

# Role of Scientific Evidence in the Adjudication of Dispute for Restoration of Burned Forest and Land

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**Abstract.** One of the objectives of the adjudication of forest and land fire dispute is to restore the burned forests and land. However, evidencing aspect of forest and land fire cases in the judicial settlement is often challenging and the scientific evidence is sought. This normative legal research analyses court verdicts in a forest and land fire case qualitatively. It aims to describes the role of scientific evidence to the proof process in the adjudication that lead to the court verdict for environmental recovery of burned forests and land. Scientific evidence in the form of scientific studies and expert opinion admitted by the court has a role in proving land and forest fire occurrence, environmental damage and loss, and the causality element of the case.

## 1 Introduction

Forest and land fires in Indonesia have attracted global attention since the great fires in 1982/83 and 1997/1998. Forest and land fires occurred again in 2007, 2012 and 2015, causing cross-border haze pollution in the south east Asia region and becoming a concern of the global community [1]. Land clearing by burning is already prohibited by law [2]. Law enforcement through administrative, criminal, and civil law enforcement through the court and outside the court had been carried out by the government to increase compliance with the law. In the period of 2015 to 2018, there were 12 cases of civil forest and land fires lawsuits which has been submitted to the court by the Ministry of Environment and Forestry [1].

One of the objectives of the process to settle forest and land fire dispute judicially is to restore the burned forests and land. However, evidencing aspect of forest and land fire cases in the adjudication is often difficult and the scientific evidence is sought. Support of scientific evidence in the law enforcement of forest and land fires has been conducted since 2000 [3].

The aim of this paper is to describe the role of scientific evidence in the adjudication of forest and land fires dispute in order to achieve the objective of burned forests and land restoration.

### 1.1 Judicial Process and Scientific Evidence

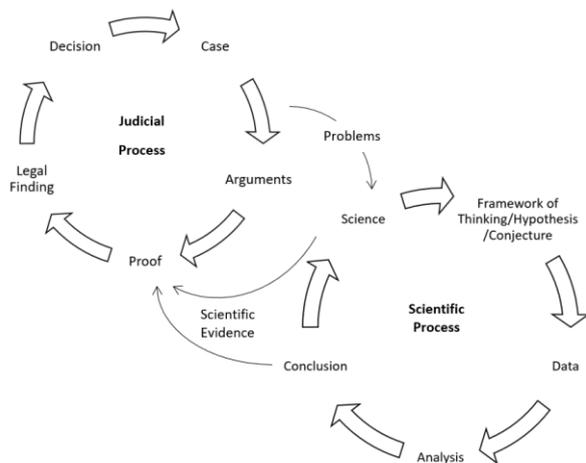
The marry of judicial theory [4,5] and theories in the philosophy of science [6,7] allows for the development of a framework that shows the relationship between law and science in the judicial process and in view of how science works better in helping the achievement of the objectives and functions of law [8]. Science not only interact with the judicial process but also their similarities and differences could be compared [9].

The use of scientific evidence in the judicial process links the concept of judiciary with the concept of science. This connection can be illustrated in the following Figure 1. The figure illustrates the relationship between the judicial process and the scientific process and the transmission of scientific evidence to the judicial process.

Law and science relate with the problems. The law functions not only to protect human interests but also to protect the environment [10]. Differences in interests among human and between human and their nature lead to the conflicts of interest resulting in disputes. For human and nature interests to be protected, laws must be implemented among other through the judiciary. The judiciary as the implementation of the law against concrete events in the case of a dispute or claim for rights carried out by an independent body by giving a decision aimed at preventing the occurrence of vigilante acts [5]. While science as human knowledge obtained by

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scientific methods try find answers to the problems with systematic steps in order to obtain reliable knowledge [6].



**Figure 1.** Overview of the relationship between the judicial process and the scientific process in the judicial utilization of scientific evidence in civil cases (researcher’s own analysis)

In court, the litigants submit their arguments regarding a disputed concrete event to get the fairest decision from the judge. The judge is a decision maker for a dispute filed with him. For him, the litigant’s argument is a hypothesis. Before arriving at its decision, the judge need to examine the arguments of the parties to determine the subject matter. The judge must also determine or do the constellation whether or not an event that become the subject matter of the case is actually happened or vice versa [4].

In science, a combination of rational and empirical approaches used to obtain reliable knowledge [6,7]. A rational approach forms a coherent and logical framework of thought. A statement is logical if the statement is coherent or consistent with previous knowledge that is considered true. With the framework of thought, the scientist predicts the relationship between certain logical factors as a conjecture which called a hypothesis. To test the hypothesis, the scientists gathering empirical facts. A statement contains empirical truth if the statement corresponds to or relates to the facts.

In the evidentiary process in the court, the parties submit evidences to convince the judges of the truth of their arguments. Proof aims to provide a reasonable certainty to the judge that what is stated in the argument is in line with the truth. In the proofing process, the judge examines the evidence to obtain certainty about the event or the rights of the parties being disputed. The judge's confidence in the truth of the arguments of the parties in the dispute is based on the evidence. The evidence could be written evidences, witnesses, presumptions, confessions, oaths, expert testimony, local examination or the judge's own knowledge [11,12]. Other evidence such as scientific evidence, photographs and data stored electronically, includes hotspot maps and its

interpretations, e-mail, satellite photos and its interpretations could also be used in civil environmental cases [13]. In an open system, all forms of evidence which can be used as evidence could be submitted to the court. This could give more flexibility to the judges and the parties in proving the case and attaining legal certainty and justice. The open system could accommodate developments of evidentiary means in the community in the long run [12,14].

Scientific evidence is generally regarded as something that tends to refute or confirm a hypothesis [15]. In the legal context, scientific evidence is evidence presented in court that was produced from scientific tests or studies [16]. Scientific evidence could be fact or opinion evidence that purports to draw on specialized knowledge of science or to rely on scientific principles for its evidentiary value [17]. In this article, scientific evidence could be fact or opinion evidence that provides specific knowledge regarding the occurrence of the event or right obtained by scientific method which used as evidence in the judicial process. Scientific evidence here serves to help the court to understand other evidence or determine the facts of a legal problem disputed by the parties.

Scientific proof of the occurrence of forest and land fires is using scientific data and facts, scientific methods, based on the results of laboratory analysis and carried out by competent experts. The final result produced by scientific proof is independent and objective report which is purely based on what happens at the burning location and not contaminated at all by other influences or certain interests [3].

In science, the empirical data are analyzed by certain methods to draw conclusions. If the hypothesis stated earlier is proven, then the hypothesis becomes scientific knowledge. Difference to the legal process, evaluation of professional opinions by fellow experts through the scientific process is slow and the final decision may not be reached for years as other scientists try to replicate the work [9]. In view of scientific knowledge aid for decision making, the concept of serviceable truth sees scientific knowledge as knowledge that fulfils scientific acceptance tests and supports reasonable decision making, without sacrificing the interests of those at risk on the altar of impossible scientific certainty [8].

In legal context, an evidence must be relevant to the case being examined, must be acceptable (admissible) and evidence obtained illegally is not recognized. The weight of relevant and acceptable evidence must be able to be evaluated by the judge [18]. Law which regulates whether or not certain instrument of evidence can be accepted or admissibility by the court and the weight of the evidence is called material evidentiary law. While the formal evidentiary law regulates how to held the proof [4].

Proof in legal proceedings will never reach absolute truth but will only reach relative truth. In the judicial process, proof might be not logically exact as in science but is

social in nature [19]. Social truth means that enough facts contain truth that is accepted by common sense. Truth of the facts stated in harmony with the truth according to public awareness [20]. In civil proceedings, the truth that the judge must seek is formal truth in the sense that the judge must not exceed the case boundaries put forward by the parties in litigation. In searching for the formal truth, a judge in civil cases is sufficient to prove with preponderance of evidence. This is different from a criminal case in which the judge must find the material truth of the event beyond reasonable doubt [4]. The modern evidentiary system in civil cases has left the passive nature of the judge in which in conducting the examination the judge leads to the search for material truth or actual truth, besides the formal truth in it [21].

After the judge concludes the event, the judge then finds the right law for the event by the process of legal discovery (*rechtsvinding*). After the law is found, the judge then applies it to the constellated event and qualifies the event as a legal event. The judge makes a constitution by applying the law to an act. The judge makes logical reasoning by applying syllogism and also reflecting his spirit to uphold justice. An ideal judge's decision contains the value of justice, legal certainty and utility [4,5,22]. If there is a conflict between justice and legal certainty, the judge must prioritize justice and pay attention to the interests of the parties with problem-oriented thinking. To produce a fair decision, it does not only require the intellectual intelligence but also an emotional intelligence of the judge [5]. The judicial process allows for the correction of judges' decisions with legal action in the form of appeals, cassations and judicial reviews. But these legal actions have their limits because every case must have an end or *litis finiri oportet* [23].

Science in modern times is based on continuous human observation and experience, systematic continuous data collection, data analysis in various ways including direct, comparison or mathematical model, the preparation of models or theories as well as the preparation of predictions with these models, and experiments to test the predictions. Modern science has a correction system that allows the gradual elimination of error to reach the truth [24]. Science develops openly, dynamically, democratically and upholds the truth. Science is not always associated with certain scientists or professions. Science activities can actually be done by people in their daily lives as long as they meet scientific principles [6].

### 1.2 Method

This study is a normative legal research which qualitatively analyses the court verdicts and relevant regulations as primary legal material, legal books and journals as secondary legal materials and legal dictionaries as tertiary legal materials [25]. The study is using case study approach which analyses the role of scientific evidence in the case of *Ministry of*

*Environment and Forestry (the plaintiff) versus PT. National Sago Prima (the defendant)* [26–28].

## 2 Result and Discussion

In this case, the district court applies a system of liability without fault (*strict liability*) on the grounds that the actions, business and or activities of the defendant pose a serious threat to the environment [2] or causes a large and significant impact on the environment [29]. According to the panel of judges, the impact caused by forest and or land fires can cause losses in all sectors, both ecological, economic, social and cultural losses and not only in the country but also its impact to the neighbouring countries [28]. Based on the strict liability system, the act of the defendant, the damage and loss of the plaintiff and the causality must be proof. The type of evidences presented by the parties to and used by the court in connection to the elements of liability are shown in the following Table 1.

**Table 1.** Type of evidences presented by the parties to and used by the court and its connection to the elements of liability (researcher's own analysis)

Evidences		Elements
SE	Expert study, expert opinion and others include satellite imagery.	Land or forest fire occurrence in the defendant plantation area
OE	Documents include photographs, witnesses, confession and others.	
SE	Expert study (include laboratory test) and expert opinion	Environmental damage
OE	Documents, include photographs, presumption and others	
SE	Expert study, expert opinion	Environmental loss
OE	Documents and others	
SE	Expert study, expert opinion and others include satellite imagery.	Causality
OE	Documents include photographs, witnesses, confession, presumption, and others	

*SE: Scientific Evidences, OE: Other Evidences*

As shown in Table 1 above, scientific evidence in the form of expert study and expert opinion has a role in proving the elements of land or forest fire occurrence in the defendant plantation area, environmental damage and loss and causality elements in the case. The role of scientific evidence in evidentiary aspect of adjudication which connected to the liability system being applied are elaborated further in the next part.

## 2.1 Land or Forest Fire Occurrence

In the court, one of the plaintiff's expert explains his study about the fire by observing the hotspot data from satellite imagery, which was then compared to the map and followed by a ground check [28]. The other plaintiff expert explains that one of the tools used in scientific evidence to find out the indication of fire is an indication of a hotspot. A hotspot is an increase in surface temperature between 37°C - 42°C and not necessarily a fire. To ensure the truth about the fire in the hotspot data area, the expert conduct field verification. The field verification was assisted with maps of the defendant's work area and from the hotspot data information that was requested by experts and could directly obtained from National Aeronautics and Space Administration (NASA). From those data the experts plotted how the hotspots performance in the fire's incident was occurred in the defendant's area. Based on these, the expert can ensure the incident of fire on the defendant's land [28].

The district court concludes that based on the defendant's confession and evidence, the statements of all witnesses, both submitted by the plaintiff and the defendant, as well as the statements of the experts, all explained that in the defendant's land there had been a fire [28].

In this case there is a difference in the calculation of the burnt land area. According to the plaintiff's claim the total area is 3,000 Ha supported by the calculation of two experts while according to the defendant's the burnt area is only 1,996 Ha. Responding to this difference, the judge is of the opinion that the dispute is not about land ownership which requires a definite measurement of the land area. The judge also referring to the precautionary principle for comprehensive environmental protection and also the land to be recovered is controlled and functioned by the defendant, so that recovery will have a positive impact on the defendant as well. The judge conclude it would be more appropriate if using the calculation used by the plaintiff for 3,000 Ha [28].

To summarized, scientific evidence presented by experts has a role in proving the occurrence of forest and land fires. In drawing the conclusions, the judge did not only look at scientific evidence submitted by experts but also considers other evidence presented by both the plaintiff and the defendant.

## 2.2 Environmental Damage

Environmental damage is a direct and or indirect change to the physical, chemical, and or biological nature of the environment that exceeds the standard criteria for environmental damage. Standard criteria for environmental damage shall be the limit of physical, chemical and or biological characteristic of the environment which can be tolerated by the environment to be able to continue to preserve its functions [2].

The plaintiff expert explains in the trial the result of his study to assess the environmental condition of the

burned land and its method including the sampling method and its analysis in the laboratory. In conducting the ground check, the expert applies a purposive sampling method by selecting the representation of the sample by means of considering the homogeneity of the burned plot. Minutes of sampling by expert was made and submitted as documentary evidence in court. The plaintiff's expert checks the damage to the soil and environment based on the applicable regulations [29,30]. Laboratory test results regarding environmental quality conditions indicate certain environmental conditions by certain parameters. In general, environmental quality testing includes the stages of sampling, transportation of samples, testing of samples in the laboratory and reporting. Field sampling and laboratory testing shall be done by certain methods in accordance with scientific rules and statutory provisions. A well-conducted environmental quality testing process will produce valid and reliable environmental quality data [31].

Laboratory test report is a certificate contains the tested parameters, the results of the analysis, and information whether the parameters present in the sample exceeds the certain levels. Report of test results shall consider important figures according to environmental quality standards based on applicable laws and regulations. It must also include the estimated value of uncertainty if the uncertainty estimation affects compliance with the environmental quality standard and is not permitted to include undetectable results but reported as less than the method detection limit value [32].

**Table 2.** Results of The Field Inspection by the Plaintiffs Experts on the Land Damage Condition (South Jakarta District Court, 2016 [28])

Parameter [29]	Damage occurred[29]	Results of field inspection by expert
Subsidence	Peat subsidence	20-30 cm
Soil pH	pH rises	4,30
Organic C	Organic C levels decrease	14.68%
Total microorganisms	Total microorganisms decrease	113.50x10 <sup>6</sup> spk/gr (colony forming unit per gram of land)
Total fungi	Total fungi decrease	2.00x10 <sup>4</sup> spk/gr
Respiration	Land respiration is decrease	18.70 mgC-CO <sub>2</sub> /kg land/day
Diversity of flora species	Species extinction	100%
Flora population	Population changes have occurred	100%
Diversity of fauna species	Species extinction	100%
Fauna population	There is a population change	100%

The results of the plaintiff soil damage expert research show the peatland damage based on the parameters in the applicable regulations [29] which include subsidence, soil acidity level pH (power of Hydrogen), organic C, soil nitrogen, total soil microorganisms, total fungi, soil respiration, porosity, soil weight, decrease in the diversity of species and populations of flora and fauna. The results of the expert's research were submitted to the court as written evidence of an expert statement. The results of the study by the plaintiff experts are detailed in the following table 2.

The defendant's expert argue that it is not possible to set quality standards and there was no land damage because not long after the fire, sago had grown again and that biological and non-biological life would gradually recover. While the plaintiff's expert argued that quality standards could be established and damage caused to the peatlands could not be restored as before because to form peatlands as before the fire it took hundreds of years for recovery. In his testimony, the plaintiff's expert explained that impact of fire cannot be recovered 100% as before, recovery carried out with a scientific approach could only recover about 70-80% of the damage caused. Responding to the matter, the district court was of the view that the expert opinion should not be in conflict with the law. The judge refer to the applicable law and regulations for determining environmental damage [2,29,33]. The judge concludes the defendant's actions caused environmental damage [28].

To summarized, scientific evidence presented by experts has a role, even central role, in proving the occurrence of environmental damage. Legal criteria for environmental damage as stipulated in the regulation is basically the application of scientific effort to materialize the recognition for environmental functions and the need to respect the limited capacity of the environment to support the human life. The legal criteria of environmental damage which was determined by the law maker shall be seen as a legal effort to achieve a broader objective. The judge applies the law and the spirit of the law, not only a regulation, to a specific case. Legal and scientific understanding here need to be observed in its broader spirit and objectives.

### 2.3 Environmental Loss

In this case the plaintiff is an environmental agency so the environmental loss must be proven [2]. Two of the plaintiff's expert calculates the environmental loss based on the applicable regulation [33]. The results of the calculation of losses due to fire in the defendant's concession area are submitted to the court as documentary evidence.

Losses due to environmental damage in the defendant area as argued by the plaintiff are shown in the following table 3.

**Table 3.** Losses due to environmental damage in the defendant area as argued by the plaintiff (South Jakarta District Court, 2016 [28])

Parameter	IDR
<b>A. Ecological Damage</b>	
(1) Water storage (The cost of making a reservoir and reservoir maintenance costs)	192,000,000,000
(2) Water management	90,000,000
(3) Erosion control	3,675,000,000
(4) Soil forming	150,000,000
(5) Nutrient recycler	13,830,000,000
(6) Waste decomposers	1,305,000,000
(7) Biodiversity	8,100,000,000
(8) Genetic resources	1,230,000,000
(9) Carbon release	2,430,000,000
(10) Carbon reduction	850,500,000
<b>B. Economic Damage</b>	
Loss of profits	95,507,922,500
<b>C. Immaterial damage</b>	very difficult to quantify
<b>D. Recovery Cost</b>	
Cost of compost purchase	600,000,000,000
Transportation costs	120,000,000,000
Costs of spreading compost in the burned area	6,000,000,000
Recovery costs to activate loss of ecological functions	27,745,500,000

The expert explains that the calculation of losses is based on ecological damage because certain layers of peat will be damaged due to the fire and will not be able to function anymore [28]. The 10 ecological damage parameters and also economic damage, immaterial damage and recovery cost used by the plaintiff expert are identical as in the guidelines issued by the Ministry of Environment [33].

According to the guideline, in an effort to restore of land that was damaged by burning, the damaged land must be recovered even though it is understood that it is impossible to restore it to the state it was before. For this purpose, the approach to recover the burnt land is with compost, a material that has closeness of function [33].

The defendant refutes the plaintiff valuation for the reason that the regulation used as a basis for it was came into force after the fire. However, the panel of judges rejected it because the lawsuit and the implementation of the recovery would be carried out after the enactment of the regulation, so the compensation calculation must refer to the regulation. The panel of judges is of the opinion that the calculation of compensation for environmental pollution and or damage has been regulated in the Minister of Environment regulation [33] which has been used as a guideline by the plaintiff.

The court sentenced the defendant to pay environmental damages and conducts environmental restoration of

burnt land. Environmental damages which must be paid by the defendant is the sum of ecological damage (A) which in total is IDR 223,660,500,000 and the Economic damage (B) which amount is IDR 95,507,922,500. In sum (A+B) the defendant must pay IDR 319,168,422,500 of environmental damage to the state account. The defendant also must conduct environmental restoration of the burnt land with a total value of recovery cost (D) amounted IDR 753,745,500,000. All of them ((A+B)+D) in total is IDR 1,072,913,922,500 [28].

The court had admitted precisely the plaintiff expert's valuation. Here, scientific evidence presented by experts has a central role in proving the environmental loss. Calculation of environmental losses due to environmental pollution and or damage in the 2014 Minister of Environment Regulation is basically a monetary valuation to the impact of environmental pollution and or damage [33]. The valuation is based on the recognition of the environmental functions to support the life system and the interdependence of human life with their environment.

## 2.4 Causality

The plaintiff argues, the defendant's negligence actions had caused a fire occurred on the land under his management and have resulted in the environmental damage as investigated by the expert. The plaintiff then argues, losses incurred and the costs of environmental recovery are a direct result of the defendant's actions that had damaged the environment in the defendant business location in accordance with his permit [28].

Obviously, natural factor is integral in environmental destruction and pollution cases since environment is the nature itself. The destruction and pollution can be caused by nature and or human factor. Liability arises for human action to nature [2].

The defendant argued that the fire occurred was a disaster due to natural factors, including weather, wind and land characteristic. The defendant submits evidence of the decision of the local regent regarding the status of emergency response in handling forest and land fire disasters. The defendants also claimed that they had made their best efforts to extinguish the fire supported among other by documentary evidence include photographs as shown in figure 2 [28].

One of the plaintiff's expert explain, by looking at the number of hotspots pattern and seasonal factors, the fire that arose was because it was deliberately set on rather than occurring naturally. Conditions in Indonesia which are relatively humid tropical region differ from conditions in countries with very low air humidity where fires are more likely to occur naturally. Another plaintiff expert explains theoretically and based on his experience it is impossible that a fire could have arisen by itself in a naturally growing sago plantation. Other experts explain that information on hotspot data and smoke spread can

prove fires without having to do ground checking. The correlation between *el nino* and the number of hotspots does not illustrate that nature triggers forest fires. Human behavior initiated by dry conditions to start combustion. It can be compared to the same *el nino* but there is a high fire and which not a high fire condition. This indicates that the handling is more on humans, not because of nature [28].



**Figure 2.** Some photographs evidence submitted to the court by the defendant (South Jakarta District Court, 2016 [28])

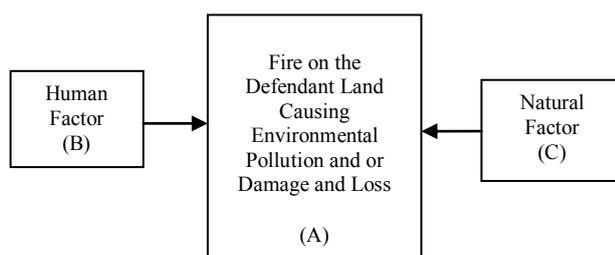
The other plaintiff's expert explains that fires are only possible because of three main factors: there must be fuel, there must be oxygen and there must be a source of ignition [3,28]. The source of ignition can come from human activity or from nature. The expert explains that the factors causing the fire in the defendant area were greater due to the ignition source originating from human activities. This is because of the fuel in the area of the defendant's land is static fuel that cannot move by itself. The expert explains that in the science of forest fires there is a combustion process such as pre-ignition. At a temperature of around 100°C water will come out, then at a temperature of 200°C will start a flammable gas, in which the gases start burning. If there is no ignition source in the form of fire then it is impossible a fire will occur [28].

On the other hand, one defendant's expert describes, nature can be a factor that make a fire difficult or cannot be extinguished at all. Other defendant expert state, in terms of nutrients, fire is an adverse process. Another defendant's expert is of the opinion that if the evidence of the decision of the local regent regarding the determination of the status of emergency response in handling forest and land fire disasters is accepted and the use of the word "disaster" in the evidence is correct, then it can be a supporting evidence of force majeure defense [28].

The plaintiff environmental law expert explains, referring to the applicable regulations [34], the occurrence of forest fires in the area of the permit holder does not consider whether negligent or not, intentionally or deliberately, there are natural factors or other factors though. The expert explained that the reasons for natural disasters would only be accepted if they were not

predictable. According to him, natural disasters can only be used as an excuse if they meet three conditions, these are: the natural factors are extraordinary and never been happened, cannot be predicted and cannot be prevented. If natural factors can be predicted, they cannot be used as defend or excuse. Even if they meet these three elements, there is a final requirement, that this natural factor is the only factor and does not mix with human activity. When mixed with human activities, all of natural factors are abort and considered to be all human actions. The expert citing two court cases [35,36] for this regard [28].

The following figure 3 illustrate the factors perceived by the parties to be the cause of fire which lead to the environmental pollution and or damage and loss in the case.



**Figure 3.** Factors perceived to be the cause of environmental pollution and or damage and loss in the case (researcher's own analysis)

The plaintiff more pointed to tries to proof the human factor (B) while the defendant more pointed to tries to proof the natural factor (C) to the occurrence of fire (A).

The judges conclude that there had been a fire on the defendant's land (A in figure 3), so the defendant as the holder of a business permit in the area must be legally responsible. Hence, the defendant's actions that caused environmental pollution and or damage as a result of the defendant's failure to anticipate the forest destruction in the event of a fire were deem as proven by the judge. The panel of judges set aside the evidence presented by the defendant who argued that the fire was due to a natural disaster. However, one member of the judges panel had a dissent opinion on this matter [28].

It appears that the district court has applied the concept of cause in fact to constellate the causality in the case. In which the court observes the damage and loss is factually caused by the act of the defendant. This could be observed as part of the strict liability system applied by the district court. With the implementation of strict liability, the aspect of foreseeability or can be estimated becomes needless to be proofed. Strict liability rests on the inelastic concept of unlawful losses. Strict liability creates a guarantee of safety or an obligation of results and supports the security of certain groups of individuals. This obligation guarantees certain losses or injuries caused by legitimate but dangerous activities. Violation of the law in strict liability only characterizes the loss and not the activity that results in the loss. Only the materialization of injuries is considered unlawful or

wrong. Violation of the law in strict liability is not elastic because the scope of protection is predetermined by the court or legislative body. Strict liability is not subject to redefinition by the court or legislative body in accordance with the circumstances of a particular accident. The offender is liable almost automatically if he causes specific event or other type of damage specified. Regardless of whether he acted intentionally, unintentionally or with the utmost care [37,38]. Applying the precautionary principle in a civil case also removes foreseeability requirements and converts liability based on faults into strict liability [39].

In strict liability system, the burden of proof of an intervening and superseding causes is the burden of the perpetrator as a form of defence. The issue of whether or not there is an intervening cause or other superseding causes is a matter of defence and no longer part of causality which must be proof by the plaintiff. Superseding causes mean the external causes that are considered to affect the loss rather than the defendant's activities [38]. While intervening causes mean an event that comes between the initial event in a sequence and the end result, thereby altering the natural course of events that might have connected a wrongful act to an injury. If the intervening cause is strong enough to relieve the wrongdoer of any liability, it becomes a superseding cause [17].

In this case, scientific evidence in the form of research reports conducted by experts and expert opinion has a role in proving the causality element directly or indirectly. However, the proof of the causality element also connected to the liability system applied by the court.

However, the Jakarta High Court in its appeal ruling rejected the plaintiff's claim on the grounds that the defendants could not be held liable for the occurrence of forest and land fires in his business area because the forest and land fires were natural disasters. The high court based its legal arguments on the evidence of the local regent decision which stated that the forest and land fires which was occurred during the period as stated in the plaintiff lawsuit as a natural disaster. The High Court also perceive that the fire spreading from other plantation lead to the fire occurred in part of the defendant land as a proven fact in the court. However, one member of the High Court judges panel had a dissent opinion on this matter [27].

The fact perceived by the High Court are: there was a fire on the defendant's land. The regent declared it as a natural disaster. The fire occurred was not committed by the defendant and the result of the fire did not benefit him. There is no exact size of the burned land that causes environmental pollution and or damage and the level or degree of damage. Based on these facts the defendant shall be released from liability [27].

In this regard the High Court did not perceive the other arguments presented by the plaintiff and the plaintiff's

experts regarding the minor possibility of forest and land fires occurring due to natural factors. The High Court seems perceives the local regent decision which stated that the forest and land fires which was occurred (including A in figure 3) as a disaster to be the proofed defence of the defendant. This reason is hard to understand because the status of the disaster declared by the regent is a matter of anticipation to the occurred condition and not sufficient to be regarded as a superseding cause.

In the mid of 2019, the Supreme Court granted the plaintiff's appeal and stated that the defendant must be responsible for forest and land fires and must pay compensation, recovery and rehabilitation costs in accordance with the principle of strict liability [26,40]. However, the actual execution of the court verdict as the outcome of the judicial process not yet known as this report being made.

### 3 Conclusion

Scientific evidence in the form of scientific studies and expert opinion and testimony which are admitted by the court has a role in proving cases of environmental damage due to land and forest fires that result in court decisions to restore the damage. In the case, admissible scientific evidence contributes directly and indirectly to the proving of land and forest fire occurrence, environmental damage and loss and the causality element of the case. Scientific evidence contributes to the proof of empirical condition of the event and help the court to understand other evidences.

Actual restoration of the damage as the ideal objective of environmental adjudication remain a challenge which need legal and scientific solutions in which the harmony between human and their nature could be rectified.

### References

1. S. N. Bakar, editor, *Status Hutan Dan Kehutanan Indonesia 2018* (Kementerian Lingkungan Hidup dan Kehutanan, Jakarta, 2018)
2. Republic of Indonesia, *Environmental Protection and Management Act* (2009)
3. Bambang Hero Saharjo, *Bukti Ilmiah Dalam Penegakan Hukum Kasus Kebakaran Hutan Dan Lahan Dengan Pendekatan Multidoor* (Institut Pertanian Bogor, Bogor, 2015)
4. S. Mertokusumo, *Hukum Acara Perdata Indonesia (Indonesia Civil Procedure Law)*, Revised Edition (Cahaya Atma Pustaka, Yogyakarta, 2013)
5. S. Mertokusumo, *Teori Hukum (Legal Theory)*, Edisi Revisi (Cahaya Atma Pustaka, Yogyakarta, 2014)
6. J. S. Suriasumantri, *Ilmu Dalam Perspektif (Science in Perspectives)* (Yayasan Obor Indonesia, Jakarta, 1985)
7. J. S. Suriasumantri, *Filsafat Ilmu Sebuah Pengantar Populer (Philosophy of Science a Popular Introduction)* (Pustaka Sinar Harapan, Jakarta, 2013)
8. S. Jasanoff, *Texas Law Review* **93**, 1723 (2015)
9. E. S. Bair, in *Model Validation: Perspectives in Hydrological Science* (John Wiley & Sons, Ltd., New York, 2001)
10. Munadjat Danusaputro, *Hukum Lingkungan: Buku I Umum* (Binacipta, Bandung, 1981)
11. E. L. Fakhriah, *Perbandingan HIR Dan RBG Sebagai Hukum Acara Perdata Positif Di Indonesia* (Keni Media, Bandung, 2015)
12. E. L. Fakhriah, *Bukti Elektronik Dalam Sistem Pembuktian Perdata* (Refika Aditama, Bandung, 2017)
13. Supreme Court, *Chief of the Supreme Court of the Republic of Indonesia Decree Number: 36/KMA/SK/II/2013 Concerning Application of Guidelines for Handling Environmental Cases* (2013)
14. E. L. Fakhriah, *Sistem Pembuktian Terbuka dalam Penyelesaian Sengketa Perdata Secara Litigasi* (Unpad, Bandung, 2012)
15. M. L. Taper and S. R. Lele, in *The Nature of Scientific Evidence* (The University of Chicago Press, Chicago, 2004)
16. L. Jeffrey and P. Shirelle, *West's Encyclopedia of American Law*, 2nd ed. (Thomson/Gale, Detroit, 2005)
17. H. C. Black and B. A. Garner, *Black's Law Dictionary*, 8th ed. (West Group, St. Paul, 2004)
18. E. O. S. Hiariej, *Teori Dan Hukum Pembuktian* (Penerbit Erlangga, Jakarta, 2012)
19. A. Pitlo, *Pembuktian Dan Daluwarsa Menurut Kitab Undang-Undang Hukum Perdata Belanda (Alih Bahasa M. Isa Arief)* (PT Intermasa, Jakarta, 1986)
20. M. Y. Harahap, *Hukum Acara Perdata: Gugatan, Persidangan, Penyitaan, Pembuktian, Dan Putusan Pengadilan* (Sinar Grafika, Jakarta, 2015)
21. Y. T. F. Harahap and I. Ikhwanasyah, *Jurnal Cita Hukum (Indonesian Law Journal)* **6**, 183 (2018)
22. G. Radbruch, *Oxford Journal of Legal Studies* **Vol. 26**, 13 (2006)
23. H. Swantoro, E. L. Fakhriah, and I. Ikhwanasyah, *Mimbar Hukum* **29**, 189 (2017)
24. S. I. Santoso, *Sejarah Perkembangan Ilmu Pengetahuan* (PT Sastra Hudaya, Jakarta, 1977)
25. Soerjono Soekanto, *Pengantar Penelitian Hukum* (Penerbit Universitas Indonesia, Jakarta, 2015)
26. Supreme Court, *Ministry of Environment and Forestry v PT. National Sago Prima* (2018)
27. Jakarta High Court, *Ministry of Environment and Forestry v PT. National Sago Prima* (2017)
28. South Jakarta District Court, *Ministry of Environment and Forestry v PT. National Sago Prima* (2016)
29. Republic of Indonesia, *Peraturan Pemerintah No. 4 Tahun 2001 Tentang Pengendalian Kerusakan Dan Atau Pencemaran Lingkungan Hidup Yang Berkaitan Dengan Kebakaran Hutan Dan Atau*

- Lahan (Government Regulation No. 4 Year 2001 on Control of Environmental Damage and or Pollution Related to Forest and Land Fires)* (2001)
30. Republic of Indonesia, *Peraturan Pemerintah No 150 Tahun 2000 Tentang Pengendalian Kerusakan Tanah Untuk Produksi Biomasa (Government Regulation No. 150 Year 2000 on Control of Land Damage for Biomass Production)* (2000)
  31. A. Hadi, *Pengambilan Sampel Lingkungan* (Penerbit Erlangga, Jakarta, 2015)
  32. Ministry of Environment, *Peraturan Menteri Negara Lingkungan Hidup Nomor 06 Tahun 2009 Tentang Laboratorium Lingkungan (Minister of Environment Regulation No. 06 Year 2009 on Environmental Laboratory)* (2009)
  33. Minister of Environment, *Peraturan Menteri Lingkungan Hidup Republik Indonesia Nomor 7 Tahun 2014 Tentang Kerugian Lingkungan Hidup Akibat Pencemaran Dan/Atau Kerusakan Lingkungan Hidup (Minister of Environment Regulation No. 7 Year 2014 on Environmental Losses Due to Environmental Pollution and or Damage)* (2014)
  34. Republic of Indonesia, *Peraturan Pemerintah Nomor 45 Tahun 2004 Tentang Perlindungan Hutan (Government Regulation Number 45 Year 2004 Concerning Forest Protection)* (2004)
  35. Supreme Court, *Dedi Cs vs Perhutani Cs* (2007)
  36. Supreme Court, *Sylvia vs Perumnas Cs* (2007)
  37. Vernon Palmer, *Tulane Law Review* **62**, (1987)
  38. Andri G. Wibisana, *Penegakan Hukum Lingkungan Melalui Pertanggungjawaban Perdata* (Badan Penerbit FHUI, Depok, 2017)
  39. B. Pardy, *Les Cahiers de Droit* **43**, 63 (2002)
  40. A. Saputra, *Detiknews* (2019)