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Dammed to be Divided: Resolving the Controversy over the Destruction of the Snake River Dams and Providing a Model for Future Decision-making

Nancy K. Kubasek

Chaz A. Giles

DAMMED TO BE DIVIDED: RESOLVING THE CONTROVERSY OVER THE DESTRUCTION OF THE SNAKE RIVER DAMS AND PROVIDING A MODEL FOR FUTURE DECISION-MAKING

NANCY K. KUBASEK* AND CHAZ A. GILES†

I. INTRODUCTION

"This is the beginning of a new chapter in river fisheries management," said U.S. Interior Secretary Bruce Babbitt, from a cliff along the edge of the Kennebec River where he was watching the beginning of the federally ordered demolition of the Edwards Dam.[1] Church bells tolled and hundreds of people cheered as the first torrent of water burst through.[2] The removal of the dam, which was voted the "Best of What's New" in 1999 by the Readers of *Popular Science*,[3] appeared to be a success story one year later, as the water had spread out to the river's natural banks and striped bass, sturgeon, and Atlantic salmon once again swam through the seventeen miles of the Kennebec River that had been shut off by the dam.[4] Eagles, ospreys and blue heron had returned to the river banks.[5] State biologists also reported that just a few months after the breaching, there was a significant improvement in the water quality.[6]

While the decommissioning of the Edwards Dam may have generated the greatest public awareness of the issue of dam removal, more than 200 dams have been dismantled over the past eight years.[7] There

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* Professor of Legal Studies, Bowling Green State University.
† Honors Program, Bowling Green State University, and Research Associate, Dept. of Legal Studies, Bowling Green State University.

[1] *Americas Dam Bust for the Environment,* BBC News, *at* http://news.bbc.co.uk/hi/english/world/americas/newsid_383000/383578.stm (July 2, 1999).
[2] *Id.*
[3] *Maine Dam Removal Voted 1999's Best New Development,* NAT'L WILDLIFE, June 1, 2000, at 65, *available at* 2000 WL 14194207.
[4] Ryan Alessi, *Once Dammed, Kennebec Now Flows Free; Fate of U.S. Dams is Being Evaluated,* THE CINCINNATI POST, July 21, 2000, at A10, *available at* 2000 WL 23835985.
[5] *Id.*
[6] *Maine Dam Removal Voted 1999's Best New Development, supra* note 3.
[7] William Booth, *Dam Removal Gains, but It's Not Easy or Cheap: Many Structures Cause Harm but Give No Benefit in Return,* THE RECORD, Jan. 24, 2001, at R1, *available at* 2001 WL 5235023.

remain today approximately 75,000 dams in the United States,[8] and with several thousand of them seen as candidates for decommissioning, it is important to closely examine the process through which the decision is made whether to breach a particular dam. This article proposes a method by which decisions about breaching can be made in a rational fashion, taking into account all of the relevant interests.

Part II of this article lays the foundation for the current debate by tracing the history of dams, from their earliest known use to the present. It is difficult to fully appreciate the debate over the breaching of dams without an understanding of their history. Part III of this article provides an introduction to one of the most controversial breaching debates currently underway—the debate over the breaching of the four dams on the lower Snake River. We have chosen this debate not only because of the widespread debate it is currently generating, but also because of the complex web of interests involved. Because of the complexity of the Snake River debate, it provides a useful case study.

Part IV of the article provides a framework for deciding whether to breach. The framework is essentially a modified cost-benefit analysis. Part IV also provides a justification for this framework. Having set forth the model, it is then applied to the case of the Snake River dams in part V of the article, in order to reach a tentative conclusion: the dams should be breached, but only under certain conditions. Part VI of the article offers some more general conclusions about the modified cost-benefit analysis model and its application.

II. HISTORICAL BACKGROUND

Although it has been relatively recently that dams have received a significant amount of attention, dams have been in existence for about five thousand years.[9] Originally dams evolved as tools to aid man in controlling his environment. Although there is some controversy over which dam is the oldest, there are two main theories. The first theory holds that the earliest recorded dam was constructed on the Nile River at Kosheish around 2900 BC.[10] The second theory asserts that the earliest

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[8] Alessi, *supra* note 4.

[9] *See* NICHOLAS J. SCHNITTER, A HISTORY OF DAMS: THE USEFUL PYRAMIDS 1 (1994).

[10] *See Dam*, ENCYCLOPAEDIA BRITANNICA, *at* http://www.britannica.com/bcom/eb/article/9/0,5716,127649+2+117292,00.html (last visited Feb. 15, 2001). Scientists believe this dam was built to divert water from the Nile River and provide a water source to King Menes' capital city of Memphis. The controversy over this dam as being the earliest recorded dam stems from alternative definitions of a dam. Those who believe

recorded dams, for which there is sufficient evidence, were located about 100 kilometers northeast of Amman, the present capital of Jordan.[11] Regardless of whether the earliest dams existed on the Nile or in Jordan, experts acknowledge, and to some extent agree, that dams have been in existence since roughly 2900 BC.

Historically, dams have been built for a multitude of purposes. Like the structure on the Nile River, dams have been constructed for diversion and transportation, in addition to storage, irrigation, flood control, power generation,[12] and, more recently, hydroelectric power generation.[13] For the sake of brevity this paper will use three main categories of the uses and purposes of dams: protection, which will include diversion, waterways, and flood control; irrigation, which will include storage; and power generation. The earliest dams were constructed for the first two purposes.[14]

Early civilizations were primarily concerned with the well-being and existence of their people; therefore, dams for irrigation and protection were extremely important. Due to the harsh conditions under which many of these civilizations existed, a consistent and controllable water source was essential. The Egyptians, for example, were able to turn the desert into a fertile valley supporting many different civilizations through water

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this is not the earliest recorded dam do not question the authenticity of the date of the dam, but rather, they question the structure's classification as a dam.

[11] SCHNITTER, *supra* note 9, at 18. These dams are believed to have been "a part of an elaborate water supply system for the town of Jawa." *Id.* Although Schnitter offers no specific date, he seems to believe that the dams were built during or shortly after the town's brief heyday around 3000 BC. *Id.*

[12] Throughout this article, mechanical power will be separated from hydroelectric power. Mechanical power, such as a water wheel that directly turned a grinder or other primitive machinery, is not included in the focus of this paper on dams for hydroelectric power production purposes. However, Schnitter discusses that mechanical hydropower sources were important during their time, especially with the invention of the cam. The cam allowed the revolutionary power of water wheels to be transferred from revolving and spinning applications to vertical and horizontal applications such as stamps, presses, saws, and pumps. He notes that although the water wheel was invented in the first century BC, it was not until the invention of the cam in the ninth or tenth century AD that the technology of hydropower spread rapidly. The spread of hydropower technology required the spread of dam technology and usage. When water wheels were moved away from the rivers, there needed to be a diversion of the river or reservoir to power the wheel. To satisfy these two needs, the medieval people turned to the use of dams. *See id.* at 107.

[13] For the purpose of this article, hydroelectric power will be defined as electricity generated through turbines that are powered by moving water.

[14] SCHNITTER, *supra* note 9, at 1; *see also* ENCYCLOPAEDIA BRITANNICA, *supra* note 10.

diversion and irrigation techniques. Through the use of dams, civilizations were able to control their environment, making it more hospitable for life.[15] Dams allowed these civilizations to support larger populations through water storage and irrigation. By constructing dams to store water from rainy seasons for use when rainfall was sparse, early civilizations were able to build communities and cities that were not in immediate proximity to a river or lake. Dams allowed the evolution from the nomadic way of life into more permanent settlement.

The need for water in arid regions is still a major impetus behind dam building. For instance, although the Aswan High Dam on the Nile River is a modern dam, it shares its purpose with many of its predecessors. This dam was constructed to store the floodwaters of the Nile for the dry season. In addition to seasonal storage, the dam also has the capability to store water from unusually high flood seasons for supplemental use in subsequent years.[16] From the time when dams were first constructed, they have offered a means to store water for human consumption or irrigation.

When early civilizations made the transition from nomadic peoples to agricultural societies, a constant demand for irrigation arose. When a river is dammed, a reservoir usually results upstream from the dam. This reservoir can become the staple source of irrigation that farmers need to

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[15] *See* SCHNITTER, *supra* note 9.

[16] *See* Michael Collier, *Dams and Rivers: A Primer on the Downstream Effects of Dams*, U.S. GEOLOGICAL SURVEY CIRCULAR 1126, June 1996, at 4. The author states, "high dams with large upstream reservoirs can store many months, if not years, of natural stream flow and can generate prodigious amounts of hydroelectric energy due to the fall of the river at the dam." *Id.* The second part of this author's statement will become relevant later in this article, as it explores the value of hydroelectricity generated by dams in comparison to their costs. *See also* HUSSEIN M. FAHIM, DAMS, PEOPLE AND DEVELOPMENT: THE ASWAN HIGH DAM CASE (1981) (discussing issues that surrounded the Aswan High Dam). In addition to the benefits associated with the Aswan High Dam, there were several major political issues surrounding the funding and construction of the dam. These political issues included the United States withdrawing funding for the project and the invasion of Egypt by France and Israel.

The Aswan High Dam illustrates some of the factors that are considered when constructing modern dams. The dam has created significant environmental problems, but it has also alleviated many population problems that Egypt was facing. In the struggle to move forward as a developing nation, Egypt was confronted with difficult issues. For example, the Egyptian leadership had to decide whether to preserve the Nile and insure its continuing viability or build the dam, recognizing that the dam would have significant impacts on the Nile River and its ability to continue to support life.

This case also illustrates the critical effect a rapidly growing population can have in the cost-benefit analysis of dams. To sustain a growing population, Egypt's leaders had to find a way to acquire a more stable and ample water source.

grow their crops and support their community's basic need for food.[17] Irrigation can also be the result of a diversion dam that redirects some of the river's waters onto what would otherwise be infertile land.

The second major advantage that made dams attractive to early civilizations was their ability to protect the society. Whether this protection stems from diverting hazardous rivers away from the community or flood control, the protective capability of dams has long been one of their major benefits. Flood control was a major reason for the construction of many early dams.[18] The Aswan High Dam was also built with flood control in mind; however, flood control was only a minor reason behind the construction of this dam.

The third major stimulus behind the construction of dams throughout history is power generation, specifically hydropower and hydroelectricity. The first recorded use of hydropower was in 250 BC to power a clock.[19] Since that time, the water wheel has powered many applications. However, the early applications of the water wheel were severely limited due to primitive technology. Initially, the water wheel's power could only be used with spinning or revolving applications. As time and technology progressed, hydropower harnessed by the waterwheel could be applied to an increasing variety of tasks.[20] The most significant technological change in the use of hydropower was the invention of hydroelectricity in 1882.[21]

Once the physical power of the river could be transformed into electricity and carried through power lines to inland users, hydroelectric projects became profitable and inviting. Although the question of power generation had always been important, now industries had new, and possibly cheaper and cleaner, means of satisfying their power needs. In addition, at this time the federal government was becoming increasingly interested and involved in the electricity industry.[22]

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[17] FAHIM, *supra* note 16.

[18] *See* Collier, *supra* note 16.

[19] *See* Stuart Baird, *The Energy Fact Sheet, at* http://www.iclei.org/efacts/hydroele.htm (last visited Feb. 15, 2001).

[20] *Id.*

[21] *Id.* Hydroelectricity was first used on the Fox River in Wisconsin in 1882. The water wheel present on the river used technology invented by Thomas Edison only two years earlier to convert the power of the river water into usable electricity. Following the Fox River power plant's success, many more hydroelectric plants were constructed.

[22] *See* Sarah C. Richardson, Note, *The Changing Political Landscape of Hydropower Project Relicensing*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 499, 500 (2000).

Hydroelectric power played an important role in the Industrial Revolution and in the expansion of electrical applications both in North America and across the world.[23] From the origin of hydroelectricity in 1882 up to World War II, dam building experienced two notable peaks;[24] however, a dramatic increase in dam production can be seen in the entire period between 1930 and 1970.[25] With the tremendous increase in power production from this completely new means of obtaining power, one can see why it has been said that the "application of electrical knowledge has been the channel through which the physicist and the engineers have exerted perhaps their greatest influence on society during the last hundred years."[26]

An example may help to illustrate the enormous impact that hydroelectricity had on America as well as the world. By 1945, the Grand Coulee and the Hoover Dam, both modern hydroelectric dams, were the two largest sources of power in the world,[27] producing 2,138,000[28] and 1,250,000 kilowatts,[29] respectively. The power production in the United States was able to grow to such large proportions because of the support given to hydroelectric projects by Congress.[30]

Due to the private economic interests involved, as well as the governmental support given to hydroelectricity, it is relatively easy to see how hydropower became such an important energy source. Currently, hydroelectricity is the largest form of renewable energy in the United

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[23] *See* Baird, *supra* note 19; *see also* Andrew H. Sawyer, *Hydropower Relicensing in the Post Dam-Building Era*, 11 NAT. RESOURCES & ENV'T 12, 12 (Fall 1996). Sawyer discusses the important role hydropower played in the development of our country between 1930 and 1970. Dams were important to the nation due to the enormous amount of renewable energy provided by projects such as the Hoover and Grand Coulee Dams.

[24] *See* Charles R. Sensiba, Note, *Who's in Charge Here? The Shrinking Role of the Federal Energy Regulatory Commission in Hydropower Relicensing*, 70 U. COLO. L. REV. 603 (1999). Sensiba notes the explosion of dam construction during the time period prior to the Industrial Revolution through World War II.

[25] *See* Sawyer, *supra* note 23.

[26] JOHN H. DALES, HYDROELECTRICITY AND INDUSTRIAL DEVELOPMENT: QUEBEC 1898-1940 1 (1957).

[27] *See* Katharine Costenbader, Note, *Damning Dams: Bearing the Cost of Restoring America's Rivers*, 6 GEO. MASON L. REV. 635 (1998).

[28] *See id.*

[29] *See* Sensiba, *supra* note 24.

[30] *See* Federal Energy Regulatory Commission, *Water Power: Use and Regulation of a Renewable Resource, available at* http://www.ferc.fed.us/hydro/docs/waterpwr.htm (last modified Feb. 3, 1998). The first notable effort made by Congress to support hydroelectric power generation projects was the Federal Water Power Act of 1920. This act is explored in detail later in this article.

States[31] and the world.[32] In addition to the seemingly unending supply of energy available from hydroelectricity, it offers another significant benefit—a clean energy source.[33] Along with the clean energy hydroelectric dams produce, they typically last significantly longer than traditional energy generation sources.[34]

Depending on the country one examines, a person may find different levels of hydroelectric usage. For example, in the United States hydroelectric power currently accounts for about ten percent[35] of the energy produced; however, in Canada hydroelectricity accounts for about sixty percent[36] of the total energy needs for the country. If we examine the total number of large dams worldwide, we find that Canada is well behind the United States, which is second only to China.[37] As of 1996, there were 2,358 hydroelectric power plants in operation in the United States.[38] The combination of benefits hydroelectric power production

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[31] *See id.* "Hydroelectric generation makes up about 96 percent of our renewable energy production, or about 910.3 billion kilowatt-hours of energy a year—saving over 531 million barrels of oil each year . . . . In 1996, there were 74,800 megawatts of developed generating capacity in the United States." *Id.*

[32] Baird, *supra* note 19. "Hydro power is currently the world's largest renewable source of electricity, accounting for 6% of worldwide energy supply or about 15% of the world's electricity." *Id.*

[33] Federal Energy Regulatory Commission, *supra* note 30.

[34] *See id.* FERC discusses some of the benefits associated with hydroelectric dams that have made them attractive over the years. "Hydroelectric plants are free from air pollution, the fuel—falling water—is not consumed, projects have long lives relative to other forms of energy generation, and electric energy is immediately available. These favorable characteristics make hydroelectric projects attractive sources of electric power." *Id.*

[35] *See id.* Although the total energy produced by hydroelectric power plants is only ten percent, the amount varies greatly depending on the region of the country one evaluates. As this paper will examine later, the hydroelectric power generation in the Northwest United States is significantly higher than for the rest of the country.

[36] Baird, *supra* note 19.

[37] World Commission on Dams, *Dams and Development: A New Framework for Decision-Making*, Figure 1: World Population of Dams by Country, *available at* http://www.damsreport.org/wcd_overview.htm (last visited Feb. 15, 2001). The United States accounts for fourteen percent of the large dams now standing in the world.

[38] *See* Federal Energy Regulatory Commission, *supra* note 30. The authors note that these power plants are responsible for the generation of "74,800 megawatts of conventional generating capacity and 18,400 megawatts of pumped storage capacity." The author also notes that every state with the exception of Delaware, Mississippi, North Dakota, South Dakota, and Hawaii have operating hydroelectric projects licensed and monitored by FERC.

offers has led to the proliferation of hydroelectric power plants across the United States and the world.

The prevalence of hydroelectric power generation across the globe has led to a multitude of governing bodies monitoring this power source. In essence, each country is responsible for its own power generation needs and responsibilities. Currently, in the United States, the Federal Energy Regulatory Commission (FERC) is the agency in charge of monitoring all details concerning hydroelectric power generation. However, FERC is a relatively new regulatory body when it comes to hydroelectricity.

Originally, a special act of Congress was required to build a federal hydroelectric dam.[39] Congress first regulated hydroelectric power in 1920 by passing the Federal Water Power Act.[40] This act created the Federal Power Commission (FPC).[41] The FPC was responsible for regulating and controlling[42] hydroelectric power generation until 1977. The FPC was empowered, but not limited, to issuing licenses, collecting and investigating data, and issuing preliminary permits.[43] Before the FPC could issue a license several factors had to be considered. The main considerations focused on the advancement of power generation and water resource utilization;[44] however, one subchapter focused on environmental concerns.[45]

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[39] *See id.*

[40] 16 U.S.C. § 808 (2000).

[41] *See id.* "[T]he FPC was responsible for licensing non-federal hydroelectric power projects that affect navigable waters, occupy federal lands, use water or water power at a government dam, or affect the interest of interstate commerce." *Id.* As one can see, the creation of this act left considerable room for interpretation and expansion of the FPC's power.

> The FPC included the Secretaries of War, Agriculture, and the Interior. The act required the FPC to 'license only those projects that in its judgment were best adapted to a comprehensive plan for improving or developing a waterway or waterways'. In 1935, Congress amended and recodified the Federal Water Power Act of 1920 as Part I of the Federal Power Act. This legislation extended the FPC's authority to regulate the interstate aspects of the electric power industry.

Id. The FPC was the established regulating body of hydroelectric projects until 1977. *See also* 16 U.S.C. § 792 (1920).

[42] Federal Energy Regulatory Commission, *supra* note 30.

[43] 16 U.S.C. § 797 (1920).

[44] *See* 16 U.S.C. § 803 (1920).

[45] *Id.* In subchapter a1, the statute provides that licenses are to be conditioned on a plan "for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat)." It continues in subchapter j1:

> in order to adequately and equitably protect, mitigate damages to, and enhance, fish and wildlife (including related spawning grounds and

During the FPC's stint as lead regulator of hydroelectric power and dams, hundreds of thousands of dams were constructed. However, due to the minimal requirement for environmental consideration, most of these dams were approved and constructed with indifference toward their environmental impacts. In 1977, Congress officially abolished the FPC by passing the Department of Energy Organization Act (DEOA).[46] With the passage of the DEOA, Congress replaced the FPC with the newly created FERC.[47] FERC basically adopted the FPC's criteria for evaluating dam construction projects, which still excluded significant consideration of environmental concerns. Provisions for the serious consideration of the environmental impacts that each dam construction project would have were not adopted until the Electric Consumers Protection Act of 1986 (ECPA).[48] Essentially, the ECPA required FERC to consider, with equal

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> habitat) affected by the development, operation, and management of the project, each license issued under this subchapter shall include conditions for such protection, mitigation, and enhancement. Subject to paragraph (2), such conditions shall be based on recommendations received pursuant to the Fish and Wildlife Coordination Act (16 U.S.C. §661 et seq.) from the National Marine Fisheries Service, the United States Fish and Wildlife Service, and State fish and wildlife agencies.

Id.

[46] Federal Energy Regulatory Commission, *supra* note 30. The DEOA officially created FERC and placed most of the duties of the abolished FPC into the scope of authority of FERC.

[47] *See* 42 U.S.C. §7171 (1977). This section of the statute created and named FERC. The current version of the Federal Water Power Act can be found at 16 U.S.C. §§ 791 (a) – 823 (c) (2000).

[48] Federal Energy Regulatory Commission, *supra* note 30. The ECPA made several major changes to the power and role of FERC by amending the Federal Power Act. The main changes relevant to this discussion are:

> (1) eliminating municipal tie-breaker preference in relicensing and establishing new procedures for processing relicense applications to increase opportunities for agencies, interested organizations, and the public to participate in the process; (2) requiring the Commission to base its recommendations for mitigating adverse effects of a licensing proposal on the recommendations of federal and state fish and wildlife agencies and to negotiate with the agencies if disagreements occur; (3) requiring the Commission to give the same level of consideration to the environment, recreation, fish and wildlife, and other nonpower values that it gives to power and development objectives in making a licensing decision; and (4) giving authority to issue compliance orders and assess civil penalties up to $10,000 per day for violations of rules, regulations, and terms and conditions of license or exemption.

Id. The most significant changes from the standpoint of this paper stemmed from the second and third changes. These two amendments to the Federal Power Act now

weight, the environmental impacts that the construction of the dam would have in comparison to the power generation and developmental benefits the dam would offer.

Overall, FERC has several other responsibilities in addition to regulating hydroelectric power generation.[49] However, this article limits its discussion to the role FERC plays in hydroelectric regulation. In the context of hydroelectric regulation, FERC has two main functions: licensing and monitoring.[50] FERC's licensing power is carried out by the

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empowered and required FERC to not only seriously consider the impacts of the dams on the environment, but to also seek the counsel of other agencies that specialize in understanding and predicting the impacts such projects would have. This change had been in the works for several years and had been pushed by several environmental organizations concerned with the dramatic impact some of the hydroelectric power stations were having on the environment. The amendments gave equal weight to the environmental impacts such projects would have and to the power generation and development gains possible from a particular project.

In addition to these effects, the ECPA effectively gave FERC the power to deny new and renewal applications on the grounds of environmental harm. FERC now has the power to decommission existing projects because the environmental costs outweigh the power generation and development benefits. The role the court system, along with FERC, now plays in deciding the fate of many existing dams is growing constantly. The influence of the courts can be seen in several cases. *See, e.g.*, American Rivers et al. v. Fed. Energy Regulatory Comm'n, 187 F.3d 1007 (9th Cir. 1999); Wisconsin v. Fed. Energy Regulatory Comm'n, 192 F.3d 642 (7th Cir. 1999). This expansion of the roles FERC and the court system play has called into question the relicensing of several large hydroelectric power dams in the United States. Renewal of the four dams on the Lower Snake River, in particular, has been called into question.

[49] *See* Federal Energy Regulatory Commission, *Vision Statement, available at* http://www.ferc.fed.us/visionstatement.htm (last modified Apr. 29, 1998) [hereinafter Federal Energy Regulatory Commission, *Vision Statement*]. FERC defines its mission in the following way:

> The Commission regulates key interstate aspects of the electric power, natural gas, oil pipeline, and hydroelectric industries. The Commission chooses regulatory approaches that foster competitive markets whenever possible, assures access to reliable service at a reasonable price, and gives full and fair consideration to environmental and community impacts in assessing the public interest of energy projects.

Id. FERC is tasked with the regulation of all energy resources that are available in the United States. The vision statement of FERC is of importance due to the changes that have occurred in the relatively recent past. The changes that this paper is concerned with are the changes with respect to the consideration of environmental aspects when considering licensing a project. The direct causes of the change and the significance of the change will be explored when this article looks into the debate surrounding the four dams on the Lower Snake River.

[50] *See* 16 U.S.C § 808 (2000). This statute refers to the Federal Power Act. However, it is important to note the environmental changes that occurred with the passage of ECPA

Division of Licensing and Compliance in two contexts. First, FERC is responsible for approving federal dam projects. Because federal dams are commissioned by FERC, they are not subject to the same scrutiny as non-federal projects. Second, for non-federal projects FERC must weigh a multitude of factors in order to determine the feasibility and impact of the project. When FERC is considering a licensing application, which can have a term of up to fifty years, their tasks include:

> reviewing the engineering, environmental, and economic aspects of the proposal; preparing an environmental document that analyzes the project's effects and makes recommendations to mitigate for the adverse effects; reviewing the comments and recommendations submitted by other government agencies, interested organizations, and the public; and determining that the proposed project is best adapted to a comprehensive plan for improving or developing a waterway or waterways for beneficial public uses.[51]

In order to fulfill all these duties, FERC requires that each applicant submit detailed engineering, dam safety, economic and environmental[52] impact reports.[53]

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as well as the Endangered Species Act, 16 U.S.C. § 1531 (1973). The Endangered Species Act requires that all agencies "seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this chapter." *Id.*

[51] *See* Federal Energy Regulatory Commission, *supra* note 30. When an applicant applies,

> the application for license must contain a complete engineering analysis, including dam safety, operation, and maintenance, and must address economic and financial aspects of developing the project. In addition, it must contain an environmental report describing the effect the project would have on fish, water quality, wildlife, botanical resources, geology, soils, botanical resources, recreation, land use, and socioeconomic values. This report also must include proposed mitigative, protective, and enhancement measures.

Id. However, the environmental considerations were not significant until the passage of ECPA in 1986. In addition to ECPA, another important piece of legislation that furthered the environmental considerations available to FERC was the 1992 National Energy Policy Act of 1992, Pub. L. No. 102-486, 106 Stat. 2776 (codified as amended in scattered sections of 16 U.S.C., 25 U.S.C., 42 U.S.C.). *Id.*

[52] *See* 16 U.S.C. § 797(e) (2000). In 1986, Congress wanted to give more consideration to nonpower interests, so it amended the Federal Power Act by enacting the EPCA,

After reviewing the applications and required reports, FERC must make several different decisions. FERC can grant the license for a period of up to fifty years, or specify that certain conditions must be met before they will grant a license for the construction project. Alternatively, FERC can deny the license application until further studies are completed; or indefinitely, due to concerns about one of the required considerations. When a license has expired or is nearing expiration, it is the responsibility of the licensee to submit a request for a license renewal. The commission then must decide whether to renew the operator's license for the dam. Until recently, licenses were renewed with few complications. However, with the recent environmental requirements and amendments to the Federal Power Act, FERC now seriously evaluates the value of existing dams.[54]

This evaluation became evident with the decommissioning of the Edwards Dam on the Kennebec River in 1997.[55] In this instance, after reviewing studies and reports about the impact of the Edwards Dam,

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providing for greater environmental protection, requiring FERC to give equal consideration in relicensing procedures to energy conservation, fish and wildlife preservation, recreational opportunities, and protection of environmental quality. *See also* Federal Energy Regulatory Commission, *supra* note 30.

[53] *See* Federal Energy Regulatory Commission, *supra* note 30. The author details fully the process that a nonfederal applicant must complete in order for FERC to grant a permit:

> The application for license must contain a complete engineering analysis, including dam safety, operation, and maintenance, and must address economic and financial aspects of developing the project. In addition, it must contain an environmental report describing the effect the project would have on fish, water quality, wildlife, botanical resources, geology, soils, botanical resources, recreation, land use, and socioeconomic values. This report also must include proposed mitigative, protective, and enhancement measures.

Id. Clearly, the application process is rigorous. For this reason, FERC offers the option for applicants to be issued a preliminary permit to perform feasibility studies as well as receiving priority status when applying for a full license in the future. These preliminary permits can be issued for up to three years.

[54] *See* BRUCE BABBITT, FERC DISTINGUISHED SPEAKER SERIES, Washington, D.C., July 8, 1998 (on file with William & Mary Environmental Law and Policy Review). Babbitt noted: "Modern conservation science reveals more about the environmental costs of dams, how they exact a toll from rivers both upstream and down. Fifty years ago, no one foresaw how drastically dams might alter the natural cycle of rivers from the headwaters to the estuaries." *Id.*

[55] *See* Yvonne Zipp, *With a Dam's Demise, Hope for Reviving Rivers,* THE CHRISTIAN SCIENCE MONITOR, July 2, 1999, *available at* 1999 WL 5380530. The impacts of FERC's decision to remove dams will be discussed in detail later in the paper.

FERC decided not to renew its operator's license, which had the effect of requiring the destruction of the dam. This process is officially called decommissioning.[56] The Edwards Dam was the first hydroelectric dam to be decommissioned against the will of the operator.

Once a license is issued, FERC is then responsible for ensuring that the dam operators are complying with all applicable codes and regulations, as well as ensuring that the dam meets safety regulations.[57] The Division of Dam Safety and Inspections is responsible for this portion of FERC's responsibilities.[58] The division, in addition to regulating the safety concerns surrounding the construction of the dams after the issuance of a license, is also employed to monitor the dams after construction for compliance with their licensing agreement. If a dam is found to be out of compliance, the operator's license may be suspended or revoked.[59]

III. THE SNAKE RIVER DEBATE

A. *Introduction to the Debate*

The four dams on the Lower Snake River have been the subject of severe controversy over the last few years.[60] Before we enter into an examination of the current debate, an exploration of the basic background and facts surrounding these dams would be beneficial. The four dams were built beginning in 1962 with the Ice Harbor Dam and ending in 1975 with the completion of the Lower Granite Dam. The construction of the

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[56] Costenbader, *supra* note 27. Costenbader notes that decommissioning is simply a generic term that is used to refer to several actions that can be undertaken by FERC. Some of these actions may include denying a new license, shutting down the power operations that are stationed at that particular dam, removing part, but not all, of the dam and complete restoration of the project site to pre-dam conditions. The last of these options is what most environmental groups are aiming to accomplish when fighting for the decommissioning of a hydroelectric project. *Id.*

[57] *See* 16 U.S.C. § 820 (1920).

[58] Federal Energy Regulatory Commission, *supra* note 30. The division of Dam Safety and Inspection is specifically responsible for dam safety and public safety programs and assists in ensuring compliance with license terms and conditions. *Id.*

[59] *See* 16 U.S.C. § 825(m) (1920); *see also* 16 U.S.C. §§ 799, 820.

[60] *See* American Rivers, *Past Present and Future*, *at* http://www.americanrivers.org/template2.asp?cat=2&page=267&id=615&filter=249 (last visited Jan. 12, 2001). The four dams on the Lower Snake River that are sparking the current controversy are the Ice Harbor, Lower Monumental, Little Goose, and Lower Granite Dams. These four dams are responsible for significant power production, but also cause significant environmental harm.

dams was for navigational purposes (mainly to transport wheat and other farm goods along the Columbia River), hydroelectric power generation, and irrigation.[61]

The navigational benefits of the dams stemmed from the ability to include locks in the construction plans of the dam to allow ships to navigate the river. In the case of the Snake River dams, the navigation interests were to account for only a small portion of the benefits of the dams.[62] The hydroelectric benefits of the dam were a way to aid industry and development in the Northwest by providing cheap electricity. Currently, the four dams produce about 1,200 megawatts of electricity and supply between 5 to 7 percent of the region's total power needs.[63]

The dams also offered a benefit to the agricultural industry of the region. The Ice Harbor Dam created the Ice Harbor Reservoir, which now provides irrigation to approximately 37,000 acres of farmland.[64] Physically, each dam stands as an impressive barrier on the river, averaging 1,200 feet wide by 100 feet high.[65] Their sheer size is an important consideration in the debate over removal of the dams; because of their grand scale, removal would be extremely costly and laborious.

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[61] *See* Trout Unlimited, *Federal Dams, Lower Snake River, at* http://www.tu.org/watch/snake.html (last modified Mar. 17, 1999). It should be noted that the purpose for the construction of these dams is contested. Some consider the main reason for the construction of these dams was to aid navigation, although Congress authorized the construction of the dams for the purpose of hydroelectricity. *See also* Keith Peterson, *Restoring the Lower Snake River, History: Lower Snake River Project, at* http://www.americanrivers.org/template2.asp?cat=2&page=22&id=2179&filter=249 (last visited Jan. 13, 2001). Peterson summarizes the battles that took place between the Army Corps of Engineers (Corps) and many transportation interests that desperately wanted the dams placed on the Lower Snake River so they could compete with the railroad industry for transporting goods throughout the Northwest. However, the Corps felt that the construction of dams on the Lower Snake River could never be justified on the basis of navigation purposes. These battles continued for over ten years until the need for more power arose during the Cold War and the Korean conflict. More power was needed for research and development of atomic weapons at the Department of Energy's Hanford Site. The Ice Harbor Dam, to be located virtually next to Hanford, became the ideal place for a hydroelectric plant. Eventually, Congress, in discordance with President Eisenhower, voted to authorize the construction of the dam. Eisenhower disagreed because, like the Corps, he felt the project was not economically sound. *Id.*

[62] Peterson, *supra* note 61.

[63] *See* Trout Unlimited, *supra* note 61; *see also* Peterson, *supra* note 61.

[64] *See* American Rivers, *Irrigation After Partial Removal of the Four Lower Snake River Dams, at* http://www.americanrivers.org/template2.asp?cat=2&page=174&id=492&filter=249 (last visited Mar. 9, 2000) [hereinafter American Rivers, *Irrigation*].

[65] *See* Trout Unlimited, *supra* note 61; *see also* Peterson, *supra* note 61.

For the Snake River dams, and many other large hydroelectric dams, the debate over decommissioning was intensified after the decision by FERC to remove the Edwards Dam, the first large hydroelectric dam ever decommissioned by FERC.[66] One of the most promising statements issued by FERC, from the perspective of those supporting breaching of the dams, came from Bruce Babbitt, then Secretary of the Interior. In a 1998 speech, Secretary Babbitt stated:

> Moreover, now we increasingly see the issue not merely in terms of a single dam, but an entire river. We see that river as part of a whole watershed. And the fate of that watershed involves all the people who live in it, and from it, and who share responsibility in deciding the future of their river.[67]

FERC's decision to decommission the Edwards Dam also invigorated environmental groups such as American Rivers,[68] Trout Unlimited,[69] and

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[66] Zipp, *supra* note 55. Zipp explores some of the implications surrounding the removal of the Edwards Dam. Zipp notes the removal of the Edwards Dam was symbolic of the end of an era: whereas previously "engineering prowess was used to harness the forces of nature for economic progress, the country has now turned to assess the environmental cost—and is starting to tear down dams deemed no longer vital to national prosperity." The Edwards Dam, the first large dam to be removed by FERC against the desires of the operator of the dam, was removed because FERC decided that it no longer provided economic benefits to justify the environmental damage it was causing. *Id.* *See also* Babbitt, *supra* note 54. Babbitt, commenting on the reasoning behind the removal of Edwards Dam, noted: "The age, location, high environmental costs and low generation at Edwards set it at one end of the hydrospectrum. The potential for fisheries restoration was so great, the electricity generated so minimal, that the consensus for removal was almost inevitable." *Id.*

[67] Babbitt, *supra* note 54.

[68] *See* American Rivers, *Mission Statement, at* http://www.americanrivers.org (last visited Apr. 11, 2000). "American Rivers is a national conservation organization dedicated to protecting and restoring America's river systems and to fostering a river stewardship ethic." American Rivers, founded in 1973, attempts to unite many grassroot organizations toward a common goal. "In addition to protecting nationally significant rivers, American Rivers' programs address flood control and hydropower policy reform, endangered aquatic and riparian species protection, western instream flow, clean waters and urban rivers." *Id.*

[69] *See* Trout Unlimited, *Mission Statement, at* http://www.tu.org/whatis/tutoday.html (last visited Feb. 13, 2001). Trout Unlimited seeks to "conserve, protect and restore North America's trout and salmon fisheries and their watersheds." *Id.*

Friends of the Earth.[70] After the Edwards Dam was destroyed, the groups increased their efforts to have the four dams on the Lower Snake River decommissioned.[71]

The debate about decommissioning dams extends beyond environmental concerns; economic effects must also be taken into consideration. Economic effects include power generation and the impact on the community. While the case for decommissioning the Edwards Dam could be justified by a relatively easy cost-benefit analysis, the interests involved in the case of the Lower Snake River dams are proving to be more difficult to balance.

The intensity of the current debate over the Snake River dams stems from the fact that the dams are highly significant, both environmentally and economically, to the Northwest. The debate that rages on addresses the basic question of how to balance economic and environmental concerns. Currently three options are being studied as possible solutions to the Snake River debate:

> (1) [R]emoving the earthen portion of the four Lower Snake River dams to allow the river to flow naturally; (2) continuing to barge and truck juvenile salmon around the dams, as is being done now; or (3) accelerating salmon barging and trucking and trying to engineer the dams and reservoirs to be safer for fish by building bigger and more screens, ladders, fish barges, and other technological fixes.[72]

As noted above, the Snake River debate has two main components: 1) economic and 2) environmental. However, there are arguments using economic and environmental reasoning that both support and oppose dam removal. While the majority of those claiming reliance on an economic rationale are opposed to dam removal, there is a significant minority that

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[70] *See* Friends of the Earth, *Mission Statement, at* http://www.foe.org (last visited Nov. 13, 2000).

[71] Richardson, *supra* note 22. After the breaching of the Edwards Dam it has become evident that "both state and federal resources agencies, and citizen groups in some cases, have the ability to affect whether or not existing hydropower dams will be able to continue producing electricity." *Id.*

[72] *See* American Rivers, *The Snake River Campaign, at* http://www.americanrivers.org/template2.asp?cat=2&page=22&id=306&filter=249 (last visited Feb. 27, 2001) [hereinafter American Rivers Campaign].

supports the removal, basing their decision on an economic rational.[73] Similarly, there are two contrasting groups under the banner of environmental protection—one in favor of removal and the other opposed.[74] This article will now summarize and explore the reasoning behind the environmental and economic arguments for and against breaching the Snake River dams.

B. *The Environmental Arguments for and Against Breaching*

1. The Environmental Case for Breaching

The major impetus behind the push for removal is the environmental degradation the dams are causing and the effect of that degradation on certain species of fish;[75] consequently, the environmental arguments focus on harms caused by the dams, and favor breaching. Dams can cause harm to the environment in many different ways.[76] Some of the more common negative impacts dams have on the environment are: the loss of wildlife habitat and species population due to the reservoir that forms behind a dam,[77] and transformations of the river's course that lead to the extinction or endangerment of native fish species.[78] Dams can harm the ecosystem by harming both the wildlife and their habitat, and they

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[73] *See* Jonathan Brinckman & Jim Barnett, *Winners and Losers in Dam Breaching Series: The High Stakes of Dam Removal,* PORTLAND OREGONIAN, July 25, 1999, at A14, *available at* 1999 WL 5361722.

[74] The two groups of environmentalists that have conflicting goals are the preservationists and the conservationists. While it should be noted that not everyone that aligns himself or herself with one of these groups necessarily supports the decision of that group, there is enough support to make this generalization.

[75] *See* American Rivers Campaign, *supra* note 72. Several species of salmon are the primary species at risk from the four dams.

[76] World Commission on Dams, *supra* note 37. The World Commission on Dams Knowledge Base notes that it is now clear the generic nature of the impacts of large dams on ecosystems. The Commission notes:

> large dams have led to: the loss of forests and wildlife habitat, the loss of species population and the degradation of upstream catchment areas due to inundation of the reservoir area; the loss of aquatic biodiversity, of upstream and downstream fisheries, and the services of floodplains, wetlands, and riverine, estuarine and adjacent marine ecosystems; and cumulative impacts on water quality, natural flooding and species composition where the number of dams are sited on the same river.

Id.

[77] *See id.*

[78] *See* American Rivers Campaign, *supra* note 72.

harm habitat by slowing a river's flow as well as preventing nutrients from passing downstream.[79] Dams also reduce water levels downstream from the dam, harming those species that depend on higher river levels to survive and breed.[80]

The Snake River dams have had major negative impacts on the native fish species, especially salmon populations.[81] The dams prevent salmon from reaching their spawning grounds by restricting migration upstream, change the physical characteristics of the river (including temperature) by slowing its rate of flow, and cause the death of thousands[82] of spawning and young fish in their hydroelectric turbines.[83] On the Snake River, all of these factors have caused many fish species to decline in numbers.[84] Of all the fish species affected, the impacts on the Snake River salmon are the most disturbing.[85]

Currently, all stocks of Snake River salmon are either extinct or endangered.[86] This drastic reduction in numbers can be traced to several factors. One of the biggest problems is the salmons' inability to reproduce on the river. When a female salmon lays her eggs, she will lay anywhere between 2,000 and 6,000 eggs.[87] From these eggs, the young salmon develop into minnow-like smolts that are dependent on the swift current of

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[79] *See* American Rivers, *Ten Ways Dams Harm the Environment*, *at* http://www.americanrivers.org/dam10ways.html (last visited Mar. 2, 2001).

[80] *Id.*

[81] *See* American Rivers Campaign, *supra* note 72.

[82] *See generally* Marc Reisner, *Coming Undammed*, AUDUBON, Sept./Oct. 1998.

[83] *See* American Rivers Campaign, *supra* note 72. On the Snake River, young salmon swimming downstream to the ocean must contend with eight hydropower dams before reaching the salt water. Up to ninety-nine percent of the young salmon now perish on this trip downstream. *Id.*

[84] *See generally* Reisner, *supra* note 82.

[85] Reisner, *supra* note 82, at 58. Reisner notes the dramatic decline of the salmon species native to the Snake River. One of the more shocking examples is the 10 to 16 million salmon that used to run the Columbia watershed, of which the Snake River is a part, to spawn each year. With many of these species now extinct or endangered, only seven percent of the Columbia salmon fisheries remain. Reisner also notes that "[a]t least 200 runs of fish have become extinct, and many other are in serious decline . . . ." The impact of the dams on salmon populations has been devastating.

[86] *See* Michael C. Blumm et al., *Saving Snake River Water and Salmon Simultaneously: The Biological, Economic, and Legal Case for Breaching the Lower Snake River Dams, Lowering John Day Reservoir, and Restoring Natural River Flows*, 28 ENVTL. L. 997 (1998). The authors examine the classification of the many different types of Snake River stocks of fish. They note the drastic declines in the fish population that have occurred since construction of the dams. In 1960 the salmon runs still averaged around 100,000 adults, in contrast to the 2000 that were averaged in 1995. *Id.*

[87] Reisner, *supra* note 82.

the river to transport them to the sea.[88] Because of the dams on the Snake River, the young salmon are not transported by the current to the sea, but drift through the reservoirs trying to avoid being pulled into the hydroelectric turbines.

Another problem presented by the dams is that they slow the juvenile salmons' progress toward the sea. Young salmon are genetically programmed to adjust to salt water very early in their life cycle. If they do not reach the sea due to the slow current or any other factor, they lose their desire to migrate and usually die.[89] In fact, on the lower Snake River, almost ninety-nine percent of the young salmon now perish while trying to migrate downstream to the ocean.[90] With the dams in place causing such a huge loss of juvenile salmon, there is little hope for regeneration of the species. A one percent survival rate will not pull the salmon back from the endangered list.

Nor are the one percent of juvenile salmon that do reach the sea finished combating the dams. If the young salmon are fortunate enough to make it to sea and mature, they face another challenge from the dams in their reproductive journey. Salmon, when it is time to spawn, travel hundreds of miles from the sea and back upriver to their spawning grounds. The mature salmon must again find a way to bypass the dams in order to make it upriver to spawn. Salmon instinctively attempt to return to their spawning grounds to mate. As evidenced by the drop in salmon returning to Columbia River fisheries, many adult fish are not able to make this return journey.[91] If the adult fish are unable to return to their spawning grounds the outlook for the promulgation of the species is not promising. Even with the efforts of barging and fish ladders, most adult fish are still unable to reach their spawning grounds.[92] The trucking and barging programs being considered are not feasible options for returning the native fish species to their pre-dam levels.[93] Several studies have concluded that fish barging and trucking are not effective.[94]

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[88] *Id.*

[89] *See id.*

[90] *See* American Rivers Campaign, *supra* note 72.

[91] *See* Remove Dams, *Fish Barging: A 20 Year Failed Experiment, at* http://www.removedams.org/SOS-site/info/viewitem.cfm?ArticleID=9 (last modified Jan. 1, 1998) [hereinafter Remove Dams, *Failed Experiment*].

[92] *Id.*

[93] *Id.* In *Fish Barging: A 20 Year Failed Experiment*, the scientists note two major problems with the fish barging attempts. First, there is no scientific evidence to support that fish barging can provide the needed survival levels to restore the wild salmon and steelhead in the Columbia Basin. In order to rebuild a sustainable and harvestable population, there needs to be a four to six percent return rate. To simply halt the salmon

With the fish ladders, the adult salmon attempting to make it over the dam must use a step system usually built off to one side of the dam. The step system allows water to flow over the structure and the fish to treat the ladder as a system of water falls that they routinely encounter during their journey upstream. The fish ladders, though better than nothing, do not allow many of the migrating fish to bypass the dam in order to mate.

However, if the dams are breached, the chances for saving the salmon are over eighty percent for both the spring and summer chinook,[95] because the dams are the principal factor leading to the decline in salmon populations.[96] Many observers suggest that breaching the dams is the only acceptable option for the Lower Snake River because of the dismal results of trucking and barging.[97] Removing the dams would also solve the problems associated with warming water and dissolved gasses that accumulate at the foot of the dams. These gasses also create another problem for the environment beside the destruction of the wildlife species. When a river is dammed, it begins to emit greenhouse gasses that contribute to global warming.[98] In an age where we must be concerned with all aspects of the environment, we should be wary of such issues.

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and steelheads path to extinction, there needs to be at least a two percent return rate. Since the inception of fish barging on the Columbia River, there has never been a return rate of two percent or higher. The second problem the scientists have with fish barging is its proclivity towards producing straying fish. In other words, fish barging is thought to impair the homing instincts present in fish as they return to mate. This impaired homing instinct leads to a lower return rate and can possibly compromise the genetic integrity of the fish that run the Columbia River. *Id.*

[94] *See id.*; *see also* Remove Dams, *Barging and Trucking Won't Restore Columbia Basin Steelhead and Salmon*, *at* http://www.removedams.org/SOS-site/info/viewitem.cfm?ArticleID=25 (last modified Jul. 22, 1997) [hereinafter Remove Dams, *Barging and Trucking*].

[95] Brinckman & Barnett, *supra* note 73. If the dams are breached, the fall Chinook have a 100 percent chance of recovery in forty-eight years and the spring Chinook have an eighty percent chance for recovery. *Id.*

[96] Blumm et. al., *supra* note 86, at 2.

[97] Reisner, *supra* note 82, at 63. Reisner notes that the Columbia salmon fishery, of which the Snake River is a part, was once the most prolific on earth and now it is only seven percent of what it was despite several billion dollars worth of restoration efforts.

[98] World Commission on Dams, *supra* note 37. "Preliminary data from a Case Study hydropower dam in Brazil show that the gross level of these emissions is significant, relative to emissions from equivalent thermal power plants." *Id.*

2. The Environmental Case Against Breaching

The environmental case for breaching the four dams on the Lower Snake River hinges on two main points: the destruction of wildlife habitat, and the subsequent loss of native fish species. The habitat destruction occurs when the dams slow the current of the river, sediment is unable to flow through the ecosystem causing a loss of breeding grounds, and the river floods natural estuaries and habitat. The destruction of the native fish species occurs because of the inability of mature fish to return to breeding grounds from the sea, and because of the inability of the few young fish hatched to escape from the breeding grounds to the sea. All of these concerns, including the greenhouse emissions caused by the reservoir, will be dispelled with the removal of the dams.

While the environmental case for destruction of the dams provides the main impetus for their deconstruction, we cannot ignore the arguments of those environmentalists who are opposed to breaching the dams because of other environmental concerns.[99] Some opponents are concerned that if the hydroelectricity generated by the Snake River is no longer available, it will be replaced by more environmentally harmful power generated by the burning of fossil fuels.[100]

A second fear is that when the dams are breached, the sand and sediments trapped for years behind these massive structures will come rushing out and clog the ecosystems downstream, thereby harming the very habitat the deconstruction is designed to protect. The sediment can cause harm by clogging the gills of fish and smothering their nesting grounds.[101] It is estimated that 150 million cubic tons of sediment would rush down the river if the dams on the Snake River were breached; there is disagreement between opponents and proponents of breaching as to

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[99] Erik Robinson, *Roundtable Participants Split on Dam Breaching*, THE COLUMBIAN, Nov. 3, 2000, at C4, *available at* 2000 WL 24842748.

[100] Currently, energy companies and agencies hold permits to build a total of eighteen new natural gas turbines in Washington, Oregon, and Idaho, and many are worried about the impact such plants would have on the air quality in the Northwest. Erik Robinson & Kathie Durbin, *The Energy Crunch: End of an Era, Cheap Hydropower May Be Gone Forever, Muddying Energy Future*, THE COLUMBIAN, Jan. 28, 2001, at A1, *available at* 2001 WL 6278026. Bill Bachman, a U.S. Forest Service meteorologist and air quality specialist, for example, worries about the impact of so many new plants in the areas upwind of the Columbia Gorge, where the air quality is already under stress. *Id.*

[101] Booth, *supra* note 7. *See also* William Booth, *The Problem Is Often What Happens When Millions Of Pounds Of Silt Are Set Free, Removing Harmful Dams is Popular and Costly*, PITT. POST-GAZETTE, Dec. 17, 2000, at A12, *available at* 2000 WL 27794946.

whether that onslaught of sediment would wreak havoc on the aquatic environment or whether nature would rapidly heal itself.[102]

C. *The Economic Arguments for and Against Breaching*

The economic concerns stem primarily from the structural changes to the industries that support the communities that surround the Lower Snake River. The main industries that would be affected by removing the dams include farming, barging, retail/outfitters, transportation, and engineering.[103] The potential gains or losses for these separate industries

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[102] Robinson, *supra* note 99.

[103] Brinckman & Barnett, *supra* note 73. Brinckman and Barnett note that the primary impetus behind removing the dams is concern about the environment. However, they also recognize and discuss the ripple effect the removal will cause throughout the economy of the region. Most of their numbers are taken from the impact statement issued by the Army Corps of Engineers. The effect would be felt from ordinary campers to corporate executives in the power companies. Brinckman and Barnett detail a list of winners and losers from the breaching of the dams. As we explore the list of winners and losers we can begin to see how, under the guise of economic reasoning, there can be both support and opposition for the breaching of the Snake River Dams. The main losers from dam breaching are barge and related shipping industries, the agriculture of the region, and the consumers. *Id.*

The barge industry is estimated to sustain substantial (if not industry-threatening) losses due to the loss of navigability on the Lower Snake River. The navigability would be lost if the dams were completely removed, as in the first option that is being considered. Once the river returned to its natural flow, barges would no longer be able to pass the rapids that were originally present on the Snake River. It is estimated that the barge operators would lose about $46 million per year in revenue immediately after breaching. *Id.*

Similarly, the customers that received many of their goods from the barges would lose an estimated $35 million a year in increased prices due to the transportation of the goods that now has to be accomplished by trucking or railroad. Farmers stand to lose irrigation provided by the Ice Harbor Reservoir to 35,000 acres of farmland. The losses affecting the farmers are estimated between $14 and $17 million per year. *Id.*

Furthermore, the Bonneville Power Administration (BPA) and electric consumers would incur some loss due to the breaching of the dams. Residential electricity rate-payers would likely see an increase between $1.50 and $5.30 a month because of the diminished supply of power and the higher cost of substitutions. BPA, the federal agency that operated the hydroelectric power generation of the four dams, stands to suffer losses as great as $250 million. *Id.*

Conversely, the "winners" stand to make significant gains if the dams are breached. The major winners include the transportation firms (i.e. rail and trucking), construction and retailers. The transportation industry benefits from the misfortunes of the barge industry. Because of the continued need for goods to be transported to market, the rail and trucking firms in the region will gain substantial business. They stand to gain around $59 million in revenue. As a complement to the transportation industry, the

are large. However, as one can see, most of the money is not necessarily lost, but rather redirected into another industry within the region.[104]

1. Economic Arguments For Breaching

Those in the region who stand to gain significant amounts of increased revenue argue that the dams should be breached in order to restore the river to its natural state and bolster several sections of the economy. To accomplish this goal would require the cooperation of several different agencies as well as private industry.[105] The main proponents of this position are in the outdoor recreation, construction, and rail and trucking industries.

The outdoor industry stands to gain large increases in revenue if the river is returned to its natural course. With a free flowing river the opportunity for adventure and recreational activities dramatically increases. It is projected that the outfitters/retailers industry, through increases in activities like camping, rafting and tourism, would stand to gain about $67 million a year.[106]

The commercial fishing industry, which is complementary to the outfitters/retailers industry, also stands to gain from the breaching of the dams. Due to the high expectations for the recovery of salmon if the dams

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construction industry will see large gains due to the lacking infrastructure in place to support other methods of mass transportation of goods. Construction companies would be needed to improve and build new roads, railways, loading docks, etc. The construction contractors will see an estimated gain between $266 and $315 million. *Id.*

Two other groups that will see major gains are retailers and outfitters. Because the river will be returned to its natural course, causing much of the wildlife to be restored, it is assumed that the tourism and outdoors industries will see increased revenues around $67 million per year. The biggest gains from the breaching of the dams are estimated to be between $800 million and $1.2 billion to the engineering firms hired to remove the dams and reinforce roads and railroads that run along the banks of the now free flowing river. *See* American Rivers, *Snake River: The Economics, at* http://www.amrivers.org/template2.asp?cat=2&page=174&id=783&filter=249 (last visited Feb. 27, 2001) [hereinafter American Rivers, *The Economics*]. The author notes the impact on the community not in dollar amounts but rather in terms of jobs gained and lost with the breaching of the dams. The long-term jobs estimated to be lost are 6,200, with 4,700 long-term jobs being created as a result of breaching the dams. These new long-term jobs are in addition to the estimated 24,000 short-term jobs created during the nine-year deconstruction process. *Id.*

[104] *Id.*

[105] *See generally* ECONorthwest, *An Economic Strategy for the Lower Snake River, at* http://www.econw.com/pdf/LowerSnakeDams.pdf (last visited Jan. 10, 2001).

[106] Brinckman & Barnett, *supra* note 73.

are breached,[107] the commercial fishing industry will be able to increase their harvests from the Snake River. Estimates of the potential gains for the commercial fishing industry range from $1.6 million by the Corps to nearly $100 million by the commercial fishing industry.[108] Because breaching the dams will allow a greater than four to six percent return of adult fish,[109] the Snake River runs will again be harvestable.

However, one area that cannot be specifically quantified by the return of the Snake River to its natural form is the benefit gained in the quality of life assets. ECONorthwest feels the breaching will give the Northwest economy "competitive advantages . . . in the competition for future job and business growth."[110]

Another industry that will benefit from the breaching of the dams is the construction industry, which will benefit in several different ways. They will receive contracts for the tasks needed for the actual bypass, as well as for improving the infrastructure surrounding the Snake River. From the actual bypassing of the dams, it is estimated that the construction industry will gain $859 million in revenue, along with roughly 12,000 jobs.[111] The second gain the construction industry would realize will come with the improvement of the infrastructure for increased rail and road traffic. The estimated costs of improving the infrastructure are between $266 million and $315 million.[112] The construction industry obviously has a significant interest in breaching the dams, since it stands to gain a substantial benefit of anywhere from $1.125 billion to $1.174 billion.

With improved infrastructure, the railroads and trucking industry could then reap benefits from the breaching of the Lower Snake River. Because breaching the dams will prevent barges from transporting goods along the current route, other forms of transportation will become

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[107] *Id.*

[108] *Id.*

[109] World Commission on Dams, *supra* note 37.

[110] ECONorthwest, *supra* note 105, at 13. ECONorthwest suggests that the Northwest's quality of life is a major reason why the region attracts and holds skilled, productive workers. Citing a survey by the Oregon Employment Department, the report found that approximately forty-four percent of new in-migrants (who generally are more skilled than current residents) moved to the state primarily because of the state's quality of life. *Id.* at 13-14. *See also* Oregon Employment Department, *1999 Oregon In-Migration Study* 17-21 (1999), *available at* http://www.olmis.org/pubs/single/inmigrate/inmigrate.pdf.

[111] ECONorthwest, *supra* note 105, at 10. The authors suggest that the biggest challenge for the local and regional economy will be to mitigate the boom and bust cycle that will take place during the nine-year construction period. *Id.*

[112] Brinckman & Barnett, *supra* note 73.

essential. The majority of the bulk goods now transported by barge would have to be moved by either truck or rail, increasing truck and/or rail revenue by an estimated $59 million per annum. Not included in this figure is the $10 million dollar taxpayer subsidy that is currently being given to the river transportation system.[113]

One alternative being explored to carry the increased bulk goods traffic is the expansion of the "Grain Train" program, which currently has twenty-nine rail cars specially designed for the transportation of grain by rail.[114] One proposed idea is to expand this program to allow bulk items to be shipped to customers in the Northwest with little increase in cost due to shipping.

One other notable beneficiary of breaching the dams would be the engineering firm(s) selected to undertake the job of orchestrating the deconstruction and bypass project. According to Brinckman and Barnett, only a few firms in the world are able to undertake such a project. Bids for the project are expected to run from approximately $800 million to $1.2 billion.[115]

In summary, several key players support breaching the dams, most of whom stand to benefit immensely from breaching the dams. The deconstruction will take a considerable amount of time, create thousands of jobs, and inject billions of dollars into local industries. The money lost from one sector will turn into revenues gained by other sectors.

2. Economic Arguments Against Breaching

With such large economic gains flowing into certain sectors of the local and regional economies, it stands to reason that other sectors will have large amounts of money flowing away from them. As one would expect, those industries that stand to suffer significant losses (such as the barging and agriculture industries) are vehemently protesting the removal of the dams, claiming that the economic impacts are too grave and outweigh other concerns. To further explore the economic losses that are expected to occur, we will look at some of the major industries that will suffer the most. Some of those who stand to suffer economic losses from breaching include barge operators, barge customers, farmers, the Bonneville Power Administration, and its customers.

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[113] ECONorthwest, *supra* note 105, at 11 fig. 4.
[114] *Id.* at 17-18.
[115] Brinckman & Barnett, *supra* note 73.

The first industry that will be hit hard due to the breaching of the dams is the barging industry. Barges currently carry about 4 million tons of bulk goods to markets in the Northwest each year.[116] If the dams are breached, barge traffic from Pasco, Washington to Lewiston, Idaho would no longer be feasible.[117] Without the ability to navigate this stretch of the Snake River, the barging industry would lose an estimated $46 million per annum in revenue.[118]

Along with the lost income for the barging industry, there would be an increase in the cost of the goods formerly transported by the barges. The market price of bulk goods that would have to be moved by more costly alternative methods would increase. The cost of transporting goods is expected to increase an average of twenty-eight percent, amounting to about $35 million in additional shipping costs.[119]

In addition to this argument, many in the surrounding communities feel that the cost of breaching will not be equally shared throughout the region and country. The prices of many goods will rise due to the loss of the barging industry, but only local residents will feel this increase. In essence, local residents will pay an increased cost for an environmental benefit that will be shared by people across the country. Those hit the hardest economically will not necessarily ever see any of the benefits that come from the breaching of the dam. Thus, a major concern among many in the local communities is that their economies will be sacrificed for the good of the region and country. Many of those affected are calling for federal assistance to mitigate the damages to their economies if the dams are breached.[120]

Another group which stands to suffer economically if the dams are breached are farmers who depend on the reservoir created by the Ice Harbor Dam for irrigation of approximately 37,000 acres.[121] With no feasible plans currently in place to replace the surface irrigation with ground wells or other methods, there will be a loss of approximately $14 to $17 million per annum in crop value.[122] The loss of irrigation will bring

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[116] *Id.*
[117] *Id.*
[118] *Id.*
[119] *Id.*
[120] ECONorthwest, *supra* note 105, at 7.
[121] American Rivers, *Irrigation*, *supra* note 64.
[122] Brinckman & Barnett, *supra* note 73.

an estimated loss of 2,256 jobs,[123] as well as a loss of $72.2 million in annual economic benefits.[124] If the dams are removed, the local farmers would have to be compensated for the loss in value of their land and the loss in potential income from their crops. The current estimate for this compensation is about $134 million.[125]

The final interest that stands to suffer economically is the Bonneville Power Administration (BPA). BPA, the federal agency that runs many of the hydroelectric power plants across the country, earns revenue from, among other things, the sale of electricity generated by the dams under their supervision. In the case of the four Snake River dams, BPA would lose the sale of more than 1,200 megawatts per year.[126] This loss of capacity would cost the BPA roughly $250 million in annual income.[127]

As one can see, there are substantial economic losses to be suffered by some groups due to the breaching of the four dams on the Lower Snake River. If the dams are breached there will be job losses for those in the local agricultural economy, the barging industry will no longer be able to operate in parts of the Northwest, consumers will have to pay higher costs at the market for bulk goods, and the BPA will lose around $250 million in annual revenue. Understandably, some observers are of the opinion that breaching the Snake River dams will harm the economy of the Northwest. Many residents in the Snake River area fear that they will have to shoulder an unfair portion of the economic burdens caused by breaching the dams.

IV. PROPOSED FRAMEWORK FOR DECIDING WHETHER TO BREACH A DAM

As demonstrated by the Snake River case, there are a plethora of factors, interests, and impacts that can bud from the decision of whether or not to breach a dam. In order to make a rational decision about whether or not to breach a particular dam, there needs to be a method by which a decision can be achieved. In other words, it is necessary to have a specific set of criteria to evaluate each potential outcome. However, this framework must be made with careful consideration, because each situation has its own case-specific nuances. Any attempt to make an

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[123] American Rivers, *Irrigation, supra* note 64. The high number of jobs lost in relation to a rather small area of lost farmland is due to the labor-intensive nature of high-yield crops, similar to those present in the areas surrounding the Ice Harbor Dam.
[124] *Id.*
[125] *Id.*
[126] Brinckman & Barnett, *supra* note 73.
[127] *Id.*

explicit and specific model, although it may prove useful for the situation for which it was designed, will result in a need to substantially revise the model for the next set of factual circumstances.

Several attempts to form such a model have been undertaken. For example, Kurt Stephenson noted that there are two general categories of decision-based models for such situations. Stephenson states that "[c]onceptually, at least two approaches to decision-making can be imagined. These two approaches—labeled here the rational analytic and political negotiation approaches—are not meant to represent reality but to merely portray two broad, stylized, and normative views of the way a process should answer these questions."[128] In order to create a model that will have a wide level of applicability, it is necessary to use the rational analysis method. The rational analysis method enables the decision-makers to have a set method to refer to when breaching cases arise, in comparison to the political negotiation method, which considers different inputs each time.[129]

The framework developed in this section is designed to be broad enough to have a wide degree of applicability in the on-going debates about the deconstruction of dams. For the reasons previously specified, a rational analysis model will be employed. The model is a derivative of the cost-benefit analysis (CBA) model.[130] CBA is a model that is widely

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[128] Kurt Stephenson, *Taking Nature into Account: Observations About the Changing Role of Analysis and Negotiation in Hydropower Re-licensing*, 25 WM. & MARY ENVTL. L. & POL'Y REV. 473, 478 (2000) (emphasis omitted).

[129] *See id.* Stephenson notes that "[f]ormal rules and procedures would be devised that would identify the rules of analysis that would evaluate, weigh, and choose between competing alternatives. These rules would provide the basis for an 'objective' analysis and identify the 'best' answers to the above questions." *Id.*

[130] *See id.* at 479.

> One manifestation of the rational analytic approach is formal benefit-cost analysis advocated by many economists and policy analysts. Formal rules of conducting analysis are derived from mainstream microeconomic (welfare economic) theory. Benefits and costs are, at the conceptual level, a measure of the different preferences people hold for the policy alternatives under consideration. Benefit-cost analysis rests on the argument that the choices individuals make in market exchanges provide the data that analysts can use to translate people's preferences into money terms. The logic of the argument is straightforward. In a market exchange money income is sacrificed (a price is paid) in order to secure some good or service. By arguing that preferences guide market choices, analysts conclude that the money value of a good or service is at least equal to the amount of income a

accepted and that has been employed in many areas of government.[131] For example, CBA has even been applied to criminal cases.[132]

CBA is an economic analysis that uses the concept of welfare economics to assign an economic value to each possible decision.[133] Focusing on welfare economics, the model employs the concepts of willingness to pay (WTP) and willingness to accept (WTA).[134] By determining the amount people are willing to pay for a particular gain or benefit and similarly determining the amount people are willing to accept for the same event, a measurement tool has been established. This tool holds that as long as the aggregate sum of the individual WTP and WTA is greater than zero, the project has benefit.[135] With this economic value, the decision-makers can, at least in theory, make an objective comparison between the potential benefits and costs associated with either breaching or not breaching.[136]

Although CBA seems fairly simple, inputting different benefits and costs to determine the total social value of the project in the Snake River case and other environmental debates is difficult. The problem with the application of CBA to environmental decisions is the model's basic assumption that all meaningful costs and benefits can be economically quantified.[137] To alleviate this deficiency, this article will make some significant modifications to the standard CBA model to account for variables that the model inherently disregards.[138]

In its most essential form, "[e]very benefit cost analysis involves two issues: (1) the value of the action being contemplated—in the current case, whether or not to modify the operations of or to breach hydroelectric

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> person spends to obtain the service. Thus, market prices are the raw data for preference measurement.

Id.

[131] *See* JONATHON LESSER & RICHARD O. ZERBE, JR., *A Practitioner's Guide to Benefit Cost Analysis, in* HANDBOOK OF PUBLIC FINANCE 221-68 (Marcel Dekker ed., 1998).

[132] *See* Brandon C. Welsh & David P. Farrington, *Monetary Costs and Benefits of Crime Prevention Programs*, 27 CRIME & JUST. 305 (2000).

[133] Stephenson, *supra* note 128, at 478-9.

[134] *See* R. KERRY TURNER ET AL., ENVIRONMENTAL ECONOMICS: AN ELEMENTARY INTRODUCTION 94-96 (1993).

[135] *Id.*

[136] The author understands that there will be some human bias, but by creating a standard model we can move towards having a more objective decision-making tool.

[137] *See* M. Neil Browne & Nancy H. Kubasek, *A Communitarian Green Space Between Market and Political Rhetoric About Environmental Law*, 37 AM. BUS. L.J. 127, 158 (1999); *See also* TURNER, *supra* note 134.

[138] TURNER, *supra* note 134, at 108-14.

dams; and (2) whose values are to count in addressing the first question."[139] In other words, to be considered in the equation of a CBA, one must have economic standing; that person's interests must be deemed of enough significance to be considered in the calculations.[140] The issue of whose values are counted or have economic standing gives rise to the first problem that must be resolved in order to apply the CBA to environmental decisions: the model inherently does not quantify environmental benefits unless turned into economic terms.[141]

CBA, to be efficient, must be adjusted to recognize all variables. Unfortunately, factors such as quality of life and the intrinsic worth of nature are not necessarily valued in the economic CBA model.[142] If CBA cannot accurately value environmental factors, it is of little use in decisions such as dam removal that generally revolve around economic and environmental arguments.[143]

Historically, CBA has undervalued environmental benefits and costs because of the difficulty in quantifying these impacts in economic terms.[144] This under-valuation of environmental impacts, if left unattended, can lead to sub-optimal decisions concerning the removal or continuance of a hydroelectric project. There are several methods that can be used to adjust CBA to properly account for environmental impacts. For example, Turner presents an equation to modify CBA to incorporate environmental variables.[145] Other methods of valuing economic nonuse variables include the contingent valuation method and the contingent choice method.[146] In addition to these methods of assigning valuations to nonuse values, there are several other methods enumerated and explained

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[139] Richard O. Zerbe, Jr. & Linda J. Graham, *The Role of Rights in Benefit Cost Methodology: The Example of Salmon and Hydroelectric Dams*, 74 WASH. L. REV. 763, 774 (1999).

[140] *See id.*

[141] Browne & Kubasek, *supra* note 137, at 158; *see also* TURNER, *supra* note 134, at 108-14.

[142] Browne & Kubasek, *supra* note 137, at 158.

[143] *See* ECONorthwest, *supra* note 105, at 2 (noting that "DREW's assessment of the impacts of the bypass is incomplete, overstates the negative impacts, and underestimates the positive impacts of the proposal.").

[144] *See* Browne and Kubasek, *supra* note 137.

[145] *See* TURNER, *supra* note 134, at 99.

[146] *See* Dennis M. King & Marisa Mazzotta, *Ecosystem Valuation at* http://www.ecosystemvaluation.org/dollar_based.htm (last visited Jan. 26, 2001). The ecosystem valuation site establishes guidelines and provides several economic pricing models to try to economically value as many environmental benefits as possible including nonuse benefits. Nonuse benefits are defined as values that are not associated with actual use, or even the option to use, a good or service.

that capture useful values of environmental benefits. The Ecosystem Valuation website, which is funded by the U.S. Department of Agriculture, the Natural Resources Conservation Service, and the National Oceanographic and Atmospheric Administration, lists eight different methods that can be used in combination to capture both useful and nonuse value of an environmental project.[147] Although some object to the inclusion of nonuse values in CBA, the EPA has stated:

> research on nonuse values makes it clear that people are willing to pay something to protect some resources that they have never used and do not intend ever to use, whether it is the bay in Alaska despoiled by the Exxon Valdez or the Serengeti Plain. Such values clearly should have standing in CBA for policies affecting natural resource qualities and quantities.[148]

Clearly, the nonuse values in economic decisions are relevant and important. Therefore, in this framework based on the CBA, it is essential to use a combination of the previously mentioned tools to capture all the benefits associated with the breaching of the dams.[149] To try to further eliminate speculation, the EPA has attempted to standardize the valuation approach for both economic and environmental factors.[150]

In addition to the valuation methods, one tool that can prove to be extremely valuable for decision makers that is not a specific valuation technique is the opportunity cost method.[151] It is valuable because it

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[147] *Id.* The list includes the market price method, productivity method, hedonic pricing method, travel cost method, damage cost avoided, replacement cost and substitution method, contingent valuation method, contingent choice method, and benefit transfer method. Each method is explained in detail on the site and each method has different benefits when examining an environmental decision. *See also* TURNER, *supra* note 134.

[148] U.S. Environmental Protection Agency, *Cost-Benefit Analysis and Regulatory Reform* 47, available *at* http://www.epa.gov/NCEA/pdfs/riskcom/resorces.pdf (last visited Jan. 24, 2001).

[149] The specific combination that is to be employed is left to the discretion of the decision makers in each specific case. The reason for leaving the method of environmental valuation as a discretionary function is due to the individual nature of each case. Certain cases, such as Yosemite Park, may involve significant travel benefits and costs, and therefore that method (in conjunction with the contingent choice and valuation method) may be more appropriate. However, careful thought and deliberation are essential because the model is only as accurate as its inputs.

[150] U.S. Environmental Protection Agency, *supra* note 148, at 14, table 3A-1.

[151] TURNER, *supra* note 134, at 116.

makes no attempt to directly calculate the environmental gains. As Turner notes, "instead, the benefits of the activity causing the environmental degradation—say, drainage of a wetland to allow intensive agriculture—are estimated in order to set a benchmark for what the environmental benefits would have to be for the development not to be worthwhile."[152] Operating with the concept of opportunity costs, decision-makers can do a standard market valuation using CBA and determine whether the initial results have benefits outweighing the costs, which would eliminate the need to apply the different environmental valuation methods.

While a standard CBA often has notable deficiencies associated with the failure to fully account for environmental benefits, by modifying the CBA process to incorporate a meaningful measure of environmental benefits (especially taking into account nonuse values), a more useful CBA framework can be created. From this framework, we can begin to build a matrix of specific questions that need to be considered when applying the modified CBA.

A. *Environmental Questions*

When addressing environmental questions, decision makers will be charged with employing the correct combination of valuation methods to gain an accurate measure of the environmental costs and benefits.[153] For the purposes of this article, the questions are framed in terms of the Snake River dams, but obviously one could substitute any dam that is being considered for decommissioning.

1. What potential benefits would arise from breaching the dams on the Snake River? Considered under this question should be all relevant environmental benefits. For example, if one were considering the impact of stopping the logging in the Northwest, one would focus not only on the positive impacts on the spotted owl, but also on the benefits of the habitat for the multitude of other species affected. One would also consider the beneficial impact on air quality which the living forest would produce in comparison to barren land. Decision makers must exercise special care to account for the nonuse values.

2. What are the potential environmental costs of this action? As in the previous question, special care must be taken to calculate the nonuse

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[152] *Id.*

[153] For the purposes of this article, we are defining the correct combination of methodologies as the set of models that allows for the most comprehensive collection of both use and nonuse values.

costs. For example, in the Snake River case, one possible environmental cost would be increased air pollution due to the loss of clean hydroelectric energy.[154] Although it may be easier to see the environmental benefits of certain projects, it is also important to thoroughly investigate potential environmental costs that may detract from or outweigh the anticipated environmental benefits.

B. *Economic Questions*

1. What are the potential economic gains from implementing the project? The gains should address the entire spectrum of the economy. It is important to look at project-related gains in the local, regional, and national economy. Specifically, decision makers applying the modified CBA should consider the following questions:

- which industries stand to gain;
- which individuals or communities stand to gain;
- do the taxpayers gain;
- are the individual gains short-term or long-term;
- if short-term, how quickly will these gains be realized; and
- if long-term, how long can the gains be expected to endure?

2. Of course, in addition to potential economic gains, one must also consider the potential economic losses that may be caused by the project. The specific areas of focus under this question directly mirror the questions asked about the potential gains, and therefore a reiteration of the questions is not necessary.

C. *Consideration of Alternatives*

1. What are the alternative measures in the case besides the two extremes? In the case of the Snake River dams, one would want to avoid the tendency to dichotomize. When exploring this question, one will primarily be focusing on alternatives that mitigate current environmental problems in order to try to reach a compromise. For example, two

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[154] This assumes that the energy would be made up through more polluting methods such as the burning of fossil fuels such as coal. However, in the Snake River case, this is a minute concern because of the small amount of power that the dams provide. *See* Trout Unlimited, *supra* note 61.

alternatives that merit consideration include the construction of fish ladders and fish barging and trucking.

2. How feasible are the alternatives? Once the alternatives have been identified it is necessary to determine their feasibility as alternatives to the two extreme options. This process attempts to avoid mutually exclusive decisions. The consideration of the feasibility of alternatives is two-headed. First, decision makers need to examine the environmental feasibility of an alternative, i.e., will it actually be successful in mitigating the environmental damages. Second, decision makers must also consider the economic feasibility of the alternative. How will the alternative affect the economy in comparison to the mitigating effect that it has? Here again, decision makers should employ the modified CBA model. The final determination concerning an alternative is the short-run and long-run impacts of the alternative. For example, how long will the alternative continue to mitigate damages? Will the effort continue to be effective? How stable does the price of the mitigation remain during the time period for which it is expected to be used?

D. *Local Impact*

What is the impact on the local and regional economy in comparison with the larger economy? This question is important for two main reasons. First, it attempts to locate where the burden or profit will be realized. Second, it attempts to compare the impacts of the burden or profit with the potential benefit that the local and regional economy will feel. In other words, the question is important because it tries to analyze the fairness of the situation. For example, if the cost of a particular project will rest chiefly on the local economy while the lion's share of the benefits goes to the larger economy, it is not appropriate to assume that the project should be undertaken simply because the benefits outweigh the costs. In a situation like this, a balancing of interests is needed in order to reach an equitable ratio of cost borne to benefits realized. For example, the federal government aided the Northwest after the logging legislation in order to arrive at a more equitable outcome.[155]

V. APPLYING THE FRAMEWORK TO THE SNAKE RIVER CONTROVERSY

Having developed the modified CBA model, we can apply that model to the Snake River debate in an effort to weigh the options and

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[155] *See* ECONorthwest, *supra* note 105, at 8 (referring to Timber Retraining Benefits).

attempt to determine an optimal solution.[156] Due to the significant economic gains and losses that are possible, as well as the environmental consequences (as measured by both use and nonuse values), the Snake River dams present an interesting test case. The case also proves intriguing because of the significant local and regional economic costs for a benefit that will be shared by a much larger community.[157] The alternative plans that are being considered in the Snake River case also provide an interesting set of variables to take into account.[158]

A. *Environmental Questions*

This section of the article explores the environmental benefits of breaching in two parts. First, it will address the use-value environmental benefits. Second, it will explore the nonuse benefits.

1. Use Value Benefits

In considering environmental use values, this article examines those economic values created by improvements to the environment that are directly measurable by the market. For example, the amount people would be willing to pay to travel to use the improved land in question is one method by which to measure the increased value of the environment; this method is referred to as the travel cost method of determining an economic use value.[159] This value could also be measured strictly by market factors such as the increase in sales related to tourism. The use values for the environmental benefits in the Snake River case are primarily related to recreation and the sport and commercial fishing industries.

The use values for these industries have already been calculated by several different sources, including the Army Corps of Engineers,[160] the drafters of the ECONorthwest study,[161] and Brinckman and Barnett.[162] In

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[156] For the purposes of this article, the optimal decision will be defined as the decision that results in the most benefit as measured by the article's framework based on the modified CBA.

[157] *See* ECONorthwest, *supra* note 105, at 1.

[158] *See* American Rivers Campaign, *supra* note 72.

[159] *See* Ecosystem Valuation, *supra* note 146.

[160] *See* U.S. Army Corps of Engineers, *Lower Snake River Juvenile Salmon Migration Feasibility Study*, *available at* http://www.nww.usace.army.mil/html/offices/pl/er/studies/lsrpublic/lsrmain.htm (last visited Jan. 25, 2001).

[161] *See* ECONorthwest, *supra* note 105, at 1.

[162] Brinckman & Barnett, *supra* note 73.

terms of use value for the recreation industry, breaching is estimated to create a benefit of $230 million over twenty years for the local businesses and residents.[163] The next industry that will make direct gains from the environmental benefits of breaching the dams is the commercial fishing industry. The projections for this industry's gains are $1.6 million after several years, once the anadromous fish of the region have been able to repopulate the Snake River.[164] This gain will be a recurring gain because of the increased availability of commercial harvests. This benefit will affect both the local and larger economy, depending on the particular fishing company.

2. Nonuse Value Benefits

Due to their relatively imprecise nature, the projections for the nonuse values have a wide range.[165] The nonuse values in the Snake River debate include habitat restoration for all of the indigenous species, the restoration and preservation of the ecosystem surrounding the Snake River, and the increase in the quality of life for the surrounding region. One of the greatest nonuse values that breaching the dams will provide is the survival of the endangered species of fish.[166] The estimates for these nonuse values range from $220 million to $1 billion.[167]

The potential environmental costs in the case of the Lower Snake River dams are almost negligible in comparison to the benefits. Some of the potential environmental costs from breaching the dams are the loss of clean energy production, flood control, and the impact on other environmental factors.

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[163] *See* ECONorthwest, *supra* note 105, at 11.

[164] Brinckman and Barnett, *supra* note 73.

[165] If an economist specializing in valuation of nature had been available to assist in drafting this article, the author would have been able to employ one of the nonuse valuation methods in order to determine an appropriate economic value. However, because one was not available, the author will use previous estimates produced by the Army Corps of Engineers and ECONorthwest. Although we cannot verify the actual values assigned to these nonuse values, we do agree that the nonuse values in this case will only increase the overall economic benefit gained from breaching the dams.

[166] For a discussion of some of the nonuse values in this case, *see infra* note 196 and accompanying text. *See also* Brinckman & Barnett, *supra* note 73 (noting that recovery odds for spring Chinook improve with breaching).

[167] *Id.*; *see also* ECONorthwest, *supra* note 105 at 11. The ECONorthwest study also quantifies the increase in the region's ability to draw skilled labor due to the increased environmental benefits. This increase in skilled labor would increase the regions competitive advantage, thus providing further benefit for the economy.

First, the Snake River dams do not provide flood control to the region, but instead provide increased navigability and irrigation.[168] Second, the breaching of the dams would not result in significant environmental costs to other parts of the environment, because we would be restoring the habitat to its natural state by breaching the dams. The main concern, then, is the replacement of hydroelectric energy with a more polluting form of energy production. Although some clean energy will be lost from breaching the dams, the amount lost is only a small quantity.[169] Furthermore, the energy lost may not necessarily need to be replaced, since it can be mitigated through minimal conservation efforts by residents of the Pacific Northwest. For these reasons, the environmental costs of breaching the dams do not weigh significantly in the CBA model for the Snake River decision.

B. *Economic Questions*

1. Potential Economic Gains

What are the potential economic gains from implementing the project? In answering this question, this article will attempt to distinguish the local gains from the larger economy's gains.[170] The gains considered will also be those gains not directly associated with the environmental benefits described above. As we detail the specific gains, we will categorize them into their respective industries and include the time in which the gain will be realized as well as its expected duration.

The first industry that will make substantial gains is the transportation industry, specifically rail and trucking. The gains for this industry are estimated at $59 million per year, and are expected to be realized almost immediately after breaching the dams.[171] In addition to the monetary increase, 475 jobs are expected to be created in the region.[172] These gains primarily benefit the local economy.

The second industry that will gain from breaching the dams is construction. The projected gains for this industry are between $146 and

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[168] American Rivers, *Irrigation*, *supra* note 64.

[169] *See* Trout Unlimited, *supra* note 61 (noting that the dams produce only seven percent of the region's energy).

[170] *See* ECONorthwest, *supra* note 105, at appendix A (defining the local economy as the fifteen counties in Washington, Oregon, and Idaho that are centered on the Lower Snake River).

[171] *See* Brinckman & Barnett, *supra* note 73.

[172] *See* ECONorthwest, *supra* note 105, at 11.

$315 million for construction and improvement of the transportation infrastructure.[173] In addition to these gains, destruction and acquisition of the dams will cost an estimated $859 million.[174] In total, expected gains to the construction industry range from $1.125 to $1.174 billion. These expected gains are a conglomeration of both local and national gains, with the lion's share extending beyond the local economy.

The acquisition gain discussed above does not benefit the entire construction industry, but rather a specific firm within the engineering industry. The task of orchestrating the removal of the dams is one for which only a few firms are qualified. The gain for the selected company is an expected $800 million to $1.2 billion.[175] This gain will probably not be captured by the local economy, but instead will likely go to the national or global economy because of the level of skill required to execute the job.

The final industry that will gain economically from breaching the dams is the energy industry, especially electric power producers in the Northwest. If the Lower Snake River dams are breached, the energy produced by the dams will be lost. Because the energy provided by the dams was supplied to consumers below cost by the BPA, alternative power suppliers will be able to replace this energy at a higher price.[176] The increase in profits for the power companies that supply the region is estimated at $300 million per year.[177] Of course, this benefit assumes that consumers will not reduce their energy consumption through new conservation methods or improved technology.

In addition to the industry gains, the taxpayers will gain as well. Currently, taxpayers are paying a $10 million subsidy for the Lower Snake River transportation system.[178] If the dams are breached, the subsidy will no longer be necessary, saving taxpayers the full amount of the subsidy.

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[173] *See* Brinckman & Barnett, *supra* note 73 (projecting gains of $266 to 315 million); *see also* ECONorthwest, *supra* note 105 (projecting gains of $146 to 267 million).

[174] ECONorthwest, *supra* note 105, at 11.

[175] Brinckman & Barnett, *supra* note 73.

[176] *See id.* Energy produced by the BPA was supplied at a discount to the local power consumers. The replacement of this energy will be provided by private companies, which will be able to increase electricity rates because of reduced supply, and therefore see an increased profit from the breaching.

[177] *Id.*

[178] ECONorthwest, *supra* note 105, at 16.

2. Potential Economic Losses

In addition to providing many potential economic benefits, breaching the dams on the Lower Snake River also has the potential to cause several economic losses. These losses will be categorized in the same manner as the gains. The first industry that stands to be hurt by the breaching of the dams is agriculture. If the dams are breached, there would be a loss of $134 million in the value of irrigated farmland[179] and a loss of $14 to $17 million in annual crop sales.[180]

The second industry that will suffer economic losses from the breaching of the Lower Snake River dams is the barging industry. If the dams are breached, navigation on the river from Pasco to Lewiston will no longer be possible.[181] Without the ability to operate on this portion of the river, the barging industry will lose an estimated $46 million per year in profits,[182] and 239 jobs will be eliminated.[183]

If the barging industry can no longer operate, the consumers who purchase goods that are transported in this manner will see increased prices. Residents of the local and regional communities will incur these increased prices. The cost of transporting goods by means other than by barge are expected to be twenty-eight percent higher, resulting in $35 million per year in extra costs to the consumer.[184]

The community will also suffer additional costs from breaching the dams, due to the increased cost of electricity. These increases were portrayed above as a benefit to the local power companies, but they are also a cost imposed on the local consumers. Rates for electricity to households are expected to rise between $1.50 and $5.30 a month.[185] In addition to increases in electric rates and in the price of goods that can no longer be shipped by barge, the local community will also be adversely affected by the loss of jobs along the section of river no longer accessible by barge. Ten ports along the river are projected to lose a total of about 100 jobs.[186]

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[179] *Id.* at 15. This loss reflects the estimated cost of buying the farmland that will lose irrigation. *Id.*
[180] Brinckman & Barnett, *supra* note 73.
[181] *Id.*
[182] *See id.*
[183] ECONorthwest, *supra* note 105, at 11.
[184] Brinckman & Barnett, *supra* note 73.
[185] *Id.*
[186] *Id.*

The effect on the local taxpayer is undetermined at this point. However, it is important to note the extent to which breaching the dams *could* harm the local economy. Whether breaching would harm local taxpayers remains undetermined, because it has not yet been decided how the costs of the breaching would be funded. With costs in the range of $800 million to $1.2 billion over nine years for the deconstruction,[187] it is important to share the costs equitably or the impact on the local economy will be too great to justify breaching. Options for cost sharing will be discussed in detail in the next section.

Outside of the local community, breaching the dams will affect the larger economy through the loss of the BPA's revenues. Without the energy produced by the dams, the BPA will lose an estimated $250 million per year.[188] This loss will occur immediately after breaching.[189]

C. *Alternatives to Breaching*

What are the alternatives to breaching, and how feasible are they? The current alternatives to breaching the Snake River dams are fish barging or trucking and building fish ladders. Although these options to breaching are available, research suggests that they are simply not feasible in this case. Fish barging is considered by many to be a significant waste of money and resources, because the program has produced no measurable results.[190] Compared to the costs of barging, the results of the program are largely unimpressive.[191] Fish barging has been a failure both

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[187] ECONorthwest, *supra* note 105, at 10. The projected timetable for deconstruction is about nine years.

[188] Brinckman & Barnett, *supra* note 73.

[189] *See id.*

[190] *See* Remove Dams, *Failed Experiment*, *supra* note 91. The article notes that since the inception of fish barging, the results have never reached a sustainable level. *See also* Rollie Wilson, *Removing Dam Development to Recover Columbia Basin Treaty Protected Salmon Economies*, 24 AM. INDIAN L. REV. 357, 398–405 (2000).

[191] *See* Remove Dams, *Barging and Trucking*, *supra* note 94. The authors note that

> [s]ince 1977 the federal government has collected young salmon and steelhead above Snake and Columbia River dams and hauled them downstream in trucks and barges in an attempt to reduce the lethal impacts of dams on migrating fish. This artificial "transportation strategy" has not halted the decline of Columbia Basin fish, according to the region's Independent Scientific Group, nor will it restore sustainable, fishable populations of salmon and steelhead, as required by law and treaty.

Id.

environmentally and economically, and cannot be considered a feasible alternative.[192]

The other alternative to breaching in this case, construction of fish ladders, suffers from the same dismal results as fish barging. Although the fish ladders on the Lower Snake River dams are some of the largest in the world,[193] their success does not compare to their physical size. The fish ladders have accounted for the death of five to fourteen percent of returning salmon at each dam.[194] However, this loss is the least of the problems associated with the fish ladders. The ladders, which are designed to allow mature fish passage back up the river to spawn, solve only part of the problem, since they do not allow juvenile fish to pass down the river.[195]

The purpose of considering the feasibility of alternatives to breaching is to avoid the tendency to dichotomize. However, in the Snake River debate, the choice between breaching or not breaching is ultimately unavoidable. Due to the lack of environmental and economic feasibility of the proposed alternatives, it would only be a waste of resources to proceed with either barging or fish ladders.

D. *Local Impact*

What are the potential impacts on the local and regional economy in comparison with the larger economy? Although the gains and losses have already been described as being primarily local or larger, it is still necessary to focus on how the cost of deconstruction will be shared. This issue must be addressed because the benefits that are received from breaching the dams, such as the survival of several species, recreation in a natural ecosystem, and the preservation of an ecosystem, are all benefits that are shared by people throughout the country. For example, Yellow Stone and Yosemite Parks are natural wonders that benefit their local

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[192] *See* Reisner, *supra* note 82, at 63. Addressing the success of the alternatives, Reisner states that "the Columbia salmon fishery, once the most prolific on earth, [is] now 7 percent of what it was, and despite several billion dollars' worth of restoration efforts [it is] headed generally downhill." *Id.*

[193] *Id.* "[A]dult spawners of the Columbia runs must climb some of the world's highest fish ladders, and at every dam, 5 to 10 percent of them don't make it." *Id.*

[194] *See* Thomas J. Eley & T.H. Watkins, *The Uncertain Fate of the Pacific Northwest Salmon: In a Sea of Trouble*, WILDERNESS, Fall 1991, at 20-26.

[195] *See id.* at 37. "Ninety percent of the smolts are lost on the downstream run—mainly because the ladders were designed to let adult salmon move upstream and did not allow for the return journey."

economies and also provide a significant benefit for all of society. However, the overall societal benefit is not necessarily reflected in the price of admission to the park and the other local benefits. Economically speaking, the federal government is trying to avoid the problem of free-rider externalities.[196] For this reason, the federal government funds the parks in order to prevent an unequal balance of costs and benefit for the local economy.[197]

Similar to the externality problem that exists with the national parks, the possibility for disproportionate sharing of the costs and benefits exists in the Snake River debate. It exists due to the fact that the costs (such as increased electricity rates, increased prices of consumer goods, and the cost of deconstruction) are primarily borne by those in the local community. Due to the higher economic value of the potential benefits compared to the costs in the Snake River dam-breaching debate, the decision now hinges upon the extent to which costs are borne proportionately by the local and federal government.

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[196] *See* M. NEIL BROWNE & JOHN H. HOAG, UNDERSTANDING ECONOMIC ANALYSIS 120-26 (1983).

> An externality is a third-party impact of a market exchange. "Third party" refers to those who are neither buyers nor sellers in the transaction in question. . . . The basic idea is that if some person producing or consuming a good imposes costs on or generates benefits for some other economic actor not involved in the economic exchange, then an externality occurs.

Id. at 120-21. In the case of the Snake River breaching, an externality occurs if the residents of the local economy pay the entire cost of deconstruction. By paying for the deconstruction costs, they are entering into a market transaction with the construction and engineering firms to remove the dams; however, this market transaction provides external benefits for the rest of the country.

The external benefits received by the rest of the nation are not accounted for in the market transaction because the rest of the nation, as a third party in this case, does not pay for the benefits it receives. The externalized benefits include: the satisfaction of knowing the ecosystem is preserved, the preservation of several species from extinction, the promulgation of a natural ecosystem for future generations to enjoy, and the increase in personal happiness from assuming the role of good stewards of the economy. Without government intervention to correct market externalities, the market price does not accurately reflect the individual consumers' willingness to pay. An accurate valuation of consumers' willingness to pay is a central tenet in market pricing. Without an accurate valuation, resources will not be allocated efficiently. In the Snake River case, the price that local consumers are willing to pay will not reflect the entire spectrum of benefits that breaching will provide. *See generally* E. K. HUNT, HISTORY OF ECONOMIC THOUGHT: A CRITICAL PERSPECTIVE 483-90 (2d ed. 1992).

[197] BROWNE & HOAG, *supra* note 196, at 124-6.

If the federal government implements plans suggested by ECONorthwest,[198] or offers assistance, as it has in previous cases, to stabilize the effect on the local economy, the breaching of the dams would be beneficial. However, it is necessary to qualify the level of assistance that is necessary. A significant number of jobs will be lost due to the breaching.[199] Although other jobs will also be created by breaching the dams, in order to mitigate the effects of this structural adjustment the federal government should offer some form of worker retraining assistance to those displaced.

For example, in the transportation industry there will be a net increase of about 239 jobs,[200] but the skills required for new jobs are not necessarily compatible with the skills used in jobs that are lost. Workers displaced from the closed ports on the Snake River should have access to a retraining program that will allow them to take advantage of new jobs that would be created in the trucking and rail industries.[201]

With federal aid, the local community will be able to replace their losses due to the breaching with the gains offered from the breaching. This option is feasible because losses suffered by local economies will fall well within the range of losses that the government has previously offered aid to mitigate.[202] By way of comparison, although the Snake River breaching will negatively impact an estimated 6,200 workers,[203] the Timber Retraining Benefits Program has aided roughly 14,000 workers.[204]

Similarly, a serious discussion must take place in order to decide how to disperse the costs of deconstruction. Funding must be split

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[198] ECONorthwest, *supra* note 105.

[199] *See id.*

[200] *Id.* at 11.

[201] *Id.* at 8. Similar programs have been offered in the past to mitigate the effects of a nationally beneficial decision on the local economy. For example, the Timber Retraining Benefits programs aim to provide displaced timber workers with new skills to find gainful employment. Similar programs have been provided to other workers, such as federal mitigation grants given to Boeing Employees.

[202] *See id.* at 7-9.

[203] *Id.* at 9.

[204] *See id.* at 8. The Timber Retraining Benefits Program is a component of the Job Training Partnership Act and targets timber-dependent communities by providing retraining for dislocated timber workers. Since 1991, when the program began, approximately eighty-one percent of the workers who participated in the program have found work. Funding to date is approximately $162 million. If the federal government provides similar help to local workers, the Snake River economy will not have to shoulder the burden of the costs. By retraining the workers negatively impacted by the breaching of the dams, those workers will be able to benefit from jobs created by the breaching. *Id.*

between the local and federal government to make breaching equitable. The federal government has a responsibility in this case for several reasons: the dams are federal projects, the benefits of restoring the salmon are shared by the nation, and salmon recovery is required by federal legislation and treaties.[205]

With an estimated $859 million to $1.2 billion deconstruction cost, it is interesting how little attention the division of this cost has received.[206] While there have been several mentions of standard ideas on how the cost should be divided, we have found little research detailing specific plans or strategies. American Rivers has offered a generic three-fold strategy whereby: 1) the local community pays for the entire breaching; 2) the federal government pays for the entire breaching; or 3) the local and federal governments split the costs.[207] The drafters of the ECONorthwest study propose a more detailed scenario for funding deconstruction, but even they omit many crucial details. They suggest two options: "1) [d]istribute the cost of the bypass among all U.S. taxpayers [or] 2) [a]lternatively, Congress could apply the current distribution for recovering the operation-and-maintenance costs of the dams, namely, 90% of costs from hydroelectric users and 10% from navigation."[208] With so little discussion surrounding one of the most important issues in the debate, it would be pretentious to offer a conclusive decision at this point. No determinative conclusions can be made due to the unknown factor of how costs will be shared, if at all. If the costs are expected to be borne solely by the local communities, breaching would be extremely and unjustifiably harmful to those affected. However, if the cost is shared by the entire country, then breaching the dams is an equitable solution due to the environmental and economic benefits that would be gained.[209]

VI. CONCLUSION

As the application of the modified cost-benefit model to the Snake River controversy demonstrates, one major benefit of this mode of analysis is that it clearly highlights the information needed to make an

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[205] *See* American Rivers, *Irrigation*, *supra* note 64.

[206] ECONorthwest, *supra* note 105.

[207] *See* American Rivers, *Irrigation*, *supra* note 64. While they do give three alternatives, there are no details offered on how the split between the two governments should be decided.

[208] ECONorthwest, *supra* note 105, at 12.

[209] Although the author is convinced that cost sharing is appropriate, without further research and cost-sharing analysis we cannot offer a specific ratio for the sharing.

informed decision and the conditions which must be met in order to obtain the optimal outcome. As illustrated in the foregoing section, breaching the dams on the Snake River appears to be the most beneficial outcome as long as two conditions are met. First, the costs of the deconstruction should be split between the local and national government so that those who benefit from the deconstruction pay a proportionate amount of the costs. Second, some form of worker retraining program should be provided for those whose jobs are displaced by the deconstruction of the dams.

While this article has demonstrated the usefulness of the modified cost-benefit model for resolving the controversy over breaching the Snake River dams, this model can also be applied to numerous other controversies that will arise over the next decade as the licenses of many dams generating hydroelectricity come up for renewal. Questions of breaching are sure to arise.[210] Of course, while the modified cost-benefit model developed in this article provides a principled framework for determining whether or not to breach a dam, other factors, such as the newly elected President's vocal opposition to breaching, may ultimately determine the fate of individual dams.[211]

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[210] For example, the Michigan and Wisconsin state conservation departments are beginning aggressive assessments of which dams ought to be removed. *See* Fred LeBrun, *Getting to the Dam Problem*, TIMES UNION (Albany, N.Y.), Apr. 15, 1999, at C7, *available at* 1999 WL 8979456.

[211] *See Sacrificing the Environment Won't Solve the Energy Crisis, Says American Rivers*, U.S. NEWSWIRE, Jan. 26, 2001, *available at* 2001 WL 4139434.