Science and Precaution: A Complex Association

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I The introduction of precaution in international declarations and political texts

- **Rio declaration**

"In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. *Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation***."**

- **Convention on Climate Change, Article 3 – "Principles"-**

"The Parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, *lack of full scientific certainty should not be used as a reason for postponing such measures*, taking into account that policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, …."

We first analyse the status of science in the various formulations of the precautionary principle.

Main ideas:

- The precautionary principle can be considered as a principle of political responsibility, after having abandoned all thought of scientific certainty to guide political decisions. In order to deal with risks, only scientific knowledge is mentioned in the precautionary principle. This can be at the origin of an important misunderstanding. As the identification and the perception of a risk depend on cultural and social characteristics, not only scientific experts can be entrusted with the task of evaluating risks. Apart from economical and social considerations, always present in political decisions, other criteria have to be taken into account, which can belong to culture, philosophy, ethics, anthropology, aesthetic… All these criteria contribute to the constitution of the preferences of a society to take a given risk – or not - at a given level.

- Therefore, other competencies than those of scientists are needed to evaluate risks.

- The defence of the precautionary principle by the European Union in the WTO context seemed to be initially partly entangled into a debate only focused on the quality of purely scientific assessments of risks. Recently propositions to introduce the so named "other factors" to allow a given country to refuse the importation of some products, for example because of cultural preferences, have merged. Such ideas are also defended by some for the Codex Alimentarius.

- Additionally, the diverse formulations of the precautionary principle indicate that precautionary decisions have to remain open in order to be able to take into account in the future the evolution of the scientific knowledge. This attitude is of course very

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reasonable and even necessary when we are dealing with serious or irreversible damages. Nevertheless, we must have clearly in mind that the speed of development of the scientific comprehension of some phenomena is very low as compared to the speed of innovation, of apparition of new products, processes and behaviours and the speed of exchanges of goods and of spreading of diseases. Moreover, lot of the questions raised by the effects of human activities on environment, health or security are of such a complexity that some will only partially be answered by scientists, and not necessarily in a very helpful way. This question deals with the attempts of society to science, and will be further developed below.

II The Heidelberg appeal to Heads of States and Governments

This appeal has received 3,082 signatures from 106 countries including those of 72 Nobel Prize Winners, and has been distributed at the inaugural session of the Rio conference.

"…We contend that a Natural State, some times idealized by movements with a tendency to look toward the past, does not exist and has probably never existed since man's first appearance in the biosphere, insofar as humanity has always progressed by increasingly harnessing Nature to its needs and not the reverse. *We fully subscribe to the objectives of a scientific ecology for a universe whose resources must be taken stock of, monitored and preserved. But we herewith demand that this stock taking, monitoring and preservation be founded on scientific criteria and not on irrational preconceptions*."

"… We intend to assert science's responsibility and duties toward society as a whole. *We do however forewarn the authorities in charge of our planet's destiny against decisions which are supported by pseudo-scientific arguments or false and non-relevant data*…."

The Heidelberg declaration in fact denies twice the pertinence and even rationality of non scientific arguments used in political decisions on environment. It also deny the existence of scientifically grounded arguments already on the table to initiate precautionary measures like those on climate change, for instance. Doing so, he questions the scientific community on climate change and criticizes the quality of its work. This *political* position is given without other justification than the presumed authority of the signers, justified by their quality of scientists. This text has received an important reaction in France, from where it came.

Among other aspects, one of the consequences of the appeal was the (previously existing, Roqueplo) tendency to describe the scientific community as divided in two parts. On the one hand, we would have the scientists which activities are oriented towards observation and modelling of the environment including anthropogenic effects; one the other hand, the other part of the scientific community would be involved in research activities confined in laboratories and driven by innovation. The latter researchers would not be preoccupied by the future of the products and processes they contribute to design, products and processes escaping to their control at the stage of industrialisation and commercialisation. (as GMOs in plain fields).

The French President recently decided to add a Charter of the environment to the Constitution. The main issue in the debate was the presence or not and then the formulation of the precautionary principle in this Charter. The examination of the project of constitutional law will begin this week in the French Parliament. The two following expressions was used in the debate: "acting science " – "la science agissante" - and "enlightening science " – "la science éclairante". This formulation tempted to pacify different opinions on the precautionary principle driven by parts of the scientific community.

This description, with is interesting from a sociological point of view, is not satisfying at all. In fact, a lot of examples demonstrate that things are much more complex and that scientific communities much more interpenetrated and permeable to each other.

For instance, in the science of climate change, some parts of the can be conducted experimentally in laboratories. Scientific developments in climatology can be used in other areas of science.

Additionally, environmental preoccupations have of course been integrated in research projects. See, for example, interdisciplinary researches on ecological packaging (India, Europe,…).

As far as expertise is concerned, assessments of risks of chemicals represent a major counterexample of the schematic description presented above. Currently the risk assessment of chemicals is conducted by ecotoxicologists and toxicologists after the products have been commercialised. Another way for products a priori very risky consists of determining few of their physicochemical characteristics in labs in a very traditional way and to select the products potentially dangerous for the environment at large scales and in an irreversible way.

Nevertheless, the most important aspect of the Heidelberg appeal from my point of view is that this event represents one of the first occasions where scientists expressed views on science and the environment in an international political arena. Others scientists, when attracting the attention of the public and policy makers to the dangers linked with climate change, ozone depletion and acid rains, initiated this process some years before.

The opposition mentioned above between to types of scientific activities from the point of view of the protection of the environment (in a large sense, including health and security) has no general meaning. What is important in fact is to recognize that scientists are submitted to pressures of two kinds, and also let this pressures develop for some part. On one hand, the pressures are oriented towards preservation and an amelioration of the environment; on the other hand they are oriented toward innovation for a better economy.

These very different preoccupations relatively often enter into conflict, but this is not a rule. Additionally, a government which send such messages to scientists through important decisions taken on research institutions, research organisation and funding (programs,…) are much more able to require and obtain expertise than citizens on risks. This dissymmetry of means for expertise is today very questionable especially when the expertise required by States is not produced with clear procedures and when the results of the expertise are not public.

At the same time, when asking scientists to describe and explain the effects of human activities on the environment, one operates a major displacement in departing considerably from the initial objectives of science. In fact, certain disciplines of science, like physics and chemistry, was initially preoccupied to discover the laws of nature. If those disciplines, with biology and other disciplines as such, can today contribute to the new objective enounced above of understanding the evolution of the environment under dynamical human strains and stresses, we have to be aware of the displacement in the definition of the scientific task operated. The laws to be discovered, additionally, will therefore have a very different status compared to Newton's laws, for example.

III How to progress in the utilisation of science and expertise of scientists for the environment?

Science

As far as climate change is concerned, for example, we need not only to develop observation means (new observation locations to produce more precise, more frequent and better geographically distributed observations), but also to progress in the production of more homogeneous data, and in the exchange of such data for research.

The systems collecting environmental data are strongly dependant on the nature of the administrative and political power in a given State – democratic or not, centralised or not. The improvement of the environment in a given State strongly depends on the quality and transparency of available data. In the context of international environmental agreements, the capacity of manipulation is correlated with the uncertainties remaining for the negotiators on national data, for instance forests in Russia for the negotiation on climate change. On the other hand, the persons having conducted actions in Russia to improve national

environmental standards are those having developed national systems of data collections on the local environment. What about very large countries like China, India?

Expertise

BSE crisis. The BSE crisis in Europe raised the crucial issue of data exchanges to pursue research in areas combining high economical interests and the diffusion of a lot of important information for risk evaluation in a complex chain of production, and transportation of food products. Therefore, some have asked to establish in the European Union the possibility of a State or of the Union to require another Member State (MS) to deliver national information dealing with a given identified risk.

A lot of progress has been made in the organisation of expertise in food safety, in the EU and in on MS like France and the United Kingdom. In the same area, the dialog between political policy makers and scientific experts has improved a lot.

Some generic questions have found different answers by MS when establishing an Agency partly dedicated to risk evaluation: the independence of the Agency from political and economical power (see the failure of the Federal Agency of Health in Germany) and the separation between evaluation and management of risks. The answers differ from one sector (drugs) to the other (food safety) for example in France, and are probably also necessarily dependant form the administrative and political organisation of a given State. The difficulty remains to define the best relations between theses agencies at the national and European level.

It must be underlined that expertise, as refined it can be, is a tool for political policy makers, who are ultimately responsible for the decisions they take. Here remains the difficulty to establish and to rigorously apply democratic procedures in order to

- take into account the other criteria in the expertise of risks
    - to properly and continuously inform and consult citizens in order to appreciate collective preferences on risks.

The IPCC represents a unique organisation of expertise on a global environmental issue. The success of IPCC has different origins: (Hervé Le Treut)

- The existence of an indisputable corpus of scientific data to demonstrate the increased atmospheric concentrations of carbon dioxide and other greenhouse gazes, such as methane, since the beginning of the industrial era;
- Climate change is a global problem and it is not yet possible to determine the potential winners and losers;
- The existence of a previously well-structured international scientific community at least for Working Group 1 of the IPCC.

Of course a lot of progress remains to be made:

- for presenting date to policy makers in a useful way;
- for better taking into account and present minority opinions in reports.

The transposition of such a structure to other global environmental issue seems to remain difficult. The reasons of that have to be rigorously analysed in order to progress in the expertise available at an international level (biodiversity,…).

One difficult issue as far as international expertise is concerned on a given environmental issue is the definition of a scientific community. Additionally, how to create the conditions allowing such a community to debate and alert serenely on the issues of its competence?

What seems to be extremely important for the quality of its work is its interdisciplinary character, which ensures that a given discipline does not work in an isolated way, but on the contrary is confronted to others, which is crucial of course for all environmental problems complex in essence .

Conclusion

Scientists have entered the political arena on international environmental issues. Nevertheless, it seems generally still difficult to scientists, more and more often required to answer questions outside their initial area of competency to collectively think in a reflexive way on their practice :

- What kind of science are we producing today?
- What are the consequences of our work for the environment in a large sense (social, economical, environmental, ethical…)?
- What is the impact of our public expression for political policy makers and for citizens?

1. A big effort remains to be done in the presentation of the state of the available knowledge to political policy makers in useful way, which combines competence and pertinence, without going so far as to present available results of analysis, models and observations at the scale of an electoral area.

2. The different temporalities of policy-making and science are not sufficiently taken into account into the organisation of expertise for precaution.

3. In order to progress in precaution approaches coordinated at an international level, the differences in administrative and political structures of the different countries have to be taken into account.

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