The Precautionary Approach

A promising strategy to prevent damage?

Over the last decades, the precautionary principle became a central principle of risk regulation, particularly in the European Union. It promotes early regulation to prevent and reduce damage to health or the environment in situations of uncertainty. A precautionary approach in risk regulation involves the application of some form of the precautionary principle. By looking into case studies about GMO regulation in the European Union and international efforts against ozone depletion, this paper analyses the following statement: 'The precautionary approach has been successful in preventing, managing and preparing for possible risks to health, safety, security, and/or the protection of the environment'. In the case of GMO regulation in the European Union, regulation was not adapted to the changing scientific evidence base. Thus, considerable opportunity benefits were missed. Instead, reference to precaution was misused to advance other political goals. The precautionary approach to ozone depletion, which peaked in the ratification of the Montreal Protocol, is an example of successful international precautionary regulation. The precautionary principle awards science a prominent role in the process of policymaking. Still, it is inherently political and thus subject to misuse. To apply it fruitfully, the different roles and responsibilities of researchers and policymakers have to be respected. It can encourage introspection and innovation in science, technology and policy. In a connected world with serious global challenges and complicated, lengthy political processes, taking agency early gains in importance.

The precautionary approach involves an intervention in risk management applying the precautionary principle (PP). The PP states that, in the face of uncertainty, early measures should be taken to prevent and mitigate potential damage to human health or the environment [1]. The core of the PP is the goal of preventing or not inflicting irreversible harm.

Background

The PP reflects aversion towards uncertainty, the caution of not making irreversible commitments that might constrain future courses of action and the value of intergenerational equity [2]. The latter requires to not impose risks on future generations for immediate benefits. The majority of contemporary jurisdictions include some type of PP [3]. Well-known examples are the Rio declaration or the constitution of the European Union (EU) [4].

Versions of the PP

All versions of the PP refer to decision making under uncertainty [5]. The uncertainty can be scientific or, as often the case in policy making, socially constructed - leading to public perceptions of uncertainty [6]. In a situation of uncertainty, the possible events cannot be fully identified, let alone their likelihood [7]. In contrast, in situations characterised by risk, the probabilities are known

and a preventative approach can be pursued [5].

Commonly, weak and strong versions of the PP are distinguished [5]. According to weak interpretations, policy makers should tackle risks even if they are not fully understood and if damage would be serious otherwise. The Rio Declaration is an example, stating that lack of full scientific certainty shall not be a reason to postpone cost-effective measures to avoid damage [8]. Strong interpretations posit that precautionary measures should be taken as a default response to uncertain risks [8].

Further characteristics of the PP

- The PP lowers the threshold for regulation [5].
- The PP grants science a central role in policy-making because precautionary measures have to take into account provisional scientific information which is subject to change [9].
- The PP is a matter of ongoing controversy in academia and practice [1]. The debates turn around its definition and practical application.
- The PP became one of the central principles of risk regulation, particularly in the EU [2].

By looking into case studies about GMO regulation in the EU and ozone depletion, the following statement shall be analysed: '*The precautionary approach has been successful in preventing, managing and preparing for possible risks to health, safety, security, and/or the protection of the environment*'.

Regulation of GMO in the EU

A precautionary approach

The European Union chose a precautionary approach to tackle the potential risks of genetically modified organisms (GMOs). With the Directive 2001/18/EC [10] on the deliberate release of GMO into the environment, it reacted to public concerns [11] and non-conclusive scientific evidence that GMOs could pose serious hazards to health and environment [12]. Member states should ensure that adverse effects on health and environment from GMOs are avoided via adequate measures.

Box 1: The EU and the PP

The PP and its application were set out by the EU before [13], reflecting a strong interpretation of the PP [12]. There, the EU specifies that general risk management principles have to be taken into account when applying the PP. Those include the principles of proportionality and nondiscrimination, consistency of the measures with existing measures, examination of costs and benefits as well as review of the measures in light of scientific developments.

Already in 1998, the EU put in place a de-facto moratorium on biotech products [11]. In the regulation of GMOs, a precautionary approach tries to reduce potential hazards to environment and health and to increase benefits for farming and trade [12].

Maladaptation to changing scientific evidence

Following the initiation of a precautionary approach, EU countries spent considerable amounts of money on research about the risks of GMOs [14]. Only while developing the base of scientific evidence can the measures in a precautionary approach be updated. Yet, the main finding of the research efforts was that the risks associated to GMOs are also present in conventional agriculture. According to the above-mentioned principles underlying the application of the PP, the EU should have adapted its regulatory measures. This has not happened [11].

Instead, the PP was then used as an argument to delay the approval of different genetically modified crops. The argument was based on assumed side-effects of GMOs compared to conventional breeding [11] whereas scientific evidence pointed in the opposite direction [15]. Today, GMOs are allowed to be cultivated and sold only under restrictions [16]. In this respect, it is striking that the EU has practiced a double standard for many years: GMO import was allowed whereas their cultivation was practically prohibited [17].

The danger of political misuse

The case of GMO regulation in the EU shows some limits of the precautionary approach. In the beginning, a precautionary approach seemed legitimate

given the unclear scientific evidence base. During the subsequent years though, the regulations were not updated in the light of the changing scientific evidence. Political arguments outweighed the scientific evidence.

Given that regulation is an inherently political matter, this might be legitimate. However, it disregards a core feature of the precautionary approach. One could argue that this reflects a weakness of the PP, namely its strong reliance on science for political decision-making. On the other hand, it could be argued that the EU left the trajectory of a precautionary approach by not updating the regulation in the context of developing scientific evidence.

The case shows that a stringent application can be complicated by political factors. There is potential to use the PP as an argument to postpone action by referring to laudable foresight.

Box 2: The Uncertainty Paradox

At the origin of the PP is the acknowledgement of uncertainty. Science cannot always provide conclusive evidence. All formulations of the PP need to refer (in oftentimes vague terms) to the level of proof required to trigger application of the PP [18]. Thereby, a paradox arises, also called the 'uncertainty paradox' [19]. On the one hand, policymakers ask for conclusive evidence from scientists on whether something is a risk. On the other hand, in a situation where a precautionary approach is considered, uncertainty is a crucial characteristic. Hence, science is asked to deliver evidence about uncertain risks, which is impossible. Otherwise, there would be no uncertainty.

Missed opportunity benefits

Another important shortcoming of the EU's approach concerns opportunity benefits [20]. Agricultural production needs to be increased in quality and quantity while becoming more sustainable. GMOs could be a promising innovation to tackle those challenges. Hence, choosing a precautionary approach towards GMO regulation should take into account the risk of not scooping the potential of GMOs to support the agricultural transformation.

The growing scientific consensus that GMO pose no additional risks compared to traditional farming suggests that the precautionary approach did not prevent noteworthy harm in this case. Rather, it impeded the scooping of the potential of the technology. Thus, it cannot be considered successful.

The role of science

The precautionary approach is a political choice [2]. It is not implied by any scientific research. This choice involves the decision on whether a situation poses the potential of considerable damage in the future.

Hence, the uncertainty paradox shifts the perspective towards the role of science and research in the framework of a precautionary approach but also in policymaking in general. It points out the fundamental challenge of dealing with uncertainty and acknowledging its meaning [19]. Science is a system of knowledge generation that is dynamic, iterative, as descriptive as possible and seldom unambiguous. Tackling societal challenges is not the responsibility of scientists but of policymakers. Science can provide orientation by drawing plausible scenarios and illustrate options. A sincere application of the PP must respect the limits of science – and accept the political responsibility.

Ozone depletion and the Montreal Protocol

Scientific warnings

A rather successful example of the implementation of a weak version of the PP is the Montreal Protocol to reduce the depletion of the ozone layer. Beginning in the 1920s, chlorofluorocarbons (CFCs) were widely used as cleaning solvents, blowing agents and flexible foam [21]. The stratospheric ozone layer alleviates the damaging effects of ultraviolet radiation on human health and the environment. UV radiation can cause skin cancer and inhibits the immune system - besides, it can damage crops and ecosystems [22].

In 1974, two scientists raised concerns about destruction of the stratospheric ozone layer (also called ozone depletion) by chlorofluorocarbons [23]. They asked for early action to prevent harm that potentially could be catastrophic. Thus, they suggested a precautionary approach. One year later, scientific evidence posited that CFCs were greenhouse gases [24].

An internationally coordinated precautionary approach

The following reconstruction of events exemplifying a precautionary approach by the international community follows [21] and [22]. Research into ozone depletion was intensified over the 10 years following the scientific warnings. While the damaging effects on environment and health were quantified, the ozone depleting mechanisms initiated by CFCs were confirmed. Consumer boycotts of certain products such as aerosols or containers containing CFCs increased. In parallel, governments started to prohibit some products.

In 1972, the United Nations Environment Programme (UNEP) was initiated at the Stockholm Conference, the first world conference on the environment [25]. UNEP started tackling protection of the atmosphere and thus the ozone layer in 1975. In 1985, 27 countries and the European community signed the Vienna Convention on Protection of the Ozone Layer [26]. This convention established a framework for the Montreal Protocol on Substances that Deplete the Ozone Layer, which was signed two years later. Additional scientific warnings [27] and the assumed appearance of the ozone hole over Antarctica [28] preceded the protocol.

Box 3: The Montreal Protocol

The Montreal Protocol [29] restricts consumption and production of ozone depleting substances (ODS) via a step-wise procedure. It achieved universal ratification. Industry began replacing the harmful substances. The Montreal Protocol has been continuously amended, keeping pace with the developing scientific evidence base. Every member state of the United Nations signed the Montreal Protocol over the following 20 years. As a result, 99 % of global production and consumption of ODS were phased out [30].

The world avoided

What would have happened without the measures implemented via the Montreal Protocol? To get a rough idea, several studies ([31], [32] or [33]) investigated scenarios assuming the OSD growth rates that were present before the protocol's enaction. Their conclusion is that the ozone layer would have been globally depleted until 2050. Thus, it is plausible to assume that the Montreal Protocol prevented a drastic increase in UV radiation an adverse health outcomes. It might also have achieved a five times higher greenhouse gas emission reduction than the first part of the Kyoto Protocol [34].

Adaptation to changing scientific evidence

The weak precautionary approach in the Montreal Protocol has definitively been successful in preventing risks to health and the environment. After initial scientific warnings, the stakeholders took around 10 years to come up with widespread precautionary measures. They emerged progressively, keeping pace with the development of the scientific evidence base. The various amendments of the Montreal Protocol after its enaction demonstrate that a precautionary approach was implemented with the willingness to adapt measures to changing scientific evidence.

Conclusion

The Montreal Protocol case shows that a precautionary approach can be successful in preventing damage to health or the environment. Coherence, rigor, and a political will to prevent damage required. Fundamentally, the approach must be flexible enough to adapt to developing scientific evidence. Otherwise, the cost of missing opportunity benefits can become substantial. This creates challenges regarding communication of uncertainty and potential change of policy direction towards stakeholders and society in general.

Values create incentives

There are considerable incentives to misuse precaution as an argument to advance other political goals. These incentives get stronger the more value-based the political stances on a specific question are. The debate on GMO is strongly centred around the value of naturalness – much more than the question about depleting ozone layers. In the former case, a narrative of foresighted politicians protecting society from unnatural technological developments can easily be built. In the latter case, objection towards measures to reduce ozone depletion are predominantly economic and do not involve disputed normative judgements.

Roles and responsibilities

The application of the PP might be seen as rather vague. Because it is intended for situations involving uncertainty and ranges on a continuum, this is not surprising. Policymakers need to accept the uncertainty and their responsibility to deal with it. Science might be able to reduce the uncertainties in the future. The different roles and responsibilities of researchers and policymakers have to be respected. A well-developed dialogue between scientists and policymakers is key.

Precaution could thus be viewed as to guide science and policy when facing uncertainty rather than as a mechanism invoked as soon as a certain evidence threshold is reached [35]. It can encourage introspection and innovation in science, technology and policy [36].

Box 4: Other issues of the PP

This paper discusses the precautionary approach by looking at two case studies. While some of its chances and shortcomings are illustrated, others cannot be treated due to the limited scope. Those include, for example, how to deal with risk-risk trade-offs, the economic effects on safety or distributional issues arising from the application of the PP. A further discussion can be found in [1] or [2].

Initiating political processes

The general idea of precaution is common sense [1] and follows the intuition of erring on the side of caution. Though this might not matter in academic terms, it has relevance for the world of politics and lends a solid amount of legitimacy to the PP.

Concerted and decided political action to alleviate potentially huge damage to health or environment takes time to implement. This is exemplified by the case of the Montreal Protocol, whose establishment took twelve years after the first scientific warnings. Would a permissive approach have been applied until sufficient scientific evidence was available, precious time would have been lost to put the topic on the political agenda. In a connected world with serious global challenges and complicated, lengthy political processes, taking agency early gains in importance.

Endnotes

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