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Protecting the Environment by Addressing Market Failure in Intellectual Property Law: Why Compulsory Licensing of Green Technologies Might Make Sense in the United States Institutional Religious Exemptions: A Balancing Approach

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Protecting the Environment by Addressing Market Failure in Intellectual Property Law:

Why Compulsory Licensing of Green Technologies Might Make Sense in the United States: A Balancing Approach

Environmental degradation is a growing concern for governments throughout the world, but especially in the United States.[1] According to most experts, global climate change presents one of the most pressing environmental problems in the world today.[2] Other significant environmental problems include degraded air[3] and water quality,[4] collapsing fisheries,[5] overloaded landfills,[6] and accumulating waste in the world's oceans.[7] Imagine that a

1. The international community has many organizations devoted to understanding environmental degradation, but perhaps the best reports on international environmental issues are produced within the United Nations. World Risk Report 2013: Focus: Environmental Degradation and Disasters, *available at* http://www.ehs.unu.edu/file/get/10487.pdf. Domestically, all you have to do is pick up a newspaper to see the multitude of environmental issues making headlines. *See, e.g.*, *Florida Sues BP Over Gulf Oil Spill*, N.Y. TIMES (Apr. 20, 2013), http://www.nytimes.com/2013/04/21/business/energy-environment/florida-sues-bp-over-gulf-oil-spill.html?ref=earth&_r=0; Bettina Boxall, *Bay Area Air Pollution Reaches Devils Postpile National Monument*, L.A. TIMES (Apr. 24, 2013), http://www.latimes.com/news/science/sciencenow/la-sci-sn-air-pollution-devils-postpile-20130424,0,5734715.story; Juliet Eilperin & Steven Mufson, *Many Coal Sludge Impoundments Have Weak Walls, Federal Study Says*, WASH. POST (April 24, 2013), http://www.washingtonpost.com/national/health-science/many-coal-sludge-impoundments-have-weak-walls-federal-study-says/2013/04/24/76c5be2a-acf9-11e2-a8b9-2a63d75b5459_story.html.

2. Naomi Oreskes, *The Scientific Consensus on Climate Change*, 306:5702 SCIENCE 1686 (2004).

3. *See, e.g.*, C. Arden Pope, III et al., *Fine-particle Air Pollution and Life Expectancy in the United States*, 360(4) NEW ENG. J. MED. 376 (2009).

4. *See, e.g.*, Robert I. McDonald et al., *Global Urban Growth and the Geography of Water Availability, Quality, and Delivery*, 40(5) AMBIO 437 (2011).

5. *See, e.g.*, Malin L. Pinsky et al., *Unexpected Patterns of Fisheries Collapse in the World's Oceans*, 108(20) PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 8317 (2011).

6. *See, e.g.*, Christine Longo & Jeffrey Wagner, *Bridging Legal and Economic Perspective on Interstate Municipal Solid Waste Disposal in the U.S.*, 31 WASTE MANAGEMENT 147 (2011).

7. Jocelyn Kaiser, *The Dirt on Ocean Garbage Patches*, 328 SCIENCE 1506 (2010).

solution to any one of these problems was within the grasp of humanity, but was quickly hidden away by those interested in perpetuating the status quo. This phenomenon has been well documented[8] and is commonly referred to as patent suppression.[9] Patent suppression is the process by which an individual or a company obtains a patent for an emerging technology in order to prevent that technology from coming to market.[10] Under the current United States patent law regime, it is possible for a company, fearing competition from an emerging technology, to buy the patent for the new technology in order to suppress it.[11] In this situation, the new patent holder can refuse to use the new technology while simultaneously refusing to license it to any other market participants, eliminating any possibility that the technology be put to beneficial use during the life of the patent. In a world that desperately needs to address its environmental problems, this use of U.S. patent law protection can delay the development of environmentally important technologies. This paper will address one possible solution to this problem: compulsory licensing.

Of course, any compulsory licensing regime must address competing policy goals. On one hand, a compulsory licensing statute can be a tool that the government uses to ensure beneficial technologies are not suppressed and are made available to the market. On the other hand, compulsory licensing laws risk eroding the value of a patent to the point that the incentive to innovate is destroyed. After all, the patent system exists as a mechanism for rewarding those who create beneficial technologies.[12] There are already a few narrowly applied statutes in the United States which

8. *See infra* Part I.B.2.

9. Richard Dunford, *The Suppression of Technology as a Strategy for Controlling Resource Dependence*, 32 ADMIN. SCI Q. 512 (1987); John J. Flynn, *Antitrust Policy, Innovation Efficiencies, and the Suppression of Technology*, 66 ANTITRUST L.J. 487 (1998); Kurt M. Saunders & Linda Levin, *Better, Faster, Cheaper—Later: What Happens When Technologies are Suppressed*, 11 MICH. TELECOMM. & TECH. L. REV. 23 (2004).

10. *See, e.g.*, Kurt M. Saunders, *Patent Nonuse and the Role of Public Interest as a Deterrent to Technology Suppression*, 15 HARV. J.L. & TECH. 389, 393 (2002).

11. SCM Corp. v. Xerox, 645 F.2d 1195, 1206 (2d. Cir. 1981) (holding that as long as a patent is acquired legally, it is not a violation of antitrust law to use the patent to the "full extent allowed under patent law" which includes preventing third parties from using a technology even when the patent holder itself is not using the patented technology).

12. 1 PATENT LAW FUNDAMENTALS § 1:6 (2d ed.).

provide for compulsory licensing of some technologies.[13] This paper will argue that a mandatory licensing statute which encompasses more environmentally beneficial technologies can overcome the problem of patent suppression while still maintaining the incentive to innovate. Part I provides a background discussion of some important environmental policy considerations, including the importance of technological advances as a means of solving environmental problems and the policy considerations surrounding patent law and compulsory licensing. Part II discusses why a broader compulsory licensing regime could be beneficial. Part III addresses some of the primary concerns over such a policy and discusses how we might potentially balance the conflicting policy goals. Part IV concludes.

I. BACKGROUND

Within the academic literature on environmental policy, there is no paucity of work discussing a market-based approach to solving environmental problems. Garret Hardin's *Tragedy of the Commons* and the long line of related commons analysis describe how many environmental problems arise from market failure.[14] That line of literature generally suggests the possibility of either privatization or regulation of public resources as a means of addressing market failure.[15] This section addresses another piece of the puzzle: technological innovation. Similar to Hardin's discussion of the commons, technological innovation is another area wherein a market-based approach may be helpfully applied to environmental policy. This section discusses how technological advancement may help to solve environmental problems. Then it discusses some of the conflicting policy considerations in trying to ensure that there are both adequate incentives for inventors to innovate while simultaneously ensuring that new innovations are diffused into the marketplace.

13. *See* discussion *infra* Part I.B.3.

14. *See* Garret Hardin, *Tragedy of the Commons*, 162 SCI. 1242 (1968) (discussing the problems inherent with public goods—where everybody has access but nobody has the right to exclude).

15. *Id*. *See also* Michael Heller, *Tragedy of the Anticommons: Property in the Transition from Marx to Markets*, 111 HARV. L. REV. 621 (1998); Lea Kosnik, *The Anticommons and the Environment*, 30:101 J. ENVTL. MGMT. 206–17 (2012) (discussing the opposite problem—where nobody has access because too many people have the right to exclude).

A. Technological Advancement as a Solution for Environmental Problems

Technological advancement has the potential to solve many of the world's most dire environmental problems. While the Industrial Revolution brought with it a slew of new environmental problems, the development of environmentally friendly technologies that followed led to significant environmental gains.[16] Catalytic converters developed in the 1970s helped to reduce the aggregate amount of harmful automobile emission despite an overall increase in the number of vehicles on the road.[17] Recent advances in sulfur scrubber technology have led to modern scrubbers capable reducing sulfur emissions by up to ninety-five percent.[18] The threat of further deforestation has been reduced by advances in recycling technology as well as the advent of email, paperless document storage, and other technological advances helping to reduce the public demand for paper.[19]

While these technological advances have helped to make remarkable environmental gains in the last century, there remains an enormous potential for further progress as new technologies are developed. Advances in battery technology could make it possible to completely displace the need for combustible engine-powered automobiles.[20] Similarly, advances in large-scale energy production technologies, like solar power plants, may help drastically reduce the need to burn fossil fuels to generate electricity. Beyond these, there are almost certainly technological possibilities which have not yet been contemplated that could mitigate environmental problems and make further environmental gains.

16. Dominique Foray & Arnulf Grübler, *Technology and the Environment: An Overview*. 53(1) TECHNOLOGICAL FORCASTING AND SOCIAL CHANGE 3 (1996).

17. David Gerard & Lester B. Lave, *Implementing Technology-forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls in the United States*, 72(7) TECHNOLOGICAL FORECASTING AND SOC. CHANGE 761, 761–62 (2005).

18. Sulfur Dioxide Scrubbers, DUKE-ENERGY.COM, http://www.duke-energy.com/environment/air-quality/sulfur-dioxide-scrubbers.asp (last visited April 25, 2013).

19. EPA, Going Paperless with Technology, WASTEWISE UPDATE, http://www.epa.gov/osw/conserve/smm/wastewise/pubs/wwupda5.pdf (last visited April 25, 2013).

20. *See, e.g.*, Steve Levin, *The Great Battery Race*, 182 FOREIGN POL'Y 88–95 (2010); John Baker, *New Technology and Possible Advances in Energy Storage*, 36 ENERGY STORAGE 4368, 4368–73 (2008).

B. Encouraging Innovation

While some of these technologies could have perhaps been invented without governmental involvement, governments have demonstrated an interest in creating a legal system that encourages innovation.[21] There are several strategies that governments can use to encourage innovation, but patent law has some advantages that the other strategies do not. One strategy is through a policy often referred to as *technology forcing*, whereby the government creates a requirement that can only be met by advancement in technology, thereby "forcing" the industry to either innovate or cease operation.[22] The problem with this approach is that it is only effective as a means of encouraging development of technologies within the foresight of Congress or relevant regulatory agencies.[23] Another strategy is direct funding of important technologies.[24] This is a good way for the government to ensure that funding is

21. *See, e.g.*, SUNIL MANI, GOVERNMENT, INNOVATION AND TECHNOLOGY POLICY: AN INTERNATIONAL COMPARATIVE ANALYSIS (2002).

22. One of the best examples of technology forcing policies leading to the development of environmentally friendly technologies comes in the development of the catalytic converter. *See* David Gerard & Lester B. Lave, *Implementing Technology-forcing Policies: The 1970 Clean Air Act Amendments and the Introduction of Advanced Automotive Emissions Controls in the United States*, 72(7) TECHNOLOGICAL FORECASTING AND SOC. CHANGE 761, 761–62 (2005). In 1970, Congress passed an amendment to the Clean Air Act that required drastic automobile emission reductions by 1975. *Id.* In 1970, the technology necessary to meet these rigorous standards had not yet been developed. *Id*. The auto industry was forced to either develop the necessary technology or be denied the right to sell their cars in the United States. *Id*. As a result, the automobile industry developed the catalytic converter which—together with subsequent technology—has led to an aggregate decrease in greenhouse gas emissions even in the face of a 34% increase in the number of vehicles on the road. *Id.*

23. Technological forcing basically leads to a game of chicken between the government and the innovator. It has been reported that in 1970, Congress had reason to believe that the new pollution standards were within the realm of technological possibility. For the auto industry, see JACK DOYLE, TAKEN FOR A RIDE: DETROIT'S BIG THREE AND THE POLITICS OF POLLUTION (New York: Four Walls Eight Windows 2000). *See also*, JAMES E. KRIER AND EDMUND URSIN, POLLUTION AND POLICY: A CASE ESSAY ON CALIFORNIA AND FEDERAL EXPERIENCE WITH MOTOR VEHICLE AIR POLLUTION, 1940–75 (1977). There would have been a problem, however, if Congress had guessed wrong. If the innovator is unable to produce the necessary technology in time, the industry is harmed. When the regulated industry constitutes a major part of the country's economy, this may have far-reaching economic and political impacts. For this reason, Congress is likely to be reluctant to require a significant technological advancement for a major industry unless it reasonably expects the industry to be able to comply. Thus, while this type of incentive for innovation can be effective, its effectiveness is likely to be limited to those technologies that can reasonably be foreseen by Congress.

24. MANI, *supra* note 21, at 107.

directed towards technological innovation that is particularly important. The problem, however, is similar to the problems associated with technology forcing: it is only helpfully applied to technologies within government foresight.

Patents, by comparison, allow the government to incentivize an infinite number of possibilities. Because patents are available for *any* invention so long as it is novel, useful, and not obvious,[25] patents serve as an incentive for an endless potential of beneficial innovation. Patents provide a government-protected monopoly on a new innovation.[26] By excluding others from use of the patented technology, the inventor can profit from his or her invention either by manufacturing and selling the invention himself, or by licensing out the right to use the invention to others.[27]

Although patent law has a longstanding tradition within the United States, the extent to which patent law should protect patent holders is sometimes unclear. A brief historical context of the patent law system will demonstrate the social contract that exists between society and an individual patent holder. By understanding this social contract, it becomes apparent that compulsory licensing might make sense as a way to ensure that the goals of the social contract are met.

1. Understanding patent law

American patent law has its roots in pre-revolutionary English law. The English monarchy, at times, granted monopolies to certain artisans, allowing them exclusive rights in their crafts.[28] These monopolies allowed the privileged artisans to charge exorbitant prices because nobody else could compete. This practice was seen by many as corrupt, and as a result, Parliament eventually passed the Statute of Monopolies in 1624 which limited the monarch's power to grant monopolies by allowing the monarch to grant monopolies only for new inventions.[29]

The debate over government-sanctioned patents did not end in England. Thomas Jefferson, at the time of the framing of the

25. 35 U.S.C.A. §§ 101–103 (West 2015).

26. 1 PATENT LAW FUNDAMENTALS § 1:6 (2d ed.).

27. *Id.*

28. Adam Mossoff, *Rethinking the Development of Patents: An Intellectual History, 1550-1800*, 52 HASTINGS L.J. 1255, 257–58 (2001).

29. *Id.*

Constitution, sought to include an anti-monopoly provision within the Constitution itself.[30] He and others viewed government-sanctioned monopolies as tyrannical and feared they would stifle competition.[31] Others, however, recognized that allowing inventors the exclusive right to their inventions could serve as a means of incentivizing innovation.[32] They understood that if inventors have a protected right to exclusively profit from their inventions, those inventors are more likely to risk the time and effort in attempting to develop new technological innovation. This is especially true when, like now, the development of a new technology often requires a substantial investment in research and development.[33] This type of investment may only be worthwhile if the inventor will have a protected legal right to profit from his invention.

The founding fathers eventually came to a compromise, deciding that a *limited* monopoly could be a beneficial way to encourage technological advancement while balancing the needs of the public. The Constitution does not contain a specific provision outlawing harmful monopolies; instead it gives Congress authority "to promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."[34] This provision not only creates a constitutional basis for allowing monopolies, but it also provides guidance on the scope and justification of that authority: Congress may authorize such monopolies for *limited times* for the purpose of *promoting* innovation. This balance between two objectives constitutes a social contract between the inventor and society at large.[35] The inventor receives a limited monopoly in the form of a

30. PATENT LAW BASICS § 1:5–6. *See also Patents*, THOMAS JEFFERSON ENCYCLOPEDIA, http://www.monticello.org/site/research-and-collections/patents. This, of course, was not a unique position to take at the time. Jefferson was probably influenced by his contemporary—economist Adam Smith—who said: "Monopoly . . . is a great enemy to good management." ADAM SMITH, THE WEALTH OF NATIONS (1776).

31. *Patents*, *supra* note 30.

32. *Id*.

33. FTC, *Chapter 3: Business Testimony: Current Innovation Landscape in Selected Industries*, TO PROMOTE INNOVATION: THE PROPER BALANCE OF COMPETITION AND PATENT LAW AND POLICY 29 (2003), *available at* http://www.ftc.gov/os/2003/10/innovationrpt.pdf (last visited April 25, 2013).

34. U.S. CONST. art. I, § 8.

35. *See, e.g.*, Dan L. Burk & Mark A. Lemley, *Policy Levers in Patent Law*, 89 VA. L. REV. 1575, 1600 (2003) (providing a succinct explanation of what the authors call Propsect

patent in exchange for bringing new technologies into the marketplace.

Judicial interpretation of this constitutional provision and the ensuring development of the American patent system reinforce the notion that inventors may receive limited monopolies in order to benefit society. Indeed, the Supreme Court has regularly recognized that the purpose of patent law is to induce new development and bring new products to market.[36] It is with this same principle in mind that patents are filed with the patent office—making a description of the technology a matter of public record.[37] An inventor can have exclusive rights to develop, manufacture and sell the invention during the life of the patent, but once the patent has expired, the technology can be further diffused into the marketplace, available to anyone interested in developing the technology for their own purposes.[38]

If Congress is not careful, however, this social contract may become too one-sided. If the monopoly becomes too strong, then the diffusion of technology may never occur. A patent holder may decide not to grant permission for others to use or sell his invention, and as a result, others will be unable to innovate further and expand upon the invention. While in some circumstances the harmful effects of this type of patent suppression may not be far-reaching, in other circumstances, such as when a new technology has the potential to address urgent issues, patent suppression may be more problematic.[39] For example, a patent is normally good for twenty years,[40] but in some circumstances, the patent can be extended even beyond that.[41] Given the urgency of some environmental problems, it may unreasonable to wait twenty years or longer to be able to ensure market access to an important technology.

Theory, which outlines the give and take between a society and inventors as it is acted out under patent policy).

36. *See, e.g.*, Brenner v. Manson, 383 U.S. 519, 533–34 (1966) (noting that "one of the purposes of the patent system is to encourage dissemination of information concerning discoveries and inventions").

37. 1 WEST ANNOTATED PATENT DIGEST § 1:13 (noting that "one of the purposes of patent systems is to disclose inventions to the public").

38. 1 PATENT LAW FUNDAMENTALS § 1:20 (2d ed.).

39. *See infra* Part I.B.2.

40. 1 PATENT LAW FUNDAMENTALS § 1:20 (2d ed.).

41. *Id.*

2. Abuse of patent law protections: patent suppression

Concern over patent suppression is not hypothetical. There have been a number of documented cases in which this phenomenon has taken place. In each case, patent suppression has been a means of hindering the progress of new technologies. Inasmuch as patent law is authorized under the Constitution in order to "promote the progress science and the useful arts," patent suppression—whereby patent holders purposefully acquire patents only to prohibit their use or development—is contrary to that purpose and represents a clear abuse of that law. This section briefly explores a few examples of patent suppression and explains how the current legal framework of intellectual property and antitrust law is generally insufficient to stop the abuse.

Perhaps one of the most well-known examples of patent suppression was brought to the forefront of public attention by the film *Who Killed the Electric Car*.[42] This documentary details the development and eventual suppression of battery technology capable of powering zero-emission automobiles.[43] According to the documentary, General Motors acquired a small battery technology company, Ovonics—which had made tremendous advances in battery technology—and began to develop an electric car that would eventually be named the EV-1.[44] When California's political climate and the looming threats of burdensome regulations made GM nervous about the timing of the technology's release, Texaco (which was soon after acquired by Chevron) stepped in and purchased the rights to the battery technology in order to suppress it.[45]

Another example occurred in the light bulb industry in the early 1900s.[46] General Electric, which had a large stake in the incandescent light bulb industry, purchased the patent for a more-efficient fluorescent light bulb.[47] In order to maximize its profits for the incandescent light bulbs, General Electric sat on the patent

42. WHO KILLED THE ELECTRIC CAR (Plinyminor 2006).

43. *Id*. Specifically, the car mentioned in the documentary is GM's Chevy EV-1. *Id*. According to the film, the car was completely battery powered and could drive distances up to 160 miles on a single charge.

44. *Id*.

45. *Id*.

46. Richard Dunford, *The Suppression of Technology as a Strategy for Controlling Resource Dependence*, 32 ADMIN. SCI. Q. 512, 516 (1987).

47. *Id*.

for the fluorescent lights, refusing to either bring the technology to market itself or to license the technology to other market participants.[48] Not until Sylvania, another electronics company, successfully marketed a similar technology did General Electric begin to use its patented florescent light bulb technology.[49]

Bell Telephone also implemented patent suppression techniques in order to preserve the status quo.[50] A 1920s investigation by the federal government found that Bell Telephone had purchased and suppressed over 3,000 patents.[51] Bell had developed a practice of acquiring patents for the sole purpose of keeping those technologies out of the hands of their competitors.[52]

The law regarding patent suppression has not always been clear and while it appears that antitrust remedies may be available as a means of preventing some instances of patent suppression, such remedies are still not generally available.[53] In 1886, a federal district court held that a patent holder could only be guaranteed legal protection of its patent if the holder was actually using the patented technology.[54] However, in 1908, the U.S. Supreme Court held that patent non-use does not foreclose the patent holder's right to protection under the law.[55]

With the birth of antitrust law, new remedies became available to stop anticompetitive behavior through which powerful companies tried to eliminate competition.[56] While it may appear that patent suppression would fall into this category of behavior, courts have demonstrated an unwillingness to apply antitrust remedies to cases of patent suppression.[57] For example, in *SCM v. Xerox*, the Supreme Court held that so long as a patent is acquired legally, it is not a violation of antitrust law to use the patent to the

48. *Id.*

49. *Id.*

50. *Id.* at 517.

51. *Id.*

52. *Id.*

53. Robin C. Feldman, *The Insufficiency of Antitrust Analysis for Patent Misuse*, 55 HASTINGS L.J. 399 (2003).

54. *See, e.g.*, Hoe v. Knap, 27 F. 204, 205 (C.C.N.D. Ill. 1886).

55. Cont'l Paper Bag Co. v. E. Paper Bag Co., 210 U.S. 405, 429–30 (1908).

56. See generally, the Sherman Act, 15 U.S.C. §§ 1–7 (2006) (originally passed in 1890); Clayton Act, 15 U.S.C. §§ 12–17 (2006) (originally passed in 1914), and the Federal Trade Commission Act, 15 U.S.C. §§ 41–58 (2006) (originally passed in 1914).

57. *See, e.g.*, SCM Corp. v. Xerox, 645 F.2d 1195, 1206 (2d. Cir. 1981.

"full extent allowed under patent law," which includes preventing third parties from using a technology, even when the patent holder itself is not using the patented technology.[58] The holding of this case has been followed in subsequent decisions and is still good law.[59] Thus, despite the similarities between patent suppression and those problems generally meant to be addressed by antitrust laws, it seems that antitrust law by itself is insufficient to stop patent suppression.

3. A solution to patent suppression: compulsory licensing

One remaining way to avoid technology suppression is through compulsory licensing. Compulsory licensing eliminates the possibility of patent suppression by requiring a patent holder, under certain circumstances, to license its technology to others for "reasonable" compensation. Compulsory licensing is not a new idea. While it is not commonly relied upon as a means of ensuring the diffusion of new technologies, compulsory licensing is already an important part of American law. Compulsory licensing laws exist by statute in some circumstances to be described below. Additionally, courts occasionally create a de facto compulsory licensing situation by refusing to enjoin patent infringers. This existing compulsory licensing framework, while helpful, is severely limited in its ability to address the full scale of patent suppression.

The Clean Air Act, Atomic Energy Act, and the Plant Variety Protection Act all include compulsory licensing provisions that are applied narrowly to specific types of technologies.[60] The Clean Air Act, for example, requires that when a technology is necessary in order to comply with certain federally established emissions standards and is the only such technology available, it must be licensed for a reasonable price to others seeking to comply with the emissions standards.[61] The Atomic Energy Act gives the Atomic Energy Commission the authority to designate certain atomic energy technologies as being within the public interest, and thus subjects

58. *Id.*

59. *See, e.g.*, Digital Sun v. The Toro Co., 2011 WL 1044502 (N.D. Cal. Mar. 22, 2011).

60. *See* Clean Air Act, 42 U.S.C. § 7608 (2012); Atomic Energy Act, 42 U.S.C. § 2183 (2012); Plant Variety Protection Act, 7 U.S.C. § 2404 (2012).

61. 42 U.S.C. § 7608 (2012).

them to compulsory licensing to either the Commission itself or to those authorized by the Commission.[62] This authority has been construed by the courts fairly narrowly and does not include, for example, patents for safety-related inventions such as anti-radiation chemical compounds.[63] The Plant Variety Protection Act gives the Secretary of Agriculture the authority to designate certain patented plant varieties as open to the public in exchange for "reasonable remuneration" in the event of a shortage of fiber, food, or feed.[64]

In addition to these very specific compulsory licensing provisions, the United States government has additional rights in regards to third party patents under Section 1498 of Title 28. The statute dictates that whenever a patented technology is "manufactured by or for the United States," without a license, the patent holder may sue the United States government for "reasonable compensation" but may not be granted an injunction.[65] Though limited in its application to use by the federal government, in practice this statute constitutes the equivalent of a compulsory license. When a patent holder's only remedy is to receive compensation for the use of his patent, the outcome is practically identical to that of a compulsory license situation.

In addition to these statutory provisions for compulsory licensing, courts can sometimes create a *de facto* compulsory licensing regime for others by refusing to enjoin patent infringers. While courts will ordinarily give injunctive relief against patent infringers, this is not always the case.[66] The patent code says that courts *may* grant injunctive relief in cases of patent infringement.[67] Sometimes, in the public interest, courts determine that it is better to allow the infringer to continue use of the patented technology while paying damages.[68] For example, in *City of Milwaukee v. Activated Sludge*, the City of Milwaukee was using patented

62. 42 U.S.C. § 2183 (2012).

63. Piper v. Atomic Energy Com'n, 502 F.2d 1393, 1399–1401 (C.C.P.A. 1974).

64. 7 U.S.C. § 2404 (2012).

65. 28 U.S.C. § 1498 (2006).

66. *See, e.g.*, City of Milwaukee v. Activated Sludge, 69 F.2d 577 (7th Cir. 1934) (noting that while ordinarily courts provide injunctive relief against patent infringers, but still holding that an injunction against a water treatment plant would be against the public interest); *but see* Ebay Inc. v. MercExchange, L.L.C., 547 U.S. 388, 391 (indicating that the standard for obtaining an injunction may be becoming more difficult).

67. 35 U.S.C. § 271 (2006).

68. *Activated Sludge*, 69 F.2d at 593.

technology in one of its waste treatment plants, but didn't have a valid license from the patent holder. The court refused to enjoin the city from using the patent and instead required the city pay damages to the patent holder.[69] In so doing, the court created a compulsory license in fact; the city was permitted to continue use of the technology while paying monetary damages, just as a licensee would pay a licensing fee for licensed technology.

Each of these examples of compulsory licensing within U.S. law has potential to prevent patent suppression, but their limitations in scope and applicability prevent them from solving the problem in a substantive way. Under the Clean Air Act, the Atomic Energy Act, and the Plant Variety Protection Act, compulsory licensing provisions apply only to a very small subset of technology and only in very specific circumstances. As a result, technologies outside of those specific industries can still be suppressed. Similarly, compulsory licensing to the United States government, while it can occur with a broader set of technology, does not allow suppressed technology to reach the national marketplace where it can be diffused and innovated upon, because only the government or its agents are authorized to manufacture otherwise suppressed technologies. Right now, a patented technology can be ensured entry into the marketplace only when a court creates a *de facto* compulsory license. Even this form of compulsory licensing is limited in effectiveness because the suppressed technology is still only legally available to the firm or individual who first sued for infringing on the patent. To really address problems associated with patent suppression, it is necessary to create a compulsory licensing regime that reaches a wider variety of technologies and guarantees access to a larger segment of the market.

II. EXPANDING COMPULSORY LICENSING LAWS TO INCLUDE MORE GREEN TECHNOLOGIES

Broadening the application of compulsory licensing laws can help to reduce the suppression of important technologies; it is impossible to completely suppress a technology when the law requires that the holder license it to others. While there are some risks associated with

69. *Id.*

expanding compulsory licensing,[70] there are tremendous benefits as well. As discussed previously, the constitutional justification for the protection of a patent is to promote scientific and technological progress.[71] Given the pressing nature of many of our environmental problems, progress in this area of science and technology is especially important. Expanding the application of compulsory licensing to include more green technologies will promote scientific and technological progress in solving environmental problems. Specifically, compulsory licensing can promote such progress by: 1) ensuring prompt access to important technologies, 2) increasing the likelihood of future innovation, and 3) decreasing judicial inefficiencies.

A. Ensuring Prompt Access to Environmentally Important Technologies

The most obvious advantage of a compulsory licensing policy is that it ensures that technological advances cannot be suppressed. There is no progress when a patent holder obtains a patent and refuses to use the patented technology. In these instances, progress can be slowed by twenty years or more, as current patent laws give a filed patent a life of twenty years, and that timeline may also be extended for various reasons.[72] Given the inherent urgency of solving certain environmental problems (such as climate change), a prolonged suppression of important technology could be detrimental. Any social costs associated with the expansion of compulsory licensing may be worthwhile if society can make swift progress in addressing environmental concerns—ending environmental tragedies decades earlier than otherwise possible.

70. The fundamental concerns over compulsory licensing are addressed in Part III. There are a number of those who claim that a compulsory licensing regime lowers the value of affected patents. *See, e.g.*, Neel Maitra, *Access to Environmentally Sound Technology in the Developing World: A Proposed Alternative to Compulsory Licensing*, 35 COLUM. J. ENVTL. L. 407, 419–427 (2010); Jeffry C. Gerber & Peter W. Kitson, *Compulsory Licensing of Patents Under the Clean Air Act of 1970*, J. PAT. OFF. SOC'Y 650, 676–77 (1972). While this may be true, it is important to keep in mind that compulsory licensing does not completely eliminate the incentive to innovate. Compulsory licensing under each of the circumstances contemplated in U.S. law, still allows the patent holder to receive payment for the use of its patent.

70. Contents and term of patent; provisional rights, 35 U.S.C. § 154 (2012).

71. U.S. CONST. art. I, § 8.

72. 35 U.S.C. § 154 (2006). S*ee also*, 1 PATENT LAW FUNDAMENTALS § 1:6 (2d ed.).

B. Encouraging Further Innovation

Furthermore, even if compulsory licensing decreases the incentive for individuals to innovate, it may still increase the overall level of innovation within the marketplace. It has been suggested that when inventors sell the patents of their inventions to those who can put all their resources into further development of the technology, the ensuing specialization makes for a more efficient marketplace: inventors reinvest their profits into future inventions and developers are able to invest their resources to manufacturing or marketing or whatever their specialty may be.[73] This type of specialization leads to a more efficient use of resources which in turn leads to greater innovation.

Additionally, as new and important technologies are released into the market, those who would have otherwise been without access to the technology can use and innovate upon them. Innovation may be spurred just by ensuring access to new technologies.

C. Increasing Judicial Efficiency

Finally, a broader compulsory licensing policy could help to decrease judicial inefficiencies. As has been discussed previously, except under the very narrow statutory compulsory licensing provisions in the Clean Air Act, Atomic Energy Act, and Plant Variety Protection Act, the best way for anyone other than the government to access a suppressed technology is to infringe on a patent and ask the court not to grant an injunction prohibiting use of the patented technology.[74] A judgment requiring payment of damages but expressly denying the right to an injunction may be the closest that a company can come to establishing a legally defensible right to an otherwise suppressed technology. Requiring a potential technology user to go through the litigation process in order to ensure access to the technology is judicially inefficient. A compulsory licensing policy will incentivize patent holders to come to the bargaining table. If a patent holder knows that the law requires him or her to license the patent, he or she will be less likely to refuse a

73. William A. Drennan, *Changing Invention Economics by Encouraging Corporate Inventors to Sell Patents.* 58 U. MIAMI L. REV. 1045, 1123–28 (2004); KENNETH PORT ET AL, LICENSING INTELLECTUAL PROPERTY IN THE INFORMATION AGE (2d ed. 2005).

74. *See supra* Part I.B.3.

reasonable offer to license the technology and will be more likely to strike a deal, thereby reducing the need for litigation.

When patent holders and potential licensees are encouraged to reach deals on their own, there is less need for the courts to be involved. As a result, court dockets, which are already overloaded in many circumstances, can focus on other issues. More importantly for the purposes of this discussion, this also means that technologies can be made available to the market more quickly. Instead of relying on the expensive and time-consuming litigation process, patent holders and licensees will come to an agreement on their own terms. This also reduces the frequency with which courts will be forced to estimate the just compensation for use of the patented technology—a task that courts are often ill-prepared to undertake.

III. THE FUNDAMENTAL CONCERN OVER COMPULSORY LICENSING: KILLING THE GOLDEN GOOSE

There is an important concern pervading the relevant literature regarding the possibility of expanded compulsory licensing: forcing innovators to license their technology will reduce the value of the patent and, as a result, decrease the incentive to innovate.[75] When an inventor invents something, she may very likely want to sell the rights for her invention to the highest bidder. Under the current system, the highest bidder may be a company whose only interest in the patent is in suppressing it as a means of eliminating potential competition.[76] If that company is no longer able to suppress the patent, then its willingness to pay for the patent may be decreased or eliminated altogether. As a result, the value of the patent to the inventor is likewise decreased. Because the value of the patent serves as a primary incentive to innovate, the reduction in value of the patent could lessen the incentive to innovate.

This paper has already discussed how the development of new "green" technologies represents an important means of solving environmental problems.[77] If green technology is compared to the mythical golden egg, then the system that fosters development of

75. Maitra, *supra* note 70, at 419–27 (2010); Gerber & Kitson, *supra* note 70, at 676–77.

76. *See, e.g.*, *supra* Part I.B.2 (discussion of General Electric, Bell Telephones, and Texaco).

77. *See supra* Part I.A.

green technology is the golden goose.[78] If we eliminate the likelihood of further innovation by trying to ensure access to current beneficial technologies, we are saving a golden egg but killing the golden goose. By carefully assessing the possibility of eroding incentive and creating a policy that addresses those possibilities, we will be more likely to develop a compulsory licensing regime that avoids unnecessary negative repercussions on innovation while simultaneously promoting progress in the development of environmental technology. While there is reason to believe that this fundamental concern over compulsory licensing is often overstated, any concerns can be largely assuaged by a careful consideration of both the price and scope of compulsory licenses.

A. Overstated Concern?

The concern that compulsory licensing could reduce the likeliness of innovation makes sense in theory; the monetary value of a patent serves as a primary incentive for inventors to create new patentable technology. Even still, there may be sufficient benefits stemming from the development of new innovation that companies will continue to invest in research and development. One study conducted by Frederic M. Scherer suggests that this might be the case.[79] Scherer surveyed a number of multinational companies to learn what effects mandatory licensing requirements had had on their incentive to innovate.[80] Specifically, he considered the level of funding companies contributed to research and development, and found that compulsory licensing provisions had little to no effect on the level of funding provided to research and development.[81]

While Scherer's study alone cannot conclusively indicate that the concerns over compulsory licensing are completely unfounded, it does indicate that the concern may be overstated. Scherer's study suggests that even in the presence of compulsory licensing laws, a significant number of companies still have sufficient incentive to warrant substantial investment in innovation. Still, policy makers

78. *Cf.* JACK AND THE BEANSTALK. For those unfamiliar with the story: in this fairy tale, Jack climbs the beanstalk to reach a mythical land in the clouds. One of the treasures he finds is a golden goose which lays golden eggs.

79. Frederic M. Scherer, *Political Economy of Patent Policy Reform in the United States*, 7 J. ON TELECOMM. & HIGH TECH. L. 167, 171–72 (2009).

80. *Id.*

81. *Id.*

should be careful about needlessly eroding incentives for innovation. By carefully looking at the price and scope of mandatory license agreements, policy makers can further ease the concerns over an expanded compulsory licensing regime.

B. Getting the Price Right

Getting the price right is important. To avoid drastically undervaluing a patent, and thereby undermining the incentive to innovate, any license resulting from a compulsory licensing regime should be compensated as close to its fair market value as possible. Even from the basic assumption that the fair market value is the price at which a typical patent holder would license a patent to a typical licensee,[82] determining the correct price for a patent license is an extremely difficult task.[83] There are a variety of methods that can be used to approximate the value of a technology license, though the most accurate methods can be remarkably complex.[84] To accurately pinpoint the fair market value might require a team of economists, mathematicians and statisticians a considerable amount of time. While this type of analysis is by no means unhelpful, it is outside the scope of this paper. Any economic analysis conducted by such experts may be helpful in adjusting the way courts determine the fair market value of a patent license, but this section will discuss the ways in which a well-drafted policy may circumvent the immediate need for such complex analysis: by encouraging both the patent holder and the potential licensee to come to the bargaining table where they can come to a licensing agreement that is beneficial to both parties. Like the colossal bear walking the tightrope in a circus act, the ideal policy will be strong enough to ensure that important patents are not suppressed, but nimble enough to avoid disrupting the fair market price of the patent. A strong policy will ensure that patent holders

82. Of course, the fair market value is often assumed to be "the price at which the property would change hands between a willing buyer and a willing seller, neither being under any compulsion to buy or sell and both having reasonable knowledge of the relevant facts." 26 C.F.R. § 1.170A–1 (2008). However, under the circumstances addressed in this paper, we are worried that some sellers may be unwilling to sell at virtually any price. Therefore, it makes more sense to look at the price at which a typical seller would sell to a typical buyer—eliminating the market disruption that occurs from a blatant refusal to sell.

83. KENNETH L. PORT ET AL., LICENSING INTELLECTUAL PROPERTY IN THE INFORMATION AGE 181–207 (2d ed. 2005).

84. *Id.*

come to the table. A nimble policy will ensure that it is applicable to a wide variety of technologies by avoiding they type of across-the-board requirements in price methodologies that may be helpful in one industry but quite inappropriate in another.

One way that existing compulsory licensing policies have ensured that their application is sufficiently nimble is to require that any licensing fee be "reasonable." A reasonableness standard leaves plenty of room for the patent holder and the potential licensee to come to terms that are beneficial to both sides. The problem inherent in such a vague term, however, is that the two parties are likely to disagree on what a "reasonable" fee should be. The purpose of this policy is not to ensure guaranteed, low-cost access to important technologies for anyone who needs it. While this type of argument is frequently attached to the discussion of international compulsory licensing of pharmaceutical technologies, where the primary concern is whether citizens of developing world countries have access to life-saving drugs,[85] this is not the primary concern here. This paper is primarily concerned with the ability of patent holders to completely suppress important technologies such that they become completely unavailable to the market and bring technological innovation to a stand-still. With this in mind, policy makers should be more willing to allow the license price to be higher than the typical market price, so long as the price is not egregiously higher. A reasonableness standard accommodates this goal by allowing the patent holder to maintain as much value in his patent as possible.

One way that a compulsory licensing statute can help preserve the value of a patent is by putting the burden of proof for "reasonableness" on the potential licensee. Such a policy could require a potential licensee wishing to license rights to a patented technology, to make a reasonable offer to the patent holder. The patent holder could choose either to accept the offer or provide a reasonable counteroffer. At this point, the patent holder has been forced to the table, but has the ability to put forth an offer that it thinks would allow it to benefit from its patent. If the potential licensee is dissatisfied with the counteroffer, she will have to demonstrate to the court that the counter offer is unreasonable. At

85. *See, e.g.*, Peter Maybarduk & Sarah Rimmington, *Compulsory Licenses: A Tool to Improve Global Access to the HPV Vaccine?*, 35 AM. J.L. & MED. 323, 325 (2009).

this stage in the process, the various methods of intellectual property valuation could be helpful, but so long as the patent holder can point to some identifiable and well-accepted valuation method used in determining its counteroffer, there will be a presumption that the asking price is reasonable.

This type of "reasonable" standard already exists in current compulsory licensing statutes. One example is the mandatory licensing provision within the Clean Air Act,[86] which provision has never been litigated.[87] Some have suggested that the lack of litigation of this provision indicates that the statute is ineffective or unnecessary—arguing that if nobody bothers to use it, it must not be effective.[88] While this point seems reasonable, the lack of litigation may also be evidence that the provision is actually working to encourage parties to come to a reasonable agreement on their own. The mere existence of a compulsory licensing provision may be enough of an incentive to get a patent holder to come to the table. Current experience with the Clean Air Act suggests that this may be the case. Furthermore, if patent holders are coming to the table, then suppressed technologies are being made available to the market. If this is the primary goal, then a compulsory licensing scheme with a "reasonable" pricing structure can be the means of achieving that goal.

If a "reasonable" standard helps to ensure that the pricing policy is nimble, a heavy damages provision can help to ensure that the policy is strong. Under a compulsory licensing statute with a "reasonable" licensing fee standard, especially when the burden of proof is put on the potential licensee, there is potential concern that that patent holder will hold out on negotiations in order to prolong the negotiation process and incentivize the potential licensee to accept an offer with an outrageously high licensing price. A heavy damages provision against the patent holder in the event that the court finds its offer unreasonable could help to reduce this risk. This type of approach to environmental policy is not new. Current federal environmental statutes regularly include high punitive damages

86. 42 U.S.C. § 7608 (2012).

87. Michael A. Gollin, *Using Intellectual Property to Improve Environmental Protection*, 4 HARV. J.L. & TECH. 193, 223 (1991) (noting specifically that "Section 308 [the mandatory licensing provision] has never been invoked").

88. *See, e.g.*, Warren F. Schwartz, *Mandatory Patent Licensing of Air Pollution Control Technology*, 57 VA. L. REV. 719 (1971).

provisions.[89] A standard punitive damage is $37,500 per violation per day, with the possibility of treble damages.[90] A similar approach could be applied to a compulsory licensing statute wherein a patent holder who refuses to provide a reasonable license counteroffer could be faced with a significant fine for each day that passes before a reasonable counteroffer is extended. A damages provision that holds would-be patent suppressors liable for unreasonable counteroffers could provide the necessary incentive to keep the patent holder from making bad-faith licensing demands.

C. Scope: What Technologies Really Matter?

In addition to determining the right pricing structure for an ideal compulsory licensing regime, it is also necessary to determine the scope of any new policy. Given the problems associated with patent suppression, it might seem that compulsory licensing provisions should be imposed on all technologies. This is probably too extreme. Sometimes guaranteeing access to a new technology is not particularly beneficial, and may not be worth the added burden associated with compulsory licensing.[91] Also, the language of the Constitution suggests that the general rule should be toward exclusive use for limited times.[92] Congress is given the authority to grant to inventors "exclusive use." While this is a power given to

89. *See, e.g.*, Penalty Adjustment Table, 40 C.F.R. § 19.4 (2013) (showing that many of the penalties associated with the Clean Water Act, Toxic Substances Control Act, and Resource Conservation and Recovery Act can be up to $37,500 per violation per day).

90. *Id.*

91. For example, suppose a firm has just developed a technology that will revolutionize the jelly bean industry—it has developed an artificial flavor that accurately represents the taste of buttered popcorn and doesn't invoke most customers' gag reflex. Further suppose that this particular concoction does not mix well with normal gelatin products and as a result cannot be formed into a jelly bean with currently available technology. The firm thinks that a new gelatin product, expected to be released next year, may hold the answer to their problems. Unsure of how else to proceed, the firm puts the development of their new jelly bean on hold. Meanwhile, a competing candy company gets word of the development in artificial buttered popcorn flavoring and wants to force the inventing candy company to license its technology. A compulsory license in this scenario would be harmful to the inventing company's competitive edge—one it had developed through a fairly substantial investment in research and development—but would not achieve any substantive social benefit. Buttered popcorn flavored jelly beans, while enjoyable for novelty's sake, do not have much of an impact on our overall quality of life. The costs of a compulsory licensing policy to a candy company—whose primary business model is to come up with novel and sellable candy concepts—is high, while the overall benefit to society is low. In this circumstance, compulsory licensing doesn't seem justified.

92. U.S. CONST. art. 1, § 8.

Congress to use at its discretion, it still seems pretty clear that the Founders anticipated that exclusive use would be the general rule.[93] Also, even with the pricing structure described above, there is still a risk of adversely affecting the market price of patents and patent licenses. While the urgency of environmental degradation may justify this risk under some circumstances, limiting the scope of compulsory licensing can help to avoid unnecessarily affecting these market prices in less urgent situations. A compulsory licensing regime that is limited only to environmentally important technologies can help avoid unnecessary market interference.

1. Why environmental technologies matter

As has been discussed above, the idea of requiring compulsory licensing of socially beneficial technologies is not new. The Atomic Energy Act, Clean Air Act, and Plant Variety Protection Act all contain compulsory licensing provisions intended to ensure access to socially beneficial technologies.[94] Additionally, there is a tremendous literature arguing for compulsory licensing of life-saving pharmaceuticals to the developing world.[95] The most compelling arguments for these types of policies emphasize their potential for achieving social good.[96] In a balancing act between the social benefit of increased access to important technology and the social cost of decreased incentive for innovation, there may be no other technology for which the choice to institute a compulsory licensing regime makes more sense. Compared to other technologies, ensuring access to those technologies which could help solve important environmental problems is especially important for three primary reasons: 1) environmental problems are increasingly urgent; 2) environmental problems have a unique impact on human health; and 3) environmental problems have long-term ramifications for multiple generations.

With an ever-growing body of science relating to environmental

93. *Id.*

94. *See* Clean Air Act, 42 U.S.C. § 7608 (2012) (mandating access, under certain conditions, to technology capable of reducing harmful emissions); Atomic Energy Act, 42 U.S.C. § 2183 (2012) (mandating access to important energy technology); Plant Variety Protection Act, 7 U.S.C. § 2404 (2012) (mandating access to plant technology as a means of preserving diversity).

95. *See, e.g.*, Maybarduk & Rimmington, *supra* note 85, at 325.

96. *Id.*

degradation and climate change, it is becoming more and more apparent that current rates of environmental degradation are becoming more urgent.[97] Sea levels are rising faster than original estimates.[98] Over 600 million people live on lands that are ten meters or less above sea level.[99] While sea levels rise, their waters are also becoming more acidic.[100] Acidifying waters threaten the quality and abundance of fisheries.[101] Decreased snowpack in the western United States is likely to have drastic effects on the amount of available water and is especially distressing given the region's already over-appropriated rivers.[102] Besides those environmental concerns which are directly related to increased global temperatures, other environmental problems present equally urgent problems. Agricultural runoff contaminated with fertilizers has created a "dead zone" that threatens fisheries in the Gulf Coast.[103] The growing natural gas industry and the process by which natural gas is often extracted, hydraulic fracturing, is potentially contaminating the groundwater supply for neighboring communities.[104] Presently, each of these environmental problems has the potential for an immediate impact on society. Any technological advancement that could help to address these issues could have immediate ramifications for those currently affected.

97. *See generally* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE [I.P.C.C.], REGIONAL IMPACTS OF CLIMATE CHANGE (1997), *available at* http://www.ipcc.ch/ipccreports/sres/regional/index.php?idp=03; I.P.C.C., CLIMATE CHANGE 2007: SYNTHESIS REPORT [hereinafter SYNTHESIS REPORT], *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf. *See also* Nathaniel Keohane, *The Urgency of U.S. Action on Climate Change, and the Prospects for Legislation*, 18 N.Y.U. ENVTL. L.J. 1 (2010); Dan Galpern, *Climate Change 101: Urgency and Response*, 23 J. ENVTL. L. & LITIG. 191, 222 (2008).

98. Keohane, *supra* note 97, at 2.

99. Gordon McGranahan et al., *The Rising Tide: Assessing the Risks of Climate Change and Human Settlements in Low Elevation Coastal Zones*, 19 ENV'T & URBANIZATION 17 (2007).

100. Keohane, *supra* note 97, at 1.

101. SYNTHESIS REPORT, *supra* note 97, at 1.1.

102. COMM. ON W. WATER MGMT., NAT'L RESEARCH COUNCIL, WATER TRANSFERS IN THE WEST: EFFICIENCY, EQUITY, AND THE ENVIRONMENT 8, 14 (1992).

103. Nancy N. Rabalis et al., *Gulf of Mexico Hypoxia, A.K.A. "The Dead Zone,"* 33 ANN. REV. ECOLOGY & SYSTEMATICS 235, 236 (2002).

104. Heather J. Avens et al., *Analysis of BTEX Groundwater Concentrations from Surface Spills Associated with Hydraulic Fracturing Operations*, 63:4 J. AIR & WASTE MGMT. ASS'N 424 (2013).

Similarly, environmental issues can have a unique large-scale impact on human health. Global warming has been associated with increased levels of malaria, dengue fever, viral encephalitis, and cholera.[105] Other studies have shown that poor air quality contributes to a host of cardiovascular and respiratory diseases.[106] A vaccine, while an important technological advance, may inoculate the individual who receives it against a harmful disease or virus, but everyone breathes the air, relies on the earth's soil for its food, and drinks the water from the earth's rivers. Significant technological advancement capable of addressing these issues has the potential to help improve human health throughout the world. When these types of technologies become available, it will be ever important to ensure that they are not suppressed.

Furthermore, many of the environmental problems of our day have the potential to be irreversible.[107] As such, addressing these problems as soon as possible may be critical to preserving our current way of life. For example, the desertification of the Middle East and sub-Saharan Africa may permanently alter the landscape—rendering it unable to support those who live there.[108] Similarly, the overuse of natural resources and resulting environmental degradation has already led to the collapse of civilizations in the new world.[109] The large-scale environmental changes that took place in these regions have been extremely long-lasting and may not be reversible. If history repeats itself and current practices lead to new environmental degradation, the catastrophic effects could be far-reaching in both space and time.

105. John M. Balbus et al., *Climate Change and Emerging Infectious Diseases*, 275(3) J. AM. MED. ASS'N 217 (1996).

106. Marion Carey & Martine Dennekamp, *Air Quality and Chronic Disease: Why Action on Climate Change is Also Good for Health*, 21:6 NEW SOUTH WALES PUB. HEALTH BULL. 115, 117 (2010).

107. *See*, *e.g.*, S.R. Carpenter et al., *Management of Eutrophication for Lakes Subject to Potentially Irreversible Change*, 9:3 ECOLOGICAL APPLICATION 751 (1999).

108. M. B. K. Darkoh, *The Nature, Causes and Consequences of Desertification in the Drylands of Africa*, 9 LAND DEGRADATION & DEV. 1 (1998).

109. THE COLLAPSE OF ANCIENT STATES AND CIVILIZATION 6 (Norman Yoffee & George L. Cowgill eds. 1991) (noting that political collapse and environmental degradation often accompanied each other).

2. Which environmental technologies?

Understanding the importance of diffusing environmental technologies is the first step, but determining *which* environmental technologies should be included within the new compulsory licensing regime is vital. If we define these technologies too broadly, we risk the possibility of interfering with the market unnecessarily. If we define these technologies too narrowly, we risk the continuation of the same problem which exists today—namely that existing compulsory licensing laws do not adequately protect against the suppression of important environmentally-friendly technologies. Finally, if we define them too loosely, we risk the need for excessive litigation—if it is too unclear which technologies should be covered under a new policy, courts will be forced to decide. While there are no clear answers to these concerns, any new compulsory licensing policy should include a clear framework on how to determine which technologies should be included. This may be best accomplished by a new or existing government agency. Administrative agencies, as opposed to Congress, can provide both the requisite scientific expertise and administrative flexibility that will be necessary for a strong but nimble policy.

To avoid the need for undue litigation, the agency tasked with determining the scope of technologies covered under the new policy should provide a clear set of environmental goals and mandate the licensing of only those technologies that can help to achieve those goals. This kind of policy has the greatest potential to achieve what current compulsory licensing law cannot: providing more stability for everyone by creating a broad, but predictable set of technologies that will be affected. The Environmental Protection Agency may be the agency best-equipped for the task because it is already responsible for assessing many of the nation's environmental problems.

To avoid the need of undue market interference, the agency should also only apply the compulsory licensing regime to those technologies that are not already otherwise available in the market or for which additional competition would be particularly helpful.[110] If

110. Reiko Aoki & John Small, *Compulsory Licensing of Technology and the Essential Facilities Doctrine*, 16:1 INFO. ECON. & POL'Y 13 (2004). Addressing the factors that the policy makers should consider when expanding compulsory licensing laws, Aoki and Small paid particular attention to the importance of only mandating the licenses of technologies that are otherwise unavailable. Other factors included the existence of other reasonable requirements

a given technology is already readily available in the marketplace and there is already sufficient competition, there is no need to interfere by mandating licenses to additional market participants.

With these primary considerations in mind, the agency should provide clear guidance for determining whether or not a technology falls within the scope of the new policy. By establishing clear guidelines and thus ensuring predictability within the system, patent holders and licensees can develop clear expectations that will help them as they negotiate the terms of their license agreements. To the extent that litigation will ensue, the courts will also have clearer guidelines than those which currently exist to help them determine the scope of mandatory licensing agreements.

CONCLUSION

In sum, the environmental problems facing the world are increasingly urgent and a new compulsory licensing scheme in the United States could help solve many of these problems. While technological innovation potentially holds the key to solving many of these problems, those interested in perpetuating the status quo currently have the ability to suppress helpful technologies by abusing existing patent laws. This application of patent law is inconsistent with the historical intent and Constitutional justification for patent protection, but it is permissible under current law. Broadening the scope of mandatory licensing could help alleviate the problems associated with patent suppression, but comes with the risk of reducing the incentive to innovate. Any modification of compulsory licensing law should be wary of unnecessary risk, but in so doing, may be able provide access to important technologies that can help solve many of the problems associated with environmental degradation.

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ensuring access to a technology and the ability of the patent owner to profit from his invention.