
7. The principles of prevention and precaution in international law: two heads of the same coin?

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7.1 INTRODUCTION

The preventive and precautionary principles are landmark principles of international environmental law. A dividing line could be drawn between these two principles: prevention is addressing tangible risks whilst precaution deals with scientific uncertainty.

Risks for which causation between an event and damage is demonstrated by irrefutable scientific proof come under the principle of prevention. Such risks can be qualified as *certain*, since it is possible to establish the causal link between the initial event and its adverse effects, and to calculate the probability of their occurrence.

Precaution epitomises a paradigmatic shift on the account that it is distinguished by the intrusion of uncertainty. Indeed, precaution does not posit a perfect understanding of any given risk: it is sufficient that a risk be suspected, conjectured, feared. In such a situation, decision-makers cannot determine the threshold levels to which preventive actions appear to be subject in order to avoid or to minimise the occurrence of the risk. In other words, precaution means that the absence of scientific certainty – or conversely the scientific uncertainty – as to the existence or the extent of a risk should no longer delay the adoption of preventative measures to protect the environment.

To sum up, whilst under a preventive approach the decision-maker intervenes, provided that the threats to the environment are tangible, pursuant to the precautionary principle, authorities are prepared to tackle risks for which there is no definitive proof either that there is a link of causation between the suspected activity and the harm or that the suspected damage will materialise.

Given that prevention and precaution appear in some ways intimately linked – two sides of the same coin – the aim of this chapter is to explore some of the key issues arising in discussion on their status in international law.

The following table highlights the different regulatory approaches according to the level of gravity of the environmental harm.

Table 7.1 Different regulatory approaches according to the level of gravity of the environmental harm

Regulatory responses according to the level of gravity of environmental harm	
Unknown probability of serious or irreversible damage	Precautionary measures
Probability of a significant risk	Preventive measures
Insignificant risks	Variable scenarios depending on the scope of the conventions and the domestic regulations

Whilst the two categories are clearly separate within the law, the dividing line between prevention and precaution is not always so clear-cut in real life. There is in some sense a continuum ranging from the certainty underlying preventive action through to precautionary action triggered by uncertainty. Preventive measures are liable to turn into precautionary measures where they become embroiled in scientific uncertainty; on the other hand, the nature of initially precautionary measures can become more preventive if scientists are able to dispel any lingering uncertainty.

7.2 THE PRINCIPLE OF PREVENTION

7.2.1 Prevention in a Nutshell

Curative measures may remediate environmental damage, but they come too late to avert it. By contrast, preventive measures do not depend on the appearance of ecological damage; they anticipate it or, where it has already occurred, try to ensure it does not spread. In any case, common sense dictates timely prevention of environmental damage to the greatest extent possible, particularly when it is likely to be irreversible or too insidious or diffuse to be effectively dealt with through civil liability or when reparation would be extremely expensive.

However, the outlines of the preventive principle are difficult to discern; it gives rise to so many questions that any attempt at interpretation calls for constant clarification. We may, for example, ask whether a preventive measure presupposes complete knowledge of the risk to be reduced, if all forms of damage must be foreseen, if intervention should take place at the level of the sources of damage or of their effects, and whether it is preferable to monitor the progress of damage or to avert damage the moment it becomes evident.

7.2.2 The Interaction between the Principle and the Obligation Not to Cause Environmental Damage to the Environment of Other States or to Areas beyond National Jurisdiction

In order to understand the scope of the principle of prevention, one has to delve into the origin of the no harm principle that has been formulated in the *Trail Smelter* case. Several authors consider this award as the first manifestation of the principle of prevention. In that case, the Dominion of Canada was judged liable for damage caused by pollutants discharged into the atmosphere by a foundry, on the ground that the government should have ensured that the plant was being operated in conformity with the obligations incumbent upon all States under international law – that is, the duty at all times to protect other States against injurious acts caused by individuals from within its jurisdiction: ‘Under the principle of international law ... no State has the right to use or permit the use of territory in such a manner as to cause injury by fumes in or to the territory of another of the properties or persons therein, when the case is of serious consequence and the injury is established by clear and convincing evidence’ (*Trail Smelter*, 1941: 1965).

The no harm principle strikes the following balance in an attempt to reconcile two contradictory ideas. According to the Charter of the United Nations (UN Charter) and the principles of international law, States have the sovereign right to exploit their own resources in line with

their own domestic policies; that sovereignty is nevertheless restricted where it entails environmental damage impinging upon the sovereign rights of other States.

Since it places emphasis on transboundary harm rather than protection of the environment per se, the no harm principle stops short of embracing a genuine preventive dimension. Moreover, today's environmental problems are global in nature rather than transboundary.

The no harm principle was enshrined in Principle 21 of the 1972 Stockholm Declaration on the Human Environment and Principle 2 of the 1992 Rio Declaration on Environment and Development. However, these soft law principles affirm States' responsibility 'to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction'. Stockholm's Principle 21 and Rio's Principle 2 entail thus a paradigm shift in placing greater emphasis on preventing damage in general rather than on the damage caused to the sovereign rights of other States.

Moreover, Stockholm's Principle 21 and Rio's Principle 2 also have a broader scope than the principle of no harm. Indeed, the reference to 'areas beyond the limits of national jurisdiction' laid the groundwork for a more comprehensive notion of prevention that is no longer restricted solely to bilateral relations (Duvic-Paoli, 2018: 9).

Although they are entangled with each other, the scope of the no harm principle and the prevention principle differ: whereas States will not breach the former principle where any damage caused is not considered to be significant, they might still breach their duty of diligence in not preventing its occurrence (Dupuy and Viñuales, 2018: 65).

Against this background, the International Court of Justice (ICJ) has established that the obligation imposed on the State to use all the means at its disposal in order to avoid activities which take place in its territory, or in any area under its jurisdiction, causing significant damage to the environment of another State 'is now part of the corpus of international law relating to the environment' (*Advisory Opinion on the Legality of the Threat or Use of Nuclear Weapons*, 1996: para. 29; see also *Arbitration Regarding the Iron Rhine Railway*, 2005: paras 222–3). Prevention is now widely recognised as reflecting a rule of customary international law, placing preventive duties on the right of States to carry out activities within their territory or under their jurisdiction (International Law Commission (ILC) Draft Articles on Prevention of Transboundary Harm from Hazardous Activities, 2001: General commentary, para. 3 (hereinafter ILC Draft Prevention Articles)).

In particular, *Gabčíkovo–Nagymaros* reflects the importance afforded by the ICJ to prevention: 'in the field of environmental protection, vigilance and prevention are required on account of the often irreversible character of damage to the environment and of the limitations inherent in the very mechanism of reparation of this type of damage' (*Case Concerning the Gabčíkovo–Nagymaros Project*, 1997).

The rule not to cause significant damage to the environment of another State entails a duty of prevention that has been acknowledged by tribunals set up under the auspices of the Permanent Court of Arbitration (PCA). In *Arbitration Regarding the Iron Rhine Railway*, the PCA held that

environmental law and the law on development stand not as alternatives but as mutually reinforcing, integral concepts, which require that where development may cause significant harm to the environment there is a duty to prevent, or at least mitigate, such harm. This duty ... has now become a principle of general international law. This principle applies not only in autonomous activities but also in activities undertaken in implementation of specific treaties between the Parties. (*Arbitration Regarding the Iron Rhine Railway*, 2005: paras 58, 220)

By the same token, in addition to the obligation to take into account the obligations stemming from the 1960 Indus Waters Treaty between India and Pakistan, which were limiting India's right to divert the waters of the Kishenganga/Neelum, the PCA found that the principle of prevention also constrained India's right to divert these waters. Indeed, States have 'a duty to prevent, or at least mitigate significant harm to the environment when pursuing large-scale construction activities' (*The Indus Waters Kishenganga Arbitration*, 2013: para. 452).

Accordingly, States find themselves bound by a due diligence requirement to prevent transboundary harm. In other words, the State must have failed to show due diligence if it is to be held liable. However, customary law does not specify what diligent conduct entails or what concrete measures States are required to take in order to fulfil their duties under Rio's Principle 2. Indeed, the obligation to prevent transboundary harm is subject to a variety of interpretations as to what preventive actions may be required of a State, as well as what amount of damage is to be prevented.

7.2.3 The Formulations of the Principle in the Different Environmental Sectors

Prevention cannot be ensured merely by setting general rules whose credibility depends on the effective implementation of State liability. The basis for the preventive principle in international law must be sought in multilateral and bilateral conventions intended to ensure environmental protection rather than in international State liability. The proliferation of preventive mechanisms found in such conventions plays a crucial role in implementing the duty of diligence to prevent transboundary harm and therefore giving substance to the principle of prevention. The preventive principle is explicitly set out or can be deduced from an extensive body of international treaties and related instruments, the subjects of which include:

- the marine environment (for instance, United Nations Convention on the Law of the Sea (UNCLOS), 1982: Articles 194(1)(2), 195, 192, 196, 204, 207, 208, 209, 210, 211, 212);
- the management of high seas fisheries (for instance, United Nations Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks, 1995: Article 5);
- the protection of rivers (for instance, United Nations Convention on Non-Navigational Uses of International Watercourses, 1997: Article 21);
- climate (for instance, United Nations Framework Convention on Climate Change (UNFCCC), 1992: Article 3(3));
- the ozone layer (for instance, Vienna Convention for the Protection of the Ozone Layer, 1985: Article 2(2)(b));
- waste management (for instance, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989: Article 4(2)(c));
- biodiversity (for instance, Convention on Biological Diversity (CBD), 1992: Articles 8 and 14);
- vulnerable ecosystems such as the Antarctic and the Alps (for instance, Protocol on Environmental Protection to the Antarctic Treaty, 1991: Article 3(2); Convention on the Protection of the Alps, 1991: Article 2); and
- transboundary environmental risk assessment (for instance, Espoo Convention on Environmental Impact Assessment in a Transboundary Context, 1991: Article 2(1); Helsinki Convention on the Transboundary Effects of Industrial Accidents, 1992: Article 3(1)).

It must be pointed out that these provisions do not establish an obligation of result, but rather an obligation to make efforts according to the due diligence rule to prevent the occurrence of significant damage. In other words, States are not obliged as to other States. Moreover, the stringency of these preventive obligations will depend largely on the nature of the instrument (soft law or hard law) and the relevant provision (for example, reference to the preventive principle in a preamble fulfils an interpretative function, while its enunciation in an operative provision is binding).

7.2.4 The Normative Contours of the Duty to Prevent Environmental Harm

According to the ICJ, the principle of prevention, as a customary rule, has its origins in the due diligence incumbent upon each State within its own territory (on the customary nature of the principle, see Duvic-Paoli, 2018: 91–136).

In 2001, the ILC fleshed out the principle of prevention into more concrete provisions (ILC Draft Prevention Articles, 2001). Given that these draft Articles are drawing on international case law, multilateral environmental agreements (MEAs), the principles enshrined in the Rio Declaration (notably 2, 10, 11, 17, 18, and 19), the 1982 UNCLOS and the 1991 Espoo Convention on EIA in a Transboundary Context, they do prescribe, to a great extent, existing international obligations. Although these Articles have not been codified in a treaty, the UN General Assembly commended these draft Articles to the attention of governments (UNGA Resolution 62/68, 2008).

In order to determine the principle of prevention in international law, a critical analysis of the scope of these draft Articles in light of case law developments is needed. The scope of the ILC Draft Prevention Articles is clarified by four different criteria (Article 1) which apply concurrently to ‘activities’:

- ‘not prohibited by international law’;
- ‘planned or are carried out in the territory or otherwise under the jurisdiction or control of a State’;
- involving a risk of ‘causing significant transboundary harm’; and
- the ‘physical consequences’ of which cause significant transboundary harm.

The key obligation stemming from the draft Articles is Article 3, which reads as follows: ‘the State of origin shall take all appropriate measures to prevent significant transboundary harm or at any event to minimise the risk thereof’.

7.2.4.1 Positive duty to prevent significant harm to the environment

7.2.4.1.1 Introductory comments

States have a positive duty to prevent significant harm to the environment (see *Arbitration Regarding the Iron Rhine Railway*, 2005: para. 222; *Case Concerning Pulp Mills on the River Uruguay*, 2010: para. 101; *Certain Activities Carried Out by Nicaragua in the Border Area*, 2015: para. 104; *South China Sea Arbitration*, 2016: para. 941). A similar duty is encapsulated in other treaties. For instance, Article 2 of the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Watercourse Convention, 1992) requires a proactive and anticipatory approach: riparian States are called on ‘to constantly adopt and implement the necessary preventive measures before any danger to the transboundary waters becomes acute or even apparent’ (Tanzi, Kolliopoulos and Nikiforova, 2015: 117).

Along the same lines, Article 3 of the ILC Draft Prevention Articles requires the adoption of ‘all appropriate measures to prevent significant transboundary harm or at any event to minimise the risk thereof’.

In determining the scope of the obligation to prevent the occurrence of significant transboundary harm, one has to take into consideration the combined effect of the probability of occurrence of the harm and the magnitude of its impact. It is, therefore, the combined effect of ‘risk’ and ‘harm’ which sets the threshold (ILC Draft Prevention Articles, 2001: commentary to Article 2, para. 2). As a result, we shall start our analysis with the examination of the knowledge of the occurrence of such damage, moving on to address the nature of the harm.

7.2.4.1.2 The knowledge of the risk

The ILC is of the view that a threshold had to be set out in order to ‘strike a balance between the interests of States’ (ILC Draft Prevention Articles, 2001: commentary to Article 2, para. 2). The risk of causing a transboundary harm of a certain magnitude amounts to ‘a high probability of causing such a harm’. However, ‘a low probability of causing disastrous transboundary harm’ is sufficient to trigger the preventive obligations (Article 2(a)). Once these thresholds have been crossed, the State of origin is called on to adopt preventive measures with a view to averting significant transboundary harm.

Accordingly, a distinction must be drawn between:

- the significant transboundary harm that must be prevented; and
- the risk of significant transboundary harm that must be minimised.

It follows that the preventive measures have to be triggered whenever there is a ‘high probability’ that a ‘significant transboundary harm’ is likely to occur. In contrast, the mere ‘risk’ of significant harm, and even disastrous harm, does not trigger the obligation of preventing its occurrence, but merely to minimise that occurrence (Handl, 2007: 540).

It comes as no surprise that this distinction is fraught with controversies. According to Handl, the ILC Draft Prevention Articles focus more on the probability rather than on the consequences of the future impact of the event (Handl, 2007: 540). Ultimately, this approach eschews the application of the precautionary principle.

Unforeseeable risks are excluded (ILC Draft Prevention Articles, 2001: commentary to Article 3, para. 5). Moreover, in emphasising the probability of the occurrence of the risk, the ILC Draft Prevention Article 2 does not take sufficiently into account the precautionary approach encapsulated in Article 15 of the Rio Declaration as a binding obligation. In its advisory opinion, the Seabed Disputes Chamber of ITLOS held that this ‘non-binding statement is an integral part of the general obligation of due diligence of sponsoring States’ (*Responsibilities and Obligations of States Sponsoring Persons and Entities with respect to Activities in the Area*, 2011: para. 131).

7.2.4.1.3 The significance of the harm

Due diligence revolves around the concept of harm and not that of environmental interference. The term ‘harm’ covers any damage that is caused not only to persons and property but also to the environment. However, Article 1 of the ILC Draft Prevention Articles does not define what is meant by the ‘environment’. *Ratione materiae*, though most MEAs setting out preventive obligations deal with pollution, the principle of prevention encompasses a variety of categories of harm. For instance, with respect to the law of the seas, prevention is ‘not limited to measures

aimed strictly at controlling marine pollution' which although 'certainly an important aspect of environmental protection ... is by no means the only one' (*Chagos Marine Protected Area Arbitration*, 2015: paras 320 and 538).

Given that it is impossible to set forth a precise technical threshold above which the harm is deemed to be illicit, the ILC employs in Article 3 the more flexible standard of 'significance'. Along the same lines, Article 10 of the 1992 Rio Declaration on Environment and Development subjects the obligation to 'prevent or abate any transboundary environmental interference or a significant risk thereof' to the existence of 'substantial harm – i.e. harm which is not minor or insignificant'. In *Pulp Mills* the ICJ held that the obligation to carry out an EIA had to be triggered by the 'risk of significant transboundary harm' (*Pulp Mills*, 2010: para. 104). The European Court of Human Rights (ECtHR) has also reasoned along the same lines: Article 8 of the European Convention on Human Rights (ECHR) applies where the level of pollution affecting the applicant's private life reaches a certain level of severity (*Maile and Hardy*, 2012: paras 187–8; *Borysiewicz v. Poland*, 2008).

As a result, any damage that does not exceed that threshold of significance should fall outside the principle of no harm, though States are still bound by a duty of due diligence to prevent its occurrence. Nevertheless, there is no such threshold of significance under many MEAs, European Union (EU) law or domestic laws.

Although the requirement that harm must be 'significant' has been established, little has been said with regard to its extent.

In the comments of its codification of the law on transboundary harm, the ILC stresses: 'The term "significant" is not without ambiguity and a determination has to be made in each specific case. It involves more factual considerations than legal determination. It is to be understood that "significant" is something more than "detectable" but need not be at the level of "serious" or "substantial"' (McCaffrey, 2001: 370). The harm must lead to a real detrimental effect on matters such as, for example, human health, industry, property, environment or agriculture in other States. Such detrimental effects must be susceptible to being measured by factual and objective standards (ILC Draft Prevention Articles, 2001: commentary to Article 2, para. 4). As a result, small or insignificant impacts must be excluded. Accordingly, the significance of the harm must be assessed on a case-by-case basis. What may be significant in one case may not be in another. The detrimental effects must be measured according to factual and objective standards (ILC Draft Prevention Articles, 2001: commentary to Article 2(4)). In that regard, the task of establishing the significance of harm can be facilitated by the adoption of environmental quality standards (EQS), which can provide a baseline against which due diligence can be assessed (Watercourse Convention, 1992: Articles 3 and 9).

It must also be noted that the threshold of 'significance' has been encapsulated in a number of environmental agreements (Convention on the Law of the Non-Navigational Uses of International Watercourses, 1997: Annex I, Article 7; Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 1992: Article 1(2)).

Last but not least, the ECtHR has been reasoning along the same lines: the protection conferred by Article 8 ECHR applies in the event that the interference exceeds 'a minimum level of severity'. *A contrario*, there would be no arguable claim under Article 8 if the effect were negligible 'in comparison to the environmental hazards inherent to life in every modern city' (*Maile and Hardy*, 2012: paras 187–8).

If the probability of the occurrence of a significant risk is fulfilled, the duty to take preventive measures to protect the environment in the context of activities not prohibited by international law applies. The next step is thus to determine the scope of this duty.

7.2.4.2 Scope of the obligation to take preventive measures to protect the environment in the context of activities not prohibited by international law

7.2.4.2.1 Territorial scope

Preventive obligations apply in relation to any activity that is not prohibited by international law and that is liable to cause significant environmental harm, irrespective of its location. The activities can be located anywhere within the territory of the State of origin, regardless of its proximity to the border with the impacted State (See, for instance, UNECE (2013), ‘Guide to Implementing the Water Convention’: para. 84).

In addition, the duty to prevent applies not only to activities within the territory of the State of origin but also to any activities that fall under its jurisdiction (ILC Draft Prevention Articles, 2001: commentary to Article 1(9)). In effect, States are called on to prevent significant environmental damage wherever it occurs, be it in their exclusive economic zone (EEZ) or on the high seas.

7.2.4.2.2 Personal scope

Ratione personae, the duty to prevent applies not only to activities on the territory of the State of origin but also to activities under its jurisdiction, such as the high seas (ILC Draft Prevention Articles, 2001: commentary to Article 1, para. 9). The ECtHR has been endorsing a similar reasoning: whether the pollution is caused directly by the State or whether responsibility for it is the result of an absence of adequate regulation of private industry, Article 8 ECHR can be invoked (see notably *Ruano Morcuende v. Spain*, 2005; *Fadeyeva v. Russia*, 2005: para. 89; *Moreno Gómez v. Spain*, 2004: para. 57; *Tatar v. Romania*, 2009: para. 87; *Dées v. Hungary*, 2010: para. 23).

7.2.4.2.3 Material scope

The preventive obligations apply to any activity not prohibited by international law that may cause significant environmental harm irrespective of the nature of such activity. Accordingly, a large number of activities are covered, provided that their transboundary environmental impacts exceed the threshold of significance.

The term ‘harm’ extends to damage caused not only to persons and property but also to the environment. That being said, Article 1 of the ILC Draft Prevention Articles on prevention of transboundary harm does not define what is meant by the ‘environment’. *Ratione materiae*, it must be noted that the majority of the agreements encapsulating preventive obligations are dealing with pollution. However, given that a holistic approach should be endorsed, the principle of prevention encompasses an array of categories of harm. For instance, with respect to the law of the seas, the principle of prevention is ‘not limited to measures aimed strictly at controlling marine pollution’ which while ‘certainly an important aspect of environmental protection ... is by no means the only one’ (*Chagos Marine Protected Area Arbitration*, 2015: paras 320 and 538). To cite another example, activities endangering vulnerable ecosystems such as coral reefs are also subject to preventive obligations, such as Article 194 UNCLOS (*South China Sea Arbitration*, 2016: para. 945). Furthermore, environmental impact assessments (EIAs) apprehend an array of environmental impacts (EIA Directive, 2011: Article 3).

With respect to the ECtHR case law on Article 8, the parties are required to adopt preventive measures with a view to preventing noise pollution (*Mileva v. Bulgaria*, 2010; *Moreno Gómez v. Spain*, 2004), atmospheric emissions (*Fadeyeva v. Russia*, 2009), smells (*Lopez Ostra v. Spain*, 1994: para. 58), radiation (*Ruano Morcuende v. Spain*, 2006), whenever these nuisances interfere in the domicile or the private life of applicants.

Given that the obligation to ‘prevent significant transboundary harm or at any event to minimise the risk thereof’ is not absolute, States are bound by a standard of due diligence that is commented upon in the next section.

7.2.4.3 The content of due diligence

7.2.4.3.1 Introductory comments

The principle of prevention has its origins in the due diligence that is required of a State in its territory (*Pulp Mills*, 2010: para. 101; ILC Commentary to Article 3, para. 7). The obligation of due diligence can be deduced from a number of international agreements (see, for example, UNCLOS, 1982: Article 194(1); Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972: Articles I, II and VII(2); Vienna Convention for the Protection of the Ozone Layer, 1985: Article 2; Convention on the Regulation of Antarctic Mineral Resource Activities, 1988: Article 7(5); Espoo Convention on Environmental Impact Assessment in a Transboundary Context, 1991: Article 2(1); Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 1992: Article 2(1)) as well as from soft law instruments (UNGA Resolution 37/7, 1982, ‘World Charter for Nature’: Principle 21).

Although the standard of due diligence is vague and elusive, the difficulty in defining it does not mean that it has no content (ILA, 2016). Although the substantive and procedural duties provided for under the different MEAs specify to some extent the content of the due diligence, it is also possible to extract from the international courts and tribunals’ case law and codification works several key substantive and procedural obligations attached to that standard.

7.2.4.3.2 Substantive content

If the State of origin fails to prevent the occurrence of transboundary harm, such occurrence triggers an obligation to ‘take all appropriate measures to prevent significant transboundary harm or at any event to minimise the risk thereof’. This begs the question as to the level of effort that is required.

Firstly, the State of origin is required to exert its best possible efforts to avert or to minimise the risk. In its advisory opinion on illegal, unreported and unregulated (IUU) fishing activities, the ITLOS Seabed Chamber clarified the scope of the principle of prevention as applied to this issue. Coastal States have a *primary responsibility* for carrying out any action necessary in order to prevent, deter and eliminate IUU fishing within their EEZ (*Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission*, 2015: para. 106 (hereinafter ‘*Sub-Regional Fisheries*’)). This *responsibility* entails an obligation of ‘due diligence’. It is therefore only the failure by a flag State to comply with its obligations of ‘due diligence’ that will constitute a breach of that State’s international obligations under UNCLOS. In explaining the meaning of ‘due diligence’, the Chamber stressed that a flag State must do ‘the utmost’ to prevent IUU fishing (para. 129).

It follows that ‘due diligence is manifested in reasonable efforts by a State to inform itself of factual and legal components that relate foreseeably to a contemplated procedure and to

take appropriate measures, in timely fashion, to address them' (ILC Draft Prevention Articles, 2001: commentary to Article 3(10)). Reasoning along these lines, the ICJ held that the State was subject to an obligation to use all means at its disposal in order to avoid activities that cause significant damage to the environment of another State (*Construction of a Road in Costa Rica along the San Juan River*, 2015: para. 104 (hereinafter '*Construction of a Road*'); *Certain Activities carried out by Nicaragua in the Border Area*, 2015: paras 104 and 118 (hereinafter '*Certain Activities*'). See also *Arbitration Regarding the Iron Rhine Railway*, 2005: para. 222; *South China Sea Arbitration*, 2016: para. 941).

Secondly, due diligence is likely to vary according to the level of threat and the nature of the activity at issue. According to the ILC, 'the standard of due diligence is that which is generally considered to be appropriate and proportional to the degree of risk of transboundary harm in the particular instance' (ILC Draft Prevention Articles, 2001: commentary to Article 3(11)). Hence, given that the extent of the required diligence increases in proportion to the severity of the risk, a higher standard of care thus applies to activities that may be considered more hazardous than the average (see, for instance, UNECE, 2013, 'Guide to Implementing the Water Convention, 2013: para. 65).

Thirdly, the States are called on to *formulate policies* designed to prevent significant transboundary harm or to minimise the risk thereof (ILC Draft Prevention Articles, 2001: commentary to Article 3, para. 17). From an administrative point of view, activities must be subject to an environmental licence. In this connection, Article 6 of the ILC Draft Prevention Articles sets forth the fundamental principle that the prior authorisation of a State is required for activities which involve a risk of causing significant transboundary harm undertaken in its territory or otherwise under its jurisdiction or control. As far as the right of privacy is concerned, it is settled case law that, pursuant to Article 8 ECHR, the State has a positive duty to enact *adequate measures* to secure the applicants' rights (*Özel v. Turkey*, 2015). Thus, the State authorities are required to put in place a preventive regulatory framework under which standards are adapted 'to the specific features of the activity concerned, and in particular to the level of risk which may result' (*Fadayeveva v. Russia*, 2008; *Budayeva and Others v. Russia*, 2008; *Tatar v. Romania*, 2009: para. 88). Similar requirements stem from EU environmental directives. By way of illustration, under Article 6(2) of Directive 92/43, which provides for the avoidance, in the special areas of conservation, of the deterioration of natural habitats, the Member States are called on to establish an appropriate system of protection of the habitats and to enforce the prohibition on construction and unplanned building works (*C-504/14, Commission v. Greece*, 2016: para. 43).

Fourthly, the requirement of due diligence is not static. In addition to the obligation to restrain activities likely to damage the environment, the principle of prevention entails a positive obligation that requires States to take *active steps* with a view to preserving the environment (*South China Sea Arbitration*, 2016: para. 941; Duvic-Paoli, 2018). For instance, Article 2 of the 1996 UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) requires a proactive and anticipatory approach: riparian States are called on 'to constantly adopt and implement the necessary preventive measures before any danger to the transboundary waters becomes acute or even apparent'. Likewise, according to the ILC, the obligation requires a continuous review of the preventive obligations in light of scientific advancement (ILC Draft Prevention Articles, para. 5). Our view is that the standard entails a constant adaptation of techniques and technologies to ward off pollution and environmental risks. It follows that the recourse to best available technol-

ogies (Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention), 1992: Article 2(3)(b)(i); Convention for the Protection of the Marine Environment of the Baltic Sea Area, 1992: Article 3(3)) could be a yardstick against which the behaviour of States could be reviewed.

Fifthly, the implementation of the environmental standards must be effective (Rio Declaration, 1992: Article 11). In *Pulp Mills*, the ICJ held that ‘It is an obligation which entails ... a certain level of vigilance in their enforcement and the exercise of administrative control applicable to public and private operators, such as the monitoring of activities undertaken by such operators, to safeguard the rights of the other party’ (para. 197). Of importance is that the preventive measures are effective. Pursuant to Article 8 ECHR, interference with the right to respect for private and home life will not be permitted where public authorities do not apply the law (*Hatton and Others v. UK*, 2003: para. 120; *Fadeyeva v. Russia*, 2008: paras 83–4).

7.2.4.3.3 *Procedural content*

In addition to the obligation to adopt and to enforce relevant environmental preventive regulations, several procedural obligations encapsulated in Principles 17–19 of the Rio Declaration on Environment and Development elaborate upon the substantive obligation of prevention (Arbour *et al.*, 2016: 130). First of all, it is settled case law that, for the purposes of protecting the environment with respect to activities that may be liable to cause transboundary harm, States are required to carry out an EIA. Subsequently, the EIA triggers a duty to cooperate with States that are likely to be affected by the activity; that duty entails notification, the exchange of information, consultation and negotiation in good faith.

DUTY TO ADDRESS THE RISK

It is settled case law that, for the purposes of protecting and preserving the environment with respect to activities which may be liable to cause transboundary harm, States are called on to carry out an EIA (*Arbitration Regarding the Iron Rhine Railway*, 2005; *Pulp Mills*, 2010: para. 204; *Certain Activities*, 2015: para. 104; *Construction of a Road*, 2015: para. 153; *South China Sea Arbitration*, 2016: paras 947–8; *Responsibilities and Obligations of States Sponsoring Persons and Entities with respect to Activities in the Area*, 2011: para. 145; ILC, 2004, ‘Berlin Rules on Water Resources’: Article 29; ILC Draft Prevention Articles, 2001: Article 7). The EIA should enable the State to determine the extent and the nature of the risk involved in an activity and consequently the type of preventive measures it should take (ILC Draft Prevention Articles, 2001: commentary to Article 7). By way of illustration, in *South China Sea*, the PCA held that, given the scale and impact of the activities likely to cause transboundary harm, China was required, ‘as far as practicable’ to prepare and communicate an EIA (*South China Sea Arbitration*, 2016: para. 988).

Along the same lines, with a view to guaranteeing a fair balance between economic development and the right to private and family life (Article 8 EHRC), the ECtHR has imposed the requirement to carry out an EIA (*Tatar v. Romania*, 2009: para. 116). By way of illustration, the resumption of mining activities liable to cause pollution must first be subject to ‘the conduct of investigations and studies of an appropriate nature to prevent and evaluate in advance’ their effects on the environment (*Lemke v. Turkey*, 2007: para. 44).

That being said, neither the commentaries nor the case law specifies who should conduct the assessment, what should be the level of independence of the assessors, what should be the content of the risk assessment, which impacts and components of the environment

should be analysed, etc. (with the exception of the Espoo Convention on Environmental Impact Assessment in a Transboundary Context, which provides in detail the content of such assessment).

DUTY TO COOPERATE

Secondly, in addition to the EIA, the State of origin is under the obligation to cooperate with the State likely to be affected by the transboundary harm. For instance, in its provisional measures order in *MOX Plant*, ITLOS held that ‘the duty to cooperate is a fundamental principle in the prevention of pollution of the marine environment under UNCLOS Part XII of the Convention and general international law’ (*MOX Plant*, 2001: para. 82 ; see also *Pulp Mills*, 2010: para. 77). Regarding the implementation of Article 61(1) UNCLOS, according to which the coastal State shall determine the allowable catch of the living resources in its EEZ, ITLOS held that States have the obligation to cooperate through regional or sub-regional fisheries organisations (*Sub-Regional*, 2015: para. 118; see also *Chagos Marine Protected Area*, 2015: para. 140).

The duty to cooperate entails three additional specific obligations:

Duty to notify

Firstly, treaty law, as well as the case law of the international courts and tribunals, requires the State of origin to notify the States likely to be affected by the planned activity causing transboundary harm (*Corfu Channel*, 1949; *Pulp Mills*, 2010; *Certain Activities*, 2015: para. 105; Rio Declaration, 1992: Principle 19; UNCLOS, 1982: Articles 165(2)(c) and 169(1); ILC Draft Prevention Articles, 2001: Article 8; ILA, 2004, ‘Berlin Rules on Water Resources’: Articles 56–7). The Convention on Early Notification of Nuclear Accidents, adopted shortly after the 1986 Chernobyl nuclear accident, greatly contributed to the crystallisation of that obligation into a customary rule.

Duty to exchange information

Secondly, if the assessment indicates a risk of transboundary harm, the State engaging in hazardous activities is required to transmit the relevant information to the affected State(s) (*Case concerning Land Reclamation by Singapore in and around the Straits of Johor*, 2003: para. 99; *Pulp Mills*, 2010: para. 79; Paris Convention on the Prevention of Marine Pollution from Land-Based Sources, 1974: Article 10; UNCLOS, 1982: Article 200; Nordic Convention on the Protection of the Environment, 1974: Article 5; Vienna Convention for the Protection of the Ozone Layer, 1985: Article 4; Espoo Convention on Environmental Impact Assessment in a Transboundary Context, 1991: Article 3; ILC Draft Prevention Articles, 2001: Article 12).

A question arises as to whether due diligence also entails an obligation to provide the public with information (ILC Draft Prevention Articles, 2001: commentary to Article 13; Rio Declaration, 1992: Article 10. See also Espoo Convention, 1991: Article 6(2); EIA Directive 2011/92/EU, Article 8; Habitats Directive 92/43/EEC, Article 6(3)). It would appear that the procedural obligations discussed above go beyond traditional interaction between the source State and the risk-exposed State(s). The procedural rights – access to information, participation, and access to justice – guaranteed under the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (Aarhus Convention) and the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean (Escazú Agreement)

must go hand in hand with the above-mentioned obligations. These EMAs contribute to enhancing States' ability to avoid prohibited transboundary impacts.

Duty to consult and to negotiate in good faith

Thirdly, States are under the obligations to consult (*Fisheries Jurisdiction*, 1974: para. 78; UN Convention on the Law of the Non-Navigational Uses of International Watercourses, 1997: Article 6(2); Espoo Convention, 1991: Article 5; Helsinki Convention on the Transboundary Effects of Industrial Accidents, 1992: Article 4; ILC Draft Prevention Articles, 2001: Article 9; ILA Berlin Rules on Water Resources, 2004: Article 58) and to negotiate in good faith (*Lake Lanoux Arbitration (France v. Spain)*, 1957; *Gabčíkovo–Nagymaros*, 1997: paras 112 and 139–41; *Certain Activities*, 2015: para. 104; *Pulp Mills*, 2010: para. 79). The obligation to consult in accordance with Article 9 ILC Draft Prevention Articles entails the obligation of seeking solutions based on 'an equitable balance of interests'. Article 10 lists the factors which must be taken into account by States when defining and implementing their preventive measures (degree of risk of harm, importance of the activity at issue, the economic viability of the activity, etc.).

Similarly, the right to protection of health set out in Article 11 of the European Social Charter will be breached where the authorities do not 'enter into fair and genuine consultations with those exposed to environmental risks' about the risks of pollution to which they are exposed due to the exploitation of lignite (*Fondation Maranyopoulos v. Greece*, 2006: para. 217).

The obligation to consult is closely linked to the prior informed consent regime applicable under the regulation of waste and pesticides international movements (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade).

The question arises as to whether due diligence entails also the obligation to provide the public with the relevant information (ILC Draft Prevention Articles, 2001: commentary to Article 13; Rio Declaration, 1992: Article 10). Our view is that the procedural obligations discussed above go beyond the traditional interactions between the source State and the risk-exposed State(s). The procedural rights – access to information, participation, and access to justice – guaranteed by the Aarhus Convention must go hand in hand with the above-mentioned obligations. According to Handl, they contribute 'to enhancing States' ability to avoid prohibited transboundary impacts (Handl, 2007: 543). In particular, according to the ECtHR case law, Article 8 of the Convention encompasses the rights to information and to challenge domestic decisions pursuant to Article 9(2) of the Aarhus Convention. In addition, Article 8 requires that 'an effective and accessible procedure be established which enables such persons to seek all relevant and appropriate information' (*McGinley and Egan v. UK*, 1996: para. 101; *Tatar v. Romania*, 2009: para. 116).

The ECtHR has underscored the importance for the public of being able to gain access to these studies in order, on the one hand, to evaluate the danger to which they are exposed and, on the other hand, to permit opponents to initiate court proceedings in the event that their observations have not been sufficiently taken into consideration. The deprivation of all effectiveness of these procedural guarantees amounts to a violation of Article 8, although this provision does not lay down any express procedural condition (*Hatton and Others v. UK*, 2003: para. 128; *Taskin and others v. Turkey*, 2004; and *Giacomelli v. Italy*, 2006: para. 82).

To conclude, Principles 17–19 of the Rio Declaration on Environment and Development give authoritative expression to the view that these three transboundary impact-related procedural obligations are part of present-day customary law (regarding the compulsory performance of an EIA, see *Pulp Mills*, 2010: para. 204). That view is reinforced by the extensive treaty practice establishing the obligations for States to assess, notify, and consult before carrying out or allowing activities likely to give rise to a significant risk of transboundary harm (Handl, 2007: 541–3). Furthermore, to the extent that States have not been challenging the obligations stemming from the ILC’s codification, they have henceforth been enforced. Rather, litigation before international jurisdictions revolves around the question whether an appropriate EIA has been undertaken, or whether the environmental domestic regulations have been consistently applied. Finally, compliance with each of these substantive and procedural duties is testament to the diligent behaviour of State authorities.

7.2.4.4 Obligation of conduct

Due diligence does not entail absolute obligations, or obligations of result. Under an obligation of result, States are responsible for any damage caused to others, irrespective of whether all due diligence preventive measures were implemented. In contrast, under a due diligence approach, States only incur responsibility where they do not take all appropriate steps to prevent the transboundary impacts resulting from activities carried out on their territory. Since it entails merely an obligation of conduct, the standard of due diligence does not guarantee that harm will never occur (ILC Draft Prevention Articles, 2001: commentary to Article 3(7)).

This is confirmed by conventional practice. For instance, the UNCLOS provisions governing fishing in the EEZ of another State or on the high seas require due diligence rather than a specific result (*Sub-Regional Fisheries*, 2015: paras 125 and 129). Likewise, the 1997 UN Convention on Non-Navigational Uses of International Watercourses sets forth an obligation to exercise due diligence in the utilisation of an international watercourse in order not to cause significant transboundary harm.

7.2.5 EU Law

Prevention is the Cinderella principle of the EU environmental policy. This principle has been proclaimed in Article 191(2) of the Treaty on the Functioning of the European Union (TFEU), together with both the principle that environmental damage should as a priority be rectified at source and the polluter pays principle (PPP). It also strengthens one of the objectives assigned to EU environment policy by Article 191(1): namely, ‘to ensure a prudent and rational utilisation of natural resources’.

The multitude of preventive mechanisms found in EU secondary law – environmental impact assessments, notification procedures, adequate control of risks, exchange of data on the impact of harmful activities, etc. – play a crucial role in preventing environmental harm and therefore give substance to the principle. With respect to waste management, prevention prevails over other operations such as reuse, recycling, recovery and disposal (Article 4 Directive 2008/98 on waste). Another good example of the implementation of the principle of prevention in EU secondary legislation is found in Directive 96/82/EC on the control of major accident hazards involving dangerous substances, which aims to prevent such accidents. Article 5(1) of the Directive requires that ‘Member States shall ensure that the operator is obliged to take all measures necessary to prevent major accidents and to limit their consequences for man and the

environment'. The obligation to maintain an appropriate distance between plants falling under the Seveso Directive on the one hand and buildings of public use on the other hand applies to all authorities involved in the implementation of plans and policies that are linked to the objective of preventing serious accidents (C-53/10, *Franck Mücksch*, 2011: para. 27).

There is no shortage of illustrations of the salience of preventive regulatory schemes in the case law of the Court of Justice of the EU (CJEU).

The presence of the preventive principle in treaty law allows the courts to interpret the provisions of the 2008/98 Waste Framework Directive (Waste FD) to favour protection of the environment. Thus, the Court has ruled that:

the principles of precaution and preventive action oblige the [EU] and the Member States to anticipate, reduce and, as far as possible, to cut off at their origin sources of pollution or nuisances through the adoption of measures intended to eliminate known risks ... To the extent that wastes, even those in temporary storage, may give rise to serious damage to the environment, there is reason to consider that the provisions of [the Waste FD] which aims to implement the precautionary principle, are equally applicable to operations involving temporary storage. (C-175/98 and C-177/98, *Francesca Bizzaro et Paolo Lirussi*, 1999: paras 51–3)

Likewise, preventive regulatory schemes are salient in the case law of the CJEU. By way of illustration, a procedure for prior authorisation to be obtained prior to the setting up of large retail establishments is appropriate for achieving the objectives relating to town and country planning and environmental protection pursued by the regional authorities. In truth, the damage which would be caused if the authorisation scheme were not to be applied could not be repaired after the establishment had been opened. Against this background, the CJEU stressed the soundness of the preventive approach: 'adoption of measures *a posteriori*, if the setting up of a retail establishment already built should prove to have a negative impact on environmental protection, appears a less effective and more costly alternative to the system of prior authorisation' (C-400/08, *Commission v. Spain*, 2011: para. 92).

The Water Framework Directive (WFD) 2000/60 entails obligations that are more binding than any Member States really expected. The Member States have to divide the ecological quality ratios ('EQRs') for each surface water category into five different classes (high, good, moderate, poor and bad). Article 4(1)(a)(i) of Directive 2000/60 states that deterioration of the status of all bodies of surface water should be prevented. The CJEU interpreted the concept of 'deterioration of the status' of a body of surface water as not entailing a reclassification of that body of water in a lower class (C-461/13, *Bund für Umwelt und Naturschutz Deutschland eV*, 2015: paras 50 *et seq.*). Accordingly, the duty to prevent deterioration of the status of bodies of surface water applies whenever the body has deteriorated irrespective of any change of class. The prohibition of deterioration of the quality of a water body and the obligation to ensure a good water status by the year 2015 are thus binding requirements and not political slogans. This obligation amounts to an obligation of standstill and is much more stringent than was previously expected.

Last but not least, with respect to habitats protection, the CJEU endorses a strict interpretation of the preventive measures. Such a measure complies with Article 6(2) of the Habitats Directive 'only if it is guaranteed that it will not cause any disturbance likely significantly to affect the objectives of that directive, particularly its conservation objectives' (C-399/14, *Grüne Liga Sachsen and Others*, 2016: para. 41; C-387/15 and C-388/15, *Orleans*, 2016: para. 40).

7.2.6 Concluding Remarks

As a customary rule, the principle of prevention originates from the no harm principle, which imposes a requirement of due diligence on a State within its territory (*Pulp Mills*, 2010: para. 101; ILC Draft Prevention Articles, 2001: commentary to Article 3(7)). There is a difference between the nature of the two principles, given that prevention is no longer envisaged from a State-sovereignty perspective. Nevertheless, both principles could be seen as two sides of the same coin.

The obligations to undertake preventive measures within the framework of activities not prohibited in international law are primary establishing norms of conduct (Hafner and Buffard, 2010: 240).

That being said, the above analysis of recent treaty and case law developments signals a move from the traditional negative aspects of prevention – i.e. to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction – towards a more affirmative duty to take all appropriate measures with a view to preventing significant harm to the environment. The analysis also highlights the pivotal role of different substantive and procedural duties in framing the content of the due diligence. The interaction between prevention and due diligence entails a cascade of far-reaching procedural obligations: the preliminary assessment as to whether the activity entails a risk of significant harm which, if it does, triggers a requirement to carry out an EIA, which in turn obliges the State to comply with the duties to notify, consult and negotiate.

Under EU law, the principle of prevention is fairly complex, owing to the number and diversity of the legal instruments in which it recurs.

In contrast with precaution, the nature of prevention is not controversial.

7.3 THE PRECAUTIONARY PRINCIPLE

7.3.1 Precaution in a Nutshell

Known at the start of the 1990s by only a few specialists in environmental law, the precautionary principle has within the space of a decade experienced a meteoric rise and, as a result, been able to establish itself as a new general principle of international law (de Sadeleer, 2002: 91–223). In addition, it has come to occupy an uncontested position not only in international but also in EU law, as well as in several European countries, to the point where it overshadows the principle of prevention. In France, by embedding the precautionary principle (PP) within the Constitutional Charter, the framers sought to enhance its autonomy as a source of French law. In the event of any conflict with EU or international law, the French concept of precaution should have precedence. Furthermore, the precautionary principle has been applied increasingly often in a wide array of areas ranging from classic environmental issues (nature, water, air, etc.) to wider areas such as food safety (mad cow disease, the spread of genetically modified organisms, etc.) as well as health issues (the French HIV blood-contamination scandal, health claims linked to phthalates in PVC toys and endocrine disruptors, among other issues). Lastly, as discussed below, some international courts draw inspiration from it, and important scholarly analyses have been devoted to it. A complete discussion of this rich literature is impossible in the space available here.

Yet, despite the success of the precautionary principle in the field of international law, its outlines are far from clear. Accorded diverse definitions in these legal orders and case law applications, the principle can in fact be understood in a variety of ways. Although fairly recent in the history of environmental law, no other environmental principle has produced as much controversy as the principle of precaution. Indeed, much ink has been spilled in a wide variety of books, journals and other publications over the status and the legal effects of the principle of precaution.

In a nutshell, precaution means that the absence of scientific certainty – or conversely the scientific uncertainty – as to the existence or the extent of a risk should henceforward no longer delay the adoption of preventative measures to protect the environment. Put simply, the principle can be understood as the expression of a philosophy of anticipated action, not requiring that the entire corpus of scientific proof be collated in order for a public authority to be able to adopt a preventive measure.

Its significance lies also in its challenge to traditional legal systems, many of which are permeated by the need for certainty. The operator's civil liability can be incurred provided that the victim is able to shed light on the link of causation between the operator's behaviour and the ensuing damage. A World Trade Organization (WTO) member is able to enact a food safety measure provided that its regulatory choice is based upon clear scientific evidence resulting from a risk assessment. This presupposes continuous recourse to scientific expertise, with experts being able to provide flawless data to both courts and decision-makers. However, at first glance, precaution provides for the possibility to act while uncertainties have not yet been resolved.

Praised by some, disparaged by others, the principle is no stranger to controversy. Discussions about its status and functions have greatly intensified with respect to WTO trade issues. Indeed, much of the recent debate has focused on the question of whether the principle fosters protectionism in justifying arbitrary standards that cannot be met by developing countries and as a result, may jeopardise innovation. As far as the manner of application is concerned, various questions remain unanswered. Must one aver a serious, significant, irreversible or collective risk? Does the adoption of a measure require a minimum set of indications showing that the suspected risk is well founded, or are public authorities relieved of all requirements to furnish proof when confronted with a significant risk? Is there an obligation for scientists to disclose all uncertainties? Do the scientists need to carry out in any case a risk assessment and according to which methodology? Is it possible to draw a line between uncertainty and ignorance? Must the decision-maker aver a serious, significant, irreversible or collective damage? As for its implementation, should action be limited exclusively to moratoria, or are control and surveillance measures sufficient? And if this is possible, for how long should these measures apply?

It is the aim of this section to provide insights as to how the principle – or the approach – has been fleshed out into a flurry of international environmental agreements embracing a wide array of environmental sectors.

7.3.2 Precaution in Response to the Limitations of Science

The significance of precaution lies in its challenge to conventional science. As a matter of fact, the rise of new technologies has caused a new generation of risks to emerge (CFCs, POPs, GMOs, hormone-disrupting chemicals, electromagnetic fields, etc.). Presenting unique chal-

lenges to the ability of science to anticipate and prevent harm, these risks are fundamentally different from traditional industrial risks. First, their impacts are much wider and more diffuse. Secondly, they are permeated with uncertainty: insufficient experience makes it impossible to determine with accuracy their probability. Moreover, it is difficult to determine the damage they may provoke, in terms of localisation, of latency between the first exposure and the actual impact of damage, frequency, duration, nature and scale. Uncertainty may impinge upon one of these factors or all of these factors. As a result, uncertainty is the linchpin around which the principle unfolds.

Accordingly, precaution came to centre stage in the field of environment policy in response to the limitations of science in assessing these complex and uncertain ecological and health risks (de Sadeleer, 2002: 20–30; Peel, 2005: 34–60). However, there is no definitive definition of uncertainty. The following examples are illustrative of the ways in which uncertainty pervades the risk assessment process:

- insufficiency: for instance, the various scientific disciplines involved in assessing the risk are not sufficiently developed to explain the cause-and-effect relationship;
- inconclusiveness: the realities of science dictate that the scientists, whatever the quality of their investigations, will never be able to eliminate some uncertainties; for instance, there may be too many unpredictable variables to enable the identification of the relative influences of each factor;
- imprecision: could be caused by the fact that the data to analyse the risks are not available or are out of date, information gaps, measurement errors, contradictions, indeterminacy, ambiguity.

To sum up, precaution aims to bridge the gap between scientists working on the frontiers of scientific knowledge and decision-makers willing to act to determine how safe is safe enough. In other words, precaution is testament to a new relationship with science, where it is consulted less for the knowledge which it has to offer than for the doubts and concerns which it is in a position to raise.

7.3.3 Methodological Observations

So far, the precautionary principle has been embroiled with controversies, critics being confused as to the scope and the status of the principle. For the sake of clarity, I should like to distinguish a legal principle and a political approach.

In effect, variations in terminology have emerged, reflecting the considerable controversy surrounding the principle. As a matter of fact, disputes have arisen as to whether precaution should be labelled as a ‘principle’ or merely as ‘an approach’ (Peel, 2004: 483–501). This debate reflects different perceptions as to the suitable regulatory response to avoid environmental and health damage amid uncertainties. Proponents of an ‘approach’ take the view that precaution is not legally binding, whereas a legal principle is clearly stated as such. To avoid the more extreme versions of the precautionary principle, which press for greater environmental protection, some – including, among others, US policymakers – prefer to use the term precautionary *approach* rather than precautionary *principle*; the latter term is preferred by the EU institutions and some of its Member States.

The various provisions of international agreements enshrining precaution mirror this variation. For instance, in the 1992 Rio Declaration on Environment and Development, the 1996

Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and the 2001 Stockholm Convention on Persistent Organic Pollutants, the principle is called an ‘approach’, while the ‘approach’ became a principle in the 1992 OSPAR Convention, the 1992 Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area and in the Barcelona Convention for the Protection of the Mediterranean Sea against Pollution (1976, amended 1995). Furthermore, to make matters even more complex, in the field of waste management, the 1991 Bamako Convention, not yet in force, uses both the terms ‘precautionary approach’ and ‘precautionary principle’ in the same provision (Article 4.3(f)). Lastly, the 2000 Cartagena Protocol on Biosafety refers to the ‘precautionary approach’ in its preamble, but uses terminology that clearly reflects the same basic rationale for application of the precautionary principle in Articles 10 and 11.

For my part, I consider this a semantic squabble. Indeed, from a legal point of view, the question is whether precaution could become a principle of customary law in international law, on one hand, and a general principle of environmental law at the national level on the other hand. As discussed below, the answer to that question depends on whether a number of criteria set out by courts and scholars alike are fulfilled. For the sake of clarity, in this chapter, I shall therefore use the terms precautionary principle and precautionary approach interchangeably.

7.3.4 The Formulations of the Principle in the Different Environmental Sectors

Precaution has slowly but inexorably been permeating the numerous crevices of international law, whether through the declaration of public policy objectives (soft law), agreements (hard law) or judicial interpretation (case law). Since the 1992 Rio Conference, it has been taken up in the majority of bilateral and multilateral international treaties relating to environmental protection. At present, the precautionary principle can be found in some 60 multilateral treaties, covering a wide array of environmental issues ranging from air pollution to waste management (see Marr, 2003; Trouwborst, 2002; Douma, 2003; de Sadeleer, 2007). Given that the principle is applied in a variety of contexts, its formulation often differs from agreement to agreement. This section reviews some of the definitions given to the principle in various international agreements, as well as representative court decisions, in order to set out the problematic elements inherent in this principle.

7.3.4.1 Policy documents

The precautionary principle has been established as a general principle of environmental policy in various soft law declarations adopted by the United Nations Economic Commission for Europe (Bergen, 16 May 1990), the Governing Council of the United Nations Environment Programme (UNEP Governing Council Decision 15/27, on the Precautionary Approach to Marine Pollution, 1989), the Council of Ministers of the Organization of African Unity (Addis Ababa, 1990), the Ministerial Conference on the Environment of the UN Economic and Social Commission for Asia and the Pacific (Bangkok, 1990), and the Environment Ministers of the Organisation for Economic Co-operation and Development (1991). It was eventually accorded universal recognition at the UN Conference on Environment and Development. Recognised in Agenda 21 of 16 June 1992 (UN, 1992), the principle was defined in the non-binding 1992 Declaration on Environment and Development, which declares that:

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. (Principle 15)

7.3.4.2 Marine pollution

The principle emerged in the 1990s as a response to transborder environmental concerns, notably the pollution of the North Sea. Explicit reference to it was made at each North Sea Ministerial Conference (1984 Bremen, 1987 London, 1990 Hague, and 1993 Esbjerg declarations). Ever since, the precautionary principle has been at the forefront in the field of marine pollution, in which an abundance of data on pollution yielded little understanding but much concern. Since the beginning of the 1990s, the principle has been set out in a host of agreements, among them:

- the 1990 International Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC: preamble);
- the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) (Article 2(2)(a));
- the 1992 Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area (Article 3(2));
- the 1976 Barcelona Convention for the Protection of the Mediterranean Sea against Pollution (as amended in 1995) (Article 4(3)(a));
- the 1980 Athens Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities (as amended in 1996) (Fifth Recital of the Athens Protocol as amended in Syracuse on 7 March 1996 (not yet in force));
- The 2003 Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Article 5).

As a matter of course, the scope of the principle varies tremendously from one agreement to another. Some of the marine pollution agreements endorse a rather stringent version of the principle. By way of illustration, pursuant to the 1976 Barcelona Convention, OSPAR and Commission for the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Commission or 'HELCOM') agreements, the contracting Parties 'shall apply the precautionary principle'. In contrast, in other agreements concerning marine pollution, the principle has been framed in hortatory terms rather than prescriptive language. For instance, the Preamble of the OPRC Convention merely notes the 'importance of precautionary measures and prevention in avoiding oil pollution in the first instance'.

In addition, the OSPAR and HELCOM agreements are probably among the most stringent international agreements relating to the marine environment as regards the level of proof required to trigger precautionary measures. Both agreements call upon the parties to take precautionary measures 'when there are reasonable grounds for concern' (OSPAR) or 'where there is reason to assume' (HELCOM) that the marine environment will be impaired. In contrast to the Rio Declaration, which submitted the precautionary principle to 'serious or irreversible damage' requirements, the OSPAR and HELCOM agreements do not apply any threshold requirements to threats of serious or irreversible damage: it is sufficient that a substance may give rise to a hazard to human health or harm living resources or marine ecosystems in order for the principle to be implemented.

As to the extent of the damage, thresholds vary significantly. According to several definitions, the principle should only apply to risks entailing non-negligible damage. Thus, the 1992 UNFCCC and the 1976 Barcelona Convention for the Protection of the Mediterranean Sea against Pollution (as amended in 1995) only recognise recourse to the principle in order to avert ‘threats of serious *or* irreversible damage’. For other agreements, damage is specified in slightly less abstract terms. The 1992 OSPAR Convention turns to the principle when pollution ‘may bring about hazards to human health, harm living resources and marine ecosystems’.

In a case between Malaysia and Singapore regarding the ecological threats entailed by land reclamation projects carried out close to Malaysian territory, ITLOS held that ‘given the possible implications of land reclamation on the marine environment, prudence and caution require’, the parties to ‘establish mechanisms for exchanging information and assessing the risks or effects of land reclamation works ...’ (*Case concerning Land Reclamation by Singapore in and around the Straits of Johor*, 2003).

7.3.4.3 Fisheries

Marine fisheries management is intrinsically uncertain. Uncertainties relate to individual stocks being harvested, other affected species, and the likely impacts of fishing on the ecosystem of which the species form part. Given the risk of overfishing and the eventual collapse of fish stocks, an explicit precautionary approach encapsulated in both international agreements and national legislation is strongly needed.

Developments in this area were fostered by the entry into force of the 1995 UN FAO Code of Conduct for Responsible Fisheries and the 1995 UN Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA) which was the first fisheries agreement to apply a precautionary approach to conservation, management and exploitation measures. In addition to introducing into the law of the sea several environmental concepts (sustainable development, utilisation of high seas fisheries in harmony with environmental requirements) it enshrines the precautionary approach, which is directly related to environmental law. Subsequently, precautionary obligations of the UN Agreement have been incorporated into the conventions of several regional fisheries management organisations, though few of these regional conventions expressly refer to the approach (Convention on the Conservation and Management of High Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPFC), 2000: Articles 5(c) and 6; Convention on the Conservation and Management of High Seas Fishery Resources in the South Pacific Ocean (SPRFMO), 2009: Articles 3(1)(b) and (2)).

The UNFSA applies only to straddling and highly migratory fish stocks that occur within and outside the EEZs. In other words, these stocks occur both on the high seas and in areas under national jurisdiction (Article 3(1)). Whereas, under UNFSA, the precautionary approach is not applicable to fish stocks exclusively confined within areas of the high seas or to areas within the jurisdiction of coastal States, under the 1993 non-binding Code of Conduct for Responsible Fisheries, the approach applies to all fisheries irrespective of the jurisdiction of the coastal States (Article 1(3)).

Articles 5(c) and 6 as well as Annex II to the Agreement apply the precautionary approach to the conservation and management of fish stocks. Deemed to be the most innovative provisions of UNFSA, these provisions call into question the unrestricted freedom of fishing on high seas.

The precautionary approach is listed as one of the general principles to be applied by States to ensure the achievement of long-term conservation and sustainable use of straddling and highly migratory fish stocks (Article 5(e)).

The scope of the approach is not restricted to stocks targeted in the fisheries, but encompasses all living marine resources and the marine environment (Article 6(1)). States are subsequently required to take into account the effects on other species of the ecosystem when adopting conservation measures for the target stocks and could be required to establish measures specially directed at protecting other species or their habitats when adopting measures for the target stocks.

Article 6(2) embodies this approach: ‘States shall be more cautious when information is uncertain, unreliable or inadequate. The absence of adequate scientific information shall not be used as a reason for postponing or failing to take conservation and management measures.’

It must be noted that in contrast to other international instruments, when the precautionary principle is to be applied where certainty thresholds are exceeded, the precautionary approach must be applied under all circumstances in fisheries management. Hence, that Agreement signals a significant shift in the burden of proof, by creating a presumption in favour of conservation. Although that definition focuses on the ‘absence of adequate scientific information’, uncertainties about the stock in question encompass also broader environmental conditions and socio-economic issues (FAO Code of Conduct, 1995: Articles 6(3)(c) and 7(5)).

Furthermore, the precautionary approach is deemed to be an integral part of an ecosystem approach to fisheries management. Accordingly, its scope is wider than the fisheries to be conserved; it applies to the living marine resources as well as the marine environment (Article 6(1)). Likewise, States are required to protect the biodiversity of the marine environment (Article 5(g)).

The precautionary approach is of both a procedural and a substantive nature. Firstly, conservation measures used to be postponed until there was adequate information on which to base them. The UNFSA reflects a significant departure from that traditional approach. It requires that a minimum level of information must be available before a fishery is established. Therefore, managers must reckon upon the best scientific evidence available when designing their management regimes. States shall thus collect and make available ‘complete and accurate data concerning fisheries activities’ (Article 5(j)). Moreover, the UNFSA makes a significant contribution to precaution in requiring States to implement ‘improved techniques for dealing with risks and uncertainties’ (Article 6(3)(a)). In this connection, whenever the data are deemed to be insufficient or incomplete, the authorities are obligated to carry out more research (data collection, collection of and new types of scientific data, monitoring the status of the stocks, etc.) (Article 6(3)(d)). Moreover, data collection and research programmes to assess the impact of fishing on non-target species must be improved (Article 6(3)(d)). Until research on the specific stock provides relevant information, a precautionary approach should ensure that the management authorities set conservative limits taking into account the level of uncertainty.

Secondly, in achieving the objectives of long-term conservation and sustainable use of fish stocks, States are called on to set ‘precautionary reference points’ for the conservation and the management of these stocks. As instruments implementing the precautionary approach, two types of points have to be used: limit and target reference points (Article 6 (3)(b) and (4); Annex II, para. 2).

On the one hand, the limit reference points set the lowest acceptable stock size. They correspond to levels where the stock is maintained within what is described as safe biological limits in order to produce maximum sustainable yield (Annex II, para. 2).

On the other hand, the target reference points aim at the optimum stock size ‘intended to meet management objectives’ (Annex II, para. 2). Acting as buffer zone, they have to be fixed at a higher biomass and a lower mortality rate.

In substance, the precautionary approach entails the obligation to adopt management strategies with a view to maintaining or restoring stocks ‘at levels consistent with previously agreed precautionary reference points’. The stocks have to be maintained within these limits and the risk of exceeding these points must be very low (Annex II, para. 5). Two scenarios must be differentiated. When these points are ‘approached’, States are called on to implement conservation and management measures (Annex II, para. 4). In the event they are exceeded, they have to take measures to ensure immediately that the stock is restored (Article 6(4)). The managers are not obliged to prove the negative outcomes if the thresholds are exceeded.

In accordance with the approach, the fisheries management agencies tend to restrict fishing mortality within safe biological limits by using buffer thresholds thanks to the enactment of target reference points. Any non-compliance with these thresholds should trigger ameliorative action. The approach obliges thus risk assessors and decision-makers alike to pay heed to uncertainties. The more uncertain the stock is, the more restrictions the management authority should impose on harvest of the fish stock concerned. By contrast, the more reliable the data is, the less significant is the buffer zone.

With respect to international jurisdictions, the ITLOS order of 27 August 1999 in the *Southern Bluefin Tuna* case seems to view the precautionary principle in a more favourable light than decisions by other international courts such as the ICJ or the ECtHR. In a case between Australia and New Zealand on the one hand and Japan on the other, concerning an experimental fishing programme for southern bluefin tuna being carried out by the Japanese authorities, ITLOS had stressed the need to carry out a precautionary policy. Although there was scientific uncertainty regarding the conservation measures to be taken, ITLOS held that the parties should ‘act with prudence and caution to ensure that effective conservation measures are taken to prevent serious harm to the stock of southern bluefin tuna’ (*Southern Bluefin Tuna Cases*, 1999). Furthermore, ITLOS required a risk of ‘serious harm’, not of irreversible damage, to southern bluefin tuna stocks in order to take provisional measures to avert their further deterioration (paras 77 and 80). However, ITLOS avoided bringing further clarification as to the meaning and the status of the principle.

To conclude, the precautionary approach occupies a central place in the integration of environmental and ecological concerns into fisheries management. It mirrors a major change in the traditional approach to fisheries management, which has tended to react to management problems only after they reach crisis level. That being said, the implementation of the precautionary approach in fisheries has so far been rather mixed; its impact has been less dramatic than previously thought in the 1990s. Its implementation in the management of fisheries rarely leads to the enactment of bans. Moreover, nothing in the different agreements and legislation indicates that the approach has priority over competing objectives, such as optimal resource exploitation. Economic efficiency can therefore trump sustainability goals and the precautionary approach.

7.3.4.4 Rivers

The principle has also been enshrined in a number of agreements related to the protection of river ecosystems, among them:

- the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Article 2(5));
- the 1994 Agreements on the Protection of the Rivers Meuse and Scheldt (Articles 2(a) and 3(2)(a));
- the 1994 Sofia Convention on Cooperation for the Protection and Sustainable Use of the Danube (Article 2(4)); and
- the 1998 Rotterdam Convention on the Protection of the Rhine (Article 4).

Again, the principle has been framed rather differently in these different agreements. For instance, whereas the 1992 Helsinki Convention as well as the 1998 Rotterdam Convention on the Protection of the Rhine state that ‘The Parties shall be guided by ... the precautionary principle’, the 1994 Sofia Convention on Cooperation for the Protection and Sustainable Use of the Danube River sets out that ‘the Precautionary principle constitutes a basis for all measures aiming at the protection of the Danube River’.

The principle has been invoked in international litigation in respect of river protection. For instance, in the *Gabcikovo–Nagymaros* case brought before the ICJ, Hungary invoked the precautionary principle to support the existence of an environmental state of necessity as a ground for justifying the breach of its obligations towards Slovakia (unilateral suspension of works on its section of a dam on the Danube) (*Gabcikovo–Nagymaros*, 1997). While recognising the seriousness of the environmental concerns put forward by Hungary to justify its refusal to observe the treaty it had concluded with the former Czechoslovakia (para. 53), the ICJ refused to accept the existence of a ‘grave and imminent peril’ justifying a state of necessity because of the uncertain nature of the dangers invoked by the Hungarian authorities. Consequently, a state of necessity can only be invoked under international law of State responsibility if there is a sufficient degree of certainty and inevitability that a peril will materialise. In so doing, the ICJ eschewed addressing the issue of precaution. However, in a separate opinion Judge Weeramantry saw the precautionary principle as a constituent of the wider legal principle of sustainable development.

In *Pulp Mills*, Argentina contended that the 1975 bilateral Statute regarding the management of the Rio de Plata adopted an approach in terms of precaution whereby the burden of proof had to be placed on Uruguay for it to establish that the paper mill would not cause significant damage to the environment (para. 160). The ICJ dismissed this argument, considering that, while a precautionary approach might be relevant in the interpretation and application of the provisions of the Statute, it did not operate to reverse the burden of proof (para. 164).

7.3.4.5 Air pollution

The uncertainty surrounding the causes and effects of atmospheric pollution has also served to favour the use of the precautionary principle. Paradoxically, the 1985 Vienna Convention for the Protection of the Ozone Layer was adopted just as the scientific controversy over the effects of global ozone layer depletion had reached its height. The sixth Recital of the 1985 Convention presented the parties as ‘Mindful ... of the precautionary measures for the protection of the ozone layer which have already been taken at the national and international levels’. Since then, the principle has been endorsed by other instruments concerning air pollution. The

preambles of the 1998 LRTAP Protocols on POPs and on Heavy Metals state that the parties are ‘resolved to take measures to anticipate, prevent or minimise emissions of persistent organic pollutants, taking into account the application of the precautionary approach, as set forth in principle 15 of the 1992 Rio Declaration on Environment and Development’.

7.3.4.6 Climate change

As to climate change (CC), this area is permeated by uncertainty. It is impossible to determine the regularity and probability of the damage CC may provoke, in terms of:

- time of latency between the increase of temperatures and the actual impact of damage (gradual or abrupt);
- speed (acceleration or deceleration);
- frequency of natural events (storms, floods, droughts, wildfires, erosion);
- duration (persistent, reversible, slowly reversible, irreversible, multigenerational);
- extent (cumulative or synergistic, serious or insignificant);
- localisation (e.g., change in the regional distribution of precipitation, Arctic region warming more rapidly than the normal mean, warming over land greater than over the ocean, increased concentration of ozone);
- impacts (human health, vulnerable countries, biodiversity loss, agricultural yields, tourism); and
- scale (global, continental, or regional).

Uncertainty pervades these issues. Indeed, uncertainty affects the calculation of the speed of the phenomenon as well as the nature and scope of the damage it may entail. In approaching such questions, scientists put forward hypotheses rather than assertions. Some uncertainties have decreased over time whereas others are still lingering due to irreducible ignorance or disagreement between what is known and unknowable. It should be noted that the precautionary principle invites the decision-maker to take account of considerably extended timescales, as uncertainty largely resides in the period between a cause and the subsequent manifestation of a harmful effect.

Moreover, this ‘cascade of uncertainties’ (Haritz, 2011: 16) is likely to be compounded by

- natural factors (resilience of ecosystems, reversibility or irreversibility of the damage); and
- anthropogenic factors (consumption and energy policy choices, demographic trends, increases in trade and gross domestic product (GDP) growth, land use changes, technological innovation, etc.).

It is important to stress in this context that according to the Intergovernmental Panel on Climate Change (IPCC) ‘aspects of uncertainty are associated with each link of the causal chain of climate change, beginning with GHG emissions, covering damage caused by climate change, followed by a set of mitigation and adaptation measures’. In particular, damage–function estimates are prone to low confidence as they involve uncertainty in both natural and socio-economic systems. It thus comes as no surprise that the intermingling between these natural and socio-political factors prevents clear-cut answers on many questions of particular importance for decision-makers.

Last, but not least, whereas the costs of damage caused by industrial pollution can be calculated somewhat accurately, CC risks may give rise to damage outside the realm of commerce

and thus be impossible to evaluate. Moreover, for a risk to be insurable, it must be as objective as possible. Given the dearth of statistical data concerning the frequency or intensity of heavy precipitation events, droughts, floods, and their average costs, it is difficult to insure the risks stemming from CC. Furthermore, given that much damage cannot be easily translated into monetary terms, the benefits of CC policies are difficult to estimate.

Against this background, the authors of the UNFCCC took precaution on board. Article 3(3) obliges parties

to take precautionary measures to anticipate, prevent or minimise 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.

By defining the risk to be averted ('lack of full scientific certainty') and specifying the damage likely to occur (which should be 'serious or irreversible'), Article 3(3) UNFCCC is setting out two thresholds aiming to limit the adoption of precautionary measures. What is more, once these thresholds have been crossed, a precautionary measure may be taken to avert the anticipated CC risk, but it should be 'cost-effective so as to ensure global benefits at the lowest possible cost'. All in all, these three thresholds assume that the Earth can assimilate a certain level of change of the climate and ensuing damage that is not too serious or irreversible (Haritz, 2011: 46).

7.3.4.7 Nature and biodiversity

Biodiversity faces a major crisis at both European and world levels, the implications of which have still not been fully appreciated. All over the world, most natural or semi-natural, continental, marine and coastal ecosystems (including essential services, e.g., pollination or water and air purification) have now been subject to significant changes as a result of human activity. Having become increasingly fragmented as a result of transport or energy infrastructure, subject to intensive urbanisation, cultivation, polluted and eutrophised, ecosystems deteriorate, losing their ecological capacity to perform functions as well as their natural and cultural specificity. For animal, plant, fungi and all other species this results in a fragmentation and isolation of their habitats, and represents one of the most serious threats to their long-term survival. On account of the degradation of their habitats, they are suffering an unprecedented rate of extinction, which is exacerbated by additional threats (poaching, excessive hunting). On a more global scale, global warming and the depletion of the ozone layer risk precipitating much more profound changes to the distribution, structure and functions of ecosystems, as well as to habitats and species. Scientists expect that these disruptions will cause an unprecedented drop in the wealth of specific and genetic diversity.

Attempts to conserve biodiversity must grapple with a wide range of uncertainties as well as ignorance. The difficulties are compounded by a lack of sufficient data as well as the complexity of modelling the functioning of ecosystems and understanding the complex relationship between human activities and the state of conservation of ecosystems and species. Most strikingly, scientists are still struggling to ascertain the number of species. In addition, there are still major gaps in understanding how ecosystems and species interact and react against new threats. In many cases, uncertainties cannot be reduced by gathering more accurate data. In other words, uncertainty is intractable.

Over the past four decades, international law has been enriched by a raft of international agreements intended to put a stop to the ‘sinking of Noah’s Ark’. However, the existence of these agreements should not lull us into thinking that all areas of biodiversity are now well protected. Conservation objectives vary from one agreement to the next, such that no harmonisation, even on a geographical level, is assured. Although particular areas of biodiversity are covered well on a continental scale (including migratory or the most endangered vertebrate species, international watercourses, semi-inland seas), others have only recently been brought under international law (landscapes), whilst yet others are practically ignored (micro-organisms or fungi, fundamental ecological processes, animal genetic resources). Ultimately, the proliferation of international legal instruments protecting different aspects of biodiversity leads to inefficiency.

In spite of all these imperfections, the precautionary principle has become the cornerstone of nature conservation law, the purpose of which is to protect nature or to thwart risks that could impoverish biological diversity (for example, invasive species, GMOs). For instance, in 1994, the principle was explicitly endorsed at the Ninth Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as in several of the Agreements on the conservation of migratory species, established under the 1979 Convention on the Conservation of Migratory Species of Wild Animals (Agreement on the Conservation of the African–Eurasian Migratory Waterbirds, 1996: Article 2(2); Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Areas, 1996: Article 2(4); Canberra Agreement on the Conservation of Albatrosses and Petrels, 2001: Article 2(3)). What is more, it should be noted that the adoption in 1992 of the Convention on Biological Diversity represented a watershed in the development of precaution. Its Preamble provides that ‘where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimise such a threat’. Although this statement is not binding, being set out in the preamble to the agreement and not its operative provisions, it is not, however, devoid of legal effects (interpretative function) (see C-67/97, *Bluhme*, 1998: paras 36 and 38). One must ask whether the ecosystem approach, as developed under the CBD, should not influence the precautionary principle.

Although the ICJ did not focus on the precautionary principle in its judgment in *Whaling in the Antarctic*, during the course of the proceedings the parties in dispute referred to this principle in terms of whether or not Japan’s whaling practices complied with it. Invoking the precautionary approach, New Zealand ascribed a limited role to Article VIII on the conduct of scientific research, adding that lethal methods could only be used when they created no risk of an adverse effect to whale stocks. In particular, it argued that States parties are required to act with ‘prudence and caution’, particularly when ‘information is uncertain, unreliable or inadequate’, so as to avoid ‘any harm’. Australia asserted that the establishment of sanctuaries also reflects the increasing importance of the precautionary approach in the International Whaling Commission’s (IWC’s) management and conservation of whales. On the other hand, Japan argued that it was conducting scientific research in accordance with a precautionary approach in order to improve the sustainability of whale stocks. In his separate opinion, Judge Cançado Trinidad stressed that, with the passage of time, the precautionary principle set in motion a move towards ‘the conservation of living marine resources as a common interest’ (*Whaling in the Antarctic*, Separate Opinion of Judge Cançado Trinidad, 2014: para. 71).

With respect to the conservation of biodiversity, risk issues entailed by the placing of GMOs on the market and their spread in the environment have gathered momentum at the international level. The extent to which GMOs pose a risk of adverse effects on the natural environment remains hitherto controversial. Moreover, these controversies have so far been exacerbated by the relative novelty of gene technology, coupled with lack of available data regarding the potential health and environmental impacts. Accordingly, the principle has been at the core of the Cartagena Protocol on Biosafety (CPB) adopted under the auspices of the CBD. The Protocol reaffirmed the precautionary approach contained in Principle 15 of the Rio Declaration on Environment and Development in several operative provisions of the Protocol (Article 1). In addition to referring to the precautionary principle, the CPB expressly authorises parties to refuse to import living modified organisms (LMOs) on a precautionary basis (Articles 10(6) and 11(8)). However, the precautionary principle is not formulated as an obligation in the CPB, but merely as the right to take a precautionary measure. Furthermore, that right is limited by the obligation of the importing party to review a decision in the light of new scientific evidence upon request by an exporting country. Nevertheless, the insertion of precautionary provisions in the CPB is significant for potential trade conflicts concerning GMOs.

In 2006 the *EC–Biotech* Panel found against the EU for violating the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement). The EU had contended that the General Agreement on Tariffs and Trade (GATT) and the SPS Agreement should be read in light of the subsequent CPB and its precautionary principle, whilst the applicants contended that the SPS Agreement should be read on its own terms. The Panel avoided the question by declaring that neither the CPB nor the CBD was pertinent to the dispute before it because some of the countries involved in the dispute were not parties to those agreements (*European Communities – Measures Affecting the Approval and Marketing of Biotech Products*, 2006: para. 4688).

7.3.4.8 Waste management

So far, unlike EU law (*C-418/97 and C-419/97, Arco Chemie*, 2000: para. 40), the principle has not succeeded in securing a strong foothold in waste management. The 1991 Bamako Convention on the Ban on the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, not yet in force, defines the precautionary approach as entailing, inter alia, ‘preventing the release into the environment of substances which may cause harm to humans or the environment without waiting for scientific proof regarding such harm’ (Article 4(3)(f)).

7.3.4.9 Chemicals

Unlike waste management policy, the regulatory approach as regards the safety of chemicals has been underpinned by rather cumbersome, time-consuming and expensive scientific assessments in the USA and in the EU alike. Indeed, chemicals policies have been related to a general preference for a certainty-seeking regulatory style in which formal, science-based and standardised risk assessment has been singled out as the predominant tool for decision-making relating to chemicals. Though chemicals assessment procedures have been calling for absolute certainty, data are nonetheless incomplete and results may be unclear or contradictory. As it is difficult to establish causal links between exposure to chemicals and health or environmental effects, there is generally a significant degree of uncertainty in estimates of the probability

and magnitude of effects associated with a chemical agent. As a result of limited knowledge, experts are not always able to provide conclusive evidence of a threat to human health and the environment.

It follows that the precautionary principle has been at the core of negotiations over two major international conventions on chemical pollutants. Recognising the risk posed by persistent organic pollutants to human health and the environment, the 2001 Stockholm Convention on Persistent Organic Pollutants (POPs) lays down the precautionary approach as its main objective (Preamble, para. 8; Article 4). Precaution also underpins the listing procedure for new POPs (Article 8(7)). In addition, the 2001 International Convention on the Control of Harmful Anti-Fouling Systems on Ships, which prohibits the use of harmful organotins in anti-fouling paints used on ships, establishes a precautionary mechanism to prevent the potential future use of other harmful substances in anti-fouling systems (Article 6(3) and (5); Preamble, fifth recital).

7.3.4.10 Nuclear energy

So far, none of the international agreements dealing with nuclear energy enshrines the precautionary principle. To make matters worse, international courts are not willing to endorse the principle with respect to risks entailed by nuclear activities.

Whereas the principle was invoked by New Zealand in the *Nuclear Test II* case, the ICJ rejected the claim in the preliminary phase of the case without entering into the merits of the matter. The case law of the organs of the ECHR indicates that these bodies are not keen to take the precautionary principle into account. In the case of French nuclear testing in French Polynesia, the European Commission of Human Rights held that the victim would have to produce 'reasonable and convincing indications of the probability of the occurrence of a violation that personally concerned him; mere suspicions or conjectures are in this respect insufficient' (*Noel Narvii Tauira and 18 others v. France*, 1995). In addition,

A claim must demonstrate in a defensible and detailed manner that owing to failure by the authorities to take sufficient precautions, the probability that damage will occur is high enough that it constitutes a violation, provided that the repercussions of the act in question are not too remote.

In the case *LCB v. United Kingdom*, the ECtHR stated that in going ahead with nuclear tests, the United Kingdom had not infringed Article 2 of the ECHR since the applicant, who was suffering from leukaemia, had not demonstrated a causal link between the exposure of her father to radiation and her subsequent illness (*LCB v. United Kingdom*, 1998: para. 38). By the same token, in its decision *McGinley and Egan v. United Kingdom*, the ECtHR judged that the British authorities had fulfilled their positive obligation according to Article 8 of the ECHR to inform the persons engaged in hazardous activities about radiation risks. Even when involved in activities that could give rise to long-term health effects (nuclear testing), the applicants must demonstrate that, at the time of the occurrence in question, the national authorities withheld relevant documents concerning the risks of ionising radiation. In the absence of such proof, they could not claim a violation of their right to respect for their private lives based on a failure to provide them with access to relevant information.

Lastly, the ECtHR ruled in two cases against Switzerland that the connection between the decision by the Swiss Federal Council to continue operating an outdated nuclear power plant and the right to protection of physical integrity invoked by the petitioners was 'too tenuous and

remote' for the latter to invoke the right to a fair hearing by a tribunal within the meaning of Article 6(1) of the ECHR (*Balmer-Schafroth and Others v. Switzerland*, 1997; *Athanassoglou v. Switzerland*, 2000). Even if the victims had successfully challenged the technical defects of the plant, they had not convincingly demonstrated a cause-and-effect relationship between the alleged risk and their right to protection of their physical integrity.

However, in a case concerning the Irish claim to suspend the authorisation of the MOX plant at the Sellafield nuclear power station, ITLOS considered that 'prudence and caution require that Ireland and the United Kingdom cooperate in exchanging information concerning risks or effects of the operation of the MOX plant and in devising ways to deal with them, as appropriate' (*MOX Plant*, 2001: para. 84).

7.3.4.11 EU law

The precautionary principle is one of the pillars of EU environmental policy. Enshrined in paragraph 2 of Article 192 of the TFEU – a provision declaring the principles underpinning EU action in the field of environmental protection – it has, however, not been defined by the treaty framers, even though there are various definitions in international environmental law. The use of the indicative rather than the conditional confirms that such provision is binding: 'Union policy on the environment ... shall be based on the precautionary principle.'

As a result, institutions as well as Member States are obliged to apply the principle when carrying out action in the environment (C-127/02, *Waddenzee*, 2004).

The precautionary principle has been fleshed out in a broad range of measures ranging from notification procedures, prior authorisation schemes, restrictions on the use or the sale of a product, and safeguard clauses (C-6/99, *Greenpeace v. France*, 2000: para. 44) to bans (T-13/99, *Pfizer Animal Health v. Council*, 2002: para. 457). The regulatory approach is not always consistent. Some EU legislation refers to the principle whereas other legislation on similar topics may ignore it. By way of illustration, the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation refers to the principle (Article 1) whereas Regulation (EC) No. 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures regulation does not mention it.

With respect to the management of fisheries, Regulation (EU) No. 1380/2013 of 11 December 2013 on the Common Fisheries Policy (CFP) requires the implementation of the precautionary approach to fisheries management (Article 2(2)). The 'precautionary approach to fisheries management', is referred to as the one defined in Article 6 of the UNFSA: 'an approach according to which the absence of adequate scientific information should not justify postponing or failing to take management measures to conserve target species, associated or dependent species and non-target species and their environment'.

What is more, the CJEU's and the General Court's case law has not only managed to extend the scope of application of the precautionary principle to all policies involving scientific uncertainty, but has also introduced extremely useful clarifications on the application of the principle, in particular in the domain of public health (de Sadeleer, 2006: 139–72). EU measures not complying with the principle are likely to be subject to judicial review. Indeed, in the last few years, the principle has been regularly invoked before the Tribunal of First Instance of the EU in major food safety and drugs cases.

The new generation of free trade agreements (FTAs) regularly include chapters on trade and sustainable development; trade and environment; labour and trade; and most recently also ref-

erence to climate change (trade and sustainable development (TSD) chapters) (see Japan–EU Economic Partnership Agreement, Article 16.4.4) emphasizing the need to meet requirements of sustainable development in the liberalisation of trade. Thanks to further market integration stemming from these FTAs, the EU is intent upon exporting its regulatory standards. It is expected that stricter environmental standards are likely to be adopted by foreign producers that are exporting their goods to the internal market (‘California effect’). However, given that the new FTAs pay lip service to precaution, the EU is not succeeding in convincing its trade partners to incorporate one of its fundamental policy principles into trade agreements. In this connection, two examples will suffice.

The fact that Canada allows the marketing of hormones banned in the EU did not prevent the EU from encapsulating in the Canada–EU Comprehensive Economic and Trade Agreement (CETA) a rather soft version of precaution. In Chapter 24 on Trade and Environment, the parties acknowledge that ‘where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation’ (CETA, 2016, Article 24.8(2). See also Joint Interpretative Instrument on CETA, 1, d)).

Another case in point is the Economic Partnership Agreement concluded between Japan and the EU, which does not require the parties to implement the precautionary principle. To the contrary, it merely allows them to ‘take account’ of a ‘precautionary approach’ (Japan–EU Economic Partnership Agreement, 2018: Article 16.9). Replacing the legal term of ‘principle’ with the political concept of ‘approach’ is not innocent. To avoid the more extreme versions of the precautionary principle, which press for optimal health and environmental protection, some – including US policymakers – have been fighting a turf war to use the term precautionary *approach* rather than precautionary *principle*; the latter term being preferred by the EU institutions. Accordingly, it can be seen as ‘a backward step’, as an approach is far less stringent than a principle. To make matters worse, the taking into account of the approach goes hand in hand with the ‘available scientific and technical information’ and the ‘relevant international standards, guidelines or recommendations’ which are not always precautionary in nature.

7.3.5 Precaution: A Principle of Customary International Law

Although subject to varying interpretations and accorded over 12 different definitions in international treaties and declarations, the precautionary principle is fast becoming a fundamental principle of international environmental law. The question whether precaution has to be considered as principle of customary international law is of utmost importance: while treaties create law between parties, the recognition of the precautionary principle as an international custom will make it applicable to all States.

While the principle of ensuring that activities within a State’s jurisdiction or control do not cause damage to the environment of other States or of areas beyond national jurisdiction is deemed to be a principle of customary international law, the procedure appears to be a great deal more delicate in the case of the precautionary principle. Whereas only the repeated use of State practice and a consistent *opinio juris* are likely to transform precaution into a customary norm, authors are crossing swords on this question.

Thus far, although it has been invoked a number of times by claimants, the ICJ as well as other international tribunals, such as ITLOS or the ECtHR, as discussed above, have not yet affirmed its customary status.

Nonetheless, in an assessment of the relevant conduct and statements of States against the generally accepted standards concerning State practice and *opinio juris*, a scholar reached the conclusion that the core content of the precautionary principle had attained the status of general international law (Trouwborst, 2002; Trouwborst, 2006). By the same token, I take the view that the prevalence of the principle in recent State practice and in international law suggests that it may indeed have attained the status of a principle of customary law, at least at the regional level. Indeed, the diversity of applications described above in any case indicates the potential of a principle which, born of environmental law, is being called upon to govern wide sections of positive law in the longer term.

In *Tatar*, when confronted with contradictory scientific assessments concerning the impact on health of sodium cyanide, the ECtHR referred to the precautionary principle when condemning the superficial nature of the investigation into the risks incurred by the local population, which had been carried out prior to the issue of the authorisation for a gold mine (*Tatar v. Romania*, 2009: paras 109–20).

Last but not least, in its advisory opinion, the Seabed Disputes Chamber held that the Nodules Regulations and the Sulphides Regulations transform the non-binding statement of the precautionary approach encapsulated in Article 15 of the Rio Declaration into a binding obligation. Moreover the Chamber pointed out that

the precautionary approach is also an integral part of the general obligation of due diligence of sponsoring States, which is applicable even outside the scope of the Regulations. This obligation applies in situations where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks. A sponsoring State would not meet its obligation of due diligence if it disregarded those risks. Such disregard would amount to a failure to comply with the precautionary approach. (*Responsibilities and Obligations of States Sponsoring Persons and Entities with respect to Activities in the Area*, 2011: para. 131)

7.4 CONCLUSIONS

The distinction between the preventive principle and the precautionary principle rests on a difference of degree in the understanding of risk. Prevention is based on certainties: it rests on cumulative experience concerning the degree of risk posed by an activity. Therefore, prevention presupposes an objective assessment of risks in order to reduce the probability of their occurrence. Precaution, in contrast, comes into play when the probability of a suspected risk cannot be irrefutably demonstrated. The distinction between the two principles is thus the degree of (un)certainty surrounding the occurrence of risk. However, as the pendulum swings back and forth between scientific certainty and uncertainty, the interplay between the two principles is circular in nature and not linear.

The status, scope of implementation, thresholds of precaution and prevention are largely determined by the characteristics of the various environmental policies: fishing, climate, marine pollution, technological risks, waste management, chemical substances. Accordingly, neither prevention nor precaution dictates a particular outcome. In other words, there is no 'one size fits all' expression of these principles (Peel, 2005: 200). In fact, the ways in which

these principles are applied are therefore likely to vary as a function not only of the technical requirements related to the nature of the various risks at stake, but also of the political needs of the field in question. A multitude of differing measures may follow from these principles, ranging from bans, phase-out, best available technologies, notification procedures, etc., whose scope may vary according to the contextual features of the decision-making setting. To a large extent, concrete measures endorsed either at international or at national level are there to breathe life into the bare bones of these two principles.

Regarding their status in international law, whilst several international courts consider prevention as a principle of customary international law, the customary nature of the precautionary principle is still subject to debate. But this is not to say that these two principles are not playing a key role in their own right in both international and municipal law.

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