Exploring trends, sources, and causes of environmental funding: A study of Florida counties

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ARTICLE INFO

Article history:
Received 26 November 2010
Received in revised form 20 June 2011
Accepted 6 July 2011
Available online 27 July 2011

Keywords:
Environmental financing
Environmental funding
Local environmental management

ABSTRACT

Florida is one of the largest spenders on the environment in the U.S. Employing a database from Florida counties, this study examines two distinct environmental funding areas in government: funding to protect the environment, and funding to develop the environment. These two types of funding serve different purposes, support different activities and operations, and draw from different revenue sources. The results show that environmental funding in government is a response to the environmental pressure generated by economic activities and population growth. Counties with a higher level of manufacturing and farming activity spend more to protect the environment, while counties with higher population densities spend more to develop the environment. Moreover, counties with more funding for public safety and economic development activities spend less on the environment, indicating that environmental funding is influenced by the political processes in public budgeting in which diversified interests compete for resources. These results show that environmental spending in government is the result of combined forces arising from environmental pressure and budgetary politics.

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1. Introduction

Humanity’s need for natural resources has grown rapidly over the last several decades. Total world energy consumption grew by 46.2 percent from 1990 to 2010, and by 2030 it is expected to have increased by 95.1 percent from the 1990 level (Energy Information Administration [EIA], 2010). The growth in the consumption of both energy and other natural resources increases the pressure for pollution abatement strategies and natural resource management. The 2010 British Petroleum oil spills in the Gulf of Mexico epitomized the pressure and signified the urgency to acquire financial sources to protect the environment, preserve natural resources, and sustain economic development.

Financing environmental needs is one of five critical areas identified in the framework of the 2009 Copenhagen Conference on climate (Levi, 2009), and available financial resources are a cause of effective environmental management (Lockwood, 2010). The urgency to discover stable and long-term financial sources for environmental needs is augmented by the fact that many environmental services do not produce a net cash stream and are, therefore, characterized by a lack of business interest in investment. For example, there is no immediate mechanism to acquire financial benefit from the purchase and protection of environmentally sensitive lands; thus, private funding is lacking. The government is the primary funding source of many environmental services and activities (Casey, 2005).

Despite the growing need for environmental protection, there is a shortage of available resources to meet the need. Lack of financial resources is a key reason for the delay in implementing Agenda 21 (UN Economic and Social Council, 2001, pp. 4–5). In the U.S., the federal government spent about 1.26 percent of its total budget on natural resources and the environment in 2010, a significant decline from 1.57 percent in 1970, 2.35 percent in 1980, and 1.40 percent in both 1990 and 2000 (OMB, 2010). Federal and state spending on land conservation is about $3.2 billion a year, far less than the $5 billion to $8 billion recommended by scientists for securing a network of habitat conservation (Leaner et al., 2007). The overall clean-energy investment in the U.S. was $18.6 billion in 2009, significantly less than China’s $34.6 billion (PEW, 2010). At the local level, the counties’ spending on conservation and natural resource management in Florida was only 2.1 percent of the counties’ total spending in 2008, much less than for many other local service areas such as public safety (33.0 percent), general management (24.2 percent), and economic development (4.3 percent).

Among governments in the U.S., the federal government has been a predominant financer of environmental services. Nevertheless, due to the significant revenue shortfalls and expenditure growths predicted for the foreseeable future, the prospect of federal...
funding for environmental needs does not look bright (Congressional Budget Office, 2010). State and local governments have played an important role in financing environmental needs (Brown, 2008). Uncertainties in economic growth, large federal deficits, and political dynamics at the federal level give states—and particularly local governments—a more important role in funding environmental services. This is evidenced by the fact that a large number of open-space measures are approved by local governments in the U.S. (Szabo, 2007). In all but six states, local funding holds the larger share of the total state and local environmental spending (State and Local Source Book, 2008). Local funding is particularly important for local environmental needs, which include the protection of local water resources, lakes, wetlands, and coastal areas.

This study examines the status of environmental financing at the local level in Florida. Using data from Florida counties, it attempts to empirically examine several questions regarding environmental financing: What are the types, trends, and sources of environmental funding? What factors influence the funding? Why do some counties spend more on the environment than others?

Florida is an interesting case study because it faces great challenges in sustaining its economic development while protecting the environment. Florida’s population has grown more than 16 percent over the past decade, from 15.9 million in 2000 to 18.5 million in 2009 (U.S. Census, 2009). The state has seen an economic growth much higher than the U.S. states’ averages during most years in the 2000s (State and Local Source Books, 2000 to 2008). Economic growth and population growth come with an increasing use of lands and, consequently, a decline in natural resources such as quality unpolluted water sources, wetlands, and forest (Florida Department of Environmental Protection, 2008; Florida Division of Forestry, 2005; IFAS, 2010). Florida is the only state in the southeast U.S. to suffer a net loss of forestland since the 1970s, losing two to three million acres of forest to urbanization (Florida Division of Forestry, 2005, p. 2). A recent national report singles out Florida counties as facing “moderate to extremely high risk of water shortage” by mid-century (Natural Resources Defense Council, 2010).

Florida is also a larger spender on the environment: it ranks second in total state and local environmental spending, exceeded only by California; fourth in per-capita environmental spending after Alaska, Wyoming, and Delaware; and first in per-capita environmental spending among the states with populations over one million (State and Local Source Book, 2008). It also ranks first in spending on land conservation among all the states (Leaner et al., 2007). Florida local governments play a critical role in environmental management efforts. They share 75.4 percent of total state and local environmental spending, more than California (66.3 percent). Florida counties comprise all populations and lands in the state, and they provide critical public services, including environmental services. Overall, in 2008, the counties spent a significant portion of their budgets ($4.25 billion) on the environment. County governments (including those in Florida) are best equipped to address environmental issues at the local level because “environmental issues are ones that typically require an area-wide response or solution at the local level, and counties possess the coordinating and linking mechanisms needed for this type of activity.” (Benton et al., 2007).

This study intends to make several contributions to our understanding of environmental management in government. First, although there is an increasing overall concern about the lack of funding for environmental protection, there are very few studies on funding types, trends, and sources in government. Little is known about the stability and security of funding for environmental projects, which often require large and long-term financial investment. There is virtually no study designed to understand the forces that determine funding trends at the local level, though there is evidence that local governments play a significant role in environmental and sustainability management (Jepson, 2004; Leuenberger and Bartle, 2009; Portney, 2003; Saha and Paterson, 2008), hold local knowledge useful for environmental management (Raymond et al., 2010), and are the most trusted by citizens to provide local environmental services (Dimitrakopoulos et al., 2010).

Moreover, this research is conducted with the goal of helping managers, particularly environmental managers in government, understand the importance of strategizing financial resources to meet the needs of the environment. An effective strategy for providing environmental services depends on a good understanding of how funding for environmental services is shaped by socioeconomic and political forces, environmental needs, and other governmental functions that compete for financial resources.

2. Framework

2.1. Important concepts

Environmental services are provided and financed by all levels of government in the U.S., both independently and collaboratively. The federal government finances activities, services, and events of national scale (such as national parks, forests, and environmental landmarks) and takes on the responsibility of developing national environmental policies and regulations. State and local governments finance environmental activities within their boundaries. Collaboration among different levels of government is achieved through intergovernmental financial-assistance programs where grants and revenue-sharing programs are popular forms of financing for environmental services in state and local governments.

Environmental spending, a category commonly used in many government documents (e.g., the Census, budgets, and Comprehensive Annual Financial Reports or CAFRs), can be thought of as consisting of two distinctive components: environmental preservation spending (EPS) and environmental utilization spending (EUS). To a great extent, EPS supports environmental activities designed to preserve the natural environment and protect natural resources. Essential components of EPS are costs associated with controlling pollution and protecting natural resources such as water, air, soil, forest, wildlife, and minerals. Pollution control and natural resource preservation are two core elements that have been used to gauge public attitudes toward national environmental policies and in shaping the surrounding debate in the U.S. (Konisky et al., 2008). EPS examples at the local level include costs associated with the purchase and management of environmentally sensitive lands, the monitoring and control of air and water pollution, the creation and restoration of natural habitats for wildlife, the control of aquatic weeds and the regulation and management of ground-pollutant storage tanks, among others.

EUS is the cost of generating products (or services) that largely utilize natural resources. Examples of these products include water supply, energy supply, sewer treatment, solid waste disposal, and storm water management at the local level (State and Local Source Book, 2008). These spending items also comprise a “physical environment” spending category in the financial reporting system in Florida. The cost of energy usage and exploration (electricity, natural gas, etc.) is often included in this spending category, although it may be listed as a stand-alone spending category in a financial reporting system (such as in the U.S. federal budget).

A key distinction between EPS and EUS is reflected in their intended purposes in funding, not in the process of funding. For
example, the purpose of funding electricity production (a EUS) is
energy consumption, although measures of energy efficiency can
be designed to conserve energy use during the process of produc-
tion and consumption. The distinction is also reflected in their use
as funding sources. EUS essentially finances the provision of a
product whose beneficiary is relatively easy to identify and from
which it is possible to exclude non-payers from consuming the
product. The financial cost of supplying the product can be recou-
ped by developing a proper pricing structure for it. In practice,
many governments who sell such products adopt user charges in
which individual customers pay the charges based on their
consumption levels of these products. The financial principle of
benefits received applies to these products.

EPS supports environmental products that serve the public as
a group. It is not feasible to identify individual beneficiaries of the
products, which are often known as public goods or common pool
resources (CPRs). The economic theory of market failure provides
an explanation about the financing of these products. Because the
beneficiaries cannot be identified or charged to recoup the cost of
consuming the products, the market for the products fails, and
private investment and financing become lacking. In the case of
CPRs such as aquifers and fisheries, the exclusion of non-payers is
infeasible and resource units consumed by one are not available for
another. Left to private markets, CPRs would be rapidly exhausted
because individuals tend to overuse resources when a mechanism
to control and protect the resources is lacking (Hackett, 2006).
Public financing sources such as taxes are primary for these goods.
Table 1 summarizes the key differences between EPS and EUS.

2.2. What influences environmental funding?

There is little literature that directly answers this question. There are, however, several theoretical frameworks as well as some
empirical evidence in various academic fields that provide clues.
The theory of new political culture specifies an emerging propen-
sity, particularly among young and highly educated citizens, to
favor a left-liberal predisposition in many postindustrial countries
(Clark and Inglehart, 1998; Rosdil, 1998; Sharp, 2005). Specifically
reflected in studies of environmental policies, citizens’ support is
placed as an intermediate variable that links their socioeconomic
and political (SEP) statuses with their attitudes toward environ-
mental funding.

Studies have been conducted to explore the existence of an
empirical relationship between SEP statuses (e.g., income, educa-
tion, gender, political ideologies, etc.) and support for environ-
mental spending (Elliott et al., 1997; Xiao and Riley, 2007). Konisky
et al. find that “political ideology and partisan affiliation are
consistent predictors of preferences [on environmental issues and
environmental spending]” (Konisky et al., 2008). These studies
establish a plausible hypothesis that SEP variables determine the
extent of support for governmental spending and that this support transforms into the actual level of environmental spending in
a democratic society.

Another possible explanation of environmental funding is
provided by the analytical framework of pressure-state-response
(PSR) in the environmental monitoring literature in which
governmental policies are part of societal responses to the pressure
induced by human activities on the environment (OECD, 1993,
1997). Government environmental spending is a result of institu-
tional policies and actions in response to the natural resource
depletion and consumption that occur during a production process
that utilizes natural resources and other forms of capitals (OECD,
1993, 1997; Oehlwein, 2006).

Consistent with this framework, environmental spending
should be associated with the pressure and demands on the envi-
ronment created by the production process. EPS should be higher in
response to a higher level of natural resource depletion, and EUS
should be higher in response to a higher level of human demand for
natural resources. There is some evidence to support this theory.
In a report by the Asian Development Bank (2009) on a conserva-
tion program in the Greater Mekong Subregion, increasing environ-
mental pressure or a deteriorating environmental state was met
with substantive environmental protection efforts in managing
forestry, biodiversity, water resources, and air pollution control. In
the areas of land degradation and ozone depletion, intermittent
responses (a response level lower than substantive) were provided
to meet stabilizing or decreasing pressure (p. 11, Table 2).

The third explanation can be found in the decision-making liter-
ature of public budgeting (PB), which prescribes that the budgetary
outcome is the result of a political process that involves budget
holders in competition and compromise on limited resources.
Public budgeting is a process in which various people, facing limited
resources, express different desires and make different judgments
(Rubin, 2005; Wildavsky and Caiden, 2004). A funding decision
involves a series of budgetary considerations that include the
previous year’s funding base, stakeholders’ perceived significance of
the funding decision, and the expected responses of other stake-
holders. This explanation reflects the political nature of the budgetary
process in which political players with different interests compete for
limited resources in resource allocation decision-making.

Consistent with this theory, environmental activities face
competition from other areas of public services for limited
resources. The environmental funding level of a government is an
outcome that reflects a trade-off between the power garnered by its
environmental units and their political advocates, and the power of
non-environmental units and their advocates. Restani and Marzluff
(2002) describe a case in which different views and objectives of
various stakeholders led to conflicting implementation decisions in
resource allocation for a prioritized agenda of protecting endan-
gered species.

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Table 1

<table>
<thead>
<tr>
<th>Types of environmental funding</th>
<th>EPS</th>
<th>EUS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purposes</strong></td>
<td>Protection and preservation of natural resources</td>
<td>Development and utilization of natural resources</td>
</tr>
<tr>
<td><strong>Examples of Products or Services</strong></td>
<td>- Environmentally sensitive land protection and management</td>
<td>- Supply of water for residential and commercial use</td>
</tr>
<tr>
<td></td>
<td>- Water and air pollution monitoring and control</td>
<td>- Supply of energy (electricity, gas, etc.) for residential and commercial use</td>
</tr>
<tr>
<td></td>
<td>- Restoration of natural habitats for wildlife</td>
<td>- Supply of sewage treatment</td>
</tr>
<tr>
<td><strong>Funding Sources</strong></td>
<td>Taxes, fees, and intergovernmental revenues specified to support governmental activities</td>
<td>User charges generated from selling products or services for business-type activities</td>
</tr>
<tr>
<td><strong>Funding Principle</strong></td>
<td>Taxes or fees are levied based on taxpayers’ or service recipients’ ability to pay, measured by the values of properties in their possession and their consumptions</td>
<td>Consumers pay on the basis of benefits they receive from the consumption of the products or services</td>
</tr>
</tbody>
</table>
Table 2
Variables and data sources.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definitions</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Funding Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPS/Total</td>
<td>Percentage of EPS in total government spending</td>
<td>FDFS</td>
</tr>
<tr>
<td>EUS/Total</td>
<td>Percentage of EUS in total government spending</td>
<td>FDFS</td>
</tr>
<tr>
<td>ES/Total</td>
<td>Percentage of ES (EPS + EUS) in total government spending</td>
<td>FDFS</td>
</tr>
<tr>
<td>SEP Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poverty Rate</td>
<td>Poverty rate in 2004</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Household Income</td>
<td>Household income of $75,000 or more in 1999</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Vote for Democrat</td>
<td>Percentage of votes for Democratic Presidential Candidate in 2008 election</td>
<td>USA Today</td>
</tr>
<tr>
<td>Education</td>
<td>Percentage of graduates from high schools or higher institutions in population in 2000</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>PSR Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population</td>
<td>Population in 2008</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Population Density</td>
<td>Persons per square mile of land area in 2008</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Population Growth</td>
<td>Average annual population growth from 2000 to 2008</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Land Size</td>
<td>Square miles in 2000</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Percent change of employment in manufacturing from 2001 to 2005</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Farm Earning</td>
<td>Average farm earning in 2005</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Farm Land Size</td>
<td>Average acres of land in farms in 2002</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Water Use</td>
<td>Daily million gallons of water used in 2000</td>
<td>The U.S. Census</td>
</tr>
<tr>
<td>Coastal Area</td>
<td>Coastal county (−1) or not (−0)</td>
<td>Map Wise Inc.</td>
</tr>
<tr>
<td>PB Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Development Spending</td>
<td>Annual average of percentages of economic development spending from 1999 to 2008</td>
<td>FDFS</td>
</tr>
<tr>
<td>Public Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spending</td>
<td>Annual average of percentages of public safety spending in total spending from 1999 to 2008</td>
<td>FDFS</td>
</tr>
<tr>
<td>General Government Spending</td>
<td>Annual average of percentages of general government spending from 1999 to 2008</td>
<td>FDFS</td>
</tr>
</tbody>
</table>

1999 to 2008 data of environmental spending and other spending variables are available. No panel data are available for other variables in this study.

3. Method

This study analyzes the data from Florida counties which work in conjunction with the state and municipalities in providing environmental services. While the state provides grants and loans to counties through a variety of environmental programs, counties largely rely on their own funding sources for their environmental needs. Although both counties and municipalities provide public services, county services reach to all populations and cover all lands in the state. Environmental preservation is a function of all county governments, and it is classified in a spending category in the state’s financial reporting system. That is not the case for many municipalities, which do not report this spending in their financial reports.

Environmental services are also provided by water management districts and conservation districts. Water management districts are regional agencies that oversee water resources. They are responsible for managing and protecting water resources by balancing and improving water quality, flood control, natural systems, and water supply (Florida Statutes Chapter 373, 2005). Nevertheless, they are not water utility entities that sell water to customers. Conservation districts provide technical assistance for conservation projects, though many of them have very limited budgets (Florida Department of Financial Services Data, 1999 to 2008).

3.1. Data

This study draws on multiple data sources. Spending data from 66 Florida counties from 1999 to 2008 were obtained from Florida Department of Financial Services or FDFS (Florida has 67 counties, but Duval County government was consolidated with the city of Jacksonville and was therefore excluded from this study). Unlike budget data, FDFS data are actual spending figures reported after a fiscal year is completed. EUS in the FDFS system is defined as “costs of services provided for the primary purpose of achieving a satisfactory living environment by controlling and utilizing elements of the environment” (FDFS, 2010, p. 107). Examples include costs of energy supply (electricity, gas), water supply, solid waste recycling, and sewer services. EPS in FDFS is defined as “costs associated with conserving and managing natural resources such as water, soil, wildlife, air, and minerals” (FDFS, 2010, p. 108). Examples include costs associated with pollution abatement and control, fish conservation, soil conservation, air and water management, and aquatic weed control.

In the FDFS system, environmental spending is reported at the fund level, allowing the specification of funding sources. Governmental funding sources (taxes, intergovernmental grants, tax-supported issues of debt, etc.) are reported separately from business-type revenues (mainly user charges). Among governmental funding sources, financial resources in capital project funds are reported separately from resources of other funds. Because capital project funds account for the acquisition of fixed assets from expenditures of debt proceeds (along with other sources such as capital grants), the reporting of expenditures in capital project funds partly captures a government’s use of future financial resources in financing environmental efforts. Also reported separately from other funds in FDFS are the financial resources restricted for specific purposes. Special revenue funds are governmental funds used to account for resources legally restricted for specific identifiable purposes. For example, a grant from a state government can be restricted for the use of covering the cleanup cost of a polluted waterway in a local government. Restrictions placed on funding purposes in special revenue funds do render a certain level of safeguard for the funding, which means that the funding is reserved for environment-related activities only. Importantly, the FDFS system also reports environmental spending in enterprise funds, which accounts for financial resources incurred to provide business-type activities. Business-type activities are often funded through user charges, which are intended to cover all costs of the activities. User charges for water and power supply are popular examples.

3.2. Measurement

A measure of the funding level was constructed by using the proportion of environmental spending in total government spending, ES/Total, ES = total environmental spending and Total = Total government spending. Measures of EPS and EUS were also created (EPS/Total and EUS/Total), where EPS + EUS = ES. An aggregate measure that averages the proportions of environmental spending in total government spending from 1999 to 2008 was also developed for the modeling process in the study. This is a measure of the relative size of environmental funding in total government spending.
funding. Similarly, the proportions of EPS and EUS in total government spending during the study period were also averaged to measure the relative sizes of EPS and EUS.

Moreover, measures were developed for SEP variables: poverty rate, household income, educational attainment, and political election results. Measures of environmental pressures, based on the PSR framework, include variables that capture the size and growth in population, industrial outputs, and land uses. The selection of these variables is consistent with the concept of environmental pressure defined by OECD as human interaction with the environment (OECD, 1993). Measures of PB variables include the proportions of total government spending on important non-environmental services such as public safety, economic development, and general government. A description of these variables is presented in Table 2.

4. Findings and discussions

4.1. Spending trend

Florida counties spent a total of $4.25 billion on the environment in 2008. On average, each county had an environmental spending total of $64.42 million in 2008, compared to $36.24 million in 1999. The environmental spending level has fluctuated. The proportion of environmental spending in total government spending had gradually increased from 11.76 percent in 1999 to a peak of 12.93 percent in 2005; however, it then declined to 12.03 percent in 2008. Environmental spending is consistently and significantly less than the spending on public safety and general government but more than the spending on economic development (Table 3).

Environmental spending was concentrated in populous urban counties. Of the 66 counties in the study, 36 (or 55 percent) spent more than 10 percent of their total government spending on the environment. Thirteen counties (or 20 percent) spent more than $100 million each on the environment. This should not be a surprise, because these large spenders tend to have large revenue bases and are located in populous urban areas of the state.

Counties spend significantly more on environmental utilization than on environmental preservation. On average, EUS of each county was $56.61 million (or 87.5 percent of total environmental spending) in 2008, compared with only $8.05 million (or 12.5 percent of the total) in EPS. In spite of its smaller share, EPS has grown. Its share in the total county spending has increased gradually from 1.22 percent in 1999 to 2.03 percent in 2008. EPS in total environmental spending has steadily increased from 8.1 percent in 1999 to 12.5 percent in 2008, as shown in Table 4, while EUS has declined from 91.9 percent to 87.5 percent.

Table 3
Proportions in total government spending: a comparison (%).

<table>
<thead>
<tr>
<th>Year</th>
<th>Environment</th>
<th>Public Safety</th>
<th>General Government</th>
<th>Economic Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>11.8</td>
<td>31.6</td>
<td>25.2</td>
<td>4.5</td>
</tr>
<tr>
<td>2000</td>
<td>12.0</td>
<td>30.9</td>
<td>25.0</td>
<td>4.2</td>
</tr>
<tr>
<td>2001</td>
<td>11.5</td>
<td>31.2</td>
<td>24.3</td>
<td>3.9</td>
</tr>
<tr>
<td>2002</td>
<td>11.7</td>
<td>30.0</td>
<td>24.6</td>
<td>4.0</td>
</tr>
<tr>
<td>2003</td>
<td>11.2</td>
<td>30.6</td>
<td>25.2</td>
<td>4.1</td>
</tr>
<tr>
<td>2004</td>
<td>12.1</td>
<td>32.6</td>
<td>24.5</td>
<td>4.0</td>
</tr>
<tr>
<td>2005</td>
<td>12.9</td>
<td>33.1</td>
<td>24.1</td>
<td>4.3</td>
</tr>
<tr>
<td>2006</td>
<td>12.4</td>
<td>32.3</td>
<td>23.7</td>
<td>4.4</td>
</tr>
<tr>
<td>2007</td>
<td>11.1</td>
<td>31.3</td>
<td>22.6</td>
<td>4.9</td>
</tr>
<tr>
<td>2008</td>
<td>12.0</td>
<td>33.0</td>
<td>24.2</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Data are county averages.

4.2. Funding sources

As shown in Table 4, the environmental funding from governmental funding sources increased from 17.1 percent in 1999 to 22.7 percent in 2008, while the environmental funding from business-type enterprise funds declined from 82.9 percent to 77.3 percent. This result indicates the increasing importance of governmental funding sources in supporting environmental activities.

EPS is financed through governmental funding sources, while EUS mainly relies on business-type revenues. As shown in Table 5, 98 percent of EPS is financed by governmental funds, and more than 87 percent of EUS is financed through business-type enterprise funds. These results provide empirical evidence to support the need for distinguishing between these two environmental spending areas, as they are financed through different sources.

Moreover, there is evidence that Florida county governments have become less reliant on general fund revenues to finance EPS and more dependent on revenues earmarked in special revenue funds and debt incomes in capital project funds. The general fund is supported by current unrestricted revenue sources such as taxes and unrestricted intergovernmental revenues. The proportion of general fund revenues in total revenues supporting EPS has experienced a significant decline from 42.3 percent in 1999 to 24.1 percent in 2008. At the same time, the proportion of special revenue funds has increased from 22.7 percent to 26.3 percent, and the proportion of capital project funds has increased from 33.9 percent to 47.5 percent.

This increase in resources restricted for environmental preservation activities suggests that funding for these activities has become more stable and secure with more earmarked revenue sources. The growth in funding of capital projects indicates an increase in the adoption of large funding sources (e.g., issuances of debts or capital grants) and in the use of future resources. This trend of adopting more secure, stable, and future funding sources seems consistent with the nature of many environmental preservation activities that are designed to tend to the long-term needs of future generations.

4.3. What influences environmental funding: a bivariate analysis

As elaborated upon in the framework, three sets of variables may influence environmental funding in government: SEP, PSR, and

Table 4
Percentages in total environmental funding (%).

<table>
<thead>
<tr>
<th>Year</th>
<th>EPS</th>
<th>EUS</th>
<th>Governmental Funds</th>
<th>Enterprise Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>8.1</td>
<td>91.9</td>
<td>17.1</td>
<td>82.9</td>
</tr>
<tr>
<td>2000</td>
<td>9.2</td>
<td>90.8</td>
<td>20.4</td>
<td>79.6</td>
</tr>
<tr>
<td>2001</td>
<td>10.4</td>
<td>89.6</td>
<td>21.2</td>
<td>78.8</td>
</tr>
<tr>
<td>2002</td>
<td>8.0</td>
<td>92.0</td>
<td>19.1</td>
<td>80.9</td>
</tr>
<tr>
<td>2003</td>
<td>8.6</td>
<td>91.4</td>
<td>20.7</td>
<td>79.3</td>
</tr>
<tr>
<td>2004</td>
<td>9.7</td>
<td>90.3</td>
<td>21.3</td>
<td>78.7</td>
</tr>
<tr>
<td>2005</td>
<td>10.0</td>
<td>90.0</td>
<td>21.4</td>
<td>78.6</td>
</tr>
<tr>
<td>2006</td>
<td>10.0</td>
<td>90.0</td>
<td>23.3</td>
<td>76.7</td>
</tr>
<tr>
<td>2007</td>
<td>10.8</td>
<td>89.2</td>
<td>21.0</td>
<td>79.0</td>
</tr>
<tr>
<td>2008</td>
<td>12.5</td>
<td>87.5</td>
<td>22.7</td>
<td>77.3</td>
</tr>
</tbody>
</table>

Table 5
Funding types by funding sources (%).

<table>
<thead>
<tr>
<th></th>
<th>Governmental Funds</th>
<th>Enterprise Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS</td>
<td>98.0</td>
<td>1.1</td>
</tr>
<tr>
<td>EUS</td>
<td>12.1</td>
<td>87.9</td>
</tr>
</tbody>
</table>

Presented are the 2008 (the latest available) spending percentages in governmental funds and enterprise funds.
PB variables. In the analysis in Table 6, the relationship between these variables and the three environmental spending measures—EPS/Total, EUS/Total, and ES/Total—is examined.

The results indicate that counties with higher poverty rates spent less on the environment. Counties with residents of higher incomes and educational attainments spent more on the environment, as did the counties with higher percentages of votes for the Democratic presidential candidate (Obama in 2008). These results provide some evidence that environmental funding may reflect individuals’ socioeconomic and political attitudes, and that governments may be responding to these attitudes when providing environmental services.

The results also show that counties with a faster rate of growth in manufacturing employment spent more in EPS. EPS was also higher in counties that had more farm land, more water consumption, and are located in the coastal area. The funding appears to respond to environmental pressure created by economic activities, a result consistent with the PSR framework.

Interestingly, there is no evidence to show that population affects EPS. None of the variables measuring population size, density, or growth is associated with EPS. Nonetheless, population size and density are associated with EUS. Counties with larger populations and higher population densities spent more in EUS, suggesting that population growth imposes pressure on governments to utilize natural resources to meet the demands for energy and natural resources. These findings suggest that population and economic activities create different types of environmental pressure that require different responses in environmental spending.

PB variables consist of spending on public safety, general government, and economic development. As perhaps the most important public service provided by the counties, public safety (i.e., law enforcement, fire protection, and medical emergency responses) is in a good position to compete for funding with the environment. The spending on general government functions was included because environmental activities often rely on administrative supports that are funded through this spending category in Florida counties. On the other hand, general government is also a large spending area in Florida counties. More spending on it may drive away limited resources that could otherwise be allocated for the environment. The spending on economic development (i.e., industry development, housing and urban development) was included because of the potentially complex relationship between economic development and environmental protection (Feiock and Stream, 2001). More spending on economic development may reduce the resources available for the environment.

The results in Table 6 show that economic development spending is negatively associated with EPS. Counties spending more on economic development spent less in EPS, suggesting a potential trade-off between these two funding areas—a funding decline in EPS is a result of the funding growth in economic development. On average, counties spending 1 percent or more of their total expenditure in EPS spent 3.43 percent of the total on economic development, while counties spending less than 1 percent of the total in EPS used up 5.05 percent of the total on economic development.

Interestingly, this result is consistent with a finding in the literature that the public’s environmental concerns are measured and reflected in their negative views toward economic growth (Klineberg et al., 1998). There is also evidence that public safety spending competes for resources with EUS. Counties spending more on public safety spent less in EUS. Consequently, as also shown in Table 6, counties with greater environmental spending spend less on economic development and public safety.

4.4. What influences environmental funding: a multivariate analysis

Caution is needed when developing a multivariate model of environmental spending, which is an understudied area where forces influencing the spending are not fully understood and where measures and data are lacking. This study used the limited measures developed in the bivariate analysis to test models with the hope that they would provide further insights into the joint impact of these variables on environmental funding. Only variables that were statistically significant at the .1 level in the bivariate analysis were included in Ordinary Least Squares (OLS) models.

Tests and measures were taken to examine possible violations of model assumptions in linearity and heteroscedasticity. No violation was found. However, the poverty rate was found to be highly associated with other SEP variables and therefore it was excluded from the models to avoid the possible violation of model assumption on multicollinearity. Population was excluded from Model 2 for the same reason. The final models showed no sign of multicollinearity (1.128 < VIFs < 3.695).

The results in Table 7 show that the models’ explanation powers judged by adjusted R² are in the 40 percent range. Interestingly, the impact of the SEP variables lessens when the impact of other variables is controlled, suggesting that their direct impact on environmental funding is reduced when combined with other variables. The influence of partisan politics and socioeconomic or demographic statuses of citizens on environmental funding may be limited. Indeed, these SEP variables reflect individual stakeholders’ attitudes, which depend on political and institutional arrangements (such as participation in political elections and government budgetary process) in order to have impact on environmental funding. Citizens may prefer more (or less) environmental funding, but their preference may have little impact on the funding if they choose not to participate in elections or the budgetary process, or if they encounter elected officials who are unresponsive to or not influential on funding outcome.

Manufacturing employment growth and farm land size are significantly associated with the EPS measure in Model 1.
suggesting that a government’s spending on environmental preservation is a response to the growth in manufacturing and farming activity. Population density is significantly associated with the EUS measure in Model 2, indicating that growing population density propels a government’s spending on environmental utilization services. These findings support the PSR framework in which environmental spending is a response to environmental pressure created by human activities. They confirm the finding in the bivariate analysis that population and economic activities result in different types of environmental pressure that require different responses in government environmental funding. While increasing economic activities call for actions in funding to preserve natural resources, population growth requires more spending to explore and utilize natural resources.

These results also show the important role of budgetary politics in environmental spending, which is negatively associated with spending in economic development and public safety. Counties spending more on economic development and public safety spend less on the environment. There is a potentially negative impact of economic development spending on EPS (Model 1) and ES (Model 3). These results provide evidence that environmental funding decisions are made in a political environment where diversified interests compete for limited resources. Environmental funding is influenced by the balanced power of its supporters and competitors.

Multivariate models in this study are preliminary and exploratory in nature. There are limitations of measurement for PB variables. Both PB variables and the dependent variables are measured by spending categories in total spending, which results in an expected ontological relationship. The potential simultaneity and the iterative relationship in the model could be explained in a more comprehensive modeling process. Furthermore, although the data of the dependent variables (environmental funding) are in panel form, the data of most independent variables are cross-sectional. This lack of variation in independent variables results in the inability to assess the temporal impact of the model. Future research with panel data analysis is needed to further validate the findings of this study.

Table 7
Multivariate models of environmental funding.

<table>
<thead>
<tr>
<th></th>
<th>Model 1: Average</th>
<th>Model 2: Average</th>
<th>Model 3: Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EPS/Total</td>
<td>EUS/Total</td>
<td>ES/Total</td>
</tr>
<tr>
<td>β</td>
<td>t</td>
<td>β</td>
<td>t</td>
</tr>
<tr>
<td>Household Income</td>
<td>.185</td>
<td>.110</td>
<td>.099</td>
</tr>
<tr>
<td>Vote for Democrat</td>
<td>.195</td>
<td>.110</td>
<td>.021</td>
</tr>
<tr>
<td>Education</td>
<td>.203</td>
<td>.200</td>
<td>.224</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>.607</td>
<td>5.761**</td>
<td>–</td>
</tr>
<tr>
<td>Employment</td>
<td>.318</td>
<td>2.863**</td>
<td>–</td>
</tr>
<tr>
<td>Water Use</td>
<td>.122</td>
<td>.034</td>
<td>.057</td>
</tr>
<tr>
<td>Coastal Area</td>
<td>.050</td>
<td>.417</td>
<td>.058</td>
</tr>
<tr>
<td>Population Density</td>
<td>–</td>
<td>.177</td>
<td>.138</td>
</tr>
<tr>
<td>Farm Earning</td>
<td>–</td>
<td>.358</td>
<td>.425</td>
</tr>
<tr>
<td>–</td>
<td>.132</td>
<td>.987</td>
<td>.147</td>
</tr>
<tr>
<td>Budgetary Variables</td>
<td>–2.32</td>
<td>–</td>
<td>.228</td>
</tr>
<tr>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Economic Development Spending</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Public Safety Spending</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>–</td>
<td>.072</td>
<td>.628</td>
<td>.233</td>
</tr>
<tr>
<td>R² (adj.)</td>
<td>.488</td>
<td>.420</td>
<td>.457</td>
</tr>
<tr>
<td>F probability</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

*p < .1, **p < .05, ***p < .01 for two-tailed t tests. β = Standardized coefficients.

5. Conclusion

There are two distinctive environmental spending areas in government: EPS and EUS. They have distinctive funding purposes, support different environmental services and operations, and draw on different resources. Importantly, they observe different funding principles. There should be a fundamental understanding among policy makers and public managers that, though environmental utilization products can and probably should generate a net revenue stream, environmental preservation activities cannot and should not be self-sustained financially and governmental fund revenues such as taxes are always the primary funding source.

Moreover, EPS and EUS are responses to different types of environmental pressure. The former reacts to economic activities while the latter is driven mainly by population. This finding, that different responses in government financing are needed for different types of environmental pressures, represents a refinement of the PSR framework. In a more practical sense, the finding indicates a need for a government to develop a structured environmental funding strategy as a response to environmental pressure. The strategy should include components of distinguishing, forecasting, and measuring the types of environmental pressure created by human activities; developing institutional actions and programs to deal with the pressure; examining the impact of the actions and programs on the government’s environmental funding; and, consequently, developing proper funding policies and practices that meet the challenges from the pressure.

The findings call for a careful consideration of the environmental consequences of economic development strategies. Different strategies of economic growth create environmental pressure/needs that require different responses in funding. For example, a strategy to attract labor-intensive businesses in service and construction industries can lead to a large growth in population and, subsequently, a growth in the need for governmental funding of environmental utilization products to meet the increasing demand for water, energy, and other natural resources. On the other hand, tax increment financing of land development for industrial use may eventually lead to large increase in the need for funding of environmental preservation activities, such as pollution control and monitoring.

The government is a primary source for environmental funding. Nevertheless, with budget shortfalls and debt growth at all levels of government, it is unrealistic to rely on government to meet all the funding needs. The request for large and expensive environmental projects (e.g., the purchase or easement of environmentally sensitive lands, the adoption of green technology in government buildings and infrastructures, and the use of renewable energies) only adds to the challenge for the government to finance them alone. A key question in environmental financing seems to be: What are the future financial sources for increasing environmental needs?

This study indicates that, because the nature of environmental utilization products, the pressure on the government’s financial sources is eased by the fact that these products can be largely self-sustained financially. Nevertheless, with continual population growth in many parts of the world and a global population projection of more than nine billion by mid-century, the need for water, energy, and natural resources will不可避免ly increase. The pressure to keep a sufficient supply of these products, with a price affordable to the public, will continue to exist.

Governmental funding resources are the primary funding source for environmental preservation activities. What is particularly challenging is the increasing demand for such activities in face of fast environmental degradation and natural resource depletion.
in many parts of the world. This study indicates an increasing share of environmental preservation funding in overall environmental funding in Florida counties, reflecting the more important role of preservation activities in environmental management.

This study suggests that Florida counties are moving away from an environmental preservation funding model that depends on current financial resources in the general fund (e.g., taxes) toward a model that utilizes more future resources (through borrowing). Nevertheless, with an already high level of debt and the economic and political costs of borrowing, governments should not be blamed for their reluctance to take on more debt. Other financing sources should be explored. Perhaps new financing opportunities exist through the attraction of business investment, private financing, nonprofit financing, and use of business-type funds in government. This study shows little use of business-type funding to finance environmental preservation in Florida counties, indicating a potential area for growth.

In the U.S., the government has a long history of involving businesses in financing and providing public services. To develop the local economy, many local governments have successfully adopted innovative financing methods such as tax increment financing or community development districts in which the development of public infrastructures benefits citizens, government, and businesses alike. The Intermodal Surface Transportation Efficiency Act (ISTEA) legislation is an example of the federal level that has simulated the leveraging of private financial resources for public services. Tools and practices of involving businesses and nonprofits in financing environmental preservation activities have also been developed (Clark, 2007; McQueen and McMahon, 2003). There is no lack of cases showing how to use these financing tools (Jenkins, 2009; Martin, 1982). The successful use of market principles in conservation activities and financing has been demonstrated in the literature (Daily and Ellison, 2002; Schuyler, 2005). The future of financing environmental preservation may lie in a nexus where the government, while still a primary source of financial resources, collaborates with nonprofit foundations and private-financing schemes. Consequently, the preservation of the environment may depend on how successful this collaboration is.

References


Xiao Hu Wang is Professor at City University of Hong Kong. Previously, he was Professor of Public Administration at the University of Central Florida in the U.S. His research covers topics in public financial management and sustainability management. He has published in many top journals of public administration and policy. His most recent book is Financial Management in the Public Sector 2nd edition (M.E. Sharpe, 2010).