

**PRESERVING PUBLIC NATURAL RESOURCES: VALUE
AND SUSTAINABILITY IN A WORLD OF HIGH COSTS
AND BUDGET SHORTFALLS**

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| I. | THE UNITED STATES HAS VAST PUBLIC NATURAL RESOURCES: THE OIL AND GAS EXAMPLE..... | 269 |
| | A. Federal Oil and Gas Reserves and Revenue..... | 269 |
| | B. State Oil and Gas Production | 273 |
| | C. State Oil and Gas Revenues..... | 274 |
| II. | THE COST CALCULUS OF SUSTAINABLE RESOURCE USE | 283 |
| | A. The Opportunity Cost of Production | 283 |
| | B. General Environmental Costs..... | 286 |
| | C. The Special Cost of Global Warming..... | 291 |
| | D. Infrastructure Costs and Other General Costs | 295 |
| | E. Macroeconomic Distortions and Dutch Disease | 297 |
| | F. Corruption and Oppression..... | 300 |
| III. | THE SPENDING DECISION | 302 |
| | A. Covering Non-Market Costs | 303 |
| | B. Spending and Sustainable Values..... | 304 |
| | C. Individual v. Public Interest and Social Benchmarks..... | 311 |
| | D. The Problems of Corruption and Mistake..... | 314 |
| | E. Local v. Generalized Investment | 319 |
| | F. Internal Conflicts | 321 |
| IV. | PROTECTING THE PUBLIC WEAL | 324 |

One of the most challenging decisions facing the officers and employees entrusted with the administration of public natural resources is deciding how the proceeds from selling those resources should be allocated, and, indeed, whether a given resource should be developed at all at a particular point in time. It makes little sense to assiduously pursue the exploration, development, and production of a natural resource if the proceeds derived from that effort are wasted. Yet the way that public resource revenues often are spent suggests that too few governments grapple with the factors that ought to infuse their decision-making.

Using oil and gas as an example, this Article sketches the factors that deserve consideration in public decisions on allocating natural-resource revenues. It starts with the costs that production can impose, because it is impossible to make a rational decision about whether to develop resources, or about how to allocate their revenues, without knowing how the expected benefits from production—all that the new revenues will bring—compare to the costs, direct and indirect, that will be incurred.

Too often, one-time revenues from nonrenewable resources are used to pay the regular operating expenses of government. The revenues may even be used to abolish or avoid income and other taxes, as occurred in Alaska and Texas. Using natural resources to subsidize day-to-day costs eases life while the revenue stream flows, but it threatens a hard landing when the effluvium comes to an end. Political bodies can become as dangerously dependent upon nonrenewable resources as individuals upon drugs. Even though a number of states have created “permanent” funds to preserve some of the resource value, the amounts saved usually are a small fraction of total revenues and in no case enough to preserve the value of the spent asset.

There are many cases, law review articles, and treatises that address the development of natural resources.¹ These authorities assume that

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development is good and that the material question is how to encourage more development.² From the opposite perspective, there are many writings on the environmental costs of resource development.³ These authors generally question not only whether development should occur, but also debate the kinds of restrictions that need to be in place to pay for damage to the air, land, and water.⁴ But almost nothing is available on how the administrators who supervise public lands ought to compare costs and benefits in order to think clearly about whether to lease public land, the pace of leasing, and how the costs of production fit into spending decisions when development is warranted.

In the early years of the United States, the vast bounty of its land, forests, and prairies, its wide rivers and abundant lakes, its overflowing fish and game, and its vast mineral deposits made it hard not to view this extraordinary natural wealth, so different from the fenced-in, domesticated Old World, as illimitable, boundless, and not needing

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1. See *Brewster v. Lanyon Zinc Co.*, 140 F. 801 (8th Cir. 1905) (holding that lessees have a duty to develop and that the standard under which they will be judged is an objective standard of the prudent operator, a standard designed to favor neither lessor nor lessee but instead to thread the needle between their conflicting interests and make way to common economic ground); see also John Burritt McArthur, *Stewarding Public Oil, Gas, and Hard Minerals: The Express and Implied Development Rights that Protect Public Resources*, 9 TEX. J. OIL GAS & ENERGY L. 215 (2014) (addressing the development rights of public lessors in natural-resource leases, particularly oil and gas leases).

2. A pro-development stance certainly marks the standard developed in the most famous American development case, *Brewster*, 140 F. 801.

3. See, e.g., Alexandra B. Class, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63 (2011); Holli Brown, *The Attack on Frack: New York's Moratorium on Hydraulic Fracturing and Where It Stands in the Threat of Takings*, 41 ENVTL. L. REP. NEWS & ANALYSIS 11146 (2011).

4. *Id.*

protection.⁵ Spoils were there for the taking. Yet even in an age in which we are more aware of the limits on our resources and have a better understanding of the costs involved in production, the dominant approach has been to favor development. Governments find it hard to resist anything that means more money for the urgent needs of today. They have little patience for considering hidden or long-term costs or the benefits that could come from leaving some reserves in the ground.

This Article discusses the factors that ideally would be considered in public development decisions. It begins by surveying federal and state oil and gas resources to illustrate the significance of public resource wealth. Part II describes six costs that often accompany oil and gas and other natural-resource production and that should be considered in decisions about whether to develop these resources: (1) the opportunity cost of production; (2) general environmental costs; (3) the special environmental cost of global warming; (4) general social costs, like added infrastructure wear and tear; (5) the possible macroeconomic distortion known as Dutch disease; and (6) the risk of corruption from the large infusion of money that often comes with natural-resource production.

Part III turns to the spending decision. If revenues come in, how should they be allocated? It considers how spending decisions should be affected by (1) non-market costs; (2) sustainability; (3) the relative efficiency of public versus private spending; (4) risks of corruption and mistake; (5) considerations of local versus more general investment; and (6) intra-regional conflicts.

The Article does not propose any single model for optimal resource use. Even in the most well-intentioned and knowledgeable world, decisions will vary with political judgment, decision maker competence, economic conditions, and risk assessments. Nor is it myopic about the limits of rationality and the role of “passions and interests” in history. Even in a rational world, costs and spending can play out differently—even for the same government at different times. Nonetheless, the identification of factors that should be considered provides a framework for approaching resource development and spending in a more productive way than in the past. Merely identifying factors does not

5. Not everyone was fooled into thinking the country's vast natural resources were inexhaustible. One of the themes running through James Fenimore Cooper's ode to outdoor living, the *Leatherstocking Tales*, is Natty Bumppo's constant ruminations over the disappearance of the unspoiled forests and the shortsightedness of those who thought the “western” bounty (western being the edge of New York State for most of the series) unlimited. Cooper, through Bumppo, foresaw the rapid settlement and resource exploitation that has been such a large part of the country's destiny. See generally JAMES FENIMORE COOPER, *THE LEATHERSTOCKING TALES I: THE PIONEERS, THE LAST OF THE MOHICANS, THE PRAIRIE* (Library of America 1985) (1823, 1826, 1827); JAMES FENIMORE COOPER, *THE LEATHERSTOCKING TALES II: THE PATHFINDER, THE DEERSLAYER* (Library of America 1985) (1840, 1841).

assure that a society will have the self-possession to rise to the challenge of addressing them, but it is the necessary starting point.

I. THE UNITED STATES HAS VAST PUBLIC NATURAL RESOURCES: THE OIL AND GAS EXAMPLE

The common American picture of a resource-rich government is likely to be of a foreign potentate with a fantastically wealthy national oil company. Few realize the vast scope of our own public land and minerals. Our federal and state economies and budgets are so huge that the part funded by natural resources is generally relatively small. But the revenues are only proportionately small because they are funneled into the world's largest national economy and some of its largest regional economies. In fact, publicly owned natural resources supply significant revenue to federal and state governments and are sources of fuel for industrial production, transportation, electricity generation, and home heating, cooling, and cooking. On the negative side, producing these resources can be a major source of pollution and other costs that need to be balanced against the economic lure of development.

In addition, the public share of national production for many resources is so large that, if administered wisely, public properties can set benchmarks for safety, conservation, and environmental responsibility and serve as technology-forcing examples for private industry.⁶

A. *Federal Oil and Gas Reserves and Revenue*

The federal government and a number of states collectively are the largest owners of natural resources in the United States. The full scope of this public wealth can be obscured because private companies have been allowed to lease and develop these resources, thus reaping a large share of the revenue and substituting for the large nationally owned companies seen in most major oil-producing nations.

Oil and natural gas are far and away the most valuable of all of our public natural resources. Public ownership includes all offshore acreage, which is owned by the appropriate state close to the shore and by the federal government further offshore. In 2010, federal land alone

6. The idea of public-owned resources setting an example for private industry is an old one. It was a mainstay of progressive politics and one of Franklin Roosevelt's justifications for public power and the development of the Tennessee Valley Authority. See ARTHUR M. SCHLESINGER, JR., *THE AGE OF ROOSEVELT: THE COMING OF THE NEW DEAL* 323 (1958); ARTHUR M. SCHLESINGER, JR., *THE AGE OF ROOSEVELT: THE POLITICS OF UPHEAVAL* 374 (1960); see also WILLIAM E. LEUCHTENBURG, *FRANKLIN D. ROOSEVELT AND THE NEW DEAL: 1932-1940*, at 55 (1963); ALAN BRINKLEY, *THE END OF REFORM: NEW DEAL LIBERALISM IN RECESSION AND REFORM* 243 (1996).

(onshore and offshore) supplied 34% of the country's oil and 23% of its natural gas.⁷

Public entities receive revenues from natural resources through lease bonuses, rentals, royalty payments, and, in almost all states, from severance taxes on all resources extracted within state boundaries and from property taxes.⁸ Both the lease-based payments and severance taxes can be large sources of revenue, but they are not necessarily correlated. A state may have substantial lease revenue, but not impose a severance tax (as California, Pennsylvania, and the federal government have failed to do), so that its severance tax revenue is zero. Or it may have a high severance tax, but not have much public land to lease. States have substantial control over resource revenues from their own land because they can choose whether to lease, when to lease, how much land to include, and how much development to require on each lease. Severance taxes depend heavily upon how actively companies explore and develop on private land, as well as on the tax rate. Government thus can influence resource revenues and underlying resource activity through changes in tax rates, as well as in lease terms. Even with severance taxes derived from private land, the revenues are "public" just as income and corporate taxes are public revenues. Public policies to recoup uncaptured costs of production can be implemented through changes in levels of taxes and also by adjustments in public lease terms. And questions of fair and optimal allocation of resource revenues surround decisions about the allocation of lease payments and also of severance and oilfield-related property taxes.

The federal government is the largest owner, by far, of mineral rights in the country. The Bureau of Land Management, which manages onshore properties, is responsible for 245 million acres of surface land and an extraordinary 700 million acres of subsurface land.⁹ This acreage

7. The 700,000 onshore mineral acres managed by the Bureau of Land Management are producing 11% of the country's natural gas and 5% of its oil. See *Oil and Gas*, U.S. DEP'T INTERIOR, BUREAU LAND MGMT., http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas.html (last visited Apr. 13, 2015). Offshore, federal land in the Gulf of Mexico provides an additional, rapidly increasing 29% of the country's oil and 12% of its natural gas. See *Gulf of Mexico Fact Sheet*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/special/gulf_of_mexico/ (last visited Apr. 13, 2015). Much of the discussion in this section is a revised version of Part I of McArthur, *supra* note 1.

8. For differences in which resources are subject to severance taxes in a comparative study across all states using 2006 tax data, see Judy Zelio & Lisa Houlihan, *State Energy Revenues Update*, NAT'L CONF. ST. LEGISLATURES (June 2008), <http://www.ncsl.org/research/fiscal-policy/state-energy-revenues-update.aspx> [hereinafter NCSL Revenue Study].

9. U.S. DEP'T OF THE INTERIOR & U.S. DEP'T OF AGRICULTURE, NEW ENERGY FRONTIER: BALANCING ENERGY DEVELOPMENT ON FEDERAL LANDS 8 (May 2011) [hereinafter NEW ENERGY FRONTIER], available at <http://www.doi.gov/whatwedo/energy/upload/NewEnergyFrontier050511.pdf>. Private mineral ownership contrasts with the property arrangement in almost all other major producing countries, in which the government, often acting through a nationally owned oil company, owns the minerals within its borders. FRANCISCO PARRA, OIL POLITICS: A MODERN HISTORY OF PETROLEUM 6 (2010) ("Outside of the United States and part of Canada,

is dwarfed by the 1.7 billion acres of offshore lands, mainly in the Gulf of Mexico, whose supervision now falls to the Bureau of Ocean Energy Management (BOEM).¹⁰ Overall, the vast, still largely unexplored offshore acreage on the federal Outer Continental Shelf may contain as much as 60% of the country's recoverable oil reserves and 40% of its recoverable natural gas.¹¹ And that acreage does not include the currently protected areas off the East Coast, Florida, the West Coast, and undrilled federal property in parts of Alaska.

The federal government collected \$12.15 billion from oil, gas, and coal lease payments of one kind or another in 2012.¹² By statute, half of the revenues generated from leased onshore federal land are given to the state in which the generating lease is located.¹³ Another 40% is distributed under the Reclamation Act.¹⁴ These "federal" revenues boost the welfare of producing states.¹⁵ Although most states share some

subsurface mineral rights are universally the property of the state."); *see also* Marilyn Radler & Laura Bell, *OGJ150 Firms Post Improved 2010 Results With Stronger Prices, Production, Reserves*, OIL & GAS J. 32, 36, 44 (Oct. 3, 2011). For the dominance of nationally owned oil companies in world oil supply, compare the lists of production and reserves for the twenty leading international companies (with BP and Shell the only majors making even one of the lists at that time) with the much smaller reserves of the leading twenty U.S. companies in various categories. Of course, the statistics in the text indicate that even in the United States, where private landowners often do own the mineral rights under their land, the federal government, and a number of state governments remain among the largest owners of oil and natural gas in the country.

10. NEW ENERGY FRONTIER, *supra* note 9, at 9, 97; *see also* GOV'T ACCOUNTABILITY OFFICE, OIL AND GAS LEASING: INTERIOR COULD DO MORE TO ENCOURAGE DILIGENT DEVELOPMENT, GAO-09-74, at 21 (Oct. 2008) [hereinafter GAO LEASING REPORT], available at <http://www.gao.gov/new.items/d0974.pdf>. Federal onshore acreage includes the twenty-three million acres in the National Petroleum Reserve in Alaska, which was established as the Naval Petroleum Reserve No. 4 by President Warren Harding in 1923. *National Petroleum Reserve in Alaska*, U.S. DEP'T INTERIOR, BUREAU LAND MGMT., <http://www.blm.gov/ak/st/en/prog/energy/oilgas/npra.html> (last visited Apr. 13, 2015).

11. NEW ENERGY FRONTIER, *supra* note 9, at 9, 85. These figures for the federal share of total production will need downward revision given the recent increase in recoverable onshore shale reserves, much of it on private land. Offshore volumes nonetheless will remain a major portion of the nation's reserves.

12. *See Statistical Information, Reported Royalty Revenues, Fiscal Year 2012*, OFFICE NAT. RESOURCE REVENUE, <http://statistics.onrr.gov/ReportTool.aspx> (last visited Apr. 13, 2015) (showing the almost \$12 billion in 2012 collections). Traditionally, royalty revenues have been the largest category of payment collected. In 2012, for instance, the federal government collected over \$9 billion in oil and gas royalties. *Id.* When rents, bonuses, and other revenues are added, the oil and gas total increases to \$10.4 billion. *Id.* Coal is the other major mineral contributor, furnishing over 12% of total listed federal revenues. *Id.* The federal government does not collect severance taxes on its property.

13. 30 U.S.C. § 191(a) (2014). Half of lease rentals are also paid to the states in which the rentals were generated, but instead of the remaining part being distributed under the Reclamation Act, the other half is paid into the Treasury special fund established by the BLM Permit Processing Improvement Act. *Id.* § 191(c)(1)(B). For federal/state sharing of offshore revenues, *see infra* note 48.

14. 43 U.S.C. §§ 371–616 (2014). §

15. *See generally ONRR Overview*, OFFICE NAT. RESOURCE REVENUE, <http://www.onrr.gov/About/default.htm> (last visited Apr. 13, 2015). The distribution of offshore revenues is more complex, with most of the revenues from submerged lands beyond a state's own boundaries going to the United States Treasury's General Fund, but funds adjacent to the

federal resource revenues, the payments are heavily concentrated in a small number of states, with the traditional leaders being, in order, Wyoming, New Mexico, Oregon, and California—four states that each were receiving \$100 million or more annually by the end of the twentieth century.¹⁶ The federal government also receives revenue from timber, grazing on public lands, and other valuable resources, but oil, gas, and coal are the dominant national public resources.

The income and economic activity generated by developing these lands stimulates the larger economy. A report from the industry's National Petroleum Council has estimated that the total annual contribution of oil and gas royalties and severance tax payments, as well as less-direct taxes on oil and gas activities like sales, payroll, property, and use taxes, is as much as \$250 billion dollars a year.¹⁷ This estimate may be high, but the development of natural resources on federal land and in productive states unquestionably gives a major boost to the American economy. Domestic production creates jobs, lowers manufacturing costs and the cost of living, improves the balance of payments, and is a source of income and capital, as well as of public revenue.¹⁸

“seaward” boundaries of certain coastal states shared with the states. *Id.* Because of the widespread belief the time of statehood that Alaska's remote economy posed unique challenges, Alaska receives 90% of the oil and gas lease sales, bonus, and royalty revenues generated on in-state federal land. 30 U.S.C. § 191 (2014). For a general discussion of federal revenue sharing with states and countries, see GOV'T ACCOUNTABILITY OFFICE, LAND MANAGEMENT AGENCIES: REVENUE SHARING PAYMENTS TO STATES AND COUNTIES, GAO/RCED-98-261 (Sept. 1998), available at <http://www.gao.gov/archive/1998/rc98261.pdf>. Details of the then-current program are listed in *id.* App. II. For history of the unique 90% federal sharing of mineral bonuses, royalties, and rents with Alaska, see *Alaska v. United States*, 35 Fed. Cl. 685, 687–96 (1996), *aff'd*, 119 F.3d 16 (Fed. Cir. 1997). For a holding that the 90% revenue distribution is not binding in perpetuity on the federal government and upholding the power to pay the state on net rather than gross proceeds, see *id.* at 698–706. For a review of the legislative history of the Alaska grant by an author not persuaded that the current high grant was intended to be permanent, see Ivan L. Ascott, *The Alaska Statehood Act Does Not Guarantee Alaska Ninety Percent of the Revenue from Mineral Leases on Federal Lands in Alaska*, 27 SEATTLE U. L. REV. 999 (2004).

16. These four states received in total over 60% of 1997 federal resource revenues shared with the states. REVENUE SHARING PAYMENTS, *supra* note 15, at App. I. The \$100 million cutoff is approximate—California is included, though it received just under \$100 million in the cited data.

17. NAT'L PETROL. COUNCIL, PRUDENT DEVELOPMENT: REALIZING THE POTENTIAL OF NORTH AMERICA'S ABUNDANT NATURAL GAS AND OIL RESOURCES 16 (Sept. 15, 2011) [hereinafter NPC PRUDENT DEVELOPMENT REPORT], available at <http://www.npc.org/nard-execsummvol.pdf>. The NPC report cites a PricewaterhouseCoopers estimation that domestic oil and natural gas “directly generated” roughly 3% of the country's gross domestic product. *Id.* (citation omitted).

18. THE NEW AMERICAN OIL BOOM: IMPLICATIONS FOR ENERGY SECURITY, ENERGY SECURITY LEADERSHIP COUNCIL (2012), available at http://www.secureenergy.org/sites/default/files/SAFE_Oil_Boom_Report.pdf.

B. State Oil and Gas Production

Although the federal government is the largest owner of natural resources, the national economy is so large and federal revenues so vast that natural-resource revenues are but a small fraction of federal revenues. In contrast, these revenues fill a much more significant role in the budget of a number of states. The revenues are particularly important in states like Alaska and Wyoming, which combine a large natural-resource base with a small population.¹⁹

A sense of the inter-state distribution of oil and gas resources can be gleaned from state-level oil and gas production figures. On a British Thermal Unit (btu) or energy basis,²⁰ the leading states in combined oil and gas production from public and private land using the most recently available (2012) data are Texas (far out in front), Louisiana, Wyoming, Oklahoma, New Mexico, and Alaska—six states that along with the Outer Continental shelf accounted for over 70% of total 2012 oil and natural gas production in the United States.²¹ Cumulative natural gas production figures are not yet available for 2012 beyond the top six states and OCS figures, but in 2011, other leading producing states in combined oil and natural gas production were Colorado, California, and Pennsylvania.²² When coal production, the other major fossil fuel and one for which mmBtu production data is available by state through 2011, is included, Wyoming moved into second place on the btu-scale, starting to get close to first-place Texas (10,269.2 trillion btus produced in 2011 in Wyoming compared to Texas at 11,680.6 trillion btus), followed by Louisiana, West Virginia with its large coal production, and

19. Although not a measure of lease payments, the National Conference of State Legislatures has counted sixteen states in which another form of natural-resource revenue, severance taxes, constituted more than 1% of tax collections. NCSL Revenue Study, *supra* note 8, at 4. When it includes states that impose at least some tax on any resource, including hard minerals and timber, it counts thirty-eight states with such taxes. *Id.* Oil and gas taxes are by far the most common specifically identified tax and the largest source of natural-resource tax revenue. Major oil producer California and a state in the process of returning to the ranks of major natural gas producers, Pennsylvania, could generate significant added tax revenues on natural resources, but for historical and ideological reasons have failed to adopt the taxes that most natural-resource jurisdictions impose as a matter of routine. *See infra* notes 48–51 and accompanying text. Pennsylvania Governor Tom Wolf has made a severance tax part of his current budget proposal and projects that the tax would raise \$1 billion. *See infra* note 56.

20. A “btu” is a British thermal unit measurement of the heat needed to raise the temperature of one pound of water by one degree Fahrenheit. 8 HOWARD WILLIAMS & CHARLES MEYERS: *MANUAL OF OIL AND GAS TERMS* 107 (Patrick Martin & Bruce Kramer eds., rev. 2006) [hereinafter WILLIAMS & MEYERS].

21. *See Natural Gas Gross Withdrawals and Production*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/ng/ng_prod_sum_a_epg0_vgm_mmc_f_a.htm (last visited Apr. 13, 2015) [hereinafter 2012 EIA Natural Gas Production] (for 2012 natural gas data) (computations taken from EIA data by Washington Lem and Barry Pulliam of EconOne, Los Angeles, California; *see also Petroleum and Other Liquids, Crude Oil Production*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/dnav/pet/pet_crud_crpdn_adc_mbb1_a.htm (last visited Apr. 13, 2015) [hereinafter 2012 EIA Crude Oil Production] (for the oil totals by state).

22. *See* 2012 EIA Natural Gas Production, *supra* note 21.

Pennsylvania, buoyed by recent natural gas shale production.²³ Some of these rankings are changing rapidly because of the dramatic impact of oil and natural gas shale production. Oil production in North Dakota, for instance, perhaps the most unexpected beneficiary of modern drilling activity, rose from 45.1 million barrels in 2007 to 242.5 million barrels in 2012, a more than five-fold increase in five years.²⁴ In 2012, the state moved significantly past California in oil production and became the second largest oil-producing state after Texas, with California third and Alaska fourth; California may rebound, though, if its Monterey Shale turns out to have at least some of the recoverable oil reserves that have been predicted and if the state allows the intensive fracking needed to produce this oil.²⁵

The largest gas shale increases thus far have come in traditional gas-producing states—particularly the huge production increases in Texas, Louisiana, and Arkansas—as gas-shale drilling radiates out from the early 1980s efforts in the Barnett Shale in North Texas.²⁶ But the potential of the Marcellus Shale that runs through New York, Pennsylvania, Ohio, and West Virginia is already showing up in the state that has most welcomed a resurrection of drilling, Pennsylvania, where natural gas production increased more than sevenfold from 182.3 billion cubic feet (BCF) in 2007 to 1.31 trillion cubic feet (TCF) in 2012, a huge increase.²⁷

C. State Oil and Gas Revenues

The state revenues from oil and gas are of great significance. The most resource-reliant (and proportionately resource-rich) state by far is

23. *Id.* Computations furnished by Washington Lem and Barry Pulliam of EconOne, Los Angeles, California. In the state count (excluding OCS production), Kentucky entered the 2011 combined oil-gas-coal ranks at number six, Colorado seventh, followed by Oklahoma, New Mexico, Alaska, and California as, respectively, the eighth, ninth, tenth, and eleventh largest producer states in 2011. *Id.* North Dakota's surging oil production is reflected by the appearance of this rising star in the twelfth spot. *Id.*

24. See 2012 EIA Crude Oil Production, *supra* note 21.

25. *Id.* For an estimate that may end up being a "peak" estimate that the largely unexplored Monterey Shale play in southern and central California could have two-thirds of all shale oil in the United States, see Norimitsu Onishi, *Vast Oil Reserve May Now Be Within Reach, and Battle Heats Up*, N.Y. TIMES (Feb. 3, 2013), <http://www.nytimes.com/2013/02/04/us/vast-oil-reserve-may-now-be-within-reach-and-battle-heats-up.html>. The latest estimates of recoverable reserves are significantly lower. Louis Sahagun, *U.S. Officials Cut Estimate of Recoverable Monterey Shale Oil by 96%*, L.A. TIMES (May 20, 2014), <http://www.latimes.com/business/la-fi-oil-20140521-story.html>.

26. Texas, already the country's leading natural gas producer, increased annual output from 6.1 TCF in 2007 to 7.2 TCF in 2012. 2012 EIA Natural Gas Production, *supra* note 21.

27. *Id.* For a history of fracking and various factors related to its impact, see RUSSELL GOLD, *THE BOOM: HOW FRACKING IGNITED THE AMERICAN ENERGY REVOLUTION AND CHANGED THE WORLD 70–77* (2014). The latest piece in the intricate mosaic of state-level policies toward fracking is New York's ban on fracking. Thomas Kaplan, *Citing Health Risks, Cuomo Bans Fracking in N.Y. State*, N.Y. TIMES (Dec. 17, 2014), http://www.nytimes.com/2014/12/18/nyregion/cuomo-to-ban-fracking-in-new-york-state-citing-health-risks.html?_r=0.

Alaska, which remains the country's fourth largest oil-producing state.²⁸ Since the development of North Slope oil, roughly 90% of the state budget has come from royalties, severance taxes, and other oil and gas payments.²⁹ The bounty has enabled Alaska to drop income taxes, avoid a sales tax, and make an annual dividend payment to each of its residents for thirty-one years.³⁰ In addition, Alaska has amassed the largest permanent fund in the country by requiring that at least a quarter of all lease rentals, royalty payments, sales proceeds, bonuses, and federal revenue sharing payments be deposited in the Fund.³¹ As of early February 2015, the Alaska Permanent Fund had a principal value of \$52.77 billion, a staggering amount for a state with a population of well less than a million people.³² The state will enjoy a major new revenue stream when a gas pipeline finally is built and producers can ship the state's massive natural gas reserves to out-of-state, and perhaps out-of-country, markets. If the industry learns how to produce the natural gas frozen in hydrates economically, Alaska almost certainly will shoot to the head of the class of producing states.³³

28. See 2012 EIA Crude Oil Production, *supra* note 21.

29. Of the 2010 Alaska state revenues that were not due to federal revenues or investments, for instance, \$6.194 billion, over 87% of the \$7.081 billion total revenue (excluding federal revenues and investment income), were from oil revenue, with severance tax payments the largest source of revenue (40.5%) followed by royalty payments (including bonuses, rents, and interest) on state leases. ALASKA DEP'T OF REVENUE, TAX DIV., SPRING 2011 FORECAST fig.1 (last modified Apr. 5, 2011), available at <http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?893r>. Projections were for oil revenues to account for over 88% of the budget in FY 2011 and 2012. *Id.* Substantial parts of the federal revenue were from mineral sharing. *Id.* In addition, of \$4.476 billion received in investment income in 2010, roughly 79% was from the Alaska Permanent Fund, built on oil and gas revenues. *Id.*

30. The 2014 "dividend" to each resident from the Permanent Fund was \$1,884. *Annual Dividend Payouts*, ALASKA PERMANENT FUND CORP., <http://www.apfc.org/home/Content/dividend/dividendamounts.cfm> (last visited Apr. 13, 2015). Although these dividend amounts may seem small, they are paid for every resident, so that a family of five, for instance, would receive \$9,420 instead of just \$1,884.

31. The principal of the Permanent Fund "shall be used only for those income-producing investments specifically designated by law as eligible for permanent fund investments." Alaska Const., art. 9, § 15. See also Scott Goldsmith, *The Alaska Permanent Fund Dividend: A Case Study in the Direct Distribution of Resource Rent*, in *THE GOVERNOR'S SOLUTION: HOW ALASKA'S OIL DIVIDEND COULD WORK IN IRAQ AND OTHER OIL-RICH COUNTRIES* 66-67 (Todd Moss ed., 2012) (showing that the fund has been supplemented by \$7 billion in special deposits that the Alaska Legislature has authorized in flush years).

32. On the Alaska Permanent Fund corpus, see ALASKA PERMANENT FUND CORP., <http://www.apfc.org/home/Content/home/index.cfm> (last visited Apr. 13, 2015). For the Census Bureau's computation of Alaska's population at 736,732, see the figures at *Alaska*, U.S. CENSUS BUREAU, <http://quickfacts.census.gov/qfd/states/02000.html> (last visited Apr. 13, 2015).

33. Estimates of the recoverable share of hydrate reserves depend on assumptions about technological changes and prices. A study under a BP-DOE Cooperative Research Agreement estimates that the North Slope houses 590 TCF of gas hydrates, of which 89 TCF seem recoverable under current technology. ROBERT P. HUNTER ET AL., RESOURCE CHARACTERIZATION AND QUANTIFICATION OF NATURAL GAS HYDRATE AND ASSOCIATED FREE-GAS ACCUMULATIONS IN THE PRUDHOE BAY - KUPARUK RIVER AREA ON THE NORTH SLOPE OF ALASKA 3-4 (2011), available at <http://www.netl.doe.gov/kmd/cds/disk10/hunter.pdf>.

The second most proportionately resource-dependent state is Wyoming.³⁴ In the 2009–2010 fiscal year (FY), severance taxes and federal mineral royalties (coal as well as oil and gas royalties) accounted for 48.9% of its General Fund revenue.³⁵ Another source of revenue is income from the \$5 billion Permanent Wyoming Mineral Trust Fund.³⁶ Altogether, Wyoming receives well over half of its General Fund revenues from mineral revenues of one kind and another.³⁷

In New Mexico, the FY 2010 budget projected that 15.6% of General Fund revenues would come from “mineral taxes, rents, and royalties.”³⁸ This was a reduction from prior years owing to low energy prices, but the figure greatly understated the contribution of natural resources, particularly oil and gas, to state finances because it did not count two large permanent funds with a combined principal of approximately \$12.5 billion that New Mexico has established to assist its schools and to bolster ongoing government operations.³⁹

34. A comparison of state energy tax revenues by the National Conference of State Legislatures, which identified states in which severance taxes supplied over 1% of state tax collections in 2007 data, listed Wyoming, North Dakota, New Mexico, and Oklahoma, along with Alaska, as states in which severance taxes supplied more than 10% of total tax revenue. NCSL Revenue Study, *supra* note 8, at 4. The study listed Alaska’s severance taxes as a share of total tax collections at 50.2% in 2004 and a whopping 64.4% in 2007. *Id.* at 3. In Wyoming, the share was roughly 40% of tax collections. *Id.* at 4. Wyoming also received the largest amount of federal resource-generated revenue-sharing money. *See supra* note 16 and accompanying text. Wyoming was the largest beneficiary of federal revenue-sharing funds, receiving \$925.3 million out of a total \$1,972.3 million distributed to states in 2007, almost half of all such funds nationwide. *See also* NCSL Revenue Study, *supra* note 8, at 6.

35. CONSENSUS REVENUE ESTIMATING GRP., WYOMING STATE GOVERNMENT REVENUE FORECAST FY 2010–2014, Sec. 1, at 1 (Oct. 2009), available at http://eadiv.state.wy.us/creg/GreenCREG_Oct09.pdf.

36. WYO. STATE TREASURER, ANNUAL REPORT FOR THE PERIOD JULY 1, 2010 THROUGH JUNE 30, 2011 (2011), available at <http://treasurer.state.wy.us/pdf/annualweb11.pdf>.

37. *Consensus Revenue Estimating Group (CREG)*, ST. WYO. LEGISLATURE, <http://legisweb.state.wy.us/lsoweb/BudgetFiscal/CREG.aspx> (last visited Apr. 13, 2015).

38. STATE OF N.M., DEP’T. OF FIN. AND ADMIN., BUDGET IN BRIEF 35 (Jan. 2009). Oil and gas generated 20% of government revenues in 2008, but price declines had reduced this share since. *Id.* at 1.

39. The New Mexico State Land Office, which handles leasing of state lands and collection of royalties and other lease revenues, manages 13.4 million acres of mineral lands, as well as almost 9 million acres of surface lands, and sends revenues from the properties to the Land Grant Permanent Fund, which supports public schools and other beneficiary institutions. *See* N.M. ST. LAND OFFICE, <http://www.nmstatelands.org/> (last visited Apr. 13, 2015). The Fund distributed \$595 million in 2015. *Land Grant Permanent Fund*, N.M. ST. INVESTMENT COUNCIL, <http://www.sic.state.nm.us/land-grant-permanent-fund.aspx>. It had more than \$14 billion in principal at the end of FY 2014. *SIC Annual Audit Reports*, N.M. ST. INVESTMENT COUNCIL, <http://www.sic.state.nm.us/sic-annual-audit-reports.aspx> (last visited Apr. 13, 2015). The separate New Mexico Severance Tax Permanent Fund had a principal of approximately \$4.7 billion at the end of FY 2014. *Id.* The investment of oil and gas revenues in Permanent Funds means that the share of government revenues generated from oil and gas holdings is far less than those resources’ total contribution to state welfare. For history of New Mexico’s funds, and efforts to preserve principal by limiting distributions to a preset percentage of principal, see Amy Williams, *New Mexico’s Land Grant and Severance Tax Permanent Funds: Renewable Wealth from Non-Renewable Resources*, 48 NAT. RES. J. 719, 722–28 (2008).

Several other states with very large production, particularly Texas, are not able to fund as high a portion of government budgets from oil and gas because their populations, economies, and budgets are so large that mineral revenues are proportionately less important. Nonetheless, resource-based programs that underwrite key public functions have been critical to the welfare of these states, too.

As befits a state with the ambitions of Texas, it has two large educational funds. The Texas General Land Office (GLO) oversees a huge inventory of fifteen million acres dedicated to the Texas Permanent School Fund, supports K-12 public education in Texas, and runs one of the “world’s largest endowment funds.”⁴⁰ Founded in 1922, the GLO has spent \$24 billion on education since 1960, had accrued a Texas Permanent School Fund balance of \$35 billion at the end of August 2014, guarantees \$58.1 billion in school bonds, and is injecting almost a billion dollars a year into Texas precollege education.⁴¹

The University Lands Office (ULO) maintains a Permanent University Fund to support higher education. The Fund has title to 2.1 million acres that hold hundreds of active oil and gas fields developed under thousands of leases.⁴² The Fund has collected \$6.44 billion in revenues since its establishment in 1876 and currently has a market value of \$17.3 billion.⁴³

Natural-resource revenues thus provide essential funding for the major human capital investments in our second largest state by acreage, with one of our largest populations and economies. This concentrated investment of state mineral revenues in education almost certainly has had a higher long-term value to the state economy as a whole than would,

40. *Energy & Minerals*, TEX. GEN. LAND OFFICE, <http://www.glo.texas.gov/what-we-do/energy-and-minerals/index.html> (last visited Apr. 5, 2015). The Permanent School Fund was begun in 1854 but was depleted by 1861 because of poor investments in railroads, the collapse of the Confederate monetary system, and the bullish decision to loan the Fund to the Civil War effort. TEXAS PERMANENT SCHOOL FUND: COMPREHENSIVE ANNUAL FINANCIAL REPORT FOR THE FISCAL YEAR ENDING AUG. 31, 2014, at 3, 23, 47–49 (2014) [hereinafter 2014 TEXAS PERMANENT SCHOOL FUND ANNUAL REPORT], available at http://tea.texas.gov/Finance_and_Grants/Texas_Permanent_School_Fund/Texas_Permanent_School_Fund_-_Annual_Report/.

Although it was subsequently replenished, the most significant input came in 1953 when Congress passed the Submerged Lands Act. Under the Act, Texas has received the right to minerals in the first three nautical miles offshore. *Id.* at 23. These lands were put into the Permanent School Fund, with the principal generated by the land to be preserved while only income could be used to pay for education. *Id.* at 23, 47–49. The Fund receives all lease payments, bonuses, royalties, and oil and gas revenues from these properties. *Id.* at 47–49. It currently has 12.6 million acres of submerged lands, as well as other onshore acreage, including 423,752 acres in West Texas. *Id.* at 33–34.

41. 2014 TEXAS PERMANENT SCHOOL FUND ANNUAL REPORT, *supra* note 40, at 5. Over the years the Fund has guaranteed \$120.4 billion in school-related bonds. *Id.* at 20.

42. *Facts About the University Lands*, U. TEX. SYS., <http://www.utlands.utsystem.edu/facts.aspx> (last visited Apr. 13, 2015). The University Land Office acreage was created in three large land grants, 220,000 acres in 1839, a million acres in 1876, and another million in 1883. *Id.*

43. *Id.*; FINANCIAL STATEMENTS AND INDEPENDENT AUDITORS’ REPORT, PERMANENT UNIVERSITY FUND: YEARS ENDED AUGUST 31, 2014 AND 2013, at 5 (Oct. 31, 2014), available at <http://www.utimco.org/Funds/Endowment/PUF/PUF2014AuditedFinancials.pdf>.

say, distributing an equal amount of money in small annual dividend checks to millions of Texas residents.

Other states have not tried as hard to save their oil revenues. For instance, Louisiana has put only very limited monies from public oil and gas development into a long-term set-aside capital account preserved for future generations. The state's only fund is a school fund based on federal revenue-sharing money that comes from a settlement with the federal government over certain offshore federal production.⁴⁴

History may explain this short-term orientation. The state's oil production was getting under way when Huey Long was elected governor in 1927. Long battled against Standard Oil and other oil interests throughout his career. As governor, he raised severance taxes, imposed a refinery tax, and used the proceeds for such infrastructure investments as roads, schoolbooks, and, later, his beloved Louisiana State University.⁴⁵ But he was far too fond of the power that doling out the money gave him to establish an independent fund. Instead, he put oil tax receipts directly into investments that appeared likely to help pull the state out of its bottom-drawer position as measured by economic and social indices.⁴⁶ This tradition may have carried over into using oil revenues as an ordinary source of government funding. Louisiana's severance taxes and its lease revenue from royalties, rentals, bonuses, and interest provided

44. See *infra* note 48.

45. T. HARRY WILLIAMS, HUEY LONG 140–46 (1981). Long attacked Governor Parker for being in Standard Oil's pocket after Parker's administration secured only a 2.5% severance tax and Parker not only claimed that he had a "gentleman's agreement" with Standard Oil on a 2% tax, but let Standard Oil's lawyers draft the bill. *Id.* at 173–80. As the Commissioner of Louisiana Public Service Commission, Long fought to treat Standard Oil Pipe Line Company and its parent as common carriers and regulate rates. *Id.* at 297. Elected governor in 1927, he advanced a program that included increasing severance tax on oil and extractive products, as well as bringing natural gas to New Orleans. *Id.* at 304–07. Governor Long proposed using bonds paid off by raising gasoline taxes and putting more money into highway fund for a large road-building program. *Id.* at 307–10. He advocated changes to increase severance tax collections by basing them on quantity of product, rather than market value, in order to pay for free school books at a time when "Louisiana was known as a state that levied remarkably few taxes," and also proposed to increase state revenue taxes on carbon black by basing the tax on quantity, rather than market value. *Id.* at 347. He pursued an occupational license tax and a manufacturer's tax on oil refiners of five cents per barrel and used revenues for education and to support the blind and deaf, a move that led to a Standard Oil-driven effort to impeach Long. *Id.* at 445.

The United States Supreme Court upheld the severance tax against a charge that levy based on gravity of oil was discriminatory. *Id.* at 446. Long proposed to allocate two cents of four-cent gasoline tax to secure bonds for roads. *Id.* at 782–85. He responded to a Standard Oil threat to close its large Baton Rouge refinery by agreeing to a four-cent rebate off the five-cent oil refinery tax in return for Standard Oil's agreement to use Louisiana oil for eighty percent of its Baton Rouge refinery input. *Id.* at 792.

46. It was a paradox that the Louisiana of the 1920s was in the "front rank" of Southern industrial states, yet with control in the hands of a long-established, wealthy elite, it had among the lowest, worst standard of living in all forty-eight states. *Id.* at 185–87. Its crown city, New Orleans, has been lapped economically by regional competitors Houston, Dallas, Atlanta, and Miami in the decades since, suggesting that elite self-interest and narrow economic vision have continued to hamper the local economy.

13.8% of the \$11.155 billion state budget in FY 2009 and 13.9% of the \$8.918 billion budget in FY 2010.⁴⁷ The risk of relying on nonrenewable resources for ordinary government expenses is quite apparent. As in a number of other oil states, until recently oil production has been in decline in Louisiana, with a corresponding pressure on the state budget.⁴⁸

In Oklahoma, the Commissioners of the Land Office have charge of over a million mineral acres.⁴⁹ Their job is to devote the proceeds from these properties to public education.⁵⁰ The leased land generated over \$120 million in FY 2011.⁵¹ The Commissioners also administer a Permanent Fund that, as of FY 2010, had grown to over \$1.5 billion.⁵²

47. LEGISLATIVE FISCAL OFFICE FOR THE STATE OF LA., REVENUE ESTIMATING CONFERENCE: FISCAL YEAR 10 FORECAST 1 (2010), available at http://lfo.louisiana.gov/files/revenue/REC_Fcsts_06_21_10_FY10_FY11.pdf; LEGISLATIVE FISCAL OFFICE FOR THE STATE OF LA., REVENUE ESTIMATING CONFERENCE: FISCAL YEAR 11 FORECAST 1 (2011), available at http://lfo.louisiana.gov/files/revenue/RevOutlook_Jan11_REC.pdf.

48. For federal revenue sharing generally, see *supra* notes 12–16 and accompanying text. There are historical variations between states on the point at which offshore land passes from state to federal jurisdiction. After the Supreme Court held that all offshore properties fall within federal jurisdiction in a series of oil-revenue-driven cases beginning with *United States v. California*, 332 U.S. 19 (1947), Congress passed the Submerged Lands Act in 1953, 43 U.S.C. §§ 1301–15 (2007), which lets states claim up to three miles offshore as part of the “state.” *Id.* The states would receive all of the oil and gas revenues and taxes from lands within the offshore limit. *Id.* The Act’s legislative history suggests that Congress believed the Supreme Court had totally misread the historic record on offshore limits and, in effect, did not know what it was talking about. This critical record is, somewhat comically, recited by the Court itself in *United States v. Louisiana*, 363 U.S. 1, 17–18 n.17 (1960), with no discussion of how the Court could have strayed so far from the historic record or why, if it had, it would do a better job weighing the disputed history of state-level offshore boundaries.

The Act allowed states to make historical claims for longer distances up to three nautical miles. In *United States v. Louisiana*, the Court found that Texas and Florida had advanced evidence supporting a three-marine-league boundary on that basis, *id.* at 36–65, 121–29, but that Louisiana, Alabama, and Mississippi had not and could only claim a three-geographic-mile area around their coasts, *id.* at 66–82. The state of Louisiana received some relief from its shorter boundary when, in 1978, the state of New Jersey pressed successfully to get more local coastal protection after offshore oil and gas discoveries and Congress gave certain coastal states a greater stake in offshore revenues as a result, amending the Outer Continental Shelf Lands Act to allow seven coastal states to receive a “fair and equitable” share of mineral revenues from federal continental shelf lands. LA. BD. OF ELEMENTARY AND SECONDARY EDUC., 8(g) ANNUAL REPORT: 2010–2011, at 6–7 (2011), available at <http://www.louisianaschools.net/lde/uploads/19069.pdf>.

In a settlement with the federal government, the state of Louisiana was given 27% of federal mineral revenues generated from production in the second three miles offshore—miles four through six. *Id.* Voters approved placing these funds in the Louisiana Educational Quality Trust Fund. *Id.* As of mid-2012, the Fund had paid out \$1.433 billion in roughly equal amounts between K-12 education and higher education, and the Fund had a market value of over a billion dollars. LA. BD. OF ELEMENTARY AND SECONDARY EDUC., 8(g) ANNUAL REPORT: 2011–2012, at 2, 10 (2012), available at <http://bese.louisiana.gov/docs/8%28g%29-documents-and-forms/2011-2012-8%28g%29-annual-report.pdf?sfvrsn=2>.

49. *Minerals Management Division*, COMMISSIONERS LAND OFFICE, <http://www.clo.ok.gov/MMD/Mmd.htm> (last visited Apr. 13, 2015).

50. STATE OF OKLA., COMM’RS OF THE LAND OFFICE, 2011 ANNUAL REPORT 2 (2011), available at <http://www.clo.ok.gov/2011CLOAnnualReport.pdf>; see also *id.* at 10–13 (listing recipients of distributed funds).

51. *Id.* at 5.

52. *Id.* at 8.

In addition to whatever they collect on leased public land and revenue from property taxes, most producing states benefit from hydrocarbon production by levying severance taxes upon all oil and gas severed from in-state lands. In this way, private resource recovery pumps substantial revenues into public coffers even before one considers the flow-through benefits of higher income and corporate taxes. Some states receive much less revenue from minerals within their borders than one would expect, however, in spite of their large resource base, because they have not had the will to tax their resources either at all, or at the same level as other states.

Two major producing states, Pennsylvania and California, have no oil and gas severance taxes. Pennsylvania, the original oil-producing state, has been unable to pass a severance tax,⁵³ so it is losing that substantial benefit from in-state production as Marcellus Shale natural gas moves from its long resting place under the state's surface to market disposition. Pennsylvania's prior governor, conservative Republican Tom Corbett, signed the Grover Norquist no-tax pledge and refused to support a severance tax.⁵⁴ Instead, he endorsed an "impact fee" that provides a lower level of funding than an average-level severance tax.⁵⁵ The fee ostensibly offsets impacts on local infrastructure. Most of the money goes to counties, but it is a Faustian gift. The same legislation allows drilling in return for the right to levy the tax,⁵⁶ thus preempting local decisions about fracking. The direct impact of oil and gas revenues on the Pennsylvania state budget has been limited, even if indirect effects through increased employment and in-state consumption are significant and growing. All this may change with the current incumbent, Tom Wolf, who has proposed a severance tax as part of his larger education funding package.⁵⁷

53. *PA Energy Severance Tax Defeated*, ENERGY CITIZENS (Aug. 6, 2014), <http://energycitizens.org/ec/advocacy/details.aspx?PostId=411153>; *Oil severance tax at center stage*, CAPITOL WKLY. (Mar. 17, 2014), <http://capitolweekly.net/oil-severance-tax-california/>.

54. PennLive Editorial Board, *Governor Corbett's Marcellus Shale impact fee is lacking*, PENNLIVE: THE PATRIOT-NEWS (Oct. 5, 2011), http://www.pennlive.com/editorials/index.ssf/2011/10/gov_corbetts_marcellus_shale_i.html.

55. *Id.*

56. H.R. 1950, Gen. Assemb., Reg. Sess. (Pa. 2012). Criticisms of the fee include that it is too low and too focused on routing money to the counties and municipalities with active wells. *See, e.g., Governor Corbett's Marcellus Shale impact fee*, *supra* note 54. In February 2015, Pennsylvania's new Governor, Tom Wolf, proposed the Pennsylvania Education Reinvestment Act that would levy a 5% severance tax plus charge 4.7 cents per mcf and would, he projected, raise \$1 billion a year for the state. Much of the money would go to support education. *Governor Wolf Proposes Education Reinvestment Plan Featuring Natural Gas Severance Tax*, PA HOMEPAGE (Feb. 11, 2015), <http://www.pahomepage.com/story/d/story/governor-wolf-proposes-education-reinvestment-plan/32084/Wpj-XcIKP0qYguhf5sRACA>.

57. *Governor Wolf Proposes Education Reinvestment Plan Featuring Natural Gas Severance Tax*, *supra* note 56.

The other major producing state that does not collect severance taxes is California,⁵⁸ one of the country's first major oil-producing states. The state generated over \$400 million in lease revenue in 2010–2011,⁵⁹ most of it from oil leases, and a total of \$7.1 billion from tideland, offshore, and river land since 1956.⁶⁰ Yet California has no severance tax. And, unfortunately, in one sign of the state's lack of political vision, California's oil and gas lease revenue goes into its general fund rather than being invested in a permanent fund or, at a minimum, being used to invest in the next generation of workers by being devoted to education. Or, if not spent on human capital, invested in high-speed rail, road and bridge repair, and other long-term physical-capital investments. The most recent effort to bring California in line with almost all other major producing states by adding a severance tax via referendum was defeated in 2006, after saturation industry advertising threatened widespread loss of jobs if the tax measure passed.⁶¹

Production on public and private land in Louisiana has made it the second largest producer of combined oil and natural gas in the country.⁶² Although the state does have a severance tax on oil and on natural gas, the natural gas tax has been set via a formula, with a base value of 7 cents per million cubic feet (mcf) and an inflation adjustment that generated a value of 14.8 cents per mcf for the period from July 1, 2012 to June 30, 2013.⁶³ The fixed levels often have been below the percentage-based returns of most other states, although low natural gas prices can disguise the rate's general below-market tendencies.⁶⁴

58. *Oil severance tax at center stage*, *supra* note 53.

59. CAL. STATE AUDITOR, STATE LANDS COMMISSION: BECAUSE IT HAS NOT MANAGED PUBLIC LANDS EFFECTIVELY, THE STATE HAS LOST MILLIONS IN REVENUE FOR THE GENERAL FUND, AUGUST 2011 REPORT 2010-125, at 3, 8–9, 41 (Aug. 2011), *available at* <http://www.bsa.ca.gov/pdfs/reports/2010-125.pdf>. The land has sixty-seven oil and gas leases, as well as geothermal and other mineral leases. Email from Chris Fossum, Executive Director, California State Lands Commission (Feb. 8, 2012) (on file with author).

60. CAL. STATE LANDS COMM'N, MINERAL RESOURCES MANAGEMENT DIVISION 5 (2015), *available at* http://www.slc.ca.gov/division_pages/mrm/Brochures/MRMD_Brochure_1-2015.pdf.

61. *Oil severance tax at center stage*, *supra* note 53.

62. *See supra* note 21 and accompanying text.

63. STATE OF LA., DEP'T OF REVENUE, REVENUE INFORMATION BULLETIN, NO. 12-024 (May 2, 2012), *available at* [http://www.rev.state.la.us/forms/lawspolicies/RIB%2012-024%20\(Natural%20Gas%20Severance%20Tax%20Rate\).pdf](http://www.rev.state.la.us/forms/lawspolicies/RIB%2012-024%20(Natural%20Gas%20Severance%20Tax%20Rate).pdf). For the formula, see La. Rev. Stat. Ann. § 47:633 (9) (2006).

64. In each of these states, industry companies lobbied aggressively against increases in severance tax burdens, arguing that new taxes would force them to shift drilling and production to other states. Oil companies lobby just as vociferously when they think they might persuade a legislature to gift them with royalty or tax reductions.

In this regard, public leases exist in an entirely different environment than private leases. While a private landowner might occasionally renegotiate if its lessee said it no longer could afford to drill but would drill under a more favorable lease, in areas where there is any competition one would expect landowners to first seek to re-lease the property to more interested companies.

When states indicate willingness to participate in these persistent efforts to reduce or avoid severance taxes or redo the lease deal, they encourage a race to the bottom of falling taxes and

Until recently, with the exception of the Gulf of Mexico, the major oil-producing areas in the United States had been in decline since the mid-1980s.⁶⁵ New oil production in the Gulf of Mexico filled most of the gap.⁶⁶ Today, however, an explosion of energy production is underway due to the massive potential of natural gas shale and tight and oil shale production. The economic significance of oil and gas revenues will grow over the next few decades as the United States secures the gains of this technologically induced advance. Production of oil from tight sands and shale, deeper offshore Gulf of Mexico drilling, offshore Arctic exploration, booming natural gas shale production, unlocking of Alaska's reinjected gas reserves by linking them to large out-of-state markets, and potential methane hydrate production: the variety of these potential developments suggests that the United States is on the way to reclaiming its position as the world's leading producer of oil and of gas as well.

A number of additional states, not just the major old producers of Pennsylvania and West Virginia, but perhaps also Ohio (and New York if it lifts its recent ban on fracking), will be added to the ranks of major natural gas producers. Shale gas already has greatly enhanced production for such traditional gas producers as Texas, Louisiana, and Arkansas.⁶⁷

North Dakota has become one of the leading oil producers because of oil shale production, just as California would come closer to past oil glories if the billions of barrels of oil embedded in the Monterey Shale can be mined profitably, a possibility that would require the state to allow intensive fracking.⁶⁸

royalty payments. Perhaps not surprisingly but also perhaps unfortunately, federal and state royalty shares in the United States tend to be materially lower than the proportionate weight of royalties and comparable payments on publicly held oil and gas in other countries. A 2008 GAO study on federal oil and gas royalty collections found that the federal share ranks near the bottom of public royalty shares in four major studies, 16 of 19 in one, dead bottom at 17 out of 17 in another, 25 out of 28 in a third, and 93 out of 104 in a study that included other U.S. states as well as foreign country shares. GOV'T ACCOUNTABILITY OFFICE, OIL AND GAS ROYALTIES: THE FEDERAL SYSTEM FOR COLLECTING OIL AND GAS REVENUES NEEDS COMPREHENSIVE REASSESSMENT, GAO-08-691, at 11 (2008), available at <http://www.gao.gov/new.items/d08691.pdf>. The GAO admitted that other factors, including the size of the reserves and cost of developing them, affect how much companies are willing to pay for a lease, but even considering such factors, it believed that federal leases are relatively attractive and, given the tenor of its report, underpriced. *Id.* at 12–13.

65. Total United States onshore production peaked in 1985 and had declined over one-third until recently, with declines in most major producing areas. U.S. ENERGY INFO. ADMIN., TOTAL ENERGY: ANNUAL ENERGY REVIEW (Sept. 27, 2012), available at <http://205.254.135.71/totalenergy/data/annual/showtext.cfm?t=ptb0502>.

66. The Gulf of Mexico provided 29% of U.S. total oil production in 2009 and holds 21% of proved crude oil reserves. GULF OF MEXICO FACT SHEET, *supra* note 7.

67. For discussion of the potential of new shale oil and natural gas production in the United States, see DANIEL YERGIN, THE QUEST: ENERGY, SECURITY, AND THE REMAKING OF THE MODERN WORLD 262–63, 326–32 (2011); see generally NPC PRUDENT DEVELOPMENT REPORT, *supra* note 17.

68. See *supra* note 25 and accompanying text.

If the potential of these formerly locked-in reserves is realized, the United States will supply yet more of its total energy domestically and, in the process, keep adding jobs and improving its balance of payments. According to some authorities, the United States already is the world's leading natural gas producer; with Canada, North America provides a quarter of the world's natural gas supply, and the United States is poised to become a net gas exporter via liquefied natural gas.⁶⁹ The United States and Canada together are also the world's largest producer of oil.⁷⁰ The changes already have had a profound impact on the international balance of economic and, to some extent, political power as well.

Many of these reserves are publicly owned. Both the federal government and the producing states should participate in this new boom in energy development. As they do, however, they need to give careful consideration to the purposes of production, its costs (both direct and hidden costs), and the allocation of revenue that will yield the highest long-term benefit. Like many policy issues, these are not as simple as one might expect.

II. THE COST CALCULUS OF SUSTAINABLE RESOURCE USE

The decision about how to allocate revenues from public natural resources ultimately is a question of getting the most benefit at the least cost over time. A key portion of this decision is how to sustain the value of a formerly unrealized asset after it has been transformed ("liquefied" in financial terms) by production, so that the benefits reach future generations as well as those living today.

A starting point for making the best decisions is that public entities must understand the full costs of producing natural resources. They need to value the cost of exhausting nonrenewable assets and the other costs imposed by production on public and private land. The costs generated by mineral development go far beyond the costs that companies pay to get the minerals out of the ground.

A. *The Opportunity Cost of Production*

The first major cost relevant to a public landowner is the opportunity cost of producing minerals and other resources now, rather than in the future. This cost is the value of using up an asset that might have a higher real value if produced at a future date, rather than produced and sold

69. NPC PRUDENT DEVELOPMENT REPORT, *supra* note 17, at 9–39. Figure ES-1 displays the U.S. lead over Russia with no other country having close to the natural gas production of either of these countries. *Id.* at 9. Figure ES-2 shows the range of estimates for total recoverable TCF in recent studies and the sharp increase in estimates of reserves to be recovered through gas shale drilling. *Id.* at 10.

70. *Id.* at 8.

today. Production will create jobs, bring funds into local communities, pay royalties (when production is on public land), and, where authorized by state law, put severance taxes into public coffers. All these benefits accrue to the producing region. But the reserves, once produced, are not there to produce again.

If minerals were renewable crops, like wheat, corn, and timber, or could be “farmed” in the same way as wind, solar power, and hydropower, public agencies could harvest them in a way that perpetuated their value. With care, they could match consumption against seasonal cycles in production. Mistakes in spending would matter less because future generations would have their own chance to decide how to spend the revenues received in their own time. But oil, gas, and hard minerals are nonrenewable. Once produced and sold, they will not generate value for the landowner again. If the resulting revenues are dissipated in nonproductive uses, they are gone forever. And if production generates long-term costs, new streams of revenue will not automatically appear to pay those costs.

One logical goal for a public resource owner is to preserve the liquid value of its resources so that the public can receive an ongoing benefit from the earnings on an amount of capital equal to the net recoverable resource value, even though the resources have had their link with the earth broken (“severed”) and have been transformed into cash or other forms of wealth. Before production, before leasing, the public receives no value from these resources. So bringing them into a marketable condition creates a value not available before. Production pulls the resource into the economic world and commodifies a previously unreachable asset. But using the revenues from the proceeds of severed resources spends what was formerly a very real, if unrealized and illiquid, asset in the ground, at least, to the extent that the revenues are spent rather than invested in a way that preserves their value. The challenge is to find a way to sustain the value of what the public owns. As Jay Hammond, the Alaska governor who championed Alaska’s Permanent Fund after earlier experimenting with a use tax on a local salmon catch when he was a borough manager, stated, “I wanted to transform oil wells pumping for a finite period into money wells pumping money for infinity.”⁷¹

Concerns about producing today what may be needed much more tomorrow and the worry that a commodity as essential to modern life as oil may hit peak production and then decline, as certainly will any particular oil or gas field, have surfaced periodically throughout the

71. JAY HAMMOND, *DIAPERING THE DEVIL: A LESSON FOR OIL RICH NATIONS* 16 (2011). For Hammond’s Bristol Bay experience, see *id.* at 4–6.

industry's history. It is telling, for instance, to see fears of running out of oil and of producing so much that it was wasted, with accompanying concerns about conservation and avoiding dissipation, arising even in the reckless, only gradually tamed, bounteous production of the 1920s and 1930s.⁷² In retrospect those look like years of boundless energy opportunity. After World War II, the United States imposed import barriers to artificially prop up domestic oil prices.⁷³ In so doing, it increased internal production and consumption of more expensive domestic oil. The country would have far greater reserves today had it let the international market work unimpeded and allowed more cheap foreign oil into the United States. The historically rapid production in the United States on public as well as private land is a reminder of how difficult it is to slow the pace of market-based development even if moderation would provide the greatest value for society as a whole.

72. Concerns about the waste of oil from poor production techniques and the pell-mell rush to produce led to repeated pressures for some kind of controls, voluntary or publicly imposed, even during the most boosterish eras of American oil production. See generally HAROLD WILLIAMSON ET AL., *THE AMERICAN PETROLEUM INDUSTRY: THE AGE OF ENERGY 1899–1959* ch. 9 (1963). According to Williamson and his coauthors, the threat of imports in the 1920s came not from lower costs abroad, for instance from cheaper labor and comparative exploration advantages (as one might expect if wells were shallower, reserves larger or easier to produce), but because foreign operators used “the best geological and engineering knowledge of the day” while, implicitly, American operators often did not. *Id.* at 301. On reserve preservation, consider the prophetic 1938 words of Northcutt Ely, who was advocating regulation of rates of oil production:

To the eye of the future consumer, . . . the indulgence with which America has allowed an obsolete property law to force the dissipation of one of her natural endowments may well appear to be an incredible indictment It may be impossible for our successors to believe that in the span of less than a century our system of laws allowed the loss of an essential resource and a resort to substitutes; that our people voluntarily submitted to the process; and that the industry was helpless to avoid it.

Northcutt Ely, *The Conservation of Oil*, 51 HARV. L. REV. 1209, 1243–44 (1938). In that innocent era before World War II, the United States still was producing 60% of the world's oil. *Id.* at 1209. Another voice in the wilderness during the 1930s was Harold Hotelling, as he wrote in his classic article on equilibrium production levels of exhaustible resources:

Contemplation of the world's disappearing supplies of minerals, forests, and other exhaustible assets has led to demands for regulation of their exploitation. . . . [I]n consequence of their excessive cheapness they are being produced and consumed wastefully [C]ertain technical conditions *most pronounced in the oil industry* lead to great wastes of material and to expensive competitive drilling

Harold Hotelling, *The Economics of Exhaustible Resources*, 39 J. POL. ECON. 137, 137–38 (1931) (emphasis added).

73. After World War II, the United States adopted import controls that left prices for domestic oil artificially high, even though domestic U.S. oil production costs were vastly greater than costs in newly developed Middle Eastern oilfields. PARRA, *supra* note 9, at 39–47. In essence, the country chose to exhaust its reserves of high-cost oil even though it could have purchased oil much more cheaply on the world market and even though this meant that domestic prices of many products that require oil inputs to make or that, like gasoline, were drawn from part of the oil or natural gas stream, were considerably higher than necessary. LESTER THURLOW, *THE ZERO-SUM SOCIETY* 27 (1980). Congress transferred income from the pockets of consumers and nonoil producers to oil companies. *Id.* (calling these protective policies “actively used to raise producer's incomes and lower consumer's incomes”).

The opportunity cost of production cannot be avoided. It should, however, be factored into the initial decision of whether to lease property as well as decisions on the terms of the lease and whether to push for rapid development once a property has been leased. In addition, preserving the value of the resource in another form needs to be part of the consideration on how to allocate the resulting funds, as Part III discusses.

B. General Environmental Costs

A second set of major costs is the direct environmental cost imposed by drilling and production. The panoply of state and federal environmental laws protecting the air, water, and land should capture many of these costs and impose them—correctly—on the producer, who can try to pass them on as far as possible and make sure that those buying oil and gas will bear at least most of the cost of production. In this way, the market should determine the best level of use of the production. But statutory and common law regulation, some enforced by state agencies, some by private lawyers suing for aggrieved landowners or their neighbors, impose high transaction costs and depend upon imperfect information. There is no built-in mechanism to ensure that all pollution will be identified and compensated. Uncaptured residual costs are likely to end up falling on state and federal governments or, if not, to impose extremely harsh losses on some individuals but not others.

Unless environmental laws could prevent all pollution, which they obviously cannot, production will bring environmental costs that sometimes will end up being borne by the public, one way or the other. Some pollutants, like the carbon emissions that are fueling global warming, are not yet restricted in many parts of the world. In other instances, regulations may be in place but a polluter may not be able to afford to remedy the damage it causes—when, for instance, a small-budget independent producer drills a few faulty and uneconomic wells and goes out of business. The damage it caused does not go away just because the company disappeared. A comprehensive measure of environmental costs from oil and gas drilling would include not just costs that a state determines have been suffered on its own land, and pollution on private land that is caught and fixed by voluntary cleanup or administrative or legal action, but also an estimate of the likely cost of latent pollution and pollution that companies fail to compensate for one reason or another.

The expanded techniques used to drill into shale formations, the combination of aggressive fracking to blow formations open, sophisticated, multi-perforation horizontal drilling, and three-dimensional seismic that makes it easier to understand subsurface

geology, pose new environmental cost issues. It is still early in the era of advanced shale drilling. In spite of substantial study, the long-term environmental consequences remain highly contested, which is one reason we see Pennsylvania welcoming fracking and neighboring New York State banning it. What financial measures do states need to take if companies are wrong and liquids used in fracking or minerals escaping from well bores do invade water supplies? Should states adhere to the precautionary principle, one of the foundational principles of international environmental law,⁷⁴ and take steps to prevent potential damages that would be very costly if they do occur? What if the growing suspicion of a link between fracking and earthquakes leads to even well-designed wells being breached by earthquakes? If an earthquake releases pollution a mile or more away, who should pay?

There has been some very public litigation focusing on surface impacts and pollution of ground and subsurface water by oil and gas activity.⁷⁵ But unintended consequences of drilling can remain long hidden. In spite of the attention focused on fracking, there remains much less awareness of underground pollution than, say, of spills that occur on or rise to the

74. See, e.g., RODA VERHEYEN, CLIMATE CHANGE DAMAGE AND INTERNATIONAL LAW: PREVENTION DUTIES AND STATE RESPONSIBILITY 75–79 (2005); DANIEL BODANSKY, THE ART AND CRAFT OF INTERNATIONAL ENVIRONMENTAL LAW 191 (2011). The at-least partly consensual international process to date for dealing with climate change puts the precautionary principle, an accepted principle of international law, at the heart of its efforts. Precaution is one of the main pillars of the United Nations Framework Convention on Climate Change, prepared at the 1992 Rio Conference. U.N. Framework Convention on Climate Change, Mar. 24, 1994, 1771 U.N.T.S. 107, art. 3.3 (the thus far utterly failed framework under which more detailed plans were supposed to proceed). For adoption of a precautionary approach by a popular expert on risk, see NASSIM NICHOLAS TALEB, THE BLACK SWAN: THE IMPACT OF THE HIGHLY IMPROBABLE 315–16, 345 (2010) (expressing skepticism about climate models but urging assumption of great harm because of lack of certainty that great harm is not occurring). For a thoughtful, sophisticated survey of what we do and do not know on “climate change,” a term he prefers to “global warming,” see NATE SILVER, THE SIGNAL AND THE NOISE: WHY SO MANY PREDICTIONS FAIL – BUT SOME DON’T ch. 12 (2012).

75. Oil drilling results in a lot of mess, even when responsibly handled. When things go wrong, the pollution can be spectacular. For a sampling from a diverse set of cases, some of them prominent in cleanup litigation, some less well known, see *Bonds v. Sanchez-O’Brien Oil & Gas Co.*, 715 S.W.2d 444, 445 (Ark. 1986) (operator plugged well, but left “water pits, concrete slabs, dams, and winrock stone on the surface”); *Holdgrafer v. Unocal*, 73 Cal. Rptr. 3d 216, 222–24 (Ct. App. 2008) (describing extensive leaks from underground oil pipelines); *Starrh & Starrh Cotton Growers v. Aera Energy LLC*, 63 Cal. Rptr. 3d 165, 167–69 (Ct. App. 2007) (2.4 to 2.9 billion barrels of produced water left in unlined pools); *Marin v. Exxon Mobil Corp.*, 48 So. 3d 234, 239–41 (La. 2010) (Exxon installed oil and gas facilities and a landing terminal, as well as oil gathering systems and oil pits used to skim oil from saltwater on plaintiffs’ property; it apparently deposited “oil, sludge, barium, chlorides, and other contaminants,” elsewhere described as “naturally occurring radioactive material” (NORM) and produced water, drilling fluids, chlorides, hydrocarbons, heavy metals, and other toxic substances in open, unlined pits that allegedly leaked); *Corbello v. Iowa Prod.*, 850 So. 2d 686, 696 (La. 2003) (in field Shell had operated since 1929, prevailing plaintiffs’ expert described “material buried down to twelve feet on the premises, including a very old gasoline dispensing tank at five feet; an old barrel labeled triethylene glycol that had been crushed and dumped; old tires and sludge out of a buried drum at two and one-half to three feet; aboveground tanks; a 500 gallon tank with piping on the side; an old well sign; as well as the contaminants his testing identified”); *Brown v. Lundell*, 344 S.W.2d 863, 864–71 (Tex. 1961) (salt water deposited in earthen pit leaked into fresh water).

surface, like the leaks in the oil gathering network on Alaska's North Slope and the forced shut-in of that network for parts of 2006 through 2008,⁷⁶ and the Macondo spill in the Gulf in 2010.⁷⁷ As one sign of the potential for extreme damage from oilfield operations—a low probability but very high consequence event—the latter already has cost BP approximately \$25 billion.⁷⁸ Such compensation is beyond the reach of almost all state governments should a similar spill be caused by a company without the money to pay for full cleanup and restoration.⁷⁹

In older producing states, there are many abandoned wells that are not inventoried and about which no one has much information. For instance, the California State Lands Commission has identified roughly 110,000 abandoned wells in the state⁸⁰—and this surely is not nearly the total number. In Pennsylvania, another leading producer from the first era of oil production, an estimated 300,000 wells have been drilled since 1859, but state law only required reporting wells beginning in 1985, long after the bulk of these wells had been drilled.⁸¹

Many of these older wells presumably have been abandoned with quite varying levels of skill applied to plugging the wells. The United States is pockmarked with abandoned nonproducing wells and other producing but leaking wells, including many low-volume “stripper” wells that can

76. The arbitrators' award that describes BP's Alaska spill and pipeline shut-ins and assesses damages of \$245 million, interest included, is available at Press Release, State of Alaska, Department of Law, BP to Pay State \$255 Million for 2006 Pipeline Spills and Shutdowns (Nov. 8, 2012), <http://www.law.state.ak.us/press/releases/2012/110812-BPArbitration.html>.

77. See generally NAT'L. COMM'N ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING, DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING 12 (Jan. 2011), available at <http://www.gpo.gov/fdsys/pkg/GPO-OILCOMMISSION/pdf/GPO-OILCOMMISSION.pdf>.

78. The Macondo spill costs to date are: the \$6.139 billion that BP had paid out to over a million claimants by March 2012 through its voluntary Gulf Coast Claims Facility, see KENNETH R. FEINBERG, WHO GETS WHAT: FAIR COMPENSATION AFTER TRAGEDY AND FINANCIAL UPHEAVAL 174 (2012); the \$7.8 billion that BP estimates it will pay in settlement to the plaintiffs whose cases were consolidated in Judge Barbier's federal court in New Orleans, Susanne Pagano, *Federal Judge Approves BP's Settlement of Economic, Property Damage Claims*, BLOOMBERG (Dec. 27, 2012), <http://www.bna.com/federal-judge-approves-n17179871595/>; whatever BP will pay parties who have opted out of the latter procedure and choose not to use the former; the recently imposed \$4 billion criminal fine, Clifford Krauss, *Judge Accepts BP's \$4 Billion Criminal Settlement Over Gulf Oil Spill*, N.Y. TIMES (Jan. 29, 2013), http://www.nytimes.com/2013/01/30/business/judge-approves-bp-criminal-settlement.html?_r=0; and added penalties and payments that will be imposed, including to those who opted out of the class action and chose not to participate in the Gulf Coast Claims Facility. BP computes that it already has paid out over \$24 billion in claims and cleanup costs. *Id.*

79. The risk of catastrophic spills and of damage from global warming fall into areas where there is “known uncertainty,” and the uncertainty goes not only to the frequency of damage but to the likely scope of damage. For recent explorations of the problem of uncertainty in both areas for decision makers, see SILVER, *supra* note 74, ch. 12; TALEB, *supra* note 74, at 315–16.

80. *Oil, Gas & Geothermal – About Us*, CAL. DEP'T CONSERVATION, <http://www.conservacion.ca.gov/dog/Pages/aboutUs.aspx> (last visited Apr. 14, 2015).

81. *Abandoned & Orphaned Well Program*, PA. DEP'T ENVTL. PROTECTION, http://www.portal.state.pa.us/portal/server.pt/community/abandoned_orphan_well_program/20292 (last visited Apr. 14, 2015).

hobble along in a high-price market but whose revenues will not support significant maintenance. Were any major producing state to attempt cleanup of all the abandoned wells in its borders, or even just those that appear to pose a serious risk of environmental hazard, it would require a long-term, ongoing, and very costly effort over generations. Even geographic areas where one would not expect many problems from older wells, for instance, Alaska, already have major cleanup issues.⁸²

States attracted to oil and gas development in hopes of paying the ordinary costs of government need clear, realistic plans about who will pay for site restoration *before* deciding how much of net revenues they can afford to spend on education and other public functions. They should consider whether bonding requirements and other security against cleanup costs are realistic in view of the scope of production, the realistically likely costs, and uncertainty; require clear signals for ongoing reporting of lease conditions and remediation progress; and mandate careful planning of preventative measures. Ideally, producers will bear the full environmental costs of their operations and pass those costs along in their product prices. Users of each energy source then would face the true cost of their choices. Markets that do not register pollution costs are inefficient and will lead users to buy too much of the underpriced polluting resource and too little of less polluting substitutes.⁸³ The public sector could ignore pollution costs in its own budgeting if it has implemented regulations that capture all pollutants of concern, but regulations are never that perfect in the real world. And where pollution control laws do not exist, or to the extent that existing laws are

82. In Alaska, for instance, major oil production is a relatively recent phenomenon. Although there was some early production in the Cook Inlet region, the heart of the Alaska industry has been the North Slope production, which only began pouring out of the Trans-Alaska Pipeline in 1977. Yet the North Slope already contains sites abandoned by operators who no longer are in business. A 2002 federal report found that the state of Alaska has identified 217 contaminated sites on state-owned North Slope property, most “the result of early oil industry activities by various oil companies and oil-related service companies, some of which have gone out of business.” GEN. ACCOUNTABILITY OFFICE, ALASKA’S NORTH SLOPE: REQUIREMENTS FOR RESTORING LANDS AFTER OIL PRODUCTION CEASES, GAO-02-357, at 53 (2002), available at <http://www.gao.gov/assets/160/157248.pdf>. In addition, the federal government had been responsible for 126 wells on the North Slope, including 76 that the Navy drilled in the 1940s and 1950s and 25 wells drilled by the United States Geological Service. *Id.* at 72. Thus, even seemingly late-blooming states already may have substantial cleanup problems.

83. For the widely accepted belief that externalities exist and inject inefficiency into a market economy, see JOSEPH STIGLITZ, *ECONOMICS OF THE PUBLIC SECTOR* 75–76 (2d ed. 1988); HARVEY ROSEN, *PUBLIC FINANCE* ch. 6 (3d ed. 1992); HAL VARIAN, *MICROECONOMIC ANALYSIS* ch. 24 (3d ed. 1992). One of the most important applications of this idea in the environmental area is Sir Nicholas Stern’s analysis of carbon emission costs as a market imperfection in his highly influential report on global warming. SIR NICHOLAS STERN, *THE STERN REVIEW: THE ECONOMICS OF CLIMATE CHANGE*, Executive Summary (2006), available at http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/sternreview_report_comple te.pdf. As Stern has written, “those who produce greenhouse-gas emissions are bringing about climate change, thereby imposing costs on the world and on future generations, but they do not face the full consequences of their actions themselves.” *Id.* at xviii.

ineffective, states and the federal government must try hard to determine how damage will be remedied before agreeing to lease land for mineral development.

To the extent that the environmental costs of resource production can be specified, the best treatment would come not at the tail end of production, with public entities having to spend scarce revenues on remediation, but through cost-allocation measures that keep the costs on the parties who pollute and deter damage-causing behavior in the first place. Imposing pollution costs on polluters and through them at least partly on the underlying demand should spur innovation in pollution reduction, because firms are intensely pressured to lower costs. But even if regulations required companies operating today to provide security for all potential environmental costs of their operations, there still would be uncertainty over how to measure those costs precisely, and the problem posed by the many hundreds of thousands (or more) wells abandoned in the United States by companies that no longer exist, in addition to wells drilled by marginal operators that will go out of business before cleanup bills come due.

Many of the companies that drilled for oil and gas in the late 1800s and early 1900s have long since disappeared. States with histories of older production have a special burden. They have to consider how they will pay to inventory and remediate abandoned wells no longer under anyone's control. States experiencing the new surge of drilling with modern production techniques, like North Dakota and the older producing states of Pennsylvania and West Virginia, should be preparing the groundwork for restoration, because many of today's drillers will not be around when the land needs restoration—or when chemicals leach into the groundwater and even quite solvent companies go bankrupt trying to provide an effective fix.⁸⁴ States should be equipping in-state

84. Serious imposition of requirements of financial assurance, be it by bonding or other measures, could solve much of the uncertainty over the ability of companies to perform cleanup and restoration obligations, at least as long as the projections of the cost of those operations are realistic. Thus, for instance, the Bureau of Land Management for Hard Rock Mining and the Interior Department's Office of Surface Mining, which oversees coal mining, traditionally required financial assurance for the full cost of reclamation before they would allow mining to begin. ALASKA'S NORTH SLOPE, *supra* note 82, at 75–76. Assurance could come from a variety of assets: “including cash, certificates of deposit, negotiable bonds, and investment-grade security, surety bonds, or irrevocable letters of credit.” *Id.* at 76. Nuclear plant licensees are required to provide financial assurance for the full cost of decommissioning. *Id.* at 76–77. Here, of course, the cap on financial liability under the Price-Andersen Nuclear Industry Indemnities Act and the fact that companies have not been required to assume the full costs of spent fuel disposal make this requirement only half a loaf, or perhaps even only a few slices, of the likely true total cost. The government heavily subsidizes the nuclear industry. If a major disaster occurs near an urban area, the bulk of the billions of dollars in damage is sure to end up coming from taxpayers one way or another.

The Trans-Alaska Pipeline (TAPS) is sometimes mentioned as an example of a situation where companies have been required to set aside cash as assurance for full decommissioning, but a GAO report reviewing the situation in 2002 pointed out that though dismantling, removal, and

engineering talent in their colleges and universities with the power and resources to help monitor the environmental consequences of drilling as part of the process of developing long-term plans and monitoring them.

Assessing environmental costs, though difficult, should be easier today because of the major improvements in the technical ability to analyze liquids at substantial depths. Today's tools for monitoring oilfield sites—for companies with the necessary resources—are much better than the last generation's. But at the same time, the vastly greater use of fracking, horizontal drilling, and drilling to deeper depths mean that a single well can pose greater risk of damage if it does leak than the shallow vertical wells that characterized the early industry.

The assessment of environmental costs is not, of course, a problem limited to oil and gas. The seemingly cleaner operations required to cut timber releases carbon into the atmosphere—deforestation is the source of a large share of global warming emissions⁸⁵—and clear-cutting can leave denuded land susceptible to erosion and degradation. Surface coal mining poses its own erosion and pollution problems.⁸⁶ Governments need accurate information on the environmental costs and risks of each resource activity before they determine whether to develop and how to allocate the proceeds of production when they do.

Handling environmental costs is not just a matter of after-the-fact cost allocation. Nor are oil companies enemies in the struggle for clean production. The largest body of expertise, knowledge, and—when incentives are right—innovation resides in the scientists employed by this highly sophisticated technology industry. The challenge is to make incentives right to motivate these private companies, which are in the best position to prevent pollution, to make production as clean as reasonably possible, and to sensibly allocate the costs of the damage that remains.

C. The Special Cost of Global Warming

In the future, a key cost for the oil and gas industry, and for states and the federal government, will be reducing or trapping greenhouse gas emissions and offsetting this negative contribution of mineral production

restoration costs (DR&R) have been included in pipeline rates, the money has not actually been put aside. *Id.* at 75. The GAO included as a “matter for congressional consideration” the setting of specific restoration goals and the issue of financial assurance. *Id.* at 79.

85. A United Nations *Human Development Report* has estimated that deforestation is responsible for 20% of the “global carbon footprint.” U.N. DEV. PROGRAMME, HUMAN DEVELOPMENT REPORT 2007/2008, at 157 (2007), available at http://hdr.undp.org/sites/default/files/hdr_20072008_summary_english.pdf.

86. For a critic's view of the widespread problem of erosion from surface and mountain-top mining, see JEFF GOODELL, *BIG COAL: THE DIRTY SECRET BEHIND AMERICA'S ENERGY FUTURE* 15–18, 25–26, 37–40 (2006).

to global warming. Damage from global warming is “indirect” in the sense that the affected air migrates, so that activity in one location can damage air quality many hundreds and thousands of miles away. Just as volcanoes can dirty the air on the other side of the globe, so Midwest sulphur emissions can kill forests in New England and Canada, U.S. carbon emissions float around the world in the upper atmosphere, and coal and other emissions in China can materially raise greenhouse gas levels in the atmosphere above the United States.

Carbon dioxide and methane emissions (as well as other greenhouse emissions) occur in the exploration, development, and production process, as well as in the consumption of fuels for electricity generation, transportation, manufacturing, heating and cooling, and cooking.⁸⁷ Increasing greenhouse gas emissions are an inherent part of oil and gas activities. To the extent that these costs are not captured in market prices, as they should be but are not today, they are very damaging externalities for which government entities some day are almost certain to have to pick up a large part of the tab.

87. Fossil fuels (including coal) are far and away the major man-made (anthropogenic) sources of greenhouse gases, with fossil fuel combustion contributing 94.9% of U.S. emissions of carbon dioxide, the greatest single greenhouse gas source, and 78% of the global warming potential of all greenhouse gases. U.S. ENVTL. PROT. AGENCY, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS: 1990–2010, EPA 430-R-12-001, at ES-6, ES-7, 2-1 (2012), available at <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-Main-Text.pdf>. When one looks at greenhouse gas emissions by economic sector, oil and gas field activities do not appear as the largest source of emissions: the most polluting economic activities are, in order, electric power generation (34%), transportation (27%), and “industry” (20%—presumably including oilfield operations and transportation). *Id.* at ES-7, ES-15. But when one points the finger of responsibility a little closer, natural gas and petroleum “systems”—the exploration, development, production, processing and refining, transportation, and distribution of oil and natural gas—do make a measurable contribution. Natural gas systems and petroleum production cause only 35.6 of a total 5,706.4 TG (million metric tons) of carbon dioxide emissions in 2010. *Id.* at ES-4, tbl.ES-2, 2-3, tbl.2-1. But when one looks at methane, a greenhouse gas with twenty-one times the “global warming potential” of carbon dioxide, *id.* at ES-3, and a rapidly growing source of warming, it is another story. Methane emissions worldwide have increased 158% since 1750, while carbon dioxide emissions grew only 39% (the latter, of course, a huge increase). *Id.* at 1-4, 1-5. Methane emissions from natural gas systems, 215.4 TGs of carbon-dioxide equivalent in 2010, are 32.3% of all methane emissions, well ahead of second place agricultural emissions from “enteric fermentation” and third place landfill emissions (coal mining, which often releases methane, is fourth). *Id.* at ES-5 (computation taken from data in Table ES-2). Although natural gas methane emissions are seven times the methane emissions from petroleum production, together natural gas and petroleum emissions account for almost 37% of methane emissions in the United States. Add in the other major fossil fuel methane emissions from coal mining, and the percentage is 48.3%. *Id.*

As for the source of natural gas and petroleum system emissions, well over half of methane emissions come from field production—from “the wells themselves, gathering pipelines, and well-site gas treatment facilities, such as dehydrators and separators.” *Id.* at 3-46. Transmission and storage are the second largest methane source, with most of the leakage coming from compressor stations, metering, and regulating stations. *Id.* Emissions also come from distribution systems and from processing. *Id.* Over 90% of emissions from petroleum systems come from vented methane, *id.* at 3-51, the very old industry problem of gas flaring. For the role of coal, and the coal industry, in global warming, see GOODELL, *supra* note 86, chs. 8–10.

The latest data suggests that the rate of greenhouse-gas pollution is greater than the worst-case scenario in the dire forecasts that became public beginning with the 1990 First Assessment Report by the Intergovernmental Panel on Climate Change, whose work has guided efforts to find an international solution to climate change.⁸⁸

88. The list of reports warning that the earth is on a path to temperatures so much higher that they will fundamentally alter and destabilize the climate is staggering. Most important are the reports of the Intergovernmental Panel on Climate Change (IPCC), a deliberately diverse body of thousands of scientists formed in 1988 by the United Nations Environment Program and the World Meteorological Organization with the specific goal of finding areas of scientific consensus on global warming. Each report has documented worse conditions than its predecessor. Knowledge may be power, but it does not necessarily lead to enlightenment, and it has not done so here.

The IPCC's fourth report, issued in 2007, found that levels of carbon dioxide, the most commonly appearing greenhouse gas, are at the highest level in 650,000 years and are largely due to use of fossil fuels and agricultural emissions. IPCC, 2007 WORKING GROUP I REPORT, THE PHYSICAL SCIENCE BASIS, SUMMARY FOR POLICYMAKERS 2-3 (2007), available at <https://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf>. The influential report by Sir Nicholas Stern, commissioned by the Prime Minister of Great Britain, determined that CO2 emissions have risen from 280 parts per million (PPM) in 1750 to 380 ppm, a rise of 100 ppm in 250 years, and will rise a stunning 170 ppm in just the next thirty to forty-five years. STERN REVIEW, *supra* note 83, Pt. I, at 3. The Fifth Report has found trends worsening. See generally IPCC, 2014: SUMMARY FOR POLICYMAKERS, MITIGATION OF CLIMATE CHANGE IN WORKING GROUP III, CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT (2014). The number of high-temperature records broken keeps growing, too. Justin Gills, *2014 Breaks Heat Record, Challenges Global Warming Skeptics*, N.Y. TIMES (Jan. 16, 2015), http://www.nytimes.com/2015/01/17/science/earth/2014-was-hottest-year-on-record-surpassing-2010.html?_r=0. Temperatures in the United States have exceeded the last century's average for eighteen of the last twenty years, according to computations by the National Climate Data Center. See NAT'L CLIMATIC DATA CTR., NATIONAL SUMMARY INFORMATION – DECEMBER 2014 (2015), available at <http://www.ncdc.noaa.gov/sotc/summary-info/national/2014/12>. No one fact is conclusive, but the weight of evidence tilts enormously toward proving rapid planetary warming and a variety of other changes, and that a fundamental cause lies in the activities of humans on the planet.

The 2007/2008 United Nations Human Development Report (HDR), devoted to climate change, called the issue the “defining human development issue of our generation” and argued that failing to combat the changes will be “a moral failure on a scale unparalleled in history.” HUMAN DEVELOPMENT REPORT 2007/2008, *supra* note 85, at 7, 127. It is also likely to be an environmental disaster on a scale unparalleled in history.

In spite of the warnings in this report, the HDR report issued four years later found no progress. It warned that the world is “reaching an upper limit to our capacity to emit greenhouse gases without dire consequences” and that we are “gambling with our planet.” U.N. DEV. PROGRAMME, HUMAN DEVELOPMENT REPORT 2011, at 16–17 (2011), available at http://www.undp.org/content/dam/undp/library/corporate/HDR/2011%20Global%20HDR/English/HDR_2011_EN_Complete.pdf. The continuing increase in emissions has been tracked in NOAA greenhouse gas index continues climbing, NAT'L OCEANIC & ATMOSPHERIC ADMIN., (Nov. 9, 2011), http://www.noaa.gov/stories/2011/20111109_greenhousegasindex.html; WORLD METEOROLOGICAL ORG., WORLD METEOROLOGICAL ASS'N, WMO GREENHOUSE GAS BULLETIN: THE STATE OF GREENHOUSE GASES IN THE ATMOSPHERE BASED ON GLOBAL OBSERVATIONS THROUGH 2010 (Nov. 21, 2011), available at http://www.wmo.int/pages/mediacentre/press_releases/documents/GHGbulletin.pdf; INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2011 (2011); and is discussed in detail in YERGIN, *supra* note 67, chs. 21–26. On one of the most dismaying consequences of changes to date, see ELIZABETH KOLBERT, THE SIXTH EXTINCTION: AN UNNATURAL HISTORY (2014) (predicting that we are well underway in a sixth mass extinction of animal species, the first one caused solely by human agency). For a sign of the understanding by those who take science seriously that we must move forward now, see the opinion piece by four Republican former EPA Administrators. William D. Ruckelshaus, Lee M. Thomas, William K. Reilly & Christine

The likelihood of high costs to clean up well sites and water, but above all dirty air, factor in favor of preserving a material part of lease revenues and portions of severance taxes where needed for remediation. To the extent that carbon emissions have not been limited in the last twenty years, and that current measures are as ineffective as they are, the cost of cleanup is rising sharply.⁸⁹

One of the issues surrounding such diffuse pollutants as greenhouse gases is whether state-level governments can alter outcomes given their limited jurisdiction. Because of the impossibility of limiting the effect of emissions to the general area where they originate, the best solutions will be at the federal and, ultimately, international level. Yet states are one of the main organized groups with an interest in lobbying the federal government for effective national global-warming laws. If major states clamp down on emissions, they can create a significant national improvement on their own. The setting of standards has to begin somewhere. The impossibility of effecting a total cure at the local level is no excuse for local governments, including state governments, taking no responsibility in areas where national governments have failed to implement needed policies.⁹⁰

Like other environmental costs, the costs of global warming should be reflected in the price of the products that generate the emissions. The market needs to be given the incentives for firms to begin devising methods of reducing emissions, including more efficient carbon capture and storage. Public agencies should require high levels of emissions limitations on their own properties and within their jurisdictions to spur

Todd Whitman, *A Republican Case for Climate Action*, N.Y. TIMES (Aug. 1, 2013), <http://www.nytimes.com/2013/08/02/opinion/a-republican-case-for-climate-action.html>. For another sign of the increasing awareness that mankind so far is losing its race with the changes it is causing in earth's climate, see the report POTSDAM INST. FOR CLIMATE IMPACT RESEARCH AND CLIMATE ANALYTICS, TURN DOWN THE HEAT: WHY A 4°C WARMER WORLD MUST BE AVOIDED (2012), available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDS/IB/2012/12/20/000356161_20121220072749/Rendered/PDF/NonAsciiFileName0.pdf.

89. In 2006, Sir Nicholas Stern estimated that failing to act on global warming could cost the world 5% of GDP each year "now and forever" with some higher-range estimates rising to as much as 20% of GDP, while the cost of taking corrective action at that time, though great, could have been limited to 1% of GDP. STERN REVIEW, *supra* note 83, Pt. I, at 6. That window has closed. Conditions have worsened with recent data indicating that the damage is likely to be more severe than the worst estimates of five to ten years ago. Sir Stern recently stated that the temperature rise is likely to be higher than he predicted and the corresponding effect on the climate worse. Heather Stewart & Larry Elliott, *Nicholas Stern: 'I got it wrong on climate change—it's far, far worse,'* THE OBSERVER (Jan. 26, 2013), <http://www.guardian.co.uk/environment/2013/jan/27/nicholas-stern-climate-change-davos>.

90. For this reason, the most exciting step in global-warming control in the United States is the carbon market that is in the process of being initiated by the state of California. For summaries of this plan, see *California's Climate Plan*, CAL. ENVTL. PROTECTION AGENCY, AIR RESOURCES BOARD, http://www.arb.ca.gov/cc/cleanenergy/clean_fs2.htm (last visited Apr. 29, 2015); *Assembly Bill 32 Overview*, CAL. ENVTL. PROTECTION AGENCY, AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/ab32/ab32.htm> (last visited Apr. 29, 2015).

innovation and cost reduction that will have technology-forcing benefits throughout all producing sectors, not just those on public land.

D. Infrastructure Costs and Other General Costs

Large-scale mining and extraction impose other generalized external costs. For instance, the recent shale oil boom in North Dakota has worn out roads in its oil regions, put tremendous strain on school systems, and stretched other infrastructure in rapidly growing oil-region communities.⁹¹ This new endeavor has brought a large increase in crime,⁹² an externality that the industry does not pay for directly. One of the rationales for severance taxes, which are levied even on severance of private reserves, has long been that they enable states to offset the negative impact of development, including damage to roads and pollution of air, water, and land.⁹³

Rapid economic growth almost always produces disruption. Any major economic change, even large-scale technological advances that confer great benefits on society at large, will hurt some groups and, without government intervention, force them to bear the costs of progress disproportionately. Once again privately beneficial production produces negative externalities. The Invisible Hand gets waylaid. Examples include the displacement of those working to supply horses and carriages who were cast aside by the automobile industry early in the 1900s; the railroad workers whose jobs disappeared as rail was replaced by cars and trucks in the 1920s and 1930s;⁹⁴ and the typewriter manufacturers, typists,

91. See Jennifer Oldham, *North Dakota Oil Boom Brings Blight With Growth as Costs Soar*, BLOOMBERG BUS. (Jan. 24, 2012), <http://www.bloomberg.com/news/2012-01-25/north-dakota-oil-boom-brings-blight-with-growth-as-costs-soar.html>. The breadth of the negative externalities can surprise even the sophisticated observer. For instance, in the areas of major new production in North Dakota, formerly solvent hospitals are running large deficits because so many of the workers who seek emergency room treatment leave false names and do not end up paying their bills. John Eligon, *An Oil Boom Takes a Toll on Health Care*, N.Y. TIMES (Jan. 27, 2013), http://www.nytimes.com/2013/01/28/us/boom-in-north-dakota-weighs-heavily-on-health-care.html?_r=0.

92. Oldham, *supra* note 91.

93. Jacquelyn Pless, *Oil and Gas Severance Taxes: States Work to Alleviate Pressures Amid the Natural Gas Boom*, NAT'L CONF. ST. LEGISLATURES (Feb. 2012), <http://www.ncsl.org/issues-research/energyhome/oil-and-gas-severance-taxes.aspx> (explaining that severance taxes “help ensure that costs associated with resource extraction—such as road construction and maintenance, and environmental protection—are paid by the producers . . .”). There is, of course, no 1:1 correlation between costs imposed by drilling and severance taxes. For some states these costs may be windfalls, with little need to devote much to restoration. Other states, like California and Pennsylvania, forego them entirely (in spite of Pennsylvania’s small fee on each well drilled), although a severance tax has been proposed by Pennsylvania’s Governor Tom Wolf. See *supra* note 56. In many states the taxes go into a general fund or a long-term permanent fund, without regard to costs of resource extraction as such. There is a wide variation in both the rate of severance tax and in the uses to which the taxes are put. See NCSL Revenue Study, *supra* note 8.

94. There is poignancy to this history as railroads carried many of the materials needed to build the road network that ultimately would undercut the rail industry. At the time, many believed the roads emanating from railroad terminals would enhance the value of rail services

bank tellers, and retail workers whose jobs have been displaced by the computer.⁹⁵ Free market societies implicitly assume that the benefits of growth—the added spending, jobs, income, taxes, and other indicia of economic activity—more than outweigh the costs of disruptive cutting-edge technologies. But this is an assumption, not an established fact. There is no guarantee that conservation technologies will keep pace with production technologies, or more generally that benefits will keep pace with costs.

The tremendous flowering of production that began in earnest with the Industrial Revolution brought with it the tools that produced catastrophic damage during two world wars, an uncontrolled economic system that is consuming our planet's limited stock of resources, and climate changes that threaten the ecosystem that sustains all life. Rarely is there a serious effort to compensate those pushed aside by this economic evolution, one that on balance indeed may bring great benefit to the society at large but nonetheless leaves uncompensated individual injuries in its wake.

One requirement for costs and benefits to stay in balance is government's ensuring that all significant costs associated with oil and natural gas production are registered and compensated, one way or another. The cost of roads, schools, police, and other government services generally are paid out of specific taxes—often property taxes for schools and general revenues, including from sales and property taxes for the other services. But in periods of rapid growth, the taxes that regularly fund these public goods and services may not provide enough money to pay for the capital-intensive facilities and services that must be available to support growth. Particularly in early boom periods, while public and private services are trying to catch up to a rapidly expanding labor force, the benefits of boom times can fall far behind the short-term costs for society at large.

and make it more useful. What they did not understand was that the economic range of cars and trucks would extend beyond the local rail terminal area and compete with substantial parts of rail service. See ALEXANDER J. FIELD, A GREAT LEAP FORWARD: 1930S DEPRESSION AND U.S. ECONOMIC GROWTH 76–77 (2011).

95. One of the interesting aspects of the run-up to the Great Depression is that toward the end of the 1920s, after the long boom but before the crash in the fall of 1929 and the economic disintegration that followed, even some captains of industry were willing to acknowledge that there is a mismatch between the overall benefits of economic advance and the costs of change. At a hearing on unemployment in late 1928, for instance, the President of the Baltimore & Ohio Railroad acknowledged that even though industrialization “[p]resumably . . . has been beneficial to society as a whole; otherwise . . . its development would not have been encouraged,” nonetheless “if society receives the benefits flowing from such a system, it must also accept the responsibilities connected with such a plan.” *Unemployment Relief in the U.S.: Hearings on Senate Resolution 219 Before the Senate Committee on Education and Labor*, 70th Cong., 2d Sess., S. Rep. No. 2072, at 83 (testimony of Daniel Willard, President, Baltimore & Ohio Railroad, Dec. 17, 1928). The President of one of the country's largest canning companies similarly stated, with good logic, that a “man who has no voice in the management of the business is certainly not responsible for his unemployment.” *Id.* at 45. (testimony of William Hapgood, President, Columbia Conserve Company, Dec. 13, 1928).

If the companies developing leases are outside corporations that drill, develop, and then leave, sending profits to outside owners, the risk increases that local benefits never will catch up with local costs. Some costs will be recouped via property, sales, and income taxes, but public agencies should consider the likelihood of uncompensated costs generated by resource production as they consider how to set severance tax levels and where to spend royalties and other payments from their own properties. A rational public planner will consider how to raise and allocate revenues to offset unrecouped costs of resource production before devoting the resulting revenues to other, less related uses. Put another way, if the general costs of, say, a boom in energy production do not get compensated, why allow the production to occur at all? The hosting government and its citizens should not be worse off because of the activity . . . nor should they have to rely on indirect effects like the income of those fortunate enough to enjoy jobs in the new sector and the ripple effects of their spending.

E. Macroeconomic Distortions and Dutch Disease

A broader but less obvious (and harder to measure and combat) cost of resource development is the potentially disruptive macroeconomic impact of successful operations. Paradoxically, sharply rising income in one sector of an economy is not always an unmitigated blessing, even though some individuals certainly will benefit greatly. The classic example of distortion from rising natural-resource revenues is what economists have called “Dutch disease.”⁹⁶

In the 1970s, as the Dutch expanded North Sea natural gas production, the influx of gas revenue drove up the value of their currency and, along with it, the prices of the country’s traditional exports. At the same time, the energy boom drew more of the labor force into this one industry. As a result, the Dutch economy lost some of its flexibility and advantages in other sectors. Economists have traced similarly paradoxical distortion to the sudden infusion of natural-resource wealth from New World gold that

96. Having a large natural-resource base is an economic advantage in many ways but, as the instability in a number of Middle East oil-producing countries indicates, one risk created by heavy dependence upon a single resource is removal of the incentive to develop a more broadly based economy. For the economic theory that over-reliance upon a small number of lucrative trades can artificially stunt the growth of other areas of economic life and prevent development of a secure, diversified economy, see W. Max Corden & J. Peter Neary, *Booming Sector and De-Industrialization in a Small Open Economy*, 92 *ECON. J.* 825–48 (1982); W. Max Corden, *Booming Sector and Dutch Disease Economics: Survey and Consolidation*, 36 *OXFORD ECON. PAPERS* 359, 362 (1984). Although these articles discuss the effect of over-reliance on narrow sources of wealth on national economies, the same factors can alter the relative fecundity and competitiveness of state economies. The overall value of currency should be less affected because the United States has a national currency, but state-level markets are vulnerable to increasing prices, labor shortages, and the decline of traditional industries in the presence of an oil or gas boom.

came into the sixteenth-century Spanish economy, the Australian and Californian gold rushes in the nineteenth century, a coffee production boom in 1970s Colombia, and from rising oil revenues in Nigeria and Venezuela (to which today one certainly has to add Russia).⁹⁷ The negative impacts have been termed the “oil curse” or “natural-resource curse” by economists studying the oil industry.⁹⁸

Distorting an economy because of an influx of revenues from just one sector is not inevitable. Studies suggest that oil revenues, for instance, are not automatically associated with a slowdown in economic growth, but instead that, in recent decades, the surprisingly disappointing effect of high oil production in many developing countries appears to have been that the injection of new revenues in these economies produced only average growth, not the *more* rapid growth one would expect from large increases in national income.⁹⁹ Growth should increase in countries that receive large infusions of income.¹⁰⁰ Oil dollars have not been as high powered in developing countries as other money in economy-wide stimulation.

Developmental economist Jeffrey Sachs has argued that the fear of Dutch disease is exaggerated and that oil revenues will be a distorting factor only if (1) the money is used to finance consumption rather than public investment and (2) the nonoil sectors that are discouraged otherwise would have made a special contribution to growth (one that shifting resources into the energy sector will not match). He argues that careful resource-based investment in long-term infrastructure and human

97. See generally MACARTAN HUMPHREYS ET AL., *Introduction: What is the Problem with Natural Resource Wealth?*, in ESCAPING THE RESOURCE CURSE 5–6 (2007); MICHAEL L. ROSS, *THE OIL CURSE: HOW PETROLEUM WEALTH SHAPES THE DEVELOPMENT OF NATIONS* 47–49, 227 (2012). See also DAVID LANDES, *THE WEALTH AND POVERTY OF NATIONS: WHY SOME NATIONS ARE SO RICH AND SOME SO POOR* 93, 113–14, 138–39, 171–73, 408–14, 425, 491–92 (1999) (discussing the economic shortcomings of Spain’s wealth-oriented empire strategy and the negative impact of the focus on oil wealth in many Middle Eastern countries; also noting that “[s]econd, failure to keep up generates its own immune reactions. In this regard, the huge oil windfall has been a monumental misfortune.”) (citation omitted).

98. See generally RICHARD AUTY, *SUSTAINING DEVELOPMENT IN MINERAL ECONOMIES: THE RESOURCE CURSE THESIS* (1993). Although Adam Smith did not develop a resource-curse theory, nor could he give his belief that voluntary trade is always beneficial, and though his theory of what had gone wrong got wrapped up in his attacks on monopoly and belief in its deleterious effect on the character of successful merchants, he certainly was aware of the damage that massive imports of precious metals had done to the Spanish and Portuguese economies. ADAM SMITH, *THE WEALTH OF NATIONS* 662–63 (Modern Library 1994) (1776).

99. See ROSS, *supra* note 97, at 3–4 & ch. 6.

100. *Id.* at 3, 189–90 tbl.6.1. Michael Ross did find that oil-producing states alternate between particularly high and low growth periods compared to non-oil-producing economies, and that their pattern of growth is much more volatile than other countries. *Id.* at 191–96. Among the distinguishing factors he found in oil-producing developing countries is a higher rate of population growth and a larger number of women out of the workforce. *Id.* at 202–05. These countries would have outperformed non-oil countries in growth of average per-capita income had they not labored under these impediments. *Id.*

capital can be the gateway to development in underperforming economies, so that oil wealth should be a strong net positive.¹⁰¹

The challenge is to make sure the funds are spent on development, not just consumption. Overreliance upon their vast store of hydrocarbon resources to subsidize consumption and buy off political unrest has been a barrier to economic development in many oil-rich Middle Eastern countries.

Sachs differentiates developed from developing countries in considering the best use of oil money. While he believes that developing countries should spend the proceeds of natural-resource revenues to leapfrog forward in development, he has mentioned Norway's using oil monies for the "long-term costs of the public pension" as an appropriate measure for that advanced economy.¹⁰² In essence, this would be using oil revenues to pay for an ordinary government function, because the government otherwise would have to raise revenues as another way to pay for the pensions. Yet while spending the income generated by nonrenewable revenues on pensions might be a good use for a country like Norway, at least while it is at full employment (so that there are no obviously underused workers or slack resources whose stimulation would produce a broad benefit), and if the funds spent are only earnings on the inflation-adjusted principal received from mineral sales, the better counsel even for most developed countries surely is for them, too, to keep their focus on the sustainability of their spending and the potential uses of resource revenues in advancing productivity and expanding personal freedom.¹⁰³ After all, even advanced industrial economies have great unmet needs, with many citizens falling outside the circle of wealth generated by their healthy GDPs. Even developed countries have a great deal of room to broaden the base from which they supply public services, educate their populations, and stimulate their economies.

The decision for developing countries is complex because the spending required to put an economy onto a path for growth almost certainly will prevent the spending needed for short-term sustainability. It will require a gamble that climbing up the rungs of the economic ladder is more

101. Jeffrey Sachs, *How to Handle the Macroeconomics of Oil Wealth*, in HUMPHREYS ET AL., *supra* note 97, at 181–86, 189 (“Still, the idea of spending only the income from accumulated financial assets makes little sense as a general rule on the timing of oil-backed outlays. To the extent that the oil income is used for public investments, the oil is turned into long-lived physical assets and human capital, rather than financial capital, but the inter-temporal benefits of the oil income are similarly spread across time.”).

102. *Id.* at 189–90.

103. The personal freedom that can be expanded by spending is the positive freedom modeled by Amartya Sen, not the classic negative freedoms of nineteenth-century liberalism. See generally AMARTYA SEN, *DEVELOPMENT AS FREEDOM* (1999). Of course, even negative freedoms can be better protected if an underfunded government is given more resources. In many parts of the world, additional judicial resources are vitally needed to advance the rule of law.

important than saving and ultimately will produce a higher, more sustainable standard of living (even after considering the increase in population that often follows injecting incomes into developing economies). If the flow of revenue is not sustainable, an undeveloped country still may be served better by using the money to raise health, education, and current economic prospects. The human and physical capital investment may yield a higher return than smaller injections of funds limited to just the earnings on the principal amount of resource revenues, and a country-wide leap forward may build a foundation for a better life for future generations, too.

Yet especially in an undeveloped country or a poor state even in the United States, implementing the decision to invest in human and physical capital carries risks. A state that builds a bridge or airport has clearly enhanced the infrastructure for its population, but only if the facilities are built in the right place and if the economy generally can profit from them. Corruption, just like gross incompetence, can divert so much money that there is no gain in a nation's level of development or the welfare of the average citizen. If the public money is spent on education, the country (or state) has to ask if the children who benefit will stay home and share their enhanced skills with fellow citizens, or instead migrate to countries with higher standards of living. Investment has to be made with an eye to whether the investing economy can capture enough of the returns to justify the investment. And, as the next section warns, if the political system is corrupt, public investment may be a polite label for the dissipation of public resources.

F. Corruption and Oppression

Substantial natural-resource revenues have had unfortunate effects on political fairness, particularly in developing countries with weak civil societies. For instance, at least since the 1980s, the receipt of oil revenues appears to have been correlated in developing countries with less democracy, more patriarchy, barriers to opportunities for women, and more violence.¹⁰⁴ The controversy over “blood diamonds” may be the

104. Michael Ross, who carefully reviewed the evidence on these seemingly negative effects of oil wealth in developing countries, concluded that since 1980, countries in the developing world with substantial oil wealth have become more likely to be ruled by autocrats, have had less opportunity for women, and experienced higher levels of violence. ROSS, *supra* note 97, at 1–2. For Ross's development of this argument, see *id.* chs. 3 (reduction in democracy), 4 (enhancement of patriarchy), 5 (link between oil revenues and violence). On the problem of corruption and oppression, see HUMPHREYS ET AL., *supra* note 97, at 11–13. The exclusion of women from the workforce is not simply a progressive issue on which lifestyles can vary: the failure to benefit from the potential of this large pool of labor may explain why oil-rich developing countries have not outperformed non-oil developing countries. ROSS, *supra* note 97, at 202–05. Certainly there is no reason to think that countries that shun female workforce participation will come anywhere close to their production possibilities frontier.

most publicized of these resource problems, but corruption issues frequently arise in countries rich in oil and natural gas, too. Even in developing countries with long democratic traditions and fully modern economies, the concentration of wealth associated with mineral revenues can tilt political competition toward owners of wealth.¹⁰⁵

How can governments get away with using oil revenues to consolidate their hold on power? Michael Ross lists several differences between these revenues and most other sources of funds: oil and gas revenues' frequently large size, the fact that the activities they fund are not financed by taxes and so are not as subject to the pressures for disclosure that might apply to tax-based spending, the revenues' instability (which can come from the unpredictability of production but also the erratic nature of prices), and the secrecy with which contracts and payments often are shrouded. ROSS, *supra* note 97, at 5–6 & ch. 2.

For a sobering look at the possibility that oil wealth may empower totalitarian regimes, consider BENJAMIN FRIEDMAN, *THE MORAL CONSEQUENCES OF ECONOMIC GROWTH* (2005). In general, Friedman makes a complex, persuasive argument that economic growth generally stimulates greater political and social openness, while declining or even static economic conditions create repressive pressures. *Id.* But, when he displays this relationship graphically, a cluster of major oil producers—Saudi Arabia, United Arab Emirates, Bahrain, Kuwait, and Iran—are outliers that display high incomes but very low levels of “average rights and liberties.” *Id.* at 313 tbl.12.1. The greater wealth in these countries has not translated into greater freedoms—Saudi Arabia, the United Arab Emirates, Kuwait, and Iran all have zero or negative growth (Bahrain is not listed in the growth table), confirming Friedman's argument that the relative change in growth compared to the recollected past is the best predictor of how economic direction will be translated into expansions or contraction of rights. *Id.* at 316 tbl.12.2.

Those living in developed countries with strong traditions of democracy should not feel pious about their immunity from similar corruption. Many quite advanced democratic economies, Italy for instance, have been unable to stamp out the inbred corruption that infects their politics as well as other institutions. For an example of the deep corruption in the United States from resource wealth when it was going through an earlier stage of development, see a recent article about the impact of coal on West Virginia. Eric Newhouse, *King Coal's Violent Reign: Century-Old Labor Strife Still Raises Constitutional Questions*, A.B.A. J. (Dec. 2012), http://www.abajournal.com/magazine/article/king_coals_violent_reign_century-old_labor_strife/. See also *infra* note 168 (discussing the larger government size in oil-rich countries); *infra* Parts II.E–F (discussing difficulty of managing oil wealth effectively).

105. The rightward shift in American politics has been heavily funded by oil companies, particularly by large investments from independent oil companies. See THOMAS BYRNE EDSALL, *THE NEW POLITICS OF INEQUALITY* 99–103 (1984). Edsall called “entrepreneurs involved in the exploration for and production of independent oil” one of three groups (the others the Republican party as an institution and conservative PACs) that were particularly aggressive in pushing to elect conservative, pro-business candidates in the early 1980s. *Id.* at 93. The oil group had a particular bent: “The combination of dependence upon and anger at the federal government has made independent oil the most conservative industry in the nation.” *Id.* at 99. For an example of an area where oil and other energy companies have direct material interests, see Judith Layzer, *Deep Freeze: How Business Has Shaped the Global Warming Debate in Congress*, in *BUSINESS AND ENVIRONMENTAL POLICY: CORPORATE INTERESTS IN THE AMERICAN POLITICAL SYSTEM* ch. 4 (Michael E. Kraft & Sheldon Kamieniecki eds., 2007). Business has a “privileged” position in terms of its access and power within the United States political process. See generally CHARLES E. LINDBLOM & EDWARD J. WOODHOUSE, *THE POLICY-MAKING PROCESS* (3d ed. 1992). It is little surprise that an industry whose victors accrue great wealth has had an outsized influence on the direction of political change. For a review of the role of businesses and business think tanks that oppose regulatory rules in major recent regulatory battles, from the fights over tobacco, acid rain, and ozone to the current effort to discredit the science of global warming, see NAOMI ORESKES & ERIK M. CONWAY, *MERCHANTS OF DOUBT: HOW A HANDFUL OF SCIENTISTS OBSCURED THE TRUTH ON ISSUES FROM TOBACCO SMOKE TO GLOBAL WARMING* ch. 6 (2010). State officials considering challenging oil companies over development or other issues that may prove costly to the companies may find many of the same organized political resources being used to attack their decisions and, for elected officials, their stay in office.

All of these costs are reminders that the decisions of what share of an oil revenue stream should be held aside to compensate for costs imposed by production, and what share to preserve public wealth, are much more complex than ordinarily is debated when a public landowner looks to the leasing rate and levels of development on its land.

III. THE SPENDING DECISION

Cost issues are but one side of resource decisions for public landowners. For whether development of a public resource is desirable at any given point in time cannot be analyzed without comparing the benefits of production to its costs, and realized benefits depend upon how the money is spent. A highly costly oil project that spews oil into the water supply or carelessly flares methane into the air may be undesirable even if it pays good wages to those lucky enough to be employed. In contrast, a carefully planned oilfield build-out in a state where significant revenues go into a permanent fund may far outweigh the costs created by production. Decisions about how much resource development a state should allow (both whether to lease and when to press for more production under an existing lease), and about how to spend the resulting public revenues, cannot be made rationally without calculating costs and benefits. The final decision should depend as much on how benefits can be allocated—what kind of gain they can secure—as on production costs.

In the short-term orientation of American politics and American business, whether to encourage production may seem a simple question of whether the state will earn an immediate return. This certainly is how the decision ordinarily is made. Yet the discussion of costs above already has shown that, properly analyzed, the decision is much more complex. And questions about how to spend revenues are at least as complex as those about how to measure and analyze the costs of production.

Decisions on spending public-resource revenues encompass how revenues should be divided between uses that preserve the asset value and consumption in the current generation; the balance between public and private uses (private uses, for instance, as when Alaska refunds a portion of its receipts in an annual distribution to each resident); diversification; and how the funds should be allocated between geographic regions.

Even though oil and gas have generated huge revenues for many states, as discussed in Part I, as have other natural resources, in too many states these revenues have been spent entirely or largely on ongoing government expenses. At times, the revenues simply substitute for a lower tax rate, leaving the money to disappear without a permanent trace on the public landscape. Yet revenues from mineral production on public land are but a concrete manifestation of a valued state asset that has now

been spent. How can the money be used to preserve at least some of the value that previously existed without leaving citizens dependent on temporary payments from a nonrenewable resource? And what duty does the generation that arranges drilling and receives all of the revenue owe to future generations?

A. Covering Non-Market Costs

The first step in analyzing the allocation of revenues from resource production ought to be to make sure that the true costs of production have been covered either by those involved in production or, if not, addressed with public revenues. Many of these costs, not only direct drilling costs but also externalities like environmental costs, should be handled by the market. The goal should be to define these costs in existing laws and regulations and impose them on the sources of pollution so that they become part of the cost of production. Regardless of whether the costs materialize as compliance costs brought on by command-and-control regulation, levies from a carbon tax and other mandated payments, or the costs and sometimes gains from tradable permits, the market can arrange payment for desirable behavior at the least cost and send correct signals to end users if the regulatory structure brings out the true costs of production.

Part II showed that the production of oil and gas imposes distinct costs that only begin with the loss of an existing but previously unrealized asset. The costs include obvious direct environmental costs, but go on to the more troubling and contested risks of global warming; increased use of infrastructure and services at the level of roads, schools, and police; possible macroeconomic distortions from overemphasis on one sector of the economy; and, ultimately, should include at least a rough sense of the risk of political distortion as well. The last cost, of course, is least likely to be incorporated into a public entity's decisions: what political body will assume its own possible corruption? Who can judge the judges?

In properly functioning markets guided by adequate regulation, major costs will be incorporated into the price of oil and natural gas and other natural resources. To the extent that major costs (like global warming) are not registered as economic costs, the affected governments, including state and municipal governments as well as the federal government, are the likeliest bodies to have to pay them in the long run. They therefore should make every effort to identify these costs and factor them into decisions on whether to allow development—with a negative decision if, on balance, the costs outweigh the benefits—as well as into decisions on how to price the state's assets when leasing them and how to set taxes, for instance severance taxes, so that the public does not allow an activity that

is highly beneficial for some private parties but leaves society as a whole worse off.

B. Spending and Sustainable Values

Any utilitarian calculus of costs and benefits, the kind of decision that in classical and neoclassical economic theory firms make all the time, should pay special attention to the fact that when public natural resources are produced, the state loses a very real, if previously unrealized, resource. Even when production is on private land, the state loses a nonrenewable opportunity to tax the resource and to enjoy the economic stimulus associated with production on some future date. The hard asset will be liquefied but the resulting assets may or may not be saved. Its loss is a cost, even if the transmutation of production into another form of value generates gains on the other side of the public wealth ledger.

The discussion of resource-based permanent funds in Part I shows that, although state use of natural-resource revenues varies widely, neither the federal government nor any state sets aside enough money to preserve a value similar to the net value of produced assets for future generations. Very few governments have tried to preserve even a majority of the value of produced oil, gas, and other natural resources. At most, some states have saved a minority share of the revenues. The federal government has not created a public oil and gas fund, and a number of states have put most of their oil and natural gas revenues into general operating expenses. Here the money is lost within the larger scale of their economies. Often the money is used to provide a temporary, highly popular, but shortsighted tax reduction that will last only as long as the mineral bounty. Other states, like Alaska, Texas, New Mexico, and Wyoming, have created significant permanent funds, even if some of the money still goes to general expenditures and the funds come nowhere close to the full resource value. But if most of the money, even in permanent funds, merely goes to support services that otherwise would be paid for by taxation, there may be no net gain to the public interest.

This is another way of saying that a cost-based factor that needs to be worked into decisions on the appropriate use of revenues from production of nonrenewable natural-resource assets, particularly whether they should be distributed directly to residents, spent to relieve the burden of current government expenses, or invested in additional education, capital infrastructure, and other long-term sources of value, is the fact that proceeds received from sale of the state's share of production are counterbalanced by its loss of a nonrenewable asset. An accurate accounting for the public economics of production would subtract the spent asset from the value of the substituted assets. Measures of public accounting that record income from produced

nonrenewable assets without subtracting the loss of produced assets overstate economic welfare. Indeed, some economists argue that most of the major oil-exporting countries have a “negative trend in long-run welfare” when oil depletion is considered as well as oil income, and that traditional measures of national income incorrectly fail to subtract depletion from the public capital base.¹⁰⁶ Many heavily oil-dependent economies are not sustainable because the source of the flow of revenues, the goose that has laid many golden (or, in this case, black) eggs, is drying up or, perhaps better put, being consumed by the society that depends upon it.

A classic standard for a sustainability-oriented approach is the Hartwick rule. Economist John Hartwick argued that an economy should invest as much in “reproducible capital” as is lost from declining stocks of nonrenewable resources.¹⁰⁷ By this standard, even most developed state (and national) funds fail the test. None have preserved a value sufficient to offset the evaporation of public assets represented by rapid oil and gas and other natural-resource production. Today the controversial disappearing resources include oil and gas, but it takes little clairvoyance

106. Geoffrey Heal, *Are Oil Producers Rich?*, in HUMPHREYS ET AL., *supra* note 97, at 166, 169–70. For added discussion of the need to incorporate other measures of well-being, not just income, as a fuller test for societal economic goals, and even from a narrow accounting perspective to include negative entries for depletion of produced nonrenewable resources, see JOSEPH STIGLITZ ET AL., *MIS-MEASURING OUR LIVES: WHY GDP DOESN'T ADD UP* 19–20, 97–98, 128–29 (2010). The Commission notes that measures of economic welfare that account for environmental and resource depletion “at some point in time start diverging from GDP” and show that “sustainability is already far behind us, and we have already entered a phase of decline.” *Id.* at 105. The same concern would arise for any state that is rapidly producing its resources without preserving a substantial part of their value for future generations.

107. See John M. Hartwick, *Intergenerational Equity and the Investing of Rents from Exhaustible Resources*, 67 AM. ECON. REV. 972 (1977) (outlining the classic economic statement of a general framework for sustainability). Hartwick argued that in a world of no extraction costs and no depreciation, intergenerational equity would be preserved by investing the returns from sale of the exhaustible resource in “reproducible” capital, and then living off earnings generated by the capital. *Id.* at 972. Depreciation would have to be accounted for by reducing current consumption, carving off a portion of the revenues from the new capital to maintain the fixed capital stock. *Id.* at 974. Or, as Hartwick phrased the “savings or investment” rule as far as proceeds from sale of exhaustible resources, “[t]he stock of exhaustible resources is never ‘consumed’ in the form of current output.” To the contrary, under his rule:

No generation shortchanges a future generation by depleting the stock of exhaustible resources without providing the future generations with, in some sense, the depleted stock equivalent in the form of reproducible capital.

John M. Hartwick, *Substitution Among Exhaustible Resources and Intergenerational Equity*, 45 REV. ECON. STUD. 347, 350 (1978).

Just putting aside enough money does not answer all questions, of course, because there is risk in any form of investment. A state might invest enough money to preserve the equivalent value of a produced nonrenewable resource but then have the investment lose value, either from an immediate loss or because it does not keep pace with inflation. In general, however, such problems are a luxury. Neither any of the producing states nor the federal government has come close to the Hartwick standard. Even Alaska, which has the largest state permanent fund in absolute terms, has spent most of the revenues from oil and gas on ordinary operations of government and, to a lesser extent, returning funds to its citizens. See *infra* notes 118–19 and accompanying text.

to see a future in which the key vanishing resources will be clean air and water, resources our civilization still tends to view as “free” or at least, as with water, far below its true cost when the opportunity cost of using the limited resource is considered.

Overall, too little has been done to determine whether resource revenues spent in the current generation really boost the long-term infrastructure and productivity of that generation, thus creating a higher base for future generations, or at least preserve the underlying asset value in some other form. States like California and Pennsylvania have not created energy-based permanent funds of any sort—and both would have very large funds today, game-changing funds, had they been required to do so from the inception of oil production in 1859 in Pennsylvania and not that long thereafter in California. Another major producer, Louisiana, has only put aside money provided by the federal government from certain special offshore properties.¹⁰⁸ California and Pennsylvania do not collect severance taxes at all and thus squander that opportunity to create a major source of permanent value. In California, where the state’s extraordinarily valuable university system is being eroded by the withdrawal of public support, foregoing a severance tax means passing up on a source of revenue that could inject billions of dollars a year into higher education, with all the positive long-term effects on the state’s economy.¹⁰⁹ If development of California’s Monterey Shale oil occurs without a severance tax, billions more that could have been devoted to public purposes will be lost.

The states that have put a material share of revenues aside in substantial permanent funds have taken a major step toward preserving at least some of a proportionate base of asset value for future generations. Alaska has \$52.77 billion in its Alaska Permanent Fund.¹¹⁰ Texas, which has invested a significant part of its mineral revenues in the

108. See LA. BD. OF ELEMENTARY & SECONDARY EDUC., 8(g) ANNUAL REPORT: 2012–2013, at 5–7 (2013), available at [http://bese.louisiana.gov/docs/8\(g\)-documents-and-forms/2012–2013-8\(g\)-annual-report.pdf?sfvrsn=4](http://bese.louisiana.gov/docs/8(g)-documents-and-forms/2012–2013-8(g)-annual-report.pdf?sfvrsn=4). In 1978, Congress agreed to give certain coastal states a greater stake in offshore revenues. *Id.* at 6. It amended the Outer Continental Shelf Lands Act (OCSLA) to allow seven coastal states to receive a “fair and equitable” share of mineral revenues from federal continental shelf lands. *Id.* Under a settlement with the federal government, the state of Louisiana receives 27% of federal mineral revenues generated from production in the second three miles offshore—miles four through six. *Id.* The fund Louisiana created from this revenue has paid out over \$790 million since its inception. 8(g) History, LA. BOARD ELEMENTARY & SECONDARY EDUC., [http://bese.louisiana.gov/8\(g\)-grants/8\(g\)-history](http://bese.louisiana.gov/8(g)-grants/8(g)-history) (last visited Apr. 14, 2015).

109. The most recent effort to secure a California oil severance tax, the 2012 Initiative 1572, Tax on California Oil and Natural Gas, sought to impose a 12.5% severance tax that, it estimated, would generate \$3 billion a year; \$2 billion was to go to the General Fund, and \$1 billion to higher education. See Press Release, California Secretary of State, Tax Initiative Enters Circulation (Feb. 17, 2012), <http://www.sos.ca.gov/elections/ccrov/pdf/2012/february/12068rp.pdf>.

110. See *supra* note 32 and accompanying text.

Texas School Permanent Fund and the Texas University Permanent Fund, one for K-12 schools and the other for the state's university systems, had \$52.3 billion by late 2014 in the corpus of these two great funds.¹¹¹ New Mexico, whose Land Grant Permanent Fund and Severance Tax Permanent Fund together had a principal of \$18.7 billion by 2014, uses the money in the Land Grant Fund generally for education and in the Severance Tax Fund to retire debt on capital projects.¹¹² Wyoming, with an estimated population of only 576,412 in 2012, has over \$5 billion in the Permanent Wyoming Mineral Trust Fund and, in addition, paid over half of the state government's operating costs with oil revenues.¹¹³ Yet even these states have not preserved enough revenue to offset fully the lost principal value of nonrenewable resources.¹¹⁴

The state of Alaska, which has built up the largest State Permanent Fund from its oil revenues, with its fund often cited as one of the most

111. See *supra* notes 41, 43 and accompanying text.

112. See *supra* note 39 and accompanying text.

113. See *supra* notes 35–37 and accompanying text. For Wyoming's population, see Wyoming, U.S. CENSUS BUREAU, <http://quickfacts.census.gov/qfd/states/56000.html> (last visited Apr. 14, 2015).

114. The differences in value preservation across states is the same as, on a larger scale, the variations among oil-producing nations, including those with national sovereign funds. See ALBERTO QUADRO CURZIO & VALERIA MICELI, SOVEREIGN WEALTH FUNDS: A COMPLETE GUIDE TO STATE-OWNED INVESTMENT FUNDS 27 tbl.2 (2010); EDWIN M. TRUMAN, SOVEREIGN WEALTH FUNDS: THREAT OR SALVATION? 12 tbl.2.1 (2010).

On a lesser scale, the problem of preserving asset value is similar to the challenges faced by the initial twelve Alaska Native Corporations when Congress allocated them land rights and cash and later the opportunity to sell Net Operating Losses as well. A 1991 study found that in the first seventeen years, native corporations would have sustained substantial losses except for one-time sales of natural resources (mainly timber and oil and gas) and for the special federal program that lets them sell their NOLs to non-native companies. See generally Steve Colt, *Financial Performance of Native Regional Corporations*, 28 ALASKA REV. SOC. & ECON. CONDITIONS 2, 1 (1991). The major sources of positive proceeds were resource sales, the NOL program, and securities investments in other companies. *Id.* at 1–2. Collectively the corporations lost money on business operations in every year except two. *Id.* at 3. The twelve corporations developed major differences in wealth (“equity”) per shareholder, net income, and dividends. See *id.* at 4, 6. The differences did not appear to be explained by differences in initial endowment. *Id.* at 6.

A follow-up study published in 2005 contrasted this disappointing performance in the years 1973–1993 with a seeming turnaround in the slightly overlapping period of 1992–1998. Stephen Colt, *Alaska Natives and the “New Harpoon”: Economic Performance of the ANCSA Regional Corporations*, 25 J. LAND RES. & ENVTL. L. 155 (2005). For the change in performance, compare *id.* at 7–10 (1973–1993 discussion) with *id.* at 11–12 (1992–1998 analysis). While the corporations generally made money in “local” small businesses, they sustained large-scale losses when investing locally in fish processing, construction, real estate, and hotel management and also, even more surprisingly, did not earn money on general investments in the North Slope oil industry. *Id.* at 13–14. This may reflect a limited number of profitable investment opportunities in Alaska. *Id.* at 14–15, 23–24. The experience suggests that for states and countries with limited local markets, investments in purely in-state industries will create risk by depriving the investor of diversification. It also is a reminder of the difficulty of preserving the value of mineral wealth when it is converted into liquid assets.

For another example of differences in use of public resource revenues, see the interesting comparison of funds created by Norway, Alaska, Alberta, and the non-fund state of West Virginia in Williams, *supra* note 39, at 733–41.

transparent and best managed sovereign funds in the world,¹¹⁵ offers hopeful lessons but also a cautionary tale. Alaska should be in the most favorable position of any oil state to preserve the value of produced oil resources. It has a very small population but huge oil and natural gas reserves (and other natural resources). As a result, putting aside substantial revenues should be easier for Alaska than other states. It also has had a very sophisticated political debate for almost fifty years about the proper use of its oil revenues.

The state's first large collection of oil and gas revenue occurred in 1970, when the first lease sale following successful exploratory drilling on the North Slope generated \$900 million.¹¹⁶ The money, almost three times the state's annual budget at the time, was spent quickly on one-off projects, a dissipation that alarmed many.¹¹⁷ And in spite of the large size of the Alaska Permanent Fund, it represents only a small share of the state's oil revenues. The vast majority of the money has been spent on ordinary government services, displacing regular taxes which, if one assumes that Alaska otherwise would have paid for government services using a progressive income tax, has been a gift to wealthier taxpayers.¹¹⁸

115. The Alaska fund matched all of the highest-ranked funds under the Santiago standards of management except one New Zealand fund and one Canadian fund and came in fifth on Edwin Truman's alternative "scoreboard" for funds. TRUMAN, *supra* note 114, at 129 tbl.6.2. Measurement issues aside, the Alaska Permanent Fund clearly is run with great fidelity to what most scholars in the area see as the best practices, including transparency, for sovereign funds.

116. See HAMMOND, *supra* note 71, at 18, 23 (lamenting spending of \$900 million bonus "windfall" on "pet projects"; calling abolition of the income tax "the most stupid thing we could do"; and accusing abolition of putting the state on the road to "uneconomic development"); see *also id.* at 4-6 (describing similar experience with fishing tax Hammond championed for Bristol Bay after he became borough manager in 1965). Stephen Goldsmith notes that the state so overspent its initial oil revenue that it had to "effectively" borrow from the oil companies against future revenues by passing a temporary reserves tax that was credited against future production taxes. Goldsmith, *supra* note 31, at 57 & n.2.

117. Former Governor Jay Hammond described the rapid expenditure of the whopping \$900 million received in 1970 from the first major lease sales on "pet projects" as the impetus that helped him enlist other like-minded politicians to initiate Alaska's Permanent Fund. HAMMOND, *supra* note 71, at 18. Scott Goldsmith, emeritus economist at the University of Alaska, has calculated that in spite of the large principal in the Permanent Fund, the state has spent most of the revenues from oil and gas on operating expenses. See *infra* notes 119-20 and accompanying text.

The Alaska Supreme Court has described the background to the state's investment decisions as follows:

In 1977, considerable interest and disagreement arose about how the state could make maximum use of the royalty oil that would be obtained from the Prudhoe Bay leases. Many people wanted the state's royalty share to be used to encourage the development of oil and gas industries in the state by subsidizing these developments through the sale of royalty oil at prices below market value. Some people wanted many small industries, while others wanted large projects. Yet others did not want oil and gas industries at all, preferring that the royalty oil be used to encourage different types of industries or that the oil be sold for the maximum price possible and the profits be distributed directly to the people of the state.

McKinnon v. Alpetco Co., 633 P.2d 281, 283-84 (Alaska 1981).

118. On the argument that the use of oil revenues to fund government services rather than an income tax primarily benefits wealthy taxpayers, see Clifford Groh, *What Happens to the*

Today, in spite of the large size of the Permanent Fund, an estimated 73.6% of the revenues Alaska has received from the production of nonrenewable oil and gas assets within its borders and of the earnings on that revenue since 1977 (\$159 billion out of \$216 billion, in other words the great majority of this money) has been spent, mostly in general fund spending, rather than saved.¹¹⁹ In the thirty-three years since the program began, over \$20 billion has been returned to residents in dividend checks to spend as they see fit.¹²⁰ With severance taxes included, the required contributions to the Permanent Fund have only

Permanent Fund Dividend and the Rest of Alaska's Unique Fiscal System As Oil Production Continues to Fall?, in EXPORTING THE ALASKA MODEL: ADAPTING THE PERMANENT FUND DIVIDEND FOR REFORM AROUND THE WORLD 74–75 (Karl Widerquist & Michael W. Howard eds., 2012) (describing Alaska's plan to save its resources and use earnings to finance the state budget as a gift to wealthy taxpayers).

119. Computation from figures published by Scott Goldsmith, economist at the Institute of Social and Economic Research at the University of Alaska (Anchorage). SCOTT GOLDSMITH, UNIV. OF ALASKA ANCHORAGE, TAPS AT 35: ACCOUNTING FOR THE OIL REVENUES, WEB NOTE NO. 12 (July 2012), available at http://www.iser.uaa.alaska.edu/Publications/webnote/2012_07_11-WebNote12.pdf. Goldsmith estimates that the state of Alaska has received \$170 billion in oil revenues since 1977 and earned \$46 billion more on savings. *Id.* The state has spent \$125 billion of incoming oilfield revenues, leaving a residual \$45 billion, and spent \$34 billion of earnings as well. *Id.* Of the amounts spent, \$133 billion has gone to General Fund spending and \$26 billion to Permanent Fund Dividends. *Id.* For a state government to transfer this much money to a population of less than a million people in barely three decades is a huge income transfer.

120. Sean Doogan, *This year's Permanent Fund Dividend check: \$1,884*, ALASKA DISPATCH NEWS (Sept 17, 2014), <http://www.adn.com/article/20140917/years-permanent-fund-dividend-check-1884> (“In its 33 years of paying qualifying Alaskans, the Permanent Fund dividend program has distributed a total of \$21.9 billion.”). The money has been paid to “residents” ever since the United States Supreme Court overturned the initial plan to disproportionately reward long-term residents by paying a fixed increment for every year that a recipient lived in Alaska. The Alaska Supreme Court, one presumably composed of relatively long-term residents or at least judges who expected to be long-term residents, quite contentedly found a higher annual dividend for every year that a recipient had lived in Alaska a reasonable, nondiscriminatory way to reward long-time Alaskans for their years of sacrifice and contributions. *Williams v. Zobel*, 619 P.2d 448 (Alaska 1980), *rev'd*, 457 U.S. 55 (1982). It cited three justifications for this differentiation among Alaskans: to provide a fair distribution of resources belonging to residents as Alaskans; to encourage continued residence (the opinion includes a lament over outsiders who come to Alaska, make it big, and leave, *id.* at 459–60); and, somewhat bizarrely, to encourage interest in the management of government affairs, *id.* at 458–63. The encouragement of long-term residency was also phrased as a reward to those who stayed to “make a lasting contribution,” like “a firm’s awarding a gold watch to a fifty-year employee . . .” *Id.* at 460.

The added accrual for years of residence would make a pretty big annual watch. The prudent management purpose theory rested on two sub-theories: that having dividends come out of the permanent fund would create public pressure for prudent investment, and that allowing payments to increase with residence would create a constituency that would not press for development at all costs, because they would get more in later years. *Id.* at 462–63. Of course, the system *did* create such a constituency. Older long-established residents, often the most organized and active voters, would have an incentive—unless they were at death’s door—to press for rapid development so that they could reap the benefits, including lower taxes, while they still were alive.

The United States Supreme Court made short shrift of these arguments, holding that the law favoring established residents over newcomers not only was not logically tailored to some of its stated purposes, but that it violated the equal protection clause. *Zobel v. Williams*, 457 U.S. 55, 61–65 (1982).

been 10% of Alaska's total oil revenues,¹²¹ not that difficult a savings regime and obviously not enough to preserve the net value of the produced state assets. Such a high level of reliance on revenues from these nonrenewable resources—the state's fixed and irreplaceable hydrocarbon capital—is not a sustainable model for Alaska's economy.

Alaska is just now beginning to experience the dire effects of its overreliance as oil prices seemingly have entered a prolonged decline. The state that relies upon oil revenue for nine-tenths of its revenues is experiencing a \$3.5 billion deficit, and the budgetary forecast is for prolonged cuts in virtually all state spending.¹²² All other heavily oil and gas dependent states are experiencing similar pressures.

It may have been more rational for Alaska in periods of high prices to spend a lot of its oil revenue than for almost any other state because Alaska has such a small population. The state has, after all, managed to create the country's largest permanent fund in absolute dollars and has the largest per-capita fund. Nonetheless, Alaska should only spend this much of its oil and natural gas revenues with the clear understanding that it will not be able to do so in perpetuity.

One reason that Alaska has had to use so much of its oil and gas revenues to fund ongoing operational costs of government is that it decided to use its oil windfall to abolish income taxes, avoid sales taxes, and even pay its famous annual dividend to every resident. Such short-term gifts get residents used to government services at far below their true cost. Indeed, a government that is 90% funded by oil revenues is almost a free government. Using nonrenewable oil revenues to subsidize almost all government services encourages the belief that public services can be had for nothing.¹²³ This experience presumably will make it very difficult to keep the state on a prudent fiscal basis when the bonanza runs out, a risk that was a great concern for Governor Hammond, who, in hindsight, lamented having signed the bill that abolished the state's income tax.¹²⁴ The discovery of new oil fields, enhanced secondary and tertiary production from existing oil fields, and production of Alaska's massive natural gas reserves (and, perhaps, someday, hydrates) that as yet are not linked to an adequate market may delay the day of reckoning

121. Goldsmith, *supra* note 31, at 66.

122. Press Release, Governor Releases Amended Endorsed Budget (Feb. 5, 2015), <http://gov.alaska.gov/Walker/press-room/full-press-release.html?pr=7072>.

123. Goldsmith, *supra* note 31, at 82 (“This generation has also never experienced paying for the state services they have received because petroleum revenues have covered all costs. This has fostered a distorted idea of the true cost of government and the sense that the role of the state is to provide public services at no cost and also to hand out cash to all citizens.”).

124. Governor Hammond strongly opposed abolishing the income tax. To him, the move pushed the state toward “uneconomic development,” development that did not generate enough revenue for the state to pay its ongoing costs. HAMMOND, *supra* note 71, at 23. He apologized to Alaskans for not vetoing the bill abolishing the tax. *Id.* at 24.

for one or two generations. Someday, however, the state will face an economy much less sustained by fossil-fuel resources.

The principal of the Alaska Permanent Fund is protected (as far as laws can protect against market losses) because the Alaska Constitution requires it to be used for income-producing investments.¹²⁵ Yet the fact that only “at least” a quarter of lease revenues (and no severance taxes) are required to go into the fund means that most of the money earned on state oil and natural gas reserves that include the largest oil field ever discovered in the United States are likely to continue to be spent, not preserved.

If the reserves do run out but are not replaced by other resource revenues—as, for instance, oil revenues in Alaska may be replaced over time by natural gas revenues that will have their own decline pattern—it will create a battle between raising taxes to pay for services that residents of most states pay for as a matter of course, and postponing this painful change by spending down the principal in the Permanent Fund or drastically cutting government services. It takes little sophistication to predict an increase in inter-group conflict over how government money is spent when the source of funding shifts from “free” natural resources to taxes.

C. *Individual v. Public Interest and Social Benchmarks*

One key factor in decisions about how to spend public resource revenues is how they should be divided between public and private uses. In a society that believes in markets in an absolute way, the answer is clear: give all the money to private citizens and let them decide how to allocate it, including between voluntary public uses (like charitable giving) and private uses and between current expenditures and future ones (for instance, establishing a college education fund for one’s children, or making a donation to one’s alma mater).¹²⁶ This approach, although a very one-sided approach, fits the classic economic model that assumes people get more utility, or pleasure, when they are given money rather than a particular good. Intuitively, the increase in welfare occurs because people are likely to have a wider range of uses for money, and thus sources of pleasure, than a government planner can envision or can incorporate even if he or she could envision it. So, in this abstract world, it seems obvious that people will increase utility by substituting other

125. *See supra* note 31.

126. Compare the overall condemnation of government programs of all sorts throughout Milton and Rose Friedman’s popularized *Freedom to Choose* with their rhapsodic treatment of private charity, MILTON & ROSE FRIEDMAN, *FREE TO CHOOSE: A PERSONAL STATEMENT* 36–37, 123 (lamenting that public welfare programs “poison[] the springs” of private charity), 133, 139–40 (1990).

goods for those a government planner might decide are best for them.¹²⁷ The only exception would be if everyone would spend all of any added income on precisely the goods that the government planner would have chosen, so that there is no difference between publicly imposed and voluntary private choices, or if they would get no more utility from other goods that they might choose (if they lived on a series of flat rather than curved utility curves in which they could arbitrarily skip back and forth among various goods and services without changing utility).

A close look at how economies work and how people gain value, however, shows that the best outcomes do not always come by leaving each individual to do what he or she thinks best without any outside input. Putting aside problem cases that involve standard market imperfections such as limited information, market power, irrational agent incentives, and inconsistency of choices, some of the largest advances in production in American history have come from corporate aggregations whose internal affairs are not run on a market basis. Successful large companies often use an internal command-and-control structure and resort to central planning to accomplish goals that are beyond the individual reach of the people and capital embedded in the company. Economies of scale and of innovation often are secured when individual resources are combined on larger levels. Efficiency gains from combination can occur in public as well as private organizations. There are also some activities, for instance, the agreement to obey stoplights, that yield a huge increase in utility just because everyone agrees to act the same way. Here the largest gains often can be produced by central direction.

With a reach that extends beyond market constraints, governments can combine resources for projects beyond the power of any individual or private combine, and can do so for the public rather than private good.¹²⁸ Particularly when competition has yielded a very unequal distribution of incomes and wealth, so that the pattern of private expenditure weights

127. The phenomenon that people may increase utility by choosing their spending themselves, rather than having government give them a good it thinks they want (or need), is known to economists as the substitution effect, as opposed to the income effect. For the demonstration that an unrestricted income grant can provide more value than equal-value provision of a particular good, see STIGLITZ, *supra* note 83, at 243–46. Distribution of a public good would match the increased utility from distributing an amount of money equal to the cost of the good only if everyone wanted to spend all of the additional money on that good, or if one assumes problems of information or transactions costs or believes that decisionmaking really is not so rational.

128. For examples of the way that public spending can boost total factor productivity, see FIELD, *supra* note 94; ROBERT D. LEIGHNINGER JR., LONG-RANGE PUBLIC INVESTMENT: THE FORGOTTEN LEGACY OF THE NEW DEAL (2007) (chronicling capital investment through New Deal jobs programs); and BRETT M. FRISCHMANN, INFRASTRUCTURE: THE SOCIAL VALUE OF SHARED RESOURCES (2013) (defining a general framework for thinking about how infrastructure can provide added social value).

the preferences of some people much more than others, government often can expand economic abundance by redirecting resources to those whom the market has left behind.

Combination is why individuals create corporations and partnerships to produce certain goods and services in-house rather than buy them in the market or produce them individually. The added precision from the division of labor, the increased knowledge generated by sharing ideas, the benefit of central direction, and the added stability of large organizations (public or private) often creates benefits beyond the reach of individuals.¹²⁹

There is no reason to think that productive economies of scale operate in the private sector but not the public sector. Alaskans no doubt will get much benefit from their individual 2014 dividend of \$1,884 per person,¹³⁰ but how great a boost would the state and its residents have gotten if more of the over \$20 billion spent in the last thirty-three years on dividends had been channeled into the university system, expanded research on arctic living, used to study the impact of global warming on polar regions, and been invested to supplement the state's infrastructure? Everyone tempted to distribute natural-resource revenues directly to residents via dividend checks, or to use revenues to reduce taxes, should consider whether concentrated public expenditures might not produce greater long-term gains.

Both New Mexico and Texas have devoted a large share of their mineral revenues to long-term collective investments in human and physical capital. In spite of the popularity of the annual dividend check in Alaska, no other producing state pays any share of its oil and natural gas proceeds directly to all residents. New Mexico received its school lands from the federal government, as did almost all states after the first sixteen states.¹³¹ Texas entered the Union with its own public lands and

129. To see the returns from recombination of the inputs of production, a possibility that means both private and public organizational knowledge may increase total output, one need only study the classics on the division of labor, for instance Adam Smith's opening argument in *The Wealth of Nations* about pin manufacturing, SMITH, *supra* note 98, at 4-5; Albert Chandler's description of the efficiency gains from railroad organization, ALFRED D. CHANDLER JR., *THE VISIBLE HAND: THE MANAGERIAL REVOLUTION IN AMERICAN BUSINESS* (1977); Ronald Coase's description of the benefits of internal operations compared to market purchases (the "make or buy" decision), Ronald H. Coase, *The Nature of the Firm*, 4 *ECONOMICA* 386 (1937), reprinted in RONALD COASE, *THE FIRM, THE MARKET, AND THE LAW* 33-55 (1988); or the extension of Coase's work in which organizational structure itself becomes an independent variable, OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* (1985).

130. *Annual Dividend Payouts*, ALASKA PERMANENT FUND CORP., <http://www.apfc.org/home/Content/dividend/dividendamounts.cfm> (last visited Apr. 14, 2015).

131. Congress only began issuing land grants in 1785. See *infra* note 138 and accompanying text. For an overview of federally-endowed school funds generally, see CTR. FOR THE SCH. OF THE FUTURE, UTAH STATE UNIV., *A MAGNIFICENT ENDOWMENT: AMERICA'S SCHOOL TRUST LANDS* (2012), available at <http://www.idl.idaho.gov/land-board/lb/documents-long-term/class-trust-lands.pdf>. For general background, see FLETCHER HARPER SWIFT, *A HISTORY OF PUBLIC*

endowed its funds itself.¹³² Both states use a large part of their accrued oil revenues to support public education, which should yield long-term stimulus to their economies.¹³³

In Texas, the combined principal of the two huge educational funds is now over \$52 billion, almost as much as the Alaska Permanent Fund.¹³⁴ Texas donates almost a billion dollars a year in earnings to grade and high schools through its School Permanent Fund and traditionally has funded much of the physical infrastructure of the University of Texas and Texas A&M from the Permanent University Fund.¹³⁵

In New Mexico, the lands originally given to support the schools can be leased or sold, but the proceeds can only be used for school purposes and the principal, even of funds received in sales or leases, must be preserved.¹³⁶ These restraints on leasing and sales are common among most of the later federal land grants given for school use. Congress came to understand that it had to police its grants with increasing aggressiveness after it observed the widespread fraud that occurred when states were given land without rules governing management of this public domain. The limitations on spending increase the odds that at least a good part of the value of these oil and gas assets will be preserved for future generations.

D. *The Problems of Corruption and Mistake*

No discussion of the effective use of public funds can be complete without mention of two other problems: corruption and intentional fraud on the one hand; and on the other hand, mistakes—unintentional errors that nonetheless may produce an effect just as far from that intended as deliberate fraud.

As for fraud, the history of federal land grants offers a graphic reminder that land can be leased in many ways that destroy its value (for instance, allowing lessees to remove timber and other resources without

PERMANENT COMMON SCHOOL FUNDS IN THE UNITED STATES, 1795–1905 (Kessinger Publishing Legacy Reprint 2013) (1911); MATTHIAS NORDBERG ORFIELD, *FEDERAL LAND GRANTS TO THE STATES: WITH SPECIAL REFERENCE TO MINNESOTA* ch. II (The Making of Modern Law 2013) (1915).

132. On the Texas funds generally, see *supra* notes 40–43 and accompanying text.

133. The federal government retained mineral rights on many of its school land grants, so a number of other states receiving federal lands have not had as full an opportunity to use mineral revenues on their school lands. ORFIELD, *supra* note 131, at 47.

134. See *supra* notes 40–43 and accompanying text.

135. See *supra* notes 40–43 and accompanying text.

136. The New Mexico Land Grant Permanent Fund is authorized to distribute 5% of its principal on a rolling five-year-average basis. *Land Grant Permanent Fund*, N.M. ST. INVESTMENT COUNCIL, <http://www.sic.state.nm.us/land-grant-permanent-fund.aspx> (last visited Apr. 14, 2015). The state's Severance Tax Permanent Fund is constitutionally limited to distributing a five-year-average 4.7% of the severance taxes to the General Fund. *Severance Tax Permanent Fund*, N.M. ST. INVESTMENT COUNCIL, <http://www.sic.state.nm.us/severance-tax-permanent-fund.aspx> (last visited Apr. 14, 2015).

adequate payment). Resources can be exchanged or sold in fraudulent schemes that strip the public of the resources' full value. Although in theory, selling some or even all of the school lands (just like allowing an oil company to produce and market state oil and gas) can enable a school fund or other permanent fund to lower its risk through diversification and to seek higher returns than may be available in the local economy, prudent investment will not be achieved if the sales are sweetheart deals or are made without attention to the full risks of investment.¹³⁷ Prudent investing also will be thwarted if a state liquefies some of its school lands but then limits investment opportunities to in-state programs that offer local stimulus but lack the diversification and range of returns of more broadly based investing.¹³⁸ Any gain from a local multiplier effect that occurs when dollars are spent locally and recirculate in nearby channels has to be balanced against the greater risk from the narrower range of less-diversified investments and the possibility that it will be harder to make investments without political pressure. Theoretical modeling of the best way to create sustainable value has to be tempered with realism about how to structure investments in order to dedicate funds to intended uses and by a realistic assessment of the risks and returns to investing.

The difficulty of maintaining large funds for public purposes is well illustrated by the fate of the school lands Congress transferred to many states. Beginning with the Ordinance of 1785 and then the Northwest Ordinance of 1787, Congress gave land to each new state as it carved them out of federally owned acreage.¹³⁹ The land was given in trust for

137. The study *A Magnificent Endowment* argues that school trust lands "have always outperformed Permanent School Funds because land has intrinsic, irreplaceable value. Therefore Trustees should be cautious in selling School Trust Lands." A MAGNIFICENT ENDOWMENT, *supra* note 131, at 16. Yet there is no reason to believe that land will always increase more rapidly in value than any other investment. Were that the case, more money would rush into real estate and drive down returns on land. Limiting values to those generated by increases in the value of land prevents meaningful diversification, thus putting a state at greater risk. On average, if managed prudently, funds like the highly diversified Alaska Permanent Fund and Norway's Government Pension Fund are likelier to achieve high returns with greater safety if they have a wider mix of investments than just land and its natural outputs. The rub, of course, is knowing how to make prudent, diversified long-term investments and avoiding the kind of political pressure that historically came to roost on the school funds just as predictably as swallows return to Capistrano.

138. For instance, the New Mexico Land Commissioner invested school funds to stimulate a New Mexico film industry through subsidies. Williams, *supra* note 39, at 728–29. While stimulating this entertainment industry may be a worthy goal for any state economy, filmmaking is highly risky, and the decision that it needs subsidization suggests that the market valued filmmaking in New Mexico less than the administrators who made this decision. It is hard to see why school funds should be used for such risky prospects. Most politicians have a list of worthy pet projects. If school funds are viewed as available for pet projects, they will quickly be spent with perhaps the best of intentions but without sufficient regard to the need to preserve assets to help schools. This, of course, is presumably one reason why Congress was so careful to establish the school lands as trust possessions and to limit the use of revenues from the land or sale of the lands to very specific purposes.

139. *Lassen v. Arizona*, 385 U.S. 458, 460 (1967). For a discussion of the role of the Ordinance of 1785, see A MAGNIFICENT ENDOWMENT, *supra* note 131, at 11.

designated public purposes, including the support of the “common schools.”¹⁴⁰ The enabling statute creating each state spells out the purposes. For instance, the 1910 Enabling Act for Arizona contains grants for twelve public purposes.¹⁴¹ All in all, Congress donated 330,000,000 acres in trust to the states, over a third of it for school purposes.¹⁴²

In issuing land grants, Congress became increasingly careful to limit use of the designated lands to specific purposes. The United States Supreme Court has tried to vigilantly police the dedication of lands and their proceeds to achieve the purposes intended by Congress.¹⁴³ The Court has noted that Congress had good reason to fear that the grants would be “exploited for private advantage” and that in grants issued over the fifty years before passage of 1910’s Arizona Enabling Act, the “restrictions placed upon land grants to the states became steadily more rigid and specific . . . as Congress sought to require prudent management”¹⁴⁴ When Congress received evidence of the waste and corruption that afflicted early grants, it began making new recipient states maintain “permanent” or “perpetual” funds.¹⁴⁵ A requirement of preserving the land grants’ principal value was one of four measures a

140. *Lassen*, 385 U.S. at 463.

141. The grants to Arizona are for “university; legislative, executive and judicial, public buildings; penitentiaries; insane asylum; school and asylum for deaf, dumb and blind; miners’ hospital; normal schools; state charitable, penal and reformatory institutions; agricultural and mechanical colleges; school of mines; military institutions; and country bonds.” *State v. Lassen*, 407 P.2d 747, 748 (Ariz. 1965), *rev’d*, 385 U.S. 458 (1967).

142. *Lassen*, 385 U.S. at 460 n.3. The Center for the School of the Future at Utah State University estimates that federal and state government donated 134 million acres, all told, for school purposes. A MAGNIFICENT ENDOWMENT, *supra* note 131, at 13.

143. In *Lassen*, the Court rejected Arizona’s effort to use school lands for public highways without paying compensation. The State argued that highways increased the value of the land enough to offset the value of the lost land. In a notably fact-free holding, the Arizona Supreme Court held that it could be “conclusively presumed” that this was true. 385 U.S. at 460. The United States Supreme Court, unimpressed by this self-serving presumption, held that Arizona’s Enabling Act required that the trust “receive the full value of any lands transferred from it and that any funds received be employed only for the purposes for which the land was given.” *Id.* at 466. Here, of course, the state had received a substantial benefit—free highway lands—while making no payment at all for the privilege. Indeed, if this gift was upheld, it would have given the state an incentive to route all its highways through whatever it retained of the 11% of the state that it had received as school lands. The school trust was not receiving the “full benefit” of the lands as intended, and the state had to pay for school lands put to highway use. That the state of Arizona would think it could use school lands as free lands to provide highways for the general benefit of the state as a whole, even if also indirectly benefitting school lands (for instance, by making school busing easier or by increasing the overall tax base for school revenues), is a prime example of the temptations that arise to divert public funds to a wide variety of seemingly worthy uses.

144. *Lassen*, 385 U.S. at 467–68. The New Mexico Supreme Court provided its own short history of the corruption problem with school trust funds and New Mexico officials in *King v. Lyons*, 248 P.3d 878, 888–91 (N.M. 2011).

145. ORFIELD, *supra* note 131, at 51. Orfield writes that Congress required Colorado, admitted to the Union in 1875, and every subsequent state receiving land grants to put funds derived from sale of school lands into a permanent fund, with only the interest available for spending. *Id.*

commentator writing in the early 1900s listed as steps Congress took to avoid fraud in the administration of land grants.¹⁴⁶ The others were (1) limiting how the lands could be leased; (2) limiting how the lands could be sold; and (3) limiting how funds resulting from land sales could be invested.¹⁴⁷

By early in the twentieth century, most of the federal land-grant funds for school purposes had been dissipated. As of 2011, only twenty of the forty-five states that received school lands had any of the land left¹⁴⁸ and even in those states much of the land had been sold. By one estimate, of the 134 million acres in federal and state land donated to schools, only 45 million acres are still held by states today.¹⁴⁹ None of the states have permanent funds with anything like the equivalent value in today's dollars of their initial grants. There turned out to be dozens of ways in which state controls were gamed to strip the public of its resources, including by the states themselves.¹⁵⁰

146. *Id.* at 49–52.

147. *Id.*

148. A MAGNIFICENT ENDOWMENT, *supra* note 131, at 13 (including list of acreage by state).

149. *Id.*

150. Fletcher Swift summarized twenty-five separate ways in which malfeasors caused losses in federal school lands. The list is daunting:

1. Lands sold for less than real value.
2. Unpaid for lands reverted to township [often with valuable resources stripped out of the land].
3. Deeds improperly recorded or not recorded.
4. Sold by towns and no records of proceeds.
5. Bad loans.
6. Unpaid notes.
7. Unpaid interest on bonds or notes.
8. Mismanagement.
9. Dishonest management.
10. Absconding of school fund officers or debtors.
11. Theft or embezzlement.
12. Losses by fire.
13. Insufficient legislation.
14. Moneys due principal not added.
15. Moneys due principal diverted.
16. Funds borrowed by the state.
17. Funds used for state expenses.
18. Funds misappropriated by state.
20. Used for other purposes.
21. Exchanged for state securities – indebtedness later repudiated.
22. Fraudulent bonds.
23. Failure of state banks.
24. Depreciation of securities.
25. Civil War [generally, investment of school funds in worthless Confederate bonds or unpaid bonds of northern states].

SWIFT, *supra* note 131, at 157–58.

Writing in 1911, Swift concluded:

In many states the permanent funds and the proceeds which should have been added to them have been cared for so carelessly, diverted, squandered, wasted, and embezzled so shamefully, that what ought to be a magnificent endowment, whose income would today be yielding an appreciable relief from taxation, has dwindled to an almost negligible sum, or exists as a permanent state debt on which interest is paid out of the taxes levied upon the present generations.

Id. at 11.

“Mismanagement, dishonest management, theft, embezzlement, absconding of debtors and of officers entrusted with the principal, constitute some of the wrongs committed against the permanent common school funds in many of the states.” *Id.* at 145. And, most disappointing of all, often the states themselves created the losses: “It has often been but a step from borrowing the fund to repudiate the state’s indebtedness to it.” *Id.* at 154. For discussion of methods of state borrowing, not all of which return fair value, see *id.* at 6–7, 155–56. As Swift wrote with great understatement,

Mistakes are also a problem in the administration of proceeds. True market adherents believe that there is no way that a central government can replicate the efficiency of the market's exchange of information and of goods and services.¹⁵¹ Further, classic conservatives are skeptical that we can ever know enough to intervene in something as complex as a society or an economy.¹⁵² They reject, in other words, the Enlightenment's faith that men and women are indeed free and can use their reason and judgment to improve their lives and, with it, the course of history.¹⁵³

The idea that government does nothing well, so that we should shrink it as much as possible and leave everything to the private sector except, perhaps, the minimum of policing, enforcing contracts, and national defense, is a guarantee for a low-performing, unhappy, and divided society. Jettisoning the benefits of public organization risks just as much a loss of freedom as jettisoning the liberating combinations achievable through the market. The stingy conception of government (and exaggeration of private potentiality) is the theory that kept Herbert Hoover from making meaningful interventions during the Great Depression and so prolonged the misery of the millions of Americans who had lost their jobs and the many millions more who lived in fear of losing theirs. It is what let the United States economy go so far out of whack in the late 2000s because it lacked, and in some instances had jettisoned, proper stabilizing public controls. But if simple opposition to considering the use of government's organizational power and resources is one mistake, so is assuming that mandating a public program ensures

Furthermore, it may be well to distinguish between real investments in state bonds which the state must redeem at their maturity and investments in bonds which, in all probability, will never be redeemed, or instead of such investment in irredeemable bonds, the creation of a permanent account.

Id. at 156. Matthias Orfield described very similarly the:

[S]pectacle of state after state throwing away the heritage of its common schools by century-long leases, premature sales at inadequate prices, or investment of the proceeds in doubtful securities [that] served more and more to impress upon Congress the importance of taking some action to safeguard the inheritance of the schools.

ORFIELD, *supra* note 131, at 49.

151. The idea of there being some magic in the efficiency of market exchanges is most famously captured in Adam Smith's concept of the invisible hand. SMITH, *supra* note 98, at 485. This function is perhaps more frequently cited to F.A. Hayek's description of the way market pricing coordinates information from many people who will never meet each other directly, and yet are part of a larger coordinated organism, the voluntary network, that generates the goods and services we so easily buy and sell in the marketplace. F.A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, 526-27 (1945).

152. For a useful but critical classification of conservative arguments against conscious social reform, see ALBERT O. HIRSCHMAN, *THE RHETORICS OF REACTION: PERVERSITY, FUTILITY, JEOPARDY* (1991) (describing conservative "perversity," "futility," and "jeopardy" arguments against social reform).

153. See generally ANTHONY PAGDEN, *THE ENLIGHTENMENT, AND WHY IT STILL MATTERS* (2013) (treating the Enlightenment's bold insistence on humankind's ability to chart its destiny as potentially as important today as it was disruptive in the eighteenth century).

that it will achieve its goals at the other extreme. Preserving resource value is not as simple as deciding to create a permanent fund and identifying a few activities that would benefit from invested earnings. Any program requires careful planning, monitoring, and adjustment to fine-tune the initial plan.

The record of massive, well-intentioned foreign aid programs has produced much disillusionment about planned developmental spending. We are now in at least a third stage of these programs, yet it remains hard to see a clear investment principle that will help struggling developing countries.¹⁵⁴ And in Alaska, one reason that the state moved to protect at least some of its oil revenues in a permanent fund, and chose one that is not invested locally, is that the earlier injection of substantial money into the local economy did not seem to pay proportionate returns.¹⁵⁵ Even if a state decides that it is going to preserve produced resources in a sustainable way, achieving this goal requires the most careful and sensitive public management.

E. Local v. Generalized Investment

The most tempting use of money put into a state fund is, of course, to spend it, or at least the earnings on it, in local projects that will generate political support and appreciative voters. A state or a nation trying to find investments that preserve the value of liquefied natural resources will be tempted to kill two birds with one stone by investing only within its own borders. The spending then not only may serve the interests of sustainability, but will directly aid the region and its population by stimulating jobs, raising incomes, and spreading multiplier effects throughout the regional economy. Sponsoring politicians will collect their own gains if they push locally popular programs.

A local investment strategy, unfortunately, has the same risks that companies court when they invest employee pensions only into their own stock. The smaller the state's (or country's) economy, the less diversified the investment and the greater the added risk, on average. Alaskan native corporations learned this to their regret when their in-state investments of start-up funds received from the federal government under the Alaska Native Claims Settlement Act did poorly. One

154. For one commentator's short summary of the recent history of this development, see NANCY BIRDSALL & ARVIND SUBRAMANIAN, SAVING IRAQ FROM ITS OIL, in THE GOVERNOR'S SOLUTION, *supra* note 31, at 90–91 (claiming three stages in international development policy: a first focused on physical infrastructure in the 1970s; a second aimed at encouraging liberal economic policies in the 1980s—one that certainly extended into the 1990s under the Clinton Administration; and a current policy aimed at the “software” of the institutional framework that creates and sustains markets). Birdsall and Subramanian find the experience of efforts to build productive national oil funds “not encouraging.” *See id.* at 96–97.

155. *See* Goldsmith, *supra* note 31, at 78 (claiming limited success in past Alaska spending on infrastructure and development loans and spending to develop diversified economy).

economist looking at the outcome concluded that there simply were not enough opportunities in the Alaskan economy to justify so many in-state investments.¹⁵⁶ When the state designed its Permanent Fund, it ended up rejecting arguments for in-state spending and adopted instead a structure in which the Fund would be treated as a true savings fund, not a local development fund.¹⁵⁷ It probably is also fair to conclude that the temptations to corruption and investment on personal, not economic, grounds are greatest when a public agency invests within its own geographic area.

There is a difference between investing in assets of diffuse value—like pools of stock, bonds, or real estate—and investments that directly cause growth in the local area, be they loans to local businesses to expand their capital or education to increase labor force skill. Broadly diversified market investments, like S&P 500 funds and emerging market funds, are good ways to spread risk, but they remove the immediate stimulus. The best use of resource funds may well depend upon a state or country's level of development and its areas of greatest need. For a developing country or state held back by illiteracy, lack of higher education, and an absence of capital, the gain from local investment may be worth the risk, at least, as long as there is reasonable assurance that the investments will not be corrupted and that investments aimed at development actually will go to fund goods and services likely to produce development. This is the basis for Jeffrey Sachs' argument against putting too much emphasis on the risk of Dutch disease in developing economies.¹⁵⁸

Investing in the local economy has another externality problem in addition to problems from the concentration of risk and vulnerability to sweetheart deals. The investing state may not be able to capture all of the benefits. Funding a large public university, for instance, can have a highly positive economic and cultural effect if graduates stay in the area. But what if they leave because the state (or country) is too isolated for their tastes and educated citizens prefer to live in more populous, wealthier countries where they see more economic opportunity and broader cultural experiences? Then a poor economy has just helped its wealthier brethren, just as many undeveloped countries have educated doctors who moved to more developed economies and captured most of

156. *See supra* note 114.

157. Goldsmith, *supra* note 31, at 59–60 (discussing the ultimate choice of savings account method over development fund, and arguments made by savings fund proponents that “investing in a portfolio of financial assets not directly linked to the Alaskan economy would maximize the fund's long-term financial earnings and that those earnings would then be available to the state for any purpose in the future.”), 67 (discussing the Permanent Fund having a policy of not investing directly in Alaska), 69 (describing arguments of proponents of in-state spending).

158. *See supra* notes 101–03 and accompanying text.

the gain on their country's educational investment in them. This is the classic brain drain problem.

Moreover, if natural-resource money is paid out in grants to students, rather than loans, to the extent that students are subsidized in educational expenditures that they otherwise would have made for themselves, the state may not be a net beneficiary at all and the added benefit would be only the private return to these students. (This is not an argument against educational funding; but it calls for wise educational loans that expand the share of the population able to secure good educations. Businesses have a similar problem in avoiding training employees who promptly decamp to competitors with their new skills). Here, as in any public activity, and for that matter any private business organization, careful planning is required if the effort is to come close to achieving its potential.

F. Internal Conflicts

Finally, there can be a divisive regional aspect to natural-resource investments. Because our federalist structure seems part of a natural order, Americans are inured to seeing states like Texas, Oklahoma, Louisiana, Alaska, Wyoming, and New Mexico reap large oil and gas revenues year after year while resource-poor states get little or no similar benefit. Fortunately, there is more historical balance between states than meets the eye. Apparent inequalities at any point in time may disguise a larger, more balanced distribution of benefits over the course of history. Pennsylvania had a lot of oil early in the industry's life, even though it did not have that much recoverable oil and gas recently until companies began to exploit Marcellus Shale reserves, and it had a huge advantage in early coal production. The New England states do not have appreciable hydrocarbon production, but they enjoyed great prosperity over 100 years ago because they were situated near massive fish populations, their forests supplied ideal materials for shipbuilding, and an accessible whale population supplying the first harvested oils was the source of great wealth.¹⁵⁹ This wealth continues to infuse local economies in returns on legacy capital held by wealthy older families and from the colleges and universities, sources of human capital training, that flourished in the nineteenth century and still are heavily concentrated in these states. Our strong federalist traditions cause most Americans to accept these differences without considering whether they are fair. In Iraq, Nigeria, and Brazil, in contrast, to name but a few countries, regional competition

159. For the fascinating story of the rapid rise and, after some decades of great wealth, rapid decline of whaling and with it the economic motor for a number of wealthy whale-oil-dependent cities, see ERIC JAY DOLIN, *LEVIATHAN: THE HISTORY OF WHALING IN AMERICA* (2007).

over oil revenues has proven a source of serious and sometimes violent internal conflict.

Inequality is not just a result of the distribution of natural resources across states. There was also inequality in the United States in the acreage endowment of federal lands. The original thirteen states, as well as Kentucky, West Virginia, Maine, and Texas, never received federal land grants.¹⁶⁰ One explanation for this seemingly unfavorable treatment of the first states is that they did not need grants because almost all of the land in their borders was taxable, while the federal government retained substantial untaxable federal land in the new states and thus put them at a tax disadvantage.¹⁶¹ Giving new states land for public purposes also helped the new states create incentives for migration to build their undeveloped economies, a national and not just local goal. The grant lands were designed to help the newer states provide core public services in spite of the lower tax base from exempt federal lands and limited economic development. Among the apparent inequities is the fact that even among states that received grants, the first were awarded only one section per township (1/36th of the land) for schools, while states established later received at least two sections, with three states receiving four sections per township.¹⁶² Congress made additional grants for universities, mechanical and agricultural colleges, and other purposes.¹⁶³ In Alaska, the federal government pumped additional benefits into the economy through the land and cash granted under the Alaska Native Claims Settlement Act.¹⁶⁴

These regional disparities excited opposition from the overlooked states, though without gaining enough support to equalize grants. Efforts by the initial states to persuade Congress to give them comparable land failed. The lucky recipients were not always grateful, either. As new

160. A MAGNIFICENT ENDOWMENT, *supra* note 131, at 11.

161. *Utah v. Kleppe*, 586 F.2d 756, 758 (10th Cir. 1978), *rev'd on other grounds sub. nom.*, *Andrus v. Utah*, 446 U.S. 500 (1980). This is a "bilateral" theory under which Congress kept a "solemn immunity from taxation of federal lands reserved or retained in ownership by the United States" in return for "acceptance by the states of the lands granted, to be held and administered by the states under trust covenants for the perpetual benefit of the public school systems." 586 F.2d at 758.

162. For the variation in sections among states that received federal land grants, see A MAGNIFICENT ENDOWMENT, *supra* note 131, at 12. Arizona and New Mexico received four sections because unappropriated lands in those states were "largely of so little value." *Lassen v. Arizona*, 385 U.S. 458, 463 n.7 (citation omitted). Utah also received four sections per township. *Kleppe*, 586 F.2d at 759.

163. Matthias Orfield listed the major categories of lands granted as well as spending categories grouped by purpose in his 1915 book on land grants. See ORFIELD, *supra* note 131, Part II, chs. II (federal grants to support schools), III (universities), IV (salt spring land grants), V (land for public building), VI (the 5% fund from proceeds of sale of in-state federal lands), VIII (lands for internal improvements, especially roads, canals, and railroads), IX (swamp lands), X (grants for agricultural colleges).

164. On the performance of the ANCSA experiment, see *supra* note 114. For the higher grant of federal mineral revenues to Alaska, see *supra* note 15.

states began to receive public lands, these fortunate but not-always-grateful beneficiaries began pressing Congress to give them *all* federal land within their borders. A committee reviewing this effort in the 1829 Congress opposed such a transfer because, among other things, it would generate “hostility between state and state.”¹⁶⁵ The matter was re-aired by the Committee on Manufactures in 1831, chaired by Henry Clay. His committee opposed the transfer of what would have been over a billion acres of land in part because “[s]uch a cession would manifestly be unfair to the old states and very far from equitable to the new, for generally the new state with the smallest population contained the largest area of untaken land.”¹⁶⁶

Similarly bitter regional objections were raised to the destabilizing idea that offshore state boundaries might vary by historical circumstance, with some states ending up just owning rights to land within three (land) miles from shore while others own rights for three nautical miles, or roughly nine miles.¹⁶⁷ Yet this is how the law ultimately unfolded.

In spite of all the factors that should be considered in deciding how to spend resource revenues, in these times of severe budget stress and carefully groomed hostility to government every state with resource revenues will experience pressure to channel the money into short-term relief of tax burdens rather than long-term investment for the future.¹⁶⁸ Oil-producing nations tend to fund a much higher percentage of governmental operations from oil and gas revenues than that industry represents in the overall economy.¹⁶⁹ At least anecdotally, the same

165. ORFIELD, *supra* note 131, at 98.

166. *Id.*

167. For differences in offshore boundaries, see *supra* note 48.

168. Even in times without fiscal pressure, states will be pressed to return monies to firms and individuals or otherwise forego needed public expenditures. Yet the private sector has incentives to underinvest in many areas, and there is a strong role for public investment even in certain areas including education and R&D that one might think markets would serve well. For a classic argument about underinvestment, see JOHN KENNETH GALBRAITH, *THE AFFLUENT SOCIETY* ch. 18 (discussing how private economies will underinvest in individual training and education and even R&D) (Mariner Books 1998) (1958); THURLOW, *supra* note 73, at 92–94 (arguing that firms will underinvest in private R&D “for the simple reason that no private firm can hope to appropriate all of the benefits that might occur”). A reminder of how difficult it can be politically to invest in public finances, even when the investment commands widespread public support, is President Clinton’s failure to persuade Congress to invest the surpluses generated in his tenure to put the Social Security Trust Fund on a more secure basis. DANIEL BELAND, *SOCIAL SECURITY: HISTORY AND POLITICS FROM THE NEW DEAL TO THE PRIVATIZATION DEBATE 177–79* (2005).

169. One study of countries with “significant” oil income computed that, on average, the oil sector provided 19% of national economic activity but funded 54% of the public budget. ROSS, *supra* note 97, at 29, 31. Petroleum not only funds a disproportionate share of the budget of an average oil-producing nation, but these oil-fortunate countries tend to have “dramatically larger governments” (about 45% larger) than their less fortunate counterparts. *Id.* at 29. Scott Goldsmith has claimed that in Alaska state government expanded to a per capita level twice that of the rest of the nation after the oil money began flowing. Goldsmith, *supra* note 31, at 56. Some of this difference certainly reflects the higher cost of providing almost any service in Alaska, as Goldsmith admits; but it also reflects the ease of expanding public spending when

pattern exists among our states. Although in theory this subsidy can be justified because the fortunate governments could be funding much more physical and human capital investment while resource revenues are flowing abundantly and thus trying to boost their stage of economic development, it is more likely that most are using the revenue to substitute for taxes in the provision of ordinary government services and subsidizing consumption by the local population. It is easier to buy stability than it is to build an economic motor that can power an economy into the future.

Alaska's traditional 90% funding of government expenses from oil and gas revenues and Wyoming's over 50% are two domestic examples of high levels of government funding from nonrenewable oil and gas revenues.¹⁷⁰ Long-term investments that replace the value of produced nonrenewable assets, rather than just paying for ordinary government operating expenses, are critical to preserving standards of living and public wealth. Political decisions about the appropriate allocation of funds must be made with long-term economic development needs in mind.

IV. PROTECTING THE PUBLIC WEAL

It is too much to expect policymakers to act as rational calculating machines, weighing costs and benefits in a neutral manner and moving in the direction in which the formulas point. Decision-making is much more complex than this,¹⁷¹ and it would be even if not embedded in a political setting. But the factors listed here would hardly yield a single optimal formula in any event. Their application depends upon judgments about the condition of the sponsoring state, risk, the scope of difficult-to-measure factors like the potential for oil spills and global warming, and broader factors such as macroeconomic distortions and corruption for which there is no accepted measurement scale.

Nonetheless, some direction can be given to public resource development decisions. It certainly is true that virtually no resource state

blessed with windfall oil revenues. The fact that the international price of oil often allows revenues at far above the marginal cost of production is one reason that petroleum revenues can generate a windfall. That the producers who pay lease royalties or severance taxes are often "foreign" corporations makes this dependency on oil revenues easier to defend politically. This is true even within American states, at least, in those in which most producers are large out-of-state producers rather than in-state independents. Alaska's abolition of its income tax is but an extreme example of oil-producing entities' tendency to end up supporting a higher share of government activity from oil revenues than those revenues represent of the total economy. Oil revenues have allowed Texas to remain without a state income tax as well.

170. See *supra* notes 29, 35–37 and accompanying text.

171. One of the most effective reminders of the limits of the rational decision maker model, of the issues of bounded rationality and "satisficing," is the discussion in GRAHAM ALLISON, *ESSENCE OF DECISION: EXPLAINING THE CUBAN MISSILE CRISIS* (1971).

consciously considers anything like the range of factors described in this Article. Most resource revenues flow into public treasuries with, at most, one or two stabs at putting a little bit of the resource revenues aside for sustainability before the rest of the money flows back out, much of it receding in the ordinary course of a state's business. Decision-making would be improved by conscious consideration of each factor discussed here.

Some problems should have solutions that do not necessarily require government funding. Even with all the risks of estimation, reasonable estimates of traditional pollution and damage from global warming can be made. The remedial costs can be imposed by regulation, either command-and-control regulations that prohibit emissions and fix penalties for violation or by setting emission rights at prices that should keep emissions within acceptable levels. As today's experience shows, firms will not voluntarily put aside funds to compensate for the environmental damages they cause, so regulations have to impose a system of tort protection and compensation or otherwise put a price on pollutants. In either event, the costs of resource production should end up being imposed in the first instance on the producers and then worked into the price of resource-embedded products. This is the only way that those using the resources will bear the costs of the harm they cause—and that consumers whose demand justifies the polluting machinery will shift to other goods when the costs exceed the benefit to them.

Costs like added wear on infrastructure ought to be compensated in one form of taxes or another—either, for people who move into a community while working on oil production, by the taxes they pay on their incomes, homes, and purchases, or by a severance tax levied directly on the production activity itself.

The harder costs to remedy are corruption and macroeconomic distortions. The front-line measures to take against corruption are to tighten policing of the political process, not put aside a fund to somehow protect against abuses in the future (if the political system is corrupt, the fund would be more likely to be raided in any event). And when faced with a large influx of capital and labor in a production boom, the involved governments should be particularly vigilant for the need to shift education and development incentives to other sectors to ensure that the larger economy is not hobbled by higher wages and easier money in the booming sector. As Middle Eastern countries are finding out, making life too easy for residents, in essence buying their loyalty with high consumption lifestyles, is a poor long-range strategy, economically and socially. It leaves the country unprotected when the resources run out. Even in the short run, subsidizing living costs rather than institutions that

can generate jobs and cultural opportunity can deprive citizens of meaningful lives.

It is hard for any political body to entertain the possibility that the benefits of production—the new jobs, the inflow of income and taxes, the visible signs of an abundance of goods and services—might be overcome by their costs. Market societies are production-oriented. Increases in gross product are assumed to be good, even if, were nonmonetized costs counted, the bottom line in the true balance sheet would fall and might well turn negative.¹⁷² For this reason, policymakers need to be particularly careful in their judgments about resource development and in making sure that they extract a fair, adequate share of the resource so that the society unambiguously benefits as well. As Jay Hammond, the Alaska Governor who pushed for establishment of Alaska's Permanent Fund, wrote about his view of public responsibility for public resource development: “[J]ust as it is the obligation of oil company CEOs to maximize benefits for their stockholders, so is it the obligation of the state's CEO to do the same for his.”¹⁷³

In deciding to develop resources, policymakers must do more than just make sure that costs are covered. They have to give careful thought to how revenues will be spent. To the extent that production entails costs that are not captured as input costs, public revenues will need to cover those costs, too. In addition, the state needs to decide how much of the value of a produced public resource should be preserved for future generations. Pouring all the money into the current economy increases the risk of temporary economic distortion, making it too dependent upon the contributing resource, but leaving it exposed when the resource runs out. It cruelly punishes future generations by leaving them without any direct share in public wealth.

With due regard to the difficulty of planning efficiency and to the risks of corruption and diversion, direct government spending can inject funds into education, capital projects, and other sources of long-term growth that are often underserved in a free market. Government can use resource revenues to help people whom the market economy has left behind. Careful planning is needed to ensure that the private gains from resource production on public land are shared with the public. The benefit should not be merely a transitory drop in taxes but, instead, a long-term gain that leaves society better off.

172. The effort to develop new measures of national welfare is one step in a movement to try to correct this bias in market thinking. See, for instance, the work of the Stiglitz Committee discussed in *supra* note 83.

173. HAMMOND, *supra* note 71, at 52.