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Fundación para la defensa del ambiente
Environment defense foundation

Document for NOW
Nature of Wonder Worldview Assembly
Greece, October 2019

How to survive as *Homo sapiens* to avoid being a future fossil species

By

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The biodiversity of planet Earth has already suffered five major spasms of extinctions, and human species is acting as main responsible for the sixth and lethal spasm (see Alvarez *et al*., 1980; Erwin, 1990; Raup & Jablonski, 1993; Alvarez, 1997; Leakey & Lewin, 1997; Raup & Sepkoski, 1997; McDougall, Brown & Feagle, 2005; Montenegro, 2007b).

Can we drastically change the current development model that leads towards such sixth spasm? Quite possibly not. But we can reduce the slope of exponential curves that define us so well. By reducing the exponential growth curb - at least some of that growth- we will also reduce human suffering and delay the severity of future crises.

Practically all countries of the world display "development patterns" which includes: a) Short food chain strategy (e.g. agriculture and cattle grazing); b) The exponential growth pattern (for most of their social and productive indicators, including population and information); c) Fix and protected territories; d) Rigid infrastructure; e) Durable artifacts and trash; f) Industrialization; g) Recognition of the concept of public and private property, and h) Flexible ecological niches whose sizes grow permanently (Montenegro, 1982a, 1982b, 1982c, 1989, 1999).

Several indigenous groups living in isolation, to the contrary, display a totally different pattern of living: a) Long food chain strategy (e.g. hunting, fishing, gathering); b) A sigmoid pattern of

growth for most of their social indicators (see Odum, 1972); c) Changing and flexible territories; d) Not rigid infrastructure: e) Sustainable artifacts; f) Not industrialized production, and g) More sustainable ecological niches. Ironically, the short food chain strategy is predominantly used all over the world, and the intensive use of genetically modified organisms, mechanization and pesticides produce huge surplus of energy and materials. Meanwhile, the long food chain strategy survives in relatively isolated cultural islands, and will disappear as a living alternative. Such disappearing is a tragedy for *Homo sapiens* and its probability of long-term survival (Montenegro, 2004a, 2004b, 2007; Montenegro & Stephens, 2006).

Prevailing of productive ecosystems over progressively reduced natural ecosystems, fix and rigid territories and infrastructure, flexible ecological niches that permanently grows (as the population itself), and single leaders governing huge populations seems not adaptive to fragile and variable environments. Unfortunately most of the countries of the world support such pattern and their exponential curb of growth. We are an experimental species that could be transformed into a failed species and eventually, a future fossil.

The solely way for surviving it's to adequately balance the surface covered by each natural ecosystems, and the surface used in such ecosystems for agriculture, cattle grazing, rapid growth forestry and cities (Montenegro, 1981, 1999). There are not sustainable productive systems without the existing of huge natural ecosystems. Nevertheless aquatic and terrestrial natural ecosystems continue to loss biodiversity, internal structure, ecological density, and particularly, volume and surface (Montenegro, 1999).

The process that produces the replacement of natural ecosystems with agriculture cannot be indefinitely maintained. A redirection is urgently needed. Mankind is within a tragic trap. If we continue the replacement of natural ecosystems for exploiting their soils, we will increase the disturbing of natural pulses (water pulses, soil pulses, climate pulses), and the pollution of existing environments. Consequently both human mortality and morbidity will increase. If we decide to stop the producing of food through productive ecosystems, and to facilitate the expansion of natural ecosystems over them, the lack of food will also produce huge mortality and morbidity. How to move outside this trap? The solely way for surviving it's to assume that any surface of productive ecosystem which has been developed over a natural ecosystem need the natural maintenance of huge surfaces of the same natural ecosystem. There is not "nature" in one side, and "crops" and "cities" in the other side. This is a wrong and tragic approach. We need sustainable mosaics of ecosystems, not solely "sustainable cities" or "companies". The reducing of population growth, stabilization and even reduction of the size of ecological niches, the protection of remnant natural ecosystems with further expansion, and the interlinked functioning of natural and productive ecosystems are some crucial decisions to be taken. Unfortunately time it's also a limited resource.

Homo sapiens need a new and unprecedented revolution. Those changes involved in such revolution shall be produced by most of Earth's inhabitants during several generations. Our current main enemies are ourselves. For practical purposes most of existing and usual ideologies are obsolete (right and left, socialism and capitalism, etc.). We need more surfaces of natural ecosystems, a new pattern of development without development, and new models of governance. Such new process could be designed as "eco-balancing". Eco-balancing implicitly includes sustainability. These are their most conspicuous issues:

1. To be implemented according a flexible and trans-generational program with regional adaptations. Such kind of programs involve periods of decades and centuries (long term program and their plan), and more in detail short and medium term program and plans.

2. Defining of the mosaic of ecosystems as the main unit of programming (natural ecosystems, productive ecosystems and urban ecosystems). Within a mosaic of ecosystems each program should consider original and current limits and surface of natural ecosystems (terrestrial ecosystems, aquatic ecosystems). Natural ecosystems are the matrixes where the mosaic is defined.

3. Keep great surfaces of natural ecosystems with a maximum of continuity. According Mac Arthur & Wilson's Theory of Island Biogeography (1963, 1967) greater surfaces of natural ecosystems loss less biodiversity than natural ecosystems having smaller surfaces. Existing and planned protected areas (like National Parks) are not sufficient for maintaining the balance between balanced and productive ecosystems (see below). Our "eco-balancing" proposal needs all kind of natural areas, not solely governmental protected areas. The distance between citizens and nature could be effectively reduced. Vis-à-vis climate change, higher surfaces of natural ecosystems increase the mosaic resistance.

4. Recovery of terrestrial natural ecosystems through techniques of selective isolation (e.g. protected from big herbivores, hunting and mining), and recovery of marine ecosystems. A global recovery plan is needed. Remnants of natural ecosystems could be used as nucleus for recovery processes.

5. Coexisting of historically defined human territories (human settlements, agriculture and other cultural land uses) with huge surfaces of natural ecosystems. Sustainable mosaics could replace existing not sustainable mosaics where natural ecosystems are permanently reduced.

6. Eco-balancing of the surfaces devoted to short food strategies (agriculture, cattle grazing, forestation with rapid growth species, etc.) and long food chain strategies (balanced ecosystems with local adapted communities, both indigenous and non indigenous). Balanced ecosystems are the solely "natural factories" that produce soils and contribute to maintain water basins.

7. Strong defense of indigenous rights all over the world, particularly among those groups in voluntary isolation. It is also needed a accomplishment of the Convention on the Rights of Indigenous Peoples (OIT, 1989) and of United Nations Declaration on the Rights of Indigenous Peoples (UN, 2007). Most of non indigenous countries, governments and civilian groups have been introducing their own lifestyles and patterns within indigenous communities during centuries. Such intromission contributed to the loss of their identities, cultures and knowledge. Northern and southern industrialized countries need to understand that indigenous peoples living in balance with natural ecosystems have unique knowledge, skills and tools for maintaining such balance over time. They are the solely experts in developing long food chain strategies and sustainable organizational patterns (flexible territories, sigmoid pattern of growth for most of their social indicators, not rigid infrastructure, not permanent artifacts, not industrialized production, more stable ecological niches). Non indigenous peoples can learn from them, but prior to any agreement, both countries and government are obliged to recognize their faults and even their genocidal behaviors (Montenegro, 2007a; Montenegro & Stephens, 2006).

8. Progressive replacement of the traditional system of functioning of human societies, mainly based in exponential growth, by systems based in sigmoid growth (were most of their variables are situated below the carrying capacity "K" of the mosaic of ecosystems). Most of human activities have been erroneously considered as successful when growing. Eco-balancing

includes adaptive and transitory exponential growth, sigmoid growth, and maintaining of sustainable mosaics (Montenegro, 1999).

9. Progressive replacement of the traditional system of education and training, currently based in complexes mega-systems of information, with "sustainable packs of information". Such "packs" includes the information we need for balancing our lifestyles with carrying capacities of ecosystems (particularly mosaic of ecosystems), for understanding our real world and its limits, for creating sustainable systems of production, for reducing consumption and waste production patterns, for diminishing violence but increasing dialogue and mutual respect, for learning the benefits of being responsible citizens, for condemning corruption, militarism and science without ethics, etc. The main difficulty in this process is to exclude huge amounts of unnecessary and non adaptive information, particularly in countries and international organizations were the exponential increase of available information is considered positive. A different and innovative pattern of education is needed (Montenegro, 1989, 1999). We cannot survive with systems of education and "meme processes" (see Blackmore, 2000) that increases threats and transfer crises to future generations. A joint work with mass media is essential.

The challenge is how to transform current educative systems, most of them rigid, geographically limited and plenty of chaotic information, into massive systems of education for increasing human adaptation to Earth, and to humanity.

10. Strongly and rapid decrease of population growth. It's important to note that human population growth produce two main impacts, the first one in terms of accumulative population (biomass), and the second one in terms of *per capita* consumption which involve accumulation of exosomatic culture (horizontal and vertical territorial spaces, artifacts, buildings, etc.), and the total accumulated consumption for the entire human population (and his associated exosomatic culture). Margalef analyzed instantaneous growth rate "r" (referred to years), and *per capita* consumption of energy in different countries, "f". Their addition could be assumed as a measure of human impact over Earth. These are the results:

Countries	R	F	r + f
Developed countries	0.015	0.039	0.054
Developing countries	0.035	0.015	0.050

The addition "r + f" in both groups of countries is similar (in the vicinity of 0.05). Margalef consider that human impact over Earth increase with similar intensity all over the world. Contemporarily, each 13 years the flux of energy managed by human population is doubled ($\log_e 2/0.05 \sim 13$). Such increase cannot be maintained during a long period of time (Margalef, 1977). Half of the impact is produced by rich people (0.054). They have minor populations (near 20% of total human population), and huge *per capita* consumption of energy (+ materials, + territorial space). Half of the impact is produced by poor people (0.050). They have huge populations (near 80% of total human population), and small *per capita* consumption of energy (+ materials, + territorial space). In those human groups where "r" increase more (particularly in poor countries) most of their individuals develop the "r" strategy (high "r", small "f", populations quite adapted to crises). In those human groups where "f" increase more (particularly in rich countries) most of their individuals develop the "f" strategy (high "f", small "r", populations not adapted to crises). The best scenario could be reached when r = f. Nevertheless, the solely way of obtaining some kind of stability vis-à-vis natural ecosystems it's r = f = 0 (Margalef, 1977).

11. Progressive replacement of the concept of fix territories with systems of mobile, flexible and "in surface" territories. This is a difficult task. *Homo sapiens* erroneously promoted rigid territories which are independent of natural ecosystems' flows and carrying capacities (e.g. countries and provinces' segments, cities, neighborhoods, etc.). In cities such territories are vertically extended creating "multi-layer" territories, e.g. buildings with 2, 3, 4, … "n" floors (Montenegro, 2007a). This strategy cannot be maintained over time. High density human settlements demand unsustainable amounts of energy, materials and space, and promote not sustainable patterns of living.

12. Progressive replacement of the traditional "country pattern" (which involves centralized mega cities and centralized governments) with decentralized human settlements (having less populated urban areas), and decentralized governments. Most of current national organizations are exposed to cultural drift phenomenon, and don't use the concept of ecosystems' mosaics for ameliorating their sustainability,

13. Progressive replacement of rigid infrastructure and artifacts by less rigid and more sustainable infrastructure and artifacts. Each element could have a life cycle integrated with cycles of natural, urban and productive ecosystem (inter cycling). Most of existing countries produce artifacts and built infrastructure and buildings which are independent of natural ecosystems and ecosystems' mosaics. Products and goods are produced without considering their impacts over provider's ecosystems (extraction of raw materials and biological products from ecosystems, and subsequent soil erosion, biological erosion, mineral erosion, water erosion, etc.), and over recipient's ecosystems (pollution of ecosystems with residual energies, materials and organisms). Among current industrial societies most of their processes involve flows and lack of integrated recycling. Those artifacts and buildings having rigidity, abiotic content and lack of planned recycling could be replaced by biotic or like biotic structures (Montenegro, 1981, 1999).

14. Progressive replacement of centralized and rigid systems of production which are dependent of transports, with decentralized and flexible systems that provide their products close to consumers (see "products"). The organizational strategy of big corporations and multinational companies cannot be maintained in the long term. In a country-based world with ineffective United Nations' functioning, big corporations and multinational companies represent serious threats. This lack of national and international controls increases their sensitivity to Cultural Drift (Montenegro, 1999). Most of giant organizations could resist both controls and audits in moving their headquarters and data bases all over the world (e.g. mining companies, oil companies).

15. Progressive replacement of the concept of public and private property with the concept of natural property. The natural property takes into account environmental stability and rights of human future generations to live within stable ecosystems. Natural property is equivalent to lack of real owners. This concept is closely related with flexible territories and "soft" infrastructure and objects (Montenegro, 1999, 2007a).

16. Progressive reduction of the size of human ecological niches trough adoption of sustainable lifestyles. It's important to promote ecological niches having reduced demands of energy, materials, information and space, and whose inputs and outputs are connected with sustainable cycles of closely related ecosystems (the mosaic of ecosystems, see above). It's important to note that differences between individual ecological niches cannot be avoided (hierarchies are unavoidable), but such differences could be reduced. Social systems that increase the distribution of benefits, and strict and equitable tax systems could be

implemented for reducing the gap between rich and poor people, and for moving the social systems (and their ecological niches) towards more sustainable and homogeneous lifestyles.

17. Progressive replacement of current systems of governance, where a single leader could act as president of millions of inhabitants, and to replace them with a social system having more balanced ratios between leaders and governed population. It's also important to decentralize population according carrying capacities of mosaics, and to reduce the size of human settlements (see Kohr, 1973). Open processes of public participation could reduce the bias of non balanced ratios between leaders and governed populations. Secret services and secrets governmental decisions are unacceptable, and shall be deleted from public administrations.

18. Progressive dismantling of governmental military systems and military armament, and their replacement with "soft" systems of territorial protection. Nuclear, chemical and biological weapons are not acceptable, and all national nuclear, chemical and biological arsenals could be dismantled. For the solely purpose of asteroid control, a minor international nuclear force could be maintained. Progressive dismantling of civilian arsenals could be reached. Homogeneous disarmament is essential for the surviving of *Homo sapiens*.

Most of existing countries develop the short food chain strategy and the exponential growth pattern, and continuously reduce the surface covered with natural ecosystems. This strategy was erroneously adopted during first agricultural, urban and cultural revolutions, and continues to be spread (Testart, 1982; Montenegro, 1999; Lavallée, 2000; Michelet, 2000; Stordeur, 2000). We cannot change such strategy in the short term. We need centuries of international and local work, and a new and innovative revolution. Even if most of our proposals seem not viable, we cannot choose. We have a solely planet, growing social and environmental crises, and scarce time for acting.

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