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THE ECONOMIC THEORY OF NUISANCE LAW AND IMPLICATIONS FOR ENVIRONMENTAL REGULATION

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INTRODUCTION

Environmental regulation, like any sort of regulation, can be implemented through different types of legal rules. The regulatory standard could be a set of *command-and-control* rules determining precisely how much of a pollutant can be emitted by a source, or what type of abatement procedures must be adopted. Alternatively, the regulatory standard could be based on a *liability rule* which requires the source of a pollutant to pay a monetary penalty that is equal to the harm imposed on society by its environmental interferences. Under a command-and-control system, the polluter is required to comply with some quantitative limit, at risk of a severe penalty such as dissolution, if the source is a corporation, or incarceration, if the source is a person. Under the liability rule system, the polluter is expected to pay for the harm it imposes on society, and is free to choose whether, as well as the degree to which, it will continue in its activity.[1]

In addition to rule types, there can be different approaches to environmental law enforcement. The two basic schemes are *public* and *private enforcement*. Public enforcement can be viewed as a system of government agencies that identify environmental interferences and bring enforcement actions against the sources.

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1 The distinction between command-and-control rules and liability rules is analogous to that between property and liability rules. *See* Guido Calabresi & A. Douglas Melamed, *Property Rules, Liability Rules, and Inalienability*, 85 HARV. L. REV. 1089 (1972); Keith N. Hylton (2006) *Property Rules and Liability Rules, Once Again*, 2 REV. OF LAW & ECON. 137 (2006), *available at* http://www.bepress.com/rle/vol2/iss2/art1/.

Private enforcement is a system in which private parties, typically the victims, bring enforcement actions against the sources.

These distinctions generate four regime types: public enforcement with command-and-control rules, public enforcement with liability rules, private enforcement with command-and-control rules, and private enforcement with liability rules. Traditional nuisance law has operated largely as an environmental regulation regime based on private enforcement with liability rules. Modern statutory environmental law tends toward the model of public enforcement with command-and-control rules.[2] Interestingly, this leaves two regime types that have been relatively unexplored in the context of modern environmental regulation: private with command-and-control rules and public with liability rules. With such a large amount of the regulatory design space still unexploited, it is reasonable to have the suspicion that an optimal environmental regulatory scheme might involve methods that look quite different from existing approaches.

I have argued elsewhere that environmental regulation could be improved by moving in the direction of the traditional nuisance law model.[3] The goal of any serious reform effort should be to find the right combination within the array of four regime types.

In this article, I will explore in detail the structure of nuisance law as a mechanism for regulating environmental interferences and suggest a modernized enforcement regime. The modern regime would retain public enforcement primarily in identifying environmental harms. Public enforcement might also be retained in the discovery of sources of harm, as long as it is more efficient than private enforcement in that task. However, enforcement efforts in the proposed regime would largely be delegated to private enforcers. Moreover, the decentralized approach would permit tougher environmental rules than under the public enforcement approach in some areas, and perhaps weaker regulations in other areas, depending on the seriousness of potential injuries. One-size-fits-all would be replaced by regional variation.[4]

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[2] For an analysis of the reasons, see Nathaniel O. Keohane et al., *The Choice of Regulatory Instruments in Environmental Policy*, 22 HARV. ENVTL. L. REV. 313 (1998). *See also* Richard L. Revesz and Robert N. Stavins, *Environmental Law and Policy* (Harvard Public Law Working Paper No. 102, 2004), *available at* http://ssrn.com/abstract=552043 (discussing the historical dominance of command-and-control).

[3] Keith N. Hylton, *When Should We Prefer Tort Law to Environmental Regulation?*, 41 WASHBURN L. J. 515 (2002). For excellent articles arguing that nuisance law should remain an important part of environmental law enforcement, see Andrew Jackson Heimert, *Keeping Pigs Out of Parlors: Using Nuisance Law to Affect the Location of Pollution*, 27 ENVTL. L. 403 (1997); Jason J. Czarneski & Mark L. Thomsen, *Advancing the Rebirth of Environmental Common Law*, 34 B.C. ENVTL. AFF. L. REV. 1 (2007).

[4] *See, e.g.*, Heimert, *supra* note 3; Czarneski & Thomsen, *supra* note 3.

The policy proposals in this article are not new. The argument that nuisance law should be permitted to do more of the work of environmental regulation has been advanced by others.[5] My contribution in this article is largely technical. Although nuisance law has existed for a long time, there have been few, if any, efforts to use economic analysis to make sense of its details.[6] My aim is to provide a positive economic theory of nuisance doctrine and to use that theory to explain the benefits of moving to a more decentralized approach to environmental regulation.[7]

I. SOME BASIC TRADEOFFS

The basic tradeoff between public and private enforcement is between what I will call *decentralization inefficiencies* and the *agency cost problem*. Private enforcement is hampered by decentralization inefficiencies. Public enforcement is hampered by the agency cost problem.

The decentralization inefficiencies of private enforcement are well known and need only brief mention here. Because environmental interferences injure a large number of victims at the same time, enforcement of environmental regulations provides a public good, in the sense that many people share in the benefits of enforcement. Thus, enforcement of environmental law suffers from the weaknesses inherent in the provision of public goods,[8] in the sense that

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[5] *See* Roger Meiners & Bruce Yandle, *Common Law and the Conceit of Modern Environmental Policy*, 7 GEO. MASON L. REV. 923 (1999); BRUCE YANDLE, COMMON SENSE AND COMMON LAW FOR THE ENVIRONMENT: CREATING WEALTH IN HUMMINGBIRD ECONOMIES (Rowman & Littlefield 1997); THE COMMON LAW AND THE ENVIRONMENT (Roger E. Meiners & Andrew Morriss, eds., 2000).

[6] For applications of economics to nuisance law, see A. Mitchell Polinsky, *Resolving Nuisance Disputes: The Simple Economics of Injunctive and Damage Remedies*, 32 STAN. L. REV. 1075 (1980); Daniel H. Cole & Peter Z. Grossman, *Toward a Total-Cost Approach to Environmental Instrument Choice* (June 23, 2001) (unpublished working paper, on file with SSRN), *available at* SSRN: http://ssrn.com/abstract=274768. Both of these studies focus on the choice of instruments (damages or injunctions) rather than the specific doctrines of nuisance law. For economic analyses of one specific feature of nuisance law (the "coming to the nuisance" doctrine), see Rohan Pitchford & Christopher M. Snyder, *Coming to the Nuisance: An Economic Analysis From an Incomplete Contracts Perspective*, 19 J.L. ECON. & ORG. 491 (2003); Donald Wittman, *First Come, First Served: An Economic Analysis of "Coming to the Nuisance"*, 9 J. LEGAL STUD. 557 (1980). For one application of economics to nuisance law generally, see Keith N. Hylton, *A Missing Markets Theory of Tort Law*, 90 NW. U. L. REV. 977, 993–1006 (1996). This article stays within the same general approach of my earlier article, but takes a much closer look at the economic function of nuisance doctrine.

[7] On the case for decentralization, see Jonathan H. Adler, *Free and Green: A New Approach to Environmental Protection*, 24 HARV. J. L. & PUB. POL'Y 653 (2001).

[8] Since members of the public can enjoy a public good whether or not they invest money or effort into its creation, there is an incentive in large groups for members to shirk from contributing to the public good. *See* MANCUR OLSON, THE LOGIC OF COLLECTIVE ACTION: PUB. GOODS AND THE THEORY OF GROUPS 9–16 (1971).

enforcement incentives are too weak relative to the benefits of enforcement. The same problem is observed quite obviously in the area of national defense. Unless a government provides the benefit, individuals are likely to have weak incentives to invest in national defense.

The agency cost problem is a label that I will use to describe the suboptimal outcomes that result because the public enforcement agent is likely to have incentives that differ from those of the hypothetical principle.[9] The hypothetical principle, a social planner committed to maximizing society's welfare, would adopt an environmental regulation scheme that minimizes the sum of the costs of environmental injuries, avoidance costs, and administrative costs. The public enforcement agent may have incentives that are skewed from this objective for several reasons: malfeasance, lack of interest, and lack of information. Public enforcers can be bribed by regulated parties.[10] They may over or under-invest in enforcement efforts because their compensation arrangements fail to align their incentives with the social objective. Or, public enforcers may support laws that benefit a concentrated interest group while providing no benefit to, or perhaps harming, the majority. Finally, public enforcers will not have access to information that is held privately, and as a result may be unable to find optimal solutions, even if they sincerely attempt to find them.

To understand the potential benefits of private enforcement, it will help to look deeper into the common law regime. In particular, it will help to examine the economic function of nuisance law.

II. THE ECONOMICS OF ENVIRONMENTAL EXTERNALITIES AND NUISANCE LAW

In this part, I will set out a simple economic model of externality and use the model to provide a positive theory of the law on

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[9] The term "agency costs" was introduced in the context of the theory of the firm. Jensen and Meckling argued that managers have incentives that often diverge from those of the shareholders, and the suboptimal outcomes that result could be described as agency costs. *See* Michael C. Jensen & William H. Meckling, *The Theory of Firm: Managerial Behavior, Agency Costs and Ownership Structure*, 3 J. FIN. ECON. 305, 308 (1976).

[10] Gary S. Becker & George J. Stigler, *Law Enforcement, Malfeasance, and the Compensation of Enforcers*, 3 J. LEGAL STUD. 1 (1974).

nuisance.[11] The theory set out in this part also explains the law on strict liability generally.[12]

A. Activity Levels and Care Levels

The law and economics literature has distinguished between care and activity levels.[13] The care level refers to the level of instantaneous precaution that an actor takes when engaged in some activity. For example, an actor can take more care while in the activity of driving by moderating his speed or looking more frequently to both sides of the road. The activity level refers the actor's decision with respect to the frequency or location of his activity. If, for example, the activity of concern is driving, it can be reduced by driving less frequently. Alternatively, a driver can change the nature of the activity by altering its location or the technology used in it. Changing the frequency, location, or technology of engaging in an activity are all methods of altering the activity level.

Many environmental harms, especially the ones that are associated with nuisance law, can be viewed as costs associated with activity level choices—*i.e.*, byproducts of activities. Consider, for example, a manufacturer that dumps toxic chemicals into the water as a byproduct of its manufacturing activity. Suppose the manufacturer is taking the level of care that would be required by the law of negligence. In spite of this, the manufacturing process leads to some level of discharge of toxic chemicals into the water supply. In this scenario, a common one in discussions of environmental economics, the environmental harm is a negative externality associated with the manufacturer's activity level choice. The manufacturer could reduce the negative externality by cutting back its scale of production, by changing its location, or by changing the production technology in a way that cuts emissions.

Whether we are considering the activity of driving a car or that of manufacturing, the model examined here is of activities that impose external costs on society even when they are carried out with great care (reasonable care under the law). The question I consider here is

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[11] My focus is on the nuisance doctrine rather than the economics of environmental policy. However, the two are clearly related. On the theory of externalities and its implications for environmental policy, see WILLIAM J. BAUMOL & WALLACE E. OATES, THE THEORY OF ENVIRONMENTAL POLICY (Cambridge Univ. Press, 1988) (1975).

[12] *See* Hylton, *supra* note 6; Keith N. Hylton, *A Positive Theory of Strict Liability* (Boston University School of Law Working Paper No. 06–35, 2006), *available at* http://ssrn.com/abstract=932600.

[13] *See, e.g.*, Steven Shavell, *Strict Liability Versus Negligence*, 9 J. LEGAL STUD. 1 (1980); Keith N. Hylton, *The Theory of Tort Doctrine and the Restatement (Third) of Torts*, 54 VAND. L. REV. 1413, 1414–1423 (2001).

how the law can regulate activity levels in a way that leads to optimal decisions.

B. The Economics of Activity Level Choices

For any activity, the actor engaged in it will set his privately optimal activity level at the point which maximizes his utility from that activity. That means the actor will consider the benefits he derives from the activity as well as the costs, and choose a level at which the excess of private benefits over private costs is at its maximum. If we let *MPB* represent the incremental or marginal private benefits to the actor from his activity, and *MPC* represent the incremental private costs to the actor from increasing the scale of activity, the actor will increase his activity level as long as the marginal private benefit of an additional unit of activity exceeds the marginal private cost (*MPB* > *MPC*). The privately optimal level of activity is the level at which the marginal private benefit to the actor is just equal to the marginal private cost (*MPB* = *MPC*).

The diagram labeled Figure 1 can be used to elaborate this argument. Assuming marginal benefits diminish as the actor increases his activity level, the marginal private benefit schedule can be represented by a downward sloping line, as shown in Figure 1. Marginal private benefits decline because the actor gains less in utility from an additional unit of the activity as his activity level expands.[14] The marginal private cost schedule is assumed to increase as the actor increases his level of activity (see *MPC* in figure 1). The reason for this is that the incremental cost of the activity goes up as the actor increases his scale.[15] The actor's privately optimal activity level choice is given by the intersection of the marginal private benefit and marginal private cost schedules, shown by point A in Figure 1. At the intersection point, the net benefits (excess of private benefits over private costs) is at its maximum.

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[14] To take a simple example, suppose the activity level is "eating ice cream." As the actor reaches his 100th scoop of ice cream, his gain from consuming an additional scoop is assumed to be less than if he had consumed only 1 scoop. Similarly, if we think of the marginal private benefit from driving, the assumption is that the gain to the actor from increasing his mileage is less when he drives 100 miles per week than if he were driving only 10 miles per week. Of course, in the case of driving, it is more likely that the marginal benefit schedule rises and then falls. For simplicity, I will focus on the portion over which it falls.

[15] For example, if the activity is driving, the upward sloping *MPC* schedule assumes that it is more costly to go from 50 miles per week to 51 than to go from 10 miles per week to 11. Of course, this assumption may not be valid in some cases. The incremental cost of going from 50 to 51 miles per week may be the same, in some cases, as the incremental costs of going from 10 to 11, but the results of this analysis are not dependent on this assumption of increasing marginal cost.

Now I will introduce externalities into the analysis. On the cost side, there are negative externalities (or external costs) associated with many activities. Suppose the activity is driving. With each mile driven, the actor imposes some risk of harm from an accident or from pollution on the public in general. Or, if the activity is manufacturing, with each widget produced, a manufacturer who discharges chemicals in the water imposes clean-up costs on others. The marginal social cost of the actor's activity is simply the sum of the marginal private cost and the marginal external cost imposed on society.

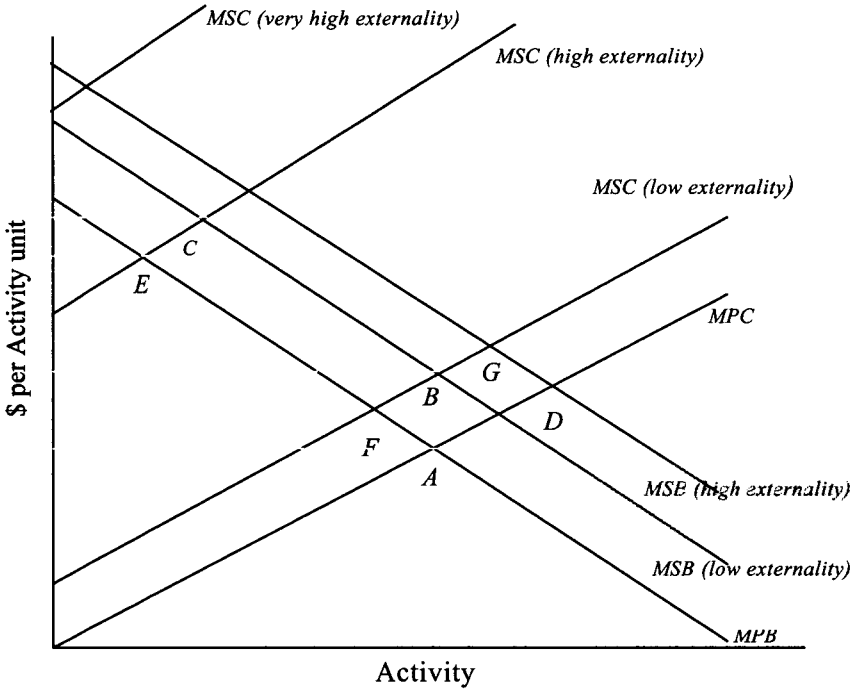
On the benefit side, it is possible that there are benefits to society generated by the actor's activity. Consider driving again. If the number of drivers increases from one to two, both drivers will have the added safety that if anything goes wrong on the road (*e.g.*, a car falls into a giant pothole), they will find someone who can help them or call for help. In the manufacturing case, suppose that instead of producing widgets, the manufacturer is producing a vaccine for some communicable disease. The marginal social benefit is the sum of the marginal private benefit and the marginal external benefit of an additional unit of activity.

The final step of this introduction to the economics of activity level choices is to consider the differences between private and social incentives. Consider the case of low externalities on both the cost and benefit sides first. Suppose there are external costs and external benefits connected to the activity, but they are relatively modest. They are shown in Figure 1 by *MSC (low externality)* and *MSB (low externality)*. The socially optimal level of activity, which equates marginal social benefit and marginal social cost, is found at the point B in Figure 1. In this case, the socially optimal level of activity (B) is roughly the same as the privately optimal level of activity (A). The reason is that the modest positive and negative externalities cancel each other out. Given this, there is no reason for government (the law) to intervene to try to reduce the level of activity.

Now consider the case of high externality on the cost side and low externality on the benefit side. This is shown by the intersection of the *MSC (high externality)* and *MSB (low externality)*, which is shown by point C in Figure 1. In this case, there is a wide divergence between the privately optimal level of activity (point A) and the socially optimal level of activity (point C). This case is one in which it appears desirable for the government to intervene to reduce the level of activity. Indeed, in the case of very high externality on the cost side (see *MSC (very high externality)*), it may be desirable to shut down the activity completely.

Consider lastly the case of low externality on the cost side and high externality on the benefit side. The intersection of the marginal social cost and marginal social benefit schedules occurs at point D in Figure 1. In this case, the privately optimal level of activity (A) is substantially below the socially optimal level (G). Thus, the government should intervene to increase the actor's level of activity.

FIGURE 1



C. Introducing the Law

I have so far considered external costs and external benefits associated with activities conducted with reasonable care. Since the actors are assumed to be taking reasonable care, the negligence rule cannot influence their activity level choices.[16] The negligence rule holds the actor liable only when he fails to take reasonable care. Since the actors are assumed to have taken reasonable care in the foregoing analysis, the negligence rule will not lead to any findings of liability.

[16] This assumes courts operate without error and that litigation is not costly. If courts make mistakes and litigation is costly, compliance with the negligence standard does not reduce liability costs to zero. On litigation costs and judicial error, see Keith N. Hylton, *Costly Litigation and Legal Error Under Negligence*, 6 J. L., ECON. & ORG. 433 (1990).

Strict liability imposes liability on actors even when they have taken reasonable care. The legal system can influence activity levels through imposing strict liability. In this part, I will examine the conditions under which strict liability leads to optimal, or approximately optimal, activity levels.

First, consider the case in which externality is high on the cost side and low on the benefit side. The socially optimal scale in this case is point C in Figure 1. In the absence of strict liability, the privately optimal scale is point A. Imposing strict liability on the actor is probably desirable in this case. When strict liability is imposed on the actor, his marginal private cost schedule becomes equivalent to the marginal social cost schedule. In the case of high externality on the cost side coupled with low externality on the benefit side, the actor's privately optimal activity level under strict liability will be point E. It is not exactly the optimal level, which is at point C, but it is close. Social welfare will most likely be improved by using liability to lead the actor to produce at scale E rather than at the socially excessive scale A.

Now consider the case in which externality is low both on the cost and on the benefit side. The socially optimal scale of activity is associated with point B. The privately optimal level of activity is associated with point A. These are the same activity levels. If strict liability is imposed on the actor, it will reduce his activity level below the socially optimal scale, and therefore reduce social welfare. If strict liability is imposed on the actor, it will lead him to choose the scale F, which is below the socially optimal scale.

This analysis implies that *strict liability is desirable only when the external costs of the actor's activity substantially exceed the external benefits associated with the actor's activity.* In this case, imposing strict liability reduces activity levels to a point that is closer to the socially optimal scale than would be observed under the negligence rule. When the external benefits are roughly equal to or greater than the social costs associated with the actor's activity, strict liability is not socially desirable.

Another case in which strict liability is not socially desirable is observed when two actors cross-externalize equivalent costs. Put another way, *when the costs externalized by two actors to each other are reciprocal, strict liability is not socially preferable to negligence.* The reason is that under strict liability, you will pay for harms to others, while under negligence (when everyone is complying with the negligence standard) you will pay only for the harms you suffer.

Since those harms are the same, activity levels will not differ under the two regimes.[17]

D. Application to Law: Nuisance and Abnormally Dangerous Activities

To this point, I have presented a model of the economics of externalities and considered its implications for law. Now I will take a look at the law, to see if it conforms to the predictions of the model, and to see if the model gives us additional insights into the law.

1. Abnormally Dangerous Activities

The most straightforward application of this model is to the law of abnormally dangerous activities. Section 520 of the Restatement (Second) of Torts provides the following rules:

> In determining whether an activity is abnormally dangerous, the following factors are to be considered:
>
> (a) existence of a high degree of risk of some harm to the person, land or chattels of others;
>
> (b) likelihood that the harm that results from it will be great;
>
> (c) inability to eliminate the risk by the exercise of reasonable care;
>
> (d) extent to which the activity is not a matter of common usage;
>
> (e) inappropriateness of the activity to the place where it is carried on and;
>
> (f) extent to which its value to the community is outweighed by its dangerous attributes.[18]

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[17] To see this, consider the marginal private cost schedule under strict liability and under negligence. Assume the level of externality is low. Suppose there are two actors, X and Y, both of whom are exercising reasonable care. Under strict liability, X will be liable to Y for the harms he causes to Y, and X will not have to bear any harms imposed on him by Y (because he will be compensated). Under negligence, X will not be liable to Y for the harms he causes to Y, but will have to bear any harms imposed on him by Y. Since the harms are, by assumption, reciprocal in nature, the actors' private marginal cost schedules are the same under strict liability and under negligence. Hence, there is no reason to opt for strict liability over negligence. *See* Hylton, *A Positive Theory of Strict Liability*, *supra* note 12.

[18] RESTATEMENT (SECOND) OF TORTS: ABNORMALLY DANGEROUS ACTIVITIES § 520 (1977).

The provisions of Section 520 are largely in line with the theory set out in the previous part of this article. First, note that Section 520 can be divided into two parts, the first three provisions and the last three provisions. The first three provisions govern the degree of residual risk. They imply that strict liability for operating an abnormally dangerous activity is appropriate only when the residual risk—the risk that remains after the actor takes reasonable care—is high. If the residual risk of the actor's activity is high, strict liability may be appropriate. On the other hand, if the residual risk is relatively low, strict liability would be inappropriate under Section 520.[19]

The final three provisions of Section 520 line up with the language in *Rylands v. Fletcher*,[20] which provides the foundation for the law on abnormally dangerous activities. The third factor, common usage, helps us identify activities for which the risks are reciprocal to those of other common activities. If an activity is one of common usage, then actors engaged in those activities will impose reciprocal risks on each other, and there is therefore no basis for adopting strict liability over negligence. The fourth factor, inappropriateness, is another way of determining whether the activity imposes a reciprocated risk. The last provision, comparing benefits and risks, guides courts to compare the external benefits thrown off by the activity with the external costs.[21] If the external costs are great relative to the external benefits, strict liability is appropriate under this provision.[22]

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[19] Ind. Harbor Belt R. R. Co. v. Am. Cyanamid Co., 916 F.2d 1174 (7th Cir. 1990).

[20] L.R. 3 H.L. 330 (1868) (affirming and quoting the Court of Exchequer Chamber, "[w]e think that the true rule of law is that the person who, for his own purposes, brings on his land and collects and keeps there anything likely to do mischief if it escapes, must keep it in at his peril, and, if he does not do so, he is prima facie answerable for all the damage which is the natural consequences of its escape.").

[21] The notion of beneficial externalities arising from the conduct of an activity should not be confused with the ultimate result or end of the activity. Consider, for example, the activity of blasting, which the law generally deems an abnormally dangerous activity. One might argue that blasting to create a public road produces an item (the road) that yields widely dispersed benefits. Accordingly, one might continue, blasting to produce something that benefits the public generally should be exempted from strict liability. However, this argument confuses the analysis by focusing on the externalities associated with the activity's end rather than the externalities associated with the activity. Unless the activity of blasting produces a substantial beneficial externality (*e.g.*, the blaster is destroying a substance that imposes a great risk on the public), it should be subjected to strict liability under the theory presented here.

[22] Consider an example. If the actor holds a lion as a pet in his backyard, he will inevitably impose a great risk on his neighbors. Moreover, it is a risk that remains great even after the actor has taken reasonable care. For this reason, holding a lion as a pet satisfies the first three elements of the Section 520 test. The last three elements are also satisfied. Holding a lion as a pet is not a common activity—the risk the lion-holder externalizes to his neighbors is not equivalent to the risk they externalize to him. The benefits externalized to neighbors from holding a lion as a pet are likely to be far less than the risks externalized to them. For these reasons, it is appropriate under the theory of this article and under Section 520 to apply strict liability to the activity of holding lions as pets.

2. Nuisance

The law on abnormally dangerous activities is the easiest case to apply the theory of this article. However, the theory applies equally well to nuisances, which is the subject of this article.[23] Most of the standard environmental interferences, such as air or water pollution, have been treated as nuisances under tort law.

Nuisance law has not been articulated clearly. The theory of this article suggests a clear interpretation for the rules governing nuisance law. First, consider the basic legal definition of a nuisance: an intentional, nontrespassory and unreasonable invasion into the quiet use and enjoyment of property. Intentional, in nuisance law, has always had a meaning very similar to its meaning in the context of trespass law: it is enough if the defendant was aware of the nuisance. There is no need on the part of the plaintiff to prove that the defendant aimed to do harm to the plaintiff. The term nontrespassory has always had the effect of distinguishing between invasions that interfere with exclusive possession of property or a portion of it (*e.g.*, a boulder hurled onto the plaintiff's property) and invasions that merely make it less desirable to remain in possession of property (*e.g.*, smoke).

Perhaps the most important term in the definition of nuisance is *unreasonable*. There have been efforts to settle its meaning, but many of them are questionable. For example, the Restatement (Second) Section 826 says:

> An intentional invasion of another's interest in the use and enjoyment of land is unreasonable if:
>
> (a) the gravity of the harm outweighs the utility of the actor's conduct, or
>
> (b) the harm caused by the conduct is serious and the financial burden of compensating for this and similar harm to others would not make the continuation of the conduct not feasible.[24]

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[23] The approach of this paper applies the theory of externalities to nuisance law, in an effort to understand the doctrine. An alternative approach to the economics of nuisance can be traced to the transaction cost analysis developed by Coase. *See* Ronald H. Coase, *The Problem of Social Cost*, 3 J.L. & ECON. 1 (1960); Thomas W. Merrill, *Tresspass, Nuisance, and the Costs of Determining Property Rights*, 14 J. LEGAL STUD. 13 (1985); Henry E. Smith, *Exclusion and Property Rules in the Law of Nuisance*, 90 VA. L. REV. 965 (2004).

[24] RESTATEMENT (SECOND) OF TORTS: UNREASONABLENESS OF INTENTIONAL INVASION § 826 (1977).

This definition is questionable because it refers to the actor's conduct rather than his activity. The core question is whether the actor's activity is one that imposes too many risks on others given its benefits (or given the costs reciprocated by others). The second provision of Section 826 is almost useless, because it implies that strict liability should apply to any nontrivial interference with a person's use and enjoyment of land.

The theory of this article suggests that the rules of Section 520 are equally applicable to nuisance disputes. The first three factors should be reworded so that they apply to nuisance disputes. The appropriate test for unreasonableness under nuisance law can be articulated as follows:

> (a) existence of a high degree of interference with the quiet use and enjoyment of land of others;
>
> (b) likelihood that the harm resulting from that interference will be substantial to the typical member of the community;
>
> (c) inability to eliminate the interference by the exercise of reasonable care;
>
> (d) extent to which the activity is not a matter of common usage;
>
> (e) inappropriateness of the activity to the place where it is carried on and;
>
> (f) extent to which its value to the community is outweighed by its dangerous attributes.

The first three factors of this test require that the interference be substantial even when the actor is taking reasonable care. As in the case of abnormally dangerous activities, the first three factors should be treated as minimal requirements for nuisance liability. If, in other words, the interference would be trivial if the actor took reasonable care, then the interference should not be considered a nuisance, and there is no need to examine the remaining factors of the test.

The last factor asks the court to compare the benefits externalized by the activity and the costs externalized. When the benefits are substantial, the last factor suggests that the court should be reluctant to impose liability on a nuisance theory. Consider, for example, the noise generated by a fire station. Suppose it is a particularly busy fire station. The noise generated by fire trucks constantly moving in and

out of the station with their alarms running could be deemed to substantially interfere with the quiet use and enjoyment of land by neighbors. However, the neighbors also benefit by being located close to the fire station. Since those benefits are substantial and widely dispersed, the neighbors should not be allowed to impose strict liability on a nuisance theory against the fire station. There is no economic basis for using liability as an incentive to force the fire station to reconsider its location decision.

Nuisance law does not provide for compensation to the extra-sensitive plaintiff.[25] The justification for this well-settled piece of the law is best understood in terms of the model of this article. A nuisance exists, under the model here, when the externalized costs associated with an activity are substantially in excess of externalized benefits. The comparison of externalized costs and benefits is made with respect to statistical averages, not to any particular plaintiff. If, on the basis of statistical averages, the externalized costs associated with an activity are not substantially greater than the externalized benefits, then the activity is not a nuisance under the theory here. If a particular plaintiff suffers a severe injury under these conditions, that harm may be actionable under some other tort theory such as negligence, but it is not actionable under nuisance law.

Local conditions play an obviously important role in nuisance law. In particular, the last three factors (d, e, and f) of the test proposed here all depend on local conditions. Most environmental pollutants are regulated because of the risk of harm they impose on people located near the source. In most cases, the risk of harm declines as people move further from the source. Thus, externalized costs are likely to be substantial near the source and declining to zero as one moves further away. Strict liability provides incentives for the pollution generator to locate in regions in which externalized costs are insignificant.

E. Shutting Down Nuisances

I have considered the conditions under which a source of an environmental interference should be held liable under nuisance law. This is equivalent to examining the proper scope of a liability rule. In this part, I will briefly consider the conditions under which such a source should be enjoined or, in simpler terms, shut down.

Nuisance law, unlike trespass law, is a balancing regime. Decisions to impose damages or to enjoin are made largely on the

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[25] *See, e.g.*, Rogers v. Elliott, 15 N.E. 768 (Mass. 1888).

basis of balancing costs and benefits in nuisance law. This contrasts with trespass law, which does not typically balance costs against benefits in order to determine whether an injunction is desirable. For example, if an actor threatened to send bulldozers over to your property, you could run to court and get an injunction to stop them. When you appeared in court to seek the injunction, the judge would not engage in a balancing inquiry—attempting to determine the extent of the threatened harm to you and the value of the threatening actor's conduct—in order to determine whether an injunction should be issued. The court would hold that the bulldozers would interfere with your exclusive possession and enjoin the threatening actor. On the other hand, if the same actor were to threaten to send black smoke from his furnace out over your property, it would be far more difficult to enjoin his activity because the court would engage in a balancing test. And since at the time you appeared in court, the threatened harm had not occurred and was merely speculative, you probably would not obtain an injunction.

Some nuisances are enjoined. The law on injunctions has not been set out with clarity. In *Boomer v. Atlantic Cement Co.*,[26] the New York court reversed a preexisting state doctrine that favored the granting of injunctions for any substantial unreasonable invasions. The court held that in the presence of a great disparity between the economic value of the nuisance generator's activity and the harm imposed on the victims, courts should issue damage awards rather than injunctions. The reason underlying the decision was consistent with long-standing principles of equity. Under those principles, an injunction would be appropriate only when the benefits of an injunction appeared to be greater than the costs. In *Boomer*, the court decided that the costs of an injunction, in terms of economic injury to the community created by the forced closure of a large employer, would be greater than the harms imposed by the nuisance generator.

If damage payments accurately reflected all of the losses suffered by victims, there would never be a need to issue an injunction. Consider Figure 1 again. If external costs are very high and external benefits are nonexistent (or miniscule), the optimal scale of the offending activity is zero (notice that the intersection of *MSC (very high externality)* and *MPB* does not occur for any positive scale decision). If damage awards correctly measured losses suffered by victims, every case involving extremely high external costs and miniscule external benefits (*i.e.*, to *MSC* (*very high externality*) and *MPB* in Figure 1) would be shut down, in effect, by damage awards.

[26] 257 N.E. 2d 871 (N.Y. 1970).

Given this, the question immediately arises why injunctions are ever issued.

The reason for issuing injunctions is that damage awards do not compensate for all of the losses suffered by victims of an environmental interference. If the nuisance is sufficiently offensive, it will impose large subjective losses on victims. Those subjective losses will not be included in damage awards. For example, suppose an environmental nuisance is so offensive that the victims are forced to sell their homes, at a great loss, and move. The victims would suffer a great objective loss, specifically the measurable market value of their homes, and a great subjective loss as well, which is the excess over the objective price that they would demand if forced to sell their homes immediately.

It follows from this that if the environmental interference is so offensive that the optimal scale of the activity is zero—*i.e.*, the scenario appears to fit in the depiction in Figure 1 of *MSC (very high externality)* coupled with *MSB (low externality)*—then an injunction rather than a damage award should be issued. The reason is that the injunction reduces the likelihood of error by forcing the nuisance generator to prove that it really is capable of operating while covering all of the social costs if it wishes to continue in operation.

In this framework, a shut-down order should be governed by a cost-benefit analysis, consistent with equity principles. If social welfare appears to be greater if the nuisance generator continues to operate while paying damages rather than shutting down completely, an injunction would be inappropriate. Since strict nuisance liability is appropriate whenever external costs exceed external benefits, the shut-down condition is more demanding. In particular, a shut-down order is appropriate only when external costs exceed external benefits *and* the total sum by which external costs exceed external benefits is greater than the total sum by which private benefits exceed private costs.[27]

Instead of a shut-down, consider an abatement order, or imposition of a binding emission standard. The principles described for the case of a shut-down order apply equally to that of an abatement order or emission standard. The standard should be imposed, or enforced by a court, only if the social benefits of the standard are greater than the

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[27] *See* Hylton, *Missing Markets*, *supra* note 6. A closely related issue is that of "coming to the nuisance". For the most part, the law does not provide immediate protection to the person who arrived first. *See, e.g.*, Ensign v. Walls, 34 N.W.2d 549 (Mich. 1948). This is consistent with the cost-benefit approach described here. If the externalized harms exceed externalized benefits by a sufficiently large margin (specifically, if the net externalized harm exceeds the net internalized benefit) the nuisance generator should be shut down, whether or not he arrived first.

social costs. In other words, cost-benefit analysis should apply to the enforcement of all command-and-control environmental standards.[28]

The cost-benefit test governing injunctions does not prevent courts from regulating negative externalities. In this framework, the scope of liability rules is much broader than that of injunctions. A regulatory authority denied the power to enforce an emission standard can always achieve the desired result through a liability rule. Of course, the liability rule itself is contestable on the basis of the test comparing externalized costs and benefits.

Recall the four types of regulatory regimes examined in the introduction of this article: public with command-and-control, public with liability rules, private with command-and-control, and private with liability rules. This discussion of nuisance law suggests that private with command-and-control has indeed been a part of traditional nuisance law. However, the scope of the command-and-control approach has been unclear. The theory presented here has implications for its ideal scope. I will return to this issue.

F. Nuisance, Economic Development, and Regional Variation

The fundamental economic test determining nuisance status examines the ratio of externalized costs and externalized benefits associated with some environmental injury.[29] If the externalized

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[28] For informative discussions of the cost-benefit controversy in environmental law, see Hsu, Shi-Ling, *On the Role of Cost-Benefit Analysis in Environmental Law*, 35 ENVTL. L. 135 (2005); Douglas A. Kysar, *Climate Change, Cultural Transformation, and Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555 (2004); David M. Driesen, *Is Cost-Benefit Analysis Neutral?*, 77 U. COLO. L. REV. 335 (2006); Stephen F. Williams, *Cost Benefit Analysis Colloquy: Squaring the Vicious Circle*, 53 ADMIN. L. REV. 257 (2001); Michael Abramowicz, *Toward a Jurisprudence of Cost-Benefit Analysis*, 100 MICH. L. REV. 1708 (2003). The Hsu article is a critique of FRANK ACKERMAN & LISA HEINZERLING, PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING (New Press, 2004). *See also* Alan Carlin, *The New Challenge to Cost-Benefit Analysis*, 28 REG. Fall 2005, at 19. For those who think that the application of cost-benefit analysis is necessarily bad for the environment, the experience in China should be taken into consideration. The authorities there generally ignore the protests of citizens threatened with pollution from new industrial plans. *See Protest in China: Mobilized by Mobile*, THE ECONOMIST, June 23–29, 2007, at 48–49. Environmental regulation in China, to the extent that it takes place at all, is conducted under an approach that often ignores the costs imposed on citizens by industrial pollution sources.

[29] On the evidence for external benefits from industrial plants, see Michael Greenstone & Enrico Moretti, *Bidding for Industrial Plants: Does Winning a 'Million Dollar Plant' Increase Welfare?* (MIT Department of Economics Working Paper No. 04–39, November 2004), *available at* http://ssrn.com/abstract=623122. Greenstone and Moretti find evidence of a positive effect on labor earnings in winning and adjacent counties, as well as positive effects on property values from the opening of a large industrial plant. The property value increase may reflect external benefits that were not capitalized into property values at the moment the new plant opened. Increasing returns to scale in location provides a broad theoretical basis for thinking that industrialization often externalizes benefits in addition to costs, see Gilles Duranton & Diego Puga, *Micro-Foundations of Urban Agglomeration Economies* (CEPR

benefits are greater than or equal to externalized costs, then strict nuisance liability is inappropriate, and an injunction even less so. If the externalized costs are substantially greater than externalized benefits, or substantially greater than the costs externalized by the typical activity in the community, strict nuisance liability is appropriate.

This approach has clear implications for the growth of nuisance law in a developing economy. In less developed economies, we should observe fewer activities that should be regarded as nuisances. There are several reasons for this. First, if some geographic areas are devoted to industry, for a range of low-level interferences the vast majority of environmental harms emitted by one industrial activity may be equivalent to those emitted by other activities within the industrial community. Where there is a reciprocal exchange of harm among activities, there is no reason to prefer strict nuisance liability over negligence. For example, if the upstream company pollutes the water, forcing the downstream firm to clean the water, while the downstream company pollutes the air, forcing the upstream company to install filters, and both companies cross-externalize equivalent costs, the same activity levels will be observed under strict liability and under negligence. Given this, there is no reason to opt for strict liability instead of negligence. And as long as the interferences are of a low-level sort and the number of residences is small, individuals who move into the region can be treated as having assumed the risk This "reciprocal harm" test suggests an immediate justification for the traditional locality test under nuisance law.[30]

The second reason we should observe fewer nuisances—*i.e.*, things that should be deemed nuisances—in developing economies is that the external benefits associated with industrial development are greater in developing economies than in developed economies. Consider, for example, an economy that is near the subsistence level. An industry that enters and produces will provide far greater benefits to all of the members of the population than would be observed by the same entry occurring in a developed economy. A large firm that enters, employing workers and producing goods, in a near-subsistence

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Discussion Paper No. 4062, September 2003), *available at* http://ssrn.com/abstract=468960.

[30] Of course, the reciprocity norm should be understood to apply to continuous *low-level* disturbances. The release of a toxic gas is a different matter. The notion of reciprocal harms carries within it the implication that the harms are of a low-level sort. If, for example, the parties each could release deadly chemicals into the environment, that sort of exchange could not continue in a reciprocal fashion. One side would be destroyed and that would be the end of the exchange. Also, once the number of residences becomes large, the nature of the region may change in a way that makes it appropriate to consider the low-level interferences as nuisances.

economy would substantially affect the living standards of all members of the population, enabling them to engage in other activities more productively. On the other hand, in the case of an advanced economy, the entry of a large employer primarily affects the living standards of its own employees and its own consumers, and even in those cases not by much in light of their preexisting alternatives.

Since the external benefits associated with any productive activity are larger in an impoverished economy, ordinary industrial activities will confer substantial external benefits over the whole economy in a poor country. This is one reason that it makes sense, on economic grounds, to tolerate a higher level of environmental interferences in developing economies than in developed economies. This is what has been observed: developing economies typically have higher levels of pollution than developed economies, and modern developed economies, such as the United States, have been through a period of industrial development in which pollution was far worse than it is today. This argument helps explain the infamous Summers memorandum on the location of polluting industries.[31] The Summers memorandum was politically controversial and led to a great deal of criticism of its author, Larry Summers.[32] But the economic reasoning of the memorandum was sound and consistent with the explanation of nuisance law provided here.

For economically advanced economies, the ratio of externalized costs to externalized benefits increases sharply for the environmental interferences associated with common industrial activities. The employment, productivity, and consumption benefits offered by any particular industry are typically narrower and concentrated to direct employees and consumers. Moreover, in robust asset markets, such as that for land, many externalized benefits are captured in asset prices. As a consequence, the benefits of industrial activity are not externalized to the general public in such a large degree as in underdeveloped economies. Since the opportunity cost, in terms of reduced consumption, of additional environmental purity is relatively low in advanced economies, the externalized costs of environmental

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[31] For the text of the memo, see Memorandum from Lawrence H. Summers, Chief Economist, World Bank (Dec. 12, 1991), *available at* http://conservationfinance.wordpress.com/2006/09/19/toxic-waste-and-the-larry-summers-memo.

[32] For a sample of the criticism, see Basil Enwegbara, *Toxis Colonialism: Lawrence Summers and Let Africans Eat Pollution*, THE TECH, ONLINE EDITION, April 6, 2001, *available at* http://www-tech.mit.edu/V121/N16/col16guest.16c.html. The view expressed in the Summers memorandum could have been presented in a more tactful way. Criticism focusing on the style rather than the content of the argument is probably appropriate.

harm associated with industry are likely to be greater than the externalized benefits associated with it.

The upshot is that an aggressive effort to internalize the external costs associated with environmental harms is a sensible approach for developed economies. However, even in developed countries, there should be some sensitivity to local conditions. Just as the ratio of externalized costs and benefits might differ greatly between a developed and underdeveloped economy, so might the ratio differ between regions of a developed country. As a general rule, internalization should occur when the ratio of externalized costs to benefits exceeds one, whether this occurs in a developed or underdeveloped region.

Suppose there are two adjacent regions and pollution drifts from one into the other. The ratio test described here applies in a straightforward way. Just as externalized costs can cross state lines, so can externalized benefits. If the externalized costs (crossing the state lines) exceed the externalized benefits (crossing state lines), the ratio test implies that the pollution generator should be held strictly liable. On the other hand, if pollution drifts across boundaries into a region in which the ratio test disfavors internalization (because the benefits externalized by the polluting source exceed the costs), then strict nuisance liability would be inappropriate. This may seem unfair because it would permit a polluter in one state to send pollution across state boundaries without being held strictly liable. But the cost-benefit test proposed here is in no sense dependent upon state boundaries. If externalized costs in the form of pollution cross state boundaries, externalized benefits may cross the same boundaries. If that is the case, the transboundary polluter should not be held strictly liable.[33]

My approach may seem similar to Thomas Merrill's "Golden Rule" analysis of transboundary pollution.[34] However, it differs in important respects and delivers different results. Merrill's approach focuses on equal treatment of home and foreign pollution sources. Under my approach, the underlying question is whether pollution sources in the two states externalize reciprocal (and generally insignificant) costs, or whether the pollution source externalizes benefits across state lines in addition to costs. If neither of these conditions holds, then my approach favors strict nuisance liability

[33] For an approach that is similar in some respects, see Thomas W. Merrill, *Golden Rules for Transboundary Pollution*, 46 DUKE L. J. 931 (1997).

[34] *Id.*

against the transboundary polluter even if the receiving state does not impose strict liability on its own polluters.[35]

Internalization can take place through taxes designed to reflect the external costs of environmental injury. Alternatively, internalization can take place through nuisance law. Government enforcement through taxation would take advantage of scale economies in the centralization of enforcement efforts, but the agency cost problem would remain. Private enforcement through nuisance actions avoids the agency cost problem, but introduces inefficiencies associated with decentralized enforcement. The ideal environmental enforcement regime for an advanced economy should minimize decentralization inefficiencies and agency costs. Public enforcement, the norm for environmental law enforcement today, has the flaw of doing too little to minimize the agency cost problem. And this is not the only flaw of the modern public enforcement regime for environmental law.

III. TOWARD AN IDEAL ENVIRONMENTAL ENFORCEMENT REGIME

An optimal environmental regulation regime would minimize the sum of the costs of environmental harms, the costs of avoiding those harms, and the administrative costs of environmental law enforcement. The problem I am concerned with here is finding the right regulatory standard and the right mix of private and public enforcement. The optimal regulatory regime would adopt a legal standard and a mixture of private and public enforcement that minimizes the total social costs associated with environmental harms, consistent with existing resource constraints.

A. Finding the Optimal Mix of Public and Private Enforcement

Since public enforcement is often suboptimal because of the agency cost problem, and private enforcement is suboptimal because of decentralization inefficiencies, the ideal environmental law enforcement regime is unlikely to be a system of purely public or purely private enforcement. The ideal system should seek a combination of public and private effort that avoids the most costly features of each type of enforcement. It follows that the ideal system would rely on public enforcement where decentralization inefficiencies were most severe and unlikely to be corrected within a decentralized private system. The system would also rely on private

[35] Admittedly, nuisance cases involving pollution across state lines are preempted by federal law. *See* Jonathan H. Adler, *Warming Up to Climate Change Litigation*, 93 VA. L. REV. (IN BRIEF) 61, 64 (May 21, 2007).

enforcement as the default pattern, since the agency cost problem is always present in a system of public enforcement.

To simplify this discussion, let us set aside for the moment the problem of finding the optimal regulatory standard. Assume that the regulatory standard is strict liability for environmental injuries.

1. Identification, Discovery, and Enforcement

Public enforcement has been considered desirable in the environmental setting because of the inefficiencies associated with decentralized private enforcement. One of the major inefficiencies is connected to the incentives to *identify* and to *discover* the source of environmental injury. Some environmental injuries are obvious to the victims, and yet the victims are unlikely on their own to discover the source of the injury. For example, if a firm dumps toxic chemicals into the water supply in the middle of the night, victims will discover the injury soon enough but may be unable to discover the source of the injury. Some environmental injuries, however, may not even be obvious to the victims for a long time. A colorless and odorless gas that is toxic and results in injury that is realized only after a long period may remain as a source of environmental harm for a long period before victims identify it as a source of harm. They may attribute any injuries they suffer to other causes, such as lifestyle decisions.

One of the key reasons victims may fail to identify the injury and discover the source of harm is the distribution of costs and benefits from such efforts. A victim who investigated the source of some environmental harm would have an incentive to do so only up to the level of his private benefit from discovery. For example, if the victim can gain a compensation payment of no more than $10,000 from the source, the victim will not invest more than $10,000 into the effort of discovering the source. If discovery of the source requires an investment of $50,000, no victim will have an incentive to invest into the discovery process. Similarly, if the harm itself is difficult to identify, some victim would have to take it on his own to monitor the local environment, without being sure of any gain that would come about as a result. Because of this public goods problem, such efforts are unlikely to be observed.

In addition to these examples of inadequate incentives for identification and discovery, there is also the familiar problem of inadequate incentives for *enforcement.* Even if every victim knew with certainty the nature of the environmental harm and its source, incentives to enforce may still be lacking. The reason is that each

victim would be better off letting someone else enforce rather than investing resources into enforcement on his own. If the first person to enforce would secure a global settlement or judgment, the incentive to enforce for any particular victim would be weak. Since the first person to enforce would obtain a judgment for everyone, every victim would prefer to wait for someone else to be first to enforce, in order to avoid the cost of enforcement and at the same time secure its benefit. Even if the first person to enforce can only gain an individualized settlement or judgment, the incentive to wait remains. Because the first person must establish liability on the part of the defendant, every victim would have an incentive to let some other victim sue first, in order to establish a precedent on which later victims could rely in prosecuting their private claims.

The general lesson suggested by these incentive problems is that there are distinguishable stages of enforcement in which inadequate incentives are likely to be observed. First is the identification stage, which involves learning of the existence of an environmental injury. Second is the discovery stage, which involves discovering the source of the environmental injury. Third is the enforcement stage.

2. Public Enforcement's Advantage

It is well known that the class action mechanism provides a solution to the public goods problem in enforcement. With class action litigation or enforcement, there is no need to rely on public enforcement as a solution to the public goods problem. The class action device effectively bundles the enforcement claims of multiple victims into one. This alters incentives so that the investment into enforcement efforts will be undertaken whenever the cost of enforcement is less than the aggregate harm caused by the injury.

Although less obvious, the class action mechanism also provides a potential solution to the incentive problems in discovery. Once an environmental injury has been identified, the cost of source discovery may be so great that no individual victim has an incentive to bring an enforcement action. But if claims are pooled into an aggregate judgment, the party with the right to sue for that judgment is far more likely to have an incentive to invest into discovery of the source. Suppose there are 10 victims, each suffering an injury of $10,000. Suppose the cost of discovering the source of the harm is $10,000. A class-action enforcer would have an incentive to invest in discovering the source as long as he could secure 10 percent of the judgment.

The core decentralization inefficiency is the production of information identifying environmental harms. Environmental injuries

that are unlikely to be detected for long periods by victims will not be discovered in the absence of some monitoring of the environment and disclosure of information on harmful pollutants. This is unlikely to occur under any private enforcement scheme, with or without the class action mechanism.

This suggests that public enforcement can be reduced to the central feature of monitoring and disclosing information. Thus, the central role for government in the regulation of environmental injury is monitoring and disclosure. Once disclosure of harm occurs, the enforcement role can be delegated in most cases to private enforcement agencies.[36] Of course, since discovery of the source will often occur at the same time as identification of the harm, the monitoring and disclosure function will usually involve both.

The core mission for public enforcement agencies is the production of information identifying harmful pollutants and their sources. Should public enforcement agencies be limited to this role? Unless public agencies can be shown to be more efficient than private agencies at enforcement efforts, public agencies should be limited to the sphere of activity in which they have a comparative advantage. I am aware of no reliable empirical evidence that public enforcement agencies would be more efficient enforcers, in cases in which the both the harm and the offender have already been identified.

Public enforcement agencies might be more efficient enforcers, in cases in which both the injury and the offender have already been identified, if there are scale economies in environmental law enforcement that could not be replicated within a private enforcement regime. However, public enforcement agencies are far more vulnerable to what I have described as the agency cost problem. Given this, a system of public enforcement is unlikely to be more efficient in general than a system of largely private enforcement.

B. The Legal Standard

It might seem to follow from the discussion of nuisance law and development that a rule of strict liability should be the norm in advanced economies. However, the rule adopted by the law should be the economic norm reflected in traditional nuisance law: compare the externalized benefits of the actor's activity with its externalized costs. The argument in favor of the traditional nuisance standard is based on

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[36] For an early proposal for a private environmental law enforcement system based on class actions, see Frank I. Michelman, *Pollution as a Tort: A Non-Accidental Perspective on Calabresi's Costs*, 80 YALE L. J. 647 (1971).

two claims: first, that it is optimal in terms of regulating activities, and, second, that it encourages the disclosure of information to courts.

In an advanced economy, the traditional nuisance test will operate in a manner that results in strict liability in probably the vast majority of cases in which there is a serious environmental injury. The exceptional cases are: (1) those in which there is no serious environmental injury that distinguishes the nuisance generator from any number of other background activities, and (2) those in which the external benefits of the source exceed the external harms. The traditional test permits courts to reach different conclusions in these cases, depending on the strength of the evidence and the circumstances of the location. Moreover, this approach provides incentives for nuisance generators to find locations in which external harms are insignificant.

Consider the first exception, in which there is no serious environmental harm distinguishable from other background activities. As a general rule, these cases are inappropriate for strict liability. The reason is if harms are trivial or reciprocal among activities, the negligence standard is sufficient for encouraging optimal incentives. There is no need to impose strict liability in order to discourage the activity.

The legal standard should permit defendants to contest cases in which there is no substantial evidence of harm or in which the evidence of harm is speculative. In a regime in which public enforcers identify harms, there is still a need for an independent evaluation of the seriousness of those harms. This is implied by the existence of the agency cost problem. In particular, if public enforcement agents are capable of being biased or corrupted, their assessments have to be subjected to independent tests. Moreover, private parties, such as the alleged injurer, may have private information bearing on the seriousness of the harm that should be aired before an impartial judge.

The controversy over global warming provides a useful illustration of this point. The science of global warming appears to have gained substantial acceptance, but the economics of global warming remains hotly contested.[37] If a government were to impose constraints on sources of global warming, the standard proposed here would permit a regulated party to contest those regulations on the basis of the

[37] BJORN LOMBORG, THE SKEPTICAL ENVIRONMENTALIST: MEASURING THE REAL STATE OF THE WORLD (Cambridge Univ. Press, 2001); BJORN LOMBORG, COOL IT: THE SKEPTICAL ENVIRONMENTALIST'S GUIDE TO GLOBAL WARMING (Knopf Publishing Group, 2007). For a review of the first Lomborg book, see Douglas A. Kysar, *Some Realism about Environmental Skepticism: Bjorn Lomborg's 'The Skeptical Environmentalist'* (August 13, 2002), *available at* http://ssrn.com/abstract=323460.

nuisance standard. The government would be required to present evidence that the regulated party's activity externalized harms in excess of externalized benefits.[38] The regulated party would be permitted to contradict the government's evidence. If the court concluded that the regulated party's conduct did not produce a nuisance, any command-and-control regulation would have to be viewed as a taking by the government.

In relatively wealthy economies, such as North America or Europe, there is a good chance that the externalized harms from production processes that emit greenhouse gases exceed externalized benefits. If so, an internalizing tax or liability charge would be appropriate on economic grounds. However, in relatively poor countries, such as China, the externalized benefits of local industry, in terms of pulling people out of miserable poverty, are probably greater than the externalized costs. Production taxes applied to greenhouse gas sources in wealthy economies and consumption taxes applied to goods imported from greenhouse gas producers in poor countries should be sufficient to regulate the production of greenhouse gases. These charges could be brought home to the relevant sources through the liability system as well in the form of class actions.[39]

To elaborate, consider two regions, A and B. A is wealthy and B is relatively poor. Although global warming has been presented as a uniform threat to all regions, the external costs from greenhouse gas emissions will probably differ between the two regions. The wealthy region will be better capable of reducing the damaging effects of greenhouse gas emissions (if those effects are ever realized). Suppose, then, that the external cost per unit of production (of those processes that generate greenhouse gas emissions) is $100 in region A and $150 in region B. Suppose that the external benefit per unit of production is $0 in region A and $300 in region B. An internalizing tax or liability charge that works out to be the equivalent of $100 per unit of production in region A would help correct incentives of producers in region A. In region B, no tax or liability charge should be applied, since, on net, the externalities generated in region B are positive. This simple example provides support for the reluctance of some developing countries (China is the best example) to impose stringent

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[38] On measuring the external costs of greenhouse gas emission, see European Commission, Directorate-General for Research, *External Costs: Research Results on Socio-Environmental Damages Due to Electricity and Transport* (2003), *available at* http://www.externe.info/externpr.pdf.

[39] Class action lawyers could sue to create a fund in which the pollution source would pay the external cost per unit of production. There are other private litigation models to consider, *see* Daniel A. Farber, *Basic Compensation for the Victims of Climate Change*, 155 U. PA. L. REV. 1605 (2007).

controls on greenhouse gas emissions. Since production in region B also imposes costs on region A of $100 per unit of region B output, region A should impose tariffs on goods imported from region B in order internalize extra-regional external environmental costs. The tariffs should be designed to impose a charge of $100 per unit of production in region B. Alternatively, sellers in region A of products (connected to greenhouse gas emissions) imported from region B could be held liable for domestic pollution costs. Aside from these actions, there is no reason under this model for region B to tax or to constrain its own producers.

Admittedly, the global warming example is a special case because it involves a cost that has to be controlled because of its aggregate global effects.[40] The more routine cases involve pollutants that should be regulated because of their harmful effects to people in the immediate area of the source. In the routine cases, location clearly matters. A regulated party should be permitted to bring in evidence that its interferences are not substantial in its location.

The second exceptional case in which the cost-benefit standard makes a difference is that in which the nuisance generator is also a source of substantial external benefits in its location (or in which the nuisance generator's activities are no more harmful than those of the average activity in the location). In such cases, the nuisance generator should be permitted to offer evidence that it is a source of significant externalized benefits to the community, and that those benefits exceed the external costs connected with environmental interferences.

For example, consider cell phone towers. Suppose evidence were developed in the future indicating that microwave radiation from cell phone towers is a source of substantial harm to residents who live or work near the towers. A strict liability rule would make the owners of cell phone towers liable for the harms. This would give the owners incentives to alter the technology to reduce harm to others, or to locate the towers in areas in which the harm to neighbors would be minimal. The cost-benefit rule of traditional nuisance law, however, would impose liability only if the externalized costs were large in relation to externalized benefits.

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[40] Because of this, some have argued that common law nuisance, as a localized solution, should not play a serious role in the regulation of climate change. *See, e.g.*, Jonathan B. Wiener, *Think Globally, Act Globally: The Limits of Local Climate Policies*, 155 U. PA. L. REV. 1961 (2007), However, I have argued here that nuisance law provides a very good framework for regulating climate change. The comparison of externalized costs to externalized benefits should produce a regime in which liability charges are brought home to sources of greenhouse gases in most developed areas.

What sort of externalized benefits might exist in this example? Suppose the network of cell phone towers in a particular town became an important element of public safety. For example, communication by cell phones among public safety officials could be an important means of minimizing harm during adverse weather conditions. These public safety benefits could be estimated and quantified – in terms of the value of lives saved and injuries avoided. A modern nuisance law regime would require both sides of the dispute to present estimates of externalized costs and externalized benefits. Such a standard would allow the private information of both parties to be revealed to the court.

The cell phone tower owners should be held strictly liable to a particular set of victims only if the external harms due to microwave radiation were greater than the value of the public-safety benefits to the victims. This rule might permit individual plaintiffs to collect if the benefits they receive are trivial (say, because the public benefits go largely to a different population) while the costs are substantial. Even if the benefits were substantial, a particular victim might be permitted to recover under this rule if the costs were far greater (*e.g.*, a high risk of cancer). However, some minimal risk would have to be tolerated under this rule if there is a substantial public safety benefit.

C. Optimal Mix and Legal Standard

Let us return to the mix of regimes considered at the start: public enforcement with command-and-control, public enforcement with liability rules, private enforcement with command-and-control, and private enforcement with liability rules. Modern environmental law consists largely of the public with command-and-control model, with nuisance suits in the background. I have suggested a mixed enforcement regime that has a different makeup. Public enforcement should for the most part be present at the base and at the edges of a modern environmental enforcement regime. Public enforcement is necessary at the base, in order to identify harms that would be invisible to most victims. Public enforcement would also be necessary as a backstop to private enforcement, to handle the cases in which private enforcement incentives were to weak. The core of the modern enforcement regime would be privately operated.[41]

[41] Obviously, this has implications for preemption of nuisance lawsuits. Since public enforcement would assume a complementary role, preemption should not be a difficult issue under the approach proposed here.

1. Allocation of Responsibilities Among Enforcement Regimes

The public with command-and-control regime is comparatively efficient when private enforcement is unlikely to occur and when liability rules are unlikely to provide a deterrent effect. One setting in which private enforcement is unlikely, already discussed, is when the source evades detection, as in the case of a criminal who poisons a water source in the middle of the night. Another setting in which private enforcement is unlikely is when the sources of harm are small and geographically dispersed. Suppose the sources of harm are 1000 owners of cars that violate optimal emission standards. Given the cost of rounding up so many defendants, individual victims are unlikely to take enforcement into their own hands. If, in addition, some of those 1000 owners are judgment proof with respect to the damages that would be asserted, liability rules are unlikely to have an effective deterrent effect. This is a setting in which public with command-and-control has an advantage over the other regimes. However, command-and-control environmental rules should be enforced only if they satisfy cost-benefit tests.[42]

The public with liability rules regime is comparatively efficient when private enforcement is unlikely to occur and when liability rules are likely to provide a reliable deterrent effect. Again, consider the case of 1000 owners of cars that violate optimal emission standards. If a scheme existed for internalizing the externalities, it would be preferable to command-and-control. The reason for this is that any actor whose private gain exceeded the harm imposed on others would simply pay for the external harm and continue in his activity. Consider, for example, a scheme in which drivers pay an internalizing tax for each gallon of gasoline. More generally, the public with liability rules regime is equivalent to using taxes to regulate environmental interferences.

The private with command-and-control regime is comparatively efficient when the source of harm has been identified and the externalized harm exceeds externalized benefits by such a wide margin that the nuisance generator should be shut down. The private enforcer in this case seeks an injunction from a court. The injunction forces the polluter to either shut down or to buy out the injunction from the private enforcer. Presumably these cases will be infrequent.

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[42] It immediately follows that prohibitions in the law on the consideration of cost-benefit analysis in the enforcement of command-and-control rules would have no place in an optimal regime. *See, e.g.*, Whitman v. American Trucking Ass'ns, 531 U.S. 457, 464–71 (2001) (EPA must establish national ambient air quality standards to protect public health and may not consider cost in setting these standards).

The private with liability rules regime is comparatively efficient when the source of harm has been identified (typically a single large source, rather than dispersed atomistic sources) and the externalized harms exceed externalized benefits, but not by such a wide margin to suggest that a complete shut down of the polluter would be socially desirable. The majority of environmental interferences should fall in this category. Class action lawsuits against major single-source polluters would provide the driving force for this regime. The following table summarizes this argument.

TABLE 1: ALLOCATION OF ENFORCEMENT REGIMES

	Public	Private
Command-and-Control	• Identification difficult• Dispersed atomistic sources / Judgment proof or unresponsive to liability	• Identification easy• Small number of sources• Shut down desirable
Liability	• Identification difficult• Dispersed atomistic sources / Responsive to liability	• Identification easy• Small number of sources• Shut down not desirable / Externalized costs exceed externalized benefits

These suggestions for allocating responsibilities among regime types have immediate implications for the choice of taxes, cap-and-trade schemes, and liability as instruments for controlling environmental interferences. Cap-and-trade and tax approaches are both subject to the agency cost problem identified earlier. Public enforcement agents may have incentives that diverge from those of potential victims or from what is in society's best interests. On the other hand, given that public enforcement is sometimes necessary, the tax approach is preferable to cap-and-trade. Cap-and-trade schemes require information on the optimal degree of interference, which is difficult to obtain. Taxes, in comparison, require less information.[43] If public enforcement is not necessary, private enforcement through liability rules is preferable because it harnesses the private information of victims and suffers least from the agency cost

[43] This claim about the administrative ease of taxation relative to quantity regulation is a generalization. There may be counterexamples. *See, e.g.*, Cole and Grossman, *supra* note 6.

problem. A loser-pays rule could be incorporated to prevent class action attorneys from filing frivolous nuisance claims.

IV. CONCLUSION

Common law nuisance doctrine provided the first system of environmental regulation in English-speaking countries. Today, most of what modern scholars refer to as environmental regulation is statutory law. But statutory law often supplants or displaces common law without reflecting its accumulated wisdom. This is perhaps most obvious in the field of environmental law, where statutory interpretation has now taken the place of the careful cost-benefit balancing of the common law. I have used this article to reexamine the function of common law nuisance doctrine, and to propose an environmental law enforcement system that exploits the lessons reflected in that doctrine.