

**PUBLIC AND PRIVATE REGULATIONS FOR THE
GOVERNANCE OF THE RISKS OF OFFSHORE METHANE
HYDRATES**

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INTRODUCTION

“The commercial development of offshore methane hydrates will necessitate planning for accidental risk.”¹ Due to the unique risks and hazards associated with offshore methane hydrates, it is unlikely that their development would begin without some form of ex ante risk governance, such as civil liability or regulations. To attain efficient governance, both public and private regulations should be considered as potential policy tools. This paper reviews the potential policy tools, and finds that both public and private regulations can be a part of a broader strategy to efficiently govern the risks and hazards of offshore methane hydrates.²

1. For a detailed introduction to the benefits and hazards of offshore methane hydrates, see Roy Andrew Partain, *The Application of Civil Liability for the Risks of Offshore Methane Hydrates*, 26 FORDHAM ENVTL. L. REV. 219 (2015) [hereinafter *Civil Liability for the Risks*]. The scientific, engineering, and technical benefits and hazards from the development of offshore methane hydrates were previously discussed in a context of sustainable development; see Roy Andrew Partain, *Avoiding Epimetheus: Planning Ahead for the Commercial Development of Offshore Methane Hydrates*, 15 SUSTAINABLE DEV. L. & POL. 16 (2015) [hereinafter *Avoiding Epimetheus*]; see also Erin Jackson, *Fire and Ice: Regulating Methane Hydrate as a Potential New Energy Source*, 29 J. ENVTL. L. & LITIG. 611, 629–32 (2014). For an introduction of similar issues as they impact polar regions in particular, see Magdalena A.K. Muir, *Challenges and Opportunities for Marine Deposits of Methane Hydrate in the Circum-Arctic Polar Region*, 32 RETFÆRD ÅERGANG 60, 63, 68–70 (2009) (discussing similar issues in the polar region).

2. Part of that broader strategy would be to apply a rule of strict liability under a system of private civil liabilities. For a detailed, yet non-mathematical, discussion on the models and arguments supporting the application of a rule of strict liability to the risks and hazards of offshore methane hydrates, see *The Application of Civil Liberty for the Risks*, *supra* note 1, at 219, 233, 237–46, 268–79,

This study first introduction offshore methane hydrates. It attempts to summarize the potential benefits and hazards that would be present if such developments were undertaken. Second, it discusses the role of public and private regulations and how standards might be set through the tool set of regulations. Third, the study discusses the reasons for, and advantages of, public regulation to govern the risks of accidents. Fourth, the study reviews the potential interactions of public regulation and private rules of civil liability. Fifth, the study examines the potential for private parties to advance private regulation to set standards and provide self-governance. Sixth, the study presents a discussion on the potential application of both public and private regulation to offshore methane hydrates. The study initially finds that the circumstances of offshore methane hydrates would benefit from both public and private regulation.

Finally, the study makes the following specific recommendations as to the optimal balancing of public and private regulation: complementary implementation of public regulations alongside a rule of strict liability, and a possible integration of additional private regulations.

I. THE POTENTIAL IMPACT OF OFFSHORE METHANE HYDRATES

The most important facts about methane hydrates can be summarized quickly. Offshore methane hydrates offer abundant energy and freshwater supplies to practically every coastal state in the world. Both developed and developing economies could be substantially impacted by the commercial development of offshore methane hydrates. Offshore methane hydrates, while providing those benefits, also serve as substantial carbon sinks for climate change policy makers. It is a policy trio of substantial benefits: water policy, energy policy, and climate change policy. But the downside is that the commercial development of offshore methane hydrates could unleash both cataclysmic and non-cataclysmic risks and hazards.

A. *Benefits of Offshore Methane Hydrates*

Methane hydrates are a potential source of both methane and freshwater.³ After the methane volumes are extracted, the methane can be converted expeditiously into routine natural gas for use as industrial and

293-98, 310-12. The lack of sufficient regulatory guidance has been explored in an international law context; see Roy Andrew Partain, *A Comparative Legal Approach for the Risks of Offshore Methane Hydrates: Existing Laws and Conventions*, 32(3) PACE ENVTL. L. REV. 101 (2015) [hereinafter *Existing Laws*].

3. *Civil Liability for the Risks*, *supra* note 1, at 220; *Avoiding Epimetheus*, *supra* note 1, at 19.

residential energy supplies.⁴ In addition, the extracted water could be used for consumer and agricultural purposes. As the methane volumes are extracted from the hydrate deposits, streams of carbon dioxide can be injected into the same hydrate structures to provide carbon capture and sequestration (“CCS”).⁵ The costs of extracting and producing offshore methane hydrates are dropping, and may become price-competitive with other energy sources in the near future; it may already be competitive with certain liquefied natural gas (“LNG”) prices.⁶

Alternatively, the methane can be combusted on-site to generate electricity and the exhaust therefrom can be re-injected into the hydrate deposits for CCS. Or, the methane can be reformed with steam (created with extracted freshwater and heated with methane) to create hydrogen fuel.⁷ From methane fuels, to carbon-neutral electricity, to hydrogen fuel options, the commercial development of offshore methane hydrates could enable a wide array of green and greener energy options.⁸ In an era concerned with anthropogenic climate change, these are potentially exciting options.

Methane hydrates exist abundantly in many locations; almost every coastal country is expected to possess methane hydrate reserves.⁹ Methane hydrates can be found both offshore and onshore in arctic permafrost.¹⁰ Developed countries, such as Japan and South Korea, that do not currently possess strategic volumes of domestic energy supplies do possess substantial offshore methane hydrate supplies.¹¹ Many developing countries with no domestic energy supplies are expected to possess substantial offshore methane hydrate reserves. Those countries might also be interested in the freshwater co-produced with the methane hydrates to assist in their agricultural development and consumer freshwater needs.

The world has faced critical energy supply shortages since the dawn of the industrialization era. While not a perfect cure to that problem, the commercial development of offshore methane hydrates could enable local access to energy supplies and level the geo-political playing field of energy

4. *Avoiding Epimetheus*, *supra* note 1, at 225–26; *Avoiding Epimetheus*, *supra* note 1, at 19.

5. *Avoiding Epimetheus*, *supra* note 1, at 19.

6. *Civil Liability for the Risks*, *supra* note 1, at 229. The LNG comparison here is to spot prices seen in the recent decade in northeast Asia.

7. *Id.* at 230–31.

8. *Id.* at 226.

9. *Avoiding Epimetheus*, *supra* note 1, at 18.

10. *Id.*

11. *Civil Liability for the Risks*, *supra* note 1, at 224.

markets. The potential benefit to both lower energy costs and potential stability of supplies could assist global economic development.

B. Hazards of Offshore Methane Hydrates

The extraction and production of offshore methane hydrates is a “new thing under the sun.”¹² To extract energy supplies from under subsea mud layers will require innovative technologies and create new risks in offshore energy extraction.¹³ Previously, offshore operators feared methane hydrates as one of the most dangerous aspects of offshore drilling and in gas-pipeline transportation. There will be a lot of un-learning to accomplish as methane hydrates are increasingly seen as valuable energy resources.

Methane hydrates collect under mud layers in the ocean.¹⁴ The icy crystals are endothermically stable, in that they need extra energy to be added to their reservoir system before they will begin to disassociate and release the methane volumes from the hydrate structures.¹⁵ Left alone, they are and have been stable for geologically long time frames.

But scientists have found evidence that ancient earthquakes and landslides added that necessary energy to ancient hydrate deposits.¹⁶ When those events happened, earthquakes and tsunamis occurred, resulting in massive impacts on coastal flora and fauna.¹⁷ For example, the Mesolithic-era Storegga event sent tsunami waves 40 meters high directly into the coasts of Iceland and Norway.¹⁸ Such an event in modern times might kill millions of coastal dwellers and severely impact a broader radius of coastal communities.¹⁹

Major disruptions of the mudlayer and of the underlying hydrate deposits could enable massive and sudden disassociation of methane.²⁰ Given a sufficient release of methane, the methane can create a funnel, or chimney, which can enable the methane to be directly released into the atmosphere without first transmitting through the water column.²¹ Such a large emission of methane into the atmosphere could cause several problems. Methane itself is combustible and explosive; such an event would create a radius of danger preventing emergency crews from gaining

12. With obvious apologies to the author of *Ecclesiastes* 1:9 (King James).
 13. *Civil Liability for the Risks*, *supra* note 1, at 252.
 14. *Id.* at 225; *Avoiding Epimetheus*, *supra* note 1, at 18.
 15. *Existing Laws*, *supra* note 2, at 795.
 16. *Civil Liability for the Risks*, *supra* note 1, at 245–46.
 17. *Id.* at 270; *Avoiding Epimetheus*, *supra* note 1, at 22.
 18. *Existing Laws*, *supra* note 2, at 795.
 19. *Civil Liability for the Risks*, *supra* note 1, at 245.
 20. *Avoiding Epimetheus*, *supra* note 1, at 22.
 21. *Id.*

immediate access to the damage area. Such volumes could also potentially asphyxiate first responders. Finally, the emission of methane into the atmosphere would be a grave accident impacting climate change, because methane is considered substantially more dangerous than carbon dioxide for inducing climate change.²²

Are cataclysmic events likely? Probably not. However, until more data is acquired from better-developed offshore extraction projects, the risk might remain difficult to ascertain. However, given that methane hydrates are endothermic, and given the potential to measure the amounts of energy injected or placed into the hydrate deposits, it should be feasible to substantially limit black-swan-type events by setting standards to ensure that cautious energy budgets are enforced to prevent overstimulation of the hydrate deposits. Yet, given the complexity of the hydrate structures, given the limits of sub-mud-line surveillance, and given the complex marine interactions that will continue to exist from natural processes, it would likely remain impossible to prevent all cataclysmic events at offshore methane hydrate installations. Thus, whatever result standards emerge to address the risks and hazards of offshore hydrate accidents, there will remain a need to ensure that those standards contemplate how to address cataclysmic accidents.

Gentler events could also substantially impact adjacent coastal communities and the flora and fauna of the oceans where offshore methane hydrate projects enable methane venting or seepage to occur.²³ For instance, the preparation of fields for production involves a variety of drilling and vibration inducing activities; extraction may include various heating injections and flooding techniques,²⁴ and the depletion of methane or water volumes could cause hydrate bed collapses, which in turn could lead to structural problems.²⁵ Both the development and ongoing operation of offshore methane hydrates could lead to non-cataclysmic methane accidents. Given the many modes in which the hydrate deposits could become disturbed and begin to emit methane, the chance of non-cataclysmic venting and seepage is not slight. Rather, one might reasonably conclude that minor events could occur in most fields. But, such an event could lose its energy source, or be detected and addressed, and thus be an event of limited duration and impact.

Methane itself is a greenhouse gas and its constant seepage and emission could enable additional anthropogenic climate change to occur.

22. *Existing Laws*, *supra* note 2, at 796.

23. *Civil Liability for the Risks*, *supra* note 1, at 238–42.

24. *Avoiding Epimetheus*, *supra* note 1, at 18–19.

25. *Civil Liability for the Risks*, *supra* note 1, at 244.

Methane is also interactive with the biota of the ocean, both as a food stock for certain micro-biota and as a displacer of oxygen.²⁶ Methane can be digested and converted metabolically into carbon dioxide, which is another critical greenhouse gas.²⁷ The nuisance of emitted methane and carbon dioxide gas volumes, the potential interference with marine economies (such as fishing and tourism) and the general anxiety of living near a field of risk, could all be considered part of the harms and hazards of living near offshore methane hydrate projects.²⁸

The commercial development of offshore methane hydrate technologies would offer both risks and rewards. The needs of certain countries to achieve domestic energy supplies, to sustain economic development, and to potentially address parallel issues of freshwater supplies and of effective climate change policies, could encourage an earlier timeframe of development. On the other hand, there are substantial risks and hazards that challenge local communities affected by methane hydrate accidents and global communities impacted by climate change events. The risks and benefits need to be balanced by obtaining optimal levels of safety and extraction activity.

II. ON REGULATIONS

Regulations, both public and private, formulate and set standards so that actors can avail themselves of these standards *ex ante* to their decisions to undertake certain activities.

Both public and private regulations can enable incentives to affect the actor's conduct prior to incidents of accident or injury.²⁹ Regulations can define and include behavioral norms as part of their *ex ante* standard setting process. While rules of civil liability respond to injury and damages, regulations can respond to both injury and to risky behaviors without resultant injury. For activities where potential hazards might be extreme or irreversible, regulations could respond to faulty behaviors prior to an accident, whereas rules of civil liability would be limited to injunction-type remedies.³⁰

26. *Id.* at 246–47; *Avoiding Epimetheus*, *supra* note 1, at 20.

27. See Roy Andrew Partain, *Is a Green Paradox Spectre Haunting International Climate Change Laws and Conventions?*, 33(1) *UCLA J. ENV'T L. & POL.* 61, 65 (2015). Some marine biota can metabolize methane. *Id.* at 240; *Avoiding Epimetheus*, *supra* note 1, at 20.

28. *Avoiding Epimetheus*, *supra* note 1, at 23–24.

29. “[F]ines can be attached to norm breaking behavior, irrespective of whether losses have occurred, and/or harmful behavior.” Roger Van den Bergh & Louis Visscher, *Optimal Enforcement of Safety Law* 3–23 (Rotterdam Inst. Of L. & Econ., Working Paper No. 2008/4).

30. Van den Bergh & Visscher set out a temporally framed set of enforcement measures: (i) preclusionary measures, (ii) act-based sanctions, and (iii) harm-based sanctions. They demonstrated

Because regulations can be applied where civil liability rules might fail to be applicable or functional, some scholars have labeled “the public law approach as ‘the preferred approach.’”³¹ Yet, the general approach developed by Steven Shavell provides an analytic structure to evaluate when public regulations might be more robust than rules of civil liability.³²

Regulations generally offer a degree of due and deliberative processes that are provided to the public, before the engagement in a potentially risky act and potentially before the standards themselves are determined.³³ In contrast, civil liability offers rulemaking of an ex post type, generally by a small sub-section of the populace. To the general public the decisions of a court may appear *deus ex machina*.

Public regulations are argued to be effective because the standards can be based upon more information than might be available to the tortfeasor or victims, as the central regulatory body would have the resources and purview to make a more complete gathering of information.

Private regulations are argued to be effective due to the specialized knowledge that certain actors might have with regards to a certain activity. These regulations might arise from a group of actors directly engaged in undertaking the regulated activity, or they could arise from other private groups engaged in observing and monitoring these activities.³⁴

Historically, another aspect that influenced the general adoption of regulations by governments is the capacity to enforce the regulations. Most modern states contain the means of enforcement (at least the means to find culpability), to extract fees or taxes from those who fail to abide by the regulations, and potentially to incarcerate those offenders.

The set of reasons generally provided from a theoretical perspective are predicated in terms of the alternatives; “public enforcement appears attractive whenever the probability of punishment under a private regime

that regulations could provide policy tools at each temporal stage while rules of civil liability would be primarily limited to harm-based sanctions with some access to preclusionary measures *via* injunction type petitions. *Id.*

31. Michael G. Faure & Stefan E. Weishaar, *The Role of Environmental Taxation: Economics and the Law*, in HANDBOOK OF RESEARCH ON ENVIRONMENTAL TAXATION 399, 404–06 (Janet E. Milne & Mikael Skou Andersen eds., 2012) (quoting L. BERGKAMP, LIABILITY AND ENVIRONMENT (Kluwer Academic Publishers 2001)).

32. *See id.* at 404–06 (explaining that regulations are more effective for activities that will not result in liability suits).

33. Generally, most modern public states develop regulations within democratic or at least publicly deliberative processes, so that the nature and character of the regulations is coordinated with social awareness.

34. *See generally* Neil Gunningham et al., *Harnessing Third Parties as Surrogate Regulators: Achieving Environmental Outcomes by Alternative Means*, 8 BUS. STRATEGY & ENV'T 211 (1999) (examining the creation and implementation of private party regulations).

appears to be low,”³⁵ particularly if one allows the notion of ‘punishment’ to mean enforcement of damages to provide ex ante incentives.

Law and economics provide a framework for evaluating the strategic consequences of incentives from public actors onto the decisions and economic activities of private actors. Rational actors are assumed to exist, where the actors face choices and prices, and can make optimizing decisions.³⁶ When the markets provide actors with a complete data set (i.e. when the costs faced by the actor include all of the potential costs derived from the consumption of a given product), then the actor could make efficient decisions. But what if informational problems arise (e.g., a product’s costs to the actor did not include the costs of damages to others beyond the actor *cum* consumer), would efficient consumption decisions still be attained? Externalities are the economic phenomena that are transferred from a first actor to a second actor without economic consideration. The recipient is thus unable to provide cost or pricing information data back to the first actor.³⁷

Arthur Pigou suggested that negative externalities could be efficiently addressed by taxing an economic activity that creates externalities within the jurisdictional zone of a sovereign; thus, economic information could be provided to the first actor.³⁸ Pigou also suggested that by setting the marginal additional tax rate for an externality, equal to the marginal costs caused by the same externality, the economic producer of the externality would be driven to efficiently balance the utility of the externality against its welfare costs to the broader community.³⁹

R.H. Coase established his revolution on the idea that in the absence of transaction costs, such an effort would be unneeded because the parties on both sides of the externality would be able to efficiently negotiate the conflict to resolution.⁴⁰ He demonstrated that externalities are essentially a conflict of overlapping property rights.⁴¹ Furthermore, he used the existence of the conflicts, and their inefficiency, to demonstrate both that transaction costs were important considerations and how those costs impacted the need

35. Keith N. Hylton, *When Should We Prefer Tort Law to Environmental Regulation*, 41 WASHBURN L.J. 515, 519 (2001).

36. Alessio M. Paces & Louis Visscher, *Law and Economics – Methodology*, in LAW AND METHOD: INTERDISCIPLINARY RESEARCH INTO LAW 85 (Bart van Klink & Same Taekema eds., 2011).

37. *Id.* see also Van den Bergh & Visscher, *supra* note 29 (discussing optimal enforcement policies to address existing externalities).

38. Arthur Cical Pigou, *THE ECONOMICS OF WELFARE* 165–66 (Macmillan & Co. ed., 4th ed. 1932).

39. *Id.* at 166–67.

40. R. H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960).

41. *Id.*

for legal rules to assign certain initial conditions to better improve market efficiencies.⁴²

The literature on environmental torts (more broadly industrial torts that have broad and diffuse impacts on nature and social settings), supports the role of *ex ante* regulations to determine standards and to provide incentives to operators to efficiently balance risk and welfare by relying on those standards. Liability rules do offer one means of clarifying initial conditions for improvement of Coasian negotiations. However, regulations have long provided an alternative to liability in that they provide specific and more comprehensive allocations of rights and of duties than liability rules could offer.

Regulatory standards are also developed within the public sphere in a manner that is subject to greater public review than the judicial decisions of appointed judges or the thought processes of tortfeasors under strict liability. Statutes enacted by legislatures are explicitly under the operation of electoral representation and thus democratic in function. By extension, when legislative bodies appoint regulatory authorities to provide more detailed review and persistent oversight of the enacted legislation and detailed regulations, those activities remain within the governance of democratic organs. Much existing legislation contains explicit requirements of public participation of various forms in the drafting of legislation, plans, and proposals. Some environmental rules provide for public engagement in the regulatory review of private projects. Thus, regulations provide an alternative mechanism for collecting information across otherwise asymmetrical sources, and for enabling a democratic process to evaluate and value the various externalities by setting standards for optimal behavior with regards to the regulated activity.⁴³

III. PUBLIC REGULATION

Civil liability rule systems are at their root, merely systems. All systems have weaknesses and dependencies. Liability rules are no exception and require systemic stress analyses to understand where they may encounter operational difficulties.

42. *Id.*

43. No argument is made herein that such regulatory drafting processes are theoretically efficient, e.g., Kenneth Arrow demonstrated the difficulties of assembling a public utility function from diverse individual utility functions, nor is there any argument presented that such processes are free of lobbying and other regulatory capture strategies. The argument is simple put that at least more voices might be heard and that some form of public audit of the regulations can occur prior to their adoption, unlike the tort liability rules developed by judicial decisions. It is an argument to distinguish procedural aspects, not quality nor efficiency.

It has been argued that there is a fundamental shift in focus between the rules of civil liability and regulations.⁴⁴ Under the rules of civil liability, the tortfeasor retains the privilege to make an independent assessment of how to optimally prevent harm.⁴⁵ Strict liability rules provide incentives to avoid the incidence of harm. Negligence rules provide incentives to minimize the amount of damages paid to the victims of the tortfeasor's risky activity.⁴⁶ In a sense, the rules of civil liability motivate the tortfeasor to consider ex ante the future ex post costs of their activity decisions; those costs are predicated on ex post determinations of causation for negligence rules of preventative due care efforts. On the other hand, regulation appears to enable a regulatory body to determine ex ante specific standards of behavior for particular risky activities.⁴⁷

A. *Theory of Public Regulation*

Shavell found three criteria that suggested when liability rules might not be effective despite otherwise sound reasons for employing rules of civil liability: (i) information asymmetry where parties lack sufficient knowledge; (ii) insolvency risk; and (iii) effective absence of lawsuit threat.⁴⁸ Additionally, there are concerns about the institutional capacity of certain jurisdictions to efficiently and effectively govern via rules of civil liability.

Effective enforcement of civil liability is predicated on three issues: (i) the probability of the violation's detection; (ii) once detected, the probability of prosecution; and (iii) the probability of punishment once prosecuted.⁴⁹ Problems at any one or more of these stages can cause civil liability regimes to be frustrated. Public regulations are seen as potentially able to address those problems.⁵⁰

44. Michael Faure, *Regulatory Strategies in Environmental Liability*, in *THE REGULATORY FUNCTION OF EUROPEAN PRIVATE LAW* 129 (Fabrizio Cafaggi & Horatia Muir Watt, eds., Edward Elgar Publishing Limited 2011) [hereinafter *Regulatory Strategies*]; Michael Faure, *Designing Incentives Regulation for the Environment*, 5, 16 (Maastricht Faculty of Law, Working Paper No. 2008-7) [hereinafter *Designing Incentives*].

45. *Id.* at 140; *Designing Incentives*, *supra* note 44, at 12–3.

46. *Id.*; *Designing Incentives*, *supra* note 44, at 19.

47. *Id.*

48. See STEVEN SHAVELL, *ECONOMIC ANALYSIS OF ACCIDENT LAW* (Harvard University Press 1986) [hereinafter *ECONOMIC ANALYSIS*]; see also Steven Shavell, *Liability for Harm Versus Regulation of Safety*, 13 J. LEGAL STUD. 357, 359–63 (1984) [hereinafter *Liability*]; see also Steven Shavell, *A Model of the Optimal Use of Liability and Safety Regulation*, 15 RAND J. ECON. 271, 273–75 (1984) [hereinafter *Model of Optimal Use*].

49. *Id.*

50. *Id.*

1. Information Asymmetry

The concept of information asymmetry is that liability rules work as designed when the affected actors have sufficient knowledge to make accurate and rational decisions to achieve efficient levels of accidents. However, there are situations that lack that characteristic. For instance, the tortfeasor might not be informed of the existence of his victims, or might lack awareness of the extent of the damages caused by his accidents.

The standard model suggested a two-step problem: (i) A market failure results from incomplete supply of information; and (ii) A market failure could be corrected by regulation based upon a more complete set of information not present in the marketplace.⁵¹

There are multiple ways in which externalities could cause informational asymmetry. First, the transaction costs to resolve the externalities may be too large. In such cases, liability rules are likely to falter and may need the reinforcement of regulation by an agency that can better integrate the disparate sources of information and integrate them for socially efficient policy decisions. Second, the public purse is assumed, in general theoretical models, to be sufficiently larger than most private budgets, such that it can afford to gather a larger amount of relevant information to facilitate proper enforcement of a legal norm.⁵² Such a result might occur due to dispersed victims or due to each victim's injury being too marginal to justify investigatory costs.⁵³ Third, the central sovereign is generally seen as having better and more complete access to the whole set of related parties and the relevant data that they might bring to the administration of the legal norm.⁵⁴

Shavell proposed a rule to determine when a regulatory framework would be more efficient than rules of civil liability.⁵⁵ Rules of civil liability should be employed when the pairing of tortfeasor and victim have more information on the impacts of the risky activity. Regulation should be employed when a regulatory body might have a more complete set of information about those impacts.⁵⁶

51. See generally George J. Stigler, *The Economics of Information*, 69 J. POL. ECON. 213 (1961); see generally Alan Schwartz & Louis L. Wilde, *Intervening in Markets on the Basis of Imperfect Information: A Legal and Economic Analysis*, 127 U. PA. L. REV. 630 (1979).

52. Hylton, *supra* note 35, at 518.

53. *Id.*

54. *Id.*

55. *Liability*, *supra* note 48, at 359.

56. *Id.*; see also Van den Bergh & Visscher, *supra* note 29 (wherein an argument is further developed that even when private parties might have informational advantages, if the private parties' private interests and broader social interests were to not align, then private parties might lack incentives to take advantage of the civil liability mechanisms to recover damages. Thus, the informational concerns

This regulatory body need not be a governmental agency. A private agency might be able to collect the complete data set and share the data as needed. But the functional role of government provide it access to a broader set of data and participants than most other potential agencies.

An argument is presented that a regulatory body could avail to itself certain economies of scale that victims, or even certain operators, might not obtain. Certain risks and hazards would be better investigated by a singular regulatory body than by the general public, or by operators in the case of offshore methane hydrate activity. As such, there is a clearly defined role for a regulatory body to relieve certain informational asymmetries that are likely to exist for offshore methane hydrate facilities.⁵⁷

2. Insolvency Risk

Liability rules depend on the consequences of being financially responsible for the damages caused by an accident. To be financially responsible is included in rational decision making procedures. To the extent that a party is unable or unwilling to be financially responsible, liability rules will not work as designed.

Shavell demonstrated that the rule of strict liability loses its efficiency in the face of insolvency, whereas a rule of negligence more robustly retains its functionality.⁵⁸ Shavell also proposed that regulations would be more efficient than rules of civil liability when the expected costs from judgment damages were expected to exceed the wealth or capitalization of the tortfeasor.⁵⁹

Insolvency is the problem when, even if the tortfeasors could be detected, prosecuted, and punishments levied, they would still avoid consequences simply because they have insufficient capital to bear the fines imposed; it is a legal null.⁶⁰ As such, those insolvent tortfeasors have no economic incentives to avoid the accidents, or to achieve reasonable or efficient levels of precaution.⁶¹

need to consider not merely the sum of data but also the strategic outcomes of the data possessed by a party; public actors might act where private actors might fail to act).

57. An argument is not being made herein that a regulatory body would be better informed on all the risks and hazards, merely that it might be more efficient at transforming a more balanced set of information regarding all of the parties and thus be more efficient at developing the necessary standards.

58. Steven Shavell, *The Judgment Prof Problem*, 6 INT'L REV. L. & ECON. 45 (1986).

59. *Model of Optimal Use*, *supra* note 48, at 273 (explaining that when the tortfeasor's wealth or capitalization is expected to be in excess of the expected damages, the rules of civil liability would retain their efficiency).

60. Hylton, *supra* note 35, at 529.

61. *Id.*

There are several conditions to consider: (i) when the actor is insolvent; (ii) when the actor has some funds, but some of his liabilities would exceed that amount of funding; and (iii) when the actor takes legal steps to avoid liability judgments.

To the extent that an actor is genuinely insolvent or unfunded (case (i)), they will rationally not include the consequences of financial liabilities, as those liabilities will be undeliverable. The actor would behave as if the liability rule were not in place.

To the extent that the actor is incompletely funded vis-à-vis his potential liabilities (case (ii)), he will only respond to liability rules as far as his funding supports. Once the potential liability extends beyond that budgetary boundary, the liability rule will cease to be effective. This could occur either by limited funds on hand, or in the case of a corporation, by limited capital reserves prior to a bankruptcy or act of dissolution.

The third issue is raised when actors take on legal forms of organization to limit their exposure to liability risks. This is an avoidance strategy concept.⁶² Limited liability for certain forms of business associations can frustrate the functional purposes of liability rules.⁶³ One of the benefits of legal incorporation is that it provides limited liability; in essence, all corporations pose a type of insolvency risk.

Given that insolvency is a problem of insufficient capital to affect economic incentives,⁶⁴ it is important to recognize that the regulatory body would need enforcement measures beyond cost-driven measures.⁶⁵ Laws that operate to reduce avoidance capacity, laws that criminalize or otherwise penalize the tortfeasors, or laws that remove access to the underlying activity itself might be instances of such measures.

3. Underdeterrence: The Effective Absence of Lawsuit Threat

62. A famous example is the structures that O.J. Simpson had in place prior to the litigation for his civil lawsuit on the murder of his wife and Ron Goldman. While Mr. Simpson lost the case and was found civilly liable for their murders, he had transferred his assets out of his personal accounts to trust funds and similar vehicles. He had paid only a portion of the financial judgments entered against him, although he was able to sustain a comfortable lifestyle post-judgment. Patricia E. Dilley, *Hidden in Plain View: The Pension Shield Against Creditors*, 74 IND. L. REV. 355, 356–57 (1999).

63. See generally David E. Pierce, *Structuring Routine Oil and Gas Transactions to Minimize Environmental Liability*, 33 WASHBURN L.J. 76 (1993) (discussing ways for various actors in the oil and gas industry to avoid assuming liability status in oil and gas transactions).

64. Every corporation has a limited account of capital against which its liabilities are limited. Considering that most of the operators that would eventually develop offshore methane hydrates would likely be incorporated, this concern of insolvency is relevant to the choice of governing mechanism.

65. Steven Shavell, *Uncertainty Over Causation and the Determination of Civil Liability*, 28 J.L. & ECON. 587 (1985).

Rules of civil liability function to set standards of optimal behavior. Those standards will work effectively as incentives ex ante if there is an expectation on the part of the tortfeasor that some real and expectable ex post damages that will be assessed when harm or injury results from the tortfeasor's activity. When the fundamental element of the lawsuit to obtain those damages fails to be pursued, then a core mechanism of civil liability fails to operate.

Regulations can address these problems by (i) directly providing standard to potentially tortious activities ex ante, and (ii) providing information to the public to better facilitate the implementation of civil liability rules.

The effective absence of lawsuits seeking redress for injuries prevents the mechanism that transits ex post damages into ex ante incentives. That lack of ex ante incentives frustrates the efficient avoidance of accidents; an alternative mechanism is needed to provide the incentives to obtain the standards. In such events wherein lawsuits fail to be filed, Shavell demonstrated that regulations could be more efficient than rules of civil liability.⁶⁶ Regulations can directly provide the necessary standards; this setting of standards can be done ex ante to the onset of activity and thus provide the necessary ex ante incentives for the tortfeasor's decision making process.

While it might seem odd that regulations could function to facilitate the implementation of civil liability rules, an argument could be made that sometimes transaction costs could prevent or frustrate the proper litigation that would enable civil liability rules to function as designed. The activity of creating standards via a regulatory process and the gathering of necessary information by the regulatory body could alleviate the problems frustrating the implementation of civil liability rules.⁶⁷ The missing information could be made public and therefore reduce the transaction costs of litigation for rules of civil liability. By facilitating the transaction costs or by fixing missing markets, regulations can either provide for the subsequent prosecution of private litigation or provide public enforcement to the same ends.⁶⁸

The central notion to liability rules is that they provide a plea for bringing an injury to court for resolution; if that process is unlikely to occur then the effectiveness of the liability rule is diminished.⁶⁹ To the extent that

66. *Model of Optimum Use*, *supra* note 48, at 273–75.

67. Hylton, *supra* note 35, at 517.

68. *Id.* at 518.

69. *Liability*, *supra* note 48, at 363; *see generally* William M. Landes & Richard A. Posner, *Tort Law as a Regulatory Regime for Catastrophic Personal Injuries*, 13 J. LEGAL STUD. 417 (1984).

such a problem is foreseeable, the liability rule will provide little to no incentive to achieve an efficient level of accidents. If the liability rule is inefficient, then regulations or other means may be called for to ensure a socially optimal level of safety and accidents.

Shavell identified three major sources of underdeterrence:

- i. Disparate Plaintiffs: When injuries are spread across too many plaintiffs, then their individual injuries and expected awarded judgments might be too small to justify the individual transaction costs of litigation.⁷⁰ This result is adverse to the community, wherein the sum of the injuries would have justified the transaction costs of litigation as a single case.
- ii. Lack of Evidence: The passage of time can enable the loss or lack of evidence to prevent bringing a case to trial.
- iii. Missing Parties: The passage of time can enable the loss of either the tortfeasor or the victim by death, disappearance, or in the case of a corporate tortfeasor, dissolution.⁷¹

Another well documented economic logic for why cases might fail to be brought forward is that the establishment of a causal linkage between risky activity, tortfeasor and victim, and the specific injury suffered may be difficult to establish, especially for many environmental injuries.⁷²

Injuries might be related to chemicals dispersed into the environment, such as toxins or greenhouse gases. While the direct effect of certain chemicals may be scientifically sound, the causal connection between a particular emissions source and specific injury could be difficult to prove.⁷³ In some instances injuries require time to develop. In such cases, the

70. Environmental and industrial injuries to individuals are often spread across a wide area and may only provide marginal injuries to the individual but cause community level harms. After the victims realize that they are injured, it might not be readily apparent that other parties are also similarly injured. Assuming that any litigation would bear at least a *de minimis* cost burden, many potential plaintiffs might evaluate their particular injury in isolation and decide to forego litigation due to the expected benefits of litigation being less than the costs. In that case, they might also decide to forego additional search costs to identify other co-victims who could have shared the costs of litigation.

71. *Liability*, *supra* note 48, at 363.

72. See Landes & Posner, *supra* at note 69; see also Howard C. Kunreuther & Paul K. Freeman, *Insurability, Environmental Risks and the Law*, in *THE LAW AND ECONOMICS OF THE ENVIRONMENT* 302 (Anthony Hayes ed., 2001).

73. *E.g.*, the U.S. Supreme Court has decided to avoid all climate change related tort cases on precisely such grounds. See *Native Village of Kivalina v. Exxon Mobil Corp.*, 133 S. Ct. 2390 (2013) (showing that the U.S. Supreme Court denied writ of certiorari, which affirms the 9th Circuit Court decision in *Native Village of Kivalina v. Exxon Mobil Corp.*, 696 F.3d 849 (9th Cir. 2012)); see also Roy Andrew Partain & Sang-Hyun Lee, *Article 20 Obligations Under the KORUS FTA: The Deteriorating Environment for Climate Change Legislation in the U.S.*, 24 *STUD. AM. CONST.* 439, 449–57 (2013) (discussing *Native Village*).

tortfeasor may no longer exist within the jurisdiction or at all. In liability litigation, such issues could raise problems with both standing and transaction costs.

Hans-Bernd Schäfer and Andreas Schönenberger observe that not all parties will bring litigation when standing would otherwise exist.⁷⁴ In that event, the tortfeasors under both rules, negligence and strict liability, would not expect to pay for all of the damages that the rules call for.⁷⁵ Thus, the tortfeasors could adopt a higher risk profile with the assumption that only a percentage of the harms would translate to actual judgments against them. In such a case, they argue that punitive damages can serve to fill the gap of missing litigation and ensure that tortfeasors are liable for the full extent of the tort rules damages.⁷⁶

A potential reason for certain plaintiffs to bring suits to recover damages is that their injuries might be non-pecuniary in character. Non-pecuniary injuries are those injuries that do not have immediate market valuations; this leads to difficulties using economic incentives under the standard civil liability models. For example, one can lose a car or economic uses and seek specific damages in the complaint, yet one may have difficulty valuing loss of companionship or enjoyment of undisturbed nature in a complaint. These difficulties increase the transaction costs of litigation for all parties because non-pecuniary injuries often call for novel approaches to compensation or remedy.

4. Institutional Capacity

Superior institutional capacity to detect, prosecute, and provide for the punishment of tortfeasors is seen as a key advantage of regulatory rules over civil liability rules.⁷⁷ The overall liability rule system needs to accurately identify externalities and determine their quantitative impacts prior to assigning those damages to a party. The government is generally assumed to have greater financial and human capital than private actors.⁷⁸ The underlying damages need to be assessed in objective monetary terms to enable replacement or compensation in proportion to the damages.

The concept of a judicially determined liability system requires the judges to have access to adequate levels of information as to the costs and

74. Hans-Bernd Schäfer & Andreas Schönenberger, *Strict Liability versus Negligence*, in *ENCYCLOPEDIA OF LAW AND ECONOMICS* 604–06 (Boudewijn Bouckaert & Gerrit De Geest eds., 2000).
 75. *Id.* at 605.
 76. *Id.* at 606.
 77. Hylton, *supra* note 35, at 529.
 78. *Id.* at 519.

benefits of the event and its externalities. If that information is not delivered to the judges, then several problems can result. If the tortfeasor is expected to take into account the actual costs of damages when liable under either strict liability or negligence, then an inaccurate judgment will cause the tortfeasor to choose an inefficient level of activity or level of caution. In a strict liability framework, underestimation of the costs of damages will result in excessive engagement in the hazardous activity or an insufficient level of caution.⁷⁹

B. Governing Offshore Methane Hydrates with Public Regulations

1. Information Asymmetry and Offshore Methane Hydrates

Shavell stated that if the tortfeasor and victim have more information, then civil liabilities would manage the risks more efficiently. However, if a regulatory body has more information, then regulations would be preferred.

The fundamental task of regulations is to set standards. Therefore, sufficient information is required to determine the standards and specifications. The question of information asymmetry engages two questions: (i) is there an incomplete supply of information that could prevent proper function of civil liability rules; and (ii) Could a regulatory body provide a cure for that problem?⁸⁰ There would likely be a potential information-processing problem for the potential victims exposed to methane hydrates. The first problem is that victims might not self-identify as victims before an accident because it may be difficult to determine the radius of harm before an actual event. As such, they would be unlikely to appropriately invest in learning about offshore methane hydrates or its risks. Also, some victims may not be able to process the scientific content or the voluminous data that might be required to develop functional understandings of the potential risks. Thus, even if information about the risks and hazards of offshore methane hydrates were publicly available, such information might not induce the efficient operation of civil liability rules to generate optimal standards. A regulatory body might need to process that data in order to better provide the necessary standards.

79. Robert Cooter, *Prices and Sanctions*, 84 COLUM. L. REV. 1523, 1540–43 (1984); see also Michael Faure, *Environmental Liability*, 1 TORT LAW AND ECONOMICS: ENCYCLOPEDIA OF LAW AND ECONOMICS 247, 252 (Gerit De Geest ed., 2d ed. 2009) (explaining that in strict liability systems, tortfeasors will not exercise the optimal standard of care without knowing the true amount of damages for their actions; they will either become overly cautious or overly careless depending on the economic incentive).

80. Discussion, *infra* § III.A.

The second problem is that although public investment in research and development allows more information to be available than private investment, potential informational asymmetries remain. As expected, the majority of offshore methane hydrate extraction activities would not only happen offshore, but also near or in the seabed. Ongoing operations would not be observable by the general public, thus potential victims would not be aware of critical developments that could impact the risk levels. It would also be undesirable for numerous visitors to observe local activities because that could place the hydrate bed at risk, frustrating the very purpose that the observations were meant to cure. A regulatory body could both collect relevant data and provide various means of publication without adding material levels of marginal activity to the hydrate beds.

The ongoing development of offshore methane hydrates will generate a lot of scientific data, which will likely need publication. A regulatory body could both act to ensure the quality and reliability of that data, and ensure its ready collection and distribution. But data is not directly useful for the average potential victim without some additional layer of translation. A regulatory body could ensure that updates to the status of field conditions and of potential dates of risk or precaution are available to the public.

While certain information be public knowledge, ongoing operations would continue to create new events of risk and ongoing needs of awareness and assurance for the general public. It would be inefficient and risky to permit the general public to privately engage in monitoring, thus the role for a regulatory body is essential.

2. Insolvency Risks and Offshore Methane Hydrates

Insolvency frustrates rules of civil liability because it limits the impact of negative financial incentives. An insolvent firm would not modify its behavior because it would not pay damages.⁸¹ An actor or firm needs to expect that its risky activities would cause insolvency in order to affect activity decisions before an event. Regulations can play several roles in addressing insolvency problems with offshore methane hydrate projects.

Regulations can set standards to both prevent insolvency in offshore operators and to address those scenarios where offshore operators are insolvent. First, they can require that prospective operators meet certain financial standards. Operators might need to establish certain financial bona

81. See a more complete discussion on the concerns regarding insolvency and the potential interfaces with both civil liability rules and regulation. *See* discussion, *infra* § V.

fides to demonstrate their history of being financially responsible to both investors and to recipients of legal judgments against the operators.

Second, regulations could provide standards to facilitate ongoing financial disclosures and audits to better monitor and prevent an insolvent operator of the methane hydrate field from operating. Parameters could enable the regulatory body to replace foreseeably insolvent operators with more financially secure operators.

Third, regulations could require that various financial and insurance tools be employed so that even unforeseeable events—that might otherwise render the tortfeasor suddenly insolvent—could provide sufficient financial means to prevent operational insolvency results. If the insolvency is not curable, such a regulation could delay the insolvency problem long enough to replace the operator as described above.

3. Underdeterrence and Offshore Methane Hydrates

It is perhaps with underdeterrence that regulations could be the greatest assistance ensuring the optimal levels of safety over the long life of an offshore methane hydrate installation. To the extent that rules of civil liabilities become underutilized, they would likely fail to optimally set standards. Regulations can be used to set standards for those scenarios where rules of civil liabilities would falter.

Shavell listed three primary sources of underdeterrence:

- i. Disparate plaintiffs,
- ii. lack of evidence, and
- iii. missing parties.⁸²

Methane hydrate accidents are not likely to impact just one or two parties; they are likely to affect broad areas of ocean and large numbers of victims. While the potential for injury to certain victims might be sufficiently large to merit private and individual recovery, the costs of litigation against a very large operator might be prohibitive. Where feasible, a regulatory body could assist to flatten the playing field and better facilitate unified litigation. Regulatory bodies could also directly represent the victims (in individual lawsuits), when coordinated litigation becomes too complex to be effective. Additionally, individuals would not efficiently pursue the costs of investigation after a methane hydrate accident; a regulatory body might

82. See discussion, *supra* § III.A.

have the means to more efficiently inquire the important questions that would need revelation prior to litigation.

Methane hydrates are combinations of water and methane trapped in seabed layers of mud; they are about as ephemeral an energy supply as one might imagine. After a seabed eruption or landslide, there may be little left in direct evidence at the origins of the harmful events. Further, were methane volumes to erupt, they are explosive and could severely damage local installation facilities. If tsunamis or similar large-scale disturbances take place, large areas of nearby record-keeping facilities might also be lost. This assumes that the cascade of events is within a short time frame; it might be that the chains of causal events were decades slow to unzip and that much of the evidence might have been obscure for years prior to the harmful events. As discussed at section III.A.1, there are many things that a regulatory body could do to collect and ensure the retention of relevant data from the field and its occupants. Thus, there is a clear role for a regulatory body to prevent and ameliorate the problem with the lack of evidence.

Further, it is quite possible that after certain cataclysmic accidents, a number of victims may simply become untrackable or lost. Seaside villages might be swept away. However, the more banal issue is that the fields are likely to be operated for multiple decades, and the post-operational plugging and abandonment phase might need much longer periods of monitoring. Few operators are likely to remain in place for that long because field assets are routinely bought and sold. Likewise, operators themselves are subject to the same market forces as all other major corporations in that they are acquired, merged, and spun off over their lifetimes. Victims should also be expected to move in and out of the potential impact zones as the years go by.

Thus, it can be readily seen that Shavell's conditions are likely to be present in the operational and post-operational years of an offshore methane hydrate installation. Underdeterrence is likely to be a realistic problem that regulations could address more robustly than singular application of civil liability rules.

Offshore methane hydrate installations might be operational for many decades. Potential onshore victims would move in and out of the zone of hazard over those years. Acts in early years might accumulate over time with later acts to create hazards and harms not readily detected at either time period. The risky activities of today might not impact victims until many years later. Those present at the event of the risky act might not be the victims present at the time of the injury. Thus, there are substantial coordination problems that might need to be addressed as offshore methane hydrates are developed and produced.

Furthermore, as Schäfer and Schönenberger stated, if there were to be a risk that some victims would fail to bring lawsuits, then the tortfeasors would logically assume more risk.⁸³ In that case, regulations could act to fill the gap to provide standards that would have otherwise been provided under rules of civil liabilities. With offshore methane hydrates, the scale difference between the financial and technological capacities of the operators and the potential transaction costs might cause routine victims to hesitate in their pursuit of litigation. In the face of non-cataclysmic accidents, for example a fisherman might need the assistance of a regulatory body if he uses a traditional fishing area due to methane venting from the seabed. Also, due to the scientific complexity of a variety of the potential interactions, many of the potential non-cataclysmic accidents and harms might escape direct notice by the victims. Again, a regulatory body might be better resourced to detect and pursue remedy with the operators.

4. Institutional Capacity and Offshore Methane Hydrates

Many of the expected locales of offshore methane hydrates are developing countries with limited resources to support rules of private civil liability.⁸⁴ While public resources to support public regulations might also face fiscal limits, it might be reasonable to expect that the public authorities would often possess educational and financial advantages to private agents of accident victims. Public authorities would be capable of superior capacity to detect, prosecute, and provide for the punishment of tortfeasors related to an offshore methane hydrate accident or its resultant harms and damages.⁸⁵

Many types of damages that might result from offshore methane hydrate accidents might be difficult to characterize as specific pecuniary losses or might lack appropriate replacement options. This would be all the more certain in the case of cataclysmic damages. As such, public regulation might offer a superior capacity to not only address potential compensation for damage questions, but also—and perhaps more critically—provide for ex ante behavioral norms, and the capacity to enforce those norms prior to the incident of harm. This would avoid or minimize the need for damages by preventing the harm prior to the accident. Thus, where institutional support of private civil liability rules is a concern, public regulations could both aid in the prevention of harms before they occur, and facilitate the

83. *See supra* § III.A.3.

84. *See supra* Section I.A; support at note 9.

85. Hylton, *supra* note 35, at 518.

address of extensive non-pecuniary damages and damages difficult or impossible to address with replacement.

The absence of either a developed insurance market for offshore methane hydrates or national plans of compensation for methane hydrate accidents makes unclear, what is the more efficient option. Such analysis must be deferred until more progress is developed with regards to potential compensation schemes.

C. *Problems of Public Regulation*

While public regulations can provide many solutions and can complement rules of civil liability, they also contain faults of their own. First, a short review of the basic functional problems of regulations is provided. Next, the problems of using the defense of regulatory compliance within a rule-of-civil-liability setting are discussed.

None of these problems are “show stoppers.” Rather, they are concerns that suggest that the use of regulation must be tempered with realistic expectations of their performance, and they reinforce the need for complementary implementation with civil liability regulation.

1. Why Efficiency May Be Lacking

There are several scenarios when the efficiency of regulation is lacking. First, regulations have historically tended to over focus on the prevention of “bad acts” instead of focusing on the attainment of targeted conditions.⁸⁶ This is somewhat to be expected because it was often the problem of emissions or spilling by the tortfeasor that would have gotten regulatory notice, not the idea of a more perfect environment. This is especially true if the regulatory design was to improve the function of a tort system in which the underlying roles included both compensation for damages, and punishment for tortious acts.⁸⁷

Second, the actual operations of regulations, when applied to large populations, require major capital expenditures.⁸⁸ Funds must be spent to gather reconnaissance on activities, monitor potential tortious conduct, evaluate potential injuries, integrate that collection of data into enforcement

86. Michael Faure & Stefan Ubachs, *Comparative Benefits and Optimal Use of Environmental Taxes*, 1 CRITICAL ISSUES IN ENVIRONMENTAL TAXATION: INTERNATIONAL AND COMPARATIVE PERSPECTIVES 27, 41, 45 (2003).

87. Also, this follows a pattern from criminal law, in that the regulatory body focused on the prevention of acts that hurt the public welfare instead of focusing on how to improve it.

88. Tom H. Tietenberg, *Invisible Toxic Torts: The Economics of Joint and Several Liability*, 65 LAND ECON. 305, 316 (1989).

decisions, and enforce. Tom Tietenberg and Lynne Lewis presented a balancing problem: policy effectiveness must be counterbalanced against the costs of the policy.⁸⁹ If the regulatory goals were too tightly defined, then the social costs of enforcement would run too costly; if the regulatory goals were too loosely defined, then the social costs of the damage from failed policies would be too costly.⁹⁰ It is implied that the social planner needs to minimize the combination of the costs to establish efficient regulations; but that recognizes that regulations are not likely to become completely successful because they would face ever higher costs as the policy goals grew stricter.

Third, regulatory standards often fall short of the level of rigor needed to provide the full set of corrective incentives that could optimally reduce accident risk and hazards.⁹¹ In such cases, full regulatory compliance would still leave excess risks in the community, reducing net welfare.

Fourth, regulations provide a jurisdiction-wide standard. That standardization is part and parcel of their appeal. However, that same standard setting prevents the attainment of decentralization and thus prevents the individual tortfeasor from efficiently reacting to its own marginal costs of precaution.⁹²

Fifth, following the third argument from above, regulations set low standards to enable innovation to become static. Regulations work by requiring parties to comply with the standards. Rarely are there incentives to perform higher than mere compliance. To profit-maximizers, such as corporations, over-compliance with a regulatory framework would be costly and wasteful. A condition results where insufficient incentives fail to motivate tortfeasors to modify their activities to optimal precaution and activity levels.⁹³ Thus, an excess of accidents would be likely to result.

Finally, the drafting and creation of regulations is burdened with complex transaction costs. The problems to be regulated must be identified and studied, and various interest groups must be brought together in order to result in a final set of regulations. Once that investment is made, it is not likely to be repeated. Thus, regulations become sticky.⁹⁴ But underlying

89. TOM H. TIETENBERG & LYNNE LEWIS, ENVIRONMENTAL AND NATURAL RESOURCE ECONOMICS 42 (Prentice Hall 9th ed. 2011).

90. *Id.* at 49.

91. *Designing Incentives*, *supra* note 44, at 26–27.

92. *Id.* at 27.

93. *Id.*

94. See Steven Shavell, *Sharing Risks of Deferred Payment*, 84 J. POL. ECON. 161, 161–62 (1976) (addressing the theoretical origins of stickiness in a discussion on insurance contracts over long time periods). Stickiness is related to a variety of phenomena, primarily the complex interactions of various transaction costs that prevent more continuous adjustments to pricing/cost data over time. In this

technological development might continue and the problems facing the victims might change. Rules of civil liability, the rule of strict liability in particular, are more efficient at adjusting to “state of the art” preventative means and to efficient activity level determinations. Further, there appears to be a risk of path-dependence⁹⁵ in regulations. Rules of civil liability might better retain the possibility of more diverse pathways of innovation.

2. Regulatory Compliance as a Defense From Liability

In a negligence rule there is no fundamental requirement that the duty of care is in any way connected to compliance with a regulatory regime. A court could simply find two disjoint systems. Some courts have found that the failure to comply with regulatory norms becomes a form of per se negligence and that the regulatory rules support some de minimis norm of duty of a necessary but perhaps insufficient level of care. On the other hand, some courts have found regulatory compliance to function as sufficient indicia of a met duty of care; this is called a “defense of regulatory compliance.”⁹⁶

The concept of regulatory compliance as a defense to liability is less positively viewed by the literature. It has been rejected by many legal systems for many reasons.⁹⁷ Regulatory standards are often set as minimums. Therefore, the enabling of a regulatory compliance defense resets the liability rule from strict liability to negligence with a defined level of care.⁹⁸ A defined level of care is likely to omit many potential events, but an otherwise undefined duty of care is not.⁹⁹

study, regulations are discussed as a form of technology and the choice to adopt up-to-date technologies is affected so that the choice of technology becomes sticky, the regulations are not frequently updated.

95. See W. Brian Arthur, *Competing Technologies, Increasing Returns, and Lock-In by Historical Events*, 99 *ECON. J.* 116, 116, 127 (1989) (a seminal paper on path dependency on effects of technological choices).

96. Michael Faure & Roger Van den Bergh, *Negligence, Strict Liability and Regulation of Safety under Belgian Law: An Introductory Economic Analysis*, 12 *GENEVA PAPERS ON RISK AND INS.-ISSUES AND PRAC.* 95, 110 (1987); see Charles D. Kolstad et al., *Ex Post Liability for Harm vs. Ex Ante Safety Regulation: Substitutes or Complements*, 80(4) *AM. ECON. REV.* 888, 897–99 (1990); Paul Burrows, *Combining Regulation and Legal Liability for the Control of External Costs*, 19 *INT’L REV. L. & ECON.* 227, 242 (1999).

97. Michael Faure & Marike Ruegg, *Environmental Standard Setting Through General Principles of Environmental Law*, *ENVTL. STANDARDS IN THE EUR. UNION IN AN INTERDISC. FRAMEWORK* 39, 55–56 (Michael Faure, John Vervaele & Albert Weale eds., 1994).

98. *Liability*, *supra* note 48, at 365; see also Faure & Van den Bergh, *supra* note 96, at 111 (discussing strict liability and safety regulations); see also Faure, *supra* note 79, at 254 (postulating that if compliance with the regulatory standard released the operator from liability, the incentive to invest in more care than the minimum would be lost).

99. Burrows, *supra* note 96, at 244.

It has been formally proven that rational actors should respond to regulatory compliance defense rules by limiting their precautions to those required by the regulations even if more efficient levels of accidents lay beyond those requirements.¹⁰⁰ If such actors received the benefit of a regulatory compliance defense, and if their legal environment lacked counterbalancing rules of civil liability, then inefficient decisions on preventative care levels would likely result.

The regulatory compliance defense rule also presents a hazard of regulatory capture in which the operator has an incentive to limit both the completeness and enforcement levels of the regulations.¹⁰¹ This presents a *quis custodiet ipsos custodes* concern because additional measures might be required to monitor the civil servants impacted by such efforts.

Tort law, developed under the common law system, acted as a gap-filler for the limitations of regulatory efforts.¹⁰² No regulatory system is ever perfect, which means that some device is needed to maintain adaption to change and justice. The application of a regulatory compliance defense rule would eliminate the role for tort law, and leave the overall system more friable.

3. Potential Impact on Offshore Methane Hydrates

As noted above, public regulations traditionally focused on “bad acts,” miss their opportunity to focus on the development and enforcement of preventative norms, rather than redressing ex post incidence of those “bad acts.” However, a primary goal of public regulations of risks from offshore methane hydrate developments could address behavioral norms ex ante. Regulations could squarely aim at the maintenance of positive behaviors and attainment of safety standards. Such regulations should not ignore other punitive aspects, but regulations for offshore methane hydrates should prioritize avoiding potential harms, not on punishing the events of harms.

Other concerns about public regulations are the potential costs of implementation including costs of monitoring, violation detection, and enforcement efforts. It may be difficult to connect the cost of regulations to appropriate beneficiaries to ensure efficiency at a public welfare level. However, for offshore methane hydrates, many—or all—of the costs of the

100. *Id.* at 238; Kolstad et al., *supra* note 96, at 888–901.

101. Michael G. Faure, Ingeborg M. Koopmans & Johannes C. Oudijk, *Imposing Criminal Liability on Government Officials Under Environmental Law: A Legal and Economic Analysis*, 18 *LOJ. L.A. INT'L & COMP. L.J.* 529, 560–61 (1996).

102. SUSAN ROSE-ACKERMAN, *RETHINKING THE PROGRESSIVE AGENDA* 123 (Simon and Schuster 1993).

necessary safety regulations might be borne efficiently by the operators and resource owners of the offshore methane hydrate projects. The logic is akin to that of strict liability or of the “polluter pays principle,” because those with the means of accident avoidance are best incentivized by the costs of harms and damages. The operators and resource owners would gain control of the revenues generated by the commercialization of the hydrates. This would allow optimal parties to bear the costs of the public externalities. Although the burden of regulation would prevent the development of offshore methane hydrates, perhaps such risky activities might not actually produce Kaldor-Hicks net welfare gains.¹⁰³ On the contrary, operators and resource owners might find it cost-competitive to invest in safety technologies and risk-reduction engineering studies to reduce the overall cost impact of alternative regulations.

A concern is that regulatory standards often fall short of the level of rigor needed to provide the full set of corrective incentives, so that even full regulatory compliance would still leave an excess of risk in the community, reducing net welfare. Environmental-impact-assessment-type efforts can ameliorate this concern. In the pre-development of offshore methane hydrates, it is advisable to broaden the outreach to include as many potentially impacted communities and individuals as possible, and the expected experts and governmental authorities. Both the U.S. and the E.U. contain sufficient Environmental Information Administration (“EIA”) tools to require operators to bear the cost, but many developing jurisdictions do not.¹⁰⁴

The development of offshore methane hydrates as energy resources will likely engage transboundary concerns. Public regulations could provide jurisdiction standards of preventative behaviors. Over time perhaps those norms could become multi-national.¹⁰⁵ However, such standardization efforts could backfire if the regulations are drafted in a manner inflexible to

103. See Stephen J. DeCanio, Presentation at the 2007 Leontief Prize Ceremony Tufts Univ. Global Development and Environmental Institute (Oct. 17, 2007) (discussing the Kaldor-Hicks principle, “which holds that a policy is socially desirable if the winners . . . are able to compensate the losers . . . that the losers are made whole, leaving something left over of the winners’ gains).

104. See Outer Continental Shelf Lands Act Amendments of 1978, Pub. L. No. 95-372, 92 Stat. 629 (1978) (codified at 43 U.S.C. § 1801) (containing “polluter pays” provisions); see also Council Directive 2011/92, of the European Parliament and of the Council of 13 December 2011 on the Assessment of the Effects of Certain Public and Private Projects on the Environment 2012 O.J. (L 26) 1, 3-4 (providing E.U. states with the tools to assess potential environmental harms).

105. While not exactly on point, there are international oil spill conventions and marine pollution conventions that do facilitate international standards of the type discussed herein. See International Convention on Civil Liability for Oil Pollution Damage, Nov. 29, 1969, 2340; see also International Conference on Marine Pollution: International Convention for the Prevention of Pollution from Ships, Nov. 2, 1973, 12 I.L.M. 1319, 1319 (stating the purpose is to “achieve elimination of intentional pollution of the marine environment”).

the individual technologies and capacities of different operators and local environmental circumstances. Decentralization of preventative costs and activities should remain a policy goal. Regulations, both domestic and multi-lateral, should be drafted with an aim to set standards of safety without becoming overly specific in order to balance the results of preventative planning with the cost-budgets, and to enable preventative activities and technologies.

It is also a concern that the drafting and creation of regulations is burdened with complex transaction costs. Those costs cause regulations to become sticky because policy makers have incentives to avoid paying those costs. Again, the desire to establish efficient norms of preventative care should be balanced against calls for excessive specificity, which could lead to regulatory stickiness. For methane hydrates, complementary public and private regulations might best address this concern. Public regulations could require private regulation to establish certain levels of preventative care with the proviso that the private regulations be subject to EIA-types of public inspection. Thus, for offshore methane hydrates, the certainty and enforcement of public regulations could be availed alongside the flexibility and innovation of private regulation.

Another concern is that regulations might set standards below optimally efficient levels. Additionally, the high transaction costs of drafting and adopting regulations often causes innovation to become static due to a lack of incentives. This concern is not wholly disjointed from the concerns raised in the second paragraph of this section on costs of regulations, nor disjointed of the EIA concerns raised in the third paragraph. In essence this concern is the intersection of those concerns, and would benefit from the strategies presented. However, perhaps the best strategy to address the problems here is to apply private civil liability in coordination with public regulations.¹⁰⁶

Similarly, regulatory compliance defense rules raise the hazard of regulatory capture. No doubt similar challenges would occur when drafting safety regulations for offshore methane hydrates if such a defense were allowed. Thus, it is advisable to carefully consider if such a defense rule should be retained for the application of regulations addressing the substantial concerns related to the risks and hazards of offshore methane hydrates. If an integrated strategy of complementary civil liability and regulations is pursued, the defense might prevent the benefits of the strategy because no additional liabilities would avail from civil liability due to the existence of the regulatory compliance defense option. Thus, this study

106. This strategy is developed, *infra* § V.

generally supports the strategy of complementary and integrated application of civil liability, public regulation, and private regulation. This study finds reasons to avoid the application of regulatory compliance defense rules for concerns related to offshore methane hydrates.

IV. PRIVATE REGULATIONS

This section will present a review of the theories on when private regulations can be efficiently employed to govern risks and hazards with an objective to determine if they could be applied to offshore methane hydrate projects. It will be demonstrated that private regulations could be efficiently applied to the risks and hazards presented by the development and operation of offshore methane hydrate extraction projects. Further, a discussion is presented that the application of private regulations should not be made in the absence of public regulation, but in complement to public regulation. Additionally, potential caveats of private regulation are reviewed.

A. *Standard Setting by Private Groups*

A key difference between rules of civil liability and public regulations is who sets the standards. In private regulations, a set of private actors who are expected to be uniquely well informed about the technologies, benefits, and potential injuries of a specific activity set the standards. These standards might arise as industrial norms,¹⁰⁷ as official rules of professional associations,¹⁰⁸ or as standards of recommended practices from industrial associations.¹⁰⁹ Such standards reflect the expertise of the practitioners within their relevant industries or technological specialties.

When it comes to regulating risks and hazards from industrial activities, a reasonable question to ask is who might have the best information on the actual risks and potential acts of precautions? One might expect that those most engaged in the activity would be well versed in such

107. See, e.g., *Technology Standards & Resources*, IEEE STANDARDS ASS'N, <http://perma.cc/5AS4-8KDU> (last visited Sept. 17, 2015) (illustrating where a private actor sets standards for industrial norms; here, standards for electrical engineering).

108. See, e.g., *AMA's Code of Medical Ethics*, AM. MED. ASS'N, <http://perma.cc/52D2-TXSF> (last visited Sept. 17, 2015) (listing and discussing the ethical rules adopted by the American Medical Association).

109. E.g., *Publications, Standards, and Statistics Overview*, AM. PETROLEUM INST. (API), <http://perma.cc/BUM3-S54P> (last visited Sept. 6, 2015) ("API works with leading industry subject-matter experts to maintain our inventory of over 600 standards and recommended practices.").

knowledge.¹¹⁰ Private regulation works on the assumption that the collective group of actors engaged in those types of activities would be well informed to determine best available practices and be able to respond to the most recent innovations. Private regulation also relies on the idea that the collective group of actors is incentivized to optimize the balance of their private profits and their duties to pay damages. However, combining knowledge sets beyond the individual tortfeasor, the collective group might be able to discover more optimal solutions.¹¹¹

However, private regulations do not need to be a collection of the tortfeasors, it could be based on another distinct group of parties similarly engaged in the issues of the activity.¹¹² Such groups have been referred to as “surrogate regulators.”¹¹³ They could be drawn from public interest groups,¹¹⁴ commercial third parties (such as green consumers or financial investors)¹¹⁵, insurance institutions,¹¹⁶ or environmental consultants.¹¹⁷ When this form of private regulation is co-integrated with public regulatory efforts then the approach has been called “integrated regulatory design.”¹¹⁸

Private regulation might be effective for methane hydrate projects and operators. The operator would face a private need to address its investors and shareholders to validate that it responsibly engaged in methane hydrate operations as a capital project to earn revenues and profits with an appropriate level of risk.¹¹⁹ Currently in offshore oil and gas operations, it is common for a group of energy companies to invest together in a common project and have one of those companies act as operator. The joint-venturers retain rights to inspect and audit the management and oversight of the offshore projects. As such, it is efficient for energy companies to have

110. The argument is not made here that such parties would be the *best* informed, but rather, only that such parties ought to reasonably be knowledgeable about such concerns. Due to the potential advancement of technology and related matters, and their likely involved role in that development, they might also be in possession of relevant information in advance of other parties such as regulators. See Faure & Stefan, *supra* note 31, at 404 (discussing liability versus regulation).

111. In this sense, it is not unlike the logic of strict liability, but it does impose the consensus result of the private regulation; that requirement to meet such a regulatory obligation could undo several advantages of strict liability such as decentralization.

112. Gunningham et al., *supra* note 34.

113. *Id.* at 212.

114. *Id.*

115. *Id.* at 214–17.

116. *Id.* at 217–18.

117. *Id.* at 218–19 (discussing the role of environmental consultants when assessing the environmental performance of firms).

118. *Id.* at 220.

119. It would be reasonable to assume that the operator and its board would have created internal incentives to better obtain such results. As such, it is reasonable to work with a rational model of a profit-seeking operator that would be responsive to economic incentives provided by the rules of civil liability or by either public or private regulations.

common standards across similar projects to enable both consistent training and to facilitate consistent audits as standards.¹²⁰ Conversely, private regulation arises in an integrated regulatory design where a collection of private but engaged groups could assist in the development and oversight of private regulations for offshore methane hydrates operations.

B. Nimbleness and Flexibility of Private Regulation

Private enterprise is more flexible than bureaucratic organs at adapting to change.¹²¹ This would be critical in an industry undergoing rapid technological innovation and development, especially if the expertise following such advancements required years of study and experience that would be difficult for new entrants to achieve. Bureaucratic organs are also challenged by requirements of due process and public deliberation, which private enterprises do not face. Thus private enterprises can process new information and reach decisions quicker.

One problem any nascent industry with innovative technologies faces is the speed at which lessons can be transformed into guidance and normative rule setting. Bureaucracies might be poorly staffed to respond to rapidly advancing technologies or they may lack funding or opportunities to investigate rapidly advancing technologies. Even executive branches of government that are more responsive to daily and short-term needs experience difficulty obtaining sufficient information to develop regulations without extensive support from those parties actively engaged in the development of the new technologies and their industrial uses.

One should expect no difference with regards to methane hydrate projects. It is foreseeable that the learning curve on safe practices and the development of preventative technologies will move quickly in the early years of the nascent offshore methane hydrate industry. It would be difficult for well informed and technologically competent public authorities to keep up with these improvements. It would be even more difficult to keep their regulations up-to-date for reasons explored in previous sections. It would likely be more efficient for the public authorities to monitor those private actors with access to the most up-to-date information, experience, and research to ensure that private actors are routinely improving and updating

120. *Publications, Standards, and Statistics Overview*, *supra* note 109. Therein lies the basis of the 600-odd "standards and recommended practices" maintained by the API. *Supra* note 119. Offshore contracts are thus able to refer to standards by their serial numbers enabling the ready inclusion of the standards without new negotiations at each project.

121. Anthony Ogus, *Rethinking Self-Regulation*, 15(1) OXFORD J. OF LEGAL STUD. 97, 98 (1995).

their standards. Additionally, public authorities could assist in the enforcement of those private regulations.

C. Informational Advantages of Private Regulation

The operator should already be aware of the costs and technologies involved in achieving the efficient level of accidents, in order to develop the new necessary standards cheaper than bureaucrats due to informational advantage.¹²² Additionally, the operator would need to bear its own costs of operations and maintain maximum profits from its investors and shareholders, so the operator will be bound to achieve both an efficient level of accidents and safety, and an efficient use of its capital resources.

It is likely that the operators will have better information than governmental actors on the technologies and best practices for efficiently operating methane hydrate projects.¹²³ In that case, it would be simpler, cheaper, and more efficient for the operator to develop the necessary guidance once that level is determined.

Additionally, if a group of operators could develop the procedures and some form of industry organization, private standards could potentially evolve and become privately enforced. For example, many oil and gas projects are joint venture projects with several operators invested, but managed and operated by a single specific operator. Another example is that when the operators ex ante agreed to certain standards and norms of operational procedures for a methane hydrate project non-operating investors would want the rights and permissions to audit to ensure that operators are indeed enforcing the agreed to standards and norms, and that their investments were soundly within planning guidelines. So long as the private regulations were acceptable to governmental and other agencies, those profiting from the ongoing operations of the methane hydrate project would bear the costs of enforcement and policing. This method of private regulation could potentially impact welfare for the operator and investors, the government *cum* regulator, and the public-at-large.

D. A Role for Private Regulation or Integrated Regulatory Design

There might be reasons to include private regulation or integrated regulatory designs alongside public regulation. Private regulations enable

122. *Id.*

123. Anthony Ogus, *Self-Regulation*, ENCYCLOPEDIA OF LAW AND ECONOMICS 587–602 (Aldershot et al., eds., 1999).

those possessing specialized knowledge on the risk activity to develop standards.

The ability of certain interested private actors to remain avant-garde is especially relevant when risky activities are highly novel and in a state of rapid innovation. Public regulations might not be able to keep up with the optimal standards as precautionary technologies and scientific understandings of the risks and hazards progress.¹²⁴ Also, where legal institutions are less likely to be able to process the technological or scientific challenges of the risky activity, it might be beneficial to address those risks with the assistance of private regulations.¹²⁵

For offshore methane hydrates, it is likely that both of the above conditions would be present in many of the hydrates locations. The technology and scientific understanding of both the means of production and of the potential risk and harms are likely to continue to advance quickly. It would be useful for the technology stakeholders to participate in developing the appropriate standards—if not exclusively through private regulation, then through mediated integrated regulatory mechanisms alongside public regulations.¹²⁶ The participation of parties beyond the operator might also be advantageous in setting standards; much of the leading expertise on offshore methane hydrates currently sits with university researchers and environmental observers.¹²⁷

The second use of private regulations would occur when offshore methane hydrates are developed in regions lacking historical experience in regulating offshore resources, or lack experience in administering regulations on high-tech but high-risk activities. In such scenarios, the operators might possess strategic advantages in the ability to set optimal standards and to ensure the exercise of those standards in relation to the local governments.¹²⁸ If governments in a developed jurisdiction in integrated regulatory mechanisms had engaged industry, then it is also possible that developing areas would indirectly benefit from the private standards set in the developed areas.

Thus, for the development of offshore methane hydrates, given its likely trajectory of innovation and its geographic diversity, private regulations could be implemented parallel to public regulations. Not only

124. See discussion on regulatory stickiness, *supra* § III.C.

125. Michael G. Faure, Morag Goodwin & Franziska Weber, *Bucking the Kuznets Curve: Designing Effective Environmental Regulation in Developing Countries*, 51 VA. J. INT'L L. 95 (210).

126. Gunningham et al., *supra* note 34.

127. *Id.*

128. See Discussion *supra* § IV.A.

operators, but also other private groups, could become engaged in a strategy of integrated regulatory mechanisms with a central regulatory body.¹²⁹

E. Perceived Caveats on Private Regulation

There are concerns about the capability of private regulation to provide fair and efficient regulation of risky activities: (i) industry needs to earn public trust; (ii) danger of weak enforcement; (iii) self-serving regulation, not necessarily in public interest; (iv) creation of barriers to entry; (v) uncertain legitimacy within democratic and open societies; and (vi) governmental limits and “conditional self-regulation.” History is full of examples of industrial groups failing to exercise due care—or at least levels of care that would have been socially acceptable to the rest of society. It would not be unfair to say that the rise of tort law in response to the industrial accidents of the nineteenth century was partially due to the divergence of industrial regards for safety.

When industries are allowed to provide private regulation for themselves, they need to be able to provide strict compliance and enforcement of those regulations. When the structure of joint ventures is taken into account, common groups of investing corporations divide operational roles across different projects. However, when all of the corporations are on both sides of the fence, it becomes clear that perverse incentives could arise to allow slack enforcement at one location to receive counterbalancing slack enforcement at another location. Without a party external to this daisy-chain of enforcement, the buck is passed along the chain without certainty of enforcement. When combined with the dangers of weak enforcement, private regulation can become ineffective.

Additionally, traditional joint venturers rely heavily on contractors and other parties to provide critical services and support roles; yet, those contractors are in need of good relationships with their clients to ensure and secure access to future work assignments. This tension between operational roles and service relationships creates an atmosphere wherein the contractors are potentially reluctant to speak out although they might actually be the actor best able to confirm or audit the maintenance of the agreed-to private regulations.

Private regulation has been doubted to take into account as many voices as might be heard by a bureaucratic organ more concerned with due process and transparency; the source of the efficiency of the private regulation is ultimately also a problem spot for private regulation. What the industrial

129. Gunningham et al., *supra* note 34.

groups decide to target as efficient levels of accidents may not align with other parties exposed to the risk. For example, an operator of a methane hydrate project might have lower regards or lower levels of knowledge for benthic micro-fauna than other interested individuals. Or, an operator might have a high regard for the integrity of its well field but low regards for the pre-existing recreational utility of that sea surface that long time community members may have previously enjoyed. As such, private regulation could potentially emerge as incomplete and in need of public adjustment or correction. For methane hydrate projects, there will likely be many voices and many concerns that would need to be integrated into a broader more cohesive set of standards and regulations in order to garner broad public support prior to the early onset of development and production activities. Private industry could muster an effort to coordinate such an engagement, but it is probably more efficient for all parties to rely on those political processes already present within open democracies to handle the development of new regulations.¹³⁰

There is a concern that private regulation could be used by those already in the industry to prevent the entry of additional market participants. The industrial insiders, as it were, could conspire to set standards too high or in a manner too difficult to comply with for those new to the industry. Also, to the extent that the enforcement was left in the hands of the same private actors, there could be concerns that the overall enforcement could be applied unevenly to benefit the original members of the collective. It is unclear just how many “new entrants” there might be to the methane hydrate industry as it does not yet exist. This particular problem is probably not sufficiently ripe for consideration in the regulation over methane hydrate projects.

Democracies promote the ideal that laws are publicly drafted through transparent procedures, vetted by the public via various forms of openness including privately held media, and ultimately approved of and legislated into law or regulation by democratically elected proxies or representatives. Even those systems that provide broad powers to judges to enact effective legislation provide ample recourse to judicial reversal and constitutional cassation of those decisions. The development of private regulation, putatively behind closed doors by private interests, could readily appear to be the opposite of a democratic process. To the effect that the private regulations are developed in lieu of public regulations, it could further appear that the process could potentially be a by pass of the role of the

130. Once those regulations are settled and agreed upon, perhaps those regulations could be implemented privately. In that sense, this discussion anticipates the issues of conditional self-regulation. *See infra*.

democratic government to determine public policy and to provide for the public welfare. Arguments could also clearly be made that even public laws are often drafted in rooms with few attendants and that private regulations can be drafted with inputs from multiple community voices. Nevertheless, it would appear that private regulation does bear the burden of demonstrating the resultant regulations and guidelines are at least as good and as balanced as what might have emerged from a more democratic process if the private regulations are to gather public support for their usage in lieu of those public regulations.

All in all, the above conclusion lead to the development of conditional private regulation, that private regulation works best if coordinated and monitored to some extent by public authorities. Governments can limit the application of private regulation to certain aspects of operations or require the inclusion of a wider range of voices in the development of the regulations. The government can impact either the development of the regulations, the means of enforcing the regulations, or both. In this manner, it is hoped that some of the efficiencies of the private enterprise can be dove-tailed with the open transparency and inclusive character of public legislation. Certainly, for novel industries, such as methane hydrate production, it will be important to get as broad a consensus as possible in the development and acceptance of any form of private regulation.

V. COORDINATION OF LIABILITY RULES AND REGULATIONS

The interactions of regulatory guidelines on the interpretation of tort law responsibilities have long been recognized as non-simple. But there are many reasons to suspect that the two systems of accident management could be used in a complementary manner.¹³¹ Indeed, Neil Gunningham and Darren Sinclair have stated that “‘single instrument’ or ‘single strategy’ approaches are misguided,” but that “in the large majority of circumstances

131. Kolstad et al., *supra* note 97; Susan Rose-Ackerman, *Environmental Liability Law, in INNOVATION IN ENVIRONMENTAL POLICY, ECONOMIC AND LEGAL ASPECTS OF RECENT DEVELOPMENTS IN ENVIRONMENTAL ENFORCEMENT AND LIABILITY* 223 (1992); Faure & Ruegg, *supra* note 97, at 53; *Designing Incentives, supra* note 44, at 143; *Regulatory Strategies, supra* note 44, at 24; see Susan Rose-Ackerman, *Public Law Versus Private Law in Environmental Regulation: European Union Proposals in the Light of United States Experience*, 4 REV. EUR. COMMUN. & INT'L ENVTL L. 312, 313-14, 317 (1995) (arguing that environmental laws can be regulated in a liability regime that allow private causes of action, tort suits, and regulatory statutes to supplement each other); see also Burrows, *supra* note 96 at 238; see also Alessandra Arcuri, *Controlling Environmental Risk in Europe: The Complementary Role of an EC Environmental Liability Regime*, 1(2) TIJDSCHRIFT VOOR MILIEUSCHADE EN AANSPRAKELIJKHEI DSRECHT [T.M.A.] 37, 37-39 (2001) (Neth.) (explaining why controlling environmental risks through a system incorporating both liability rules and public law as complements to each other is more effective than one which relies on one or the other).

(though certainly not all), a mix of instruments is required, tailored to specific policy goals”¹³² There is a broad understanding within the literature that for environmental hazards, the coordinated implementation of civil liability rules and regulations could be more robust than the singular application of either.¹³³

The effectiveness of the regulations depends greatly upon the underlying effectiveness of the regulatory body to enforce the regulations. In certain situations, it might be desirable to “belt and suspenders” by using the complementary private aspect of civil liability rules to ensure that risky activities remained monitored when regulatory bodies face enforcement challenges.¹³⁴

Regulatory bodies, and the regulators inside them, face targeted efforts to lobby them and capture their agenda; this effort to refocus regulatory control is known as agency capture. Employment of civil liability rules reduces the effectiveness of agency capture.¹³⁵

There are other logical reasons for a complementary implementation of both civil liabilities and regulations. A regulatory body can work to collect and then publicize the missing information that prevented civil liability rules from being effective; i.e., the regulatory body can assist in fixing Shavell’s missing market or market failure. Or, rules of civil liability might be useful in mitigating the Nyborg & Telle problem of “regulatory loss of control”; the parallel existence of private enforcement from civil liability claims could reduce the tortfeasor’s expectation of evasion.¹³⁶

The development of regulations can also be used as a sort of *de minimis* duty of care; the ability to spot the tortfeasor’s failure to attain the regulatorily-set minimums could provide courts with a lower cost method to identify when negligence occurs. This use of regulations is referred to as negligence per se. The reverse of this logic would be to suggest that attainment of regulatory standards could act as a proof that the prescriptive duty of care was met; this argument has not found broad support among economists.

Regulations, especially those traditionally labeled “command and control,” are systems that contain both benefits and flaws. The singular application of a public regulatory framework has been modeled as

132. Neil Gunningham & Darren Sinclair, *Regulatory Pluralism: Designing Policy Mixes for Environmental Protection*, 21 L. & POL’Y 49, 50 (1999).

133. See Faure & Weishaar, *supra* note 31, at 405–06 (explaining that liability rules alone may be insufficient to prevent environmental harm).

134. *Regulatory Strategies*, *supra* note 44, at 22.

135. *Id.* at 25.

136. See Van den Bergh & Visscher, *supra* note 29 (discussion of the Nyborg & Telle problem within their discussion of compliance strategies as an alternative to deterrence strategies).

potentially adverse to the morale of the public.¹³⁷ This is in part because the uniformity of the adopted regulations removes the choice making from the tortfeasor and victim and places it elsewhere;¹³⁸ the active ‘decider’ has become the process that drafts and enacts regulations.¹³⁹

Regulations may be expensive to operate,¹⁴⁰ poorly focused on activity instead of results, insufficiently written to achieve optimal targets, prevent decentralization, and effectively reduce incentives for tortfeasors to achieve optimal levels of precaution and activity level setting.¹⁴¹ Many of these flaws are inherent in the benefits; e.g., the expenses of operating a regulatory framework are often due to the costs of collecting information about the various tortfeasors and the character of their activities—this is the very collection of data that was valued as a reason to implement regulations.

As such, where regulations are weak is often well aligned with where civil liability rules are efficient; thus, the argument for the complementary implementation of civil liability rules and regulations is well founded.

A. *Civil Liabilities Defend Against Agency Costs and Lobby Capture*

A central problem to the effective exercise of positive regulation is the need for administration by human agents who may not always align with the aims of the regulation itself; “public enforcement agents do not always have the right incentives.”¹⁴² Actors within the regulatory body may thus set regulatory standards that deviate from the optimal set of standards vis-à-vis what they would have done unimpeded.

First, there are a couple of reasons why regulatory bodies can become inefficient without external distractions. Internal bureaucratic processes, such as who gets promoted, may be at odds (perhaps innocently due to simple complexity) with the broader regulatory targets.¹⁴³ Also, there are

137. Bruno S. Frey, *Morality and Rationality in Environmental Policy*, 22(4) J. CONSUMER POL’Y 395, 396, 404 (1999).

138. *Id.* at 400.

139. As Frey stated, even the movement towards market based incentives to reinforce regulatory frameworks is very much akin to selling indulgences, it provides the wrong message that environmental error can be washed clean with cash when in fact much of that damage cannot. *Id.* at 402–03.

140. Rules of civil liability are generally seen as a “relatively cheap instrument” in contrast to the “higher system costs” of regulation. The formulation of detailed ex ante norms, the coordination costs of aligning inconsistent policies across divergent bureaucracies, and the costs of monitoring can all lead to regulations being more costly than rules of civil liability. See Van den Bergh & Visscher, *supra* note 29.

141. *Regulatory Strategies*, *supra* note 44, at 26.

142. Hylton, *supra* note 35, at 520.

143. *Id.*

substantial agency costs in the administration of public regulations.¹⁴⁴ Agency costs refer to the various transaction costs of administering public regulations, but primarily focuses on the concept of lobby capture and other means in which the regulator receives incentives contrary to the original design of the regulations.¹⁴⁵

Second, Keith Hylton proposed that the specificity of regulations themselves encourages the tortfeasor to lobby for participation in the drafting and determination of those rules in ways that are unavailable within the framework of private litigation.¹⁴⁶ He added that concentrated interest groups would be able to bring such lobbying efforts forward, in a way that private citizens would not due to the transaction costs of integration and representation.¹⁴⁷ Hylton argued that such resultant regulations might look harsh at first glance but would actually be friendly (i.e., sub-optimal from a general welfare perspective) to the industry that brought the lobbying effort to the regulatory body.¹⁴⁸

When rules of civil liability are alongside standards set by regulation, it becomes more or less cost-effective for industry groups to lobby solely regulatory bodies because those bodies no longer offer “one-stop shopping” for regulatory relief. Especially because regulatory compliance is generally not a valid defense in most jurisdictions¹⁴⁹ actors who would have sought regulatory shielding will find themselves still exposed where rules of civil liability enabled victims to pursue damages in court.

B. *Revelation of Hidden Information*

Private litigation, especially negligence lawsuits, produces ex post information to the public.¹⁵⁰ This production of ex post information can transform into informed ex ante rules.

The victim is an expert on injuries suffered; the tortfeasor is an expert on the activity and precaution options; the attorneys can bring various other experts into the courtroom. All of these testimonies are further focused by

144. *Id.*

145. *Id.*

146. *Id.* at 523.

147. *Id.*; but see Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups*, in 124 HARVARD ECONOMIC STUDIES (Revised ed. 1971) (explaining the theories of groups and how large groups can be affective or not).

148. Hylton, *supra* note 35, at 523–24. Given the modern development of private interest lobbying groups from all sectors of life, perhaps this argument is not as strong as it might once have been.

149. *Supra* § 3.2.

150. *Id.*

the actual incident of a specific harm.¹⁵¹ This is advantageous, cost-wise, over the ex ante parliamentary or administrative discussions prior to the drafting of regulations which need to address a wider range of potential harms and hazards over a wider range of potential parties. The benefits of litigating ripe cases with present injuries provide a much richer data set than otherwise obtainable:

A public regulatory scheme could not hope to match the negligence system in terms of its scope, detail, and encapsulation of private information. To do so would require public agents to discover ex ante how much a potential victim would be hurt by a specific injury, and how much it would cost a potential injurer to avoid the injury.¹⁵²

As courts resolve tort cases, conduct norms emerge, predicated on real-life events and data.¹⁵³ As additional courts continue to process the conduct norms in civil liability litigation, there is the potential for stable expectations to develop on likely outcomes; these expectations form the basis of ex ante rules for all future accidents and risk planning.¹⁵⁴

C. Information Revealing Mechanisms

There is a developing area of mechanism design: that of truth revealing mechanisms.¹⁵⁵ The purpose of truth revealing mechanisms is to create incentives that encourage the revelation of information between the regulator and the regulated actor.¹⁵⁶

Matthew Glachant offers a critical appraisal of the Shavell analysis; informational asymmetry may present an intractable problem for policy makers in the choice of civil liability, regulation, or nothing at all.¹⁵⁷

At the root of Glachant's concerns is that Coase may have suggested a deeper paradigmatic shift than accounted for by Shavell. Glachant's concern is that the costs of research is a form of transaction costs. If they are included in the overall cost analysis, then the informational clarity to

151. *Id.* at 525.

152. *Id.*

153. *Id.*

154. *Id.*

155. Matthieu Glachant, *The Use of Regulatory Mechanism Design in Environmental Policy: A Theoretical Critique*, in *SUSTAINABILITY AND FIRMS: TECHNOLOGICAL CHANGE AND THE CHANGING REGULATORY ENVIRONMENT* 179, 179 (Sylvie Faucheux et al. eds., 1998).

156. *Id.* at 180.

157. *Id.* at 182–83.

pursue regulatory guidance in the face of informational uncertainty or asymmetry might be incomplete.¹⁵⁸

In such models, the assumption is that the regulator has less information than the actor, who is closer to the facts or technologies that affect the safety levels.¹⁵⁹ But in turn, the actor has less information about the potential harms and hazards, particularly as they impact third parties beyond the actor.¹⁶⁰ Due to the state of incomplete or imperfect data, economic tools are employed instead of direct quota systems to enable the actor to integrate sufficient data to determine an efficient level of activity and of care.¹⁶¹ A tax may have the ability to transfer information to the actor.¹⁶²

If the regulator were to ask the actor for his estimated impact costs of pollution abatement, the actor would be tempted to over-report his costs in order to minimize the policy decision's impact on his operations.¹⁶³ As Glachant stated the problem: "[C]ommunication between agents is subject to strategic manipulation if (i) the objectives sought by the emitter and the receptor differ and (ii) the receptor's decisions influence the emitter's gains."¹⁶⁴

The regulator searches for a collection of methods, *F*, to transform the receipt of the messages into a functional policy, *A*, that holds true for two conditions: (i) that the regulator's method can yield a specific policy for each unique set of messages; and (ii) that for all combinations of private pollution abatement costs there will exist some set of messages from the *n* actors that will establish an equilibrium of the game.¹⁶⁵ Glachant states that indeed there is a menu of such methods to transform the messages from the actors into specific policies that will reveal the necessary information to the regulator.¹⁶⁶

It is the dynamic of the messages on the likely policy results that drive this potential to reveal information and balance the earlier recognized asymmetry.¹⁶⁷ However, there are several concerns that this analysis

158. *Id.* at 185 (arguing that it may be impossible to discern when civil rules, regulations or no policy at all might be preferable if the sum of the overall set of transaction costs is not readily resolvable).

159. *Id.* at 180

160. *Id.* at 180–81.

161. *See id.* at 182 (explaining the formula for truth-telling profitability).

162. *See id.* at 183 (discussing taxation systems firms can chose from).

163. *See id.* at 180 ("[firms] have incentive to announce overestimated pollution abatement costs in order to get a less ambitious policy.").

164. *Id.*

165. *See id.* at 182 (explaining the formula used).

166. *Id.*

167. *See id.* at 182–83 (explaining how different information will affect a firm's costs).

reveals. First, an assumption of budgetary neutrality cannot be maintained, i.e., there will always be an effective capital flow from the regulator to the actors; subsidies will be provided for the information received.¹⁶⁸ Second, because of the aforementioned capital leakage, the system is second-best optimal.¹⁶⁹ The results can be improved, but examples in the literature suggest that the mapping of the administrative communications with emitters that can result in actionable policies might actually require drafting unique policy instruments for each actor.¹⁷⁰

As such, Glachant projects, in a Coasean manner, that the overall problem with routine mechanism design is that it assumes too readily zero-cost transaction costs to obtain information relevant for policy design.¹⁷¹ As he states, “given the centralized nature of the mechanism . . . this assumption is particularly unrealistic regarding the regulator.”¹⁷²

He documents several problematic areas that are not likely to be zero-costs in the collecting or processing of information:

- (i.) The design of the menu options by the regulator (this is an exercise in scientific, engineering, and economic analysis of $(n + 1)$ participants)¹⁷³;
- (ii.) the means of communicating the menu to n actors;¹⁷⁴
- (iii.) the strategic calculations undertaken by each actor to determine their message, m_i , back to the regulator¹⁷⁵ (frankly, the interlinearity of actors responding to each other’s anticipatory strategies could be computationally vexing in a way that would require next-best approximations);
- (iv.) the messages need to be correctly and timely collected and sorted by the regulator;¹⁷⁶
- (v.) the mapping of the received messages into a coherent and workable policy (especially if the policies need to be actor-specific, could be especially cost intensive).¹⁷⁷

168. *Id.* at 183.

169. *Id.*

170. *See id.* (stating that mechanisms are only “second-best optimal”).

171. *Id.* at 179, 184.

172. *See id.* at 184 (“given the centralized nature of the mechanism . . . this assumption is particularly unrealistic regarding the regulator”).

173. *See id.* (stating that the complexity of the task depends on the quality of the information). And here is a latent assumption of a singular policy challenge; imagine the complexity facing real administrators facing numerous industrial settings.

174. *Id.*

175. *Id.*

176. *Id.*

177. *Id.*

The results of Glachant's study are that informational strategies do exist to rectify the observed informational asymmetries, but they will likely be costly. Thus, regulations might not be appropriately seen as more efficient than lawsuits in civil liability when informational asymmetry is too costly.

This is not to suggest that no form of rules or regulations could ever be efficient. But it does highlight the centrality of obtaining sufficiently accurate information for the regulatory body to be able to efficiently set optimal standards. And, underlying that challenge is the quest to obtain that information in the closest verisimilitude to perfect cost less information as much as possible.

Assuming one has perfect information, one can forecast which rules or regulations might efficiently set optimal standards. But when faced with uncertainty, it becomes more complex to ensure those efficient results. When information needs to be obtained from private actors, transaction costs will be incurred; these costs could affect which sets of standards are optimal given the inclusion of the costs of this information against the *ceteris paribus* of zero-cost information. Second, regulators seeking to improve the mapping of policy to individual information sets on cost would likely need to produce a result that appears rather similar to the idea of decentralization. But the tailoring of policy to each actor would likely bear its own set of transaction costs. In summary, if regulatory bodies face costly information acquisition problems, the results could be differing sets of standards shy of the optimal standards obtained had the information been cost less.

Thus, regulatory bodies are in need of cost-efficient means of obtaining critical information for standard setting. As a consequence, Glachant's model establishes a predicate for arguments raised in Section III, *infra*, that public regulations can be complementary to the function of rules of civil liability. As such, the application of a regulatory process can suss out information that once acquired might aid either regulators or petitioners in addressing their Coasean negotiations or lawsuits. Additionally, Glachant's concerns could be addressed by the development of standards by private regulation. While the public and private regulations might not result in identical standards, the development of private regulations and the promulgation thereof does reveal information that might otherwise be difficult for the regulatory body to efficiently obtain.

D. Regulatory Noncompliance as Negligence Per Se

While the idea of negligence per se is not a necessary logical result, it does provide the benefit of reinforcing the regulatory regime with the

power of the tort system if the regulatory system itself lacks the ability to ensure compliance or effective policing. Additionally, the idea of per se negligence also reduces certain transaction costs for courts attempting to find clear means of defining a minimal duty of care as the regulations can provide clear structure where the common law may yet be vague and undefined.

The drafting of regulations also usually provides a certain due process and openness to community voices so that the regulations may suggest and include concerns that might not otherwise be readily apparent in an adversarial courtroom setting. The engagement of the concept of per se negligence does provide a certain marriage of tort liability and regulatory command and control; the use of tort law to reinforce a regulatory system and the use of a regulation to assist the process of tort law liability would appear to provide some resilience to both sides.¹⁷⁸

Yet, Shavell demonstrated that negligence per se might lead certain actors to become overcautious because their efficient care level would have been the level set by the regulations.¹⁷⁹

E. Coordinated Use of Civil Liability and Regulations

On the other hand, there can be useful applications of regulatory frameworks to liability rule systems. While most papers debate the comparative efficiencies, as if only one could be applied to the exclusion of the other, a growing trend of research in law and economics suggests that the joint-implementation of civil liabilities and regulations may be incrementally beneficial beyond the singular implementation of either.¹⁸⁰

178. Rose-Ackerman, *supra* note 131; Faure, *supra* note 79, at 252.

179. *Liability*, *supra* note 48, 365–66.

180. Kolstad et al., *supra* note 96; and *A Model of the Optimal Use*, *supra* note **Error! Bookmark not defined.**, are the only two such articles that pre-dated Faure, *supra* note 79, at 252. Patrick W. Schmitz, *On The Joint Use of Liability and Safety Regulation*, 20 INT'L REV. L. & ECON. 371, 372 (2000). Since then, there have been many more such studies. These are some of the most cited such articles, according to Google Scholar: Marcel Boyer & Donatella Porrini, *Modelling the Choice Between Regulation and Liability in Terms of Social Welfare*, 37 CAN. J. ECON./REVUE CANADIENNE D'ECONOMIQUE 590, 592 (2004); Paul Calcott & Stephen Hutton, *The Choice of Liability Regime When There is a Regulatory Gatekeeper*, 51 J. ENVTL. ECON. MGMT. 153 (2006) (explaining that recent economic analyzes are attempting to prove that tort liability and regulation can be effectively used in tandem); Gerrit De Geest & Giuseppe Dari-Mattiacci, *Soft Regulators, Tough Judges*, 15 SUP. CT. ECON. REV. 119, 137–39 (2007); Robert Innes, *Enforcement Costs, Optimal Sanctions, and the Choice Between Ex-Post Liability and Ex-Ante Regulation*, 24 INT'L REV. L. & ECON. 29 (2004) (explaining the optimal efficiency of integrated government choice of enforcement, liability design, and regulatory policy in a model of unilateral accidents); Richard Just et al., *Risk Aversion, Liability Rules, and Safety* (Nat'l Bureau of Econ. Research, Working Paper No. 9678, 2003).

As Shavell indicated informational uncertainty frustrates the application of civil liability rules.¹⁸¹ More recently, Kolstad et al, demonstrated that regulatory frameworks, with their ex ante clarifications on appropriate levels of care, can be implemented to correct the inefficiencies of negligence rules facing informational uncertainties.¹⁸²

Patrick Schmitz extended the family of Shavell-Landes-Posner models in the development of his system.¹⁸³ Schmitz finds that when tortfeasors face different budgetary assumptions, then civil liabilities and regulations can be complementary and optimal.¹⁸⁴ The Schmitz model relies on a strict liability rule as its modeled civil liability rule within a unilateral accident model from Shavell.¹⁸⁵

When the regulatory optimand is developed without reliance on a civil liability rule, and if injurers are heterogeneous with regards to wealth, then the complementary use of regulations and civil liability rules may lead to reduced social cost. In contrast, social costs are higher when only regulatory rules or only civil liability rules are enforced exclusively.¹⁸⁶ The complementary use scenario has two extreme forms: (i) When the population of tortfeasors is poor, then regulations are socially cost efficient;¹⁸⁷ and (ii) When all of the tortfeasors are wealthy, then civil liability is more efficient.¹⁸⁸ The model demonstrates that when civil liability is employed alongside regulatory frameworks, the regulatory standard should be set lower than it would have been if the regulatory framework were designed without a corresponding civil liability rule.¹⁸⁹

F. Grounds for Deference to Rules of Civil Liability

Private tort litigation, relying on rules of civil liability, enables private actors to bypass those problems by simply eliminating the middle-man problem.¹⁹⁰ The economic models of civil liability demonstrate that private

181. See generally Steven Shavell, *Strict Liability Versus Negligence*, 9 J. LEGAL STUD. 1 (1980).

182. Kolstad et al., *supra* note 96.

183. Schmitz, *supra* at note 180, at 3. He also makes reference to an earlier survey by Schäfer and Ott in 1995, which is in turn fully coordinated with the more recent Schäfer models presented in H. B. Schäfer & Schönenberger, A., *Strict Liability Versus Negligence*, in *ENCYCLOPEDIA OF LAW AND ECONOMICS* (Edward Elgar, 2000).

184. Schmitz, *supra* note 180, at 373.

185. *Id.* at 374.

186. *Id.* at 376.

187. *Id.*

188. *Id.* at 375–76.

189. *Id.* at 377.

190. Hylton, *supra* note 35, at 521.

litigation can bring damages to the tortfeasor sufficient to provide incentives to the tortfeasor to alter his behavior to achieve reasonably efficient care. Private actors can achieve efficient behaviors from tortfeasors without the agency costs of the central bureaucrats, at least theoretically.¹⁹¹

There is also an institutional-arrangements argument to be made that common law civil liability rules, and also to a certain extent civil law's judicial mandates within civil liability, provide a "flexible, undefined structure" with which to solve tortious disputes.¹⁹² Tort law provides redress for injuries without too much in the way of specifics delineating which injuries are permitted redress.¹⁹³ The regulatory structure is the opposite; it "has more structure and definition" and offers detailed rules.¹⁹⁴

It can be argued that private litigation provides a better defense to over-zealous use of resources to achieve enforcement of the legal norms in contrast to the risks posed by the central bureaucrats.¹⁹⁵ Private litigators need to produce their own capital resources for litigation and thus must limit their activity to the expected outcomes of the litigation; this is a key concept within the theoretical models of civil liability.¹⁹⁶ Research shows that government agencies can become trapped in political rhetoric or in zealous pursuit of compliance and expend disproportionate sums on lesser problems, economically speaking.¹⁹⁷

While not explicitly stated in Hylton's argument, it appears, in contrast to his argument on private litigators, that he finds regulators bound by neither capital budgets of enforcement nor by the effective costs of their imposed sanctions.¹⁹⁸ The regulators are argued to operate beyond economic feedbacks to match the sanctions to the harm in proper alignment as suggested by theoretical economic models of civil liability.¹⁹⁹

191. *Id.* (providing a model on the of various civil liability rules to achieve those ends).

192. *Id.* at 523.

193. *Id.* Hylton remains squarely within reference to common law, but there does not appear to be any substantial contrast with the civil code notions of routine tort and their support of redress by civil liability. Perhaps his argument could have been made more broadly.

194. *Id.*

195. *Id.* at 522.

196. *Id.*

197. *Id.* Hylton referred to the research of Viscusi and Hamilton, which has revealed economic problems with the execution of various hazardous waste clean-up sites in the United States. They demonstrated that regulators often required million-dollar solutions to problems posing harms of magnitudes less. *See id.* (citing W.K. Viscusi & J. T. Hamilton, *Are Risk Regulators Rational? Evidence from Hazardous Waste Cleanup Decisions*, 89 AM. ECON. REV. 1010 (1999)).

198. *Id.*

199. *See id.* at 6. (making an argument bureaucracies are likely to see the enforcement of regulations as a "full employment program" that has little regard for the actual regulatory ends); It is unclear to the present author that American rules on financing tort trials are any less subject to abuse and thus limits this argument from Hylton as potentially rhetorical. *Id.* Dicken's arguments were indeed

Essentially, the private litigation system presents an effective equivalent to the “public with prices” model of public regulations.²⁰⁰

G. *Potential Symmetries of Policy Effects*

Hylton provided a taxonomy of public and private civil liability and regulations.²⁰¹ The means of law enforcement are bifurcated into two major camps: that of public law and that of private law.²⁰² Then public law is divided into rule compliance or sanctions-driven law, and into taxes and fees or prices-driven law. The first grouping is labeled public law with controls, and the latter grouping as public law with prices.²⁰³ Private law is divided into private with strict liability and private with conduct norms. Negligence and nuisance fall into the latter category.²⁰⁴ The environmental regulatory structure in the U.S. is described as a public law with controls system; the U.S. is described as very short on implementations of public laws with prices.²⁰⁵

Hylton stated that the public law with prices system should be equal in function and efficiency to private law with a strict liability system.²⁰⁶ But traditional common law in the U.S. has not had such a pure system of private with strict liability. Thus, abstract system of economically driven mechanisms remains largely untested within the U.S. for environmental torts.²⁰⁷ The U.S. has traditionally had a large system of private with conduct norms.²⁰⁸ Such rules include: (i) trespass, (ii) nuisance, and (iii) Ryland-based strict liability for abnormally dangerous activities.²⁰⁹

H. *Complementing Strict Liability with Regulations*

against private litigators. See CHARLES DICKENS, BLEAK HOUSE 10 (1853) (arguing against private litigators).

200. Hylton, *supra* note 35, at 516–17.

201. *Id.* at 515.

202. *Id.*

203. *Id.*

204. *Id.* at 516.

205. *Id.*

206. *Id.* at 517.

207. *Id.* at 516.

208. *Id.* at 517.

209. *Id.* Hylton states that while the Ryland standard is a form of strict liability, it is quite distinct from the standard form developed with law and economics literature. The common law version under Ryland requires an analysis of the defendant’s conduct, his state of mind about the activity, and ultimately the general activities of the local community. These are all softeners that cause Ryland liability to approach the functional description of negligence with a very high duty of care. *Id.*

It is generally advisable to coordinate rules of civil liability with complementary regulations. Both public and private regulations can be implemented in a coordinated, integrated regulatory mechanism. Thus, it would likely be optimal to consider how combining rules of civil liability, public regulation, and private regulation could all play a role in setting the optimal standards for the development of offshore methane hydrates.

If regulations are not efficient in all circumstances, then there might be opportunities to implement rules of civil liability alongside those regulations as a buttress. Regulations may fall short of efficiency or optimality under several circumstances.²¹⁰ Likewise, in certain circumstances rules of civil liability are less robust and provide poor incentives to achieve optimal levels of precaution and activity; but, regulations can sometimes improve those circumstances.

As previously demonstrated, in Section II, the more robust rule of civil liability for offshore methane hydrates would be a rule of strict liability. Rules of strict liability are optimal for risks of unilateral accidents, certain bilateral accidents, and abnormally hazardous accidents, among others.²¹¹ But rules of strict liability cannot efficiently provide incentives for certain circumstances; complementary regulations could assist to remedy those circumstances.²¹²

Although distinguishable, both strict liability rules and regulations could effectively govern certain offshore methane hydrate developments. This dual, yet complementary, system would provide for a more comprehensive portfolio of incentives to optimally govern the commercial development of offshore methane hydrate installations.

CONCLUSION: REGULATIONS IN HARMONY WITH RULES OF CIVIL LIABILITY

“Given the fact that (for a variety of reasons) all policy instruments seem to have particular advantages, but also suffer from particular weaknesses, it may be best to use the strength of particular policy instruments in an optimal way in combination with other instruments.”²¹³

210. For a more complete discussion of the circumstance within which regulations are likely to become inefficient, see Section II.C.

211. *Civil Liability for the Risks*, *supra* note 1, at 257–58; *Existing Laws*, *supra* note 2, at 799–801.

212. ERIC BROUSSEAU, GLOBAL ENVIRONMENTAL COMMONS: ANALYTICAL AND POLITICAL CHALLENGES IN BUILDING GOVERNANCE MECHANISMS 303 (Eric Brousseau et al eds., 2012); *Existing Laws*, *supra* note 2, at 801.

213. BROUSSEAU, *supra* note 212, at 303.

This study establishes the place of public and private regulations to set standards for optimal levels of activity and precaution. It shows that public regulations can function alongside private regulations in integrated regulatory mechanisms.

The final conclusion and recommendation of this study is that strict liability, public regulation, and private regulation should be complementarily implemented to govern the risks and hazards of offshore methane hydrates. Civil liability and regulations possess strengths in different areas that could be jointly integrated to create a portfolio of incentives to govern a wide collection of risks and hazards. Furthermore, the operations of civil liability rules can function to protect and enhance the operations of regulatory efforts, and vice versa, regulatory efforts can provide information and other transaction cost relief that could enhance the operation and efficiency of rules of civil liability.

A. Public Regulations

This study analyzes whether regulations might efficiently govern the risks and hazards of offshore methane hydrates; it was found that they may. A fundamental issue is that public regulations would be able to set standards prior to offshore-methane-hydrates development and production activities.

A regulatory body would be capable of addressing certain problems that might be present in the development and operation of offshore methane hydrates. This study presents several reasons to adopt and employ regulations. Regulations can rebalance information asymmetries and restore full function to weak instances rules of civil liability. Regulations can pursue tortfeasors where civil liability rules falter, such as when avoidance schemes or insolvency are present in tortfeasors. Regulations can assist when lawsuits are unlikely to be filed because regulatory bodies can unify disparate victims, can persist over time, and could have the capital, human, and technological resources that many victims might not. Additionally, regulatory bodies might be able to process claims in their own manners, e.g., administrative courts, to provide a sense of due process that might otherwise be institutionally lacking in some locales.

B. Private Regulations

Arguments have been presented that private regulations, particularly when part of smart regulation or integrated regulatory mechanisms, could improve standard setting and the benefits of public regulation. Such a mechanism could thus benefit from the participation of regulatory bodies,

of operators and investors, of university researchers and scientists, and of informed observers such as environmental groups. Because the technology of offshore methane hydrate operations would be expected to be rapidly advancing, the private actors engaged in that technological development could bring their knowledge to the design of the standards and ensure that the standards remain “best available” and up-to-date to avoid regulatory stickiness.

As a separate concern, offshore methane hydrates can be found in many locations where local governments might lack historical experiences governing the risks of offshore resources or be institutionally challenged to address the technological complexity of the hydrate operations. In such settings, private regulations could facilitate the local governments’ efforts to govern the risks and hazards. The role of integrated regulatory mechanisms can, in part, be shared from areas with offshore experience to areas lacking those experiences.

C. Integration with Rules of Civil Liability

The findings show that rules of civil liability, particularly strict liability, and regulations could be complementarily implemented for offshore methane hydrates.

It appears that often where one paradigm is weak, the other is more robust. In that sense, there is an opportunity to apply regulations in complementary fashion alongside civil liability rules; it need not be an exclusive choice. Providing the tortfeasors with incentives from both the regulatory paradigm and the civil liability paradigm would provide the tortfeasors with a more complete portfolio of incentives to better ascertain efficient management of accidental risks in contrast to the limited basket of incentives provided by mere regulatory guidance.²¹⁴

It is really in the complementary aspect that regulations gain their best effect. The power of the regulatory body to correct the market will attract those to “correct” the regulatory body. The coordinated implementation of civil liability rules would limit potential distortion and recursively make the original attack on the regulatory body less attractive in the first place. Regulations help civil liabilities to function better; civil liabilities help the regulatory body to function better.

In closing, neither paradigm is perfect, but in complementarily implementing regulations and rules of civil liabilities, can function better than either would alone. Thus, it would be preferable to see joint

214. *Regulatory Strategies*, *supra* note 44, at 26.

implementation of regulations alongside a rule of civil liability for the governance of methane hydrates. When reviewing the circumstances of offshore methane hydrates in light of the regulatory findings of this study, a rule of strict liability should be implemented alongside an integrated regulatory mechanism with both public and private regulations.

In conclusion, this study supports the joint application of strict liability, public regulations, and private regulations in complementary implementation. The study finds that both public and private regulations could be engaged in an integrated regulatory mechanism. Combining the civil liability rule of strict liability together with an integrated regulatory mechanism could enable reinforcing feedback, and thus enhance and improve the function of both sides.