State Liability and Critical Infrastructure: A Comparative and Functional Analysis

*Anne van Aaken and Isabelle Wildhaber**

Critical Infrastructure (CI) provision is characterized by privatization of CI providers, transnational risks and a changing role of the state. We describe two paradigmatic systems of state liability with a view to CI liability, namely Germany as a fault system and Switzerland as a strict liability system. Both are unsatisfactory and not well adapted to the modern realities and exigencies of allocation of risks and liability in CI and show flaws from a functional, incentive-based perspective. Therefore, we make suggestions how those systems may be ameliorated, suggesting organizational, design and supervisory liability reforms.

I. Introduction

Critical infrastructure (CI)[1] liability is paradigmatic for three general developments of the modern state. First, increasingly the legal boundaries of the state, its tasks and responsibilities blur – in a vertical sense and in a horizontal sense. Delegation to international organizations or international cooperation may solve problems which occur beyond state borders and transnationally (vertical blurring). Even more interesting in the context of this article is the blurring of boundaries in a horizontal manner (horizontal blurring), i.e. the state cooperating with private entities to provide public goods and services which have traditionally been the task of the state. This changes the task of the state from producer to supervisor or may lead to the creation of private public partnerships (thereafter PPPs). Second, the complexity of the world, especially technical complexity, grows, which enhances uncertainty, unpredictability and risks.[2] Third, this has legal implications for the responsibility and liability of the state. Both can become murky and intransparent with implications for the rule of law. One aspect of the rule of law is that the law is clear in assignments of rights and duties, including the state´s duties. State liability in a world with these developments has been thoroughly underexplored, both in the legal literature as well as in case law. The question arises how state liability needs to adapt in order to capture these developments with a special view to CI. Although a responsibility for CI of the state has been discussed in literature,[3] the question of state liability for CI has been neglected.

There are many ways, more particularly in the design of CI, in which it is possible to *ex ante* reduce the probability of damage or mitigate the seriousness of

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1 The EU Commission defines CI as follows: "Critical infrastructure is an asset or system which is essential for the maintenance of vital societal functions. The damage to a critical infrastructure, its destruction or disruption by natural disasters, terrorism, criminal activity or malicious behaviour, may have a significant negative impact for the security of the EU and the well-being of its citizens", see EU Commission, "Critical infrastructure", available on the internet at <http://ec.europa.eu/dgs/home-affairs/what-we-do/policies/crisis-and-terrorism/critical-infrastructure/index_en.htm> (last accessed on 25 January 2015).

2 The term risk denotes the possibility that an undesirable state of reality (adverse effects) may occur as a result of human activity or natural events. Risk is conventionally defined as the harm of an event (effect) times the probability of this event. See Ortwin Renn, *Risk Governance. Coping with Uncertainty in a Complex World* (London: Earthscan, 2008), at p. 1. Those risks usually refer to hazards which are known and calculable due to past experiences, whereas uncertainty refers to hazards where no probability is known. See for a discussion in the context of risk governance Marjolein B.A. van Asselt, Ellen Vos and Bram Rooijackers, "Science, Knowledge and Uncertainty in EU Risk Regulation", in Michelle Everson and Ellen Vos (eds.), *Uncertain Risks Regulated* (Abingdon: Routledge-Cavendish, 2009), 359 *et sqq.*, at p. 360 *et sqq*.

3 See Georg Hermes, *Staatliche Infrastrukturverantwortung: Rechtliche Grundstrukturen netzgebundener Transport- und Übertragungssysteme zwischen Daseinsvorsorge und Wettbewerbsregulierung am Beispiel der leitungsgebundenen Energieversorgung in Europa*, (Tübingen: Siebeck Mohr, 1998).

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the consequences.[4] Precautionary measures to reduce the likelihood of disasters causing damage to CI can be taken by individuals, and, especially for large scale measures, by government by designing adequate structures of and between different actors involved in CI and organizations. Furthermore, government can build dams to prevent flooding or it can introduce earthquake warning systems. More importantly, government can issue zoning regulations, for example prohibiting constructions in avalanche-prone areas or prescribing particular building techniques in earthquake-prone areas. A failure to prevent the disaster or not taking adequate measures to mitigate the damage can hence in some cases be due to the government.

We will first embed the CI problem in the general current developments of the state, risk and complexity (II), and will then turn to a doctrinal description of German and Swiss state liability laws and how they deal with CI. The systems are legally opposed in that Germany has a very restrictive state liability law, whereas Switzerland is much more generous (III).[5] We identify functional deficits in both. We then search for tentative solutions on how to design an adequate system of CI liability for the state, discussing organizational, design and supervisory liability (IV). The last part concludes (V).

II. The Complications of State Liability in CI Provision and Protection

CI is characterized by becoming ever more complex, especially due to technological developments and the growing multiplicity of actors. This complexity in turn creates uncertainty and unpredictability concerning the actors involved and the developments of the system if something goes wrong: Risks are not being clearly allocated and become less controllable. Murky responsibilities of the actors, including the state, are the result. We deal with those problems with a special view to state liability for CI in order to clarify the special problems CI liability is faced with.

150 years ago, a huge part of the population was still self-sufficient and thus CI almost non-existent. In the modern world, this has completely changed. Parting from private sufficiency, the state took over the provision of public services ("Daseinsvorsorge").[6] Whereas the danger of natural disasters was always present, as technology has advanced, the disruption of CI via human action, such as man-made disasters and (cyber)terrorism, has become more real[7] and less controllable. The system therefore has become more vulnerable. Geographical and sector interdependencies aggravate the complexity problem.

Due to the vertical and horizontal cooperation of modern nation states, a multiplicity of actors is involved in the provision of CI. Many different actors are involved and contribute to policies, decisions and action in modern states, making it difficult to ascribe exact responsibility for CI and also liability for undesired outcomes: "profusion of agents obscures the location of agency."[8] This phenomenon, which is not solely confined to CI provision, has been dubbed "the problem of many hands."[9] Not only can several state

4 See Herman B. Leonard and Arnold M. Howitt, "Acting in Time against Disaster: A Comprehensive Risk Management Framework", in Howard Kunreuther and Michael Useem (eds.), *Learning from Catastrophes, Strategies for Reaction and Response* (New Jersey: Wharton School Publishing, 2010), pp. 18 *et sqq*.

5 For other systems in Europe, which all vary, see in Oliver Dörr (ed.), *Staatshaftung in Europa. Nationales und Unionsrecht*, (Berlin: De Gruyter Handbuch, 2014); Julia Iliopoulos-Strangas, Stanislaw Biernat and Michael Potacs (eds.), *Verantwortung, Haftung und Kontrolle des Verfassungsstaates und der Europäischen Union im Wandel der Zeit* (Baden-Baden/Zürich: Nomos/Stämpfli 2014), especially the contribution of Antonio Lazari therein, "State Liability in Comparative and European Union Law", p. 123 et sqq., discussing three models of fault in the UK, Spain and France; Duncan Fairgrieve, *State Liability in Tort. A Comparative Law Study* (Oxford: Oxford University Press 2003), discussing UK and France. Basil S. Markesinis, Jean-Bernard Auby, Dagmar Coester-Waltjen and Simon Deakin, *Tortious Liability of Statutory Bodies: A Comparative and Economic Analysis of Five English Cases* (Oxford: Hart 1999) compare the UK non-liability rule on a variety of policy and economic efficiency grounds with the German and French case law which are less strict on liability. See also Robert Rebhahn, "Public Liability in Comparison – England, France, Germany", in Helmut Koziol and Barbara C. Steininger (eds), *Tort and Insurance Law Yearbook, European Tort Law 2005* (Vienna: Springer 2006), 68. The whole book contains comparative chapter and country chapters on public liability.

6 For a detailed description of this development and the legal implications, see Wolfgang Rüfner, "Daseinsvorsorge und soziale Sicherheit", in Josef Isensee and Paul Kirchhof (eds.), *Handbuch des Staatsrechts der Bundesrepublik Deutschland, Band IV, Aufgaben des Staates* (Heidelberg: C.F. Müller, 2006), pp. 1049 *et sqq.*, and Hans Peter Bull, "Daseinsvorsorge im Wandel der Staatsformen", 47 *Der Staat* (2008), at pp. 1-19.

7 See the discussion in the articles of Eric Luiijf, "Governing Critical ICT: Elements that Require Attention" and Peter Burgherr, "Accidents in the energy sector and energy infrastructure attacks in the context of energy security", in this issue.

8 Dennis F. Thompson, "Responsibility for Failures of Government: The Problem of Many Hands", 44 *American Journal of Public Administration* (2014), pp. 259 *et sqq*, at 259.

9 Dennis F. Thompson, "Moral Responsibility of Public Officials: The Problem of Many Hands", 74 *American Political Science Review* (1980), pp. 905 *et sqq.*, at p. 905.

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agencies be involved, but private-public-cooperation has also been predominant since the privatization wave of CI production in the 1980s, be it in telecommunication, energy or water,[10] thus generating a multiplicity of private actors.

Furthermore, CI risks are not confined to national boundaries. Rather, much of the CI supposed to be regulated and provided nationally is of a transnational nature in its consequences (if not in production). Spill-over effects of malfunctioning CI activities in one country may severely affect CI in another country (negative externalities).[11] Thus, CI provision faces a challenge of fragmentation and of guaranteeing safety for all participants of the system. This problem is far from solved in state liability: Sharing of risk and liability cross-nationally is absent to our knowledge; no international convention for CI responsibility exists, similar to nuclear energy accidents liability.[12]

The problem of many hands being involved in CI provision has long been discussed as a responsibility problem,[13] but not necessarily as a liability problem. However, liability follows (often) from responsibility. Liability must adapt to the shift from production of CI by the state to CI provision via PPPs or to supervision by the state. If a liability gap for CI is to be avoided, state liability must change to organizational, supervisory or to design liability. Especially the latter plays an important role in incentivizing the state to adapt and learn: "Potential designers who knew about the defects may not have had the power to fix them, and those who had the power may not have known (though often they should have known). If we look only for design faults in the past, we are likely again to find too many hands with too little responsibility."[14] Since functioning CI provision is a public good, private firms may not only have coordination problems (e.g. on standards) but may also free-ride. Thus, it must be the state which takes over the task of correctly designing a CI system, including its transnational nature. Even if the state does not provide the CI itself, it still has a duty to protect it (and often the only means to do so): In order to see whether state liability is able to capture the developments and problems in CI provision and protection, we now turn to analyzing state liability *de lege lata*.

III. Comparative State Liability

Different countries have very different approaches to state liability. We take two rather opposing models, namely Germany, following a negligence model with additional restrictive features, and Switzerland, following a strict liability model. We discuss those models with the view on incentives for the relevant actors.

1. Germany: The Negligence Model

Germany´s state liability law is only very partially codified after a federal state liability code of 1981[15]

10 Martin Bullinger, "Von administrativer Daseinsvorsorge zu privatwirtschaftlicher Leistung unter staatlicher Rahmengarantie", in Franz Ruland (ed.), *Verfassung, Theorie und Praxis des Sozialstaats: Festschrift für Hans F. Zacher zum 70. Geburtstag* (Heidelberg: C.F. Müller, 1998), pp. 85 *et sqq*.

11 E.g. the problems of cross-border provision of CI in Air Traffic Control: instructively, see the decision of the German County Court concerning the negligence of the Swiss Air Traffic Control Company Skyguide, a partially privatized firm (Zürich) in the Überlingen accident, LG Konstanz, Decision of 27 July 2006, AZ 4O 234/05 H.

12 Adopted in 1986 following the Chernobyl nuclear plant accident, the Convention on Early Notification of a Nuclear Accident (entered into force on 27 October 1986, 119 State Parties) establishes a notification system for nuclear accidents which have the potential for international transboundary release that could be of radiological safety significance for another State. It requires States to report the accident's time, location, radiation releases, and other data essential for assessing the situation. More importantly, liability is also regulated. In September 1997, governments took a significant step forward in improving the liability régime for nuclear damage. Over 80 States adopted a Protocol to amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (capping private liability) and also adopted a Convention on Supplementary Compensation for Nuclear Damage (additional compensation by States). See for details of how to deal with disasters after they have occurred, but not considering liability issues, David D. Caron, Michael J. Kelly and Anastasia Telesetsky (eds.), *The International Law of Disaster Relief* (Cambridge: Cambridge University Press, 2014).

13 Responsibility (Verantwortung) is the broader notion, it may also be political. Liability is a sub-form of responsibility, namely legal responsibility for the damage done (usually via restitution or damage payments). See e.g. Jan Henrik Klement, *Verantwortung: Funktion und Legitimation eines Begriffs im öffentlichen Recht* (Tübingen: Siebeck/Mohr 2006). In international law, the terms liability and responsibility are used differently. Responsibility follows from wrongful acts whereas liability is the term used for liability even if there was no internationally wrongful conduct, e.g. liability for damage caused by space objects.

14 Thompson, *supra* note 8, at p. 261.

15 German "Staatshaftungsgesetz" of 26 June 1981, BGBl I, at p. 553.

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was declared unconstitutional by the German Federal Constitutional Court (GFCC).[16] It is now principally based on § 839 German Civil Code (GCC, dating from 1900), Art. 14 Basic Law (BL) and on judge-made law. Its basis, § 839 GCC, covers state tort and rights infringements, whereas Art. 14 BL covers expropriation and will be neglected in our context. No voice in Germany is positive about this state of affairs – state liability is seen as one of the most problematic, complex and incoherent fields of public law.[17] Since it is not adapted to the new developments described above, it has become even more dysfunctional[18] in CI liability constellations.

§ 839 I GCC needs several prerequisites for the state to be liable. First, the public official must act in his or her official duty. A public official can be either a public servant or a private person or firm which was bestowed official duties. For example, formerly state-owned entities (e.g. air traffic control) being transformed into privatized enterprises could still be held liable under state liability. Thus, privatized CI can still fall under state liability norms, if such a bestowment act exists. Furthermore, the action or measure in question must be done in fulfilling an official duty. Here, private law action is distinguished from public law action – often not an easy task and potentially relevant for CI production and maintenance. Furthermore, § 839 I GCC requires the violation of an official duty which is protecting third parties ("drittschützende Amtspflicht"), fault and causation between the action and the violation of the right (as well as causation between the right violation and the damage). For CI, the official duty is the first hurdle. Official duties have, in principle, to be described in a statute. The more the state gets involved with the protection of CI by establishing legal norms and guidelines, the more it exposes itself to a liability risk since proving liability for positive duties is easier.

The issue is more complicated for omissions of the state if there is no legal norm stating a duty. The GFCC has developed the so-called theory of duties to protect. Art. 2 II 1 together with Art. 1 I BL contain – additionally to the negative right component – the duty of the state to protect goods such as life and bodily integrity, including protecting those goods against third parties (e.g. terrorists).[19] Correspondingly, a duty to protect property was developed based on Art. 14 I BL.[20] Those duties to protect include the duty to protect against acts of God.[21] Although this sounds encompassing, the legislator has no duty to protect against any *de facto* "rest risk" ("Restrisiko"),[22] even if this would be legally and factually possible. Rather, the legislator has plenty of discretion how to use its funds and how to set priorities. Precautionary measures should, however, not be totally unsuitable or insufficient.[23] This rather wide discretion extends to CI protection against third parties or against acts of God.

Even if such a duty to protect is constructed, under current doctrine, the official duty or the law must be meant to protect a concrete third person ("Drittbezogenheit der Amtspflicht") and not just the

16 German Federal Constitutional Court BVerfGE 61, at p. 149 *et sqqq*. Unconstitutionality was found due to the missing competence in the Basic Law of the federal level (the federal level competence is subsidiary to the state level). Although the competence article was changed afterwards, hitherto, no new law has been passed. The German Democratic Republic, in contrast, had a state liability law since 1969 which, similar to the Swiss law, discarded with the necessity of fault.

17 See only Bernd Grzeszick, "§ 47 Staatshaftungsrecht", in Uwe Erichsen and Dirk Ehlers (eds.), *Allgemeines Verwaltungsrecht* (Berlin: De Gruyter, 2005), para. 1 *et sqq*. See also Ulrich Magnus, "The Liability of Public Authorities in Germany", in Ken Oliphant (eds), The Liability of Public Authorities in Comparative Perspective, (Antwerp: Intersentia 2015), forthcoming.

18 For an encompassing critique, see Wolfram Höfling, "§ 51 Vom überkommenen Staatshaftungsrecht zum Recht der staatlichen Einstandspflichten", in Wolfgang Hoffmann-Riem, Eberhard Schmidt-Aßmann and Andreas Voßkuhle (eds.), *Grundlagen des Verwaltungsrechts, Band III* (München: C.H. Beck, 2009), at p. 945.

19 This was originally developed in the abortion cases, but has since been extended, including to nuclear energy. German Federal Constitutional Court decisions BVerfGE 39, 1 (Schwangerschaftsabbruch I), BVerfGE 88, 203, 251 (Schwangerschaftsabbruch II); BVerfGE 49, 89 (Kalkar). See also Hans Hugo Klein, "Die grundrechtliche Schutzpflicht", *Deutsches Verwaltungsblatt* (1994), at p. 489, and extensively Johannes Dietlein, *Die Lehre von den grundrechtlichen Schutzpflichten,* 2nd ed. (Berlin: Duncker & Humblot, 2005).

20 German Federal Constitutional Court BVerfG, NJW 1998, 3264 (3265) – Forests, Acid Rain.

21 Klein, *supra* note 19, at p. 490.

22 The notion of "rest risk" has been developed in the nuclear energy cases (Kalkar) of the GFCC: German Federal Constitutional Court BVerfGE 49, 89, 142 *et sqq*.: "Ungewißheiten jenseits dieser Schwelle praktischer Vernunft haben ihre Ursache in den Grenzen des menschlichen Erkenntnisvermögens; sie sind unentrinnbar und insofern als sozial-adäquate Lasten von allen Bürgern zu tragen." For a critique, see Hasso Hofmann, *Rechtsfragen der atomaren Entsorgung* (Stuttgart: Klett-Cotta, 1981), at p. 328-354.

23 German Federal Constitutional Court BVerfGE 77, 170 (214 et sq.) = NJW 1988, 1651 – Chemical Weapons Deposition.

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general public.[24] This provision delineates risk spheres between the state and its citizens. The determination of whether a norm protects concrete third parties depends on the protective purpose of the respective norm.[25] Supervision over economic activities (e.g. banking) mostly does not contain any duty vis-à-vis (banking) customers but is meant to protect (only) the system.[26] Although for some CI, e.g. telecommunication and railway, a responsibility to provide is constructed,[27] there is no subjective individual right to it – and thus no state liability if those public services are not provided.[28] The same would then hold true concerning protection. Those arguments may be extended to all CI.[29] The result would be a missing state liability for CI, but there are further prerequisites which make it even more unlikely that state liability for CI can be claimed by injured persons.

In Germany, the fault of the official must be proven by the claimant; negligence is sufficient. An objective violation of a duty is insufficient for liability. This is different in Swiss law, as we will see. Given that there is a lot of discretion on how to provide and protect CI, negligence in the exercise of that discretion is unlikely.

But let´s assume for a moment that a law exists which is protecting third party individuals and even negligence can be proven. German state liability under § 839 I 2 GCC is only subsidiary.[30] This is another big difference to Swiss law. If a private third party has contributed to the violation and the damage, the third party is liable for the whole damage, unless the official has acted willfully. This "liability privilege" of the state has been much criticized[31] and has been narrowed down by case law. Now, if the state acts as a private person (e.g. when a police car is driving normally and not in alert mode), the state loses the privilege. Still, the principle stands whenever the state acts in a public capacity (e.g. when the police car causes an accident chasing a person and a third car is also involved). The third party then has to pay the whole damage. The burden of proof that there is no third party liability lies with the claimant. This brings special problems for CI. Since most of CI is provided for by private firms or in cooperation (PPPs), via law, the liability of the state is excluded once there is contributory negligence of the CI provider. Assume a case where the state has acted negligently in supervision or information exchange in CI protection. If the CI provider was also negligent, it is its liability alone. This clearly leads to a moral hazard problem on the part of the state officials.

A further hurdle for state liability to be taken is § 839 III GCC, stating that "liability for damage does not arise if the injured person has intentionally or negligently failed to avert the damage by having recourse to appeal". If the injured party misses to take the available remedies, it is barred from claiming damages. By the German doctrine, this rationale is viewed as being part of contributory negligence, thus excluding the claim against the state in its entirety.[32] The reason behind this is that the principle "acquiesce of the act and then liquidate the damage" is not accepted under German law. In all other factual cases, i.e. when remedies are not at stake, the normal comparative negligence of § 254 GCC is applied by the courts. Although there are further judge-made bases for state liability claims, e.g. for special sacrifices, § 839 GCC is the most likely legal basis in cases of CI liability.

2. Switzerland: The Strict Liability Model

Of course it is also possible in Switzerland that those affected by CI damages will make claims against the

24 For details, see Fritz Ossenbühl and Matthias Cornils, *Staatshaftungsrecht,* 6th ed. (München: C.H.Beck, 2013), p. 44 *et sqq*.

25 BGH, Decision of 16 February 1995 - III ZR 106/93 -, BGHZ 129, 23 *et sqq*. = NVwZ 1995, 928 = DVBl 1995, 511 *et sqq*. and Ossenbühl and Cornils, *supra* note 24, pp. 60 *et sqq*.

26 See Ossenbühl and Cornils, *supra* note 24, p. 65 *et sqq*.

27 Kay Waechter, *Verwaltungsrecht im Gewährleistungsstaat* (Tübingen: Siebeck/Mohr, 2008), at p. 239.

28 Markus Möstl, "Art. 87 et sqq.", in Theodor Maunz and Günter Dürig (eds.), *Kommentar zum Grundgesetz* (Beck: München, 2010), at para. 63. Different but minority opinion, Stephan Sommer,*Staatliche Gewährleistung im Verkehrs-, Post- und Telekommunikationsbereich: Zur Interpretation der Gewährleistungsnormen der Art. 87e IV und 87f I GG im System verfassungsrechtlicher Leistungspflichten* (Berlin: Mensch & Buch, 2000), pp. 96 *et sqq*., at p. 171.

29 For dams and the protection against acts of God, like floods, see Wolfgang Ewer, "Ersatz-, Entschädigungs- und Ausgleichsansprüche wegen Hochwasserschäden", 55 *Neue juristische Wochenschrift* (2002), pp. 3496 *et sqq*.,at p. 3497.

30 The reason is historical. Until Art. 34 entered into force, BL which shifts the liability of the official to the state, the liability of the official was a personal liability and the idea was to protect the official against claims and to uphold the risk neutrality of public administration.

31 See e.g. Ossenbühl and Cornils, *supra* note 24, at p. 80 with further references.

32 Ossenbühl and Cornils, *supra* note 24, at p. 90 *et sqq*.

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state,[33] based on the Swiss Federal Law on the Liability of the Confederation[34] or the state liability laws of individual cantons. These laws are applicable if public officials fulfilling public duties cause damages. The claims are addressed directly to the state or to the organization fulfilling public duties (exclusive state liability). Several prerequisites need to be fulfilled for the state to be liable. These prerequisites are similar as in German law. For CI, these prerequisites can be serious hurdles, just like under German law.

The state will only be liable for damaging acts and omissions deriving from official activities regulated by public law (functional connection).[35] For the state to be liable based on an action, there must be a violation of official duties. The action is violating official duties if the duties and responsibilities of the public authorities are described in a statute. Therefore, it follows that the more the state gets involved with the protection of CI by establishing legal guidelines, the more it exposes itself to a liability risk.[36] For the state to be liable based on an omission, there must be legal regulations forcing the state to act, or a legal duty to act based on a protective regulation.[37]

Even if there is a duty to protect from CI damages, this duty is limited. As in Germany, the state has to take the necessary, feasibly and economically reasonable measures.[38] Not all possible safety provisions must be taken in order to ward off potential risk, but only provisions deriving from legal provisions or proving appropriate and reasonable with a view of general precaution.[39] As in Germany with its concept of socially adequate "rest risk", the state is not obliged to protect the population from all damage and risk resulting from damages to CI.

In extraordinary situations there is a lot of pressure to decide and to decide quickly. The public authorities should have and do have a considerable margin of appreciation and discretion.[40] Public authorities often being multitask agents, they have to balance different externalities against each other and thus need a large discretionary power in their decision-making.[41]

As mentioned, the prerequisites for the state to be liable for CI damages can be serious hurdles for the claimants. In many cases, the state will not be held liable because there will be no official duty that has been violated or because causation will not be given.[42] But many dispositions can be found in the police law of certain cantons, in some cantonal constitutions, as well as in some cantonal civil protection laws (e.g. fire brigade operations);[43] just as in Germany at a sub-federal level.[44] An omitted warning will not be enough for a state liability claim, if the damage could not have been prevented with a warning

33 Kristian Cedervall Lauta, "New Fault Lines? On Responsibility and Disaster", 2 *European Journal of Risk Regulation* (2014), pp. 137 *et sqq*.

34 Swiss Federal Law on the Liability of the Confederation, "Bundesgesetz über die Verantwortlichkeit des Bundes sowie seiner Behördenmitglieder und Beamten (Verantwortlichkeitsgesetz, VG)" of 14 March 1958, (SR 170.32).

35 Ulrich Häfelin, Georg Müller and Felix Uhlmann, *Allgemeines Verwaltungsrecht* (Zürich: Dike, 2006), at N 2244.

36 Isabelle Wildhaber, "Von Hochwasserschäden bis zu AKW-Störfällen: Wer ersetzt Katastrophenschäden?", I *Zeitschrift für Schweizerisches Recht*(2013), pp. 381 *et sqq*., at p. 409; Jean-Baptiste Zufferey, "L'Etat et sa responsabilité – Constats et questions", in Marco Borghi and Antonio Perugini, *Gestione di una Catastrofe e Responsabilità* (Lugano/Basel: Helbing Lichtenhahn, 2003), pp. 417 *et sqq*., at p. 441; Dagmar Hinghofer-Szalkay, *Naturkatastrophen: Haftung des Staates für Schäden der Opfer* (Wien: Jan Sramek Verlag, 2012), at p. 5.

37 Swiss Federal Court decision BGE 132 II 305 Consid.4.1 (318); BGE 123 II 577 Consid. 4d/ff (583); BGE 118 Ib 473 Consid. 2b (476/477); BGE 116 Ib 367 Consid. 4c (374); Jost Gross, *Schweizerisches Staatshaftungsrecht,* 2nd ed. (Bern: Schulthess, 2001), pp. 164 *et sqq*., at p. 175 *et sq*.

38 Bern Association of Administrative Jurisdictions, 18.3.2004 (VGE 21 657/VGE 21234), BVR/JAB 1995, at p. 3; Peter Queitsch, "Hochwasserschutz und Haftung im Zeitalter des Klimawandels", *Umwelt- und Planungsrecht* (2011), pp. 130 *et sqq*., at p. 135; Viviane Sobotich, *Staatshaftung aus Kontrolltätigkeit im Baurecht*(Zürich: Schulthess, 2000); Béatrice Weber-Dürler, "Die Staatshaftung im Bauwesen", *Schweizerisches Zentralblatt für Staats- und Verwaltungsrecht*(1997), at p. 405.

39 Bern Association of Administrative Jurisdictions, 18.3.2004 (VGE 21 657/VGE 21234), (BVR/JAB, 2005), at p. 3, E. 3.4; Swiss Federal Court decision BGE 127 IV 62 Consid. 2d, 126 III 113 Consid. 2a/aa, Consid. 2b, 116 II 422 Consid. 1.

40 Bern Association of Administrative Jurisdictions, 18.3.2004 (VGE 21 657/VGE 21234), (BVR/JAB, 2005), at p. 3, Consid. 4.3; Tobias Jaag, „Staatshaftung nach dem Entwurf für die Revision und Vereinheitlichung des Haftpflichtrechts", I *Zeitschrift für Schweizerisches Recht* (2003), pp. 3 *et sqq*., at p. 62; Patrick Nützi, *Rechtsfragen verhaltenslenkender staatlicher Information* (Bern: Stämpfli, 1995), at p. 292.

41 Gerrit De Geest, "Who Should be Immune from Tort Liability?", 41 *Journal of Legal Studies* (2012), pp. 291 *et sqq*., at p. 291.; Jef de Mot, "Public Authority Liability", 22 *Tort Law Review* (2014), pp. 120 *et sqq*., at p. 120.

42 Blaise Knapp, "La Responsabilité de l'Etat en cas de catastrophes naturelles", I *Zeitschrift für Schweizerisches Recht* (1986), pp. 589 *et sqq*., at p. 596 *et sqq*.; Zufferey, *supra* note 36, at p. 428.

43 Häfelin, Müller and Uhlmann, *supra* note 35, at N 2298a.

44 See instead of all others, § 2 I Hessisches Katastrophenschutzgesetz (HKatSchG): a task of the states, the administrative districts (counties) and municipalities not associated with a county.

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(causality missing).[45] Warning duties exist if the extraordinary risk was known to the authorities, but not to the population. In Germany as well, it has been held that insufficient warnings and information of the population can constitute a violation of an official duty in the sense of § 839 GCC, based on organizational fault.[46] Again, the margin of appreciation in deciding on the extent and the time frame of the information and the warning is large. An unlawful omission to inform can only be assumed if the discretionary power was used contrary to official duties.[47]

In cases of state liability claims for CI damages, one of the central questions will be whether causation might have been interrupted because of force majeure.[48] Force majeure will exclude liability.[49] It is dependent on the frequency of the event per century.[50] Force majeure cannot be accepted, if certain elements call for caution, no matter what the frequency of the event is and no matter how extraordinary it is.[51]

Other than in German law, negligence is not required in Swiss law. However, the action or omission of the state must be illegal ("Widerrechtlichkeit"). The Supreme Court follows the so-called objective illegality theory ("objektive Widerrechtlichkeitstheorie"). If there is violation of body, life, freedom, personality or property, there is always illegality ("Erfolgsunrecht").[52] If, however, the damage is only of a financial nature ("reiner Vermögensschaden"), there must be violation of legal duty of care for the action of the state to be illegal ("Handlungsunrecht").[53] The public agent must have violated either his own or the state's duty of care.[54] If the state is accused of an omission, which will often be the case for CI,[55] the violation of a duty of care is also necessary.

3. Functional Disadvantages of both Models

Both models have upsides and downsides. Liability law sets incentives for the actors and those incentives should ultimately be set with a view of hazard minimization and compensation. There is some literature arguing that this incentive effect may not work in the case of public authority liabilities, since politicians (within states) are (differently than ordinary tortfeasors) not maximizing profits, but seeking reelection. This is an argument in favor of limited state liability.[56] Nevertheless, we believe that this argument is questionable or at least has to be differentiated. Although the single public official may be shielded by transfer of liability to the agency or the responsible jurisdiction (e.g. a state or canton), there are indirect ways of sanctioning a public official causing liability payments. In short, although the incentive effect may be more indirect then with private liability, we still assume that there is an effect. Since politicians prefer more money available to less (due to the reelection constraint), it is plausible to assume that they prefer to spend money on social projects etc., rather than on liability.

In Germany, state liability for CI provision and protection is very restrictive and sets wrong incentives

45 Bern Association of Administrative Jurisdictions, 18.3.2004 (VGE 21 657/VGE 21234), (BVR/JAB, 2005) at p. 3, consid. 5.

46 BGHZ, 27 January 1994 - III ZR 109/92.

47 Anne-Christine Favre, "Die Haftung des Gemeinwesens am Beispiel des Schutzes vor Naturgefahren", 6 *Raum & Umwelt VLP-ASPAM* (2007), p. 1 *et sqq*., at p. 7; BGE 120 Ib 248 Consid. 2b, 119 Ib 208 Consid. 5b, BGE 118 Ib 473 Consid. 7.

48 Wildhaber, *supra* note 36, at p. 413.

49 Knapp, *supra* note 42, at p. 599 et sqq.; Eugénie Holliger-Hagmann, "Staatshaftung: Nur in seltenen Fällen Schadenersatz", *Schweizer Versicherung* of 7 November 2001, available on the internet at: <www.schweizerbank.ch/de/artikelanzeige/artikelanzeige.asp?pkBerichtNr=30490> (last accessed 6 February 2015); Favre, *supra* note 47, at p. 20; Christian Roten, "Questions choisies de responsabilité civile au sujet des intempéries", *Zeitschrift für Walliser Rechtsprechung ZWR* (2001), p. 3 *et sqq*.

50 Swiss Federal Court decision BGE 122 III 229, 236; Swiss Federal Court decision of 18 May 2005, 4C.45/2005, Consid. 4.2.3; Roland Brehm, „Die Entstehung durch unerlaubte Handlungen: Art. 41-61 OR", in *Berner Kommentar VI/1/3/1*, 3rd ed. (Bern: Schulthess, 2006), at art. 58 N 99c/d.

51 Swiss Federal Court decision of 30 August 2006, 6P.39/2006; Favre, *supra* note 47, at p. 199 *et sqq*.

52 Swiss Federal Court decisions BGE 123 II 577 Consid. 4; BGE 132 II 449 Consid. 3.3; BGE 132 II 305 Consid. 4.1; BGE 135 V 373 Consid. 2.4.

53 Häfelin, Müller and Uhlmann, *supra* note 35, at N 2248.

54 Häfelin, Müller and Uhlmann, *supra* note 35, at N 2249.

55 Wildhaber, *supra* note 36, at p. 409 *et sqq*.

56 See *inter alia* Roger Van den Bergh and Hans-Bernd Schäfer, "Member States Liability for Infringement of the Free Movement of Goods in the EC", 156(2) *Journal of Institutional and Theoretical Economics* (2000), pp. 381 *et sqq*.; Hans-Bernd Schäfer, "Can Member State Liability for the Infringement of European Law deter National Legislators?" in Thomas Eger and Hans-Bernd Schäfer (eds), *Research Handbook on Economics of European Union Law*, Edward Elgar, Cheltenham, 2012, pp. 82 *et sqq*.; Roger Van den Bergh and Hans-Bernd Schäfer, "Liability of Member States for Infringement of the EC Treaty: Economic Arguments in favour of Obvious Negligence", *European Law Review*, 1998, pp. 552 *et sqq*.

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for the state, shifting risk mainly to the injured party and to the private parties contributing to CI via production or otherwise. Germany maintains the privileged position that it can chose whether to make its public tasks protective for the individual or only in the general interest. Only in the former case is a violation of the law actionable by the injured person. In the latter case, even if the law mandates, e.g. a supervisory or coordinating tasks for CI, any violation would go unsanctioned. Furthermore, Germany maintains its privileges of ultimate risk bearing for CI. Ever more CI is provided by private persons with a supervisory task of the state or via public-private cooperation. Here again, German law sets wrong incentive concerning third private party liability (of PPPs). Private CI providers will underprovide or be more expensive since they bear all liability risk of negligence (even that of the state) and the state does not have the correct incentive to provide due care. Germany, however, does set the correct incentive concerning contributory negligence, but only insofar as it makes sure that consumers of CI can protect themselves via primary remedies.

In Switzerland, state liability for CI has very different downsides from Germany. Since there is no liability privilege for the state and negligence is not required, state liability is very strict in principle. Due to the heavily criticized objective illegality theory applied by the Swiss Supreme Court, sometimes a violation of a duty of care is not even required for state liability which is problematic. The state may be liable for damages based on controlled or approved safety risks, even if there was no violation of a duty of care. This result is clearly not desirable.[57] It tantamounts to an absolute state liability.[58] The state control resp. the state approval itself becomes a liability risk. This sets a wrong incentive for the state, since the control or approval process of the state aims at avoiding unnecessary risks.[59] All in all it can be said that the state's position is changing for the worse if it gets involved in the protection of CI. If the state does not take any preventive measures for CI, it is not liable, as long as it does not violate a specific duty of care. If, however, the state has built works or plants for protective reasons, and if these have shortcomings, or if the state has set itself specific CI duties, then it is liable.[60] These chilling effects should be avoided. When those effects (i.e. taking measures that merely aim at avoiding liability, but in fact decrease social welfare) exist, there may be arguments for a more restrictive approach to the liability of public authorities. A public authority often acts as a multitask agent who should have some discretionary power to balance various external costs in an appropriate manner without having to fear liability. A more restrictive approach to state liability also makes sense from a risk-based approach.[61] It is not always right to conclude that, just because a risk could have been prevented, it should have been prevented. This could be counterproductive: Entities might forgo a risk analysis out of fear of liability, if they recognize risks, but do not reduce them for cost reasons. Therefore, the reasonableness of the possible safety measures should be considered decisive.[62]

Furthermore, the application of the objective illegality theory does not give the state any room for judgment and discretion when dealing with catastrophes.[63] It ignores the fact that often in cases of damages to CI, quick decisions are required and there is a lot of time pressure on the state. Under this theory, illegality is approved even if the state has not violated a duty of care. Therefore, the illegality in state liability cases should only be accepted if the state has violated a duty of care.[64] Courts should change their case law. There should be no state liability without the minimum of a violation of a duty of care. There are arguments to go even further and demand that there should in fact be a partial immunity and only liability for gross negligence.[65]

IV. Proposals for Reform

There is a broad consensus that state liability is neither tailored to the special problems of CI provision, nor to the changing role of the state after privatization of many CI industries and the growing use of

57 Bernhard Rütsche, "Staatshaftung für bewilligte Sicherheitsrisiken – warum die objektive Widerrechtlichkeitstheorie nicht funktioniert", *Jusletter* of 4 April 2011.

58 Rütsche, *supra* note 57, at N 19-22.

59 Rütsche, *supra* note 57, at N 27.

60 Favre, *supra* note 47, at p. 12.

61 Hansjörg Seiler, *Risikobasiertes Recht – Wieviel Sicherheit wollen wir?* (Bern: Stämpfli, 2000), pp. 206 *et sqq.*, at p. 230 *et sqq*.

62 *Ibid*.

63 Favre, *supra* note 47, at p. 7; Swiss Federal Court decision BGE 119 Ib 208 Consid. 5b, 118 Ib 473 Consid. 7.

64 Rütsche, *supra* note 57, at N 22, 35 *et sqq.*; Swiss Federal Court decision BGE 123 II 577 Consid. 4d/aa.

65 Gerrit de Geest, *supra* note 41.

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PPPs in CI protection. In the following, we make some suggestions of how state liability may be understood in order to share responsibilities in a transparent way, while avoiding to shift the risks away from the state to CI providers (only) and onto the population. After shortly discussing the necessity of strict and clear delimitation of responsibilities of the many actors involved in CI provision (1.), we turn to three liability forms which we deem necessary for adopting state liability to the current system of CI: organizational liability (2.), supervisory liability (3.) and design liability (4.).

1. Clear Delimitation of Liabilities between CI Providers and the State

As Patricia Wiater and Christopher Bovis explain in their contributions to this special issue,[66] public-private cooperation is by now the norm concerning CI provision. But not all forms of cooperation are clear in who bears the risks for what and how liability is assigned if something goes wrong. This is especially true if there are no contracts or regulation, but only soft or unclear guidelines.[67]All risks associated with CI should be covered in either regulation or – better – in the respective contracts with the CI providers. Both of the contributions do not deal with supervisory liability – but since the production of CI is oftentimes privatized, the state may retain supervisory responsibility and potentially liability if there is a legal duty which has not been fulfilled especially in CI protection. It should be clarified how far supervisory liability goes and how it is interlocked with private liability of CI providers. Under a very strict state liability approach as in Switzerland (objective illegality theory), the state may even have supervisory responsibility without violation of a legal duty. In Germany, in contrast, although the alignment of liability is clear – the state escapes liability (1) because supervisory liability is in principle excluded due to a narrow understanding of the protective norm and (2) because state liability is excluded in case a private CI provider has also contributed faultily to the damage. Germany thus sets wrong incentives for the state unless there are special norms. We thus propose, first, clear assignment of tasks and liability for non-fulfillment and second, if several actors have contributed to a damage, several liability according to their contributions which need to be defined clearly ex ante. Only this way can the "problem of many hands" be mitigated.

2. Organizational Liability of the Administration

The problem of murky task distribution and the resulting risk shifting is well known from organizational theory. Blame games are common.[68] Furthermore, responsibility shirking to avoid punishment is a strong motive for delegating a decision right.[69] Failures of government and of governance, including a clear allocation of tasks and competences, demand a better design of processes of organizational responsibility, including those between different state agencies with responsibilities for CI (inter-agency responsibility) and within an administrative agency dealing with CI (intra-agency responsibility). Organizational failure needs to be tackled and might lead to liability for CI non-provision or non-protection. Furthermore, depending on the country, although formal privatization has taken place, many CI providers are still (majority) owned by the state.[70] This has consequences for state liability as well: The state may still be liable as a CI provider, including for organizational failure (as was the case in the Überlingen accident where Skyguide, the responsible air traffic control firm in Zürich, had insufficient personnel).[71]

As we have seen, in Switzerland the state liability is based on a strict liability model. The reason for this strict liability model may well be that the cause for damages is primarily based on organizational responsibility within the administration.[72] Omissions. especially in the organizational sphere, may lead to liability in Germany and in Switzerland, especially if the

66 See the articles of Patricia Wiater, "On the notion of 'Partnership' in Critical Infrastructure Protection", and Christopher Bovis, "Risk and Public-Private Partnerships", in this issue.

67 See Wiater, *supra* note 66, part II.

68 Christopher Hood, *The Blame Game. Spin, Bureaucracy, and Self-Preservation in Government* (Princeton/Oxford: Princeton University Press, 2011).

69 See for experimental evidence, Björn Bartling and Urs Fischbacher, *"Shifting the Blame: On Delegation and Responsibility", 79 Review of Economic Studies* (2012), pp. 67 *et sqq*.

70 E.g. the Air Traffic Controller Skyguide in Switzerland (majority state owned) and the Air Traffic Control in Germany, completely state owned.

71 Cf. LG Konstanz, *supra* note 11.

72 E.g. Verantwortlichkeitsgesetz, *supra* note 34, Art. 19.

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duties are mentioned in the respective law.[73] Also, insufficient personnel in times of catastrophes can constitute a violation of an official duty. Surely, there must be a violation in the exercise of discretion[74] as well as socially adequate causality to lead to liability.[75] Duties of the state should be mentioned explicitly and in a detailed manner in the respective laws. The clearer the organizational duties are, the more this enhances incentives and the more legal predictability of liability for the state, the victims and potential CI providers is guaranteed.

3. Supervisory Liability

Next to the genuine responsibility of the state, including as a CI provider, the role of the state in CI production has shifted more and more to supervisory tasks and thus also to CI protection via supervision. In order to supervise, information is needed. In CI constellations, the state needs to request information from the CI providers or incentivize them to reveal information. This information can be general information, like risk assessments and a formulation of the risk appetite of the firm (as e.g. in banking), which is then controlled for by the supervisor inter alia via visits. Also, the supervisor may adjust the company´s plans if the risk appetite is too high (e.g. because CI externalities are not taken into account). Ad hoc information needs to be revealed, e.g. if certain disturbances happened, as in IT infrastructure. However, it is often not in the interest of the provider to reveal information to the supervisor due to the risk of getting punished. Supervisory responsibility thus demands smart solutions. One model is not to punish each case of breach, but to have everybody collaborate in learning to find better solutions and make CI safer.[76] So, if the provider reveals a weak link, the revelation should not get punished. Competition law may serve as an example: In a lot of jurisdictions the violator who blows the whistle will not get punished or will get a reduced fine.

Hitherto it is easy to escape from state liability in these constellations: Primary fault lies with the supervised CI provider and in Germany this even excludes any state liability via § 839 I 2 GCC. But is this satisfactory? If the supervisory duty is not fulfilled by adequate information request and handling, state liability should, in our view, be possible. The burden of proof should in this case be shifted to the state that it has used best practices to gather information from CI providers. Hiding behind insufficient information should be impossible – and a traditional gateway to circumvent liability closed. The state would need to show that it did not neglect available information and expertise and made reasonable effort to make such expertise and information available.

4. Design Liability

A failure of CI may well be due to the structure of the organization and its relationship to other organizations (state or private). Design is prospective and thus investigations into responsibility for past outcomes need to serve as a guide for making changes to clarify responsibility for future outcomes and future oversight. Monitoring, learning and reforming the structures is no less important than assigning responsibility for outcomes;[77] failure to do so may well lead to liability. Furthermore, design responsibility of the state demands putting into place structures which allow for detection of and rapid reaction to problems with CI. This would e.g. entail not only a hierarchical design in which all information is gathered by the state (vertically), but the state needs to connect the different CI providers horizontally in a network in order to make the system more resilient. Failure to provide the connection possibility (so to speak a "second order CI") may result in design liability. Those duties should be stated in the law in order to clarify where the risk of non-fulfillment lies, as is the case with other design features of CI. Germany would need to get rid of § 839 I 2 GCC, which has long been heavily criticized in the literature for being obsolete and

73 BGHZ, 27 January 1994 - III ZR 109/92, para. 24. § 8 sent. 1 HKatSG states that the agencies have to guarantee an efficient protection against catastrophes.

74 BGHZ, 15 February 1979, - III ZR 108/76 -, BGHZ 74, 144, 156; permanent legal practice. This should also be an absolute requirement under Swiss law, contrary to the current jurisdiction of the Swiss Supreme Court under the objective illegality theory.

75 For Germany: BGHZ, 21 October 2004 - III ZR 254/03. For Switzerland: Wildhaber, *supra* note 36, p. 410 *et sqq.*; Bern Association of Administrative Jurisdictions, 18.3.2004 (VGE 21 657/VGE 21234), (BVR/JAB, 2005) at p. 3, consid. 5.

76 This is e.g. practiced in the IT industry for open source software. See on the embeddedness and thus crucial function of IT technology as a CI sector for all other CI sectors, Luiif and Klaver, "Governing Critical ICT: Elements that Require Attention", in this issue.

77 For details, including case studies from the US, where design responsibility was faulty, see Thompson, *supra* note 8.

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setting wrong incentives. If the state (a) does not create a network structure, and (b) does not make sure that it works efficiently between the CI providers, it may fail to have its duty fulfilled and be held liable.

Another design responsibility may consist of the failure of the state to help private insurance solutions, since the most reliable protection against financial damages deriving from CI are private insurance solutions.[78] The insurance supply is limited, however, because damages deriving from CI are difficult to calculate and therefore constitute a challenge for insurances.[79] Only few CI risks are currently insurable. CI fundamental knowledge is improving and CI protection and management is becoming more professional. The state is often supporting the insurance systems concerning CI by assuming some of the risk,[80] thereby mitigating market failure. This may be reasonable if the supply of voluntary insurance protection gets improved. However, when intervening into the insurance market, the State has to be careful. State intervention should neither generate insurance demand where there would not be any demand with a risk-adjusted premium. This may have a counterproductive effect by increasing risk, particularly in areas prone to flooding.[81] Nor should state intervention lead to a one-sided subsidization of particular industrial branches, for example the nuclear energy industry.[82]

Furthermore, design responsibility includes prevention. One prominent example are zoning laws. Nowadays, the building activities of mankind have often extended into unsuitable areas due to moral hazard (expecting compensation from the state),[83] due to rationality failures of the builders (over-optimism) or due to false security pretended by building permits given by the state. It may not be reasonable to rebuild CI in the same place once there has been damage to it. Knowledge about natural risks impacts on land use planning and may lead to a limitation or ban of use. Property owners may have a right for material expropriation.[84] They may also have state liability claims if there should have been a ban or limitation of use.[85]

V. Conclusion

The current legal systems of state liability in Germany and Switzerland, used as examples of other countries´ systems, are unsatisfactory and not well adapted to the modern realities and exigencies of allocation of risks and liability in CI, which is characterized by privatization of CI providers, transnational risks and a changing role of the state. This leads to murky responsibilities with unclear risk burden and liability: An undesired outcome from a legal security perspective and thus an incentive and compensation perspective. This is even truer for Germany with its rather restrictive system of fault, strict handling of official duties and exclusion of liability in case of third private party contribution to the damage. This clearly sets wrong incentives for states and overburdens private CI providers.

In both countries, reform of state liability laws in the area of CI may be needed in order to adapt the law to the changing circumstances. We have discussed only a small part of those due to space restrictions. Another suggestion would be to have enhanced international cooperation since, especially in Europe, where CI structures are interlocked transnationally.[86] Although in the field of nuclear energy there are international conventions concerning liability of producers and states (though they can hardly be considered as "state of the art" examples of how an efficient liability regime should be shaped), a wide gap exists in other areas of CI. General international law is insufficient to allocate risks in CI provisions in a clear and predictable manner. Thus, the question of state liability for CI provision and supervision remains wide open, nationally and internationally. This article is a small contribution in a still under-researched field.

78 Göran Skogh, "Risk-Sharing and Insurance: Contracts with Different Institutional Implications", in Thomas Eger, Jochen Bigus, Claus Ott and Georg von Wangenheim (eds.), *Internationalisierung des Rechts und seine ökonomische Analyse. Festschrift für Hans-Bernd Schäfer zum 65. Geburtstag* (Wiesbaden: Gabler, 2008), at p. 297.

79 Wildhaber, supra note 36, p. 393 *et sqq*.

80 Wildhaber, *supra* note 36, p. 396 *et sqq*.

81 Stephen D. Sugarman, *Roles of Government in Compensating Disaster Victims*, Issues in Legal Scholarship 2007, p. 17.

82 Another paper in this special issue "Private Liability and Critical Infrastructure" critically discusses the nuclear liability conventions from that perspective, see Michael Faure, XXX.

83 See e.g. Louis Kaplow, "Incentives and Government Relief for Risk", 4 *Journal of Risk and Uncertainty* (1991), pp. 167 *et sqq*.

84 Bernhard Waldmann, *Entschädigung aus materieller Enteignung für raumplanerische Nutzungsbeschränkungen zum Schutz vor Naturgefahren?*, Sicherheit & Recht 2009, p. 159 *et sqq*.; Wildhaber, *supra* note 36, p. 405 *et sqq*.

85 Wildhaber, *supra* note 36, p. 410 *et sqq*.

86 See for details, Marjolein van Asselt, Ellen Vos and Isabelle Wildhaber, "Some Reflections on EU Governance of Critical Infrastructure Risks", in this issue.

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