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INTRODUCTION

Since the passage of the Outer Continental Shelf (OCS) Lands Act in 1953,[1] more than 43.9 trillion cubic feet of natural gas and 5.2 billion barrels of oil have been severed from federal waters.[2] Extremely destructive oil spills and the recent accelerated search for energy resources have heightened the concern of coastal states who are more closely examining possible environmental damage resulting from OCS drilling activity. Many proposals have surfaced aimed at reducing the amount and extent of environmental damage, from voluntarism and taxing schemes, to involuntary regulatory compliance. Devising a neutral policy to achieve the goal of environmental preservation becomes more complex when juxtaposed with the nation's apparent insatiable appetite for energy. This article documents and evaluates the attempt of one coastal state, Louisiana, to preserve its coastline through the use of an earmarked tax levied on natural gas entering its borders from OCS waters.[3]

Plan of the paper is straightforward. First, a survey of the environmental impacts of transporting natural gas through the coastal ecosystem is presented. Then, evaluation of the first-use tax proceeds along two lines: it is critiqued as a viable mechanism to preserve Louisiana's coastline and compared with alternate policies for minimizing damage from natural gas transportation. Following the analysis of the three standard mechanisms for pollution and environmental damage control, provisions of the 1978 Louisiana first-use tax are discussed. Critique of the tax continues with an examination of possible distributive and allocative nonneutralities associated with its imposition. Finally, the paper concludes with a discussion of possible policy implications of the Louisiana first-use tax.

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1. Outer Continental Shelf Lands Act of 1953. 43 U.S.C. § § 1331-1343 (1976).
2. UNITED STATES DEP'T. OF INTERIOR, GEOLOGICAL SURVEY, CONSERVATION DIV., OUTER CONTINENTAL SHELF STATISTICS, 1953-1979, at 91 (June, 1980).
3. LA. REV. STAT. ANN. § § 47:1301-1307, -1351 (West Supp. 1980).

PIPELINE CONSTRUCTION METHODS

What then is the nature of environmental damage incurred from natural gas produced in offshore waters? Oil and gas well explosions resulting in petroleum slicks and culminating in hydrologic damage are well documented. Up to 1979, such blowouts accounted for a relatively minor amount of water pollution in the Gulf of Mexico.[4] The bulk of environmental damage, however, results from pipeline construction and energy exploration activities. Since the first-use tax is levied on natural gas produced in OCS waters, this segment of the paper focuses on the environmental damage resulting from the transportation of natural gas to onshore coastal facilities.[5]

There are three methods employed in pipeline construction: dry land method, push-ditch or shove method, and the flotation method. In each method, the pipeline company must purchase rights-of-way. The dry land method necessitates that all vegetation be cleared from the right-of-way. After clearing, a ditch is dug and welded pipe is lowered. Backfilling is necessary and the land is suitable for its previous use, unless that use was as woodland. It is desirable to keep the right-of-way cleared of trees, brush, and undergrowth in order to prevent possible damage to the pipe from root infiltration. Agricultural activities are generally permissible since the ditch depth is usually eight feet for a standard 125 feet right-of-way.[6]

The second method, push-ditch or shove, is suitable where the marshland is firm, and requires approximately 150 feet for a right-of-way. First a ditch is excavated to about four to six feet in depth and eight to ten feet wide.[7] Since this method is one of the two methods employed in marsh environments, the ditch usually fills with water, forming a shallow canal. Sections of pipe are welded at the starting point of the canal and the entire line is given artificial buoyancy. As each new pipe section is welded, the entire line is pushed through the canal.[8] Once a sufficient length of pipeline has been constructed, floats providing buoyancy are removed and the entire line sinks to

4. The famous Ixtoc I well blowout in the Bay of Campeche may reverse this observation.

5. Conversations with industry officials revealed that virtually all of the natural gas produced in the OCS waters adjacent to Louisiana's coast is transported to onshore facilities by pipeline.

6. J. Stone, *Environmental Impact of a Superport in the Gulf of Mexico* (paper presented at the annual meeting of the American Institute of Chemical Engineers, Chicago, 1975).

7. W. CONNER, J. STONE, L. BAHR, V. BENNETT, J. DAY & R. TURNER, OIL AND GAS USE CHARACTERIZATION, IMPACTS, AND GUIDELINES 82 (report prepared for the Louisiana State University Center for Wetland Resources, December 1976) [hereinafter cited as OIL AND GAS USE].

8. *Id.* at 83.

the bottom. Backfilling, even in areas of firm marsh, usually results in substantial soil subsidence.[9]

The last method of laying a pipeline is the most expensive and is used when the marsh is not firm. Requiring a 300 feet right-of-way, the flotation method utilizes a pipe-laying barge which necessitates that a 40 to 50 feet wide canal be excavated to a depth of six to eight feet. In addition, a trench must be dredged to provide a minimum of ten feet clearance from the top of the pipeline.[10]

Canal dredging necessitates the disposal of spoil.[11] Usually the spoil is deposited on each side of the canal forming a levee 30 to 40 feet from the canal. Levees range in height from three to five feet, and the width at the base ranges from 50 to 85 feet.[12] High water content of the spoil leads to significant subsidence, and as much as a 50 percent reduction in levee height is not unusual.

The significant water content contributes to the additional problem of backfilling. Rarely is there sufficient spoil to backfill the pipeline trench or the barge canal. Hauling adequate amounts of nonmarshland soil to compensate for subsidence is probably not economical and the environmental impacts are not presently known.[13]

ENVIRONMENTAL DAMAGE FROM PIPELINE CONSTRUCTION

Three separate effects of pipeline construction on the coastal ecosystem can be discerned: physical, chemical, and biological changes.[14] Since pipeline construction in coastal areas is undertaken with either the flotation or push methods, much land is lost due to canaling. Land loss is proportional to the method used and the width and length of the canal. A canal excavated by using the push or shove method results in an eight to ten feet wide ditch. Approximately one acre of land is lost for each mile of canal excavated.[15] On the other hand, dredging a 40 to 50 feet wide canal to accommodate a flotation method pipe-laying barge results in a loss of approximately six square miles of land per mile of canal.[16]

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9. J. MCGINNIS, R. EWING, C. WILLIAMSON, S. ROGERS, D. DOUGLASS & D. MORRISON, FINAL REPORT OF ENVIRONMENTAL ASPECTS OF GAS PIPELINE OPERATIONS IN THE LOUISIANA COASTAL MARSHES (report prepared for the Batelle-Columbus Laboratories, December 1972) [hereinafter cited as PIPELINE OPERATIONS].
10. *See* OIL AND GAS USE, *supra* note 7, at 83.
11. Spoil is the excavated material which results from dredging.
12. *See* OIL AND GAS USE, *supra* note 7, at 83-86.
13. *Id.* at 86.
14. *See* PIPELINE OPERATIONS, *supra* note 9.
15. *Id.* at 3.5.
16. *Id.*

Gagliano and van Beek estimate that in the 30 years prior to 1970, Louisiana lost a total of approximately 495 square miles in land area, an average of 16.5 square miles per year.[17] A further estimate accounts for 45 percent (7.4 square miles) of this loss to human-induced forces which, of course, include more activities than just natural gas pipelining.[18] McGinnis estimates that approximately six percent, or one square mile, of annual Louisiana land loss is due to natural gas pipelining.[19] Additional marshland acreage is lost or altered in the dispersion of spoil and the siting of gas compressor and reprocessing stations.

Due to the common practice of bulkheading,[20] pipeline canal erosion is not a significant factor in total coastline erosion. Storms and tidal changes apparently account for the major portion of Louisiana's coastal erosion. Spoils from the canal dredging present some physical damage since drainage patterns are altered and the character of the surrounding marsh is changed.[21] Finally, changes in turbidity are also associated with canal dredging and spoil dispersion.

Besides the physical damage to the coastal environment, pipeline dredging inflicts various degrees of chemical damage. After dredging, displaced soils have low pH values and high concentrations of toxic hydrogen sulfide. This explains the slow revegetation of levees after dredging operations are complete.[22]

Water salinity is extremely important in the marsh ecosystem because of the estuary's role as a nursery for shrimp, fur animals, and oysters. Much of the rate of change in coastal estuarine salinity is seasonal due to rainfall and drainage from the Mississippi and Atchafalaya Rivers.[23] Unfortunately, no firm impact studies on marshland salinity changes from pipeline construction have been undertaken.

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17. 1 HYDROLOGIC AND GEOLOGIC STUDIES OF COASTAL LOUISIANA: S. GAGLIANO & J. VAN BEEK, GEOLOGIC AND GEOMORPHIC ASPECTS OF DELTAIC PROCESSES, MISSISSIPPI DELTA SYSTEMS (prepared for the Louisiana State University Coastal Studies Institute and the Department of Marine Sciences, 1970).

18. 3 HYDROLOGIC AND GEOLOGIC STUDIES OF COASTAL LOUISIANA: S. GAGLIANO, P. LIGHT & R. BECKER, CONTROLLED DIVERSION IN THE MISSISSIPPI DELTA SYSTEMS: AN APPROACH TO ENVIRONMENTAL MANAGEMENT (prepared for the Louisiana State University Coastal Studies Institute and the Department of Marine Sciences, 1971).

19. *See* PIPELINE OPERATIONS, *supra* note 9, at 3.4-3.5.

20. Bulkheading is the practice of constructing a retaining wall at the point at which a pipeline canal opens to a body of water.

21. PIPELINE OPERATIONS, *supra* note 9, at 3.10.

22. *Id.* at 3.11.

23. 2 HYDROLOGIC AND GEOLOGIC STUDIES OF COASTAL LOUISIANA: S. GAGLIANO, H. KWON & J. VAN BEEK, SALINITY REGIMES IN LOUISIANA ESTUARIES (prepared for the Louisiana State University Coastal Studies Institute and the Department of Marine Sciences, 1970).

Dredging pipeline canals with no thought to the possible current and tidal flows into the marsh would certainly contribute to increased salt water intrusion.

Vegetation may be lost in pipeline construction from the actual ditch dredging, erosion of the canal after the pipeline is completed, compaction under the weight of equipment, or burial beneath the levee.[24] Canaling increases the frequency of tidal flooding of brackish marsh, thereby raising the salinity and often resulting in the destruction of native vegetation. These effects change plant specie composition, further disrupting the food chain and, in turn, the marsh ecosystem.

Very little is known about the effects of gas pipelining on animal populations and behavior. Dredging and the resulting land loss decrease habitable areas for some species of animals indigenous to the marsh. But for other species, for example muskrat, nutria, and certain reptiles, canals may represent an increase in habitable areas. It should be recognized that habitat is dependent upon an adequate food supply. Spoil disposal, land loss, and chemical changes due to pipelining may offset the possible positive effects of increasing habitats for selected species due to canaling.

Little conclusive evidence is available on the effects of gas pipelining on bird populations. Broad generalizations, however, point to the nature of the problem. Chemical changes in the marsh ecosystem, such as lower pH levels and high salinity concentrations, disrupt the bird food chain. Ultimately, nesting patterns and the success of nesting may suffer. Food supply may also be reduced or eliminated if channelization increases water depth and if habitat is continually destroyed through spoil dispersion.

Finally, and of great concern to commercial fishermen, is the effect of dredging and natural gas pipelining on shrimp and oyster populations. Dredging and canaling result in the suspension of many heavy metals, sulfides, and various bacteria, high concentrations of which have been found in oysters and other mollusks.[25] Release of gases, increased siltation, higher salinity levels, and increased turbidity are additional effects that can detrimentally affect shrimp and oysters in the marsh estuaries. Conclusive evidence of the ultimate effects of these changes on seafood productivity is limited, and there is a distinct need for field programs to obtain more specific data.[26]

24. *See* PIPELINE OPERATIONS, *supra* note 9, at 3.6.
25. *Id.* at 3.22.
26. *Id.* at 3.21-3.27.

POLICY OPTIONS TO CONTROL EXTERNALITIES

Direct quantity controls have been used in the United States because of the visibility of their results, as in auto emission standards and nuclear power plant steam ejections. Setting standards for environmental damage inflicted on marsh environments by pipeline activities, however, would appear to be extremely difficult, due to the complexity of the marsh ecosystem.

Fairly accurate estimates of land loss due to pipeline construction could be attained through on-site inspection during and after construction. A zero land loss standard is in the state's interest. Given the high water content of marshland, however, such a goal may not be feasible. That is, mandatory backfilling would necessitate the importation of nonmarsh soil. While this could possibly reduce land loss and subsidence, thereby contributing to the effectiveness of the quantity control, the impact of introducing such nonmarsh soil into the marsh ecosystem is not known and adds an additional dimension.

Furthermore, quantity controls would have to be applied to other environmental damages incurred. Revegetation, chemical, and turbidity standards would first have to be established followed by extensive biological testing to determine critical levels that the marsh ecosystem can accommodate. Coupled with enforcement and information costs, control cost would tend to be prohibitive.[27]

Of marginal significance would be the imposition of subsidies to stimulate corrective action. Positive effects of subsidies are their contribution to equity and minimization of high control costs incurred in setting standards. However, it is far from proven that subsidies result in full compliance.[28] Furthermore, knowledge by the pipeline company or offshore gas producer that government will share in the cost of marsh reclamation and minimization of chemical and biological damage may not induce the firm to use other methods of pipelaying, particularly the placing of pipelines in existing channels and canals.[29]

In addition to standards and subsidies, one must also consider the feasibility of damage charges or taxation. Griffin suggests that effluent charges work reasonably well in reducing pollution.[30] The two advantages of the tax which appear most significant are the minimi-

27. Griffin, *Environmental Quality and Rising Energy Needs: a Collision Course?* in STUDIES IN ENERGY TAX POLICY 253 (G. Brannon ed. 1975).

28. *Id.* at 278.

29. Peterson and Galper, *Tax Exempt Financing of Private Industry's Pollution Control Investment,* 23 PUB. POL'Y. 81 (1975).

30. *See* Griffin, *supra* note 27, at 280.

zation of information and control costs, and the stimulant to install pollution abatement equipment.

Unlike control standards, a given percentage reduction in environmental damage is difficult to achieve with a tax. However, if pollution abatement costs are less than the damage tax, each firm should be induced to install such equipment rather than pay the tax on its emissions.[31] A heavy tax placed on the amount of subsidence after using the excavated spoil as backfill might induce pipeline companies to import nonmarsh soil. Such a tax would have to be extremely high to offer sufficient inducement for such abatement, for the cost of transporting foreign backfill material would almost surely be great. Furthermore, a "Catch-22" paradox may then surface. As pointed out earlier, introducing foreign backfill into the marsh environment may also result in damage to the ecosystem.

Since much of the chemical and biological damage incurred in the marsh environment results from pipeline dredging activities, it may not be feasible to levy a tax on pH changes, increases in turbidity, salinity changes, or vegetation losses. That is, the latter are the effects of the damage, not the cause. In addition, information and control costs would be enormous in order to acquire adequate compliance data.

THE LOUISIANA FIRST-USE TAX: PROVISIONS AND EVALUATION

Signed into law by Louisiana Governor Edwin W. Edwards on July 18, 1978, the Louisiana first-use tax is indeed an innovative measure.[32] The need for such a tax points to the dilemma with which most coastal states are confronted. Offshore energy activities are a proven source of employment and stimulation to coastal industrialization; however, present and future general welfare of the population entails more than economic welfare. Paramount to a high quality of life is the prevention of natural resource squandering and the preservation of coastal ecosystems.

In its statement of policy on the establishment of the first-use tax, the Louisiana legislature recognized three important guidelines. First, current severance taxes on oil and natural gas produced within the state's boundaries do not prevent the economic waste of Louisiana's energy resources.[33] Furthermore, the legislature expressed a concern

31. Wenders, *Corrective Taxes and Pollution Abatement*, 16 J. OF LAW & ECON. 365 (1973).
32. The first use tax became effective on April 1, 1979.
33. LA. REV. STAT. ANN. § 47:1301(A) (West Supp. 1980).

for equity when it stated that taxing in-state producers for the environmental damage done by natural gas pipelines carrying offshore-produced gas may unduly discriminate against in-state producers.[34]

Second, the coastal state's natural resources extend beyond its geographical land borders. Of extreme importance are the water-bottoms, barrier islands, and marshlands that are temporarily inundated by tidal currents. These areas form vital links in the ecosystem, create the habitat for a myriad of aquatic life and wildlife, protect the coastline from erosion, and are of commercial, recreational, and aesthetic value.[35] The Louisiana legislature obviously felt that the state should be compensated for environmental damage to these coastal resources from the introduction of natural gas from offshore waters.

Lastly, the legislature expressed concern over an equitable share of the burden of environmental coastline preservation. It was indeed common in past years to disburse public funds for the protection of the state's shoreline and barrier islands.[36] However, benefits of publicly funded coastal improvements do not accrue solely to the producers of natural gas from offshore tracts, as Act 294 suggests. Offshore producers of natural gas bear a part of the burden to protect the coastal environment through property taxes imposed on pipeline companies, through corporate income taxes, and through other indirect means. Imposition of a tax on the parties responsible for most of the coastal ecosystem damage would, therefore, seem to shift much of the burden presently imposed on state residents.

Act 294 imposes a tax of $.07 on each 1000 cubic feet of natural gas that is first used in the state of Louisiana, provided that gas has not been already taxed by the state. "Use" is defined as

> the sale; the transportation in the state to the point of delivery at the inlet of any processing plant; the transportation in the state of unprocessed natural gas to the point of delivery at the inlet of any measurement or storage facility; transfer of possession or relinquishment of control at a delivery point in the state; processing for the extraction of liquefiable component products or waste materials; use in manufacturing; treatment; or other ascertainable action at a point within the state.[37]

Exclusions from the tax include natural gas on which a severance tax is levied, gas used in the extraction of mineral resources, natural gas shrinkage volumes attributed to the extraction of ethane, propane,

34. *Id.* § 47:1301(C) (West Supp. 1980).
35. *Id.* § 47:1301(B) (West Supp. 1980).
36. *Id.* § 47:1301(C) (West Supp. 1980).
37. *Id.* § 47:1302(8) (West Supp. 1980).

butane, and other hydrocarbon liquids, and natural gas used in the manufacture of fertilizer and anhydrous ammonia.[38]

After the creation of a permanent Initial Proceeds Account in the sum of $500 million, proceeds from the Louisiana first-use tax are earmarked for two trust fund accounts. Seventy-five percent of the tax revenues are deposited in the Debt Retirement and Redemption Account. The legislature determined that these monies would be used to "purchase, in advance of maturity, on the open market any outstanding obligations of the state, or to call, pay, or redeem in advance of maturity any outstanding bonds, notes, or other evidences of state debt."[39] Such purchases or redemptions would only be made if they resulted in interest savings to the state. The remaining 25 percent of the monies are deposited in the Barrier Islands Conservation Account and are earmarked for capital improvement projects designed to conserve, preserve, and maintain the barrier islands, reefs, and shores of the state.[40]

The 1978 Louisiana first-use tax does not appear to fit the description of a damage tax as outlined above. However, the purpose of the legislature was apparently to establish a relatively firm relationship between the first-use tax receipts and the decision as to how to disburse the revenues. It is common in such examples of functional-decisional earmarking to deposit tax receipts in trust funds.[41]

The crisis over adequate energy supplies, and increased scrutiny of public spending projects, have apparently slowed the drive toward public spending on improved environmental quality. Specific environmental improvement projects still require legislative approval under Act 294. However, not having to compare an environmental project to other projects requiring general revenues would relieve the decision-makers of some public pressure that may otherwise exist. Furthermore, compensation from an activity such as pipeline construction may ease public resistance to an activity that would destroy valuable marshlands.[42]

The rationale for depositing 75 cents of the receipts in a debt retirement account appears to have been concern for equity and for shifting the burden of correcting past environmental destruction. However, current state debt was not entirely incurred by capital im-

38. *Id.* § 47:1303(A) (West Supp. 1980).
39. *Id.* § 47:1351(A)(2)(b) (West Supp. 1980).
40. *Id.* § 47:1351(A)(3) (West Supp. 1980).
41. Brannon, *Earmarked Revenues to Finance Energy-Related Objectives,* in STUDIES IN ENERGY TAX POLICY, *supra* note 27, at 273; Buchanan, *The Economics of Earmarked Taxes,* 74 J. OF POL. ECON. 457 (1963).
42. *See* Brannon, *supra* note 41, at 390; Griffin, *supra* note 27.

provement projects designed to prevent or correct past environmental damage. Therefore, the Louisiana legislature obviously viewed a tax on OCS-produced natural gas as a vehicle for revenue generation, and by earmarking the tax to debt retirement, eased some of the public's reluctance to the establishment of yet another tax. The revenue-generating goal of the legislature becomes vivid when one considers the recent record of state severance tax revenues to total revenues. In the period April 1, 1979 through August 30, 1980, first-use tax collections totaled $402.5 million whereas state severance taxes were $742.6 million. The latter represented 24.2 percent of total state revenue in that period, yet in fiscal year 1974-75, severance taxes represented 42.0 percent of total state receipts.[43]

As a user tax, the first-use tax can be evaluated on the grounds of possible distributive and allocative nonneutralities. Both will depend heavily on the price elasticity of the demand for natural gas, cross-elasticities of natural gas with other fuels, the time period allowed for adjustment to a price change, and the availability of substitutes.

Most of the natural gas produced in the OCS waters is dedicated to interstate gas markets. Because of this market, non-Louisiana consumers of natural gas would bear a disproportionate share of the burden of the first-use tax in the short run.[44] Residential demand for natural gas in the short run appears to be relatively inelastic, thus facilitating the supplier's ability to shift the tax forward to the consumer.[45] Such a pass-through will be more difficult in the long run, since the price elasticities for natural gas are likely to increase, and the residential consumer may have an added stimulus to switch to other fuels, provided adequate substitutes exist. One possible substitute might be natural gas produced within the continental United States, given that such supplies could be discovered and developed.

Ability of the residential consumer to substitute coal or petroleum for natural gas in the long run will be further influenced by consumer income. Lower income non-Louisiana consumers of natural gas will probably pay a higher percentage of their income in the first-use tax than high income non-Louisiana consumers. In addition, the higher income natural gas consumer has a greater capability of financing the

43. Scott & Richardson, *Louisiana's Oil and Gas Severance Tax: an Historical Review*, 42 LA. BUS. REV. 2, 5 (July 1978).

44. Culbertson, *Economic Analysis of the Proposed Use-Tax on Natural Gas from Offshore Areas*, 41 LA. BUS. REV. 2, 12 (Feb. 1977).

45. Current Federal Energy Regulatory Commission policy allows such a pass-through by interstate natural gas companies. *See* U.S. DEP'T. OF ENERGY, ENERGY INFORMATION ADMINISTRATION, 14 ENERGY POLICY STUDY: ENERGY TAXATION: AN ANALYSIS OF SELECTED TAXES 52 (prepared by the Committee on Energy Taxation, Assembly of Behavioral and Social Sciences, National Research Council, Washington, September 1980).

investment necessary to substitute other fuels. The regressive nature of the tax is thus aggravated.

Difficulty arises in trying to determine the effect of the first-use tax on industrial demand for natural gas. Wide variations in the own-price elasticity estimates in the industrial sectors are reported in Pindyck, and much of this is probably due to the individual industry uses of natural gas.[46] Some industries may be extremely sensitive to natural gas price changes, while others are unable to substitute coal and petroleum for their energy needs depending on the nature of the goods they produce and their ability to acquire suitable substitutes. Electricity generation demonstrates a considerable ability to substitute fuels, but the industry generally utilizes that fuel which is relatively least expensive.[47]

Determining how much of the first-use tax will be shifted to the final end-use customer is clouded by the prospect of price deregulation. Since the tax is placed on the volume of natural gas, it will represent a smaller proportion of the cost of fuel outlay as natural gas prices increase. If the prices of coal and petroleum rise more than proportionately when compared to natural gas prices, substitution of the former fuels may not occur, regardless of relatively high cross elasticities and the availability of alternatives to OCS-produced gas.

On the other hand, a long run condition of high own-price elasticity for natural gas, high cross elasticities with substitutes, and a high price of natural gas relative to other fuels, may result in a backward shifting of the first-use tax. Such an occurrence may result in three related effects. First, marginal natural gas wells in the OCS waters may be shut-in, resulting in a reverse multiplicative effect on the coastal economy. The adverse economic effects of such industry behavior would almost surely be localized. Second, producers may lower bids and royalty payment offerings on future OCS lease sales.[48] Effects of the latter long run behavior by producers would be more diffused, but would generally reduce federal revenues and would require some counter action by the federal government. A third long run effect may be the exporting of natural gas transmission capital (pipelines) from the Louisiana offshore regions to the coastal areas of neighboring states. This last scenario is similar to that hypothesized by McLure in response to a Texas refining tax.[49]

46. Pindyck, *The Characteristics of the Demand for Energy*, in ENERGY: CONSERVATION AND PUBLIC POLICY 38, 39 (J. Sawhill ed. 1979).

47. *Id.;* Griffin, *Inter-Fuel Substitution Possibilities: A Translog Application to Intercountry Data*, 18 INT'L. ECON. REV. 755 (1977).

48. *See* Culbertson, *supra* note 44, at 13.

49. McLure, *Economic Constraints on State and Local Taxation of Energy Resources*, 31 NAT. TAX J. 257 (1978); *The Economic Effects of a Texas Tax on the Refining of Petroleum Products*, 11 GROWTH & CHANGE 2 (July 1980).

A final effect of the first-use tax is its contribution to a long run redistribution of aggregate income. Miernyk hypothesizes that due to rising energy prices, the traditional energy producing states will realize a windfall in personal income, wages, rents, and taxes.[50] Since the Louisiana severance tax on petroleum is an ad valorem tax based on the value of the resource, higher petroleum prices will provide a tax windfall to Louisiana at the expense of those states which are net consumers of petroleum. The first-use tax of $.07 per 1000 cubic feet of natural gas is the same as the state's severance tax on in-state produced gas. Given that non-Louisiana residents bear a bulk of the burden of paying the first-use tax in the short run, Louisiana will receive an additional windfall in tax revenues, and an aggregate redistribution of income will have occurred.

SUMMARY AND POLICY IMPLICATIONS

Damage inflicted on the marsh environment from pipelines is obviously extensive. Other than the implications for land loss, measurement of ecosystem changes is inconclusive. There is, however, a dire need for extensive field investigations to at least begin an inventory of data to which future marsh ecosystem changes can be analyzed and compared.

High information and control costs associated with damage taxes, quantity controls, and subsidies would appear to negate the advisability of such control mechanisms. Complexity of the marsh ecosystem, therefore, necessitates the employment of a user tax on natural gas with the revenues of the tax earmarked for environmental improvement projects. A major flaw in the Louisiana first-use tax lies in its inability to prevent future environmental damage from pipeline construction and other energy related activities in the coastal ecosystem.

One rather severe drawback of the first-use tax is that the tax is placed on a restrictive group. Natural gas producers in OCS waters and interstate natural gas pipeline companies are not the only parties inflicting damage on the coastal environment. Producers of oil and gas in the marsh and oil pipeline companies inflict similar, if not identical, damage. These parties are not subject to the first-use tax, while severance and property taxes paid by in-state producers of petroleum and natural gas are not earmarked for coastal preservation. Therefore, Louisiana would appear to be discriminating against OCS producers

50. W. MIERNYK, F. GIARRATANI & C. SOCHER, REGIONAL IMPACTS OF RISING ENERGY PRICES (1978); Miernyk, *Regional Consequences of High Energy Prices in the United States,* 1 J. OF ENERGY & DEV. 213 (1976); *Regional Employment Impacts of Rising Energy Prices,* 26 LAB. LAW J. 518 (1975); *Rising Energy Prices and Regional Economic Development,* 8 GROWTH & CHANGE 2 (July 1977).

for environmental damage done by a much broader group of producers and pipeline companies.[51]

Revenue potential for the first-use tax appears to be excellent. The possibility of earmarking such increased revenues to environmental goals, as well as to state debt retirement, may offset northeastern states' reluctance to allow OCS exploration and production activities. Enactment of a similar energy tax by such states will of course depend on the outcome of current court tests regarding the legality of the first-use tax.[52]

The nature of the short run elasticity for natural gas contributes to the regressive nature of the first-use tax. It is unlikely that residential users of the fuel will be able to substitute alternative fuels; however, depending upon the industrial uses of natural gas and the long run deregulated price, industrial substitutions to alternate energy sources may be accelerated due to the first-use tax. Therefore, in the long run, the first-use tax will probably be shifted backward to the suppliers and producers of OCS natural gas.

51. Since the original lawsuit was brought before the United States Supreme Court, eight additional states and seventeen pipeline companies have joined Maryland as plaintiffs and the Federal Energy Regulatory Commission has filed an *amicus curiae* brief. *See* Maryland v. Louisiana, 99 S. Ct. 2876 (1979).

52. *Id.*