

The theory - Hazard, harm, risk and safety

A quick search of the internet may leave you convinced that GMOs and in particular GM crops and foods are hazardous, harmful, risky and/or unsafe. To understand how the risks associated with GMOs are assessed and managed and to be able to better judge these claims for yourself, a basic understanding of risk analysis, its vocabulary and context is required.

Understanding the meaning of the terms most often used in risk analysis is important, not only because it helps to define the context of the discipline, but also because it will assist you in doing your own risks assessments.

Harm - is an adverse outcome or impact.

Hazard - is any potential source of harm (the possibility to cause harm).

Risk - is the probability of a harm occurring under defined circumstances.

Safety - is the condition of not being exposed to or being protected from harm; not likely to be harmed.

It is difficult to explain the concept of risk because it is only a probability or chance of something happening, we therefore can't really give concrete explanatory examples of it. Hazards, in contrast, are all around us in our familiar physical world, e.g. the bottle of bleach under the sink or the motor vehicle in the garage. Similarly, it is fairly easy to come up with examples of possible harms associated with these hazards, e.g. bleach poisoning or an injury sustained in a traffic accident. Risk is the "probability link" between hazard and harm. In other words, risk defines the chance that a hazard (car) will result in a harm (injury) and implies opportunity (access to a car), action (driving the car), incident (being involved in an accident) and a harmful result (a broken arm) – generally referred to as a pathway to harm.

In formal, science-based risk assessments the extent of a risk is estimated by considering both the likelihood and consequence of a harm occurring (risk = likelihood x consequence). Reducing either of these, e.g. using the car less often or investing in voice-to-text software, will therefore lower the risk of you not being able to write your memoirs due to a broken arm sustained in a traffic accident!

[For more on this topic please watch this Green Facts video](#)

BUT...

For the average person defining a risk is not an objective, quantitative calculation, our perceptions, experiences and emotions (personal frame of reference) also have a profound effect on our **perception** of and **response** to risk. Two different persons may therefore perceive and respond very differently to the same risk - the root cause of many of the heated disagreements about technical subjects such as GMOs.

The key determinants of your perception regarding a particular risk are

- (1) any facts you may know of (technical know-how, statistics, etc.),
- (2) how familiar you are with a particular risk situation (driving a conventional car vs. sitting in a driverless car), and
- (3) if you consider it to be a dreaded risk (resulting in catastrophic, uncontrollable harms, e.g. nuclear war), and
- (4) how the possible risks are balanced out by the possible benefits.

In principle this means the less we know about a particular risk the higher we perceive it to be. Now add to this the fact that our perceptions are shaped more by our personal experiences and own frame of reference than externally communicated facts and you'll realise why people often view a specialised activity/technology/product as risky while the facts paint a completely different picture - the main reason why the public debate on GMOs has not evolved much over the last two decades.

There are some great resources on *Risk Bites* that further explore these issues – please see www.riskbites.org and in particular <https://www.youtube.com/playlist?list=PLVpUweVc-T4gEAhwQZtZf08jvP0tD6-l>