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Natural Resources, Congestion, and the Feminist Future: Aspects of Frischmann's Theory of Infrastructure Resources

Marc R. Poirier*

Brett Frischmann's 2005 Economic Theory of Infrastructure argues that certain important resources should be governed not by a property regime but by a regime that incorporates open, nondiscriminatory access. His theory works well for information and the Internet, as well as for some aspects of antitrust, and has received a warm reception by scholars in these fields. It is not as apt for natural resources and environmental services. Unlike information, most natural resources are congestible. Managing congestible resources requires more than a principle of nondiscriminatory access, and must account for negative externalities, in a complex and resource-specific analysis. In the Essay published in this volume, Frischmann's theory has been refined to account for environmental infrastructure in more detail; the principle of open, nondiscriminatory access gradually recedes behind the complex considerations of managing competing uses of each resource. The original kernel of Frischmann's theory remains helpful in some other ways, however. By stressing the pervasive uncertainty of downstream benefits from the use and reuse of information, Frischmann's theory suggests that the environmentalists' project to quantify the value of ecosystem services and create markets in ecosystem services cannot be applied to information, as some advocates of cultural environmentalism appear to assert. At the same time, Frischmann's focus on the importance of making vital renewable resources available to downstream users, including users in subsequent generations, corresponds in a perhaps surprising way to feminist and communitarian theories of interpersonal obligations about sharing resources. Frischmann's theory may therefore help to lay the groundwork for a feminist analysis of intergenerational environmental obligations.

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INTRODUCTION

Brett Frischmann's *Economic Theory of Infrastructure and Commons Management*¹ offers a comprehensive new proposal about managing certain types of resources by providing public access to them on an obligatory and nondiscriminatory basis. It critiques any systematic right to exclude as inappropriate—a right that would be an integral part of a typical resource management scheme based on private property. For many resources that are broadly shared and reusable, Frischmann argues, open access will be more conducive to maximizing the production of public and nonmarket goods on an ongoing basis. The beneficial processes of shared use and reuse, with their many positive spillover effects, would be impeded by granting a property right to an owner who then could exclude potential downstream users, based on inadequate signals about demand. Frischmann concludes that fundamental infrastructure should instead be shared.

Frischmann applies his Economic Theory of Infrastructure to what he calls “nontraditional infrastructure” resources, including information, the Internet, and the environment.² His theory is important and helpful in addressing current issues of resource management structure for information and the Internet. But without considerable amendment, it is not as helpful in assessing most

1. Brett M. Frischmann, *An Economic Theory of Infrastructure and Commons Management*, 89 MINN. L. REV. 917 (2005) [hereinafter Frischmann, *Economic Theory*]; accord Brett M. Frischmann, *Infrastructure Commons*, 2005 MICH. ST. L. REV. 121 [hereinafter Frischmann, *Infrastructure Commons*] (summarizing Frischmann, *Economic Theory*, *supra*).

2. Frischmann, *Economic Theory*, *supra* note 1, at 927–28. More traditional infrastructure resources might include roads and highways, canals, railroads, the mail service, telephone, and telegraph. *Id.* at 925.

environmental resource management options, because normal levels of use result in the congestion of most environmental resources. Access to natural resources must therefore be managed in one way or another, or their deterioration and loss of the vital services they provide will ensue. Open, nondiscriminatory access alone is an insufficient theoretical framework for congestible resources.

This Essay first focuses on two central points: the inevitable congestion that arises from normal use of natural resources and the environmental services they provide,³ and the consequent need for managing the use of natural resources and environmental services.⁴ Frischmann's contribution to this volume takes his earlier theory in exactly the right direction to deal with these issues.⁵ But the focus necessarily shifts away from open and nondiscriminatory access.⁶ This Essay also notes two other interesting and perhaps important implications of Frischmann's theory. The first concerns claims that intellectual property theory needs to develop a better theory of cultural environmentalism.⁷ Frischmann's critique of the demand-side economics of infrastructure resources casts doubt on whether techniques being developed in the environmental arena to achieve a more precisely measured accounting for and quantification of the value of future environmental services can be applied similarly to information.⁸ At the same time, Frischmann's theory focuses on a need to assure availability and access of infrastructure resources to downstream users, including future generations. It thus dovetails with a feminist vision of intergenerational environmental equity.⁹ This Essay concludes that Frischmann's theory offers both less and more for natural resources and environmental services than it purports to at first reading.

I. THE INEVITABLE CONGESTION OF NATURAL RESOURCES

One justification for creating private property in natural resources begins with the fact that most natural resources are congestible at some scale of use. Preventing the congestion or exhaustion of these natural resources helps preserve the cumulative value of their use. Use limitations that would limit congestion can be implemented through any of three types of strategies:

3. See *infra* Part I.

4. See *infra* Part II.

5. Brett M. Frischmann, *Environmental Infrastructure*, 35 *ECOLOGY L.Q.* 151 (2008).

6. See *infra* Part II.B.

7. Generally speaking, cultural environmentalism involves arguments by scholars of intellectual property and the Internet that environmentalism succeeded in part through political, technical, and legal measures which created a strong popular movement in support of environmentalism's goals; and that similar strategies should be deployed to protect the public domain from inappropriate propertization. See, e.g., James Boyle, *The Second Enclosure Movement and the Construction of the Public Domain*, 66 *LAW & CONTEMP. PROBS.* 33, 70–74 (2003) [hereinafter Boyle, *The Second Enclosure Movement*] (explaining the concept of cultural environmentalism). See generally *infra* Part III.

8. See *infra* Part III.

9. See *infra* Part IV.

informal norms, property-based rights to exclude, or regulatory restrictions and allocations.¹⁰ However, other consequences follow from these strategies. In particular, a newly formed property-based right to exclude allocates the resource to an owner, and away from others who were sharing uses or who could have shared uses if the resource had continued to be managed as a commons.¹¹ The new owner may choose to allow access to other users, most often in response to payment—in other words, a market in the resource. Overall availability of the resource would then be governed by a market, with downstream would-be users paying the owner of the resource, and the owner relying on price signals from downstream would-be users to determine access to the resource and, in cases where the owner can determine supply, the quantity of the resource. This basic description is fundamental to Frischmann's critique of the use of property rights to manage infrastructure resources.¹²

A. *Managing Infrastructure Resources, According to Frischmann*

Frischmann argues (1) that certain types of resources, which he calls infrastructure, can be used by many people without being used up, that is, they are nonrival or partly nonrival goods;¹³ (2) that a large part of the value of these infrastructure resources comes from downstream or subsequent uses, which themselves are nonrival or partially nonrival; and (3) that these downstream uses themselves serve to supply a wide variety of goods, some of which themselves are nonrival or partly nonrival.¹⁴ Frischmann thus identifies a class of resources whose most important uses can be shared without being used up, and whose uses and value to society are potentially iterable and

10. See generally Carol M. Rose, *Rethinking Environmental Controls: Management Strategies for Common Resources*, 41 DUKE L.J. 1 (1991) [hereinafter Rose, *Rethinking Environmental Controls*].

11. Exclusion is, among other things, the mechanism of the enclosure and commodification of previously shared resources. At some point in our history, common land was enclosed, made private property and commodified; these days, a kind of enclosure threatens the information commons. See, e.g., Boyle, *The Second Enclosure Movement*, *supra* note 7.

12. There are two other standard justifications for creating intellectual property rights in the areas of copyright and patent. Creating a property right might sometimes be justifiable as either a reward for merit, or as an incentive for creating such resources. The merit justification is not central to this Essay. The incentive to create justification is more relevant. A limited monopoly, achieved through a prohibition on unauthorized copying, rewards creativity, so that more of a particular kind of infrastructure will be created and supplied. For natural resources, in contrast, the supply of the resource and of corresponding environmental services is typically limited; resource management policy needs to focus on preventing degradation of the limited supply, rather than expanding supply. See discussion *infra* Part II. (To be sure, technological advances and shifts may have the effect of increasing the overall utility of a good in limited supply. Patents may reward this kind of technological innovation.)

13. Nonrival goods are goods that may be consumed by one person without that use preventing the simultaneous use by others. Broadcast television service is an example. Partly rival goods are goods some of whose uses are nonrival and some of whose uses involve consumption or congestion. A lake is an example.

14. Frischmann, *Economic Theory*, *supra* note 1, at 956.

cumulative—both to uses and users existing in the same time frame in different locations, and to uses and users from one generation to the next.¹⁵

For infrastructure resources, the downstream, nonconsumptive, iterative uses often cumulate into large and valuable benefits, and yet the specific downstream users and beneficiaries cannot be identified. That is, the resources are important, useful for many uses, and widely available as shared resources, but we do not know just who will be using them, what they will use them for, or how valuable those uses will be. There will be subsequent uses. Again, we do not know who will then use the resources, what they use them for, and how valuable those uses will be. Moreover, many of the benefits of use are public goods or nonmarket goods. For both these reasons, Frischmann argues that it is fundamentally problematic to create a private property-based right to exclude in an upstream owner or user of fundamental infrastructure, and then rely on a market to produce roughly the right amount of the resource, and to allocate the resource to subsequent downstream potential users. We can predict that the demand signal coming from downstream potential users to the current owner, if we create one, will be inaccurately small because the large downstream values from reuses of the resource are nevertheless largely uncertain as to time and producer.¹⁶ This systematic failure of demand signals will lead to an inadequate supply of important reusable resources and a loss of overall social benefits, both intragenerationally and intergenerationally. Sharing is better, Frischmann argues; fundamental infrastructure resources should be managed by providing open access to them for nonrivalrous uses and users, rather than creating a right in someone to use, exclude, and sell access.

In order to distinguish Frischmann's account from other and perhaps more familiar versions of the natural resource commons, several aspects of Frischmann's argument are worth noting briefly here. First, Frischmann

15.

Infrastructures are sharable in the sense that the resources can be accessed and used by multiple users at the same time. Infrastructure resources vary in their capacity to accommodate multiple users, and this variance in capacity differentiates nonrival (infinite capacity) resources from partially (non)rival (finite but renewable capacity) resources.

Id. at 942. The specific type of shared or repeated use depends on the type of resource. Information may be used and reused for various productive ends. A lake may be used for many purposes, some of which will degrade the useful qualities of the lake or even destroy it.

Part IV *infra* suggests that intergenerational iterated uses of a partially rivalrous resource may be thought of as a kind of sharing. Frischmann's work has not yet conceptualized intergenerational uses as sharing in any detail, though he acknowledges the usefulness of considering the issue at several points in his most recent work. Frischmann, *Environmental Infrastructure*, *supra* note 5.

16. Frischmann describes a category of nonmarket goods produced through infrastructure resources. Frischmann, *Economic Theory*, *supra* note 1, at 965. "They are neither provided nor demanded through the market mechanism," but they may be provided by government, community, family, or individuals. *Id.* Perhaps we could call these noncommodified and usually noncommodifiable spillovers. They are both positive and negative. The demand and supply for these resources seems to me to be potentially problematic—but for different reasons than Frischmann sets out. They just do not have market value.

expressly focuses on commons or open access as a deliberate resource management strategy, not as a default opening position in a state of nature.¹⁷ Second, Frischmann's concept of access is a broader strategy than the true, free open access that forms the backdrop for the classic tragedy of the commons,¹⁸ inasmuch as he contemplates that most infrastructure resources must be paid for somehow.¹⁹ And third, despite his explicit and repeated inclusion of environmental resources in his argument, especially lakes,²⁰ and his acknowledgement that some infrastructure resources typically are not produced but are instead naturally occurring,²¹ Frischmann focused his original argument on concern about the demand signal to a hypothetical resource owner and its effect on the potential production of more fundamental infrastructure, rather than on managing the use of preexisting fundamental infrastructure to prevent its degradation.

B. Crucial Differences Between Environmental and Informational Resources

A central focus of Frischmann's infrastructure theory is the problem with a demand-side signal from downstream would-be users to a hypothetical resource owner for production and maintenance of the resource. While

17. Compare, e.g., Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. (PAPERS & PROC.) 347 (1967) (commons as a state of nature), Garrett Hardin, *The Tragedy of the Commons*, 162 SCI. 1243 (1968) (same), and Rose, *Rethinking Environmental Controls*, *supra* note 10 (same), with ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION (1990) (exploring successful traditional limited commons management schemes), Richard A. Epstein, *The Allocation of the Commons: Parking on Public Roads*, 31 J. LEGAL STUD. S515 (2002) (challenging the assumption of straightforward evolution from commons to private property), Charlotte Hess & Elinor Ostrom, *Ideas, Artifacts, and Facilities: Information as a Common-Pool Resource*, 66 LAW & CONTEMP. PROBS. 111 (2003) (arguing that limited commons management strategies are increasingly understood to be effective under some conditions), and Carol Rose, *The Comedy of the Commons: Custom, Commerce, and Inherently Public Property*, 53 U. CHI. L. REV. 711 (1986) [hereinafter Rose, *The Comedy of the Commons*] (exploring and proposing justifications for traditional forms of inherently public property). For an overview of the history of our understanding of the commons, see Thomas Dietz, Nives Dolšák, Elinor Ostrom & Paul C. Stern, *The Drama of the Commons*, in THE DRAMA OF THE COMMONS 3 (Elinor Ostrom, Thomas Dietz, Nives Dolšák, Paul C. Stern, Susan Stonich & Elke U. Weber eds., 2002).

18. See Hardin, *supra* note 17.

19. Frischmann, *Economic Theory*, *supra* note 1, at 925–26, 933–34; see also *infra* Part II; cf. Boyle, *The Second Enclosure Movement*, *supra* note 7, at 66 (noting that “some of the theorists of the e-commons do not see restraints on use as anathematic to the goal of freedom; indeed, they may see the successful commons as defined by its restraints”).

20. Frischmann, *Economic Theory*, *supra* note 1, at 982–90; Frischmann, *Environmental Infrastructure*, *supra* note 5; Frischmann, *Infrastructure Commons*, *supra* note 1, at 132–34. In a recent e-mail Frischmann communicated that he used the example of a lake at first because he lived and worked near Lake Michigan at the time, and that he has simply continued to use this example. E-mail from Brett M. Frischmann, to Marc R. Poirier (Mar. 13, 2008) (on file with author).

21. Frischmann, *Economic Theory*, *supra* note 1, at 948 (sunshine); *id.* at 954 (not all resources are “amenable to capacity expansion,” specifically giving the example of “environmental resources that act as a sink for pollution”); Brett M. Frischmann, *Some Thoughts on Shortsightedness and Intergenerational Equity*, 36 LOY. CHI. L.J. 457, 463 (2005) [hereinafter Frischmann, *Intergenerational Equity*] (natural resources are inherited, not created).

important, this observation is more centrally relevant to concerns about how to manage information and culture than to management of the use, congestion and potential loss of our preexisting environmental services.

Core natural resources and environmental services share characteristics that distinguish them from information resources. In presenting this argument I rely principally on the work of Richard Lazarus,²² with support from articles by Holly Doremus,²³ Daniel Farber,²⁴ Charlotte Hess and Elinor Ostrom,²⁵ Richard Posner,²⁶ Carol Rose,²⁷ Jim Salzman,²⁸ and Rob Verchick.²⁹ None of the points I make are particularly surprising. But they are important.

Richard Lazarus argues that what distinguishes environmental law from information resources is the nature of the injury.³⁰ Environmental law addresses injury to the natural environment, not human health.³¹ Lazarus lines up six characteristics of an “ecological injury”:

- (1) irreversible, catastrophic, or continuing, or increasing over time;
- (2) physically distant, with cause in one place and effect in another;
- (3) temporally distant; the effect may not be felt for a long time, or may be felt soon but increases over time; this characteristic poses issues of responsibility to future generations, especially when they cannot be represented in decisionmaking;
- (4) characterized by uncertainty and risk, due both to lack of scientific knowledge and to the sheer complexity of natural processes;
- (5) evidencing multiple causation; and
- (6) noneconomic or nonmonetary in character (sometimes).³²

22. Richard J. Lazarus, *Human Nature, The Laws of Nature, and the Nature of Environmental Law*, 24 VA. ENVTL. L.J. 231 (2005) [hereinafter Lazarus, *Human Nature*]; Richard J. Lazarus, *Restoring What's Environmental about Environmental Law in the Supreme Court*, 47 UCLA L. REV. 703 (2000) [hereinafter Lazarus, *Restoring What's Environmental*].

23. Holly Doremus, *Constitutive Law and Environmental Policy*, 22 STAN. ENVTL. L.J. 295, 319–29 (2003) (outlining the distinctive characteristics of environmental law).

24. Daniel A. Farber, *Building Bridges Over Troubled Waters: Eco-Pragmatism and the Environmental Prospect*, 87 MINN. L. REV. 851, 855–65 (2003) (examining the basic characteristics of environmental problems); Daniel A. Farber, *Probabilities Behaving Badly: Complexity Theory and Environmental Uncertainty*, 37 U.C. DAVIS L. REV. 145 (2003) [hereinafter Farber, *Probabilities*].

25. Hess & Ostrom, *supra* note 17.

26. Richard A. Posner, *Do We Have Too Many Intellectual Property Rights?*, 9 MARQ. INTELL. PROP. L. REV. 173 (2005).

27. Rose, *Rethinking Environmental Controls*, *supra* note 10.

28. James Salzman, *A Field of Green?: The Past and Future of Ecosystem Services*, 21 J. LAND USE & ENVTL. L. 133 (2006) [hereinafter Salzman, *A Field of Green?*].

29. Robert R.M. Verchick, *The Case Against Cost-Benefit Analysis*, 32 ECOLOGY L.Q. 349 (2005) (reviewing FRANK ACKERMAN & LISA HEINZERLING, *PRICELESS: ON KNOWING THE PRICE OF EVERYTHING AND THE VALUE OF NOTHING* (2004)).

30. Lazarus, *Restoring What's Environmental*, *supra* note 22, at 744–48.

31. To be sure, human health is often of central concern in environmental law, but Lazarus points out that in environmental contexts our concern is specifically focused on the effects of environmental injury on human health. *Id.* at 744–45.

32. *Id.* at 744–48. This is a summary of several pages of discussion, preserving Lazarus' taxonomy.

Some of these characteristics of ecological injury run parallel to the problems of managing information as an infrastructure resource. We are dealing with shared resources, and therefore with both intragenerational and intergenerational concerns about equity—who gets what. Where ecological injury is concerned, causation issues are complex and often opaque, as are questions of putting values on future uses and on the deleterious effects of prior uses on future uses. We face similar difficulties in understanding the complex relationships of various uses of information.

Yet there is at least one vitally important difference between environmental resources and informational resources: environmental resources carry with them the risk of loss from the mere normal and basic use of natural resources infrastructure. Natural resources and the environmental services they provide³³ are congestible or exhaustible, and thus are fragile in a way that information is not. Lazarus expounds on the risk of serious harm to basic, vital natural resources and services, stating that, “[i]n consuming for the basic necessities of energy, food, shelter, and clothing, humankind necessarily increases entropy in parts of the ecosystem in the form of polluted global resources and destroyed natural resources.”³⁴ Moreover, generally speaking, natural resources preexist us, and are not created by us, and are not easily expanded by us. Consequently, we must attend much sooner to the details of use and the adverse consequences of use.

Most natural resources and environmental services on which we depend are congestible, even if only in tiny increments. To be sure, natural processes may replenish renewable resources,³⁵ which gives us the illusion that the services are ever present and inexhaustible. But these natural recycling processes may not continue to work as they have. Small interferences cumulate. Also, as we are coming to understand, these natural processes may be fragile and, in a technical sense, chaotic. Due to the accumulation of human impacts and fragility of the environment, there exists a small but undeniable risk of catastrophic consequences.³⁶ The risk from congestion can thus be of several types: a classic tragedy of the commons, where small injuries cumulate; or the small risk of a catastrophic and irreversible event that permanently disrupts some natural process; or the loss of something unique and irreplaceable, such as an endangered species or a unique and beautiful place.

33. Hess and Ostrom discuss the concept of a resource pool or platform that provides a stream of benefits over time. Hess & Ostrom, *supra* note 17, at 121.

34. Lazarus, *Human Nature*, *supra* note 22, at 235.

35. Some important natural resources are nonrenewable, therefore exhaustible, though there might be plausible substitutes.

36. See Farber, *Probabilities*, *supra* note 24; see also Douglas A. Kysar, *Climate Change, Cultural Transformation, and Comprehensive Rationality*, 31 B.C. ENVTL. AFF. L. REV. 555, 564–70 (2004) (exploring problems of uncertainty in the context of possible catastrophic events related to climate change).

As Frischmann's basic theory notes, a central concern in resource management strategies is the impact of present actions on future uses of the resources. Here, too, there is a significant difference between information and natural resources. Lazarus observes that it is human nature to focus on certain and short-term gains and to slight the possibility of more distant adverse consequences.³⁷ "The need for environmental law can be seen as arising from the persistent gap between the spatial and temporal horizons of human nature and the much wider and longer spatial and temporal dimensions of the consequences of human activities because of the laws of nature."³⁸ If we do not manage that gap, we face "potentially tragic consequences."³⁹

This potential for "tragic consequences" is perhaps another fundamental difference between information resources and environmental resources. Information is said to be nonrivalrous,⁴⁰ with the consequence that congestion need not concern us to any great extent. In contrast, many basic environmental services may *appear* to be nonrivalrous because the consumptive uses are relatively small and because the resources eventually regenerate. Air, drinking water, and fish are examples. These resources, systems, and processes are, nevertheless, congestible.⁴¹ Congestion is especially evident in recent times because the scale of use has increased dramatically due to increased consumption, to changes in the technologies that facilitate consumption, and, let us not forget, to dramatic population growth.

Another important difference between environmental and informational resources involves the difference between potential gain and potential catastrophic loss. Frischmann's argument focuses on protecting potential gain. While this focus makes sense in terms of lost opportunities if information is hoarded instead of shared, it does not easily apply to ecological injury, which often deals with the loss of vital services that we now have and that we cannot

37. We do not instinctively do well with environmental problems, not just for lack of scientific information or because of the uncertainty and complexity of cause and effect (though these are problems too), but because of our own selfish biases towards the present. See Lazarus, *Human Nature*, *supra* note 22, at 237–38; see also David A. Dana, *A Behavioral Economic Defense of the Precautionary Principle*, 97 NW. U. L. REV. 1315 (2003).

38. Lazarus, *Human Nature*, *supra* note 22, at 239.

39. *Id.*

40. That information is nonrivalrous is the standard position. Sometimes valuable uses of information may not be able to coexist, however. So the *uses* of information may be congestible or rivalrous. But that is a different point. See David W. Opperbeck, *The Penguin's Genome, or Coase and Open Source Biotechnology*, 18 HARV. J.L. & TECH. 167, 206–12 (2004) (arguing that contrary to the accepted view, information should be understood to be rivalrous because of conflicting uses and customs around it).

41. Jamie Boyle puts it this way: "Unlike the earthy commons, the commons of the mind is generally 'non-rival.' Many uses of land are mutually exclusive. . . . [T]his means that the threat of overuse of fields and fisheries is generally not a problem with the informational or innovational commons." Boyle, *The Second Enclosure Movement*, *supra* note 7, at 41. As Frischmann develops the application of theory to natural resources and environmental services, he has begun to acknowledge this pervasive issue of congestion from normal use. Frischmann, *Environmental Infrastructure*, *supra* note 5, at 166–67.

do without.⁴² Many of the risks of loss addressed by environmental policy are qualitatively different from the missed opportunities that Frischmann identifies.⁴³

This argument may in part merely be giving expression to an endowment effect that occurs when assessing the environmental services that flow from already existing natural resources.⁴⁴ In this I certainly would not be alone. Edith Brown Weiss, for example, uses the rhetoric of “holding” the natural environment in trust, a trust with people as both trustees and beneficiaries.⁴⁵ This choice of language reflects a sense of a certain kind of ownership and use—an entitlement coupled with an obligation. Other articulations of the obligation to preserve natural resources from one generation to the next employ similar ownership words—patrimony, or heritage, or trust.⁴⁶ They reflect the same expectation that the natural world and its environmental services should continue to be available to support human life and well-being at no less a level than it has been.

II. THE NEED TO MANAGE ACCESS TO NATURAL RESOURCES

As a consequence of congestion, access to natural resources must be managed and open, nondiscriminatory access qualified, in a way that Frischmann did not explore in any detail in his initial work. In his Essay here, he considers that issue. However, the concepts that served so well to develop the original argument for open, nondiscriminatory access point to a welter of context-specific inquiries around alternatives uses, their values and near- and long-term consequences. It seems impossible to provide any generally applicable principle for managing natural resources along the lines of the principle Frischmann asserts should apply to information and the Internet. The

42. See generally Lazarus, *Human Nature*, *supra* note 22.

43. As Jamie Boyle points out, “[t]he concerns in the informational commons have to do with a different kind of collective action problem [than the tragedy of the commons]: the problem of incentives to create the resource in the first place.” Boyle, *The Second Enclosure Movement*, *supra* note 7, at 41–42. Frischmann’s contribution to this volume briefly acknowledges the difference between losing the services we already depend on, and losing opportunities for future gain if information is not widely shared. Frischmann, *Environmental Infrastructure*, *supra* note 5, at 167 n.55. It will merit more attention in future work.

44. It is well established that we tend to place a higher value on something we own and could part with than something we do not yet own and could buy. That is the endowment effect. See, e.g., Christine Jolls, *Behavioral Law and Economics*, in *BEHAVIORAL ECONOMICS AND ITS APPLICATIONS* 115, 116–21 (Peter Diamond & Hannu Vartiainen eds., 2007).

45. See, e.g., Edith Brown Weiss, *Our Rights and Obligations to Future Generations for the Environment*, 84 AM. J. INT’L L. 198, 198–99 (1990) [hereinafter Weiss, *Rights and Obligations*] (discussing EDITH BROWN WEISS, IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY, AND INTERGENERATIONAL EQUITY (1988)).

46. For example, the National Environmental Policy Act states that one goal of the Act is to “fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.” 42 U.S.C. § 4331(b)(1) (2006). Frischmann has used the common law concepts of usufruct and avoidance of waste to describe intergenerational obligations concerning natural resources. Frischmann, *Intergenerational Equity*, *supra* note 21, at 462.

management regime for each specific resource seems to be determined more by contextualized assessments of values of use and problems of congestion than by a principle of open, nondiscriminatory access alone. Frischmann's theory can perhaps provide a systematic framework for analysis, but it does not do as much of the work for natural resources as it did with information and the Internet.

A. *Open, Nondiscriminatory Access to Natural Resources Creates
Congestion, Which Must be Managed:
The Example of New Jersey's Public Trust Doctrine*

It is certainly possible, if not inevitable, to combine a commitment to open and nondiscriminatory access with attention to the management of use-related congestion. For example, various versions of the public trust doctrine⁴⁷ include a right of nondiscriminatory access or use, a point of overlap with Frischmann's core argument.⁴⁸ New Jersey's public trust doctrine recognizes that congestion must always be managed. I explore that doctrine here as a case study.

The leading case, *Borough of Neptune City v. Borough of Avon-by-the-Sea*,⁴⁹ revived an unclear and perhaps decrepit doctrine which had most often been applied to hold that certain natural resources (typically lands submerged under navigable waters, including tide-flowed lands at the water's edge) could not be alienated, and that public access to these resources should be preserved.⁵⁰ The New Jersey Supreme Court applied the public trust doctrine in a novel way to manage the recreational uses of the state's ocean beaches.⁵¹ Although *Neptune City* is typically thought of as a beach access case, the issue in *Neptune City* was not the *absolute* right of Neptune City's residents to have access to Avon-by-the-Sea's public beach, but whether Avon could charge a

47. The public trust doctrine is formulated and applied to natural resources in a variety of ways, many of them fuzzy and contested. See, e.g., Michael C. Blumm, *Public Property and the Democratization of Western Water Law: A Modern View of the Public Trust Doctrine*, 19 ENVTL. L. 573, 575 (1989) (the public trust doctrine "sometimes seems as if it's all things to all people"); Marc R. Poirier, *Modified Private Property: New Jersey's Public Trust Doctrine, Private Property and Exclusion, and Shared Public Use of Natural Resources*, 15 SE. ENVTL. L.J. 71, 117 (2006) [hereinafter Poirier, *Modified Private Property*] (the public trust doctrine is "unformed and variable").

48. For a discussion of Frischmann's core demand-side argument, see *supra* Part I.A.

49. 294 A.2d 47 (N.J. 1972).

50. See, e.g., *Ill. Cent. R.R. Co. v. Illinois*, 146 U.S. 387 (1892); *Arnold v. Mundy*, 6 N.J.L. 1 (N.J. 1821). See generally BONNIE J. MCCAY, *OYSTER WARS AND THE PUBLIC TRUST: PROPERTY, LAW AND ECOLOGY IN NEW JERSEY HISTORY* (1998). The public trust doctrine had been invoked contemporaneously and powerfully as a general paradigm for managing natural resources. Joseph L. Sax, *The Public Trust Doctrine in Natural Resources Law: Effective Judicial Intervention*, 68 MICH. L. REV. 471 (1970).

51. *Neptune City*, 294 A.2d at 54. (holding that "the public trust doctrine dictates that the beach and the ocean waters must be open to all on equal terms and without preference and that any contrary state or municipal action is impermissible."). See Rose, *The Comedy of the Commons*, *supra* note 17, at 753-58 (asking whether recreational uses should be subject to open access).

higher beach permit fee for nonresidents.⁵² New Jersey's public trust doctrine as applied to beaches has thus always been about rate regulation as well as a right of access. To be sure, subsequent New Jersey cases have involved a right of reasonable access successfully invoked against an attempt at absolute exclusion.⁵³ But beach fees are also a recurring and central issue.⁵⁴

One permissible justification for beach access fees is to distribute the costs of congestion created by use of the resource. *Neptune City* recognized that requiring municipalities to open their beaches to large numbers of nonresidents would create "burdens, financial and otherwise."⁵⁵ Municipalities may recoup these costs through reasonable beach user fees.⁵⁶ The collected fees are to be used for maintenance of the beach and provision of services related to beach use, such as lifeguards, trash collection, and police services.⁵⁷ As is typical

52. New Jersey municipalities were first authorized to charge reasonable fees for access to beaches in a 1955 law. N.J. STAT. ANN. § 40:61-22.20 (2008). The state Supreme Court recently clarified that the state Department of Environmental Protection (DEP) has authority over such fees. *Raleigh Ave. Beach Ass'n v. Atlantis Beach Club, Inc.*, 879 A.2d 112, 125 (N.J. 2005). Newly issued regulations address some aspects of beach fees, under the supervision of the DEP. N.J. ADMIN. CODE § 7:7E-8.11(m) (2008).

53. See *Nat'l Ass'n of Homebuilders of the U.S. v. N.J. Dep't of Env'tl. Prot.*, 64 F.Supp. 2d 354 (D.N.J. 1999) (reasonable access-related exactions across private property are justified based on the public trust doctrine, as well as on a *jus publicum* right of use inhering in previous submerged lands); *Raleigh Ave. Beach Ass'n*, 879 A.2d 112 (right of reasonable access across a privately owned beach); *Matthews v. Bay Head Improvement Ass'n*, 471 A.2d 355 (N.J. 1984) (reasonable right of access across a privately managed but quasi-municipal beach). For a current account of the right of public access to the New Jersey shore, see Timothy M. Mulvaney & Brian Weeks, "Waterlocked": *Public Access to New Jersey's Coastline*, 34 *ECOLOGY L.Q.* 579 (2007).

54. The most extended exposition of the concern about the effects of the structure and level of beach fees can be found in *Slocum v. Borough of Belmar*, 569 A.2d 312 (N.J. Super. Ct. Law Div. 1989) (relying on a statutory regulatory scheme, with the public trust doctrine in the background), but they are discussed in several of the public trust cases. See, e.g., *Raleigh Ave. Beach Ass'n*, 879 A.2d at 124-25 (discussing structure of rates for public use of private beach); *Neptune City*, 294 A.2d at 55 (discussing structure of rates for public use of municipally owned beach by nonresidents); *Sea Isle City v. Caterina*, 303 A.2d 351 (N.J. Super. Ct. Law Div. 1973) (allowing preseason discount but invalidating a weekly fee structure that ran from Saturday at noon through the following Saturday at noon with the consequences that out-of-town weekend vacationers had to buy two weeks of passes); cf. *Hyland v. Allenhurst*, 372 A.2d 1133, 1137 (N.J. Super. Ct. App. Div. 1977), *modified*, 393 A.2d 579, 581 (N.J. 1978) (allowing a municipality to charge nonresidents a higher fee for use of a beach club that was built with and in part maintained by municipal funds obtained by taxing town residents; nevertheless access to the beach itself had to be provided on a nondiscriminatory basis). See generally Brian Weeks, *Public Rights of Access to and Use of the Shores of Tidal Waterways in New Jersey*, 237 N.J. LAW. 12, 15-16 (2005) (discussing the relationship of beach fees to public rights of access in New Jersey). New Jersey also recently revised and recodified its administrative regulations pertaining to beach access. 39 N.J. Reg. 5222(a) (Dec. 17, 2007). The principal regulation, now entitled "Public Trust Rights", is codified at N.J. ADMIN. CODE § 7:7E-8.11 (2008). It addresses issues such as linear access, perpendicular access, visual access, beach fees, parking, the spacing of public access points, and the availability and spacing of public restrooms.

55. *Borough of Neptune City v. Borough of Avon-by-the-Sea*, 294 A.2d 47, 55 (N.J. 1972).

56. *Id.* at 56.

57. Typical costs to which fees may be applied would include "direct beach operational expenses, additional personnel and services required in the entire community, debt service of outstanding obligations incurred for beach improvement and preservation, and a reasonable annual reserve designed to meet future capital expenditures therefore." *Id.* at 56.

with utility regulation, the level and use of fees are scrutinized for reasonableness.⁵⁸ The “reasonableness” of public access later articulated in *Matthews v. Bay Head Improvement Ass’n*⁵⁹ thus extends not only to when access is allowed, but also to the way in which beach fees are structured.⁶⁰

The cases elaborating New Jersey’s public trust doctrine indicate in some other ways as well that the right of access is not absolute, and must always be implemented with regard to problems of inappropriate use and congestion of various kinds. Perhaps most important for our purposes is that New Jersey’s public trust doctrine allows access to be limited to avoid overcrowding.⁶¹ Concern for the effects of human use on endangered species can also be accommodated by limiting public access.⁶² There is also no absolute right of access to use a beach in a storm,⁶³ or to go to the beach topless.⁶⁴ New Jersey’s new regulations provide a list of circumstances where public access may be modified, although they also specifically state that the underlying public trust obligation to provide access is not thereby relinquished.⁶⁵ Closing off public access is a temporary and contextual accommodation to circumstance.

On the one hand, then, the New Jersey beach access cases, as well as the new beach access regulations, are committed to the kind of open, nondiscriminatory access that Frischmann recommends. On the other hand, they are grounded in the realities of congestion due to the use of the resource.

58. The underlying statute requires beach fees to be reasonable. N.J. STAT. ANN. § 40:61-22.20 (2008); N.J. ADMIN. CODE § 7:7E-8.11(m) (2008) (associated regulations); *see also supra* note 54 and cases cited therein.

59. 471 A.2d 355, 366 (N.J. 1984) (“The public must be afforded reasonable access to the foreshore as well as a suitable area for recreation on the dry sand.”). *Matthews* uses the words “reasonableness” or “reasonable” fifteen times. The most recent case in the line, *Raleigh Avenue Beach Ass’n v. Atlantis Beach Club*, 879 A.2d 112 (N.J. 2005), uses those words twelve times. Poirier, *Modified Private Property*, *supra* note 47, at 93 n.164.

60. *Neptune City*, 297 A.2d at 56 (“reasonable beach user fees” are permissible); Poirier, *Modified Private Property*, *supra* note 47, at 93–96; Weeks, *supra* note 54, at 15–16.

61.

[A]n area-related occupancy restriction limiting the number of people who may use a beach at one time based on the size of the dry sand beach area would be appropriate. The regulation must not, however, place so great a burden on recreational use of undeveloped beaches as to prevent the fulfillment of the State policy of encouraging maximum access to the ocean beach.

Lusardi v. Curtis Point Prop. Owners’ Ass’n, 430 A.2d 881, 888 (N.J. 1981) (involving a zoning dispute about multiple-family use of an undeveloped beachfront parcel that was zoned single-family residential). *Lusardi* was decided with explicit reference to background state land use policies, including the public trust doctrine. *Id.* at 886–87; *see also Borough of Neptune City v. Borough of Avon-by-the-Sea*, 294 A.2d 47, 56 (N.J. 1972) (municipalities may regulate on a first come, first serve basis the number of people on the beach at any one time).

62. In *Raleigh Avenue* the public beach immediately to the south of the private parcel in question was closed to public access during most of the summer season in order to protect an endangered species, the piping plover. *Raleigh Ave. Beach Ass’n v. Atlantis Beach Club, Inc.*, 879 A.2d 112, 121–22 (N.J. 2005); *see also* N.J. ADMIN. CODE § 7:7E-8.11(f)(2) (allowing closure of beaches to protect species).

63. *State v. Oliver*, 727 A.2d 491 (N.J. Super. Ct. App. Div. 1999).

64. *State v. Vogt*, 775 A.2d 551 (N.J. Super. Ct. App. Div. 2001).

65. N.J. ADMIN. CODE § 7:7E-8.11(f) (2008).

They acknowledge, often individually and certainly as a corpus, that natural resources subject to nondiscriminatory access requirements have to be managed; that this management entails costs if the resources are to continue to be made available; that costs must be recouped in one way or another; and that governmentally established fees have to be designed with specifically articulated policies in mind. Also, in the course of balancing these concerns, they reflect the values of democratization, distribution, antidiscrimination, and, invoking Carol Rose's concept, socialization.⁶⁶

*B. Frischmann's Basic Theory At First Did Not Address
Congestion of Natural Resources in Detail;
As He Refines His Work, Open and Nondiscriminatory Access Becomes
a Less Important Piece of the Overall Analysis*

As articulated in his original infrastructure scholarship, Frischmann's theory justified open and nondiscriminatory access as a management strategy for information and Internet infrastructure resources based on the demand-side problem he articulated.⁶⁷ Despite his assertion that this theory applied to environmental resources as well, the theory was worrisomely vague on the issue of congestion resulting from open and nondiscriminatory access to natural resources and environmental services. There was nothing fundamentally wrong with Frischmann's theory at this stage; but it was incomplete. The problem of downstream demand signals that Frischmann identifies as a core part of his theory does not provide enough of a principle to manage natural resources infrastructure; it simply does not give us a sufficient strategy for how to approach the complex and interlocking uses of any number of natural resources.

To be sure, all along Frischmann contemplated managed access. Moreover, payment for access fit into his theory, so long as there was no discrimination based on the identity of the user.⁶⁸ So governmental management, perhaps with fees, was something Frischmann's theory allowed

66. See, e.g., Blumm, *supra* note 47, at 595–97 (describing how procedural aspects of the public trust doctrine provide a democratizing force in natural resources management); Marc R. Poirier, *Environmental Justice and the Beach Access Movements of the 1970s in Connecticut and New Jersey: Stories of Property and Civil Rights*, 28 CONN. L. REV. 719 (1996) (describing antidiscrimination concerns in beach access policy); Poirier, *Modified Private Property*, *supra* note 47, at 103–08 (outlining distributional, democratic, and antidiscrimination concerns addressed by the public trust doctrine); Rose, *The Comedy of the Commons*, *supra* note 17, at 776–81 (socialization). On the concept of socialization as a justification for broad public access to beaches and other similar recreational venues, Rose posits that recreation “educates and socializes us, it acts as a ‘social glue’ for everyone, not just those immediately engaged; and of course, the more people engaged in any socializing activity, the better.” Rose, *The Comedy of the Commons*, *supra* note 17, at 779–80.

67. Frischmann, *Economic Theory*, *supra* note 1.

68. Frischmann, *Economic Theory*, *supra* note 1, at 926; Frischmann, *Environmental Infrastructure*, *supra* note 5.

for.⁶⁹ But until the Essay being published in this volume,⁷⁰ there was no detailed articulation of principles and details of management of natural resources.

Natural resources that produce important environmental services typically are quite complex, as Frischmann recognizes.⁷¹ Indeed, much of his contribution to this collection is an exploration of this complexity, as he specifically turns his attention to environmental infrastructure.⁷² After a preliminary consideration of the task at hand—valuing and managing environmental infrastructure⁷³—Frischmann focuses the analytical building blocks of his original argument on environmental infrastructure,⁷⁴ and identifies a series of reference questions to sort out various types of resources and uses, in pursuit of appropriate management schemes.⁷⁵ He also explores the similarity between application of the framework he proposes and already existing approaches: multiple use management and ecosystems valuation and management.⁷⁶ As he points out, “[t]he concept of environmental infrastructure seems to fit well within existing environmental scholarship.”⁷⁷

And yet the problem of complexity remains front and center. The lake that Frischmann often focuses on as an example may be one of the most complex resources of all, in terms of the number of types of uses and the variability from one lake to the next.⁷⁸ For example, Joseph Kearney and Thomas Merrill, in the part of their article on the *Illinois Central* case that addresses the public trust doctrine as a policy matter, refer to submerged lands under navigable waters as a “vexed resource” subject to extreme uncertainty.⁷⁹ They explain that “[a] resource such as submerged lands under navigable waters requires a blend of open access and exclusion rights.”⁸⁰ Private ownership is desirable to

69. Frischmann, *Economic Theory*, *supra* note 1, at 925–26.

70. Frischmann, *Environmental Infrastructure*, *supra* note 5.

71. Frischmann, *Economic Theory*, *supra* note 1, at 924.

72. See Frischmann, *Environmental Infrastructure*, *supra* note 5, at 161–78.

73. *Id.* at 162–66. Although I will not explore the issue at length here, Frischmann moves too quickly past the point that sometimes with environmental matters the problem is not that we do not know yet, or that the public does not understand yet, but that we are incapable of knowing the actual effects of our actions. See, e.g., Kysar, *supra* note 36 (critiquing the application of a comprehensive rationality approach to the problem of climate change). Frischmann’s discussion also seems to skirt the issue of the possibility that there are deep disagreements of values, not simply questions of quantification, at stake. See, e.g., Doremus, *supra* note 23, at 329–35 (characterizing many environmental disagreements as “wicked,” using the terminology of Horst W.J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning*, 4 *POL’Y SCIENCES* 155, 160–67 (1973)).

74. See Frischmann, *Environmental Infrastructure*, *supra* note 5, at 166–69.

75. *Id.* at 174–75.

76. *Id.* at 175–8.

77. *Id.* at 175.

78. Frischmann also acknowledges how different one lake is from another in terms of the services provided. Frischmann, *Economic Theory*, *supra* note 1, at 990.

79. Joseph D. Kearney & Thomas W. Merrill, *The Origins of the American Public Trust Doctrine: What Really Happened in Illinois Central*, 71 *U. CHI. L. REV.* 799, 928 (2005) (exploring the back story of *Illinois Central Railroad Co. v. Illinois*, 146 U.S. 387 (1892)).

80. *Id.* at 929.

encourage the development of docks, wharves, and so on, and yet we also want public access to navigation.⁸¹ Too much or too little privatization is problematic. Kearney and Merrill ultimately recommend a flexible, case-by-case approach, perhaps supervised by an administrative agency.⁸² And despite the caution of their approach, Kearney and Merrill have in fact grossly oversimplified the question of management of land at the water's edge.⁸³

Generally speaking, where natural resources are concerned, generic policy recommendations about the future consequences of present management decisions involving privatization versus common access are dubious at best. The problems with describing an appropriate management schemes for lakes, or even for a particular lake, suggest that the very complexity and specificity of environmental problems will make it difficult for any general theory of access to be broadly helpful without much more resource- and case-specific attention. Frischmann's contribution to this volume demonstrates as much; as he begins to explore the daunting complexity of interactions of uses of typical environmental resources, his observation about the problems of demand-side signals diminishes in importance, becoming just one among many types of problems to be considered.⁸⁴

There is another potential aspect of Frischmann's theory that eventually has to be addressed. Charging for use, even on a nondiscriminatory basis, may push up against some of the appeal of Frischmann's access argument for those with commitments to distributive, democratic, or moral and ethical justifications for access. Not all users or types of use may be able to pay the same. This could prove to be problematic, especially if the price of access, even though nondiscriminatory, is high. If the product or service is vital, a high price will cause great suffering to the poor. This point does not vitiate the value of Frischmann's theory but indicates another area where his theory may need to be supplemented with different arguments around distribution and equity, in order to preserve some of its appeal.

81. *Id.* at 881; accord Richard A. Epstein, *The Public Trust Doctrine*, 7 CATO J. 411, 417 (1987) (characterizing navigable rivers as "a mixed asset, some of whose attributes should remain private and others should be public").

82. Kearney & Merrill, *supra* note 79, at 929.

83. See Poirier, *Modified Private Property*, *supra* note 47, at 96–98 (exploring the complexity of managing the uses of water and land at the water's edge, and commenting on Kearney and Merrill's analysis); see also Richard J. Lazarus, *Crystals and Mud in Nature*, 18 YALE J.L. & HUMAN. 134 (2006) (critiquing James Salzman, *Thirst: A Short History of Drinking Water*, 18 YALE J.L. & HUMAN. 94 (2006), for oversimplifying the problem of managing water resources by focusing on drinking water instead of the various complex and interrelated uses and effects of water); Carol M. Rose, *The Story of Lucas: Environmental Land Use Regulation Between Developers and the Deep Blue Sea*, in ENVIRONMENTAL LAW STORIES 237, 241–45 (Richard J. Lazarus & Oliver A. Houck eds., 2005) (exploring the many conflicting uses of the coast as an explanation for the prevalence of first coastal management regulations and then coast-related regulatory takings challenges).

84. Frischmann, *Environmental Infrastructure*, *supra* note 5, at 166–75.

III. THE VAGUE PROMISE OF CULTURAL ENVIRONMENTALISM:
UNDERMINED BY FRISCHMANN'S THEORY?

Frischmann's theory has enjoyed an immediate favorable reception in the fields of intellectual property, Internet law and policy, and antitrust law.⁸⁵ It is subject to ongoing discussion and refinement, by Frischmann and others.⁸⁶ Frischmann's argument happens to be deeply and immediately relevant to current political and legal controversies in information law, intellectual property law, and Internet law; for recent intellectual property law "seems to be moving in the direction of privatization and away from a traditional 'commons.'"⁸⁷ Frischmann's theory is undoubtedly useful not only to those concerned with identifying resource management strategies that are most likely to maximize social welfare in a utilitarian sense, but also to those who favor open access to information or the Internet out of other moral or ideological commitments.⁸⁸ Perhaps Frischmann's theory is especially appealing to those opposed to proprietization of information and the Internet for moral and ethical reasons because it purports to beat property-oriented welfare economists at their own game.

The theory's success as applied to information resources does not mean that Frischmann's theory is particularly helpful to environmentalists. Indeed, such usefulness as there is may run the other way. Beginning with Jamie Boyle

85. See, e.g., Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 107 COLUM. L. REV. 257 (2007); Brett M. Frischmann & Barbara van Schewick, *Network Neutrality and the Economics of an Information Superhighway*, 47 JURIMETRICS J. 383 (2007); Brett M. Frischmann & Spencer W. Waller, *Revitalizing Essential Facilities*, 75 ANTITRUST L.J. 1 (2008); Greg Lastowska, *Decoding Cyberproperty*, 40 IND. L. REV. 23 (2007); Lawrence Lessig, Reply, *Re-Marking the Progress in Frischmann*, 89 MINN. L. REV. 1031 (2005).

86. See, e.g., Brett M. Frischmann, *Cultural Environmentalism and the Wealth of Networks*, 74 U. CHI. L. REV. 1083 (2007) [hereinafter Frischmann, *Cultural Environmentalism*] (reviewing YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* (2006)); Frischmann, *Environmental Infrastructure*, *supra* note 5; Frischmann & Lemley, *supra* note 85; Frischmann & van Schewick, *supra* note 85; Frischmann & Waller, *supra* note 85.

87. Opperbeck, *supra* note 40, at 170 (providing examples); see also Maureen Ryan, *Cyberspace as Public Space: A Public Trust Paradigm for Copyright in a Digital World*, 79 OR. L. REV. 647 (2000).

88. These might include concerns about democratic use of information and cultural resources, and the distributional consequences of enclosure of information and culture, see Boyle, *The Second Enclosure Movement*, *supra* note 7, at 39–44; see also Jessica Litman, *The Public Domain*, 39 EMORY L.J. 965 (1990) (framing copyright issues in property language as enclosure of a public domain); Ryan, *supra* note 87 (recommending a public trust model drawn from natural resources law for managing copyright); and concerns about First Amendment rights and value, see, e.g., Yochai Benkler, *Free as the Air to Common Use: First Amendment Constraints on Enclosure of the Public Domain*, 74 N.Y.U. L. REV. 354 (1999). For concern that excessive proprietization of culture, especially through copyright, will not leave "enough and as good" of the raw material of culture left for individuals freely to create and express themselves, see Wendy J. Gordon, *A Property Right in Self-Expression: Equality and Individualism in the Natural Law of Intellectual Property*, 102 YALE L.J. 1533, 1562 (1993) (discussing the natural law of property from John Locke and applying it to the theory of intellectual property). For a discussion of access to culture as part of a right of human flourishing, see Julie E. Cohen, *Creativity and Culture in Copyright Theory*, 40 U.C. DAVIS L. REV. 1151, 1159–62 (2007) (exploring the human rights as capabilities approaches of Amartya Sen and Martha Nussbaum as applied to copyright).

about a decade ago,⁸⁹ intellectual property theorists noted that environmental policy experts had had success in part by turning to ecology and economics to help assess the future consequences of present actions on natural resources; and they have advocated trying to follow suit in their considerations of information law and policy.⁹⁰ “Cultural environmentalism” is, generally speaking a call for the development of effective overarching politics and rhetoric opposing the proprietization of information and the Internet, by analogy to the successful development of the environmental movement out of what had theretofore been typically disconnected and local struggles over the management of natural resources.⁹¹ But the notion of cultural environmentalism is often vague, aspirational, and metaphorical, at least at this stage. Frischmann acknowledges this, but does not address how to solve these inadequacies.⁹²

Perhaps cultural environmentalism will eventually develop quantitative intellectual property policy analysis, along the lines of natural resource ecosystem services analysis.⁹³ In my view, significant success here is unlikely.

89. The leading article is James Boyle, *A Politics of Intellectual Property: Environmentalism for the Net?*, 47 DUKE L.J. 87 (1997). Boyle noted that a more developed politics of intellectual property would help to combat excessive proprietization of the public domain, and began to explore the success of environmentalism as a model for a similar politics of intellectual property. *Id.* at 108–13. In particular, he noted the importance of two disciplines to the development of environmental politics: ecology and economics. *Id.* at 108–09. Standing behind Boyle’s article is his book, JAMES BOYLE, SHAMANS, SOFTWARE, AND SPLEENS: LAW AND THE CONSTRUCTION OF THE INFORMATION SOCIETY (1996).

90. See, e.g., James Boyle, *Cultural Environmentalism and Beyond*, 70 LAW & CONTEMP. PROB. 5 (Spring 2007) [hereinafter Boyle, *Cultural Environmentalism*]; Boyle, *The Second Enclosure Movement*, *supra* note 7, at 70–74; Frischmann, *Cultural Environmentalism*, *supra* note 86; Frank Pasquale, *Towards an Ecology of Intellectual Property: Lessons from Environmental Economics for Valuing Copyright’s Commons*, 8 YALE J.L. & TECH. 78 (2006). A symposium held at Stanford Law School in 2006 on cultural environmentalism was recently published as *Cultural Environmentalism @ 10*, 70 LAW & CONTEMP. PROB. 1 (Spring 2007); see also Litman, *supra* note 88 (laying the groundwork for the resource management approach by analyzing the public domain in copyright as a commons); Ryan, *supra* note 87 (exploring the public trust doctrine as an analogy between natural resource management and information resource management).

91. Jamie Boyle recently described “cultural environmentalism” as follows:

Cultural environmentalism is an idea, an intellectual and practical movement, that is supposed to be a solution to a set of political and theoretical problems—an imbalance in the way we make intellectual property policy, a legal regime that has adapted poorly to the way that technology has broadened its ambit, and perhaps most importantly a set of mental models, economic nostrums, and property theories that each have a public-domain-shaped hole at their center.

Boyle, *Cultural Environmentalism*, *supra* note 90, at 6. One aspect of this project is to make visible in economic terms the value of contributions of the public domain, just as a combination of earth science and economics had assisted environmentalists to make visible the value of ongoing contributions of ecosystem services. *Id.* at 6–7; see also Frischmann, *Cultural Environmentalism*, *supra* note 86, at 1087–91 (summarizing cultural environmentalism).

92. Frischmann, *Cultural Environmentalism*, *supra* note 86, at 1086 (cultural environmentalism is a metaphor insufficiently worked out); Frischmann, *Economic Theory*, *supra* note 1, at 980–81. He leaves the question open again in his contribution here. Frischmann, *Environmental Infrastructure*, *supra* note 5, at 174–75.

93. See, e.g., NATURE’S SERVICES: SOCIETAL DEPENDENCE ON NATURAL ECOSYSTEMS (Gretchen Daily ed., 1997); Robert Costanza et al., *The Value of the World’s Ecosystem Services and Natural*

For one thing, the resources are just different, as discussed in the preceding two Parts.⁹⁴ Also, quantifications of the future effects of current natural resource management decisions⁹⁵ are already highly contested, and are subject to thoughtful, sometimes withering and persuasive criticism.⁹⁶ They receive equally vigorous defense.⁹⁷ This is hardly stable ground on which to build foundational policy for intellectual property. The premise that cultural environmentalism can emulate the quantification methodologies of natural resources environmentalism is belied by the controversy over the very environmental methodologies that are sometimes sought to be imitated.

The ecosystem services approach seeks to quantify the long-term value of environmental services in order to make them concrete and recognizable, thus facilitating cost-benefit arguments against their degradation; some also aspire to create markets in ecosystem services.⁹⁸ This approach is grounded in the observation that ecosystem services, considered as unpriced positive externalities with widely-shared benefits, are subject to market defects.⁹⁹ In marked contrast, Frischmann's central point about demand signals turns precisely on the intractable uncertainty of quantifying future benefits from downstream uses of resources such as information (or the Internet as a platform for information).¹⁰⁰ Frischmann's argument thus runs exactly counter to the

Capital, 387 NATURE 253 (1997); J.B. Ruhl & James Salzman, *The Law and Policy Beginnings of Ecosystem Services*, 22 J. LAND USE & ENVTL. L. 157 (2007) (introduction to a symposium on the law and policy of ecosystem services).

94. Richard Posner explores a somewhat different set of differences between physical property and intellectual property. Posner, *supra* note 26.

95. Quantification of future effects of current natural resource management decisions is at the heart of cost-benefit analysis.

96. *E.g.*, ACKERMAN & HEINZERLING, *supra* note 29; Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553 (2002); Shi-Ling Hsu, *On the Role of Cost-Benefit Analysis in Environmental Law: A Book Review of Frank Ackerman and Lisa Heinzerling's Priceless: On Knowing the Price of Everything and the Value of Nothing*, 35 ENVTL. L. 135 (2005) (book review); Gregory N. Mandel & James Thuo Gathii, *Cost-Benefit Analysis Versus the Precautionary Principle: Beyond Cass Sunstein's Laws of Fear*, 2006 U. ILL. L. REV. 1037 (book review); Verchick, *supra* note 29.

97. *E.g.*, CASS R. SUNSTEIN, *LAWS OF FEAR: BEYOND THE PRECAUTIONARY PRINCIPLE* (2005); Matthew D. Adler & Eric A. Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165 (1999); Daniel A. Farber, *From Here to Eternity: Environmental Law and Future Generations*, 2003 U. ILL. L. REV. 289 [hereinafter Farber, *From Here to Eternity*] (this is a qualified defense of cost-benefit analysis); Stephen Clowney, Note, *Environmental Ethics and Cost-Benefit Analysis*, 18 FORDHAM ENVTL. L. REV. 105 (2006).

98. *See, e.g.*, James Salzman, *Creating Markets for Ecosystem Services: Notes from the Field*, 80 N.Y.U. L. REV. 870 (2005).

99. *See* James Salzman, *Valuing Ecosystem Services*, 24 ECOLOGY L.Q. 887, 892 (1997) ("The ideal method to assess development alternatives would be to give local ecosystem services an accurate monetary value.") (reviewing NATURE'S SERVICES, *supra* note 93); *see also* Salzman, *A Field of Green?*, *supra* note 28, at 135–36 (describing the failure to recognize the value of ecosystem services in terms of a series of market defects around demand).

100. Jim Chen points out that the Internet (and likewise source code) provides a basic platform for information to be developed and disseminated. Thus information and the Internet should be considered different parts of the same resource in terms of their usefulness to society. Jim Chen, *Webs of Life: Biodiversity Conservation as Species of Information Policy*, 89 IOWA L. REV. 495, 521–22 (2004).

aspiration of some intellectual property scholars who seek to quantify the future effects of various present policy decisions about the management of information resources.¹⁰¹ Frischmann's basic theoretical argument turns on the impossibility of ever getting that future value of information pinned down. Whatever cultural environmentalism ought to be about, it cannot be about quantifying the value of future use of these resources, if Frischmann is correct.

Recognizing the uncertain value of future benefits may not be altogether impossible, nevertheless. Frischmann mentions certain familiar vague standards or principles that are often applied to environmental policy, including the precautionary principle, intergenerational equity, and sustainable development.¹⁰² Some scholars see these principles as useful to intellectual property despite their vagueness.¹⁰³ Vague principles addressing the future uses of natural resources may facilitate people working together when they share a specific political goal but differ on rationale.¹⁰⁴ As Holly Doremus points out, vague principles may facilitate adaptive management, as new information and changing mores require changes in resource management strategy.¹⁰⁵ And they may educate citizens, including future citizens, orienting them in a particular direction while allowing them to fill in later and in context the specific contents of a sense of obligation to the future.¹⁰⁶ At the same time, however important these principles may be, they are hardly clear or uncontested.¹⁰⁷

IV. ENVIRONMENTAL RIGHTS AND INTERGENERATIONAL CAREGIVING

Frischmann's theory offers another intriguing angle for consideration. He desires to have and preserve the possibility of iterable, downstream benefits from nonconsumptive uses of infrastructure. Moreover, because he posits open

101. See, e.g., Pasquale, *supra* note 90.

102. Frischmann, *Economic Theory*, *supra* note 1, at 981.

103. See, e.g., Thomas F. Cotter, *Memes and Copyright*, 80 TUL. L. REV. 331, 403–08 (2005) (arguing for development of a version of the precautionary principle to manage the risks created by the continuing enclosure of the public domain).

104. See Gregory N. Mandel, *Technology Wars: The Failure of Democratic Discourse*, 11 MICH. TELECOMM. & TECH. L. REV. 117, 178 (2005) (“overdetermined policies allow individuals of differing worldviews to agree on one policy, even while disagreeing on its meaning or purpose”); Jennifer Prah Ruger, *Toward a Theory of a Right to Health: Capability and Incompletely Theorized Agreements*, 18 YALE J. L. & HUMAN. 273, 304–22 (2006) (exploring the applicability of Cass Sunstein's theory of incompletely theorized agreements to the prospect for developing policies around a right to health; see generally Cass R. Sunstein, *Incompletely Theorized Agreements*, 108 HARV. L. REV. 1733 (1995)).

105. Doremus, *supra* note 23, at 360–61.

106. *Id.* at 360.

107. Compare the approaches to the precautionary principle of, for example, Dana, *supra* note 37; Robert V. Percival, *Who's Afraid of the Precautionary Principle?*, 23 PACE ENVTL. L. REV. 21 (2005–2006); Cass R. Sunstein, *Beyond the Precautionary Principle*, 151 U. PA. L. REV. 1003 (2003); and Christopher Stone, *Is There a Precautionary Principle?*, 31 ENVTL. L. REP. (Envtl. Law Inst.) 10,790 (July 2001). As Lawrence Solum writes, “[t]he progress of science has, ironically, created an awareness of risks to future generations that may not easily be reduced to calculable probabilities of quantifiable harms.” Lawrence B. Solum, *To Our Children's Children: The Problem of Intergenerational Ethics*, 35 LOY. L.A. L. REV. 163, 167 (2001).

access, he expresses commitments to facilitation of egalitarian democratic ideals, distributional equity, and indeed of human well-being generally, intragenerationally as well as intergenerationally. This focus on maintaining the long-term possibility of iterable, downstream benefits from the nonconsumptive uses of natural resources infrastructure is an important jumping-off point for a particular version of environmental human rights.

Once we get past the lifetimes of our own grandchildren, the gesture of intergenerational resource preservation takes on an impersonal and ethical character.¹⁰⁸ Dan Farber views the apparently infinite regress of the principle of natural resource preservation as expressing an intuitive “perpetuation value,” a value of unboundedness.¹⁰⁹ It could be seen to reflect the “intrinsic value of a sense of community over time,” Farber argues, or, put differently, “a cooperative project with later generations.”¹¹⁰ Frischmann's framework fits here as applied to natural resources. If we understand the underlying issue to be a need to assure that human beings will have the external resources that enable us to care for one another (thereby asserting that there is an obligation to assure that those resources are available from one generation to the next), perhaps Frischmann's infrastructure theory opens onto an intergenerational ethics of care.

Feminist philosopher Eva Feder Kittay suggests that John Rawls, in his important work on liberal political theory, made a serious error in beginning with the assumption that human beings act as fully independent, rational adults. As a descriptive matter, one essential characteristic of human experience is long periods of dependency, certain to occur in childhood and often occurring in illness and old age.¹¹¹ In Kittay's version of the feminist “dependency critique” of Rawls,¹¹² any account of the goods of society must include caregiving and must assure that caregiving is available. Kittay argues that the “just organization [of dependency work] is as central to the formation of a just

108. See generally Solum, *supra* note 107 (surveying the philosophical positions on intergenerational equity issues).

109. Farber, *From Here to Eternity*, *supra* note 97, at 319–25.

110. *Id.* at 324.

111. Eva Feder Kittay, *Human Dependency and Rawlsian Equality*, in FEMINISTS RETHINK THE SELF 219, 221 (Diana Tietjens Meyers ed., 1997) [hereinafter Kittay, *Human Dependency*] (critiquing JOHN RAWLS, *POLITICAL LIBERALISM* (1992) and JOHN RAWLS, *A THEORY OF JUSTICE* (1971) for failing to address issues of dependence and caregiving outside the political sphere); see also EVA FEDER KITTAY, *LOVE'S LABOR: ESSAYS ON WOMEN, EQUALITY, AND DEPENDENCY* (1999) [hereinafter KITTAY, *LOVE'S LABOR*] (providing an expanded discussion of the dependency critique of Rawls); Robin West, *Rights, Capabilities, and the Good Society*, 69 *FORDHAM L. REV.* 1901, 1924–29 (2001) (summarizing Kittay's argument for a right to care and for a right of support for those who give care, and advocating for inclusion of these rights among the positive constitutional rights supporting a liberal state).

112. Kittay, *Human Dependency*, *supra* note 111, at 223; see also *id.* at 254 nn.9–10 (discussing feminist critiques of Rawls).

society as is development of the principles of distribution under conditions of moderate scarcity.”¹¹³

Significantly, not all caregiving can be justified in terms of direct reciprocity between caregivers and those who receive care. Some who receive care will not give it and vice versa.¹¹⁴ Because “society is an association that persists through generations”¹¹⁵ we require “an extended notion of reciprocity.”¹¹⁶ This will “open a conceptual space for dependency concerns within social cooperation in a just society.”¹¹⁷ Kittay expands reciprocity by defining an ethical principle of “nested dependencies, linking those who help and those who require help in order to give aid to those who cannot give help,” which she calls “*doulia*.”¹¹⁸ Kittay notes here a parallel to the “just savings” principle that John Rawls eventually developed to deal with issues of intergenerational equity:¹¹⁹

As Rawls recognizes, the care we take to hand over a world that is not depleted is never reciprocated to us by those whom we benefit. Rather the benefit we bestow on the next generation ought to be the benefit we would have wanted previous generations to bestow on us. The semblance between this extended notion of reciprocity and *doulia* is not accidental. In both contexts, we deal with human development and with its “chronological unfairness.” Moreover, just as the gains and savings from a previous generation pass from us to the next generation, the care a mother bestows on her child calls for reciprocation from the adult child not only back to the parents but also forward to a future generation.¹²⁰

The structure of Kittay’s account of caregiving begins to look much like certain versions of environmental ethics. Edith Brown Weiss’ notion of fairness to future generations states that we have an obligation to deliver unto others who come after us no less than what we have received from those before.¹²¹ Frischmann’s core theory runs parallel to such approaches. It depends on the iterative production of shared downstream benefits, an iterative production that relies on nonrival or recycled fundamental resources as repeated input. One could fit Kittay’s account of caregiving within Frischmann’s description, just as

113. *Id.* at 223.

114. *Id.* at 221, 253 n.3.

115. *Id.* at 233–34.

116. *Id.* at 234.

117. *Id.* at 233.

118. *Id.* The word “*doula*” is Greek for “slave,” and may be familiar to modern families encountering pregnancy and childbirth—a *doula* is a person outside the nuclear family unit who is responsible for taking care of the mother. See KITTAY, *LOVE’S LABOR*, *supra* note 111, at 106–07. Kittay expands the concept from the private obligations of the *doula* to a public conception of *doulia*. Kittay, *Human Dependency*, *supra* note 111, at 234.

119. See, e.g., RAWLS, *supra* note 111, at 273–74.

120. Kittay, *Human Dependency*, *supra* note 111, at 234 (citations omitted).

121. See, e.g., Weiss, *Rights and Obligations*, *supra* note 45, at 200. Frischmann has touched on intergenerational obligations briefly. Frischmann, *Intergenerational Equity*, *supra* note 21. The issue has not yet become a focus of his work.

one could fit it within the broader notions of the human right to a material basis that will support human capabilities as articulated variously by Amartya Sen and Martha Nussbaum.¹²² These theories suggest that environmental rights could be cast not as entitlements to environmental services in themselves, but as rights to a natural resources infrastructure and associated environmental services that will facilitate the capability of full human flourishing. This should be understood to include an obligation to pass on the infrastructure and its services to future generations, so as to facilitate yet further full human flourishing. Preserving natural resources and the environmental services they provide could not be seen as ends in themselves, but would be about further facilitation of caregiving. Frischmann's theoretical description of iterated uses of infrastructure resources identifies a need to preserve these resources for future users, and is thus congruent with Kittay's *doulia* principle.

Gregory Alexander develops a remarkably similar argument dealing with obligations attached to property ownership.¹²³ Alexander's civic communitarian account suggests that we benefit from and depend on the actions of those who have gone before; we do not exist as completely freestanding individuals but owe our position as individuals, and our lives and identities, to society.¹²⁴ Because we value the capabilities that facilitate our own flourishing, we therefore have some kind of obligation to society as a whole to provide similar support for others.¹²⁵ This obligation is reflected, *inter alia*, in obligations attached to property, and in the possibility of being called on to sacrifice our property interests for the good of society.¹²⁶

122. See, e.g., MARTHA C. NUSSBAUM, *FRONTIERS OF JUSTICE: DISABILITY, NATIONALITY, SPECIES MEMBERSHIP* (2006); MARTHA C. NUSSBAUM, *WOMEN AND HUMAN DEVELOPMENT: THE CAPABILITIES APPROACH* (2000); Martha C. Nussbaum, *Capabilities and Human Rights*, 66 *FORDHAM L. REV.* 273 (1997); Martha C. Nussbaum, Foreword, *Constitutions and Capabilities: "Perception" against Lofty Formalism*, 121 *HARV. L. REV.* 4, 10–24 (2007) (describing the Capabilities Approach and contrasting it with utilitarian welfarism and libertarian minimalism); MARGARET JANE RADIN, *CONTESTED COMMODITIES* 63–78 (1996) (discussing the capabilities theory of human rights developed, *inter alia*, by Amartya Sen and Martha Nussbaum, as applied to Radin's personhood theory of property); AMARTYA SEN, *DEVELOPMENT AS FREEDOM* (1999); Amartya Sen, *Equality of What?*, in 1 TANNER LECTURES ON HUMAN VALUES 195 (Sterling M. McMurrin ed., 1980); Robin West, *Human Capabilities and Human Authorities: A Comment on Martha Nussbaum's Women and Human Development*, 15 *ST. THOMAS L. REV.* 757 (2003). Note, however, that Nussbaum's account of human capabilities theory may omit proper consideration of caregiving and the care of caregivers. See West, *supra*, at 786–87 (the list of human capabilities should include rights of care and *doulia*, citing KITTAY, *LOVE'S LABOR*, *supra* note 111). Nussbaum acknowledges that the relationship with the physical environment is part of the capabilities approach. Nussbaum, *Constitutions and Capabilities*, *supra*, at 74 & n.294.

123. Gregory S. Alexander, *The Social-Obligation Norm in American Property Law*, 93 *CORNELL L. REV.* (forthcoming 2008), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1104757; see also Gregory S. Alexander & Eduardo M. Peñalver, *Properties of Community*, 9 *THEORETICAL INQUIRIES IN LAW* (forthcoming 2008).

124. Alexander, *supra* note 123, at 16–23. This approach is also explicitly based on the capabilities approach of Martha Nussbaum and Amartya Sen. *Id.* at 18.

125. *Id.* at 23–28.

126. *Id.* at 2–4, 31–32. Specific examples include "entitlement sacrifices" such as property being subject to eminent domain, *id.* at 32–37, and limited monetary damages for nuisance, *id.* at 37–41; and

Alexander's argument parallels Kittay's critique of Rawls in two ways. Both emphasize the necessity of accounting for caretaking or dependency in any valid liberal political theory. And neither Alexander nor Kittay relies on reciprocity between individuals as the foundation for obligations.¹²⁷ They both develop some notion of a debt owed to society for facilitating our being individuals, a debt that may require sacrifice.¹²⁸ While Alexander does not specifically discuss intergenerational obligations, they seem to be a necessary consequence of the ontological source of the property obligation in a preexisting community. Obligations towards the future concerning shared natural resources, as well as the kinds of property obligations Alexander explores, seem to flow from his argument. Thus Frischmann's economic argument for preserving access to future users is also congruent with Alexander's account of nonreciprocal obligations to future potential users of fundamental resources that support human capabilities.

There is much to be explored here. Suppose we tinker with Frischmann's theory, replacing information and innovation as the iterated but uncertain downstream benefit with the care of others, one generation to the next. That care must still be facilitated by a fundamental infrastructure of natural resources and the environmental services they provide. Care is productive and fruitful, like information, and it generates further fruitful, uncertain, and unexpected downstream positives. Surprisingly, then, Frischmann's theory, for all its welfare economics, points us towards human rights as capabilities, and towards a certain strand of feminist theories of rights (including environmental rights) as facilitating human care, *in saecula saeculorum*.¹²⁹

CONCLUSION

Brett Frischmann has in effect proposed a field theory justifying open, nondiscriminatory access to an important class of resources. It is a theory which he continues to develop and refine. The consequences of open, nondiscriminatory access are not immediately problematic for information and, perhaps, the Internet. Consequently, the demand-side signal problem that Frischmann identifies goes a very long way towards justifying access. The additional support that Frischmann's theory provides for open, nondiscriminatory access to information and the Internet is especially important

"use sacrifices" such as restrictions based on historic preservation, *id.* at 54–60, environmental concerns, *id.* at 60–68, and the public trust doctrine's access requirement, *id.* at 68–79.

127. Alexander distinguishes his account of the origin of social obligations, which he terms communitarian, from a contractarian account of social obligation norms as based on agreement between freestanding individuals. *Id.* at 13–16. The two versions involve fundamentally different conceptions of community. *Id.* at 17.

128. Compare *id.* at 16–23 with Kittay, *Human Dependency*, *supra* note 111, at 232–35, 258 n.34.

129. Forever and ever. I choose this Latin expression not so much for its religious overtones as because its literal translation is "into centuries of centuries" and it captures the iterative quality of the future.

in the face of persistent contemporary political pressures and theoretical claims for enclosure and propertization of information and the Internet.

In contrast, issues of environmental resource congestion are ever present. In order to develop appropriate resource management policies for natural resources, we must therefore look much more closely at the specifics of each resource and its varied potential uses, present and future. We must inevitably attend to the consequences of congestion insofar as we can discern them, up front and more systematically than is the case for information. Thus, as argued in Parts I and II, Frischmann's infrastructure theory is incomplete. While it can provide an important and novel starting point for arguments that support access, policymakers will have to continue to work with the kinds of approaches already developed to address and justify the benefits and difficulties of open, nondiscriminatory access. And access will only be one of several issues that must be taken into account in designing environmental policy.

Frischmann's theory may be useful for some other reasons. If the benefits of iterated downstream uses cannot be determined in advance, as Frischmann argues, then quantifying the downstream benefits of the uses of a shared resource becomes an unattainable goal. One strand of cultural environmentalism seeks to borrow quantitative methods from environmental policy, specifically ecosystems services analysis, in order to apply them to intellectual property policy. This particular project may be seriously undercut by Frischmann's theory.

At the same time, Frischmann's focus on iterated uses of nonrival or recycled resources has an analog in theories of intergenerational obligation around the management of resources, whether the approach is that of Eva Kittay's *doulia* or Greg Alexander's communitarian obligation attached to ownership of property. Frischmann's theory may help us to notice and to justify a certain kind of precaution and forbearance in our approach to natural resources, so that others may use them elsewhere and at a later time. The very characteristics of downstream uses of infrastructure resources described by Frischmann, large positive values that are uncertain and not capturable in the dynamics of the market, suggest that perhaps we should turn to a vaguer, ethically-phrased obligation to future generations in order to preserve the cumulative future benefits that Frischmann has identified so well.

