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**Legal Approaches to Scientific Uncertainty
- The Case of EU Nature Conservation Law -**

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Environmental law provisions often refer to the “present state of scientific knowledge.” Applying these laws can become quite challenging, however, when there is no general agreement in science about its present state. The law has responded in a variety of ways to these situations of scientific uncertainty, including, but not limited to: laying down procedural requirements, involving experts, defining specific levels of protection, or guiding administrative and judicial decision-making through general principles such as the precautionary or proportionality principle. This article investigates legal measures governing situations of scientific uncertainty in environmental law. To this end it first examines German legislation laying down permission requirements for industrial and nuclear plants. It then proceeds to analyse European Union law on habitat and species conservation, focussing particularly on German administrative courts’ decisions which address scientific uncertainties under EU nature conservation law.

Introduction

Social sciences have made lawyers aware that one distinctive feature of modern societies is their conscious and systematic approach to uncertainty. For example, they have interpreted the establishment of private and public insurance systems as early responses to uncertainty¹. Along these lines, they described the development of the welfare state as a means to cope with the risk of poverty looming large in developing industrial societies.²

In the area of environmental law, the early development of technical safety standards has also played an important role in addressing uncertainty. In Germany, environmental standards emerged during industrialisation in the 19th century. Standards were developed and used, for example, by the so called *Steam Boiler Associations (Dampfkesselvereinigungen)* which were founded in Prussia to improve the safety of technical installations. These standards were widely accepted as *generally recognised rules on technology*, or standards based on the *present state of technology*, or the *best available technology* and subsequently became legal technical safety standards, i.e. they were either used in administrative or judicial decision-making or simply integrated into legislative acts³. The effort to systematically approach technological risks, however, has not only been interpreted as an attempt to reduce uncertainty and increase safety, but also as a strategy to address unintended side-effects: *Ulrich Beck*, in particular, in his famous study on the "risk society"⁴ has drawn attention to what he referred to as "blind spots in risk management". He developed his thoughts in view of the Chernobyl Disaster, aptly describing certain approaches to risk management as "organised irresponsibility"⁵. Anthony Giddens has similarly pointed toward the consequences of modernity, using the image of the famous *juggernaut wagon*, pointing out that technological inventions and accelerating social processes can be extremely difficult to control⁶.

Targeting uncertainty in general should be distinguished from addressing scientific uncertainty in particular, the latter being of great importance in the area of environmental law. Since the 1970s, uncertainties are no longer a mere scientific problem, but have increasingly become a governance challenge, including lawmaking as well as administrative and judicial decision making. In Germany, uncertainty and knowledge problems have played a major role in several areas of environmental law, particularly with a view to governing the planning and permission of industrial and nuclear plants as well as genetic engineering. Both the German *Atomic Energy Act* and the *Genetic Engineering Act* (the latter one being strongly influenced by EU law) have defined levels of protection by explicitly referring to the "state of science and technology" or the "state of the art in science" and thus have made the available scientific knowledge the yardstick for granting different kinds of permits.⁷ In the national legal discourse, related questions have been discussed under the term "risk administration"

¹ F Ewald, *Der Vorsorgestaat* (Frankfurt/Main, Suhrkamp, 1986).

² A Evers /H Novotny, *Über den Umgang mit Unsicherheit* (Frankfurt/Main, Suhrkamp, 1987).

³ R Wolf, *Der Stand der Technik* (Wiesbaden, Springer, 1986).

⁴ U Beck, *Risikogesellschaft* (Frankfurt/Main, Suhrkamp, 1986).

⁵ U Beck, *Risikogesellschaft* (Frankfurt/Main, Suhrkamp, 1986); U Beck, *Gegengifte* (Frankfurt/Main, Suhrkamp, 1988).

⁶ A Giddens, *The Consequences of Modernity* (Oxford, Polity Press, 1990).

⁷ See § 7 I No. 3 Atomic Energy Act; § 11 I No. 4 and § 16 I No. 2 Genetic Engineering Act. In Directive 2001/18/EC on the release of genetically modified organisms, reference is made at various points to scientific findings and the precautionary principle; see, for example, Art. 4 I Directive 2001/18/EC and Annex II, Part B.

or "risk management law"⁸. Both terms (or headlines) try to capture how administrations as well as the legislature systematically call for the generation and evaluation of risk relevant knowledge ("risk assessment") and systematically address remaining uncertainties regarding possible damages by applying the precautionary principle. In the international social science discussion, the term "regulatory science"⁹ has also become prominent in this regard. The terms "risk management" and "regulatory science" indicate and highlight that science is increasingly important in the context of regulation, e.g. particularly with a view to generating knowledge about environmental and health risks, identifying adequate levels of protection, and for supporting procedures of acquiring and processing risk knowledge for practical decision making¹⁰.

Early on, German courts proved to be important drivers in the development of risk related administrative law, especially in the area of immission control and nuclear safety. Since the 1970s, courts have been repeatedly and continuously confronted with knowledge issues regarding reactor safety and radiation protection¹¹, regarding air quality and health impacts, and –increasingly since the 1990s - with safety issues concerning genetic engineering. In response, they have developed concepts for addressing emerging knowledge issues, for example, the "practical reason formula" provided by the Federal Constitutional Court in its jurisdiction on nuclear power plants¹².

In Germany, specific knowledge standards regarding habitat and species conservation, however, became relevant in courts relatively late, i.e. mainly in connection with nature conservation law regulating *interferences with nature* (the so called *Naturschutzrechtliche Eingriffsregelung*). Later, however, ECJ decisions on Natura 2000 sites strongly influenced German courts, making clear that the state of science or the best available scientific knowledge is also important for governing species and habitat conservation¹³. Since then, open questions regarding the adequate level of protection in nature conservation have increasingly been subject to court proceedings, culminating in a decision by the Federal Constitutional Court in 2018, the latter deciding on the prohibition to kill certain animal specimen. In this regard, the Court addressed the question of how to handle scientific uncertainty with a view to the negative impacts of wind energy projects on specific animals. The decision had a strong impact on the German legal scientific discourse; mainly because - according to the Court - scientific uncertainty must not prevent the decision-making bodies to take decisions and that they must not wait in such cases until better or full knowledge is available. According to the Court, however,

⁸ U Di Fabio, *Risikoentscheidungen im Rechtsstaat* (Tübingen, J.C.B. Mohr, 1994); G Bechmann, *Risiko und Gesellschaft Society* (Opladen, Westdeutscher Verlag, 1993); A Scherzberg, 'Risiko als Rechtsproblem' (1993) *Verwaltungsarchiv* 484-513; A Scherzberg, 'Risikosteuerung durch Verwaltungsrecht' (2004) *Veröffentlichungen der Vereinigung Deutscher Staatsrechtslehrer* 214-263; W Köck, 'Risikoverwaltung und Risikoverwaltungsrecht - Das Beispiel des Arzneimittelrechts' (2003) *UFZ-Diskussionspapiere* 1-13; W Köck, 'Rationale Risikosteuerung als Aufgabe des Rechts' in E Gawel (ed.), *Effizienz im Umweltrecht* (Baden-Baden, Nomos, 2001).

⁹ S Jasanoff, *The Fifth Branch: Science Advisers as policy makers* (Cambridge, Harvard University Press, 1990); Jasanoff, S, 'What is the regulatory science?' (2011) *Clinical Evaluation* 167-180.

¹⁰ I Appel, 'Methodik des Umgangs mit Ungewissheit' in W Hoffmann-Riem/ E Schmidt-Aßmann (ed) *Methoden der Verwaltungsrechtswissenschaft* (Baden-Baden, Nomos, 2004).

¹¹ BVerwG (1 C 102/76) Coal-fired power plant Voerde, BVerwGE [1978] 55, 250.

¹² BVerwG (1 C 102/76) Coal-fired power plant Voerde, BVerwGE [1978] 55, 250.

¹³ C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449; C-674/17 *Luonnonsuojeluyhdistys Tapiola Pohjois-Savo – Kainuury* [2019] ECJ., System of strict protection of animal species — Annex IV — *Canis lupus* (wolf).

administrations are called upon to provide for directions that address existing uncertainties, including the adoption of binding standards¹⁴.

The following chapter is structured as follows: First, we will explain how environmental and technology law deal with knowledge problems, how decisions regarding conservation requirements have been linked to the best available knowledge (II.), particularly how courts have developed different doctrinal approaches to connect them (II.1.). The second section will provide some general information about the German judiciary, explain the courts' margin of control over administrative decision-making, and introduce courts' tasks in identifying scientifically unresolved issues that matter for the decision-making process (see II.2. below). The third section is dedicated to nature conservation law (see III. below). Here, information about the ECJ's case law on knowledge requirements is provided (III.1.). Subsequently, German case law on habitat and species protection is analysed (III.2.). Special attention will be paid to the seminal ruling of the Federal Constitutional Court of 23.10.2018 (III. 3.). The chapter ends with a brief summary and an outlook (IV.)

I. Environmental and technology law, scientific uncertainty, and the role of the courts

Courts in Germany were initially confronted with questions concerning the state of the art in science and how to handle scientific uncertainty in areas where the protection of humans from technical risks was at stake. Particularly permit applications for industrial and nuclear plants were important in this regard.

Laws aiming to guarantee the safety of industrial and nuclear plants emerged from laws regulating regular industrial activities (the so called *Gewerberecht*) or the public order (the so called *Polizeirecht*). In the 1970s, it transformed into what is nowadays referred to as *Immission Control Law* (the so called *Immissionsschutzrecht*). All of these laws shared the aim to control or prevent hazards¹⁵. In German law, a *hazard* is understood as a situation in which a damage to a legally protected good seems not only possible, but is reasonably likely (i.e. *hinreichend wahrscheinlich*). While laws governing traditional industrial activities or the public order¹⁶ based their assessments regarding the imminence of hazards on the police's day-to-day experience¹⁷, the newly emerging special law branches drew on "expert knowledge" and based their assessments regarding on state of the art scientific and technical knowledge¹⁸.

¹⁴ BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [24].

¹⁵ W Martens, 'Immissionsschutzrecht und Polizeirecht' (1981) Deutsches Verwaltungsblatt 597, 609.

¹⁶ B Drews/ G Wacke/ K Vogel/ W Martens, *Gefahrenabwehr* (Heymanns, Köln, 1986).

¹⁷ K H Ladeur, 'Risiko und Recht. Von der Rezeption der Erfahrung zum Prozess der Modellierung' in G Bechmann (ed.), *Risiko und Gesellschaft* (Opladen, Westdeutscher Verlag, 1993).

¹⁸ W Martens, 'Immissionsschutzrecht und Polizeirecht' (1981) Deutsches Verwaltungsblatt 597, 609; W Köck, 'Grundzüge des Risikomanagements im Umweltrecht' in A Bora (ed.), *Rechtliches Risikomanagement. Form, Funktion und Leistungsfähigkeit des Rechts in der Risikogesellschaft* (Berlin, Duncker & Humblot, 1999).

1. Defining conservation requirements in accordance with the scientific state of the art and the precautionary principle

a) Scientific state of the art in the laws governing industrial plants

Legal requirements regarding levels of protection are often worded vaguely. One illustrative example is the German law regulating industrial plant safety (§§ 4 ff. BImSchG). For approval, industrial plants must not inflict any harmful effects on the environment, avoiding i.a. negative effects on the “public” or the “neighbourhood” (§ 5 I No. 1 BImSchG). In this regard, the Federal Administrative Court (BVerwG) had stated in an early landmark decision that the required level of protection should be based on “general life experience, in particular on the state of the art in science” and that the application of the law must ensure “risks identified on the basis of the state of the art in science” are avoided with “sufficient probability” as well as “in accordance with the principle of proportionality”¹⁹. Initially, risks were only those for which it could be reasonably assumed that they would result in damages²⁰. Here, the law ties in with the older concept of *hazard* as explained above. Scientific uncertainties, however, had to be taken into consideration, irrespective of any known risks, by requiring the industrial plant operator to take preventive measures in accordance with the state of the art, in order to keep pollutant emissions as low as possible (§ 5 I No. 2 BImSchG).

b) Scientific state of the art in the laws governing nuclear plants

The Atomic Energy Act (AtomG) defined the level of protection in Germany for nuclear power plants. Compared to laws regulating regular industrial plants the requirements were much more stringent. Permits for building and operating nuclear plants could only be granted if “necessary measures” were adopted to prevent damages. Whether measures were necessary was determined on the base on the “state of the art in science and technology” (Section 7 II No. 3 Atomic Energy Act). In its famous decision on the *Kalkar Nuclear Power Plant*, the Federal Constitutional Court (BVerfG) ruled that

“by referring to the state of the art in science, the legislator exerts an even stronger constraint to ensure that the legal regulation is in conformity with the latest scientific and technical developments. Measures deemed necessary in accordance with the latest scientific knowledge must be taken to prevent damages. Where preventing damages is not yet technically feasible, permissions may not be granted; what is deemed necessary thus does not equal what is currently technically feasible. This formula, however, raises even more problems for the authorities than the referring to the “state of the art”. In case expert opinions are contradictory, authorities may have no choice but to take a position on the dispute over science.”²¹

The Court then continues:

“As far as damages to life, health and property are concerned, the legislator has established a standard in the Atomic Energy Act which only permits granting a licence if a damaging event appears practically impossible, i.e. according to the state of science and technology (...). Remaining uncertainties which lie

¹⁹ BVerwG (1 C 102/76) Coal-fired power plant Voerde, BVerwGE [1978] 55, 250 [254].

²⁰ BVerwG (1 C 102/76) Coal-fired power plant Voerde, BVerwGE [1978] 55, 250 [254]; BVerwG (7 C 19/02) Nanopowder, BVerwGE [2003] 119, 329 [329].

²¹ BVerfG (2 BvL 8/77) Kalkar Nuclear Power Plant, BVerfGE [1978] 49, 89 [136].

*beyond this threshold of practical reason flow from the limits of human cognitive capacities; they are inevitable and insofar to be accepted and borne by all citizens as socially adequate burdens."*²²

What this means was further explained by the Federal Administrative Court (BVerwG) in its 1985 decision on the *Wyhl Nuclear Power Plant*:

*"Where the necessary measures within the meaning of Section 7 II No. 3 Atomic Energy Act are taken, risks must practically be rendered impossible; the decision required in this regard must be based on the 'state of the art in science and technology'. Uncertainties with a view to the identification and assessment of risks must be considered in light of the damage potential, particularly by making sufficiently conservative assumptions (...) in doing so, the authority responsible for granting permission must not rely on the 'prevailing opinion' in science, but must consider all reasonably justifiable scientific findings"*²³

In the same decision the Court elaborated generally on the relationship between the legislature, the judiciary, and the executive with a view to taking risk-decisions. The Court held that the executive is particularly well equipped institutionally to identify and assess risks, including its capacities for consulting with the scientific community. Accordingly, the judiciary is restricted in reviewing its decisions in this regard.²⁴ The following subsection will draw some general conclusions.

c) Interim result: Increased importance of administrative risk management

Against this background, it may be concluded that the way the German legal system has approached scientific uncertainty depended on the requirements regarding a specific level of protection. Law governing the development and operation of regular industrial plants refers to the "state of the art technology" with a view to preventing damages and to the "state of the art of scientific knowledge" when there is confirmed knowledge about likely damages (i.e. the standard aiming at hazard prevention). The remaining uncertainties are addressed by an obligation to use the "best available technology" (i.e. as a standard of extended risk prevention). In contrast, however, laws governing the development and operation of nuclear plants or genetic engineering refer to the "state of science and technology" and oblige addressees to make sufficiently conservative assumptions, i.e. apply further safety factors or make "worst case assumptions" in order to provide for safety. In this case, the application of the precautionary principle is an integral part of the protection standard.

At the same time, the courts have emphasised the executive's competence regarding risks assessments, particularly their margin of discretion. Accordingly, courts will respect administrations' discretion and not replace it with their own considerations. The courts justify their limited will to review administrative discretion by arguing that the executive is much better equipped to organise and draw up expertise. Courts, instead, should concentrate on controlling whether the best available knowledge has been taken into consideration and processed without arbitrariness. Courts' have also emphasised that the effectiveness of judicial reviews can be increased by laying down procedural requirements that determine the process of administrative knowledge generation and processing.

Referencing to "practical reason", courts have made particularly clear that some risks may simply have to be accepted in a modern, technology driven society. There is no "zero risk", especially when applying

²² BVerfG (2 BvL 8/77) Kalkar Nuclear Power Plant, BVerfGE [1978] 49, 89 [143].

²³ BVerwG (7 C 65/82) Nuclear Power Plant Wyhl, BVerwGE [1985] 72, 300 [316].

²⁴ BVerwG (7 C 65/82) Nuclear Power Plant Wyhl, BVerwGE [1985] 72, 300 [316].

the precautionary principle. Which levels of (residual) risk has to be accepted may vary with a view to different activities. Regarding the operation of nuclear plants, the obligation to take preventive measures ends where a risk can no longer be recognised, i.e. at the limits of what humans can possibly know²⁵. With a view to permitting regular industrial plants or managing hazardous substances, things are different. Where substances are of very high concern (which is the case when a complete risk control is not deemed possible), permission depends on whether the substance's socio-economic benefits outweigh the risks and whether lower-risk alternatives are available (Art. 60 No. 4 REACH Regulation). Against this backdrop it becomes clear that both the legislative design and application of the precautionary principle varies greatly from sector to sector.

d) The concept of "normative concretisation"

In order to relieve the burden of administrations from specifying protection requirement in accordance with the scientific state of the art for each individual case, legislatures often empower governments to adopt generally applicable directives. For example, the German Government has issued the so called *Technical Instructions on Air Quality (Technische Anleitung Luft)*. Doctrinally these "Technical Instructions" constitute an administrative regulation. It contains both immission-limits as well as specific requirements regarding emissions, mostly specific emission limits²⁶. Several landmark decisions by the Federal Administrative Court have characterised this set of rules as "anticipated expert opinions"²⁷ and later as administrative rules that bind the administration²⁸. Such administrative rules can be reviewed by the courts only to a certain extent, i.e. to a) control whether the government has considered scientific and technical knowledge indiscriminately, b) whether the state of knowledge has developed since the adoption, and c) whether the case in question has special features that require the application of different standards²⁹. To the authors' knowledge, the concept of "normative concretisation" by the government or administrations is probably still one of the special characteristics of German environmental law³⁰. In essence, the approach emphasises the executive's competence to evaluate the state of the art in science and technology and develop specific requirements that allow for a uniform application of openly worded environmental laws. The courts have both co-developed and accepted this approach.

e) Procedural requirements: Organisation of scientific expertise in risk management

To this day, courts in Germany have not developed detailed procedural requirements to ensure that the executive bases its decisions on the scientific state of the art. Many environmental and technical laws, however, provide rules that demand the involvement or establishment of expert bodies as well as obligations to consult specialised expert councils or governmental agencies that can hold expert knowledge. For example, the *Federal Immission Control Act* requires the establishment of a "Commission for Plant Safety" (§ 51a BImSchG), who is required to identify options for improving plant safety in regular intervals or on special occasions. The Genetic Engineering Act contains a similar provision that requires the establishment of a "Commission for Biological Safety" (§ 4 GenTG). The

²⁵ BVerfG (2 BvL 8/77) Kalkar Nuclear Power Plant, BVerfGE [1978] 49, 89 [143].

²⁶ W Köck, 'Grenzwerte im Umweltrecht' (2020) Zeitschrift für Umweltrecht 131-140.

²⁷ BVerwG (1 C 102/76) Coal-fired power plant Voerde, BVerwGE [1978] 55, 250 [256].

²⁸ BVerwG (7 C 65/82) Nuclear Power Plant Wyl, BVerwGE [1985] 72, 300 [315].

²⁹ R Hender, 'Umweltrechtliche Grenzwerte in der Gerichts- und Verwaltungspraxis' (1998) Die Öffentliche Verwaltung 481-491.

³⁰ See also O Dilling/W Köck, 'Environmental Law - Country Report Germany' in E Lees, /J E Vinuales (ed.), *Oxford Handbook of Comparative Environmental Law* (Oxford, University Press, 2019).

latter's main function is to advise the federal government on safety-related issues and to provide advice in specific permission procedures under the Genetic Engineering Act (§ 10 VII GenTG). The Genetic Engineering Act is an illustrative example for a law that requires the involvement of expert bodies in permission or licensing procedures. For example, decisions over the releasing of genetically modified organisms are taken by a federal authority which must involve three additional expert bodies, i.e. the Federal Agency for Nature Conservation, the Robert Koch Institute (a typical "regulatory science" authority), and the Federal Institute for Risk Assessment (§ 16 IV GenTG). This illustrates how the legislator has responded to knowledge problems as well as the difficulties in assessing and identifying the state of science by establishing expert authorities and by involving external expertise.

f) The role of courts

In principle, German administrative courts themselves have defined their own function regarding the control of administrative decision-making in the face of uncertainty as follow: They ensure that a) science has to be consulted, and b) knowledge about risks needs to be based on the existing state of the art. They have refrained from laying down specific procedural requirements in this regard. They made clear, however, that the government and administrations cannot base their decisions about what should be done on the "prevailing opinion in science" alone, but must form their own judgments, especially in cases where a sound and well established knowledge-base is lacking, i.e. "at the limits of knowledge". This holds particularly true for those areas of the law which are guided by the precautionary principle. This requirement is based on the idea that at the very limits of knowledge a) legitimacy must be generated through political and not expert decision, and b) applying laws and rules is a normative process, which cannot draw conclusion from sciences alone, if natural fallacies should be avoided.;³¹.

g) Result: Renaissance of legislation? - On the importance of procedural lawmaking

Decision-making at the limits of knowledge thus requires normative legitimacy. This, in turn, calls for both the executive taking responsibility as well as the legislator providing guidance through legislation and public participation.³² Particularly the Corona pandemic has made clear that taking important political decisions in the face of uncertainty must not be left to experts alone, but requires democratic political discourse and public support³³

Irrespective of whether and to what extent parliament engages risk management, there is and will be a demand for legislative guidance of the executive in its approaches to scientific uncertainty. The legislator has to consider carefully how precisely it needs to direct the executive's own regulation and decision-making through law, both with a view to the levels of protection and procedures. With regards to procedural requirements the parliamentary legislator needs to ensure that the law generates clarity about a) what we know for sure, i.e. what is soundly proven or evident, b) what currently remains not

³¹ O Dilling/ T Markus, 'Ex Rerum Natura Ius? Sachzwang und Problemwahrnehmung im Umweltrecht' in O Dilling/ T Markus, *Ex Rerum Natura Ius? – Sachzwang und Problemwahrnehmung* (Baden-Baden, Nomos, 2014).

³² L Münkler, *Expertokratie* (Tübingen, Mohr Siebeck, 2020); E Denninger, *Verfassungsrechtliche Anforderungen an die Normsetzung im Umwelt- und Technikrecht* (Baden-Baden, Nomos, 1990); R Steinberg, *Der ökologische Verfassungsstaat* (Frankfurt/Main, Suhrkamp, 1998); T Markus, 'Changing the base: legal implications of scientific criteria and methodological standards on what constitutes good marine environmental status' (2013) *Transnational Environmental Law*, 145-165.

³³ A Klafki, 'Mehr Parlament wagen? Die Entdeckung des Art. 80 IV GG in der Corona-Pandemie' (2020) *Neue Zeitschrift für Verwaltungsrecht* 1718-1722.

fully understood (e.g. concerns exist due to first scientific assessments), c) whether existing knowledge gaps may be closed in the near future through systematic research, e) on which additional criteria and arguments decisions are to be based, and f) what kind of assessments and evaluations need to be carried out to revisit decisions and adapt them in accordance with updated and improved knowledge³⁴. Different aspects of these ideas have been discussed in the early 1990s in the course of the effort to codify environmental law in a unified environmental act (“Umweltgesetzbuch”). The codification effort failed, however, due to lack of a political majority. Nevertheless, discussions have been revitalised by the German Constitutional Court’s Decision of 23 October 2018, which may place some of the suggestion made here back onto the political agenda (see III.3. below).

2. Dealing with scientific uncertainty in judicial proceedings

a) The organisation of the judiciary in Germany

The judicial system in Germany comprises the *ordinary courts* (responsible for civil and for criminal cases) and the *specialised courts* (responsible for administrative, social welfare, fiscal, and labour law cases). In addition, constitutional courts exist at the federal and state levels which are responsible for disputes between state organs as well as for individual claims regarding violations of fundamental rights (including cases relating to the state’s obligation resulting from fundamental rights to protect the environment). Repeatedly over the last decades, the Federal Constitutional Court had to decide cases in which it had to evaluate compliance of environmental legislation or administrative acts with fundamental rights, most recently issuing its spectacular ruling on the fundamental right to climate protection in March 2021³⁵.

German environmental law is largely regulated in different administrative codes which address specific environmental issues such as, for example, nature protection, waste treatment, immission control, renewable energy. Administrative decisions based on these codes are mostly subject to the jurisdiction of the administrative courts. Regular administrative courts are at the lowest level, higher administrative courts are placed at the middle ground (level of the federal states), and the Federal Administrative Court is at the top level. The Federal Administrative Court was originally conceived as a court of appeals, i.e. to merely review the interpretation of the law by the lower courts, but not conducting investigations of facts. In an effort to accelerate judicial procedures after the German reunification in 1989, however, the Federal Administrative Court has gained additional adjudicative powers in some specific areas, now also being responsible for investigating facts in all major infrastructure projects. Another judicial reform was adopted in the interest of accelerating the transformation of the German energy sector. In the course of this reform the higher administrative courts were assigned the responsibility to act as courts of first instance in certain immission control cases, which include, for example, cases concerning the permission of wind turbines (Investment Acceleration Act, 2020). The purpose was to accelerate judicial procedures to ramp up climate protection through the development of renewable energies.

Within the system of specialised courts in Germany, a system of specialized judges has evolved. At the Federal Administrative Court, for example, special panels (senates) are responsible for environmental

³⁴ W Köck, ‘Grenzwerte im Umweltrecht’ (2020) Zeitschrift für Umweltrecht 131-140.

³⁵ BVerfG (1 BvR 2656/18, 1 BvR 96/20, 1 BvR 78/20, 1 BvR 288/20, 1 BvR 96/20, 1 BvR 78/20) Klimaschutz, BVerfGE [2021] 157, 30; see G Winter, ‘The Intergenerational Effect of Fundamental Rights: A Contribution of the German Federal Constitutional Court to Climate Protection’ (2021) Journal of Environmental Law 1-13.

disputes. These *environmental senates*, however, consist exclusively of lawyers and thus do not follow the model of so-called "environmental courts", which has been introduced in a number of other countries (such as Sweden or New Zealand), mainly to guarantee for courts' scientific and technical expertise³⁶. To this day, there has not yet been a political discussion in Germany on whether specific environmental courts could improve the judicial process. In principle, however, the German judicial system knows of specialised courts including non-legal experts on the bench. For example, patent courts, trade courts, and courts deciding social welfare cases include judges or honorary judges who are not lawyers but acknowledged experts in the respective field³⁷.

To this day, however, non-legal-experts have not been included in administrative courts. Accordingly, environmental law proceedings rely strongly on external expertise in cases in which difficult scientific or technical questions are involved. Of particular importance are experts appointed by the courts. Of different value are expert opinions drawn up and funded by the parties or expert opinions from third parties submitted by the parties (official reports etc.). Courts need to consider them and particularly assess whether they are based on correct assumptions and if they are comprehensible and coherent. Both judges and parties have the right to question experts³⁸. Some senates at the Federal Administrative Court are exclusively responsible for environmental law proceedings. Accordingly, judges serving on these chambers have acquired substantial experience in dealing with external non-legal experts. Nevertheless, the relationship between legal and extra-legal knowledge remains precarious³⁹. Currently, there is a discussion about improving the quality of experts by means of qualification and certification processes. It was suggested that the government should establish an agency for this purpose.⁴⁰ All this is important to facilitate the functioning of the courts.

b) Judicial legal protection

Article 19 IV of Germany's constitution, i.e. the so called *Basic Law (Grundgesetz)* states "Should any person's rights be violated by public authority, he may have recourse to the courts." The right to judicial protection is thus based in constitutional law and is deemed to have the legal status of a fundamental right.

Public authority includes in particular the executive (government and administration). Their actions are subject to review by administrative courts. In principle, access to courts is only granted to those who can claim that their rights have been violated by decisions of the executive. Since the executive bases all its decisions on (environmental) laws, what matters in this regard is whether a legal norm grants rights to individuals (particularly whether a specific norm aims to protect specific persons, i.e. in accordance with the so called *Schutznormtheorie*) and whether the respective norm has been applied correctly or incorrectly.

³⁶ G Pring/ C Pring, 'Environmental Courts & Tribunals. A Guide for Policy Makers' (2016) UN Environment; R Guidone/ H Jonas, 'A review of environmental courts and tribunals' in C Voigt/ Z Makuch (ed.) *Courts and the Environment* (Cheltenham, Edgar Elgar, 2018); D C Smith, 'Environmental courts and tribunals' (2018) *Journal of Energy & Natural Resources Law* 137-140.

³⁷ L Schönfelder, 'Umweltgerichte - eine mögliche und gebotene Institution in der deutschen Gerichtsbarkeit?' (2021) *Europäisches Umwelt- und Planungsrecht* 302-321.

³⁸ A Guckelberger, 'Erschließung extrajudizialen Wissens durch die Verwaltungsgerichte' (2017) *Verwaltungsarchiv* 143-174.

³⁹ H Sendler, 'Richter und Sachverständige' (1986) *Neue Juristische Wochenschrift* 2907-2915.

⁴⁰ K Rennert, 'Funktionswandel der Verwaltungsgerichtsbarkeit unter dem Einfluss des Unionsrecht?' (2016) *Paper 71st Deutscher Juristentag, Essen* 1-31.

If an authority addresses a legally binding decision directly at a specific person (for example, when granting a permit or issuing a prohibition), access to courts will always be granted, i.e. based on the so-called *Addressee Theory (Adressatentheorie)*. In these cases it is irrelevant whether the relevant norm aims to protect the plaintiff (i.e. in accordance with the above mentioned *Schutznormtheorie*). Addressees of administrative decisions, for example persons who want to carry out a construction project, can therefore have all relevant decisions of the administration reviewed by a court.

In case an administrative decision affects third parties or the environment, in contrast, legal standing before courts depends on whether claimants can base their arguments on rules that have been adopted to also protect their specific individual interests (for example, their interests as neighbours) and not solely aim to direct administrative decision-making for pursuing general public objectives. For example, a specific individual interest has been confirmed by courts with regards to laws that set limits for certain air pollutants, denied, however, with regards to general provisions protecting habitats or species.

In her opinion in the BUND case, Advocate General Elenor Sharpston described the German administrative judicial system as a "Ferrari with closed doors."⁴¹ While the review and control are deep and thorough ("Ferrari"), getting access to courts can be difficult, particularly for third parties ("closed doors").

EU legislation (Directive 2003/35/EC) implementing the Aarhus-Convention has brought about substantial change to the German judicial review system. Several strategic lawsuits before the ECJ have also contributed to clarifying the law on access to justice in environmental cases⁴². As a result, the German *Environmental Remedies Act* had been amended several times –and extended non-governmental environmental organisations' access to courts with a view to having administrative decisions in environmental matters reviewed⁴³. In addition, recent ECJ-decisions have also made clear that individual plaintiffs are *not only entitled to file cases* where laws are meant to protect them ("Schutznormtheorie") or where they are individually affected by administrative decision⁴⁴.

c) Dealing with scientific uncertainty: standards of control and recognition of administration's margin of discretions

In Germany judicial reviews of administrative decisions are deemed to be comparatively thorough. In principle, all administrative decisions can be fully reviewed by the courts. Restrictions only exist where the law grants administrative discretion to a) determine the content of a norm or b) decide on its legal consequences⁴⁵. This decision-making power has been acknowledged by the courts, inter alia, with regards to laws governing the operation of nuclear plants as well as in cases in which the government has been authorised to concretise the law through ministerial decrees (see 1.d and 2.a above).

⁴¹ C-115/09, Opinion GA Shapston, ECJ I-3676, para 77.

⁴² C-237/07 *Jancek v Bavaria* [2008] ECJ I-6223; C-115/09 *Bund für Umwelt und Naturschutz Deutschland, Landesverband Nordrhein- Westfalen eV v Bezirksregierung Arnsberg* [2011] ECJ I-3701.

⁴³ B Wegener, 'Der Braunbär lernt schwimmen' (2018) *Zeitschrift für Umweltrecht* 217-222; A Guckelberger, 'Die Ausgestaltung der Umweltrechtsbehelfe für Verbände seit der UmwRG-Novelle 2017' (2020) *Nature and Law* 505-512.

⁴⁴ W Köck/ E V Henn, 'Die Rechte der Wasserversorger bei der Grundwasserressourcenbewirtschaftung - am Beispiel der PFC-Grundwasserbelastungen in Mittelbaden' (2020) *Neue Zeitschrift für Verwaltungsrecht* 504-511; C-674/17 *Luonnonsuojeluyhdistys Tapiola Pohjois-Savo – Kainuu ry* [2019] ECJ.

⁴⁵ M Schuster *Beurteilungsspielräume der Verwaltung im Naturschutzrecht* (Berlin, Duncker & Humblot, 2020); BVerwG (9 A 22/11), BVerwGE [2013] 146, 145.

Recently, the Federal Constitutional Court has indicated that in the face of substantial scientific uncertainty it does not matter to what extent the legislator has entitled the executive to specify existing legislation. With a view to their legal review, courts are allowed to follow the executive's assessment, i.e. "at the limits of knowledge". According to the Federal Constitutional Court, the limits of knowledge constitute the limits of judicial review and control.⁴⁶ This will be explained in greater depth in Part III (see III. 3. below).

d) Fact finding: The role of expert opinions in German administrative courts

Proceedings before German administrative courts are guided by the so called "inquisitorial principle" (Untersuchungsgrundsatz). The principle manifests in § 86 para. 1 of the Code of Administrative Court Procedure which provides that "(t)he court investigates the facts ex officio (...). It is not bound by the submissions of and requests for evidence by the parties." In accordance with this principle, the courts must "make all reasonable efforts" to investigate the facts of the case and are required to make use of all possibly relevant sources of evidence, including expert opinions⁴⁷. Courts are only obliged to call in experts if they are not confident that they have sufficient expertise. Where experts are relied on, their task is to provide courts with specialist knowledge and enable the judges to fully assess the facts. From a legal point of view, the experts remain "assistants to the court", i.e. it is upon the courts to eventually determine which facts are relevant and how they are to be assessed from a legal point of view. Judges are particularly required to resolve contradictions that may arise from the submitted facts and –where relevant– different expert opinions⁴⁸. The following subsection will elaborate on how these principles are implemented by courts with regards to existing scientific uncertainty in the application of EU nature conservation law.

II. Scientific uncertainty in EU nature conservation

Uncertainty had been a prominent issue in German nature conservation law, already before the latter was significantly influenced by EU legislation. Since the 1970s German nature conservation law's central legal instrument was the so-called *interference with nature regulation* (*Eingriffsregelung*). This regulation requires those who would like to take actions that may have a significant impact on protected habitats or species to minimise the effects and to provide for compensation, primarily through taking measures that promote nature conservation (§§ 13 - 18 BNatSchG). To some extent the *interference regulation* bears resemblance to two other important environmental law instruments, i.e. the environmental impact assessment and the requirement to compensate for environmental damages. Scholars have also classified the *interference regulation* as a "soft version" of the "non-deterioration-obligation" as well as a consequent approach to implement the polluter pays principle⁴⁹.

Both methods and criteria to assess the impacts on habitats and species as well as compensation measures were left unregulated and, accordingly, subject to legal conflicts. The courts responded by granting administrations a prerogative to assess nature conservation issues⁵⁰. The courts would only

⁴⁶ BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [23].

⁴⁷ S Rixen, in Sodan/ Ziekow (ed.) *Verwaltungsgerichtsordnung* (Baden-Baden, Nomos, 2018), § 86 para 48.

⁴⁸ H Lang, in Sodan/ Ziekow (ed.) *Verwaltungsgerichtsordnung* (Baden-Baden, Nomos, 2018), § 96 para 41.

⁴⁹ A Voßkuhle *Das Kompensationsprinzip* (Tübingen, J.C.B. Mohr, 1999).

⁵⁰ BVerwG (9 A 11/03) New construction of federal road B 2, BVerwGE [2004] 121, 72.

go and check whether the impact assessments and the compensation concepts were based on suitable methods and whether the official assessment was “plausible”⁵¹.

This early approach developed by the courts was of limited use, however, with a view to reviewing the implementation of the increasingly important EU nature conservation law, particularly with a view to the formalised assessment approach in the area of habitat-protection. Courts became quickly aware that investigation requirements are comparatively high under the EU law and that their own control requirements would have to mirror and live up to them. Requirements, however, would seem somewhat less demanding in the context of compensation pursuant to Art. 6.4 Habitats Directive and in the context of species protection law (Art. 12 and 16 Habitats Directive) (see 2. below). Before going into greater detail, the ECJ’s case law on the Habitats Directive knowledge requirements for site and species protection will be briefly be outlined (see 1. below).

1. ECJ-case law concerning knowledge requirements for site and species protection under the Habitats Directive – the impact on German case law

The CJEU case law is discussed in detail in chapter 2 of this book. In this sub-sections, only some specific rulings in three important CJEU decisions will briefly be highlighted in order to explain the Court’s influence on German case law.

In its case law on the Habitats Directive, the ECJ has laid down knowledge requirements both with regard to site and species protection. It also provided guidance on how to deal with scientific uncertainty.

In its “Waddenzee Decision” (C-127/02), the Court dealt with the protection of Natura 2000 sites, particularly with the assessment of the implications of certain projects for protected sites. Among other things, the Court had to decide when an assessment pursuant to Art. 6.3 Habitats Directive has to be carried out for a project and under which conditions a project affecting protected areas can be approved. The ECJ concluded that Art. 6.3 of the Habitats Directive requires the application of the precautionary principle⁵². In addition, the Court decided that

“any plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site’s conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects.”⁵³

The degree of certainty required by the court appears relatively high. After completing a screening process, it must be clear - with reasonable certainty - that there will be no adverse effects. If uncertainties remain in this respect, precautionary measures are required.

⁵¹ BVerwG (9 A 11/03) New construction of federal road B 2, BVerwGE [2004] 121, 72.

⁵² C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [58].

⁵³ C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [45].

In its ruling in “Coöperatie Mobilisation for the Environment and Vereniging Leefmilieu” (C-273/17), the ECJ exempted certain agricultural fertilizing practices from the approval requirement under Art. 6(3) Habitats Directive, if they would not exceed a certain threshold value or a certain limit value in terms of nitrogen deposition (“programmatische approach Netherlands”). National courts, however, have to be satisfied that the “appropriate assessment’ within the meaning of that provision, carried out in advance, meets the criterion that there is no reasonable scientific doubt as to the lack of adverse effects of those plans or projects on the integrity of the (Natura-2000) site concerned.”⁵⁴. The ECJ also made clear that national courts need to be satisfied with a view to all Natura 2000 sites⁵⁵.

In practice, however, it is most likely to be very difficult for courts to be satisfied in this respect, because possibly affected sites can be very diverse and an average thresholds may not provide sufficient evidence⁵⁶. Accordingly, both a) projects within protected areas and b) projects outside these areas impacting them will have to undergo an assessment which considers their cumulative effects.

The ECJ has repeatedly and consistently argued that the appropriate assessment of a plan’s or project’s implications for a specific site that must be carried out pursuant to Article 6(3) of the Habitats Directive implies that “all the aspects of the plan or project which (...), either individually or in combination with other plans or projects (...) “must be identified in the light of the best scientific knowledge in the field”⁵⁷. The ECJ also stated that there must be no reasonable scientific doubt that the project will not have a significant effect on the protected site⁵⁸. It follows from this that all aspects of the project that may lead to adverse effects, either individually or in combination with other plans or projects, must be identified⁵⁹. In addition, assessments “may not have lacunae and must contain complete, precise and definitive findings and conclusions capable of dispelling reasonable scientific doubt as to the effects of the proposed work on the protected area concerned”⁶⁰. However, the required level of certainty (“capable of dispelling reasonable doubt”) does not require authorities to consider every existing expert opinion. Nevertheless, the authority empowered to take a decision must give a detailed statement of reasons why it rejected the finding of a scientific expert opinion⁶¹. This suggests that the authorities are granted a certain margin of discretion.

If an assessment indicates that significant adverse effects of a plan or project cannot be ruled out, protective measures aimed at avoiding or reducing any direct adverse effects may be taken into account. The effectiveness of the protective measures, however, must be confirmed. According to the ECJ, confirmation of their effectiveness at the level of “beyond all reasonable doubt” could not be

⁵⁴ C-273/17 *Solvay Chimica Italia SpA and Others v Autorità per l'energia elettrica, il gas e il sistema idrico* [2018] ECJ [112].

⁵⁵ C-273/17 *Solvay Chimica Italia SpA and Others v Autorità per l'energia elettrica, il gas e il sistema idrico* [2018] ECJ [120].

⁵⁶ S Möckel ‘Natura 2000 impact assessment - Neue Entscheidungen des EuGH’ (2019) *Natur und Recht* 152-159.

⁵⁷ C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [54]; C-399/14 *Grüne Liga Sachsen e.V. and others v Freistaat Sachsen* [2016] ECJ [49].

⁵⁸ C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [59].

⁵⁹ C-399/14 *Grüne Liga Sachsen e.V. and others v Freistaat Sachsen* [2016] ECJ [49].

⁶⁰ C-461/17 *Brian Holohan, Richard Guilfoyle, Noric Guilfoyle, Liam Donegan v An Bord Pleanála* [2018] ECJ [49].

⁶¹ C-461/17 *Brian Holohan, Richard Guilfoyle, Noric Guilfoyle, Liam Donegan v An Bord Pleanála* [2018] ECJ [52].

achieved by merely conducting monitoring activities⁶². In case a significant adverse impact cannot be ruled out with certainty, the project may be approved only subject to the conditions laid down in exception clause provided in Art. 6.4 Habitats Directive. Exceptions, in turn, require compensatory measures necessary to ensure the overall coherence of the Natura 2000 network. To this day, however, the ECJ has not required the same certainty standards it applies to protection measures pursuant to Art. 6.3 Habitats Directive to the question of effectiveness of compensation measures.

The ECJ has also not decided yet whether the same certainty requirements apply under the Habitats Directive's provisions protecting species. Notably, however, the Court has never referred to the precautionary principle in determining whether the species protection prohibitions have been complied with. It has also not used the formula "best scientific knowledge".

Against this background, the German Federal Administrative Court has concluded that habitat protection standards cannot be applied 1:1 to species protection⁶³. In contrast, the European Commission's 2007 Guidance Document on Species Protection has referred to the precautionary principle with a view to the provisions on species protection, namely with regard to the protection of resting places and the concept of preserving ecological functionality of a site. According to the Commission, there must be a high degree of certainty that the measures are sufficient to avoid any deterioration or destruction in order to meet the requirements of species protection⁶⁴. The Commission's opinion does not contradict with the rulings of the Federal Administrative Court (BVerwG), i.e. a strict certainty requirement only applies to the effectiveness of protective measures that aim to counter known damage risks.

However, in its *Tapiola* decision of 10.10. 2019 (C-674/17), the ECJ explicitly applied the precautionary principle to the exception clause provided in Art. 16.1 Habitats Directive. It states:

*"(...), it must also be noted that, in accordance with the precautionary principle enshrined in Article 191(2) TFEU, if, after examining the best scientific data available, there remains uncertainty as to whether or not a derogation will be detrimental to the maintenance or restoration of populations of an endangered species at a favourable conservation status, the Member State must refrain from granting or implementing that derogation."*⁶⁵.

The decision concerned wolf hunting in Finland, which was to be permitted on the basis of a population management plan by the Finnish government. Since European wolf populations are considered to be seriously threatened; the ECJ imposed a strict ruling⁶⁶. Whether the ECJ will apply this standard to all Annex IV species or even to all European bird species is not yet clear.

In summary, the case law provides:

⁶² C-142/16 *European Commission v Federal Republic of Germany* [2017] ECJ [34-38].

⁶³ BVerwG (9 A 3/06) Highway A 44 (Hessisch Lichtenau), BVerwGE [2008] 130, 299 [56 et. seq.]; BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [123].

⁶⁴ EU-Commission, 'Guidance Document on the strict protection of animal species of community interest under the Habitats Directive 92/43/EEC' (2007) [48, 76].

⁶⁵ C-674/17 *Luonnonsuojeluyhdistys Tapiola Pohjois-Savo – Kainuu ry* [2019] ECJ [66].

⁶⁶ Sobotta, C, 'Zur Rechtsprechung: Neues vom Vorsorgeprinzip - jeder Zweifel ausgeschlossen?' (2020) *Natur und Recht* 453-457.

- With a view to assessing the impacts of projects on site-protection, the precautionary principle must be applied in case uncertainties exist. This also applies to the so-called "programmatic approach", which seeks to avoid project-specific assessments through the adoption of threshold standards (i.e. the nitrogen issue described above). Here, too, the precautionary principle requires that no reasonable scientific doubt remains.
- The ECJ also requires that an assessment has to be based on the "best scientific knowledge". Plans or projects may only be approved if there is "no reasonable doubt" that they will not have any significant adverse effect on the protected site. Expert opinions that may give rise to doubts must not be ignored; instead, the responsible decision-making body has to address submitted arguments and provide nature conservation-specific reasons why they are not being followed.
- Regarding species protection, the ECJ does not require the application of the precautionary principle in cases of scientific uncertainty. This is different, however, if exceptions under Art. 16 Habitats Directive are requested: In these cases, it must be ensured that the affected species remain in or can achieve a favourable conservation status. In this regard, too, "no reasonable doubt" should be admissible, and assessments must be based on the "best available scientific knowledge".

2. Case law of German courts

The following sections investigate how German courts deal with knowledge requirements and scientific uncertainties in the areas of site- and species-protection.

a) Site-protection

The national case law on appropriate assessments under art 6(3) HD has developed substantive, procedural, and methodological requirements. The leading case was the Federal Administrative Court's ruling of 17 January 2007 on the further development of a motorway near the city of Halle (*Westumfahrung Halle*). In this decision, the Court decided that the relevant assessment should not aim at a "zero risk". Accordingly, merely theoretical concerns should be deemed irrelevant. Concerns about possibly significant adverse effects must at least be based on some sort of actual indication or evidence⁶⁷.

If the screening of a project, however, gives rise to serious concerns about possible adverse impacts "this concern can only be dispelled by a conclusive scientific argumentation (including nature conservation expertise) that proves existing concerns wrong"⁶⁸.

The Court then proceeds:

"Proving concerns about a project's damaging potentials fails in two cases: First, if risk analyses, predictions and assessments do not consider the best available scientific knowledge. Second, if reasonable doubts regarding significant adverse effects cannot "objectively" be ruled out on the ground of existing scientific knowledge. Remaining scientific uncertainties about cause-effect relations, however, may be compensated through by an effective risk management approach (...). In addition, it is permissible to work with basing forecasts on probabilities and estimations; these, however, have to

⁶⁷ BVerwG (9 A 20/05) West Bypass Halle, BVerwGE [2007]128, 1 [60].

⁶⁸ BVerwG (9 A 20/05) West Bypass Halle, BVerwGE [2007]128, 1 [62].

be made explicit and transparent (...). One example of a legitimate methods is drawing conclusions by analogy. Where scientific standards are being met, this method can be used to bridge existing knowledge gaps. (...). In addition, to assess and estimate the impact of a project on conservation objectives regarding a specific site, so-called key indicators can be used (...). Another common approach to make estimates is to develop "worst-cases" in which the project will create long-lasting negative effects (...). This approach basically equals a widely accepted conservative risk assessment. However, this method must provide results that are scientifically sound and unequivocal ("on the safe side") with regards to the issue in question."⁶⁹.

With a view to applying the precautionary principle, the court expresses the following opinion⁷⁰ (referring several times to GA Kokott's opinion in the Waddenzee-Case, C-127/02):

"The precautionary principle requires that existing scientific uncertainties are minimized⁷¹. This requires exhausting all scientific means and sources (...), but does not require that new research is to be carried out (by tendering new research contracts) to fill existing knowledge gaps and remedying methodological uncertainties in the assessment. Rather, Art. 6.3 Habitats Directive only requires the use of the "best available scientific means". This includes identifying knowledge gaps that cannot be closed within a reasonable time and assessing their relevance to the findings (...). This kind of risk assessment can contribute to developing proposals for an effective risk management within the framework of the assessment, particularly to determining which measures are appropriate and necessary to prevent the risk from materialising⁷².

In the view of the Court it is also clear that Art. 6.3 Habitats Directive does not only lay down a control standard, but also a requirement for the administrative approval or permit procedure: The core requirement regarding the procedure is to obtain expert scientific advice for the risk analysis, prognosis and evaluation. No other type of evidence is admitted. Notably, no special method is required for carrying out the assessment (...). The available scientific findings, however, must not remain abstract. They must become the basis for investigations making "specific observations (...). In order to prove the project to be harmless, the assessment must compare all the adverse effects arising from the plan or project. To that end, both the adverse effects and the conservation objectives must be identified."⁷³. It follows that, in principle, the resulting scientific findings must be documented (...). Particularly in complex or controversial cases, documentation is the only means by which an assessment can prove that it was based on the best available scientific standard."⁷⁴

In a later decision, the Federal Administrative Court made it clear that species-specific studies must be carried out in case potentially affected species have different behavioural patterns (the case concerned

⁶⁹ BVerwG (9 A 20/05) West Bypass Halle, BVerwGE [2007]128, 1 [64].

⁷⁰ Referring several times to General Kokott's opinion on C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449.

⁷¹ See opinion of General Kokott on C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [100].

⁷² BVerwG (9 A 20/05) West Bypass Halle, BVerwGE [2007]128, 1 [66].

⁷³ C-127/02 *Landelijke Vereniging tot Behoud van de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij, Coöperatieve Producentenorganisatie van de Nederlandse Kokkelvisserij UA* [2004] ECJ I-7449 [97].

⁷⁴ BVerwG (9 A 20/05) West Bypass Halle, BVerwGE [2007]128, 1 [68,70].

the construction of energy grids and potentially negative effects on different bird species with different flight behaviour)⁷⁵.

Today in Germany, a significant number of nature conservation guidelines have been developed that attempt to standardise conservation requirements.⁷⁶ The Federal Administrative Court has accepted some of these guidelines, confirming that they have been developed on the basis of the "best available scientific knowledge". The executive, however, has so far not integrated the respective guidelines into an administrative regulation or issued a decree granting them binding status (despite legal authorisation exists in this regard, see in § 54 XI of the National Nature Conservation Act). Overall, the Federal Administrative Court has⁷⁷ only recognised a rather small margin of discretion for administrations regarding their own assessments about nature conservation question, i.e. only with a view to qualifying habitat types⁷⁸. Nevertheless, in principle, administrations may develop their own expert forecasts and estimates, as long as they develop their arguments in a transparent and accessible manner.

Despite the ECJ's ruling of 7.11.2018⁷⁹ ("Coöperatie Mobilisation for the Environment and Vereniging Leefmilieu") in which it developed the programmatic approach to nitrogen management in the Netherlands, the German Federal Administrative Court continues to argue that the method to assume critical loads and to cut-off an additional load of 0.3 kg/ha*a reflects the "best scientific knowledge available" for determining allowable nitrogen inputs into Natura 2000 sites⁸⁰. The Court obviously assumes that this approach complies with EU law requirements.

With a view to ensuring that compensation measures do not impair the coherence of Natura 2000 sites (within the exception regime laid down in Art. 6.4 Habitats Directive), the Federal Administrative Court does not require the absence of all doubts regarding their effectiveness. The Court states:

"Assessment requirements are less stringent compared to those regarding the damage avoidance and mitigation [i.e. within the assessment pursuant to Art. 6.3]. While the latter requires full proof of effectiveness, because only then the necessary certainty about the compatibility of a plan or project with the law can be obtained (...), it is sufficient to ascertain a high probability (based on best available scientific knowledge, of coherence measures). Unlike damage prevention and mitigation, creating coherence typically involves restoring or redeveloping habitats or habitat types. Imponderables usually occur throughout this process. Accordingly, the success of the measure cannot be predicted with certainty ex ante, but only be prognostically estimated. Requiring certainty would render impossible a positive decision, because the coherence requirement would prevent any balancing under Art. 6.4

⁷⁵ BVerwG (4 A 5/14) Uckermarkleitung, BVerwGE [2016] 154, 73 [78].

⁷⁶ See documentation K Wulfert/ M Lau/ T Widdig/ K Müller-Pfannenstiel/ A Mengel, 'Standardisierungspotenzial im Bereich der arten- und gebietsschutzrechtlichen Prüfung' in Bundesamt für Naturschutz (ed), *FuE- Vorhaben im Rahmen des Umweltforschungsplanes des Bundesministeriums für Umwelt, Naturschutz und Reaktorsicherheit im Auftrag des Bundesamtes für Naturschutz – FKZ 3512 82 2100* (Herne, Leipzig, Marburg, Kassel, 2015).

⁷⁷ In contrast to voices in the literature, see K Fassbender/ A Glaess, 'Schutz der Natura 2000-Gebiete' in H Posser/ K Faßbender (ed.), *Praxishandbuch Netzplanung und Netzausbau* (Berlin/Boston, De Gruyter, 2013).

⁷⁸ BVerwG (9 A 3/06) Highway A 44 (Hessisch Lichtenau), BVerwGE [2008] 130, 299 [74].

⁷⁹ C-461/17 *Brian Holohan, Richard Guilfoyle, Noric Guilfoyle, Liam Donegan v An Bord Pleanála* [2018] ECJ.

⁸⁰ BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [76 et. seq.].

*Habitats Directive. In essence, this would contradict the regulatory purpose of Art. 6.4 Habitats Directive*⁸¹.

Finally, German courts' reviews of administrative decision-making is limited in this area. The German Federal Administrative Court grants the authorities the prerogative to assess nature conservation issues. According to its rulings, courts will only check whether administrations' assessments of impacts and compensation is transparent and comprehensible⁸².

a) Species protection

The leading case in the field of species protection is the Federal Administrative Court's ruling of 9 July 2008⁸³. This decision addresses different legal questions regarding a road construction project (i.e. a federal motorway bypassing the city of Bad Oeynhausen). In this decision, the Court stated that the precautionary principle has to be taken into account, not only with a view to assessing legal habitat protection, but in the area of species protection as well⁸⁴. It pointed out, however that normative differences exist between these two issues. It highlighted that the assessment requirements in Art. 6.3 Habitats Directive are directed at very specific protected areas and at clearly defined objectives regarding their protection. Accordingly, requirements regarding the depth of investigation in this area can be very high. Regarding species protection law, the object of investigation has not been defined as clearly, and a formalised assessment procedure is not required. Against this background species protection law requires to consider – from the outset – not only the precautionary principle, but also the principle of proportionality, "The latter determining significantly the investigation effort"⁸⁵. In other words, regarding the protection of Natura 2000 sites, the law structures normative decisions relatively clearly and the review procedure merely addresses cognitive questions of how to deal with uncertainty. In contrast, the investigation requirements are less clearly contoured with a view to species protection, so that the investigation requirements are also co-determined by the principle of proportionality.

The BVerwG states:

*The principle of proportionality is failed where requirements were imposed with regards to species assessment that would not promise any significant gain in knowledge for the approval decision of a (important infrastructure) project and were out of any reasonable proportion with a view to the benefits for nature and the environment. Accordingly, an assessment has to be carried out in accordance with a standard of practical reason.*⁸⁶

The same decision continues:

The species conservation assessment must be exclusively based on scientific criteria, both with regards to finding and evaluating possible impacts. The relevant legal questions, e.g. whether a species is "significantly disturbed" and whether a population remains in a "favourable conservation status", require ecological assessments and evaluations for which more detailed standards are lacking. In

⁸¹ BVerwG (9 A 3/06) Highway A 44 (Hessisch Lichtenau), BVerwGE [2008] 130, 299 [201].

⁸² BVerwG (9 A 3/06) Highway A 44 (Hessisch Lichtenau), BVerwGE [2008] 130, 299 [202].

⁸³ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274.

⁸⁴ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [57].

⁸⁵ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [57].

⁸⁶ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [57].

contrast to other areas of environmental law (...), the legislator has so far not even come close to establishing sufficient guidelines for applying the laws governing species conservation, i.e. neither by issuing such guidelines by himself nor by involving or commissioning expert committees. Accordingly, those who have to apply the law depend on the extra-legal expertise of ecological science and practice. This ecological expertise, however, in many areas is not yet sufficiently developed enough to provide applicants with reliable answers (...). In many cases with regards to numerous questions, different scientific assessment may justifiably contradict each other, and a sound and well established body of scientific knowledge is missing⁸⁷.

"This finding has significance for all levels of the nature conservation assessment, which (can also) include normative assessments, i.e. both in the ecological investigations and in the assessment of the findings, namely in the quantification of possible impacts and in evaluation of their population-related effects. It is obvious that the results of the assessment, which is an indispensable legal requirement, may vary depending on the methodological approach and the criteria and standards applied. If and as long as ecological science does not prove to be a clear source of knowledge in this respect, the courts lack the authority (which would have to be based on better knowledge), to object the administration's as "wrong" and "not legal". Accordingly, their assumptions are only subject to limited judicial review. They are to be accepted by the court as long as they are justified from a nature conservation point of view and not based on an assessment procedure that proves to be a method that is to be regarded as inadequate or unsuitable to meet the legal requirements. In this respect, the approving authority has a prerogative to assess nature conservation issues, which has already been recognised by the Federal Administrative Court for various comparable issues"⁸⁸.

And with regards whether an expert opinion is justified, the Federal Administrative Court states:

"A nature conservation expert opinion is not superior or preferable to another one simply because it deems more extensive or more elaborate investigations or 'stricter' requirements to be correct. This is only the case when such an investigation has become the generally accepted state of the art and the contrary opinion can no longer be maintained (anymore). The provision governing species protection do not require the project sponsoring party or the permit approving authority in cases of scientific uncertainty or conflict to award research assignments (...) or to conduct studies that would require a similar amount of effort. If they take a scientifically justifiable position which is in accordance with the current state of knowledge, it would not be objectionable"⁸⁹.

As is often the case with the law governing environmental and risk management (see II. above), the court grants authorities a real margin of discretion to decide in the face of existing scientific uncertainties. It does not require a "worst-case assessment" and it does not call for keeping the standard of "leaving no reasonable doubt" as it does with a view to defining the required certainty standard regarding the conservation of sites.

The killing prohibition laid down in Art. 12.1a Habitats Directive has become particular significant in the context of both road construction ("roadkill") and wind energy projects ("birds & bats"). This is mainly due two factors. First, the killing prohibition applies to individual animals. Second, the ECJ has adopted a broad interpretation of the concept of intention, i.e. killing an animal in the sense of Art. 12

⁸⁷ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [64].

⁸⁸ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [65].

⁸⁹ BVerwG (9 A 14/07) Highway North Bypass Bad Oeynhausen, BVerwGE [2008a] 131, 274 [66].

Habitats Directive does not only involve deliberate killing, but also accepting its death⁹⁰. According to the case law of the Federal Administrative Court, the killing prohibition in Art 12.1a of the Habitats Directive only applies if a project significantly increases the risk of killing a species protected under EU law (*significance criterion*)⁹¹. To establish whether this is the case, the following steps are taken:

- determine a baseline risk for the protected species in the project-relevant area,
- determine the risk for killing induced by the project,
- compare the baseline risk and the project-induced risks,
- assess the risk's significance based on
 - species-specific behavioural patterns,
 - criteria related to the specific biology of the species concerned, and –
 - other nature conservation criteria.

Of great practical importance for the construction and operation of wind turbines are measures that require projects to keep a specific distances to certain areas and to avoid certain aspects in the design of projects. All these measures aim to keep the risk of killing below the significance threshold⁹².

As with habitat protection, there is a growing number of concepts for species conservation⁹³. Since the German *Länder* (i.e. Germany federal states) are responsible for implementing the nature protection law, recommendation differ regionally quite a bit.

Since courts have generally accepted the administrations' assessment prerogative⁹⁴, their main responsibility is to reject and sort out scientifically and technically unsuitable concepts and methods. With a view to the remaining issues, courts restrict themselves to review only whether the administrative decisions' overall results are compatible and justified under the existing law. In principle, courts accept uncertainties and do not require keeping a strict standard of certainty. They will intervene where a decision contradicts views that clearly prevail in science ("generally accepted state of science") and which render opposing views unjustified⁹⁵. Accordingly, the courts' current review standard cannot ensure the uniform implementation of species conservation law in Germany. As a result, the call for uniform federal guidelines for implementation got louder in recent years.

3. The Constitutional Court's decision of 23.10.2018 on uncertainty in species protection law

Questions regarding scientific uncertainty in nature conservation law have evoked a sensational decision by the Federal Constitutional Court in the end of 2018. The decision was prompted by the complaint of a project developer who felt that his right to effective legal protection enshrined in Article 19 IV of the Basic Law had been violated. He claimed that he was illegally denied a permit for the development of a wind turbine. The claimant particularly criticized the way the competent authority

⁹⁰ C-103/00 *Commission v Hellenic Republic* [2002] ECI I-1163 [36, 39]; C-221/04 *Commission v Spain* [2006] ECI I-4537 [69].

⁹¹ BVerwG (9 A 14/07) *Highway North Bypass Bad Oeynhausen*, BVerwGE [2008a] 131, 274 [91].

⁹² S Akerboom/ C Backes/ J Bovet/ E Cavallin/ A Cliquet/ W Köck/ D McGillivray/ F Mathews/ H Schoukens/ H T Anker, 'Wind energy projects and species protection law: a comparative analysis of the application of EU law in five member states' (2019) *European Energy and Environmental Law Review* 144-158.

⁹³ W Köck/ J Bovet, 'Die Anwendung des EU-Artenschutzrechts bei der Zulassung von Erneuerbare Energien-Projekten' (2018) *Zeitschrift für Umweltrecht* 579-587.

⁹⁴ BVerwG (9 A 14/07) *Highway North Bypass Bad Oeynhausen*, BVerwGE [2008a] 131, 274 [65].

⁹⁵ BVerwG (9 A 9/15) *Northwest Bypass Hamburg*, BVerwGE [2016a] 155, 91 [144].

had determined a “significantly increased risk of killing” for the protected species of the *red kite*. The Federal Administrative Court had previously confirmed the authorities’ decision in the last instance. The plaintiff asked the Federal Constitutional Court whether the administrations’ prerogative was in compliance with German constitutional law.

Although eventually the Federal Constitutional Court denied the plaintiff access to court, it made several far-reaching decisions. First, it confirmed that courts’ judicial reviews ends where they, after the greatest possible effort, reach the limits of the knowledge currently provided by nature conservation science and practice. In such a situation, the right to effective legal protection does not compel the respective court to

“conduct further investigations, but allows it to base its decision on the authority’s plausible assessment of the relevant question. The limits to judicial control do not flow from the administration’s assessment prerogative and it does not require specific legislator authorisation”⁹⁶

The court pointed out, however, that

“(the legislature) may not permanently transfer decisions to implementing authorities where those decisions are relevant to fundamental rights and where there is a “knowledge vacuum” that neither the executive nor the judiciary are able to fill (...). Depending on how severely fundamental rights are affected, the legislature may assume in the short term that knowledge gaps will be closed by advances in professional circles and science. In the longer term, however, the legislature must not stand idly by, mainly because it would evade its decision-making responsibility, open up uncontrolled and far-reaching influence on state decision-making to private expertise, and fail to guarantee a uniform application of the law. Where scientific and technical aspects remain unclear, the legislature must at least provide for the establishment of standards which can be applied uniformly by administrations, for example by setting up expert committees that determine uniform standards and methods, or by prescribing more precise rules for choosing between several scientifically justified opinions”⁹⁷.

The Federal Constitutional Court has obviously relied on the principles governing risk administration and risk management law that were developed in different court decisions on nuclear power plants during the 1970s and 1980s (see II.1. above). At that time, particularly the Federal Administrative Court had based decisions on the argument that the executive is better suited to prepare and guide normative decisions in face of high levels of scientific uncertainty, i.e. at the “limits of knowledge”⁹⁸. However, the executive actually needs to take that action, either by developing administrative standards that specify the laws or by means of adopting delegated legislative acts (the last option would be preferable from an EU law perspective, EUGH 1991),⁹⁹

⁹⁶ BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [23].

⁹⁷ BVerfG (1 BvR 2523/13) Red kite, BVerfGE [2018] 149, 407 [24].

⁹⁸ BVerwG (7 C 65/82) Nuclear Power Plant Whyll, BVerwGE [1985] 72, 300.

⁹⁹ See K P Dolde, ‘Naturschutzfachliche Einschätzungsprärogative - Normkonkretisierung tut not!’ (2019) *Neue Zeitschrift für Verwaltungsrecht* 1567-1572; W Köck, ‘Grenzwerte im Umweltrecht’ (2020) *Zeitschrift für Umweltrecht* 131-140.

III. Conclusions

The legal approach to scientific uncertainty in environmental law is largely influenced and determined by the desired level of protection. Where the level of protection should be high, a *concern* or a *reasonable doubt* will be sufficient to assume that a legally protected good will be impaired. If the level of protection is less high, indications regarding an impairment must be significantly clearer. In German environmental law, the concepts of *hazard* (it is sufficiently likely that damage will occur) and *risk* (legitimate concerns regarding a damage exist) are pertinent.

Where the executive implements the law, it will have to specify abstract rules in this regard. The judiciary monitors whether the executive's actions eventually comply with the law.

Regarding the EU's habitat and species conservation law, no binding union wide standards exist to specify different levels of protection. To this day, the EU Commission's guidelines have remained incomprehensive and non-binding. In Germany, too, there are no binding standards at the federal level, but only non-legal scientific and technical recommendations. At the federal state level, however, there are some administrative regulations that direct administrative implementation practices.

Accordingly, specifying the legal requirements of EU law has thus mainly been carried out by courts. In this regard, the ECJ's influence was stronger with a view to the provision on habitat conservation than on species protection. The ECJ adopted a less strict and clear conservation level for species protection, so that German courts have – to some extent – developed their own approach to dealing with uncertainties. In particular, implementing administrations have been granted the right to use varying methods to approach scientific questions. Methods, however, must not contradict with the "generally accepted state of science". As long as administration abide by this rule, they are free to exercise a margin of discretion.

The Federal Constitutional Court quite rightly pointed out in 2018, however, that the executive won't meet its constitutional obligation, if it does not develop clear guidelines and specific criteria in situations of scientific uncertainty, e.g. in the form of administrative regulations or binding decrees. The Federal Constitutional Court's call has been answered by the German government. It currently drafts a binding regulation that aims to direct the executive in the face of uncertainty and to ensure a uniform implementation of the law throughout the country.

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