancient ones, but respecting mandatory rules: -there are never advantages without disadvantages, -there are never rights without duties, -you get nothing without effort, -to survive that is to turn disadvantages into advantages and to avoid benefits becoming disadvantages, -only ARMSADAs will survive!

**Education, the key process of people integration, must not be uniform** (linked to a dominant society) and with a single language (bad English). Otherwise, there is the risk of -an heredity of the social offices at the world level, -a static “ready-made-standardised” society, -with an education disdaining qualities such as originality, initiative, freedom, solidarity and invention. Variety is the key-factor of resiliency that emerges from a former variety: we cannot create any physical and psychical variety without pre-existing ones! Without variety of choice... how to get ready to survive in a changing world? (systemics constructal law!)

### 3c3. **Governance, Democracy, Accountability: a Systemic view.**

**Diversity is the key word** to globally ensure a conservation of our natural, cultural, and educational inheritance and to allow the society to be resilient! First a minimal requisite variety is needed for making new ARMSADAs, but within limits (Figures 3, 6, Table 1). Operating at the limits, the capacity of resiliency resides through regulations within limits and between limitations (Table 2). The dynamic behaviour engineering of a system uses feedbacks. The system design is constrained by trade-offs **between** making the system efficient and robust while minimizing output errors, and oscillations as **an inevitable side effect**. This universal trade-off “law” slightly depends on the system details (Figure 1) and generalises to the robust efficiency of any auto-catalytic and autopoietic network, with only one law: “to survive that is to eat and not to be eaten” and only one process: “percolation” (Figure 2).

The respect of human rights is necessary everywhere. But it is less important than the respect of environmental rights at a global scale (Table 1). For the Mankind to survive, the other species must survive first, not only the domesticated ones but also the wild ones. In the management of ecological, economical, educational and political systems, fair business practices -with the respect of the truth regarding the quality of the products/services and the transparency of the processes- are requirements for the producers and customers. The development of communities first needs an holistic sensibility of the real common local place of the Man species in the global “economy” of Nature. Humans are always behind decisions and actions. Politics must focus on developing human capacity as a key leverage for a “**sustainable and sustained**” economical, social, and ecological development inside Nature. Balancing agricultural production, economics and biodiversity, Societal and Environmental Responsibility goes far wider than the business world; it includes all managers and decision makers from all ways of our life (environmental sustainability, poverty alleviation, agriculture, health systems, governance, education).

### 3c4. **Education and Health: same regulation (common sense, transparency and ethics).**

In France, the Social Security works on the principle of solidarity. “Each pays according to his/her means and receives according to his/her needs.” The private insurances work with premiums independently from incomes and accordingly to incurred risks.

How to regulate the costs of Health or Education: - by professionals, supposed to apply the fair care, the best training, at the slightest cost, - by users, supposed not to waste the limited and expensive collective goods? Regulation by the market postpones the increasing costs on the users, either directly or through -care or training- traders. That drives only to failure!



The consumer is not enlightened... He did not choose to be sick. He needs a work ...

The liberal companies aim for profit!

Public regulations require **to estimate the "advantages/disadvantages" balance and the "profits/costs" ratio** of care, formations and environmental managements for the users, the professionals and the society together. The "chosen" part of the societal wealth to be allocated to Education and Health, in a “united-through-diversity” and “equally-balanced-regulated” system, will impose the "compulsory" “mutually-designed” rate of the takings.

***"Freedom, Equality, Brotherhood."***

**3c5. Towards an economy of services or death...**

Today, whatever the local penalties, neither the Education nor the Health or the Culture does bear hard in front of the global Economy of Profit. When the local States are not any more able to perform their missions as services distributors and regulators, as guarantors of rights equality and social cohesion -for not being economically competent!-, to face worldwide business companies, international foundations must replace states [9].

## **Conclusion**

Only Culture and Ethics can stop the neoliberal Economy and its political adversities. Peoples live, think and dream beyond economy. Money is useful. But the wise question is "for what, for why, for whom?" and not "to whom?". Europe committed suicide by war, for territory quarrels in a local world, in the XX<sup>th</sup> century. Today, the world commits suicide by the economic war of virtual money.

The failure of the local policies, which have for only objective to spare time, proves the necessity of a global answer with a change of our governance paradigm. The individual is neither reasonable, nor necessarily interested in the maximal, monetary, political, cultural or scientific profit. Man is a social animal. Individuals want to be "recognised" and live in “human-sized” companies. Feeling threatened they "squeeze up elbows" in associations.

Whatever the governance, without transparent rules, the disappointment, as high as the lies will, will be source of violence. Only Societal, Economical and Environmental ARMSADAs will survive. Simultaneously and collectively, states, institutions and companies have to commit to insure the financial, economical and political stability of all their members, through agreeing to reduce their consumption.<sup>4</sup> Semi-autonomy allows a sustainable growth, mutually supported by everybody and a sustainable development, reciprocally shared with everyone, with transparent advantages and disadvantages.

This is the way for the endangered Mankind to evolve -***“for the best and for the worst”***- towards a more resilient organisation of the society, to locally and globally face economical, entrepreneurial, environmental, societal, and political systemic crises.

***“Only Man is the remedy to Man.”*** (Senegalese saying).

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4 Every day in the world, excluding agriculture and construction, 10 billion kilos of waste are produced, 1 billion TV remain in standby consuming mode. The economic growth is based on internet, but the future is in “farming“!

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**"We all have the power to change. So what are we waiting for."** Arthus-Bertrand Y. (2009) **HOME**.

The movie was released 100% free on June 5th simultaneously in cinemas all over the world, on DVD and on YouTube.

No profits will be made from its release or future showings. <http://youtu.be/RoLYZf-1E8o>