

Paper Number: 3434

## **Legal, social, scientific and ethical responsibility of geoscientists**

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All Geoscientists have the legal, scientific, social and ethical responsibility not only to research results themselves but also for their applications. These four responsibility have different criteria with each other, and adopted independently based on the type, origin, impact, frequency and other factors of geoscientific process. It is necessary to distinguish the four in adopting to real cases.

Legal responsibility should be put on the proved damages according to the principle of legality (no punishment without law), and its application is limited to the restricted case. Compensation and punishment are applicable to physical, economic, political and mental damages, and their type and level differ based on the intention or accident, negligence or absolute liability, and with or without extenuation.

Social responsibility is also put on the damage, however, in contrast with legal one, it may be widely applied including for damages which are not legally defined, such as scenery, culture, mood, reliance, and other fuzzy damages. Though it is difficult to determine the compensation and punishment.

Scientific responsibility is put on any behaviour which has deviated, obstructed or delayed the development of science. The duty of scientists is to obtain detailed and advanced information through continuous scientific research, and provide their knowledge and skills to the society. All the scientific processes should be properly carried out, and that the knowledge is definitely correct and effectively utilized in the society. It is, however, unavoidable to fail his research caused by various factors, including accident, negligence, careless, inexperience and insufficiency. If any mistake was found, the scientist may be damaged his impartiality, suspended his license, or dismissed his position, and he should immediately correct by errata, revision, or even retraction of the previous paper.

Ethical responsibility is put on any unethical thinking and acting, regardless the quantity and quality of damage. Ethical problems in academic research are classified into the following three categories by National Academy of Sciences [1] [2]. 1. Misconduct in science, including fabrication, falsification, or plagiarism, in proposing, or reporting research. 2. Questionable research practices, such as inadequate research records, refusing access to research materials or data, honorary authorship, inappropriate statistical or other methods, etc. 3. Other misconduct without direct relationship with science, such as sexual harassment, tease, default, research funding fraud, conflict of interest, property damage, etc. Compensation and punishment may differ with these category and damage.

Geoethics should be very carefully and purely considered as the ethics dealing with the way of thinking and acting in relation of geosciences. We should permeate the Geoethics to the human society for the development of geosciences and their proper utilization. We should not overlook unethical behaviour,

but we should avoid personal attacks which are not effective on ethical problem. Also it is strictly excluded to misuse the Geoethics for other purposes such as political and/or economic profits.

*References:*

- [1] National Academy of Sciences (1992) Responsible Science, Volume I: Ensuring the Integrity of the Research Process. i-xxiv, 1-199
- [2] Swazey, J. et al. (1993) American Scientist 81(6):542-55

