The World Commission on Dams:
A Case Study on Grand Coulee Dam and the Columbia River Basin Project
Process and Lessons Learned

by Paul C. Pitzer

Except for the Great Wall of China, dams are the largest man-made objects on this planet. The World Commission on Dams (WCD) states that there are around eight hundred thousand of them scattered across six of the seven continents. Most are comparatively small in volume, but an estimated forty-five thousand are higher than a five story building, and a few are monumental exceeding ten or more million cubic yards of material.[1] These dams are responsible for about 30-40 percent of the irrigated land worldwide and dams generate 19% of the world's electricity.[2]

Various studies have looked at individual dams - their histories, their politics, their technological achievements, their environmental and cultural impacts.[3] From these it is clear that dams can and have dramatically altered the surroundings where they were built. Those changes have brought both positive and negative results and spirited debate continues about which might outweigh the other. Specifically, government bodies, civil society organizations, private contractors, and financial institutions have debated the costs and benefits of dams, large and small. Large dams have come under especially close scrutiny. Proponents point to power production, flood control, irrigation, domestic water supply, navigation, and recreation as worthy enhancements resulting from their construction - this reflecting the nature of most dams as multi-purpose projects. Opponents decry adverse environmental, social, and economic impacts that generally follow in the wake of dam construction - with many of those impacts being unanticipated. There is apparently no exact way to determine if the benefits of a dam outweigh the costs and the heated debate over this has accelerated and continued without resolution. People on both sides of the issue agree that the polarization of opponents and proponents has resulted in a virtual breakdown of constructive dialogue."[4]

One aspect of the argument is the degree to which large dams collectively have successfully accomplished the goals initially projected for them. There have been few comprehensive studies of all large dams on a worldwide basis. "Cooked" figures often cloud the ability to weigh the value of benefits against those of costs. The estimated values of those costs and benefits are generally based on subjective judgments complicated by rapidly changing social priorities. While large dam building in the Industrialized World peaked in the twentieth century and now has more or less stopped, Third World Counties continue to project and build large dams; for example, The Three Gorges structure on the Yangtzee River in China currently under construction. The question is whether or not this is wise, and if so, under what conditions and guidelines future large dams should be built in order to maximize their benefits while minimizing their costs and their detrimental impacts, and guaranteeing achievement of the goals projected for each structure.

In Third World countries many dams have been and are financed by the World Bank.[5] In April 1997, the World Bank, together with the World Conservation Union (IUCN), held a meeting in Gland, Switzerland to discuss a recently completed World Bank study of fifty Bank-funded dams.[6] Participants[7] agreed that an independent commission should review the "performance of large dams and set guidelines for the future."[8] After subsequent meetings, the result was the recommendation that the World Bank and World Conservation Union create, by November 1997, a World Commission on Dams (WCD) which would work (following a five month preparation period) for two years.[9] It would function under two "overarching goals."

First would be "to review the development effectiveness of dams and assess alternatives for water resources and energy development," and second would be "to develop internationally-accepted standards, guidelines and criteria for decision-making in the planning, design, construction, monitoring, operation, and decommissioning of dams."[10] These goals were elaborated in six objectives:

1. To assess the experience with existing, new and proposed large dam projects so as to improve (existing) practices and social and environmental conditions.

2. To develop decision-making criteria and policy and regulatory frameworks for assessing alternatives for energy and water resources development.
3. To evaluate the development effectiveness of large dams.

4. To develop and promote internationally acceptable standards for planning, assessment, design, construction, operation, and monitoring of large dam projects and, if the dams are built, ensure affected peoples are better off.

5. To identify the implications for institutional, policy and financial arrangements so that benefits, costs and risks are equitably shared at the global, national and local levels.

6. To recommend interim modifications-where necessary-of existing policies and guidelines, and promote 'best practices'.[11]

The planners and stakeholders immediately recognized a few significant problems. First, they needed to insure objectivity and second, they needed to involve representatives of all 'stakeholders' in each aspect of the work.[12] To that end, they recommended an independent commission composed of a chair and eleven commissioners with a "secretariat" appointed by the chair. In addition to the goals and objectives, the final report of the WCD was to include "recommendations on policies, standards, guidelines, best practices and codes of conduct" as well as an "understanding of the accuracy of predictions of costs and benefits used in the dam planning process and of their overall development effectiveness and the need for restoration and reparation where necessary."[13] A third problem was the fact that every dam, regardless of size, is unique in its technical configuration, its effects, and its economic and social/cultural surroundings. The planners recognized that drawing meaningful conclusions from many different and distinct sources and studies would be a formidable task.

Finally, there was the problem of paying for the study. The World Bank agreed to arrange funding in the amount of just under ten million dollars. By June 2000, fifty-one contributors had pledged more than seventy-five percent of that amount.[14] Significant contributions came from the governments of Germany, Norway, Australia, Canada, China, Denmark, Finland, Ireland, Japan, South Africa, Sweden, Switzerland, the United Kingdom and the United States.

Guidelines for selection of the commissioners included the need for eminent persons with appropriate expertise and experience, objectivity, and integrity, and independence with the ability to represent the diversity of stakeholders and their points of view including various affected regions, communities, and both public and private sectors.[15] Selected as Chair of the WCD was Professor Kader Asmal of South Africa (Minister of Water Affairs and Forestry).[16] Vice-Chair was Lakshmi Chand Jain of India (High Commissioner to South Africa). The remaining commissioners were Donald J. Blackmore of Australia (Chief Executive,

Murray-Carling Basin Commission), Joji Cariño of the Philippines (Executive Secretary, International Alliance of Indigenous-Tribal People of the Tropical Forest based in London), José Goldemberg of Brazil (Professor and Director of the Institute for Electro-technical Energy, University of Sao Paulo), Judy Henderson of Australia (Chair, Oxfam International), G"ran Lindahl of Sweden (President and CEO, ABB Asea Brown Boveri Ltd. - a global engineering firm), Deborah Moore of the United States (Senior Scientist, Environmental Defense Fund), Medha Patkar of India (Founder, Struggle to Save the Narmda River), Thayer Scudder of the United States (Professor, California Institute of Technology), Jan Veltrop of Norway (Harza Engineering Company and Chairman of the United States Committee on Large Dams), Shen Guoyi of the People's Republic of China (Director General of the Department of International Cooperation in the Ministry of Water Resources), and Achim Steiner as Secretary-General and ex-officio Commissioner.[17]

On 16 February 1998, in Cape Town, South Africa, Professor Asmal officially launched the World Commission on Dams with an address to its commissioners, members of the press, and other interested parties. He emphasized the diversity of the commissioners and the unanimity finally achieved by the stakeholders in their selection - this apparently after some difficulty and disagreements. He emphasized the overarching goals for the WCD and added, "At a time when dam building is increasing in some countries, in others, dams are already reaching the end of their useful lives. Clearly consideration may have to be given to the mechanisms, both with existing dams and those being contemplated, for the effective and efficient decommissioning of dams. Indeed this reality now confronts the owners of a number of large dams in the United States."[18]

The WCD hosted the first of its many public meetings on 21 and 22 September 1998 in Bhopal, India. That meeting focused on "Large Dams and Development in South Asia: Experiences and Lessons Learned."[19] Seemingly having had a successful beginning, the Commission went on to a variety of large and smaller meetings during which announcements identified the representative large dams that it would study in depth. Specifically, the Commissioners identified seven individual large dams and river basins for detailed case studies. These were the Tucurui Dam and Amazon/Tocantins River in Brazil, the Glomma Dam and Lagen River Basin in Norway, the Tarbela Dam and Indus River Basin in Pakistan, the Pak Mun Dam and Mekong/Mun River Basins in Thailand, the Aslantas Dam and Ceyhan River Basin in Turkey, the Kariba Dam and Zambezi River Basin in Zambia/Zimbabwe, and the Grand Coulee Dam (GCD) and Columbia Basin Project (CBP) and the Columbia River Basin in the United States. In addition, the WCD would complete country reviews of China and India. A pilot study would first be done on the Gariep/Van der Kloof Dams and Orange River in South Africa.[20]

For each individual case study, the following questions were to be addressed:

- What were the projected versus actual benefits, costs, and impacts of the dam?
- What were the unexpected benefits, costs, and impacts?
- What was the distribution of costs and benefits - who gained and who lost?
- How were decisions made?
- Did the project comply with the criteria and guidelines of the day?
- What were the lessons learned?

Questions three and six were if greatest significance.

In addition to the seven in-depth studies, the WCD announced that it would also do a limited analysis of an additional 150 dams using existing data from as many sources as possible. The WCD urged interested parties to make contact with specific study groups in order to contribute information and views.

For the following two year period, the WCD established subgroups that began the indicated studies. Commissioners and designated group leaders held extensive meetings and workshops to that end, adhering as much as possible to its "multistakeholder process" - that is, involving representatives of every identifiable aspect connected with that specific project.[21] It is not the purpose of this paper to explore all of those studies but rather to focus specifically on the Grand Coulee Dam study and its findings. Some attention, however, will be given to the final report since the Grand Coulee study contributed to it.

The WCD announced that selection of Grand Coulee Dam for study was based on the dam's size and because of the ongoing debate about its positive and negative impacts. The WCD added that Grand Coulee Dam was also of vital interest since it is a mature dam in a mature democracy where debates about re-licensing, decommissioning, protection of endangered species, and recreational demands on water resources are more advanced than elsewhere in the world.[22]

WCD senior advisors Sanjeev Khangram and Jamie Skinner traveled to Seattle, Washington in February 1999 to begin work on the Grand Coulee study. To guide and complete the study, the advisors selected Dr. Leonard Ortolano of the Civil and Environmental Engineering Department at Stanford University. Assisting Ortolano was Dr. Katherine Kao Cushing from the University of California at Berkeley.[23]

On 20 May 1999, fifty-six stakeholders met with Ortolano, Cushing, Commissioner Jan Veltrop, and WCD Senior Advisor Sanjeev Khagram (an assistant professor of public policy at the John F. Kennedy School of Government at Harvard University) at Cavanaugh's Inn at the Park in Spokane, Washington. The stakeholders represented government agencies, farmers, industry, and Native-Americans. Most of those attending were from the United States but there was some representation from Canada. The meeting was at times contentious as various stakeholders had strongly-held views and agendas. Some feared that the whole thing was an attempt by environmentalists to remove more dams - specifically Grand Coulee Dam. In fact, a column in the Davenport Times of Spokane had called the Commission an "upstart group of pseudo scientists" who would "come down on the side of removing, abandoning or breaching the mighty Grand Coulee Dam."[24] Columbia Basin Project farmers wanted to redress decades-old grievances concerning cost of the water delivered to them and their desire to expand the project. Native-Americans were anxious to discuss their cultural losses resulting from dam construction. Regional politicians were disturbed at the prospect of somehow losing local control. Some questioned the origins of funding for the WCD, wondering who was behind the study and to what end? Bureau of Reclamation Public Affairs Officer Craig Sprankle reported later that after listening to Professor Ortolano and looking at and commenting on the issues and questions to be studied, there was less suspicion.[25]

Antagonisms between project farmers and others involved with irrigation projects is an on-going saga. Farmers, who often pressured the government to build dams and irrigation facilities later complained bitterly about the cost of the water. Such had been the case on the Columbia Basin Project. Early on in the project's history, many farmers balked at land ownership restrictions and withdrew from the project. In the late 1950s and early 1960s, farmers and the Bureau of Reclamation carried on an especially acrimonious debate about renegotiation

of costs. The need to raise charges stemmed to some degree from high unanticipated costs needed to install drainage facilities.[26] Easing of land ownership restrictions during the Reagan years has led farmers to want project expansion, but they balked at the anticipated cost which in the 1990s was estimated at about two billion dollars.

In the 1990s the Bureau of Reclamation conducted two environmental impact studies concerning project expansion and concluded that it was not practical at that time.[27] Area farmers dispute the findings and challenge figures - especially the allocation of moneys collected from the sale of power generated at the dam.[28] Many of the "old-timers" remember promises made in the 1920s and 1930s that the water would actually be free, and that power sales would pay all of the costs.[29] All of the deeply held opinions among the participants made it difficult for participants to achieve consensus.

The purpose of the Spokane meeting was to draft a scoping paper delineating the issues to be addressed within the framework of the case study procedure. Eventually the stakeholders divided into breakout groups and addressed the task. Under the headings of Irrigation, Hydropower, Flood Control, Project-Affected People, Ecosystems/Anadromous Fish, Recreation, Distribution of Benefits and Costs, and Basin-Wide Issues, the participants identified 114 issues. These were later arranged into three categories: Issues to be addressed in the study, Interesting background information, and Issues of less direct relevance. Forty-three issues were listed as primary for the study, fifty-eight were background information, and eleven were of less direct relevance.[30]

The WCD Grand Coulee team also held a meeting on 4 October 1999 in Castlegar, Canada to gather additional input. Seventeen stakeholders attended representing BC Hydro, Canadian First-Nations, and others. They added to and discussed the results of the Spokane meeting.

In the area of irrigation, the stakeholders directed Ortolano to concentrate on technological changes since the start of the project - specifically increased efficiency, altered attitudes concerning the environment (with emphasis on fish, waterfowl, and groundwater quality), and factors obstructing expansion of the project. Concerning hydropower, the stakeholders urged focus on distribution of low-cost benefits (specifically, the stakeholders pointed out that availability of low-cost power in the region had drawn new industry creating a growing market for power which was resulting in increased costs to all including farmers). There were no concerns aimed at flood control. In the category of project-affected people, stakeholders directed the WCD team to detail the "displacement" of Native-Americans, reparations for such displacements, disruption to their cultural lives, and destruction of such culturally significant items as burial sites. With ecosystems and anadromous fish, there was a range of opinions. In general, the stakeholders urged consideration of impacts of Grand Coulee Dam on native species as well as those introduced to mitigate anticipated damage. Concerning recreation, conflict between the need for occasional drawdowns of Franklin D. Roosevelt Lake and the desires of locals for consistent lake levels drew attention. Distribution of benefits and costs led the stakeholders to urge reexamination of the "relationship between hydropower revenues and cost of providing irrigation works and water." In addition, stakeholders pointed to the Columbia Basin Treaty between the United States and Canada, and wondered, "Who pays for what? Who benefits and who looses?" Finally, under basin-wide issues, the Canadian stakeholders felt that "...basin-wide management system, in some instances, led to a transfer of benefits from Canada to the U.S. (For example, there used to be orchards upstream, now there are none. But there are orchards downstream)." In short, the stakeholders urged the WCD committee to explore fully the Columbia Basin Treaty.[31]

It is significant to speculate, at this point, that the comments of the stakeholders and the degree to which at least some of them pursued their individual agendas rested on a measure of misunderstanding on their part about the nature and authority of the World Commission on Dams. Although none of the stakeholders said as much at the Spokane meeting, or at any other meeting, there was in their comments an implication that they felt the WCD had the power and authority to redress their grievances. Lost was full appreciation of the WCD's charge to examine the dams in question only with the hope of presenting information about past experiences and develop guidelines for future large dam development elsewhere. At no time did the WCD studies intend to influence existing conditions nor did it have the authority to correct problems and injustices however lamentable.[32]

Based on their study so far and the results of the Spokane meeting, in June 1999, Ortolano and Cushing issued their scoping report for the Grand Coulee Dam and Columbia Basin Project case study.[33] It presented a précis that would act as the guide for the eventual final report. Divided into eight major sections, that final report would contain an introduction explaining the study and naming the participants, an overview of the nature of the Columbia Basin Project, an historical analysis of the project's development, discussion of costs and benefits including unexpected impacts, a look at distribution of those costs and benefits, analysis of consistency with planing criteria and norms, basin-wide linkages, and finally, an assessment of development effectiveness and lessons learned. The lessons learned would be the heart of the findings and the most significant section that would move on into the WCD's overall final report.

Over the next six months, Ortolano and his team gathered information, conducted interviews, drew together detailed background and historical studies and essays, and began to formulate their final report. Early in December 1999, the team released a circulation draft of the proposed final report.[34] At over four hundred pages, the draft report contained detailed histories, charts, maps, and other findings including analysis of interviews and conclusions based on the data. Copies of the draft were circulated to stakeholders who were then invited to a final meeting.

That all-day meeting was held at the Benson Hotel in Portland, Oregon on 13 January 2000. Thirty-four persons attended - somewhat fewer than anticipated.[35] Twenty-six were stakeholders; two of the others were WCD Commissioners Jan Veltrop and Deborah Moore, two observers came from the World Resources Institute and Harvard University (both of which were conducting independent investigations of the WCD process), representing the WCD was Senior Advisor Jamie Skinner, and the others were in some way part of the Grand Coulee study team.[36]

After introductions and statements by Commissioners Veltrop and Moore, Professor Ortolano presented the study's main findings. He recited a brief history of the project and detailed its beneficiaries and major cost-bearers. To no one's surprise, he listed the beneficiaries, in order of significance, as Columbia Basin Project farmers or irrigators, Bonneville Power Administration ratepayers, Downstream residents and businesses, Recreators and recreation-related commerce, and United States residents in the Northwestern states, and Canada.[37] Major cost-bearers were, in order of significance, Native-American and First Nations Tribes, environmentalists and environmental non-governmental organizations, commercial fishermen, sport fishermen, non-Native-Americans forced to resettle, United States taxpayers, Bonneville Power Administration ratepayers, some United States farmers outside the project area, and Canada.[38]

At first glance, it appears odd that Bonneville Power Administration (BPA) ratepayers appeared on both lists. Grand Coulee Dam is a key component of the Federal Columbia River Power System which supplies seventy-five percent of the power in the region at costs well below the national average. Direct Service Industries and large industrial customers benefit from even

more generous rates. On the other hand, the rates could be lower. BPA ratepayers also underwrite irrigation, fish mitigation programs and programs to enhance and recover endangered anadromous fish populations. In the area of irrigation, ratepayers cover eighty-seven percent of the irrigators' construction costs - a sizable subsidy which accounts, in large part, for irrigation being the first item among the beneficiaries. In fact, there was nearly unanimous agreement among interviewed stakeholders that the irrigating farmers were the prime beneficiaries of the project. BPA ratepayers would pay even less if they did not subsidize irrigation and fish protection. Hence they both benefit and at the same time, bear some of the costs of the project.

Despite the extensive benefits received by farmers, following in the tradition of their physiocrat predecessors, representatives of the irrigation districts felt the study should reflect what the farmers pay rather than what they do not pay. "For example, they pay for Operation and Management and equipment replacement. The subsidy irrigators receive is only for construction. Irrigation district representatives felt there was no power subsidy because they pay for primary and secondary pumping costs 'at cost.' Professor Ortolano responded by saying that what the farmers pay does not reflect the value of power in the open market. The irrigators voiced their objection to the use of the term subsidy."[39] At no time did anyone point out that without the government underwriting the project and the income from the sale of electricity, the cost to farmers to compensate for the water they receive would be both astronomical and prohibitive.

Native-American representatives felt that modern tribal economies and the project's effects on them were not adequately covered in the report. Representatives of the Colville Confederated Tribes agreed to supply Ortolano with additional information detailing specific losses resulting from construction of the dam, the reservoir, and the irrigation project.

Stakeholders were then each asked to fill out a form dealing with the eight "lessons learned," that appeared in section eight of the draft study. Each could indicate strong agreement (sa), agreement (a), no view (nv), disagreement (d), or strong disagreement (sd).

Briefly stated, the eight lessons and the feedback on them were as follows:

1. An open planning process facilitates identifying and resolving conflicts among stakeholders; a close process serves the opposite purpose.
sa: 7 a: 6 nv: 0 d: 2 sd: 3

2. Periodic, planned re-evaluations of project operations provide a mechanism for incorporating temporal changes in social values into project operations.
sa: 6 a: 4 nv: 1 d: 2 sd: 5

3. Periodic, planned re-evaluations of project operations provide a mechanism for incorporating changes in science and technology into project operations.
sa: 6 a: 5 nv: 0 d: 2 sd: 5

4. While subsidies for water project outputs can accomplish useful social policy objectives, they can lead to situations where resources are not used in an economically efficient manner.
sa: 2 a: 9 nv: 0 d: 4 sd: 3

5. There are limits to government planning in a market-driven, capitalistic system.
sa: 2 a: 9 nv: 2 d: 1 sd: 4

6. In a decentralized resource management decision-making context such as the one existing in the Columbia basin, failure of stakeholders to coordinate can lead to major institutional failures.
sa: 1 a: 9 nv: 2 d: 2 sd: 3

7. Decisions that introduce significant irreversible effects should only be taken after very careful study.
sa: 4 a: 7 nv: 1 d: 2 sd: 3

8. Tools for cumulative impact assessment need to be applied to avoid resource management problems.
sa: 6 a: 6 nv: 0 d: 2 sd: 3

While the minutes of the meeting reflected the analysis that stakeholders mostly agreed with item number one and items five through eight and were split on items two through four, it is clear that there was no consensus or general agreement and that respondents were 'all over the board.' Not all stakeholders responded to each lesson, and one stated later that he had disagreed with all statements simply because he disagreed with the report in general.

Discussion of the lessons learned took considerably longer than had been anticipated and consequently, participants did not complete the full agenda. Comments included suggestions for an increased list of beneficiaries.[40] Three additional lessons learned were suggested:

1. Once you build a project, there will continue to be debate about how a project is operated and a plan should be in place for a process to manage these debates about operations.

2. In large projects, most of which are multi-purpose, it is possible for the various purposes to be in opposition, and even mutually exclusive (e.g., foregone power revenues due to irrigation withdrawals).
3. Mechanisms need to be created to address claims by peoples adversely affected by projects.

With all of this in hand, Ortolano and his team prepared the final report which they issued in March 2000. It contained eleven lessons learned; three (number one, number seven - which became number ten, and number eight - which became number eleven) remained the same or nearly the same as in the preliminary study. Altered were numbers two, three and five and added were five entirely new items. The altered and new items are listed below:

1. Same as #1 above

2. In a multipurpose water project, it is common for project purposes (e.g. flood control and recreation) to conflict. Because conflicts among various purposes are practically inevitable, a process for managing stakeholder contributions to debates on project operations should be institutionalized on future projects.

3. (which was changed from #2 above) For future projects, periodic, planned re-evaluations can provide a mechanism for incorporating temporal changes in social values into project operations. To meet social policy objectives, it might be necessary to reduce uncertainties for stakeholders whose decisions would be influenced by results of re-evaluations.

4. (which was changed from #3 above) For future projects, periodic, planned re-evaluations provide a mechanism for incorporating changes in science and technology into project operations. To meet social policy objectives, it might be necessary to reduce uncertainties for stakeholders whose decisions would be influenced by results of re-evaluations.

5. Substantial inflation-corrected cost overruns in GCD and CBP reflect the uncertainties that surround large construction projects. These uncertainties underscore the need for wide-ranging sensitivity analyses to ensure that project goals and objectives are robust and can be met with available resources. Implicit or indirect subsidies need to be evaluated under alternative market conditions to ensure that the subsidies are in line with the project's social objectives.

6. Stakeholders and planners involved in an open planning process need to work with a common conceptual framework and vocabulary in making formal project appraisals. Of particular importance is the distinction between private and social (economy-wide) perspectives. Failure to develop a shared conceptual framework and vocabulary can lead to unnecessary acrimony.

7. In large water resources projects, those who bear the costs may not receive many benefits. Therefore, mechanisms for ensuring just compensation are important. In a project that has impacts that cross international borders, the usual forums for allowing parties to make compensation claims -- for example, the judicial system in the US -- may not be satisfactory, and alternative forums should be considered. Alternative dispute resolution mechanisms may also be able to speed up the settlements of claims normally brought using the court system.

8. (Which was changed from #5 above) Limits exist on the extent to which government plans can be implemented effectively in a market-driven capitalistic economy.
9. In designing institutions for river basin management, centralization and decentralization each have their advantages and disadvantages.

10. Same as #7 above.

11. Same as #8 above.[41]

The report altered a bit the list of beneficiaries and cost bearers and concluded that the major beneficiaries of the Columbia Basin Project (CBP) were/are, in descending order, the local Irrigators and agribusiness people, Bonneville Power Administration (BPA) rate payers (including public utility districts [PUD]), downstream residents, people using the area for recreation, the general economy of the Northwestern United States, and British Columbia Hydro ratepayers. On the distaff side, the cost bearers in descending order were/are United States and Canadian native peoples, persons concerned with maintaining ecosystem integrity, commercial fishing interests in the United States and Canada, sports fishing interests, non-Native peoples who were forced to relocate, United States taxpayers, some United States farmers outside of the CBP area, and some upstream residents and businesses.[42]

No project in American history had been as completely and thoroughly studied prior to its construction as was the Columbia Basin Project. Through the 1920s numerous investigations looked into the various plans to irrigate the Columbia Basin with the definitive report completed by the Army Corps of Engineers in 1932; the so-called Butler Report or 308 Report.[43] That report established the "grand plan" for development of the Columbia River, a blueprint largely followed through subsequent decades. It finally established the physical, if not the economic

viability of Grand Coulee Dam and the Columbia Basin Project. In the 1940s, Harlan Barrows of the University of Chicago investigated twenty-eight potential problems that would guide the development of irrigation using water from behind Grand Coulee Dam. Barrows, who had been instrumental in planning for the Tennessee Valley Authority, took four years and used over three hundred people to scrutinize every aspect of the project then imaginable with the hope of yielding a planned and orderly development free from significant difficulties. The resulting Columbia Basin Joint Investigations (CBJI) filled many books and acted as the guide for building not only the irrigation works, but also planned communities, industry, and laid out the whole economic and physical strategy for the area.[44] The overarching ideal was to create a "planned promised land" where the economy and the environment were controlled eliminating both financial depression and drought. A hold-over from the New Deal, the concept of planning would have been applied as fully as possible.[45]

Repeatedly, the findings of the WCD report indicate the failures of particularly the Joint Investigations.[46] For example, farmers were scheduled to repay fifty percent of the cost of irrigation but they actually pay only about ten to fifteen percent. The CBJI dramatically underestimated productivity per acre on the project. Crop production in 1998 was $637 million, over twice what had been predicted, even with dollar values adjusted for inflation. The investigations projected 80,000 families living in created towns and on something in excess of 10,000 farms of about 160 acres each. The average farm size now of about five hundred acres is much greater than the planners recommended as prodigious changes in farm technology have thwarted the goal that would have fostered the growth of small family farms and rural communities.[47] None of the anticipated planned communities/cities have materialized. Farmers tended to locate in already existing towns rather than in new communities or on their farms.

The CBJI did not envision a third powerhouse at Grand Coulee Dam or any of the large upstream dams that now regulate the flow of the Columbia River. When dollar values are adjusted for inflation the cost of the original and the newer power generating facilities at the dam have run about thirty percent higher than estimated.[48] On the positive side, among other things, the CBJI in no way anticipated the atmospheric pollutants avoided through the use of hydroelectric power rather than fossil fuel alternatives, a benefit which has a high value but one difficult to calculate.

The WCD report concluded that it would be impossible to assess the success or failure of the Grand Coulee Fish Management Project (GCFMP) which set a target rate of 36,500 salmon passing up the river to spawn annually. In the 1930s, over 70,000 fish were caught annually by commercial fisheries alone. Nobody knows the total number of fish that utilized the river in those days. Today there is no viable commercial fishery as little or no commercial fishing is allowed. This change in conditions renders meaningless any attempts at evaluation.[49]

If nothing else, the case of Grand Coulee Dam and the Columbia Basin Irrigation Project demonstrates the difficulties encountered in trying to plan a large project with multiple and varied impacts existing in a dynamic and rapidly changing society. Anticipating the future with its shifting values and goals is impossible. This author clearly remembers one of his teachers in the early 1950s telling our elementary school class that the large dams on the Columbia River were "conservation projects." Few knowledgeable teachers would make that statement today.

"At the time GCD was planned, assessing ecological effects of proposed federal projects was neither a requirement nor a priority."[50] "The state of knowledge of ecosystems at the time was such that virtually no consideration was given to the maintenance of genetic biodiversity."[51] In addition to the most obvious damage to the salmon (anadromous fish), the project caused

dramatic changes in the plant and animal populations of the project area while at the same time creating new wetlands and habitat areas. Little of this was anticipated, and only minimal care is taken now of the new wildlife areas.

In the 1930s and 1940s, there was no process for including input from the Colville and Spokane tribes in any aspect of the decision making process. This matter was not addressed for decades and was only somewhat remedied in the mid-1990s when the government finally reached a settlement with the affected peoples.[52]

Trade-offs also exist between regional development and objectives related to equity and the environment. This is clearly shown by the way GCD affected indigenous peoples in the upper Columbia River Basin. In the view of many Native Americans and members of First Nations in Canada, GCD was nothing short of catastrophic. For them, the project had a disastrous effect on the continuance of their culture.[53]

The WCD report stresses the need to have all stakeholders involved in decision making from the outset, and this is reflected in the lessons learned listed above; especially lesson number one.

The WCD report gave considerable attention to the economic viability of Grand Coulee Dam and the Columbia Basin Project. Because an economic efficiency objective (the condition that economic benefits exceed costs) for water resources projects developed by Reclamation and the Corps did not come about until the late 1930s and early 1940s, this objective had little formal influence on the planning of GCD and CBP. However, concerns about what would now be termed economic efficiency were raised in the context of GCD and CBP. For example, the US Secretary of Agriculture and the Chief of the US Army Corps of Engineers both used economic efficiency arguments to support their opposition to the project.[54]

The WCD report concludes that due to the need for projects to increase employment during the economic depression of the 1930s , Franklin Roosevelt's promise to honor campaign commitments in the Northwest, and the strength and effectiveness of local project supporters, concerns about whether or not the undertaking would be economically viable were ignored or overridden. Furthermore, at the time, there was minimal concern, if any, for the feelings of and cultural stability of the Native-Americans involved. The WCD report continues,

> ...the consensus of the 12 individuals we interviewed representing irrigators, PUDs, and local governments in the CBP area was that the net positive impacts of GCD and CBP for the region far outweighed the costs to Native Americans [sic.]. Such regional development arguments frequently ignore the subtleties involved in making arguments related to economic efficiency. Indeed, some of those who trumpet the economic significance of the project do not recognize either the failure to pay interest on the capital cost of irrigation or the lost power revenues associated with providing below-market price energy to pump irrigation water as signs of economic inefficiency.[55]

If judged in terms of only regional development goals, the CBP must be considered a success. Indeed, the WCD report admits that the hydroelectric facilities have had an overwhelmingly positive benefit-cost ratio.[56] However, there have been considerable power cost subsidies to local users such as Public Utility Districts (PUDs). In other words, had the market price been charged to all, the benefits would have been even greater.

The report's executive summary concludes,

> The regional development objectives of GCD and CBP have, to a considerable extent, been achieved. But they have come at a substantial cost to the rest of the economy, both in terms of direct construction subsidies and in revenues foregone from indirect subsidies in the form of below-market energy prices.[57]

As for the cultural impact of the project, the WCD report states,

> There is no calculation procedure that allows a balancing of these negative social impacts and cultural losses against the substantial regional development benefits that the US Northwest has enjoyed as a result of GCD and CBP.[58]

The report also commented on the irreversible elimination of anadromous fish runs in the hundreds of miles of habitat upstream from Grand Coulee Dam, and the damage done to wild stocks of salmon and steelhead in the mid-Columbia River tributaries with the introduction of hatchery and transplanted fish.

Today, US citizens rely on an open planning process tied to NEPA (National Environmental Protection Act) to help decision-makers become aware of trade-offs: how much of one objective, such as the quality of the environment, must be sacrificed when attempting to augment another, such as regional development. However, nothing equivalent to NEPA existed in the time that President Franklin Delano Roosevelt and his administrators decided to proceed with construction of GCD. Moreover, even the open planning prescribed by NEPA has limitations. For example the NEPA process does not necessarily address the consequences of unequal power among stakeholders, a problem that still plagues the anadromous fish recovery and recreational jurisdiction issues associated with GCD and CBP.[59]

Finally, the WCD report summary concludes:

> After nearly 60 years of project operations, those who have benefited from GCD and CBP have, quite naturally, become focused on maintaining the advantages they have enjoyed as a result of the project -- mainly low-cost irrigation water, low-cost electricity, and benefits from flood control and recreation. At the same time, groups that were disadvantaged by the project (i.e., Native Americans and First Nations) are continuing their struggles to obtain compensation for what they perceive as broken promises and grave injustices of the past. It is possible that individuals who gain or lose from future water resources projects will be just as tenacious in defending their gains or seeking compensation for their losses many years after basic project decisions have been made.[60]

The overriding objective of the WCD was to provide guidance for future large dam projects. The preceding quote was aimed toward that end, and it provides a convenient segue into comments about the completed final overall report of the WCD which would assess and meld the findings of all of the regional studies including the GCD and CBP study.

With some fanfare, Nelson Mandela and the WCD Commissioners unveiled the final report at a luncheon held in London on 16 November 2000. Over three hundred invited dignitaries attended including World Bank President James D. Wolfensohn and World

Conservation Union Director General, Maritta von Bieberstein Koch-Weser.[61] That report incorporated findings of the worldwide studies of large dams including those from Grand Coulee Dam.[62]

The Final Report found that worldwide sixty to eighty million people have been displaced by dams while sixty percent of the world's rivers have been affected by dams and diversions.[63] The study found the use of water worldwide to be more than twice what it was fifty years ago. The report listed eight significant conclusions:

- Large dams display a high degree of variability in delivering predicted water and electricity services -- and related social benefits -- with a considerable portion falling short of physical and economic targets, while others continue generating benefits after 30 to 40 years.

- Large dams have demonstrated a marked tendency towards schedule delays and significant cost overruns.

- Large dams designed to deliver irrigation services have typically fallen short of physical targets, did not recover their cost and have been less profitable in economic terms than expected.

- Large hydropower dams tend to perform closer to, but still below, targets for power generation, generally meet their financial targets but demonstrate variable economic performance relative to targets, with a number of notable under-and over-performers.

- Large dams generally have a range of extensive impacts on rivers, watersheds and aquatic ecosystems -- these impacts are more negative than positive and, in many cases, have led to irreversible loss of species and ecosystems.

- Efforts to date to counter the ecosystem impacts of large dams have met with limited success owing to the lack of attention to anticipating and avoiding impacts, the poor quality and uncertainty of predictions, the difficulty of coping with all impacts, and the only partial implementation and success of mitigation measures.

- Pervasive and systematic failure to assess the range of potential negative impacts and implement adequate mitigation, resettlement and development programmes for the displaced, and the failure to account for the consequences of large dams for downstream livelihoods have led to the impoverishment and suffering of millions, giving rise to growing opposition to dams by affected communities worldwide.

- Since the environment and social costs of large dams have been poorly accounted for in economic terms, the true profitability of these schemes remains elusive.[64]

The report continued, "...the WCD Global Review documents a frequent failure to recognize affected people and empower them to participate in the process. As the Global Review of dams makes clear, improving development outcomes in the future requires a substantially expanded basis for deciding on proposed water and energy development projects."[65]

The report made recommendations and commented,

> Social, environmental, governance and compliance aspects have been undervalued in decision-making in the past. It is here that the Commission has developed criteria and guidelines to innovate and improve on the body of knowledge on good practices and add value to guidelines already in common use. Seen in conjunction with existing decision-support instruments, the Commission's criteria and guidelines provide a new direction for appropriate and sustainable development.

Bringing about this change will require:

- planners to identify stakeholders through a process that recognizes rights and assesses risks;
- States to invest more at an earlier stage to screen out inappropriate projects and facilitate integration across sectors within the context of the river basin;
- consultants and agencies to ensure outcomes from feasibility studies are socially and environmentally acceptable;
- the promotion of open and meaningful participation at all stages of planning and implementation, leading to negotiated outcomes;
- developers to accept accountability through contractual commitments for effectively mitigating social and environmental impacts;
- improving compliance through independent review; and
- dam owners to apply lessons learned from past experiences through regular monitoring and adapting to changing needs and contexts.[66]

The WCD congratulated itself by pointing out that it had conducted "the first comprehensive global and independent review of the performance of essential aspects of dams and their contribution to development."[67] But the recommendations, while commendable, are somewhat utopian. It is clear that consideration of all "stakeholders" in the decisions affecting any given large dam would have meant that few, if any, would ever have been built. Identification of stakeholders itself presents a problem. In the 1930s, at the time of Grand Coulee Dam construction, for example, who could have predicted the advances in power transmission that would make the entire trans-Rockies West a market for the dam's electricity? And if that had been anticipated, would (or should) power interests in California or Nevada have been allowed the same input as those in Oregon and Washington? This is a question of particular significance at this writing (March 2001) as power shortages and brown-outs plague California.

When a government agency implements its act of "taking" through eminent domain, not many feel adequately compensated, and changes in lifestyle or culture are beyond replacement or adjustment. All large dams have involved tradeoffs, and in most cases, the power of government and/or industry have overshadowed the desires of those adversely affected. There is little reason

to believe that this will not continue, and in fact, it continues today with the formidable Three Gorges Project on the Yangtzee River in China where over a million people will ultimately be displaced. Where the environment is concerned, when and where push comes to shove, the demand for power, for example, will undoubtedly overshadow environmental damage.[68] Few Americans are willing to keep their homes cooler in winter, do without air conditioning in summer, and eliminate use of other electrical conveniences.

The studies by the World Commission on Dams were a prodigious and laudable undertaking. Their main contribution may be amassing and assembling information about dams, their histories, and their problems all in one place. Few, if any, of the findings are new or startling. The report, like the final report on Grand Coulee Dam, while acknowledging past goals and how they have changed, clearly reflects and emphasizes the values and concerns of the late 1990s industrialized countries and not those of the times when the various dams were built or the conditions under which they were built. The recommendations are praiseworthy, but only time will tell if they have any significant impact.

ENDNOTES

1. The Large Dams Debate, http://www.dams.org/about/debate.htm. The International Commission on Large Dams (ICOLD) estimates that there are in excess of 20,000 dams in China alone. See the Web Page of the World Commission on Dams: Dam Facts and Statistics; http://www.dams.org/consult_region_esea_stats.asp. Note that the extensive and detailed web pages of the World Commission on Dams form the primary source for this paper along with printed copies of the Commission's reports and the personal experiences of this author working on some of those reports. As web pages are fluid and often changing things. some of the addresses listed in notes below may no longer be functioning. This author has printed copies of all web pages cited. To start with the main page of the WCD, go to http://www.dams.org. Note that spellings in all WCD documents (including where such are cited in this paper) conform to British spellings.

2. ***World Commission on Dams, Dams and Development: A New Framework for Decision-Making, The Report of the World Commission on Dams***, (London: Earthscan Publications, Ltd. November 2000), Executive Summery, p. xxviii.

   Examples of such studies would include: Murray Morgan, The Dam (New York: Viking Press, 1954); Joseph E. Stevens, Hoover Dam: An American Adventure (Norman, Oklahoma: University of Oklahoma Press, 1988); Russell Martin, A Story That Stands Like a Dam: Glen Canyon and the Struggle for the Soul of the West (New York: Henry Holt and Company, 1989)

3. The Large Dams Debate, http://www.dams.org/about/debate.htm.

4. Social, economic, and environmental problems resulting from dam construction led the World Bank to consider ending funding for dam construction and switch emphasis to coal as a source of power. The problems from burning of fossil fuels led to a renewed interest in dams. See WCD in the Media, 19 April 1997, http://www.dams.org/MediaItem.asp?item=46.

5. The Mandate of the World Commission on Dams; http://www.dams.org/mandate.asp. For a list of participants in the Gland, Switzerland workshop, see: Commission World Dams1, http://www.cwra.org/news/arts/tonydam1.htm.

6. Participants included the Institute of Hydrology, UK; Tata Energy Research Institute, India; Institute of Population Resources, China; ISAGEN, Columbia; Tropical Environmental Cons. Ltd., Senegal; Intermediate Technology Development Group, UK; Volta River Authority, Ghana; Harza Engineering Company, USA; Lesotho Highlands Water Project, Lesotho; Movimento dos Atingidos por Barragens, Brazil; Alliance for Energy, Nepal; Electricite de France, France; International Commission on Irrigation and Drainage; Ministry of Water Resources, China; Asea Brown Boveri (ABB), Switzerland; International Finance Corporation; Berne Declaration, Switzerland; Narmada Bachao Andolan (NBA), India; Nam Theun 2 Electricity Consortium (NTEC), Laos; International Rivers Network, USA; Laymeyer International, Germany California Institute of Technology, USA; International Commission on Large Dams; Electrowatt Engineering Ltd, Switzerland; The World Bank; IUCH-The World Conservation Union, Switzerland and Laos. World Commission on Dams Overview Http://www.dams.org/overview.asp. Also see Press Release for 11 April 1997, http://www.dams.org/PressReleaseItem.asp?item=42.

7. The Mandate of the World Commission on Dams; http://www.dams.org/mandate.asp.

8. The initial goal was for the World Commission on Dams to start work in June 1998 and file its final report in June 2000. With some delays, the final report, discussed below, was issued November 16, 2000.

9. The Mandate of the World Commission on Dams; http://www.dams.org/mandate.asp.

10. World Commission on Dams Overview Http://www.dams.org/overview.asp

11. A 'Stakeholder' is any person or group that has some interest in or can be in any way affected by a project or undertaking. For creation of the WCD, the World Bank and World Conservation Union identified fifty stakeholders who guided selection of the Commissioners.

12. World Commission on Dams Overview Http://www.dams.org/overview.asp.

13. Contributors included Swedish International Development Cooperation Agency (Sida); Norwegian Ministry of Foreign Affairs; The World Bank; Deutsche Gesellschaft für Technische Zusammen Arbeit (GTZ); Siemens; Kreditanstalt für Wiederaufbau (KFW); South African Department of Water Affairs and Forestry; Harza Engineering; The Government of the People's Republic of China, Ministry of Water Resources; German Federal Ministry of Economic Cooperation and Development (BMZ); Denmark Ministry of Foreign Affairs; Enron; Hydro Quebec; Ministry of Finance - Japan; National Wildlife Federation; Swiss Agency for Development and Cooperation (SDC); World Wildlife Fund; Canadian International Development Agency; United Kingdom Department for International Development; Charles Steward Mott Foundation; Bureau of Reclamation, United States; Coyne et Bellier; Atlas Copco (USA); Berne Declaration; Skanska;

Republic of Ireland; United Nations Foundation; Goldman Environmental Fund; United Nations Environment Programme; AusAID, The Australian Government's Overseas Aid Programme; Ministerie van Buitenlandse Zaken - The Netherlands; Ministry of Foreign Affairs, Finland. Funding and Finances, http://www.dams.org/about/funding.htm.

14. The Commissioners, http://www.dams.org/about/commissioners.htm.

15. For additional information on Professor Kader Asmal, see WCD Press Releases 24 September 1997, http://www.dams.org/PressReleaseItem.asp?item=41.

16. The Commissioners, http://www.dams.org/about/commissioners.htm, and http://www.dams.org/comm.asp. It is significant to note that all of the commissioners had multi-national experiences in their professional lives. Selection of some commissioners and of the vice-chair were complicated by controversy and disagreements among the stakeholders. History-Commission Launch, http://www.dams.org/launch.asp.

17. History: Commission Launch, http://www.dams.org/launch.asp. Also see http://www.dams.org/press/pressrelease_4.htm.

18. WCD Press Releases, 7 September 1998, http://www.dams.org/PressReleaseItem.asp?item=37.

19. Focal Dams/River Basin Case Studies, http://www.dams.org/studies/. For individual press releases announcing WCD studies, see WCD Press Releases, 29 January 1999 (Tarbela Dam) http://www.dams.org/PressReleaseItem.asp?item=67; WCD Press Releases, 21 February 1999 (Grand Coulee Dam), http://www.dams.org/PressReleaseItem.asp?item=68; WCD Press Releases, 18 March 1999 (Tucurui Dam), http://www.dams.org/PressReleaseItem.asp?item=71, WCD Press Releases, 20 March 1999 (Pak Mun Dam), http://www.dams.org/PressReleaseItem.asp?item=21, WCD Press Releases, 20 March 1999 (Kariba Dam), http://www.dams.org/PressReleaseItem.asp, WCD Press Releases, 14 June 1999 (Gloma and Lagen River Basin) http://www.dams.org/PressReleaseItem.asp?item=77, Dams Newsletter No. 2, March 1999, http://www.dams.org/newsletter2_studies.asp.

20. Anthony H. J. Dorcey, "World Commission on Dams: a Unique Multistakeholder Process, Agreement and Initiative," http://www.cwra.org/news/arts/tonydam1.html.

21. WCD Press Releases, 21 February 1999 "World Commission to Study Grand Coulee Dam," http://www.dams.org/PressReleaseItem.asp?item=68.

22. Leonard Ortolano and Katherine Cao Cushing, WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report], (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) Ortolano and Cushing added additional authors: Nicole T. Carter (Stanford University), William Green (CCRITFC - Canadian First Nations), Carl Gotsch (Stanford University), Kris May (Stanford University), Tim Newton (B. C. Hydro), Paul Pitzer (Beaverton, Oregon), Sophie Pierre (Canadian First Nations), Josh Smienk (Columbia Basin Trust), Michael

Soules (University of California, Berkeley), Marilyn Watkins (Watkins Historical Research - Native Americans), and Hazzara Engineering (Chicago, Illinois).

23. WCD In the Media, "World Commission Butts Heads With Local Farmers," 26 May 1999, http://www.dams.org/MediaItem.asp?Item=23.

24. WCD In the Media, "World Commission Butts Heads With Local Farmers," 26 May 1999, http://www.dams.org/MediaItem.asp?Item=23.

25. Paul C. Pitzer. ***Grand Coulee: Harnessing a Dream*** (Pullman, Washington, Washington State University Press, 1990), pp. 291-310.

26. CH_2MHill, “raft Environmental Impact Statement: Continued Development of the Columbia Basin Project, Washington”(Boise, Idaho: Bureau of Reclamation, September 1989).

27. It is significant to remember that during the early debates that led to the construction of Grand Coulee Dam and the Columbia Basin Irrigation Project, proponents held that the sale of electricity generated at the dam would pay for all of the costs of irrigation. Paul Curtis Pitzer, "Visions, Plans, and Realties: A History of the Columbia Basin Project," unpublished Ph.D. dissertation, University of Oregon, 1990, pp. 247-353. A study by the General Accounting Office further concluded that expansion of the project would not be economically feasible. See: Government Accounting Office, ***Water Resources: Issues Concerning Expanded Irrigation in the Columbia Basin Project.*** (Washington D.C., Government Printing Office, January 1986).

28. Paul C. Pitzer. ***Grand Coulee: Harnessing a Dream*** (Pullman, Washington, Washington State University Press, 1990), pp. 26.

29. Leonard Ortolano and Katherine Cao Cushing, ***WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report Annexes]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.), pp. A1-1 - A1-12.

30. Leonard Ortolano and Katherine Cao Cushing, ***WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report Annexes]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.), pp. A1-1 - A1-12

31. This comment is based on the personal observations of this author who was present at the 13 January 2000 meeting in Portland, Oregon which is discussed below.

32. Leonard Ortolano and Katherine Kao Cushing, "Scoping Report for the Grand Coulee Dam and Columbia Basin Project Case Study," World Commission on Dams, 5th Floor, Hycastle House, 58 Loop Street, PO Box 16002, Vlaeberg, Cape Town, 8018, South Africa, June 1999.

33. Leonard Ortolano and Katherine Kao Cushing, "Grand Coulee Dam and Columbia Basin Project USA," circulation draft: (Cape Town, South Africa, World Commission on Dams,

December 1999).

34. Bad weather that day may explain why some of the stakeholders missed the meeting.

35. "Meeting Minutes: World Commission on Dams - Grand Coulee and Columbia Basin Project Case Study, Second Consultative Meeting," 13 January 2000, Portland, Oregon, p. 1.

36. Leonard Ortolano and Katherine Kao Cushing, "Grand Coulee Dam and Columbia Basin Project USA," circulation draft: (Cape Town, South Africa, World Commission on Dams, December 1999), pp. 5-1 to 5-6. Benefits to Canada resulted from lower costs for power and because the Canadian government used the proceeds from the Columbia River Treaty to build major water projects in Canada. Without those benefits, the government had anticipated building coal-fired powerplants.

37. Leonard Ortolano and Katherine Kao Cushing, "Grand Coulee Dam and Columbia Basin Project USA," circulation draft: (Cape Town, South Africa, World Commission on Dams, December 1999), pp. 5-1 to 5-6

38. "Meeting Minutes: World Commission on Dams - Grand Coulee and Columbia Basin Project Case Study, Second Consultative Meeting," 13 January 2000, Portland, Oregon, p. 2.

39. Additional beneficiaries suggested included hunters on the Columbia Basin Project, contribution to Allied forces in World War II, British Columbia Hydro ratepayers, environmental gains due to the lack of pollutants since coal-burning power stations are not needed, and environmental gains in the various reservoirs and wetlands created. "Meeting Minutes: World Commission on Dams - Grand Coulee and Columbia Basin Project Case Study, Second Consultative Meeting," 13 January 2000, Portland, Oregon, p. 7.

40. Leonard Ortolano and Katherine Cao Cushing, ***WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) , pages 8-1 to 8-16.

41. Note that the major change from the list in the preliminary report was the elimination of Bonneville Power Administration ratepayers from the cost-bearer side. Leonard Ortolano and Katherine Cao Cushing, ***WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) , pages 5-2 to 5-4.

42. Paul C. Pitzer. ***Grand Coulee: Harnessing a Dream*** (Pullman, Washington, Washington State University Press, 1990), pp. 21-59. A study required by Congress in its 1925 Rivers and Harbors Act resulted in a report issued on August 12, 1926 called House Document No. 308, 69th Congress, 1st session; it has come to be called the "308 Report" as have most subsequent studies done by the government on the Columbia River. The original "308 Report" called for an extensive survey of a number of rivers including the Columbia River. Congress authorized that study in 1927. Done in two parts, one looked

at the river above the confluence with the Snake River and it was supervised by Major John Soule Butler for the Army Corps of Engineers. Although Butler completed most of his work by mid-1930 the finished report was not released to Congress until March 29, 1932 as Columbia River and Minor Tributaries: Letter from the Secretary of War Transmitting Pursuant to Section 1 of the River and Harbor Act approved January 21, 1927, ... Containing a General Plan for the Improvement of the Columbia River and Minor Tributaries for the Purposes of Navigation and Efficient Development of Water-Power, the Control of Floods, and the Needs of Irrigation, 2 Vols. (Washington, D.C..: U.S. Government Printing Office, 1933).

43. Paul C. Pitzer. ***Grand Coulee: Harnessing a Dream*** (Pullman, Washington, Washington State University Press, 1990), pp. 270-271.

44. Richard Lowitt. ***The New Deal and the West*** (Bloomington, Indiana, Indiana University Press, 1984), pp. 138-152.

45. Leonard Ortolano and Katherine Cao Cushing, ***WCD Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) , ix.

46. Ibid.

47. Ibid., p. x.

48. Ibid., p. xiii

49. Ibid., p. xii.

50. Ibid., p. xiii.

51. Paul C. Pitzer. ***Grand Coulee: Harnessing a Dream*** (Pullman, Washington, Washington State University Press, 1990), p 222.

52. Leonard Ortolano and Katherine Cao Cushing, WCD ***Case Studies: Grand Coulee Dam and Columbia Basin Project USA*** [Final Report], (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) , p. xxix.

53. Leonard Ortolano and Katherine Cao Cushing, WCD ***Case Studies: Grand Coulee Dam and Columbia Basin Project USA [Final Report]***, (World Commission on Dams Secretariat, Vlaeberg, Cape Town, South Africa, March 2000.) , xxvii; also 9-3.

54. Ibid.

55. Ibid., xxix.

56. Ibid.

57. Ibid., p. xxx.

58. Ibid.

59. Ibid.

60. Press Release, 16 November, 2000, "World Commission on Dams Launches 'Landmark' Final Report.", World Commission on Dams, http://www.dams/org/press/pressrelease_73.htm. Also see: ***The Christian Science Monitor***, 20 November, 2000, editorial; and ***The Oregonian***, 17 November, 2000, p. A30.

61. Complete reports from all studies are available on the web page of the World Commission on Dams (http://www.dams.org). The final report is also available at http://www.damsreport.org. That site offers information on purchase of a published copy of the final report titled ***Dams and Development: A New Framework for Decision-Making - The Report of the World Commission on Dams***, (Earthscan Publicans Ltd., London and Sterling, Virginia, November 2000).

62. World Commission on Dams, ***Dams and Development: A New Framework for Decision-Making - The Report of the World Commission on Dams***, (Earthscan Publicans Ltd., London and Sterling, Virginia, November 2000), p. xxx.

63. Ibid., p. xxxi. (Note the use of British spellings throughout the report).

64. Ibid.

65. Ibid., p. xxxvi.

66. Ibid., p. xxxvii.

67. "BPA energy crisis may put salmon at risk," ***The Oregonian***, 19 January 2001, p. 1. The need to release water from federal dams on the Columbia River to sustain California power needs has decreased the reservoir holdings behind those dams making release of water during the spring and summer salmon runs problematical. This situation backs this author's position that the demand for power, as it has in the past, will continue to jeopardize and/or overshadow environmental considerations. It is significant that as dams in the United States come up for re-licensing, something that happens every fifty years, environmental groups are attempting to use this opportunity to challenge the operations of various dams. At the same time, dam owners and government agencies are seeking to expedite and simplify the process in order to complete it more quickly.