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Equity in Policy: Failure and Opportunity

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ABSTRACT

The preoccupation of economists with matters of efficiency helps to explain why matters of economic equity have been neglected. Further, the fact that desirable patterns of equity cannot be identified scientifically constrains economists from making normative judgments about equity. The fact that policymakers are frequently disinterested in equity matters means that economists tend to look elsewhere within their field for interesting questions to pursue. Two case study examples illustrate how the resolution of equity issues can be joined with solutions to other water management problems. The first case study, Northern Voices, *focuses on the making of land and water policy in an area at considerable risk from the development of the Alberta, or Athabasca, tar sands and other upstream mining. Policy options which acknowledge, rather than ignore, the preferences of First Nations aboriginal peoples of the Northwest Territories would protect environmental assets which provide significant environmental services for all residents of the Western Hemisphere. The second case study concerns the Colorado River, and exemplifies the problems of over-allocated river basins. Recent experience shows that conventional negotiating processes are unlikely to lead to reductions in water allocations. The significant claims of Native Americans to the waters of the Colorado could be settled and over-allocation managed by awarding basin tribes rights to much of the Colorado River and authorizing them to auction water to the highest bidder through a Colorado River Water Exchange.*

I. INTRODUCTION

In recent decades, considerations of equity or fairness have played little or no role in the making of federal natural resource policy. This neglect of equity is particularly glaring in the making of recent federal water policy history, where the principal trend has been one of devolving policy responsibility—but not financial resources—to the respective states. Natural resource policy, and water policy more specifically, mirror these trends in federal policymaking that date back nearly 30 years. Beginning around 1980, the United States experienced a growing disparity between the socioeconomic positions of the well off and the poor. Although this trend was attenuated to some extent in the 1990s, it accel-

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erated significantly immediately upon the turn of the century. It remains to be seen whether future efforts to reduce this disparity can work in the current political landscape.

As a simple empirical matter, continuation of trends which produce a widening gap between the rich and poor should be a cause for concern. Historical evidence suggests that societies that ignore such gaps are not sustainable. More specifically, the relegation of more and more people into categories of poverty and near poverty, while the few well-off become increasingly more prosperous, raises serious issues about the validity of the social contract between government and the governed. The issue of economic equity or fairness is not one that can be ignored with impunity.[1]

In the modern era, taxation and social welfare policies have been the means most used for addressing inequities in the distribution of economic assets. But, simultaneously all manner of spending programs and various subsidies have also affected the distribution of economic assets. Some of these subsidies, such as land grants to railroads, have solely favored corporations, while others have favored both individuals and corporations. Such was the case with the early participants of the federal reclamation program, whose interest payments were forgiven on capital investments needed to impound and deliver water to their farms. Other programs have favored the rich and are frequently tagged as "welfare for the rich."[2]

The distributional effects of tax and welfare policies are reasonably well known and broadly publicized. This is generally not the case with spending programs where the incidence or distributions of benefits are often masked or hidden, making it difficult to sort them by personal income or wealth categories. Although there are probably a few exceptions, most federal natural resource policies have not been distributionally neutral, favoring businesses, corporations, or individuals in the upper half of the income and/or wealth spectrum. The poor, minorities, and indigenous people have rarely been the beneficiaries of such policies.

This general discussion raises two broad questions: First, why is it that the distributional impacts of alternative spending and programmatic policies are rarely analyzed and debated? Although a full explanation has several factors, a partial explanation lies with the fact that professional economists have rarely focused upon the incidence of costs and

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1. National Intelligence Council, Global Trends 2025: A Transformed World (2008); Tony Judt, Ill Fares the Land (2010).

2. Paul Krugman, The Conscience of a Liberal (2007).

benefits of alternative resource policies *ex ante*. In turn, this fact has multiple explanations.

Second, if there is in fact a will to redress obvious examples of inequity or unfairness, could such redress be a joint outcome of policies designed to address other important problems along with the management of water resources? Two case studies, one focused on the Mackenzie River Basin of northern Canada and another focused on the Colorado River Basin of the southwestern United States, suggest that there are ample opportunities to devise solutions to modern problems of resource management while at the same time enhancing the welfare and the quality of life of indigenous peoples. The remainder of this article addresses these questions, first, by considering why so little work has been done on the economic equity implications of policy alternatives *ex ante*, and second, by presenting two relatively straightforward cases in which equity objectives could be achieved jointly with other important objectives of water policy. These cases illustrate instances in which equity considerations can be addressed simultaneously with allocative issues and issues of water quality.

II. THE ECONOMICS OF EQUITY

There are several disciplines that deal directly with issues of fairness or equity. Important contributions to issues of fairness have come from philosophy, political science, law, and even geography.[3] Within this mix, the economics discipline offers at least one distinct advantage and one distinct disadvantage. The advantage is that economics is a solid and long-standing empirical tradition. Within this tradition economists have developed relatively simple and straightforward methods for describing the distribution of income and or/wealth. The disadvantage, however, lies with the fact that economists view questions of fairness or equity as value judgments. Thus, one of the main tenets of the discipline is that normative issues—issues related to the desirable or optimal patterns of fairness—cannot be resolved scientifically. Economists then have no special insights or training that permits them to make normative statements about fairness. This narrows the playing field considerably, as virtually all other areas of economics are open to normative and prescriptive research.

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3. JOHN RAWLS, A THEORY OF JUSTICE (1971); John G. Tisdell, *Equity and Social Justice in Water Doctrines*, 16 SOC. JUST. RES. 401, 416 (2003); EDITH BROWN WEISS, IN FAIRNESS TO FUTURE GENERATIONS: INTERNATIONAL LAW, COMMON PATRIMONY AND INTERGENERATIONAL EQUITY (1989); Wicky Meynen & Martin Doornbos, *Decentralizing Natural Resource Management: A Recipe for Sustainability and Equity*, 16 EUR. J. DEV. RES. 235 (2004).

The structure of economics creates prejudices and disincentives, which result in the lack of attention to, or outright neglect of, the distributional effects of alternative policies. The fact that the economics of wealth or income distribution is limited only to measuring and describing alternative states of economic equity makes such endeavors relatively unattractive compared with other areas. Moreover, compelling issues in public economics thus tend to crowd out interest in describing the distributional consequences of alternative public policy. Nevertheless, the discipline has already developed convenient, shorthand methods of describing the distribution of income or wealth. The failure to employ such methods more frequently in public policy discourse, however, is a shortcoming that could be easily rectified.

A. Positive and Normative Economics

There are a number of important distinctions within the discipline of economics. One is the distinction between positive and normative economics. Simply stated, positive economics is concerned with the description, specification, and measurement of historical, current, or future economic conditions. It focuses on actual or hypothetical circumstances and on their causes and impacts. Normative economics, on the other hand, focuses on the description, specification, and measurement of economic circumstances as they should be. In other words, normative economics focuses on the achievement of economic optima which can be expressed in a variety of ways.

Normative goals and objectives for the economy are frequently expressed in terms of efficiency. Efficiency has a number of meanings but is commonly understood to characterize either circumstances where product and/or value is maximized from some fixed set of resources, or where the allocation of inputs and outputs maximizes the economic return, which is subject to appropriate adjustment for external costs and benefits for the existence of public goods.[4] In macroeconomics, normative objectives typically focus on several factors, such as: reducing levels of unemployment, keeping inflation and deflation in check, assuring appropriate levels of aggregate investment, and optimizing the growth and level of gross domestic product. Normative studies are typically prescriptive and are based on the desirability of achieving widely agreed upon economic goals (at least among economists).[5]

4. RICHARD W. TRESH, PUBLIC FINANCE: A NORMATIVE THEORY 549 (2d ed. 2002).
5. *Id.*

Economic equity is typically defined in terms of the fairness of the distribution of economic assets such as income, wealth, and capital.[6] As noted above, economists have no special qualifications that allow them to describe what optimal or desirable pattern of economic equity would look like. That is a value judgment that ought properly be left to those who broker values in society. This lesson is drummed into the heads of graduate students in economics at virtually every opportunity.

The consequence of this lack of specialized qualifications is that economists interested in equity and distributional issues face a domain that is constrained to the measurement, description, and forecasting of historical, existing, or future states of distribution. This alone might be sufficient to encourage many economists to work in different subfields where the opportunities to develop credible policy prescriptions are much greater. There is one important qualification, however. The distributional consequences of tax policy have long been of interest to economists because the economics of taxation is partly a matter of incidence.[7] Interest in such issues is strong because there is general agreement within society that taxes should be fair. The fact that there is no agreed upon definition of the concept of "fair" means that the distributional consequences of taxation vary widely. Some are progressive, falling disproportionately on the rich or wealthy, and some are regressive, falling disproportionately upon the poor.

Another frequently discussed objective of taxation is the issue of allocative neutrality, meaning, all other things equal, that taxes should be designed in such a fashion as to leave relative prices unaffected so that the allocation of goods and services, and the resources needed to produce them, remains unaffected by the presence of taxes. However, interest in the allocative consequences of taxes at the policymaking level appears to be minimal, much like the interest in distributional consequences. In recent years, the goals of tax policy have been heavily influenced by monied interests bent on reducing their own burdens.[8] Although it is generally conceded that recent taxation policies have worked to the benefit of the wealthy (which in itself seems inconsistent with the American sense of fairness) there is little or no interest on the part of policymakers in addressing these issues in the short term.

The lack of interest on the part of policymakers in the distributional consequences of substantive, programmatic, and spending policies acts as a strong disincentive for economists to focus on such consequences. Moreover, the distributional consequences of alternative sets of

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6. *Id.*
7. BERNARD SALANIE, THE ECONOMICS OF TAXATION 848 (2003).
8. KRUGMAN, *supra* note 2.

policies affecting millions of citizens may be difficult to work out *ex ante*. Furthermore, the introduction of distributional goals into natural resource policymaking creates another set of difficult value judgments. For example, to what extent should principles of good management and husbandry be traded off to advance distributional considerations about which there may not even be general agreement?

Welfare policies aside, it can be inferred from most national authorizing and appropriations legislation that the distributional consequences of spending and programmatic policies should remain obscure. In some instances this obscurity may be due to the outrageousness of the associated distributional consequences, making them impossible to sustain if widely known. In actuality, very few policies that are focused on the management of natural resources in general (water in particular), have distributional consequences that are well understood. For example, it seems highly unlikely that the people in the lower quartile of the income distribution spectrum were the principal beneficiaries of the large subsidies associated with the administration of the Reclamation Act of 1902 as amended.[9]

B. Public Economics

In the last decades of the twentieth century the field of public economics expanded from a focus on taxation to consideration of all appropriate programs of public spending and programmatic policies. The "new" public economics included detailed consideration of justifications for public interventions in free market activities, as well as detailed characterizations of pure public goods, open access resources, and common property resources.[10]

This latter focus had important implications for resource and environmental economics both conceptually, and in specifying appropriate management strategies and interventions. At the conceptual level, the work of Baumol and Oates, and that of Ostrom, was critical in classifying and clarifying the characteristics of various resources that were not optimally exploited and allocated under free markets. Ultimately, many of the concepts developed by these authors form the basis for substantial literature on groundwater, on grazing lands, on genetic resources, on

9. Reclamation Act of 1902, ch. 1093, 32 Stat. 388 (codified as amended at 43 U.S.C. § 391 (2006)).

10. JOSEPH E. STIGLITZ, ECONOMICS OF THE PUBLIC SECTOR (3d ed. 2000).

many assets which provide environmental services, and on issues of the global commons such as global warming.[11]

The volume, magnitude, and efficacy of this work would seem to have made it far more attractive and significant than work on the distributional issues of natural resource and environmental policy. Indeed, the sheer volume of work on the economics of natural resource exploitation and management, the oversight of open access and common property resources, and the valuation of non-marketed assets suggest that the interests of economists in equity and distributional issues were crowded out by the many other opportunities available in the subfield of resource and environmental economics.

C. Measuring Distributional Impacts

For all of the disincentives and constraints that confront the economist interested in working on distributional and equity issues, there is a common method for measuring those impacts at hand. This method is both graphical and mathematical and allows for the general distributional consequences of any set of policies to be summarized at a glance by examining either or both. The concepts in question are the Lorenz Curve and the Gini Coefficient. Both take equal distribution of income or wealth as the point of reference. It is understood that this is the point of reference and not necessarily the desired objective, which ultimately remains a value judgment for determination by policymakers.[12]

As shown in Figure 1 (below), the Lorenz Curve is a simple plot with the percent of cumulative income earned (or wealth) on the vertical axis and the percent of families or individuals on the horizontal axis. The diagonal line represents the locus of points depicting an equal absolute distribution. That is, the point where 20 percent of the families have 20 percent of the wealth, and 80 percent of the families have 80 percent of the wealth, and so forth. The Lorenz Curve is the line which depicts the actual distribution of wealth. As shown, it summarizes a distribution of wealth that is skewed away from poorer families and towards more wealthy families.

The Gini Coefficient is a simple mathematical measure of the extent and direction of inequality. In Figure 1, the Gini Coefficient is equal to (area A) divided by (area A + area B). The closer the value of the coefficient is to one, the more income (or wealth) is distributed with ab-

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11. William J. Baumol & Wallace E. Oates, The Theory of Environmental Policy (2d ed. 1988); Elinor Ostrom, Governing the Commons: The Evolution of Institutions for Collective Action (1990).

12. Brian Slack & Jean-Paul Rodrigue, The Gini Coefficient: Definition, http://people.hofstra.edu/geotrans/eng/ch4en/meth4en/ch4m1en.html (last visited Apr. 28, 2010).

Figure 1: The Lorenz Curve

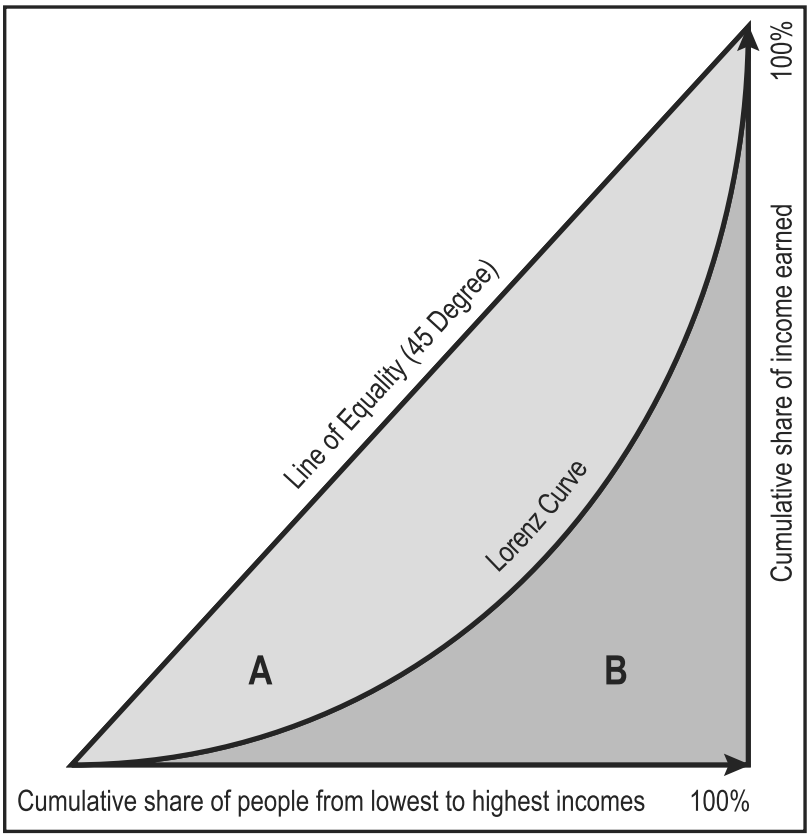

Figure prepared by Linda Petras.

solute equality. It should be recognized that obtaining the data necessary to produce Lorenz Curves and Gini Coefficients may not be a trivial task. In some circumstances, the acquisition of data *ex ante* may be a significant constraint on efforts to make systematic assessments of policy options. Nevertheless, the Lorenz Curve and the Gini Coefficient provide a convenient shorthand for understanding the distributional implications of alternative policies where the will and resources are present to support the acquisition of the necessary data.

III. EQUITY AND JOINTNESS IN POLICY: TWO CASE STUDIES

One of the conclusions flowing from the economics of equity is that it will always be cheaper and more efficient to tackle distributional

issues directly.[13] This implies that taxes and direct subsidies (not subsidies in-kind) would be the preferred means of altering the distribution of income, for example. This prescription stands in contrast with prevailing practices which tend to obscure the incidence of costs and benefits from subsidies as well as program and spending policies. For example, the true cost of the U.S. Bureau of Reclamation program, which provided irrigation water to western farmers, was masked because the magnitude of the subsidy inherent in free interest on the capital needed to build the facilities was rarely acknowledged.

Nevertheless, it has been rare historically, and would be unusual now, to enact natural resource or water resource policies for the exclusive purpose of altering income or wealth distribution in favor of some preferred income or wealth distribution. It follows then that efforts to adjust or "improve" distributional patterns of wealth or income through resource policy would most frequently be joint in nature. Stated more specifically, there is almost always more than a single strategic policy which can achieve some desired outcome. The distributional consequences of alternative policies may differ significantly or not at all. Consequently, it is important to recognize that natural resource or water policies achieve distributional consequences jointly with the objective they are primarily designed to pursue.

Two case studies illustrate how joint policies can affect equity by enhancing the welfare of indigenous peoples historically treated unfairly. The first case, selected from northern Canada, shows how the protection of environmental assets conferring environmental services on the entire Western Hemisphere can protect those services while also enhancing the welfare of aboriginal peoples who inhabit the Northwest Territories. The second case, which is in the form of a proposal, provides an example of a mechanism that addresses the over-allocation of water from a given river basin while also enhancing the income and wealth of a group of Native American tribes. Both studies illustrate how problems of over-allocation and reallocation can be solved in ways that enhance the income and wealth positions of indigenous groups that have not always been the beneficiaries of water resources policies.

13. TRESH, *supra* note 4.

A. CASE STUDY I: *Northern Voices*—Protecting Environmental Assets

The Northwest Territories of Canada occupy an area of 1.2 million square kilometers—about 12 percent of the total area of Canada.[14] It is a sparsely populated land of rivers, lakes, and muskeg. Population totals a little over 43,000, of whom slightly more than half are aboriginal, or First Nations citizens, as they are known in Canada.[15] As shown in Figure 2 (below), the Northwest Territories lie within the Mackenzie River Basin. The Mackenzie is the largest north flowing river in the Western Hemisphere. Average annual discharge of the Mackenzie is 10,300 m^3/second, which makes it the second largest river in North America and the twentieth largest in the world in terms of discharge. The principal tributaries are the Athabasca and Peace rivers which originate in Alberta and British Columbia respectively, and conjoin to make the Slave River which flows into Great Slave Lake, the sixth largest freshwater lake in the world. The Mackenzie River itself flows out of Great Slave Lake and northward to the Arctic Ocean.[16]

The waters and associated aquatic and terrestrial habitats of the Northwest Territories support an array of environmental assets which include habitat for migratory birds and waterfowl, fisheries, and land-based wildlife. The role of the Mackenzie's freshwater discharge in the behavior of the sea-ice-freshwater interface is as yet incompletely understood, but there is at least the possibility that destabilization of existing equilibria through alteration of the quantity and quality of flows could exacerbate the looming problems of climate change. In addition, the cultural and spiritual values of the waters of the Northwest Territories are very important to the aboriginal people. Aboriginal rights and Canadian federal law make clear that waters must remain substantially unaltered with respect to protection of the health of aquatic and related terrestrial ecosystems. The aboriginal peoples wish to preserve the option of living off the land which entails hunting, fishing, and trapping. This option cannot be preserved if there is significant destruction of habitat.[17]

As noted earlier, the environmental assets of the Northwest Territories confer real benefits as well as option value not just on the citizens

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14. Government of the Northwest Territories, NWT Statistics, http://www.gov.nt.ca/research/facts/index.html (last visited Apr. 28, 2010).

15. *Id.*

16. GOVERNMENT OF THE NORTHWEST TERRITORIES, NORTHERN VOICES, NORTHERN WATERS: THE NORTHWEST TERRITORIES WATER STEWARDSHIP STRATEGY DRAFT 6 (2009).

17. ROSENBERG INTERNATIONAL FORUM ON WATER POLICY, REPORT OF THE ROSENBERG INTERNATIONAL FORUM ON WATER POLICY TO THE GOVERNMENT OF THE NORTHWEST TERRITORIES 7 (2009).

Figure 2: The Mackenzie River Basin

This figure was originally created for a paper prepared by Rob C. de Loë, Professor and University Research Chair in Water Policy and Governance, University of Waterloo, *Transboundary Water Governance in the Mackenzie River Basin, Canada*, for the 7th Biennial Rosenberg International Forum on Water Policy (Nov. 15–17, 2010). Reproduced with permission of the author.

of the Northwest Territories but also on the citizens of Canada, all of North America and, to a lesser extent, the Western Hemisphere. These benefits have many of the properties of a pure public good. They are not exclusive in consumption and are widespread. Thus, there is a clear case for collective action and public oversight in the protective management of these environmental assets. In this way, the interests of the aboriginal peoples of the Northwest Territories align with the interests of millions of other North Americans (and Central and South Americans as well). There are major questions surrounding the protection and sustainability of the environmental assets which produce these benefits. These questions focus on the growing industrial uses of water for mining, hydroe-

lectric, and nuclear power development, and the escalation of the development of the Alberta, or Athabasca, tar sands in the tributary watersheds upstream from the Northwest Territories.

Although phosphate mining in Saskatchewan and the development of additional electrical generating capacity—both hydro and nuclear—in British Columbia pose significant threats to the ecosystems of the Mackenzie Basin, the largest threat today is the escalating development of the Alberta tar sands. In brief, the exploitation of the tar sands entails massive excavation of hydrocarbon bearing material from the ground; thermal separation (cooking) of the hydrocarbon material from the remaining material; and the upgrading of the hydrocarbons to a form from which they can be refined to conventional hydrocarbon products such as gasoline and oil.[18] The process is expensive and requires vast amounts of land and water. In recent years, the sheer scale of the total operation has grown as demand for hydrocarbon products continues to skyrocket and supplies from conventional sources become tighter.

The main environmental threats from the tar sands include the high probability of a dike failure in the tailing ponds, widespread and total destruction of the environmental attributes in the immediate area of the tar sands—an area that is expanding rapidly and could grow almost unimaginably in the future—and the diminution of water flows in the Athabasca River to support the extraction and refining processes of tar sands. The area occupied by tar sands tailing ponds has grown from several hundred hectares in 1970 to nearly 14,000 hectares today. One or more dike failures at the tailing ponds could have extremely adverse effects on the quality of the Athabasca River. The distinguished Canadian limnologist, David Schindler, has stated that a breach in any of the dikes and subsequent spillage of toxic residue into the Athabasca River would cause the world to forget about the Exxon Valdez disaster.[19]

The need to clear cut forests, drain wetlands and fens, and scrape off the soil used to construct dikes has destroyed thousands of hectares of forested land which, because of its northerly location, will not easily self-repair—even under more modest climatological circumstances. Additionally, the enormous amount of water used by tar sands processing, which, by one estimate requires three barrels of water for each barrel of non-upgraded hydrocarbon, threatens the flow regimes of the Athabasca

18. ANDREW NIKIFORUK, TAR SANDS: DIRTY OIL AND THE FUTURE OF A CONTINENT (2008); Dr. David Schindler & Dr. Vic Adamowicz, Presentation at Running Out of Steam? A Workshop on Oil Sands Development and Water Use in the Athabasca River Watershed: Science and Market-Based Solutions (May 10, 2007) (transcript available at http://www.powi.ca/pdfs/running_out_of_steam_final.pdf).

19. *Id.*

River. Tar sands operations alone account for reductions in river flows that total 9 percent. There is further concern because dry season flows have declined by 30 percent since 1970 and are projected to decline 50 percent by 2050.[20] These declines, which are apparently attributable to global climate change, coupled with continued expansion of the tar sands, would clearly exacerbate flow declines to levels substantially below those experienced in the past.[21]

While the tar sands represent the principal threat to the environmental integrity of the Northwest Territories, there are other prospective developments that could pose major threats. The proposed construction of a natural gas line and the development of oil and gas in the Western Canadian Sedimentary Basin within the Mackenzie Basin could materially change the environmental face of all but the upper reaches of the Mackenzie watershed. In addition, there are numerous ore deposits in the basin which are likely to be mined as the global appetite for raw materials continues to grow.

First Nations citizens and other downstream residents believe that the quantity and quality of their waters is significantly impaired at today's levels of development. They are fearful that projected future levels of development would rob them of the resources upon which they have depended historically and, in turn, rob them of the cultural and spiritual values they derive from those resources. Even if such intangible values are ignored, a preliminary valuation study indicates that the value of land devoted to oil, gas, mineral, or timber production in the Mackenzie Basin would contribute approximately $245/hectare (where 1 hectare = 2.47 acres) to gross domestic product as compared with a value of $2790/hectare for environmental services.[22] The citizens of the Northwest Territories have responded by advancing a carefully designed, highly consultative process to develop a water resource management strategy for the Northwest Territories.[23] Although, not yet complete, the draft strategy enunciates some 14 principles including fairness and equity. It also identifies four sets of primary needs which are: (1) human sustenance; (2) ecosystem support; (3) support of traditional cultural needs; and (4) economic needs. There are a number of important issues that are identified for early resolution. They are:

- The lack of monitoring and the need for better data.

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20. *Id.* at 143.

21. *See id.*

22. MARK ANIELSKI & SARA WILSON, THE REAL WEALTH OF THE MACKENZIE REGION: ASSESSING THE NATURAL CAPITAL VALUES OF A NORTHERN BOREAL ECOSYSTEM (2009).

23. GOVERNMENT OF THE NORTHWEST TERRITORIES, NORTHERN VOICES, NORTHERN WATERS, TOWARDS A WATER RESOURCE MANAGEMENT STRATEGY FOR THE NORTHWEST TERRITORIES (2008).

- Conflicting and ambiguous water rights and the need to establish complete clarity of water rights, including aboriginal rights.
- The need for planning that acknowledges the importance of both terrestrial and aquatic ecosystems and the interactions between both.
- The need to acknowledge and adapt to climate change.
- The need to identify and screen emerging issues.

The strategy, which was to be finalized on May 20, 2010, not only acknowledges the special needs of aboriginal peoples for protection of land and water resources, but also demonstrates that the citizens of the Territories are prepared to be effective stewards of the environmental resources for themselves, the citizens of Canada, and other residents of the North America and the Western Hemisphere. However, the strategy and related documents underscore the problems—both current and potential—posed by existing management practices in upstream jurisdictions: Alberta, British Columbia, and Saskatchewan. Industrial water use upstream for mining and energy development is beyond territorial control but has significant influence on the quantitative and qualitative properties of the waters delivered to the Territories. Upstream industrial water use and the strategies used to manage it will have a major effect on the ability of the citizens of the Northwest Territories to manage their own resources.[24]

The problem is complicated further by the Canadian national government which, in other circumstances, might be expected to adopt a stronger position in the management of interterritorial/interprovincial matters. The national government is perceived by some as an unwanted intruder into both regional and local affairs, and by others as timid and largely ineffectual in dealing with interprovincial matters. The citizens of the Northwest Territories perceive the national government with some ambivalence because not only has it failed to enforce existing laws and treaties which would protect the Mackenzie and its tributaries, but also continues to devolve responsibility for the management of natural resources to the provinces. This means that the accustomed problems of interjurisdictional water management—such as between provinces and territories—fail to get needed attention and effective oversight from the national government.[25]

For example, a recent report from an independent review panel concludes that there is ample legislative and treaty protection for both

24. *Id.* at 15.
25. ROSENBERG INTERNATIONAL FORUM ON WATER POLICY, *supra* note 17, at 24.

the Northwest Territories and its aboriginal residents.[26] The panel identifies no less than seven pieces of existing national legislation that protect the quantity and quality of national waters, fisheries, and the environment at large. In addition, there is one treaty, Treaty 8, which protects the rights to land and water resources of at least one group of aboriginal peoples in the Northwest Territories.[27] The review panel expressed surprise that all of the Acts and the Treaty are being systematically violated at Alberta's tar sands. The panel concluded that the passivity and timidity of the national government were simply unwarranted given the existing legislative and Treaty mandates.[28]

There are two fundamental conclusions from this case. First, continuing development of the Alberta tar sands, other upstream mineral resources, and new sources of energy at projected rates of growth threaten to inflict enormous environmental damage on the Northwest Territories. If allowed to occur, these damages will not only have devastating effects on aboriginal citizens but also inflict costs in the form of lost environmental services on a far wider population. In this instance, the welfare of First Nations citizens as protected by law can be viewed as consonant with the objectives to protect environmental assets conferring benefits on a far larger population. These two objectives are joint in nature and can be jointly achieved.

Secondly, institutions (specifically laws and treaties) are already in place to enforce the policies that will protect the environment and treat aboriginal peoples fairly. Policy, as if equity matters, simply requires the enforcement of existing laws and treaties by the national government of Canada. It is true that rigorous enforcement of such laws will retard and constrain the development of the tar sands, but these equity considerations are likely supported by relevant economic values. What is required is a policy decision between one option that protects environmental assets and enhances the welfare of aboriginal peoples and another that favors the oil and gas industry, its producers, and its consumers.

B. CASE STUDY II: The Colorado River—Rationing Over-Allocation

Many western streams are already over-allocated. Over-allocation now looms in the more humid East as recent experiences in the metro-

26. *Id.* at 17.
27. 1899 Can. T.S. No. 8.
28. ROSENBERG INTERNATIONAL FORUM ON WATER POLICY, *supra* note 17, at 24.

politan regions of Washington, D.C., and Atlanta, Georgia, attest.[29] In this context, over-allocation is taken to mean the formal allocation of rights to waters which, taken together total more than the long-term average annual flow of the stream.[30] Over-allocation can occur when rights are unclear or conflict and/or when more water is used than has been formally allocated. For several reasons the problems of over-allocation are expected to become more severe in the future.

Allocation of stream waters is usually based on stream flow measurements from an historical period of record.[31] Not infrequently, the period of record is short and may encompass a particularly wet or dry period. In the case of a wet period, allocations turn out to exceed the flows that prevail over the long term, resulting in over-allocation. There are two reasons for suspecting why over-allocation may become more common. First, it is now understood that stream flow varies within long time frames. This means that the assumption of stream flow stationarity—holding that historical patterns of stream flow are a valid guide to future patterns—in fact is not a valid assumption. Indeed, evidence from tree ring records and measurements of streams over long periods of time confirmed non-stationarity as the only acceptable assumption. This means that stream flow averages change over long time periods. There are wet periods and dry periods that last for decades and centuries. The long-term nominal variation in climate means that in the future some proportion of the nation's streams that may not have been over-allocated in the past will become so in the future.[32]

The second reason for expecting that stream flow allocation may become more common is global climate change. Today, there is an emerging consensus that anthropomorphic activities will likely accelerate and accentuate long-term climate changes.[33] In addition, most of the modeling efforts to date suggest that the mid-latitudes of the United States are likely to become drier as a result. Changes in the time of snowmelt and runoff may also diminish the quantities of stream flow available for use in the warmer months when various water demands tend to peak.[34]

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29. David L. Feldman, *Preventing the Repetition: Or What Los Angeles' Experience in Water Management Can Teach Atlanta About Urban Water Disputes*, 45 WATER RESOURCES RESEARCH W04422 (2009).

30. *Id.*

31. P.C.D. Milly et al., *Stationarity Is Dead: Whither Water Management?* 319 SCIENCE 1, 573–74 (2008).

32. NATIONAL RESEARCH COUNCIL, COLORADO RIVER BASIN WATER MANAGEMENT, EVALUATING AND ADJUSTING TO HYDROCLIMATIC VARIABILITY (2007).

33. P.C.D. Milly et al., *supra* note 31, at 573–74.

34. *Id.* at 189.

Over-allocation should prompt special concern largely because there is very little experience in dealing with it. In almost every instance it will require that either right holders reduce their water use below usual and accustomed levels, or the reduction of quantities attached to different rights. In either of these cases, real economic losses are likely to ensue, prompting strong incentives to resist such losses.

The importance of this point can be illustrated by the adjudicational experience of several urban groundwater basins in southern California. There, a number of urban groundwater basins were persistently over drafted, ultimately causing the realization that current rates of use could not be sustained.[35] In many instances, the state court system was given the responsibility of adjudicating the claims to pumping rights in these basins. It was recognized at the outset that many, if not all ground water extractors would have to reduce the historical level of individual extractions in order to bring total extractions into balance with rates of recharge. These reductions were offset by making supplemental surface supplies available so that total usage remained constant despite the court-mandated reduction in individual ground water extractions. In summary, there are no instances in California where persistent overdraft has resulted in reductions in aggregate use. One source is simply substituted for another. In some circles this is called the "physical solution" to groundwater overdraft.[36]

The problem with physical solutions to over-allocated river basins is that water supplies are either static or shrinking while demands for them grow. This means that in most locales, supplemental waters to affect physical solutions are not available, thus rendering physical solutions infeasible. Managers of water resources at the river basin level will soon have to confront circumstances in which water rights or entitlements will have to be reduced absolutely. As a result, these reductions with their attendant economic losses will have to be imposed in some fashion regarded as fair.

Consider next, the Colorado River Basin which flows through the seven southwestern states and into Mexico. It is the longest river in the world flowing through predominantly arid lands. The southwestern United States is the fastest growing and urbanizing region of the country. Several major urban areas such as Los Angeles, Phoenix, Las Vegas, Salt Lake City, and Denver are dependent upon the waters of the Colorado to support existing populations and new growth. Irrigated agriculture, which is the largest consumptive user of water in the basin, is

35. WILLIAM BLOMQUIST, DIVIDING THE WATERS: GOVERNING GROUNDWATER IN SOUTHERN CALIFORNIA 52–54 (1992).

36. *Id.* at 304.

dependent upon Colorado River flows, although not exclusively. Additionally, the Colorado River flows through some of the most spectacular environments in the world—rendering many environmental amenities and services dependent upon its flows.

The story of the division of the waters of the Colorado River is widely known.[37] This case study rests on three primary circumstances that characterize the Colorado River Basin: First, the waters of the river have been over-allocated. The existing allocations among nations and states which have been solemnized by three interstate compacts, an international treaty, and one Supreme Court decision were based upon a period of record that barely exceeded 50 years. The period in question turns out to have been much wetter than subsequent periods and much wetter than what is now thought to be the long-term average flow. In short, the various formal instruments, all of which have been ratified in one form or another by the federal government, have allocated quantities of water among the United States, Mexico, and the seven basin states that exceed the quantities that now appear to be available. Until now, the over-allocation has not caused many problems because some of the upper basin states have never used their full allocations. It appears, however, that with continued population growth in the region and intensifying scarcity of water from all sources, over-allocation will become increasingly urgent and must be addressed.

A second circumstance and source of enormous uncertainty surrounding issues of water rights and entitlements in the basin is the status of Native American water rights. Under the terms of various decisions of the U.S. Supreme Court, including *Winters v. United States*, nations, bands, or tribes of Native Americans who reside on reservations are entitled to such waters as needed to satisfy the purposes for which the reservation was created.[38] Additionally, in *Arizona v. California*, the Court held that the amount of practicably irrigable acreage can be used as a standard in establishing the quantities of water to which groups of Native Americans may be entitled.[39] Under the terms of these and other decisions and policies related to tribal water rights, the tribes of the Colorado River Basin are in a position to advance claims that, in the aggregate, may exceed the entire flow of the Colorado River. Many of these claims

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37. NORRIS HUNDLEY, DIVIDING THE WATERS: A CENTURY OF CONTROVERSY BETWEEN THE UNITED STATES AND MEXICO (1966); NATIONAL ACADEMY OF SCIENCES, WATER AND CHOICE IN THE COLORADO RIVER BASIN: AN EXAMPLE OF ALTERNATIVES IN WATER MANAGEMENT (1968); WATER AND THE ARID LANDS OF THE WESTERN UNITED STATES (Mohamed El-Ashry & Diana Gibbons eds., 1988); NORRIS HUNDLEY, JR., WATER AND THE WEST: THE COLORADO RIVER COMPACT AND THE POLITICS OF WATER IN THE AMERICAN WEST (2d ed. 2009).

38. Winters v. United States, 207 U.S. 564 (1908).

39. Arizona v. California, 373 U.S. 546, 565 (1963).

have not been asserted or adjudicated but they would almost certainly come into play in any process intended to adjust the allocation of basin waters downward. Moreover, the need to accommodate such claims would complicate the entire process enormously.

A third and final point has to do with the economics of existing allocations of water within the basin. When judged on the basis of economic efficiency criteria, the existing allocation can be characterized as inefficient. No scarcity value is assigned to the water itself. The price paid by users includes only the costs of capture, treatment, and delivery, which are frequently even subsidized. Among other things this signals to users that water is freely available, which it is not. High-valued uses—such as those to support an urban population in Las Vegas—go begging, while low valued uses such as growing alfalfa in the desert are lavishly served. Water for environmental purposes is probably under allocated as well. It is fair to assert that an allocative system that acknowledges water scarcity accommodates hydrologic variability by providing means to equilibrate allocations in different years with available supplies, and one that reduces perceived inequities would be superior to the system now in place.

An arrangement proposed here would address and have the potential to resolve all of these problems. The proposal would entail a reduction and rearrangement of allocative entitlements which would yield a residual pool of water that could be devoted to the highest valued uses through a market-like exchange. It would have the following elements:

- Ensure the first priority to Colorado River stream flows would be sufficient to satisfy the U.S. Mexican Treaty of 1944 as amended.
- Second priority would be accorded to "lifeline quantities" of water reserved to each of the seven basin states. Such quantities would be modest, perhaps 20 gallons/day/capita.
- Third priority would be assigned to environmental flows which would be established by the Secretary of the Interior on the recommendation of an expert committee to be appointed by the National Academy of Sciences. Environmental allocations would be reviewed and adjusted adaptively each decade.
- Use rights to the remaining flows would be vested with the Colorado River Basin tribes, who would be further authorized to establish a Colorado River Water Exchange through which the water would be available to the highest bidder.
- The Exchange would permit the sale of water rights, with appropriate priority attached: long-term water leases, short-term

water leases, a water bank for the banking of water, and a spot market.

- The economic rent from the sale and lease of this water would accrue to the tribes.
- The Secretary of the Interior would remain the River Master and would continue to serve in appropriate trustee roles for the tribes. This would ensure that there would be appropriate oversight and regulation of the exchanges.

The resulting Colorado River Water Exchange would have numerous benefits to citizens of the southwestern United States and to the nation at large. First, by vesting rights to the waters of the region to Native Americans, more than a century of unfair treatment could be rectified. It would give Native Americans a stake in, and the benefits of, natural resources that may have been taken from them. It would also acknowledge the historical record of Native Americans as husbanders of natural resources. It would be a policy that illustrates how equity matters.

Second, it would provide "lifeline" quantities of water to each of the seven basin states with a scarcity cost of zero for the purpose of ensuring adequate supplies of both drinking and water sanitation services. This allotment would be modest—on the order of 20 gallons per person per day. Using 2008 population estimates for the basin states means that less than 1.3 million acre-feet would be needed for this purpose.

Third, it would acknowledge and explicitly provide allocations of appropriate quantities of stream flow to protect and support environmental amenities and environmental services. In addition, it would provide that these allocations could be adjusted adaptively every five years or so as additional experience and knowledge are gained.

Fourth, market-like arrangements for the allocation of water among consumptive uses could ensure that water is allocated efficiently. That is, water would be put to uses maximizing the economic return to water. Markets would "wring" inefficient, low-valued uses out of the system and "rationalize" (in economic terms) the patterns of water allocation.

Fifth, this arrangement would allow for different types of rights and titles. Thus, for example, for urban areas that need reliable supplies, there would be the possibility of purchasing rights which have a high priority. Short and long-term leases could also be accommodated. Spot markets would allow for onetime acquisition of water for specific purposes.

Sixth, the exchange would provide an allocative mechanism which could adjust to inevitable hydrologic variations through year-by-year allocations and over the longer run. The water bank envisioned as

one element in the water exchange would also provide a means of evening out water flows in the river.

Finally, the federal interests in the Colorado River would be protected, providing firm guarantees of sufficient water to honor U.S. treaty obligations to Mexico. The federal role would remain limited as supervisory and of broad oversight.

In spite of the various advantages offered by this proposal, there is every reason to expect resistance to individual parts as well as in its totality from many of the existing water using interests in the basin. This would be almost inevitable given the fundamental changes in allocations and the distribution of "rights" that are implicit in the proposal. Nevertheless, there are broad opportunities for strong coalitions to develop support for the arrangements outlined above. For example, two states where existing water supplies are probably inadequate to meet current and prospective demands—Nevada and California—might well join with Colorado Basin tribes in an effort to move an agenda forward to accomplish the kinds of changes proposed herein.

What seems clear is that simply resisting change will not work for very much longer. More water has been allocated than will likely be present in the river on an average annual basis, and the prospects for developing additional storage are not at all encouraging. Moreover, the opportunities to develop new supplies through recycling and desalination are, for the most part, very costly. A Colorado River Water Exchange is likely to make water available at less cost, address longstanding inequities, and provide appropriate guarantees for international and environmental commitments. Nevertheless, the arrangements proposed herein will be resisted by those with large stakes in the *status quo*; despite the fact that the pervasive scarcity of water in the basin will likely make the *status quo* untenable. These proposed arrangements will benefit citizens throughout the basin by ensuring that water is put to its most productive uses while at the same time conferring significant benefits on the basin's indigenous citizens. No alternative arrangements which would achieve most or all of these outcomes have been proposed. It is not clear whether there is any alternative arrangement that would benefit the citizens of the Colorado River Basin to the same or greater extent than those proposed in this article.

IV. CONCLUSION

Considerations of equity have not been prominent in the making of water resources policy in the United States and elsewhere. The explanations are numerous and include the difficulty of tracking the incidence of the costs and benefits of water policy, the inability of economists to make prescriptive recommendations regarding equity, and the frequent

desire of policymakers to ignore or mask the distributional consequences of policies related to natural resources. Recent history shows that it would be unusual—and sometimes confounding—to base water policies solely on distributional or equity considerations. There are, nevertheless, numerous opportunities in which substantive management objectives can be combined with equity goals to achieve joint outcomes. The two case studies described in this article are examples.

Northern Voices entails issues of fairness to the indigenous peoples who inhabit the Mackenzie Basin of northern Canada. There are numerous laws and at least one treaty that appear to protect various elements of environmental quality which are important both spiritually and economically to these peoples. What is missing is political will on the part of the Canadian national government to enforce existing laws and treaties that protect the environmental assets of the Mackenzie Basin. The equity implications of this failure extend beyond the Northwest Territories and Canada to inhabitants of the northern and central Americas and perhaps to all of the inhabitants of the Western Hemisphere who depend upon the environmental attributes of the Mackenzie Basin to maintain environmental quality generally. The fact that indigenous peoples of the basin are prepared to act as stewards of these resources would confer large and widespread benefits upon the millions who inhabit the Western Hemisphere. Effective implementation of policy as if equity matters is just as important as the policy itself.

The Colorado River is characterized by over-allocation of its waters. Climatic variability and change threaten to reduce river runoff further, and exacerbate the over-allocation. Native peoples of the basin have not benefited fully from the presence of water and other resources, though the basin is their homeland. The establishment of a Colorado River Water Exchange would: (1) guarantee water to meet treaty obligations with Mexico, for environmental purposes and to provide minimal quantities for basic human domestic and sanitary needs, and (2) provide for auction of the remainder to the highest bidder with profits and rents to be retained by Colorado Basin tribes. Such an exchange would provide an effective means of rationing increasingly scarce water supplies in the basin and compensate for some of the inequities that have been visited upon the native peoples of the basin historically. The establishment of such an exchange would be an example of a policy in which equity matters.