

**For an overall assessment of GMOs  
Renewed epistemological perspectives for risk analysis  
short summary of the final "EvaGlo" program report in the framework of  
"RiskOgm" - Ministry of Ecology, Sustainable Development and Energy.**

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March 11, 2016

The assessment of technologies as it is currently practiced remains in line with commodo/  
incommodo investigative procedures, where one seeks to balance the advantages and disadvantages  
of a given innovation for the persons concerned.

The basis of the approach remains risk and benefit assessment, all within a non specified context  
of judgement, consisting of an ever-present state of “already there”.

A value judgment (good / bad, advantage / disadvantage ...) does not arise in the absolute. What is  
good for one person, in a certain context of meaning, is not necessarily good for another and may  
even be to his/her detriment. The establishment of an ethical or moral framework will already allow  
for a hierarchy, stipulating that public interest comes before personal interest. And even then a  
coherent meaning needs to be provided for what is considered interest and risk, in accordance with  
the realities of the world. This reflection must constitute the initial stage of an approach towards the  
notion of evaluation , otherwise we will assimilate this process with a very unsuitable ritual for our  
current needs, leading to blind steering of a rampant technology.

General ethics, conceived as representing the whole (explicit and implicit) of which drives thought  
and deed towards public interest, constituting thus the overall context of value judgments, has  
however been excluded de facto from reflection and debate, at least regarding that which relates to  
biotechnologies, using case by case analysis. In this approach, proposed and in some instances  
imposed by the biotechnology industry, the ethical context is banished from the procedure of  
assessment. That is why we have submitted a proposal to Jean-François Dhainaut, the then president  
of the High Council of Biotechnology (HCB), to establish a working group on general ethics, as  
part of this institution, aiming to lay the foundations for an assessment of biotechnology, falling  
within a contextual meaning adapted to modern conditions<sup>1</sup>.

The human being is not suitable to live alone in the wild. Its survival requires social organization.  
Individual interest is therefore established within a social ethic. Within this framework of  
conventional social ethics, nature implicitly has infinite resilience and the need for this social  
individual to be compatible with natural organization as well, only appears culturally significant

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<sup>1</sup>"General ethics and evaluation of new technologies"

([http://www.hautconseildesbiotechnologies.fr/fr/system/files/file\\_fields/2015/10/28/ethiquegeneraleevaluationdestechnologiesnouvelles.pdf](http://www.hautconseildesbiotechnologies.fr/fr/system/files/file_fields/2015/10/28/ethiquegeneraleevaluationdestechnologiesnouvelles.pdf)). Note that, in going against the request made by Ségolène Royal to continue this working group, the new team of HCB has terminated the working group on ethics.

towards the mid twentieth century.

At a time when the impact of human activities on nature can no longer be ignored, a general social ethics must now come within the context of a general ethics of nature. The emergence however, of such an ethics is actually happening as a new phenomenon and we do not yet have references for appropriately established and recognized values.

It is in this highly evolving context, not widely shared at this time that political decisions must be made and debate organized, without recourse to pre-established recipes.

Overall evaluation has an intimate connection with general ethics, as we have no doubt understood. The major purpose of evaluating acts and thus also techniques should be making them compatible with the survival of humanity, since this survival can no longer be taken for granted. The difficulty which emerges immediately is that due to the complexity of the biosphere, we cannot predict, by using the conventional analytical method, the effect of changes made in nature by these techniques, especially as they are more powerful. The same applies for the impact on human societies.

We are therefore faced with a paradox, since it is evident that new technologies must be evaluated considering their deleterious effect on the biosphere and life in society, while it is impossible to answer the most important questions that affect our own survival. Therefore in order to make coherent decisions we need a method other than the conventional, analytical, loco-regional and causal, knowing that we will not do without either technology nor innovation.

It is in an attempt to pave the way to another manner of considering assessment that GIET 2 has proposed, instead of asking the unanswerable question: "what will be the reaction of the biosphere system to such an act?", to state that we will not predict the form of the answer, but that we will question the seriousness of the act instead. Another formulation: we want to know if a given act, a given technique, interferes with one or several essential principles of the organization of the complex system represented by the biosphere (the question can also be asked for smaller ecosystems). If the technique is life threatening to the organization of the system itself then, the precautionary principle is justified, insomuch as this is a major collective concern and not just an individual concern. This issue constitutes the essential of overall evaluation. It is summarized in the RiskOGM call for projects :

*"Instead of the will to predict what response a certain act can cause, one could for example substitute, vis-à-vis a complex natural system taken as such, the will to know the "level of organization" with which one is interfering without trying to guess the form of responses generated by this interference."*

## Method

The EvaGlo program does not aim to provide solutions, but essentially open new ways of thinking and research. Firstly several methods are possible and must be explored without presupposing superiority of one over the other. In EvaGlo we proposed several paths (not exhaustive):

1) The first is to ask what is essential for an organization to exist, in order to assess possible interactions between a technology or a desire to act and these organizational traits.

2 Transdisciplinary International Studies Group.

Indeed, if such an interference exists while one is not capable to determine whether this interaction challenges the organization of the system, then the principle of precaution is founded. The proposed reflection comes from a primary feature of any organization: it is different from randomness.

Everything is possible for a random phenomenon at every stage regardless of what has happened previously. The organization requires restrictions (and we show that it involves drastic restrictions) in what is possible and these restrictions are historic in that they depend upon the past. Artificial genetic modifications transgress the natural restrictions (it is their purpose) and are at odds with the historicity of biological objects. One of our colleagues, the mathematician and philosopher Nicolas Bouleau expresses himself in these words:

*"The result is that which is tried by nature in the natural context today is a very small part of what is possible. One should consider this context as a "protected area" by the myriad of experiences - failures or success - past, and therefore the artificial modification of the combinatorial biology is fundamentally based on the idea that the combination is benevolent beyond the context in which we find ourselves. **But this is based on an abusive principle of induction since the only law which has been applied so far is that of a natural context.**"*

Complex systems are usually very resilient and practices transgressing restriction and historicity as is the case for biotechnology do not result automatically in changing the organization of the system considered. Therefore it is the quantity of artificial beings produced that must be taken into account, which does not allow at all, of course, case by case analysis. It is certainly not **one** GMO, however it may be, that can have a sufficient effect to substantially change our destiny, but trivialization of these productions, as tends to happen today with the ease introduced by new biotechnologies can not continue without having previously shown the absence of serious organizational impact on society and the biosphere of these transgressions in almost exponential number. Work also exists which relate, not to the prediction of what will happen, but rather relates to points of instability of complex systems.

It appears to us indeed of primary importance in the framework of public decision, to be able to know whether we are close to critical thresholds which indicate times when the organization of complex systems crumbles, causing a collapse of the system.

To move forward, it is also necessary to rethink the nature of the source of meaning, of the status of being (focalization of a recursive source of meaning ) and also to better understand the nature of the properties of complex systems including resilience, critical points (beyond which the systems previously resilient collapse more or less brutally), the relevance of the acquired knowledge concerning the models and the science of system (which only use a very poor and "flat" predicates of first-order logic) as well as the concepts they provide (attractor dynamics, phase space, fractality etc.). The assimilation of genetics with a formal system, made by molecular biologists can also be questioned in order to better help identify prejudices used or not used in modern biology and to draw consequences.

2) overall assessment is radically new in its way of posing problems and opening up brainstorming ways. In this sense, it can be described as non-standard. It is important to place the situation of this overall assessment within a philosophical context , since we do not have a clear semantic framework in which to develop it. Recent development by a non-standard philosopher (François Laruelle) seems to provide such context. This is explored by Leo Coutellec in the chapter "*Critics of the standard evaluation, elements for a non-standard evaluation,*" in which the evaluation notably parts from the restrictive notion of risk and where the object " GMO ", takes on new dimensions when it is out of its field of emergence (when the GMO is out of the laboratory and placed in nature and society), "accepting as a multiplicity of epistemologies, their objectives and their objects. "

3) The confrontation of theoretical developments with reality can of course not be done on the level

which interests us most, namely the biosphere. Models exist which allow experimentation on more reasonable levels. Many publications on limited ecosystems including lacustrine systems have been made. We also have studies concerning repertoires of mice T lymphocytes, which were made in a very multidisciplinary way, confronting experimental protocols and modeling, thus constituting a very interesting model to address issues that emerge from theoretical considerations. That's why Véronique Thomas-Vaslin participates in EvaGlo program (see her contribution: "*Contribution to an overall assessment of complex systems and disturbances: the example of the immune system* ") and the reason for our involvement in the immunocomplexiT program of the Institute of Complex Systems, Paris-Ile de France.

## Continuation

Following this work, two seminars were organized, which broaden and enrich this work, both having taken place at the Institute of Complex Systems, Paris-Ile de France :

14 October 2014: "Evaluation facing global challenges";

12, 13 and 14 October 2015: "Theoretical approaches and modeling of biological diversity and dynamic resilience of complex systems organized with multi-scale approach : from immune system to macro-ecosystems. "

The detailed programs are attached.

Currently the GIET is working on deepening themes concerning the source of meaning, the relation to reality, historicity, resilience and what formal approaches could contribute. A synthesis report will be produced end of 2016, which will be posted on the site of GIET and addressed to RiskOGM.