

2019 EUFJE CONFERENCE

The Role of Science in Environmental Adjudication

12-14 September 2019

Summary Report: Analysis of the Questionnaire

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I. Introduction

Science and technology enter environmental adjudication in various forms ranging from competing science-based arguments to scientific evidence offered by experts and the parties. These invite highly technical assessments from judges and fundamentally impact the dynamic of the judicial process. Different national jurisdictions adopt divergent approaches to interpret scientific input and employ different methods for scientific fact-finding, setting the standard of review, as well as determining the standard and burden of proof. These judicial techniques will be in the center of this analysis. Domestic courts have a significant role in effective enforcement of EU and domestic environmental laws, therefore they have a key role in promoting efficient legal protection of the environment in member states of EUFJE.

The EUFJE 2019 Annual conference focused on the role of science and technology in the environmental case practice of national courts. EUFJE tasked the authors of this report to craft a questionnaire and two case studies to map the various judicial tools with which different jurisdictions handle and engage with the techno-scientific aspects of environmental disputes. Respondents have been judge members of EUFJE working in 21 member States² of EUFJE in national administrative, criminal, civil, constitutional courts as well as in specialized environmental courts in civil law and in common law jurisdictions.³ The

¹ The answers to the questionnaire have been analyzed by dr. Katalin Sulyok (ELTE University, Faculty of Law) and Fruzsina Bögös (judge, Secretary General of EUFJE), and the case study analysis has been prepared by dr. Tiina M. Paloniitty (University of Helsinki) and dr. Mariolina Eliantonio (Maastricht University). This report only reflects the authors' views, not those of the European Commission. The European Commission is not responsible for any use that may be made of the information the report contains.

² Finland, Sweden, Croatia, Poland, Italy, Ukraine, Belgium, Spain, Estonia, Czech Republic, Cyprus, Hungary, France, Bulgaria, Germany, Norway, Slovakia, Austria, Denmark, Portugal, and the UK.

³ The original answers of judges can be downloaded from EUFJE's website.

questionnaire has also been answered by a staff member of the Court of Justice of the European Union, providing his personal view.

The EUFJE has tasked the authors of this report to prepare a comparative analysis of the answers received to the questionnaire. The questions focused specifically on science-intensive environmental disputes, where scientific facts are inextricably linked to the legal controversy that is decided by judges. In such cases, scientific expertise is typically seen as a requisite to rational judicial decision-making. Yet, the necessary techno-scientific competence normally is not incorporated in the bench, therefore judges need to rely on expert opinions to assess the scientific aspects of disputes. A corresponding challenge in this respect is that judges ought to preserve their monopoly over dispute resolution by exerting certain control over the expert input to prevent inadvertent delegation of the judicial function to non-elected experts, who therefore lack legitimate authority to decide such disputes.

Against this background, the questionnaire has a two-fold aim: to appraise the differences and similarities in national jurisdictions' approaches to expert evidence and to the scrutiny of scientific conclusions of administrative authorities, and to evaluate whether such divergences in the treatment of science allow for preserving adequate judicial control over the resolution of science-intensive disputes on the one hand, and for ensuring uniform application of EU environmental law on the other hand.

The questions interrogated five main issues of interest. First, the variety of ways in which scientific arguments are raised before national courts (Questions 1-3). Second, the process of scientific fact-finding, i.e. the ways in which scientific evidence and expertise is gathered and evaluated by courts (Questions 4-5). Third, to survey the characteristic challenges that judges face in science-intensive adjudication (Question 6/a). Fourth, to appraise whether judges experience concerns for uniform application of EU environmental law as well as for preserving the judicial control over scientific expertise (Question 6/b-c). Lastly, the questionnaire seeks to identify room for improvement in the scientific engagement of courts and the types of capacity-building techniques judges deem necessary (Question 6/d).

The questionnaire covered these overarching topics by posing 19 specific questions grouped into 6 broader themes all interrogating different procedural aspects of judicial engagement with scientific evidence in environmental cases.

The forthcoming analysis will first provide an overview of the answers received for each question. This will be followed by a conclusion containing the remarks of the authors on the commonalities as well as divergences discerned from the responses. Lastly, two case studies will be analyzed that also formed part of the questionnaire.

II. Analysis of the answers received

This section shall analyze the answers of the respondent judges to each specific question. A summary of the answers received is followed by some analytic remarks of the authors with respect to each question.

1. Mandate of the court to review techno-scientific matters

1.a In what forms do judges gather scientific advice (e.g. party-appointed experts, court-appointed experts, in-house experts, expert judges (legal adjudicators having a formal training in a certain scientific field), and/or expert assessors (scientific experts sitting with judges during the deliberation without the right to vote))? What is the task of these actors?

1.a. 1. Summary of the answers received

When it comes to scientific evidence gathering by judges, the findings show substantial differences among the legal systems of the respondents. According to the answers, the countries under review can be classified into three main groups.

In several jurisdictions, administrative courts do not gather evidence at all and judges only evaluate whether the evidence gathered by the authorities was collected and assessed correctly (see: Poland).

In some respondent countries technical/expert judges/expert members ⁴ (hereinafter: expert judges) act together with legally trained judges. These professionals are either full members of the court (e.g. Vaasa Administrative Court and Supreme Administrative Court in Finland, technical judges in Sweden) or are appointed on a case-by-case basis (e.g. Norway, expert members in Sweden). They assess the case from a scientific/technical point of view. In these jurisdictions party-appointed experts and court-appointed experts may act beside expert judges.

Among the jurisdictions that involve appointed experts in reviewing techno-scientific matters in environmental disputes, the answers are diverse. In some respondent countries only

⁴ In Sweden technical judges assess environmental cases together with legally trained judges, while at the district court level, expert members are involved in environmental adjudication. In Finland expert judges assess the cases from a scientific point of view. In Norway expert judges are appointed on a case-by-case basis and they participate in the judicial panel.

court-appointed experts are involved, but in most jurisdictions both the opinions of party-appointed experts and court-appointed experts are taken into consideration. However, in some countries the opinion of party-appointed experts' weighs less (e.g. in Estonia). Interestingly, in Denmark (in first instance and high courts, but not in the Supreme Court) two experts are involved with the same vote as legal judges in deciding the case. In Portugal only one expert can be involved in the case, who is either appointed by the court or by the parties, or by a panel of three experts, where each party appoints one expert and the third one is appointed by the court. The Netherlands has a very elaborate system of relying on independent court experts provided by a separate government funded scientific expert body called "Stichting Advisering Bestuursrechtspraak voor Milieu en Ruimtelijke Ordening" or "Foundation of Independent Court Experts in Environmental and Planning law" ("STAB"). The purpose of STAB is to supply the judiciary with technical expertise in environmental and planning cases.⁵

Also, some respondents pointed out that the authority's previous examination in the environmental case, including techno-scientific matters, is a prerequisite for the court proceeding. Accordingly, courts rely on the case files and reports of the authorities. Moreover, in some countries, whenever a technical/scientific issue arises, before appointing an expert, courts should consult with either the authority or the expert involved in the administrative procedure (e.g. Czech Republic and Hungary). In Belgium, the official reports and opinions of the environmental authorities (environmental inspection department, Agency for Nature and Forest, Flemish Environment Agency) contained in criminal and administrative files are an important source of scientific advice. These reports and opinions are prepared by experts in the field (water, air, soil, waste...) and allow judges to have a good understanding of the environmental interests at stake, without having to appoint an expert.

In some countries specialists can also be involved to assist the court in technical issues (e.g. selection of samples for examination), however, their assistance does not substitute for an expert report (e.g. Ukraine). Mention was also made of *amicus curiae* briefs as a way of assisting the court in scientific questions (see: France).

1.a.2. Analytic remarks

There are significant divergences among the respondent jurisdictions. While there are

⁵ In more detail see the presentation of Rosa Uylenburg and A.T. Dalen Gilhuijs on EUFJE's website under "conferences" - "Helsinki 2019".

administrative courts that do not gather evidence at all in environmental disputes, as they only review the legality of evidence gathering by the authorities, other courts involve expert judges by default to assess technical/scientific issues in environmental cases. At the same time, most jurisdictions in the latter group allow for involving experts in the adjudication of scientific issues in environmental disputes.

A fundamental distinction can be made between countries where expert judges are involved in environmental adjudication. These countries face different challenges than countries that decide on technical/scientific issues by appointing experts. EUFJE members' courts that gather scientific advice through expert judges do not face either the challenge of distinguishing between technical and legal questions in fact-intensive disputes, or the challenges of exercising control over the scientific fact-finding process. However, it is important to note that even in these countries experts can be involved in environmental actions.

1.b. What forms of scientific references are acceptable as bases for making persuasive scientific findings (E.g. expert evidence, standards issued by competent international or national organizations, regulatory trends of other states, etc.)?

1.b.1. Summary of the answers received

The answers show that the most common form in which judges confront science is through the evaluation of scientific expert opinions. The types of expert involvement will be addressed in Question 3 below. Other widely applied fact-finding techniques to revealing scientific information are typically site inspections, or documentary evidence. In administrative cases, judges also confront scientific evidence that is in the case file of the public authority. Importantly, national courts differ quite remarkably in the depth of scrutinizing the scientific assessments of competent authorities during judicial review. This aspect will be addressed in more detail under Question 5.

Numerous respondents stress the absence of any formal limit on acceptable scientific evidence. Several answers made mention of using scientific materials that are more informal than expert reports. Relevant examples are standards or reports issued by competent national institutions (e.g. research institutes) or international organizations (e.g. the IUCN's Red List, the Codex Alimentarius of FAO, WHO food standards) and the regulatory trends of other States. The latter is especially relevant in the assessment of the Best Available Techniques

(BAT). Understandably, standards of other countries are not sufficient for national courts to challenge a regulatory decision, but such scientific information can still inform the judicial inquiry. Also, some respondents pointed out that soft law documents and case-law of other countries are also considered by judges.

1.b.2. Analytic remarks

A noteworthy aspect of the responses is the relatively widespread use of scientific references other than expert evidence. In many jurisdictions standards of competent organizations provide a persuasive bases for making judicial findings, which may be traced back to the standing and prestige of such institutions in the respective scientific fields. One respondent explicitly mentioned that such scientific information usually influences the reasoning of the courts in the background, suggesting that these scientific materials can enhance the scientific competence of judges and their ability to control party-adduced scientific evidence, by equipping the court with scientific information that is independent from the parties.

It is submitted here that relying on such more informal sources of scientific information may confer several advantages on courts. First, they ensure unbiased non-partisan scientific insights that are independent from the parties' submission. Second, they can be accessed by the court free of charge and thereby they facilitate low-cost evidentiary procedure, the importance of which has been pointed out by respondents (in more detail see Question 6/a). Third, these pieces of scientific information can be gathered relatively quickly, thus their usage can well fit in the strict time frame of court proceedings.

1.c Can a higher court (e.g. appeal court, supreme court) in your jurisdiction investigate scientific questions, and/or review the scientific findings of lower courts? If so, to what extent?

1.c.1 Summary of the answers received

In jurisdictions where expert judges are involved in environmental adjudication, higher courts can investigate scientific questions and are entitled to review the findings of lower courts in their entirety. In these countries expert judges also participate in adjudication at higher courts.

In countries where both appeal courts and supreme courts are involved in environmental adjudication, second instance courts can review scientific findings of lower courts. However, the supreme courts in these countries are bound by the facts ascertained by

the second instance courts.

In countries where only the supreme court is involved in environmental disputes (either as a second-instance court or an extraordinary review body), except for Bulgaria, it cannot investigate scientific issues.

Several respondents pointed out that if the appeal court has doubts about the scientific findings of the lower court, it usually quashes the first instance judgement and does not engage in scientific fact-finding.

1.c.2 Analytic remarks

The answers revealed that the respondents' appeal system differs in environmental court proceedings. In some countries both appeal courts and the supreme court are involved in environmental adjudication, while in other countries only the supreme court acts as a second-instance court or as an extraordinary review body. Consequently, the different appeal structures seem to fundamentally determine whether higher courts are entitled to investigate scientific questions and/or can review the scientific findings of lower courts.

The issue of whether a higher court (appeal court or supreme court) can investigate scientific questions and review the scientific findings of lower courts is closely linked to the legal systems of the respondent countries, namely, whether it gives higher courts reformatory or cassation competence over the decisions of the authorities. Presumably, in countries where higher courts have cassation competence, these courts cannot investigate scientific questions. Where higher courts also have reformatory competence, these courts can investigate scientific questions and review the scientific findings of lower courts. It should be noted that according to the available data, there are many respondent countries where no appeal courts adjudicate environmental cases. In these countries, supreme courts act in environmental disputes, however, no data are available to indicate whether supreme courts act as second-instance courts or as extraordinary review courts.

1.d How would you handle evidence derived from geospatial technologies (GEOINT) (such as satellite images, aerial photography, drones, etc.) (see for instance the use of geospatial intelligence in the Bialowieza case, C-441/17 R)? In what type of cases and in what ways do you utilize them? How can they promote compliance monitoring and more effective enforcement?

GEOINT is intelligence about human activity on Earth derived from the exploitation and analysis of imagery and geospatial information that describes, assesses, and visually depicts physical features and geographically referenced activities on Earth. GEOINT consists of imagery combined with other geospatial information.⁶

1.d.1 Summary of the answers received

With the rapid development of GEOINT technologies, the vast amount of information provided by Earth observation is becoming a significant tool for courts as well. Answers revealed that most jurisdictions use GEOINT technologies, many of them frequently, though some still do not avail themselves of such evidence in environmental cases. The Court of Justice of the European Union also relies on such evidence. Respondents use several types and platforms to gather GEOINT data, such as Google Earth, Google maps, aerial photography, and satellite images. Some jurisdictions even have their own central GEOINT platforms to provide GEOINT data pertaining to their country (e.g. Estonia).

The answers indicate that GEOINT information can be used for a variety of purposes in the context of a litigation. Respondents specifically mentioned among the functions of GEOINT data: fact-checking, gathering up-to-date data, conducting real time inspections, spotting illegal activity, verifying changes over time in land use or biotopes (conducting ‘before vs. after’ assessments), and replacing site visits. GEOINT information has been used in a range of cases concerning spatial planning, waste landfill, land use, permitting process, nature conservation issues and toxic pollution.

In most jurisdictions it is possible to gather GEOINT data by the court’s own motion. In such cases special rules may apply to enable the parties to comment on GEOINT evidence gathered *ex officio* (see such rules in Finland). As one respondent noted, courts should be aware of the possibility of selective and/or warped depiction of such evidence. The deeper analysis of geospatial imagery may therefore necessitate using expert witnesses.

1.d.2 Analytic remarks

Relying on GEOINT data by judges appears to confer several advantages on courts. First, they can assist courts in monitoring environmental processes that are temporally and spatially spread out. These characteristics of environmental problems have been specifically mentioned

⁶ Commission Staff Working Document, Environmental Compliance Assurance — scope, concept and need for EU actions, Brussels, 18.1.2018 SWD(2018) 10 final, p. 44.

by respondents among the typical challenges of environmental disputes (for more details see Question 6/a). Earth observation technologies can also assist judges in dealing with these difficulties inherent in environmental cases by enabling the court to trace pollution and other harmful processes back in time, which may facilitate identifying the cause of environmental destruction (see e.g. the criminal case on marine pollution decided by French courts). Also, GEOINT technologies may offer open-access data accessible free of charge⁷, thereby relying on them supports low-cost evidentiary proceedings. Satellites now offer GEOINT data with different properties and resolutions allowing to detect anomalies at various scales and to zoom with a high enough resolution⁸ to inform the judicial fact-finding or to guide in-situ inspections to areas eventually at risk. An important further benefit of relying on GEOINT data is that it provides persuasive evidence in scientifically complex cases. As one respondent explicitly pointed out (see: CJEU), the veracity of GEOINT is usually not challenged by the parties, and therefore provide a persuasive basis for courts to make factual findings.

Yet, the use of GEOINT data may be hindered by the fact that the majority can only be used through specialized software and with the help of GEOINT experts. A noteworthy initiative, which facilitates harnessing GEOINT technologies in law enforcement has been mentioned in the Italian report. The so-called Geographic Resources Analysis Support System is a software designed for prosecutors to conduct image processing, geospatial data management and spatial modeling and visualization. The use of such GEOINT tools may significantly enhance the accuracy of data used in court proceedings. For this reason, it appears beneficial if courts develop capacities for relying on GEOINT technologies *ex officio*.

2. When do judges gather expert advice?

2.a How do you distinguish between technical/scientific questions and legal questions in fact-intensive disputes, where science and law are closely interlinked in the underlying legal rules and concepts?

2.a.1 Summary of the answers received

According to the information received, the way in which judges distinguish between scientific and legal questions in environmental disputes reveals three main patterns.

⁷ For example Earth observation data and information products produced by the EU COPERNICUS programme offers open access and free-of-charge data.

⁸ Certain satellites are now able to deliver native 30cm resolution imagery. See: <https://www.digitalglobe.com/products/satellite-imagery>

In countries where expert judges adjudicate together with legally trained judges, this issue is not relevant as both scientific/technical and legal questions are managed by the judicial panel.

In most of the jurisdictions the distinction between technical/scientific and legal questions is made by judges on a case-by-case basis. Many respondents mentioned the difficulty in distinguishing between scientific and legal questions, and that scientific issues must be tackled by experts and legal issues by judges.

In Ukraine the Ministry of Justice has approved a set of recommendations including an indicative list of issues eligible for a particular type of examination. The courts in Ukraine are guided by this list. Beside this indicative list, the law of Ukraine allows for involving a legal expert who both has a scientific degree and is a legal specialist.

It is interesting to note that the Court of Justice of the European Union in actions against legal acts of the EU institutions relies mostly on the findings of these institutions under the doctrine of wide discretion/margin of appreciation.

2.a.2 Analytic remarks

It is fair to say that the distinction between technical/scientific and legal questions in fact-intensive disputes is one of the greatest challenges in environmental adjudication as scientific and legal questions are often indistinguishable. According to the national reports, this issue can only be tackled on a case-by-case basis. The answers show that none of the respondent countries has any guidelines or law on this issue. Interestingly, case law providing guidance on that issue was not mentioned either.

Delineating legal issues from questions of fact is essentially a judgment call left to judges' discretion. As one respondent argues courts may sometime distance themselves from complex scientific questions and limit their role to assess only the legal aspects of the dispute. Problems may also arise, when courts define legal issues too extensively by also deeming certain factual issues as a matter of purely normative judgment. The Czech report mentions a case, where the court appraised the significance of food waste without having regard to the scientific evidence on the gravity of the problem. This approach has been criticized in a dissent.

2.b Are there any types of cases and/or questions where gathering scientific evidence is mandatory under domestic law?

2.b.1 Summary of the answers received

Concerning the extent of mandatory scientific evidence gathering, the national reports show that in most of the countries there are no types of cases and/or questions where gathering scientific evidence is mandatory under domestic law. Only Poland mentions that in some environmental cases (water permits and decisions on the environmental conditions for implementing a project) gathering scientific evidence is necessary under domestic law.

The detailed rules of the member states show insignificant differences. For instance, Finland's Environmental Protection Act requires some plans to be taken into account *ex officio* and water management plans based on national legislation transposing the Water Policy Framework Directive are to be taken into account when assessing the impacts of an activity. Moreover, the Italian national report notices that courts must gather technical data in water and waste management cases.

Some national reports emphasize that whenever scientific knowledge is required to assess facts or where facts are not common knowledge, it is obligatory to appoint an expert or to gather scientific or technical evidence.

2.b.2 Analytic remarks

The answers (except for Poland) are almost identical in claiming that no scientific evidence gathering is mandatory in environmental court disputes. Interestingly, some answers put this down to the fact that in some types of environmental cases evidence gathering is mandatory already during administrative proceedings. This approach again confirms that judicial discretion may fundamentally impact the extent to which factual issues will be investigated in the court proceedings.

2.c To what extent are judges allowed to investigate the scientific dimensions of cases ex officio?

2.c.1 Summary of the answers received

Concerning *ex officio* investigations on scientific issues, the available data show three main

patterns.

In two-thirds of the respondent countries, judges have full competence to investigate *ex officio*. It is worth mentioning that in Sweden, despite the *ex officio* investigation of courts, it is the applicants' obligation to provide the court with sufficient materials. Where any information is missing, the court asks for further materials. In absence of the necessary information, the applicant's claim may be dismissed.

In countries where no *ex officio* investigation exists, the burden of proof lies on the plaintiff or the parties to the case.

Some countries note that *ex officio* investigation is allowed in particular situations. However, the examples mentioned are not related to the scientific dimensions of environmental disputes (competence, procedural or legal issues).

Finally, it is noteworthy that in Austria judges can investigate *ex officio* if the parties have the right to raise the relevant issue.

2.c.2 Analytic remarks

Although the answers did not make such a distinction, it is logical to differentiate between *ex officio* investigation and *ex officio* evidence gathering. The former only means raising a question *ex officio* by the judge and afterwards he or she allocates the burden of proof on that question. Whereas the latter means that as a part of an *ex officio* investigation, the court itself can also gather evidence.

Even in countries where judges cannot investigate *ex officio*, the national reports point out that the judge is entitled to determine the questions to be answered by the experts and in this respect the judge is not bound by the parties' motions (e. g. Croatia, Hungary).

It is interesting to notice that the national report of Finland referred to the principle of prohibiting *reformatio in peius*, by which in some environmental disputes the scientific dimension of a decision is not assessed in its entirety.

Although the questionnaire did not touch upon how the principle of *reformatio in peius* applies in environmental adjudication, the principle may have an impact on the extent to which judges are allowed to investigate scientific issues.

3. Rules of expert appointment

3.a What are the selection criteria of experts in your jurisdiction (e.g. having requisite training, being impartial, independent from the party, being enrolled on government-issued lists, etc.)?

3.a.1 Summary of the answers received

Concerning the selection criteria of experts, there are three countries which adjudicate environmental disputes by involving expert judges. In Sweden, expert judges are appointed by the government (until retirement age) and by the President of the Republic in Finland (with eligibility for another 5 years). The expert members of Swedish courts are appointed by the Judges Proposals Board.

In Norway and Belgium's Constitutional Court and administrative courts, no specific rules apply to experts. However, Belgium's administrative courts use a list of EIA experts and in Norway the law allows for creating a register of court-appointed experts.

The remaining respondent countries prescribe a master's degree and legal or other postgraduate training, and enrolment in government-issued lists (national registers). Some countries require accreditation by the minister in charge of justice or a fixed length of experience (5 to 7 years) and not only the obligatory training but also completion of an examination.

Most of the national reports also emphasize impartiality and independence from the parties among the selection criteria of experts.

3.b Whether and on what basis can a party challenge the appointment of a party-appointed/court-appointed/in-house expert?

3.b.1 Summary of the answers received

The national reports appear to be homogeneous in terms of bias and lack of impartiality as reasons for challenging expert appointment. However, the rules of procedure are different. In some countries the reasons for challenging an expert are the same as for judges. Furthermore, while a party-appointed expert in Germany cannot be challenged, a court-appointed expert can in case of a conflict of interest.

The ways in which claims of bias are considered are different. They may be processed by another judge of the court as in Sweden, and the decision may be subject to appeal, like in Norway. There are countries where the competence of the expert can be contested. In France there is a judge specifically in charge of exercising control over the expert investigations, who is authorized to change the expert and attend expert sessions.

Finally, there are EUFJE members' countries, where experts shall be discharged from the appointment for objective reasons (e.g. illness, mental disease, lack of requisite training and delay in submitting the expert report).

3.b.2 Analytic remarks

When it comes to the selection criteria of experts the only requirement that applies uniformly is having the necessary skills and experience. In addition, there is a wide range of criteria from the lack of specific rules through obligatory training, enrolment in government-issued lists, to professional experience. Not every national report referred to the criterion of being impartial and independent, although the answers given to Question 3/c below show that the appointment of experts can be challenged on the grounds of bias and lack of impartiality in every respondent country. Thus, being impartial and independent is clearly a selection criterion of experts in every jurisdiction.

3.c To what extent and in what ways do judges in your jurisdiction exercise control over the scientific fact-finding process (e.g. by defining precisely the scope of factual controversy needed to be addressed by experts)?

3.c.1 Summary of the answers received

Finland is unique in that it involves expert judges who can independently define the scope of relevant scientific evidence.

The most common form for judges to exercise control over the scientific fact-finding process is to define the scope of appointment. A slightly different approach is adopted by Sweden, where courts define the questions to be answered by the applicant and the applicant will engage an expert. Furthermore, in the UK, experts are appointed and selected by the parties, whereas the scope of expert investigation is settled by the court together with the parties, preparing a list of questions to be answered by the expert. In France, where the need

arises for further clarification after submission of the expert report, judges may interview the expert at a court hearing in the presence of the parties. Also, judges in France may decide on the replacement of appointed experts and are also authorized to attend expert sessions.

Some national reports point out that judges are not bound by the expert's findings but must duly justify their deviation from the expert report.

3.c.2 Analytic remarks

The most common form of exercising control over scientific fact-finding is limited to defining the scope of the appointment. On the one hand, the fact that judges define the questions to be answered by the experts guarantees that a distinction is made between scientific/technical and legal questions. On the other hand, the most challenging part in fact-intensive environmental disputes is to identify the technical/scientific aspects. A recurring concern among respondents is how legally-trained judges can put the right questions to experts (See: Question 6/a)

A few jurisdictions seem to adopt tighter control over expertise, e.g. in France the judge may also attend expert sessions. This arguably ensures that the court gains deeper insights into the scientific aspects. As has been mentioned above, jurisdictions with expert judges exercise such control through these special judges who have a major role in enlightening lawyer judges about the scientific dimensions.

4. Evidentiary issues: standard and burden of proof

4.a What is the applicable standard of proof for environmental cases in administrative, civil and criminal law (e.g. preponderance of the evidence, beyond reasonable doubt, etc.)? Is it set in domestic law, or are judges free to adjust the standard as they deem fit?

4.a.1 Summary of the answers received

The majority of answers posit that the preponderance of evidence standard (also known as 'more likely than not' standard) is used in environmental claims most frequently, except for criminal cases, where the standard is higher and requires proof beyond reasonable doubt. The standard may also be dependent on the interests at stake. Hence in certain countries, in cases where human health is concerned, proof beyond reasonable doubt is required (see: Austria). Respondents indicated that they do not use a standard specific to environmental cases. The

standard of proof in all except two jurisdictions (see: Czech Republic and the UK) is not set in legislation. Hence finding the applicable standard suitable to the circumstances is usually a matter of judicial discretion.

Relying on statistical and therefore uncertain evidence poses challenges for plaintiffs especially in proving causation. Toxic tort situations inevitably involve such evidence as proving a causal link is a requisite to establishing a tort. The respondent from the Czech Republic explicitly mentioned that epidemiological studies are accepted as causal proof in toxic tort cases. Czech courts even used to establish partial liability of a polluter for causing toxic torts corresponding to the likelihood of causation. This entailed that Czech courts could rely on probabilistic scientific evidence to establish the probability of the conduct's causal role in engendering the injury complained of.

French law provides another avenue for establishing causal links based on uncertain evidence. The Civil Code relaxes the standard for proving causal links between damage and the environmental cause. Instead of requiring direct and certain causal link in such situations, judges may presume a causal nexus based on “serious, precise and concordant presumptions”.

4.a.2 Analytic remarks

The answers showed judicial awareness of the difficulties scientific probabilities pose for establishing legal claims. Several respondents highlight that it is impossible to gather scientific evidence attesting ‘absolute certainty’.

National legal systems provide different solutions for accommodating legal doctrine to the uncertainty of scientific evidence. Adjusting the standard of required proof is an important tool in this respect. Lowering the standard of proof fosters finding science-based environmental claims established. In this vein, the significance of the preponderance standard lies in being more responsive to scientific uncertainty, because probabilistic evidence, which expresses likelihoods in statistical terms could meet such a lower standard more easily.

As in the overwhelming majority of jurisdictions, setting the appropriate standard of proof is a matter of judicial choice, judges’ awareness of the peculiarities of scientific knowledge, especially its inevitably uncertain nature, is of paramount importance with respect to environmental adjudication.

4.b What are the rules of allocating the burden of proof in science-intensive cases?

4.b.1 Summary of the answers received

The burden of proof is normally borne by the alleging party, and the majority of jurisdictions does not apply a special rule for deciding environmental claims.

Certain jurisdictions do, however, adopt peculiar rules to account for evidentiary difficulties inherent to environmental cases. Some of them apply the precautionary principle in permitting cases, entailing that the burden of proving the lack of harmful effects lies with the operator and any uncertainties in the scientific data affects the chances of success in securing a permit (e.g. Finland and Sweden). In Spain the proximity of proof principle applies, which places the burden on both parties inasmuch as they are both required to ascertain all the relevant facts. In Estonia, courts must support the weaker party in meeting its burden with respect to existing evidence that he is unable to submit to the court if he indicates where it could be found. In administrative cases, the burden is reversed and lies with the authority whose act is under judicial review (e.g. in Ukraine).

4.b.2 Analytic remarks

Generally, courts of respondent states do not apply special burden of proof requirements in environmental cases. The allocation of the burden of proof has significant consequences in environmental cases, where uncertainties in science render difficult, if not impossible, for those carrying the burden of proof to substantiate any science-backed environmental claims. The reversal of the burden of proof can be a powerful tool to abate the difficulties of gathering scientific evidence of possible environmental harm, yet the majority of jurisdictions does not apply it.

5. Rules of evaluating expert evidence: standard (intensity) of review

5.a How do you choose between two competing or conflicting pieces of expert evidence?

5.a.1 Summary of the answers received

Judges have differing tasks in assessing the scientific merits of the case across jurisdictions. In certain countries judges are only assisted by party-appointed experts, whereas in others, they may also appoint independent experts helping them evaluate conflicting party-submitted scientific evidence. Yet among the jurisdictions, where judges are allowed to have court-appointed experts, several indicate that this rarely happens in practice (e.g. Belgium, environmental administrative courts, and CJEU, in more details see Question 1/a). In

adversarial systems, judges are assisted in the evaluation of party-adduced evidence by cross-examination by the opposing party (see: UK, Cyprus).

In this vein, despite that the free evaluation of evidence principle applies across all jurisdictions, states vary in terms of how courts ought to evaluate conflicting expert evidence and to choose between them. In certain jurisdictions, judges must do it on their own, in others they may use the help of experts as courts can order reassessment of the evidence if it was ambiguous, contradictory or insufficient (see: Estonia). Still others may appoint a third expert to make a review opinion (e.g. Czech Republic, Hungary) or to make a third opinion (e.g. in Bulgaria), or delegate this task to a college of experts (see: criminal courts in Belgium), or may order the provision of an expert opinion from expert institutes (e.g. Slovakia). The answers reveal that expert or technical judges have a significant role in making scientific information understandable for lawyer judges and thereby in enabling the court to make its own choice between competing claims (e.g. Finland, Sweden, Norway). In the practice of the Court of Justice of the European Union, the doctrine of manifest error results in increased weight of the assessments produced by EU institutions.

In certain countries, judges do not follow specific, universally applicable criteria in deciding about the credibility of an expert position and in making their choices between competing scientific evidence, and may choose whichever they find more convincing as long as their decision is justified (see: Italy). In others, certain common standards can be discerned from the case-law. For instance, a given piece of evidence will prevail if its methodology best applies to state-of-the-art science and has best chances to be agreed upon by the scientific community (e.g. in Sweden, UK, France), or whichever has a thoroughly justified authority, or provide a more complete answer and description of relevant circumstances (e.g. Poland, Ukraine), or is more coherent and comprehensible (e.g. Austria). In other jurisdictions, judges ought to determine what is the most probable line of evidence (e.g. France, Finland). Courts may expressly consider normative guidelines, such as the precautionary principle in the weighing and balancing of evidence (e.g. Estonia).

5.a.2 Analytic remarks

States adopt widely divergent solutions in defining the judicial task in assessing the evidence. One important underlying concern is how adequate judicial control can be maintained over the experts involved in the case. Such concerns are equally applicable with respect to party-appointed and court-appointed experts. Party-adduced expert evidence may be biased,

whereas using the courts' own experts may still threaten with unintended delegation of the judicial task if judges accept them to an excessive extent, in a quasi-automatic way.

To exert such judicial control over expertise, courts in respective jurisdictions devised various tests to assess whether a certain piece of scientific evidence is acceptable in the court proceedings. The wide variety of the exact tests and the relevant factors used in such judicial appraisal underlies the significance of judges' inner conviction and discretion in evaluating the scientific aspects of disputes.

5.b Could you review the scientific assessments and justifications made by a competent domestic authority (by conducting a de novo review of the evidence)? Or is your judicial review deferential towards the scientific claims of domestic authorities?

The issue of the standard of proof arises in judicial review of administrative acts. The intensity of judicial review may spread across a theoretical spectrum ranging from total deference (automatic acceptance of agency's findings) to de novo scrutiny (re-evaluation of the evidence and the scientific conclusions of authorities).

5.b.1 Summary of the answers received

In most jurisdictions, the standard of review, i.e. the extent of deference towards administrative bodies is not set in legislation but formed by judicial practice. In many jurisdictions the standard has been announced by higher ranking courts ensuring a uniform approach to scrutiny among different fora (e.g. in Estonia, EU judiciary).

Courts in different States grant differing extent of deference to primary decision-makers. It appears that granting total deference is exceptional (see: Ukraine), and several jurisdictions apply *de novo* review (Sweden, Croatia, Czech Republic, Hungary, Germany, Bulgaria). *De novo* review entails that judges can decide on the credibility of expert opinions, and investigate the scientific validity and factual accuracy of the evidence (see e.g. Czech Republic, Bulgaria, Slovakia). Courts in such jurisdictions must dispel any reasonable doubts regarding the conclusions of domestic authorities and are free to arrive at their own conclusion based on the evidence submitted.

A considerable portion of relevant jurisdictions conduct a scrutiny that lies somewhere in between the above two extremes, and therefore these courts neither refrain from scrutinizing the scientific findings of authorities nor do they substitute their own assessment for the agency's decisions. For instance, checking only whether the agency's conclusions are

manifestly wrong or unfounded or suffer from serious shortcomings (e.g. CJEU, Belgium environmental administrative court) is a slightly more intrusive review than total deference, though appears to be largely deferential. Whereas courts in Finland do not review the scientific evidence systematically, which scrutiny arguably falls short of a *de novo* assessment, but is a more intense review than the manifest error assessment. Courts may also presume the unbiased nature of administrative decisions, which may be rebutted by the plaintiff with scientific evidence (e.g. Finland, Estonia). This necessitates a closer review than total deference or manifest error assessments, yet such a review is more deferential than *de novo* assessment. Norwegian courts may show restraint when scrutinizing the scientific assessments of domestic authorities if they are ill equipped to substitute their own decision for that of the authorities. Further examples for exact standards of review will be addressed in more detail under Question 5/c below.

A relating aspect of the standard of review concerns the bases on which courts can examine and challenge agency conclusions in jurisdictions that allow a certain measure of judicial scrutiny of authorities' scientific findings. In some states, judges may set aside a decision if parties submit scientific evidence that runs counter to the authority's experts (e.g. Estonia, Finland). In other jurisdictions, judges may do so if they find the decision not meeting a certain standard. These standards will be discussed in the next session under Question 5/c.

5.b.2 Analytic remarks

First of all, the intensity of the judicial review seems to be closely tied to the nature of the court's task, i.e. whether they have reformatory competence and are empowered to revise science-based administrative decisions, or they are only allowed to set aside erroneous decisions and reprimand the case for re-examination to the competent authority (cassation powers). *De novo* review of administrative acts is usually applied in States, where courts have reformatory powers.

Second, it appears that the overwhelming majority of jurisdictions employ certain judicial techniques to double-check administrative authorities' scientific decisions. Even more deferential jurisdictions that do not conduct *de novo* assessments (e.g. Belgium, Estonia) usually allow the parties to submit competing evidence against authorities' scientific assessments. Despite the fact that authorities are usually better equipped with scientific expertise to conduct such assessments, courts seek to maintain control over their decision-making to some extent during judicial review.

5.c What is the applicable standard of review to scrutinize the scientific assessments of domestic authorities (e.g. scrutinizing 'manifest errors', or the reasonableness/consistency/coherence of their scientific conclusions, or interrogating the scientific validity and factual correctness of the evidence, or reviewing the procedural aspects of science-based decision-making process at hand)?

5.c.1 Summary of the answers received

The exact legal test with which courts may review authorities' conclusions is not set in legislation, but are developed by courts and therefore it largely depends on the judge's own perception in a given case.

Courts apply a number of different judicial tests as standards of review to scrutinize administrative authorities' scientific findings. Such judicial tests are the following: scrutinizing manifest errors, or whether the authority arrived at unreasonable, illogical or absurd results (e.g. Spain), or irrational and absurd findings (e.g. UK), whether the given scientific claim conforms to applicable guidelines and state of the art science (e.g. Sweden), whether necessary procedural rules have been observed in the decision-making process (e.g. Bulgaria, Sweden, Estonia), whether there were significant shortcomings in the authority's assessment (e.g. Estonia), and sometimes courts investigate the reasonableness, coherency of the scientific assessment (e.g. in Croatia). Those courts that conduct *de novo* review often scrutinize whether the scientific finding conforms to state-of-the-art scientific guidelines (e.g. Sweden) and must dispel any reasonable doubt as to the conclusions of authorities (e.g. Czech Republic).

A nuanced approach to standard of review differentiates between applicable tests depending upon the soundness of scientific knowledge implicated in the case. As a general rule, German courts may conduct a *de novo* assessment, yet if scientific knowledge is limited in the relevant field, the judicial review ought to be confined to assessing whether the authority's decision was plausible. A plausibility review is a less intense standard of reviewing administrative decisions compared to *de novo* review.

5.c.2 Analytic remarks

The nuances of the above tests determine the role of courts in investigating science in a dispute. More intrusive standards of review invite closer engagement with the scientific evidence from judges, more deferential standards allow courts to distance themselves to some extent from the scientific aspects.

The varied extent to which courts ought to interact with science in their assessment suggests that the task of judges may be subtly different across jurisdictions when it comes to

scientific engagement. Some general remarks, however, can be discerned from the answers as to the desirable limits of judges' task in science-intensive disputes. As one respondent stressed, courts ought not to fill gaps in the scientific knowledge. Indeed, it is important for courts not to get entangled in taking sides in the underlying scientific debates by deciding about scientific truths but rather have to decide the legal controversy, which nevertheless necessitates engaging with the scientific evidence involved. With the words of another respondent, judges ought not to be given the impression that they may become scientists as they are only able to assess scientific facts from the position of "a reasonably intelligent laymen". At the same time, several accounts also stressed that judges must be able to exercise certain procedural and methodological control over the expertise involved in the case and to assess the evidence to identify weaknesses. This may necessitate different scientific capacity-building techniques for courts, which will be addressed in Question 6/d below.

To sum up, a fine line therefore has to be drawn between deciding the scientific debate (which courts ought not to do) and the legal dispute (which courts ought to do). The modalities of the latter may differ among jurisdictions dependent upon the institutional structure and composition of the judiciary and underlying substantive law.

The Court of Justice of the European Union enjoys a special status as it acts as a supranational judicial body scrutinizing complex and elaborate science-based regulatory decisions of EU institutions. In this regard, it practices judicial self-restraint and therefore affords a wide margin of discretion to competent institutions.

6. The role of science and technology in the courtroom – an overall assessment

6.a To what extent do you consider the difficulties of scientific fact-finding to be a defining challenge in environmental adjudication compared to other difficulties?

6.a.1 Summary of the answers received

The overwhelming majority of respondents indicate that the presence of scientific claims poses challenges for adjudicating environmental disputes. Some labeled the intrusion of uncertain scientific input into the judicial appraisal a „relevant factor”, the „biggest problem”, “crucial and defining challenge”, others view it entailing dilemmas of „very sensitive” nature, and posing „major” or „significant challenge” as well as being “a decisive element at all stages of an environmental dispute”.

More specifically, the following reasons have been highlighted by respondents among the challenges judges face in science-intensive environmental cases: the incompleteness of data, the difficulty of predicting future changes and the protracted nature of environmental

processes, distinguishing between legal and scientific questions, differentiating between honest errors and expert bias, finding proper experts, facing 'partisan' evidence, or being able to ascertain the scientific facts relevant in the case. A major challenge in certain jurisdictions is that judges are left alone to evaluate the scientific dimensions of cases as they cannot appoint experts.

Others highlighted that judges sometimes do not completely understand the scientific ratio of the case when highly technical questions underlie the litigants' dispute. Judges sometimes may also be unable to navigate among conflicting expert opinions and resolving such contradictions is quite challenging.

Difficulties are also manifest in terms of how to preserve the judicial control over the experts. In this respect, one respondent pointed out that judgments in an environmental case in the end depend on how convincing the expert opinion was and less on the use of law. Another participant stressed the importance of judges not being influenced in their decisions by experts. Furthermore, it may be difficult for judges to evaluate expert evidence without making scientific assessments themselves. A related challenge posed for courts is to comprehend the scientific evidence and how it affects the legality of the act under revision, especially in respect of whether judges regard the science at hand 'certain' or 'uncertain'.

On a practical level, judges experience challenges in gathering low-cost scientific expertise that is independent from party-submitted evidence. In certain countries, judges are reluctant to appoint experts for keeping the costs low and not to delay the trial, and try to evaluate the scientific aspects by themselves. Also, in certain jurisdictions the expensive nature of producing relevant scientific evidence prevents small environmental claims from reaching the court as respective claimants usually lack sufficient funding. Cost barriers may also exclude very serious environmental problems from courts' purview as no claimant has the financial means to introduce them to the court. In this vein, one respondent emphasized that scientific fact-finding poses challenges more for litigants than for courts.

Certain judges see difficulties flowing from the complexity of environmental regulation and the normative landscape of environmental law, which therefore only indirectly relate to the presence of science. Legal approach to science-based claims may also often determine judges' possibilities to grant compensation to victims or to take action against certain harmful activities. For instance, a change in tort law rules has entailed that partial causation is no longer sufficient to substantiate science-based environmental damage claims in the Czech Republic.

Notwithstanding the above, a few respondents have indicated that science is not a defining challenge for their adjudicatory work. It appears that such responses arrived mainly from legal branches as well as higher ranking courts that by their very nature or mandate do not confront with scientific assessments.

Certain respondents also noted that the presence of science poses difficulties also for the litigants themselves, who are often unable to fully understand the scientific issues underlying their legal dispute (see: Portugal).

6.a.2 Analytic remarks

What can be discerned from the answers is that science poses a virtually uniform challenge for environmental adjudication in all jurisdictions. The challenges mentioned may be grouped into four main categories: 1) those flowing from the lack of in-depth scientific knowledge and expertise of the bench; 2) those that can be traced back to the difficulties of maintaining control over scientific experts and retaining the judicial function over scientific cases; and 3) the problem of where to draw the line between exercising the requisite judicial task of providing normative evaluation of science and deciding the scientific controversy itself. A corresponding challenge lies in the division of competences between experts and judges and in defining what judges expect from experts. 4) There are difficulties in fact-finding on the practical level due to cost-related barriers.

6.b Do you consider the domestic rules of expert involvement to be appropriate to secure judicial control/monopoly over deciding environmental disputes? Or do you think judges should exercise greater control over the scientific fact-finding process?

6.b.1 Summary of the answers received

The majority of country reports indicated that judges consider their jurisdictions' own rules to be appropriate in terms of securing the judicial control over dispute resolution. Yet, some suggestions as to desirable improvements have also been mentioned. One respondent specifically pointed to developing admissibility criteria for expert evidence as a form of exercising greater control over party-adduced evidence, similarly to the Daubert standard that is prescribed by the U.S. Federal Rules of Evidence requiring peer-review as an admissibility criterion. A few other respondents also indicated that certain changes were beneficial in improving access to independent expertise and to allow for low-cost evidentiary proceedings, which will be detailed under Questions 6/a and 6/d.

The CJEU report suggests that the EU judiciary could verify more strictly whether all the relevant scientific knowledge was taken into account without encroaching upon the powers of the competent authority.

Some respondents also mentioned that judges must clearly define what they expect from expert reports, and scientists acting as experts must confine their opinions to the factual issues at hand and shall refrain from making normative evaluations.

6.b.2 Analytic remarks

The majority of respondents deem current legal rules and judicial practice appropriate. Yet, among the challenges and the possible room for improvement, problems with resolving contradicting expert advice as well as scrutinizing the work of experts were frequently mentioned (for a more detailed analysis on these aspects see: Questions 6/a and 6/d).

6.c Do you consider the limits of curial supervision of fact-intensive cases appropriate for providing effective judicial protection and promoting uniform application of EU law?

6.c.1 Summary of the answers received

The majority of respondents saw no formal obstacle in their scientific engagement to the uniform application of EU law. Only three reports indicated relating concerns (see reports from Bulgaria, Estonia and the CJEU). One submitted that such concerns may occasionally arise due to low quality scientific fact-finding and the reluctance of courts to intervene in such complex issues. Another respondent assigned a key role in ensuring uniform application of EU law to the accuracy of underlying scientific data on the one hand, and to the unrestricted competence of courts in their judicial review, on the other hand (see: Finland). Account of the EU judiciary emphasizes that the principle of procedural autonomy allows Member States to provide for stricter judicial control over the fact-finding process and this may result in differences in the application of EU law.

6.c.2 Analytic remarks

Although evidentiary rules may appear to be mere technicalities of the adjudicatory process, they in fact fundamentally shape adjudication by *inter alia* marking what types of evidence must be produced by the parties, what questions are open to judicial evaluation as opposed to factual assessment bestowed on experts, as well as the extent to which shortcomings in the scientific assessment of competent authorities can be challenged before a court of law. These

altogether influence plaintiffs' chances for success in bringing environmental claims to courts and, thus, impact the efficiency of enforcing environmental laws. Viewing from this perspective, the procedural rules of scientific fact-finding, and the extent to which they allow judges to scrutinize expert evidence, impact the extent to which legal rules ensure environmental protection.

6.d Do you think it is necessary and if so, in what ways, to improve the scientific engagement of judges (E.g. would you improve the procedural rules of scientific fact-finding, enhance the scientific competence of the judges through training and capacity building, or develop new legal tests to review contradicting scientific evidence, etc.)?

6.d.1 Summary of the answers received

A virtually universal support for scientific capacity building for judges and/or staff can be discerned from the answers. Respondents generally favored increasing judges' knowledge in environmental sciences to enable them to ask the good question from experts as well as to better evaluate the gravity of human impact on natural environment, especially in criminal law.

The answers differed as to their preferred capacity building technique. Some mentioned organizing training e.g. a basic course in environmental sciences for judges and or staff (8 respondents), others deemed beneficial to appoint expert judges and in-house experts. Only one answer indicated that scientific training for judges could only provide a piecemeal solution due to the varied nature of scientific problems that may arise in an environmental case.⁹ Some respondents would also welcome developing new judicial tests in their jurisdictions to foster a more active engagement with science. One report suggested pooling the recognized state-of-the-art scientific methodologies on a European level, especially in complex and evolving areas, to enable judges reviewing such evidence. Another report posited that no improvements were necessary as experts could adequately answer applicable scientific questions.

Another common thread in the country reports concerns setting requirements for becoming an environmental judge. Gaining expertise in relevant industry or having long experience in the environmental field were mentioned in this respect, as well as four respondents explicitly mentioning the need for appointing judges, who are specialists in this

⁹ The respondent also pointed out that in their institutional structures, judges have unfettered access to independent scientific advice, which makes judicial training less important.

field, equipped with adequate awareness of environmental issues and in-depth knowledge in environmental law.

The Court of Justice of the European Union has a special status in this respect, as the current institutional structure makes it very difficult to develop a closer engagement with the evidence. Its report reveals that appointing an expert is of extremely limited practical relevance as EU institutions, given their wide discretion/margin of appreciation, may make the relevant scientific findings and EU courts mostly rely on such findings.

6.d.2 Analytic remarks

The answers received suggest that the presence of scientific evidence and science-based arguments is among the defining challenges of environmental disputes. The majority of respondent judges would approve capacity-building techniques though differed in terms of the exact technique. Indeed, there is no one size fits all solution in this respect either, as each jurisdiction has its special needs and possibilities in their existing institutional structures. The overwhelming support among respondents for enhancing judges' scientific competence also underlines the benefits of having specialized environmental courts equipped with technical or expert judges. Even though the possibility of such judicial institutional reforms is too far-reaching in many jurisdictions, exploring other forms of scientific capacity-building techniques may be warranted even in the short-term.

III. Concluding remarks

This questionnaire ultimately sought to map the ways in which EUFJE members' courts are responsive to science in environmental adjudication. The judicial tools with which courts evaluate expert evidence and scrutinize the scientific conclusions of administrative authorities may impact plaintiffs' prospects for success with bringing environmental claims before a court of law, and therefore a key aspect of environmental adjudication. The responses of respondent judges suggest that science is seen by the overwhelming majority as a significant challenge for deciding environmental disputes. There appears to be an overwhelming support among environmental judges for different forms of scientific capacity building for judges and/or staff to enable them to better engage with the scientific background of cases.

The presence of science triggers divergent judicial reactions across jurisdictions. States differ to a considerable extent in their procedural rules of scientific engagement. The mandate and composition of the court is a major factor influencing the extent to which science is investigated by judges. Yet, even among courts with comparable characteristics one sees subtle differences in the methods and the extent of engaging with scientific evidence. Several of the most important evidentiary rules, i.e. the exact standard of review or the standard of proof are normally not set in legislation leaving a significant role to judges to adjust these rules to the peculiarities of a science-intensive assessment as they deem fit. Similarly, judges have considerable room for maneuver in distinguishing between legal and scientific issues, calling for expert evidence, and in conducting evidentiary assessments under the free evaluation of the evidence principle. Similarly, appraising whether a certain scientific result is seen ‘certain’ or ‘uncertain’ is also a matter of normative judgment for judges to make. All these place the role of judicial discretion in the limelight.

Although in every jurisdiction judges bear the burden of investigation, they ought to perform this task with or without the help of experts dependent upon the relevant state’s legal system. In certain countries expert advice cannot be gathered *ex officio* by judges, hence they ought to rely on only party-adduced evidence. Whereas in other countries, court-appointed experts are allowed but the answers showed that such experts are appointed only very rarely. This again signals that judges’ choices fundamentally shape the extent to which science will be considered in environmental adjudication.

The responses reveal that the majority of relevant courts do in fact rely on a number of scientific references other than expert evidence, which enables judges to gather scientific information independent from the parties at low cost and in manner fitting in the timeframe of court proceedings.

Answers highlighted the importance of ensuring low-cost scientific evidentiary procedures. In certain cases, cost-efficiency may be improved by relying on GEOINT data. This survey suggests that awareness of and access to geospatial information can be improved in certain jurisdictions. Those GEOINT technologies that can offer timely remote sensing data with adequate properties¹⁰ can be an extremely useful tool for courts to track protracted environmental processes and to detect change of environmental conditions over time. It is to be noted that both high and low resolution GEOINT data can be a valuable source of evidence

¹⁰ Relevant properties include spatial resolution, location accuracy, radiometric resolution (e.g. thermal infra-red, optical channels, lidar or radar frequencies), and temporal resolution (e.g. the capacity to revisit, monitor the areas of interest with a given frequency in time).

in court proceedings. Raising awareness of the judicial use of such technologies and equipping courts with the necessary expertise to analyze GEOINT information appears to be useful for enforcing EU and domestic environmental laws.

Some judges favour greater expert involvement in deciding environmental disputes, but regularly emphasize the importance of preserving control over expertise, and thereby being able to resolve contradicting expert evidence and to choose between competing scientific claims. Other respondents are contented with the current level of expert involvement, but emphasize the importance that judges ought not to substitute their scientific views for the expert input and to conduct scientific assessments themselves. Also, jurisdictions where judges rely primarily on party-adduced evidence likely face dangers of biased evidence tainted with advocacy, which necessitates closer engagement with the evidence.

The answers suggest that judicial scientific fact-finding is also dependent on the quality of expert opinions. It is important to clearly define for experts what judges expect from them, especially the need for confining expert reports to factual assessment and not to make legal evaluation. Trainings for experts may also be a welcome solution in certain jurisdictions to improve the informational quality of expert inputs.

In terms of judicial scrutiny, jurisdictions show a varied picture as some of them conduct a deferential review of administrative acts, while others conduct more intrusive assessments, including *de novo* review that authorizes the court to draw its own conclusions based on the scientific evidence. The approaches seem to be closely tied to the power of the court, *i.e.* whether they are allowed under national laws to modify the authorities' decisions or only to remand the case for re-examination. It is nevertheless important in both approaches to retain judicial control over scientific expertise to prevent inadvertent delegation of the judicial task to non-elected experts. This could be achieved for instance by allowing the parties to submit contradicting scientific evidence even when the courts refrain from conducting *de novo* assessment, and when courts conduct intrusive reviews, by gathering scientific information independently from the parties.

The differing extent of relying on and scrutinizing expert evidence may impede uniform application of EU law. While this may be a corollary of procedural autonomy granted to EU Member States, such phenomenon still suggests that claimants, who rely on scientific evidence face obstacles to differing extent in different jurisdictions to prove their claims. This also reinforces that science plays a key role in shaping environmental adjudication.

To sum up, this survey suggests that science presents a cross-cutting challenge for relevant jurisdictions for deciding environmental disputes before courts with various mandates. Jurisdictions react to these challenges in varied ways, providing for different solutions to interpret scientific evidence by courts of law. A general pattern, however, can be discerned, inasmuch as several techniques of judicial engagement with science are usually not set in legislation but shaped by judicial discretion. In this vein, the efficiency of legal protection of the environment often depends on judges and their willingness and ability to interact with scientific evidence involved. Awareness raising and best practice sharing with respect to effective scientific engagement may therefore facilitate the work of judges in various jurisdictions.

Notwithstanding the above, the role of courts in deciding science-intensive environmental disputes remains highly complex and challenging. With the words of some of the respondents, judges will need to "do with" the scientific elements, even if they are insufficient, uncertain or contradictory, and decide the question in law by making normative judgments about the science involved from a position of a "reasonably intelligent laymen".

IV. Analysis of the case studies

How would you delineate applicable questions of law and science in the following cases, what types of expert evidence would be gathered, and how would they be evaluated?

Choose one of the following cases, according to your field of expertise:

a. The case brought before you is about a proposed artificial groundwater production plant that might impact a nearby Natura 2000 -site, whose conservation values are contingent on groundwater levels, thus being of concern when authorizing artificial groundwater undertaking outside the protected area. The Natura 2000 site has e.g. the region's largest sinkhole that has wetland at the bottom of it, and is thus connected with the groundwater formations. It also has coniferous forests on glaciofluvial eskers, and the site is generally described as having calcareous fens and springfens (all listed as Natura 2000 habitats). Up until now the plant has gained the required approvals. The groundwater model used in the proposed undertaking's plans modeled the water currents in the ground. As typical of such models, it was more uncertain in the rims of the area than in its centre. Coincidentally, these

rims of the area also included especially sensitive and small wetland formation. The administrative authority, in its statement of reasons, discussed the role of the precautionary principle and scientific uncertainty, noting that neither formed as such a reason to not allow the venture. They only obliged the administration to establish such permit conditions that they adequately curbed the harmful impact.

However, an environmental NGO brings a claim against the permit arguing that the permit should not have been granted at all. They claim that since the scientific assessments presented before the administrative authority did not remove all justified scientific uncertainty on the undertaking's consequences, and since there are thus relevant risks of detrimental impact to the Natura 2000 –site, the plan should not be allowed to proceed.

The replies to the case study a. are arranged here in a descending order: from the broadest review and widest access to scientific knowledge to the narrowest. The arrangement is far from perfect since the replies varied largely in length and detail. We needed to leave out some replies for we were left uncertain of the precise content.

The replies are divided in two categories: Section a.1 holds the jurisdictions where the judges seem to point towards a substantial assessment of the technical aspects, whereas Section a.2 includes countries where the review seems to be more limited.

Some concluding remarks at the beginning: it is interesting how the role of the precautionary principle varies in the replies. Some EUFJE members, like from Sweden and Germany, write that if scientific uncertainty cannot be removed, the permit will be overturned (i.e. not given). According to other member judges from e.g. Czech Republic and Finland, in case of persistent scientific uncertainty the case becomes a question of the precautionary principle.

The differences of opinion prove why the review of the factual side is elementary: how facts are understood or reviewed in the courts impacts directly on how the courts interpret legal norms and principles.

a.1 Substantial assessment in the Court

a.1.1 Finland

As correctly suggested by the Finnish judge answering the survey, the case had a real-life example in Finnish Supreme Administrative Court case law. In Finland there was an in-depth substantial analysis in the court. The court chamber consisted of two expert judges, one natural scientist, an other technical expert on hydrology. The court chose between competing pieces of evidence, and conducted on-site inspection and oral hearing during the process.

Expert judges were found essential in understanding what was relevant in the case— still, all the judges individually assessed the relevance of the investigation and the role of the precautionary principle.

a.1.2 Sweden

The NGO's claims would lead to the court assessing them. If they were found relevant, additional questions would be directed to the applicant, and perhaps also further scientific investigations would take place. If uncertainty could not be removed, the permit would not be given.

a.1.3 Germany

In Germany there would be active examination by the court. If matters were unclear after the authority, the court would investigate *ex officio* and have the possibility to engage an independent expert. If the NGO or the defendant submit private reports to this effect, the court will first examine whether they are sufficient for a decision on the claim. If this is not the case, the court will seek an expert opinion on the issues raised, on the basis of which - together with the opinions already available - a decision should be possible.

The NGO and defendant could provide expert reports and the court would decide if they needed further expert opinions. If the scientific question remains unresolved, the court would overturn the permit.

a.1.4 Austria

In Austria there is substantial evaluation by the court and request of independent external expert, if necessary. The court would check if expertise authority used was complete and understandable; whether there are any weaknesses.

If there would be need of minor clarifications, the court would turn to the same expert as the authority did. If there were major mistakes or ambiguities, they would call a new expert. In Austria there are oral hearings where expert statements are challenged and fully discussed. The expert is present during these hearings.

a.1.5 Hungary

In Hungary there is active investigation with old or new experts. The court relies on parties to refute the original conclusions on scientific matters.

The court assesses expertise used in administrative proceedings. If this is incomplete, the court asks the expert to complete. If it was ambiguous or contradictory, the court appoints forensic experts—in this pending case one in hydrology and one in conservation. (Having two experts was also the case in the original real-life case in Finland.)

In reality, if parties can refute the expert's conclusions, then the Court takes up the question.

a.1.6 Czech Republic

In the Czech Republic, substantial examination in the court takes place. In case of disputed uncertainties of scientific matters, the court can appoint experts for an opinion and the NGO can prove the authority's stances wrong.

If scientific uncertainty persists, it becomes a question of legal decision-making. In this case, since there is scientific uncertainty, the court would likely first consider whether such argument is valid *prima facie*, even without the involvement of experts. If that would not be the case, the NGO could present evidence to raise considerable points against authority's conclusions. Since the uncertainty is disputed, the court can appoint an expert for an opinion.

If the authority's decision is illegal, the court quashes the permit. If the NGO fails in providing evidence or the appointed expert seconds the authority's opinion, the matter becomes a question of precautionary principle.

a.2 Reviewing only lawfulness

a.2.1 Estonia

In Estonia the court rarely relies on other expertise than what parties offer—they can offer expert opinions.

The court could also appoint experts but they rarely do so. In any case, expert opinions hold no predetermined evidentiary strength.

a.2.2 Ukraine

In Ukraine, expert evidence from earlier stage is assessed in the court ‘along with other evidence in the case’.

We understood this to mean evaluation of the reasonableness of authority’s actions.

a.2.3 Cyprus

The Cyprus courts check if there was non-performance of due diligence. The courts do not resort to independent expert evidence, and applicants need a leave to present evidence on the authority missing some crucial aspects.

For the court to intervene in the matter there must have been a non-performance of due diligence, in other words, the authority failed to examine all aspects of the project.

To our reading the Cyprus courts employ what we call the reasonableness threshold. If the case is that the applicant needs to prove the lack of due diligence, the threshold for review is very high.

a.2.4 Belgium

On the basis of the Nature Decree, the permit can only be granted if there is certainty that the project cannot cause significant damage to the Special Area of Conservation.

If the NGO can demonstrate that the EIA project / appropriate assessment shows that there is no such certainty, the permit will be annulled. In this case there is no need for the appointment of an "expert", because the appropriate assessment, prepared by an expert, is sufficient (and is already part of the administrative file that is delivered to the court).

If, however, the appropriate assessment shows that there will be "no significant damage" to the Special Area of Conservation and the Nature and Forests Agency agrees with that conclusion (favorable opinion of the Nature and Forests Agency), the NGO will have to demonstrate that the appropriate assessment (and the opinion) is unlawful (e.g. based on incorrect data, incomplete, etc.). In that case, the NGO can, for example, try to prove this with a report from its own expert or a reference to other expert reports. If there is "reasonable doubt" that the appropriate assessment on which the government has relied, is unlawful, the permit will be annulled and a new appropriate assessment must be made (and a new opinion of the Nature and Forests Agency must be obtained).

In Belgium, it appears that only incorrect or incomplete authority's decisions can be reviewed. The courts seem to generally rely on documentary evidence only. The Belgium administrative environmental courts seem to rely on the expertise provided by either the authority or the NGO.

a.2.5 Poland

In Poland '[a] particular role is played in this evaluation by the precautionary principle and scientific uncertainty'

Drawing from the earlier work (by Magdalena Bar in the EEELR 2018 Special Issue) we assume the judge was referring to the authority's expert, rendering the scope of review and use of expertise narrow.

a.2.6 CJEU

The CJEU concluded its analysis that the decision appears to infringe Article 6(3) of the Habitats Directive. (In the original real-life case in Finland the decision wasn't annulled but the project area was curbed down to leave out the areas where scientific models were most uncertain.)

a.2.7 UK

In the UK, the legal questions ‘might also include the adequacy of the reasons’ provided by the administrative authority to substantiate their conclusion that the permit should be granted.

b. The case brought before you is a case of illegal trade in birds protected under the EU CITES regulation Annex A (e.g. Red kite, Egyptian Vulture). Trade activities with respect to these birds are prohibited. There is an exception when one can prove that a specimen has been bred and born in captivity. These birds can obtain a CITES-passport, which makes them marketable. Through forgery of rings and breeder's declarations, the defendants obtained CITES-certificates for "captive-born and bred species", which allowed them to commercialise the birds in spite of the general prohibition to trade EU CITES Regulation Annex A species. A bird protection NGO becomes a party to the criminal proceedings and claims moral damages because of the loss of the birds. Would this be evaluated by an expert? If not, how would the court estimate the amount of the compensation?

There were fewer replies to case study b, and most were quite short. The ones we received are copied below.

b.1 Belgium

In Belgium the case is taken to a criminal court. There, if the NGO’s evidence is sufficient to estimate compensation, no extra expert is appointed. If not, an extra expert could be called at NGO’s request. It is however only rarely done.

b.2 Bulgaria

In Bulgaria, the matter of proof would be that these birds were born and bred in captivity, and technical expertise should be assigned to prove counterfeiting of certificates.

If the NGO claims property damages, the court appoints an economic expert to establish the amount of the claimed property indemnity.

In the case of a claim for non-pecuniary damage, the court will determine the amount in fairness.

b.3 Czech Republic

In the Czech Republic, the NGO cannot be a party in criminal proceedings or claim damages for the loss of birds.

In questions of environmental liability, the State could claim damage - but in practice this never happens.

When punishing the perpetrator in administrative proceedings, a financial sanction can be imposed. If this is the case, the courts merely review its proportionality. In lack of domestic advice, the courts often seek guidance in Slovak legislation with determined values (prices).

b.4 France

In France, if the NGO claims only non-pecuniary damage, there is no need for expertise. If the NGO invokes ecological damage, expertise might be needed, or advice from independent bodies specialized on wildlife matter (in addition to the advice that parties produce).

b.5 Italy

In Italy, an expert could be needed to specify to the judge the approximate worth of a single bird. However, the judge would still assess the final amount on an equitable basis.

b.6 Norway

In Norway, damages are fixed and go to the government. For assessing the value of environmental aspects, an expert can be appointed (however, this does not extend to the monetary value). In our understanding the monetary value is then decided by the court, with the expert's aid.

b.7 Spain

In Spain, the forgery of rings is a specific crime, because the rings are considered as an official document. The case would be of fraud and environmental crime.