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City Adoption of Environmentally Sustainable Policies in California's Central Valley

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Problem: Sustainability remains "the current object of planning's fascination," as Campbell described it in 1996, but it is unclear what causes local governments to adopt environmentally sustainable policies and whether they are effective once adopted.

Purpose: The goal of this article is to explain why communities adopt environmentally sustainable policies.

Methods: We develop an environmental policy sustainability index for 100 incorporated cities in California's Central Valley using a combination of survey and archival data. We then use regression and cluster analyses to test which independent variables expressing three theoretical perspectives (Tiebout's public goods development model, Peterson's fiscal capacity model, and Logan and Molotch's interest group/growth machine model) are best at explaining this index.

Results and conclusions: The results suggest that sustainable policies are more likely to occur in cities with better fiscal health and whose residents are of higher socioeconomic status. These findings raise important questions about the relationship between developed and developing cities that were not raised in previous studies, which focused only on major metropolitan areas in the United States.

Takeaway for practice: Our results suggest that small, less-developed cities will need substantial technical, financial, and planning assistance to move toward greater sustainability. Many medium-sized, more developed cities may also need technical assistance, but are otherwise capable of becoming more environmentally sustainable. Any new policies should not discourage the largest cities from continuing to pursue their current sustainability activities, but should pass the lessons they have learned along to smaller cities to help them change to more sustainable development trajectories.

Keywords: sustainability, growth machines, growth management, environmental policy, green cities

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Campbell's (1996) description of sustainability as "the current object of planning's fascination" (p. 296) remains as true today as then, with the idea continuing to draw considerable attention from local government officials, planners, and researchers. To help understand this phenomenon, this article develops an environmental policy sustainability index for 100 incorporated cities in California's Central Valley and seeks to identify variables that predict cities' scores on the index. Our analysis builds substantially on the work of Portney (2003) and Bowman (2005), in particular by borrowing their categories and lists of sustainability policies. The index is constructed in the spirit of previous work that quantifies how well local plans express sustainability principles (Berke & Conroy, 2000; Conroy & Berke, 2004; Jepson, 2004).

To make the discussion more concrete, the map in Figure 1 previews the basic results with darker circles indicating higher index scores and the size of the circles reflecting population. Based on Portney (2003) and Bowman (2005), we classified 50 potential sustainability policies into eight categories: land use, zoning, transportation, economic development/redevelopment, pollution prevention, resource conservation, administration, and green symbols, and then used a combination of archival and survey information to determine

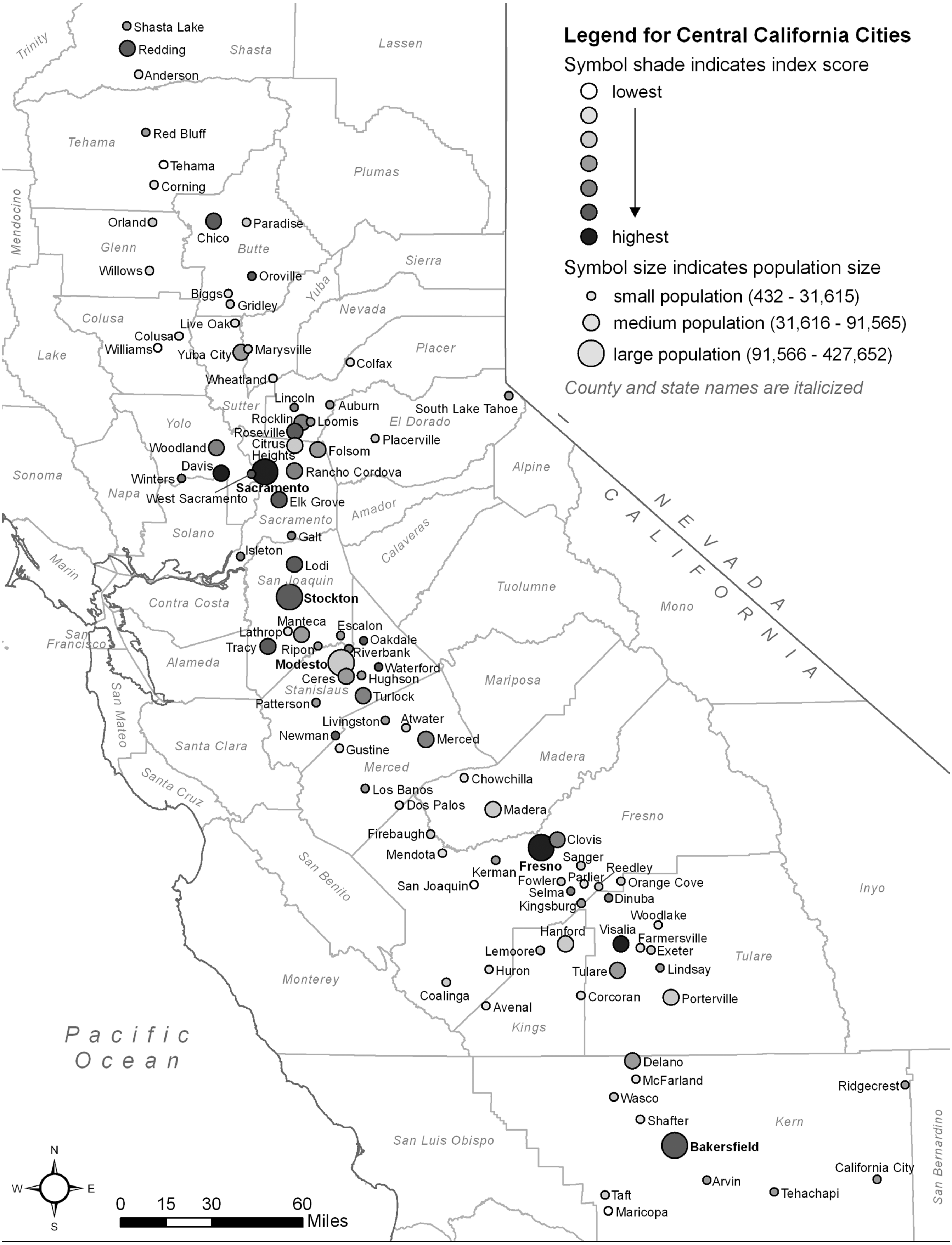

Figure 1. Map of Central Valley cities, showing sizes and environmental policy sustainability indices.

which of these policies were present in each city. After some adjustments (described later), we then summed these policies to create the environmental policy sustainability index for each city. Though the measure could theoretically range in value from 0 to 50, the lowest score observed was 5 and the highest score observed was 33. The index is basically a tool for measuring a city's overall level of commitment to environmental sustainability as portrayed in local plans and policies that are "part intention, part feasible future" (Innes, 1996, p. 462).

We studied Central Valley cities in part because this region is at a critical juncture in growth and environmental management. According to the Public Policy Institute of California, the region gained more than one million new residents during the last 10 years (Johnson & Hayes, 2004). From a population of 6.5 million in 2005, the California Department of Finance projects that by 2040 the valley will be home to over 14 million people (California Department of Finance, 2004) . This population growth has been accompanied by loss of agricultural land (Farmland Monitoring and Mapping Program, 2006), increasing traffic congestion (Schrank & Lomax, 2007), poor air quality (Hall, Brajer, & Lurmann, 2006), and other environmental problems. Policy decisions Central Valley cities make now regarding how and where to grow will influence agriculture, natural resources, and the overall quality of life for future generations.

Our study also answers Conroy's (2006) call for "basic research on both the level and type of sustainable development-related activities taking place in communities that are less known, and perhaps, less notable when it comes to sustainable development" (p.18). Conroy notes that many previous analyses have focused on developed metropolitan areas (Bowman, 2005; Portney, 2003), high quality plans (Berke & Conroy, 2000), or cities with reputations for sustainability. The Central Valley, on the other hand, contains a mixture of large cities like Sacramento and very small cities like Isleton, with a potentially wide range of planning resources and commitments to sustainability. Furthermore, despite California's reputation for having a fairly progressive planning culture, we suspect studies that focus on other regions with a wide range of developed and developing cities will produce similar results.

The regional focus, along with explicit quantitative measurement, forces what we regard as healthy recognition of some of the major conceptual and practical challenges researchers face in studying sustainability in planning. First, while most definitions of sustainability encompass environmental health, social equality, and economic opportunity (Brown, Hanson, Liverman, & Merideth. 1987; Campbell, 1996; Schaller, 1993), it is difficult to adequately measure all of these components. Although we measure many policies thought to contribute to the "triple bottom line" (Rogers & Ryan 2001), our index focuses mainly on the environmental aspect of sustainability and is not a comprehensive audit that examines the tradeoffs among environmental, social, and economic goals. See Jepson (2004) for a more comprehensive measure.

Second, sustainable policies may be largely symbolic, while macrolevel variables and long-term trends that are beyond any single city's control (e.g., credit markets) may have more influence on actual ecological, economic, and social outcomes. Cities' sustainability efforts may also be rendered symbolic by their own past decisions. For example, Sacramento, CA, scores high on our index but also has the highest flood risk of any city in the United States due to previous development decisions and reliance on century-old levees. On the other hand, Sacramento has signaled its intent to become more sustainable by recently updating its general plan to identify how to protect against flood risk for the 200-year flood. Sacramento's score on our environmental policy sustainability index reflects this intention, although it is not entirely clear whether the city can achieve the desired outcome.

Third, to what extent do different types of cities really need sustainability policies? Our analysis finds that large cities are more likely to have sustainability policies than small cities, though it is unclear whether smaller cities should be expected to have policies that address mostly urban problems like brownfield redevelopment. It may be more important to ask whether or not a particular city is on a sustainable development pathway that will avoid some of the problems experienced by the larger cities that ignored sustainability issues earlier in their growth processes. Thinking about sustainability as a developmental process raises important questions: whether development pathways are knowable; what rights less-developed cities have to engage in economic activities that might have negative regional consequences; what potential exists for less-developed cities to leapfrog toward sustainability by learning from their neighbors; and what role state and national government policies should take in shaping local decisions.

Fourth, the theory and results described here demonstrate how sustainability is linked to traditional issues of urban growth. We test three standard models of local policymaking: Tiebout's (1956) public goods development model, Peterson's (1981) fiscal capacity model, and Molotch's (1976) interest group/growth machine model. These have been applied to many different local government policies in the urban political economy literature. Many of our independent variables, such as population size, have been used to predict other aspects of plan quality (Burby & May, 1998; Dalton & Burby, 1994; Zahran, Brody, Vedlitz, Grover & Miller, 2008). We entirely agree with Conroy (2006) that achieving sustainability requires applying long-standing principles of good planning to integrate the many issues typically involved in growth management. Sustainability requires an evolution, not a transformation, of the politics of local planning and urban growth.

The next section summarizes the three models of local policymaking we borrow from the political economy and urban politics literature and the variables they identify that might potentially influence the adoption of environmentally sustainable policies. We then discuss the construction of our environmental policy sustainability index and present the results of our statistical analyses showing which cities are likely to receive higher scores. In conclusion, we discuss the implications of the findings for local sustainability policies.

Models of Local Policymaking Applied to Sustainability

While some theories of sustainability have been proposed (Mulder & van den Bergh, 2001), they are unsatisfying for this analysis because they are either vague and filled with rhetoric or more applicable to nations than to local governments. In the spirit of "sustainability science" (Clark & Dickson, 2003; Kates et al., 2001) instead of sustainability rhetoric, we relate sustainability policies to theories of urban politics that take into account the political and economic incentives generally involved with local economic development, policy change, and growth management.

Public Goods and Development

Tiebout (1956) provided perhaps the most famous model of local growth. The Tiebout model assumes that cities seek an optimal size in order to provide the most desirable package of taxes and public goods. The Tiebout model is driven by the assumption of rational citizens voting with their feet, which causes cities to compete for citizens with high tax potential. While there is still substantial disagreement about the validity of the Tiebout assumptions (Dowding, John, & Biggs, 1994), there is general agreement that cities struggle with finding optimal levels of tax and service provision, and that patterns of growth influence these issues.

Sustainability policies generally aim to provide a variety of public goods that are not provided by private markets, including environmental quality. In this article we ask what attributes or circumstances will lead citizens to demand the public goods that sustainability policies provide. Following Lubell, Feiock, and Ramirez (2005), we hypothesize that sustainability policies provide the greatest benefits when development pressures make local land and infrastructure resources scarce relative to demand. Research on local development and growth management refers to this as a "need-based" explanation (Lewis & Neiman, 2002; Steinacker, 1998). Hanna (2005) calls demand for sustainability a "reactive" citizen response to growth that threatens social, economic, and environmental welfare. Conroy and Berke (2004) find that general plans are more sustainable in cities with higher growth rates. Larger cities also devote more administrative resources to planning, giving them greater planning capacity (Burby & May, 1998). We expect that residential density would be an indicator of the level of physical development and potential strain on environmental resources. Thus, we expect more populous, faster growing, and more densely settled cities will have more sustainability policies.

City Fiscal Capacity

Peterson (1981) took the Tiebout argument a step further by focusing on how local governments are limited by their heavy reliance on property and sales taxes to generate local revenues. Given these constraints, cities seek to attract richer citizens with high tax revenue potential but lower service requirements. Cities thus focus on *development* policies that increase the average benefit-tax ratio, and generally avoid *redistributive* policies that decrease this ratio by taking income from high-tax citizens and providing services to low-tax citizens. Cities also avoid *allocational* policies that have neutral effects on the benefit-tax ratio. The fiscal health of a city thus has a direct influence on the types of policies it passes; fiscally healthy cities are more likely to bear the burden of redistributive and allocational policies.

Unfortunately, it is hard to determine a priori how to put sustainability policies into Peterson's categories. Certainly the rhetoric of sustainability argues that sustainability policies increase both economic and environmental welfare and therefore should be considered developmental policies. If that is true and Peterson's theory is right, then local fiscal health should have little influence on the level of sustainability. But some of the policies in the index, such as development impact fees, have been criticized by the development industry as barriers to economic growth and thus may be redistributive. Many others may be allocational policies with neutral effects on economic growth. Given this, it is probably safest to consider sustainability policies to be mixtures of developmental, allocational, and redistributive policies, and thus likely to respond to the fiscal health of cities. Thus, we hypothesize that cities with higher per capita tax revenues are more likely to have sustainable policies.

Intergovernmental revenues, in particular grants from state and federal sources, are another important source of local government funds. But these often make the city dependent on the outside funding sources (Wirt, 1985), and thus influenced by the funder's policy mandates and preferences. Dependency on intergovernmental funds for transportation (one of the biggest categories of federal funding) may enable sprawl if the funding does not require cities to adopt sustainable policies such as alternative transportation. On the other hand, intergovernmental funding can also provide an avenue for influencing city behavior in a more sustainable direction; the conclusion discusses some recent examples of this from California. High levels of intergovernmental revenue and low per capita taxes are both signs of a city in poor fiscal health, which may limit its capacity to effectively engage in planning activities (Hanna, 2005) or compete for government grant money designed to encourage sustainability. Hence, overall, cities with higher levels of intergovernmental revenue and lower per capita taxes will have fewer sustainability policies.

Interest Groups and Growth Machines

Interest group models of local policy focus on the relationship between local politicians as suppliers of public policies and the demands of various interest groups in the local community. Interest group models adopt a modern pluralist perspective, hypothesizing that policy emerges from interest group competition, with the groups that do the best job of delivering political resources to local elected officials being most likely to see their preferred policies adopted. This model provides the theoretical basis for expecting "growth machines" ruled by political alliances between local government officials and development interests (Molotch, 1976; Logan & Molotch, 1988). Development interests have the upper hand in local politics because they receive concentrated benefits from developmental policies. This provides the incentive for them to organize to protect those benefits, while opposition to such policies, even when it is in the public interest, is diffuse. This logic predicts that development interests will oppose pro-environmental policies because such policies may restrict development opportunities.

We expect interest groups with pro-environmental attitudes will counterbalance development interests. Policy entrepreneurs can often organize diffuse public interests to participate effectively in local political decisions, and local governments are certainly capable of pro-environmental policies (Elkins, 1995; Feiock, 2002; Goetz, 1994). Previous work suggests that individuals of high socioeconomic status (income and education) tend to place higher value on protecting the natural environment and are more likely to join environmental groups (Dunlap, Van Liere, Mertig, & Jones, 2000). Democratic Party voters are also more likely to support environmental policies (Guber, 2001). Thus, we hypothesize that measures of Democratic voters and socioeconomic status should capture much underlying support for environmental policies.

There are two possible ways to apply this theory to sustainability. The first says sustainability policies are similar to other environmental policies, and will be less common in communities with many strong development interests, and more common in high socioeconomic status communities with many Democratic voters. Under the second, proponents of sustainability claim that sustainability policies are good for both the environment and the economy, creating synergy between environmental quality and economic opportunity. If this is true, then both environmental and development interests should support sustainability policies.

Community *intellectual capital* may also be a source of support for sustainability.[1] It is sometimes measured using the proportion of establishments in managerial, financial, and high-tech industries; the sectors of the local economy focused on information processing, symbolic analysis, transactions, and advanced management functions (Pollard & Storper, 1996). The theory is that people working in these industries are important sources of innovation and ideas, often seek out external sources of information, and participate in international networks. Thus, intellectual capital provides a vector for ideas about sustainability to spread in a local community, as well as indicating willingness within the community to accept innovation and change.

Our primary method for integrating the interest group framework is to measure characteristics of communities that reflect certain types of interests. We measure community characteristics that then serve as proxies for constituency characteristics and interest group participation in the political process. This approach is justified by Lowery and Gray (1995), who show that the density of interest groups is a positive function of the size of the latent constituency. Two of the authors have also used community characteristics as proxies for interest group constituencies in other work (Lubell, Feiock, & Ramirez, 2005; Lubell, Schneider, Scholz, & Mete, 2002).

Data Collection and Variable Definition

The basic idea behind the environmental policy sustainability index is to identify a relevant set of sustainability policies, and then count how many of those policies exist in any given Central Valley city. We used the Great Valley Center's (2005) definition of the Central Valley, which includes the 100 incorporated cities in the counties of Butte, Colusa, El Dorado, Fresno, Glenn, Kern, Kings, Madera, Merced, Placer, Sacramento, San Joaquin, Shasta, Stanislaus, Sutter, Tehama, Tulare, Yolo, and Yuba.[2]

As mentioned earlier, the index is based on Portney (2003), and Bowman (2005). Table 1 contains a full listing of the individual policies. We derived the definitions we used for coding each city's policies mainly from Portney, but refined them for application to the Central Valley. We also included policies specific to the Central Valley, such as agricultural zoning and the Williamson Act land preservation program.

Collection of Data for the Environmental Policy Sustainability Index

We collected two forms of data on the policies in each city: archival information and surveys of local planning officials. Members of the research team collected archival data between January 2006 and August 2007 from city general plans, municipal codes, official city websites, and other web-based sources. We used state-level databases containing information for all cities to identify 11 policies. Because these data were not standardized, and not all cities reported the same amount of information, we developed comprehensive rules to guide the coding team. After an initial round of data collection, we clarified each policy definition to improve consistency across coders. To assess the performance of the coding scheme, we randomly

Table 1. City policies counted for the environmental sustainability index.

Pollution prevention and mitigation (10)
Air pollution mitigation program
Superfund site remediation
Asbestos abatement program
Household solid waste recycling
Household hazardous waste recycling
Household green waste recycling
Commercial solid waste recycling
Commercial hazardous waste recycling
Industrial recycling
City government recycled product purchase

Economic development/redevelopment (9)
Eco-industrial park development
Cluster or targeted economic development
Infill financial incentives
Impact fees
Mandatory dedications
Negotiated exactions
Public redevelopment investment
Redevelopment authority
Brownfield redevelopment

Land use (8)
Comprehensive land use plans identify Environmentally Sensitive Areas (ESAs)
Habitat conservation planning under ESA
Encourages conservation easements
Williamson Act lands in jurisdiction
Williamson Act support
Minimum density standards
Eco-village project or program
Growth phasing

Zoning (6)
Green zoning
Agricultural zoning
Up zoning
Inclusive use zoning
Mixed-use zoning
Urban growth boundary

Transportation (6)
Traffic impact analysis
Public transit system
Downtown parking limits
Carpool program
Alternative fuel fleet vehicles
Bicycle ridership program

Resource conservation (5)
Commercial green building program
Energy conservation programs
Renewable energy use by city government
Consumer alternative energy
Water conservation program

Green symbols and membership (4)
Green symbol logos
Member, International Council for Local Environmental Initiatives
Member, Cities for Climate Protection Campaign
Signatory, Mayors' Climate Protection

Administration and coordination (2)
Sustainability agency/nonprofit
Sustainability goals in comprehensive plan

selected 10 cities and had two different people code their policies. Both coders agreed on whether the policy was present or absent in 86% of the policies coded for these cities.

We also surveyed professional planning and development officials in each city; the majority of these were planning directors or senior planners.[3] We generated the list of officials by using the California Planners Information Network (CALPIN; Governor's Office of Planning and Research, State Clearinghouse and Planning Unit, 2006). We sent invitations to participate in the survey via electronic mail starting in June 2006; responses were received via email, fax, regular mail, or telephone. A total of 92 cities surveyed responded, with 82.5% participating via email and 17.5% via telephone. Despite months of follow-up calls and emails, we received no response from eight cities, and thus have archival data, but no survey data for the cities of San Joaquin, Shafter, Chowchilla, Dos Palos, Gustine, Elk Grove, Lathrop, and Ceres.

Constructing the Index

The main purpose for collecting both archival and survey data was to reduce the effects of random measurement error that is likely to be present in both types. In the archival data collection, coders may have misidentified a specific policy that did not fit well with the definitions, or failed to find a specific policy in the large amount of documents being reviewed. The documents might not have reported a policy that did in fact exist, perhaps informally. In the survey, individual respondents may have misunderstood the survey question or had incomplete knowledge of all the policies that existed in a particular community. Thus, we expected both modes of data collection to misclassify some of the policies as present or absent. Measurement error of this type is probably ubiquitous in the quantitative analysis of public policies, as well as in broader sustainability indices that use many different types of measures.

There is well-established literature in psychology that examines how combining multiple measures into a single scale can ameliorate the effects of random measurement error (John & Benet-Martinez, 2000). Hence, we took several steps to combine the information from the survey and archival data into a single measure. First, we compared the agreement rate for 35 policies for which we had both survey and archival data (the other 15 policies were collected from centralized databases, only archival, or only survey sources). For those policies with more than 50% agreement (28 policies), we averaged the scores of the archival and survey data; thus, a policy was scored 0 if both sources agreed it was absent, 1 if both sources agreed it was present, and .5 if the sources disagreed. Averaging is the main technique for taking into account the possibility of measurement error across data collection modes. For those policies with less than 50% agreement (7 policies), we either averaged the data (eco-industrial park; city government recycled products), used the survey data because it was difficult to observe the policy in the archival sources (public redevelopment investment; traffic impact analysis; negative exactions) or used the archival sources because survey respondents indicated confusion about the policy definition (agricultural zoning; growth boundary).[4]

We aggregated the policies within each city to produce an overall index score with a possible range from 0 to 50. Figure 2 shows that the distribution of scores (reported as a proportion of all cases) is relatively normal, although it is a fairly small sample. We also aggregated the scores into subindices for land use, transportation, and so on. We conducted a principal factor analysis of all the subindices, showing all of them loading on a single factor (first eigenvalue = 2.96; one-factor solution explains 75% of variance), and that the overall index has a Cronbach's alpha reliability coefficient of .77. Overall, the index appears to be a good measure of a city's overall commitment to sustainable policies.

Measures of the Independent Variables

The goal of this article is to identify whether the variables suggested by the models of local policymaking we discussed earlier will predict the sustainability indices for cities. The economic development perspective suggests that sustainable policies are more likely in geographically larger, more populous, and more developed cities. The geographic areas and populations of the cities we studied are highly correlated (Pearson's r =.83) and are not normally distributed, with many small- and medium-sized cities and a few much larger ones. Thus, we created a variable called *city size* by taking the natural logarithms of city area from the 2000 U.S. Census of Population and Housing and 2004 population estimates produced by the California Department of Finance, standardizing the logged scores to have a mean of zero and standard deviation of one to put both measures on the same scale, and then summing the two standardized scores together for each city. City size is thus expressed in standard deviation units and measures a city's size relative to the others in our study. Following Conroy and Berke (2004), we also include *proportion population growth* (1990–2004).[5] A positive correlation (Pearson's r = .18) between the city size and population growth variables suggests that people are moving to the larger metropolitan areas in the Central Valley. We also included *housing density* (the number of dwelling units per square mile) from the 2000 Census of Population and Housing in the

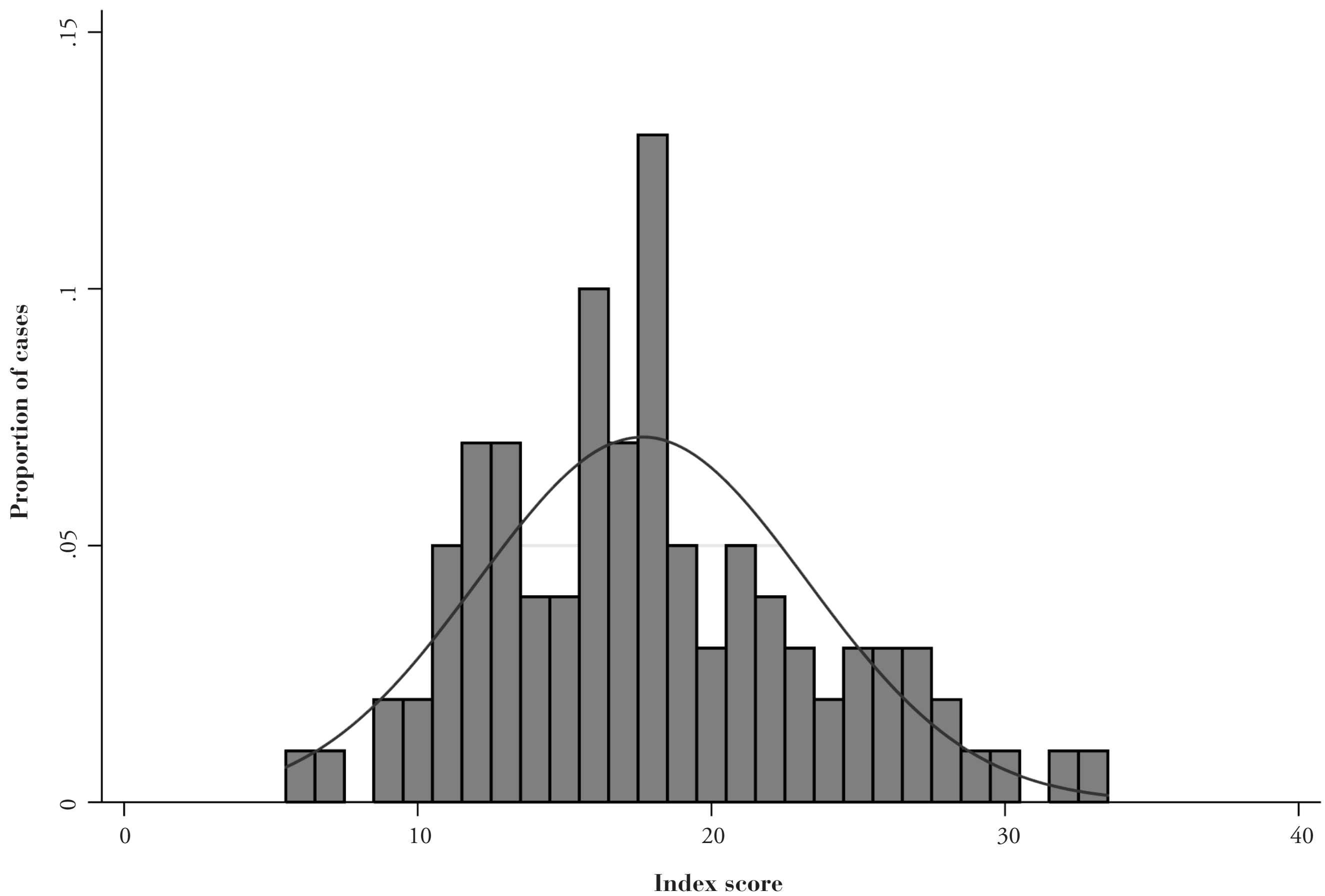

Figure 2. Environmental policy sustainability index distribution.

models to measure the level of physical development and potential strain on environmental resources.

We tested the fiscal capacity argument using total local *taxes per capita* and *percent intergovernmental revenue per capita* from the 2002 U.S. Census of Governments and the 2000 Census of Population and Housing.[6] Property and sales taxes are the primary revenue for local governments, and fiscally healthy governments are more likely to invest in sustainability policies. The main sources of intergovernmental revenue are transportation and housing funding, and cities with high levels of intergovernmental revenue have lower fiscal capacity and are more likely to be constrained by the preferences of funding agencies.

We test the hypotheses of the interest group model with several variables connected to a city's economic structure and community characteristics. We defined *intellectual capital* as the proportion of business establishments that were professional and scientific, educational, managerial, and health and social services based on 2000 U.S. Census Zip Code Business Patterns aggregated for zip codes. We defined *development industry* as the proportion of business establishments in construction and development from the same source. We defined *socioeconomic status* as a scale that combines percentage of the population with bachelor's degrees or higher, median household income, and median housing value, all from the 2000 Census of Population and Housing. These socioeconomic indicators are very highly correlated and thus difficult to distinguish in a multivariate analysis. We created the scale by first standardizing each raw score to have a mean of zero and standard deviation of one, and then summing together the standardized scores. Analogous to the city size scale, the socioeconomic status scale provides a measure of relative socioeconomic status. Lastly, we included *percent Democratic voters* in the 2004 presidential election using data from the California Secretary of State (2004) as a proxy for environmental attitudes; Democrats are generally more supportive of environmental policies.

Cluster and Regression Analysis: What Explains City Sustainability?

This section identifies the factors that explain the level of environmental sustainability policies we measured for each of the cities we studied, shown on the map in Figure 1. Larger cities like Sacramento and Fresno have higher index values, while smaller cities like Tehama and Maricopa have lower index values. We grouped similar cities using cluster analysis on their index scores and independent variable values and then tested which variables and local policy-making models were the best at predicting the index scores with regression analysis. We include a matrix of the correlations among all variables as an Appendix.

Cluster Analysis: Methods and Results

Table 2 reports the results of a cluster analysis using Euclidean distance similarity measures and complete linkage clustering. The resulting dendrogram and cluster-stopping statistics suggested a solution that classifies cities into four groups, which we have labeled *traditional rural*, *transitioning rural*, *Sacramento suburbs*, and *established urban centers*. While the cluster analysis reflects some of the trends that will be demonstrated in the regression analysis, it also demonstrates how some of the variables identified by the theories may combine in surprising ways.

For example, the Sacramento suburbs score relatively high on the sustainability index and possess many attributes predicted to encourage sustainable policy adoption, such as

Table 2. Average variable values for types of cities identified by cluster analysis.

	City types			
	Traditional rural (n = 11)	**Transitioning rural (n = 55)**	**Sacramento suburbs (n = 5)**	**Established urban centers (n = 23)**
Mean environmental sustainability policy index score	11.95	15.94	21.80	23.30
Development indicators				
2004 population,	7,402	15,147	51,323	113,945
Geographic area (sq. mi.)	2	9	19	32
2000 housing density (units per sq. mi.)	878	909	810	1160
1990–2004 proportion population growth	.40	.54	1.53	.37
Fiscal capacity indicators				
2002 local taxes per capita ($ thousands)	.13	.32	.30	.47
2002 % per capita revenue from intergovernmental sources	45	25	13	21
Interest group indicators				
2002 intellectual capital (%)	13.7	17.9	25.0	27.8
2002 development industry (%)	9.0	15.4	20.5	13.9
1999 median household income ($)	26,346	35,476	57,176	38,134
2000 median housing value ($)	77,545	101,515	179,880	128,070
2000 % of residents with college degrees	3.4	9.7	26.0	20.4
2004 voters % Democratic	57.1	40.4	36.1	43.5
Representative cities				
Most populous city	Arvin	Madera	Roseville	Sacramento
Most populous city population	14,499	48,366	96,922	440,976
Least populous city	Tehama	Isleton	Galt	Auburn
Least populous city population	435	832	22,151	12,634

Notes:
See the text for details on the construction of the variables. Six cities (South Lake Tahoe, Elk Grove, Citrus Heights, Shasta Lake, Rancho Cordova, and Placerville) were not classified because we were missing data on some variables.

extremely high growth, low reliance on intergovernmental revenue, and well-educated and wealthier populations. These cities are located on highway corridors leading in and out of the largest urban center in the Central Valley. They are also some of the most politically conservative, Republican constituencies in the region, unlike Sacramento, which has more Democratic voters. It appears that the growth pressures and resources available in these suburbs encourage planners to implement sustainable policies despite a political culture that generally resists government interventions. Planning staff may act as policy entrepreneurs in these cities by using professional expertise in sustainability to address emerging growth issues (Jepson, 2004).

The transitioning cities, so named because they are slowly transitioning away from the agricultural basis of the Central Valley economy, are the largest category with mid-range scores on the sustainability index. These cities have growing populations accompanied by increasing education and wealth, which are important resources for implementing sustainable policies. The transitioning cities generally have many opportunities to create sustainable growth patterns because they still have space to expand. In contrast, many of the established urban centers such as Sacramento and Fresno have already filled much of their available space and made development decisions that will constrain future choices. While the established urban centers have the highest scores on our environmental policy sustainability index, they are probably also most likely to have policies that are merely symbolic.

The traditional cities score lowest on our index and have small populations, poor fiscal health, and low educational levels. These cities were largely supported by the traditional agricultural economy of the Central Valley and may be in danger of being left behind as cities that are better positioned to integrate agriculture with other economic activities grow faster. Achieving sustainability in these cities will probably require substantial investment from outside actors such as state government or nonprofit groups.

Regression Analysis: Methods and Results

Table 3 presents the results of four regression analyses testing how well each model of local policymaking predicts the environmental policy sustainability index score of each city. Regression models show that the associations in the data are consistent with the theoretical predictions, but cannot establish causality. The furthest left column of results shows a model that includes all of the independent variables we tested and each of the remaining three columns isolates explanatory variables for a single theoretical model. We separated the models because we analyzed a relatively small number of cities and many of the variables are highly correlated, making it hard to distinguish independent effects in a comprehensive model.

However, estimating the models separately makes it harder to judge the relative importance of each individual variable. Hence, we use model selection techniques based on Akaike's information criteria (AIC) to determine which model is the best predictor of the index score (Burnham & Anderson, 2002; Johnson & Omland, 2004). AIC is based on information theory and allows one to identify which model from a set of models does the best job of balancing prediction with the number of estimators. Table 3 shows the raw AIC score, and also the AIC weight. The AIC weight ranges between zero and one and the weights sum to one across all the models; the model with the highest AIC weight makes the best overall prediction considering the number of parameters. In this analysis, the development model that is based on the city size and housing density variables has the highest AIC weight and thus is the best fitting model. Figure 3 plots city size against city index values to illustrate this relationship.

However, the AIC weights are really very similar across all the models and the development model is only slightly better than the other models. The adjusted R^2 values show that all of the models explain a nontrivial amount of variance, although the fiscal capacity model has less predictive power due to having fewer independent variables. Therefore, it is safe to conclude that all of these theoretical models are useful; they are difficult to distinguish because many of these factors are linked together in the political economics of local government, and tend to move in similar directions as cities develop. The cluster analysis results in Table 2 displayed some fairly obvious development gradients. For example, socioeconomic status increases in parallel with city size. Untangling the causal relationships among these variables, which are likely dynamic and reciprocal and of importance for other policy and planning issues, is an important goal for future research.

The signs of the regression slope coefficients are largely consistent with our predictions. In the development model, the index has higher values in larger, more populous, and denser cities. Although our measure of population growth is not significant in these models, it does reach significance in models that exclude the city size variable. While there is obviously a close relationship between the overall size of a city and population growth, it is hard to tell in this analysis whether population growth is a trigger for the adoption of sustainability policies or if sustainability tends to appear once a city reaches a certain size. However, the cluster analysis does suggest that population growth is serving as a trigger in the Sacramento suburbs.

Table 3. Regression models predicting the index for cities.

	Full model		Development model		Fiscal capacity model		Interest group model	
	Coeff.	**S.E.**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**	**Coeff.**	**S.E.**
Constant	4.55	3.62	13.45	1.32**	16.46	2.03**	1.71	3.52
Development indicators								
2004 city size	2.66	.70**	3.45	.47**				
2000 housing density (units per sq. mi.)	.003	.001**	.004	.001**				
1990–2004 proportion population growth	–.10	1.14	1.14	1.14				
Fiscal capacity indicators								
2002 taxes per capita ($ thousands)	7.02	2.53*			9.69	2.62**		
2002 % per capita revenue from intergovernmental sources	.004	.04			–.09	.05		
Interest group indicators								
2002 intellectual capital (%)	.09	.11					.18	.09*
2002 development industry (%)	.20	.08*					.46	.09**
2000 socioeconomic status	–.12	.68					1.23	.64
2004 voters % Democratic	.05	.04					.09	.04*
N	94		94		95		96	
Adjusted R^2	.56		.46		.26		.40	
Akaike information criteria, corrected	5.59		5.74		6.04		5.84	
Akaike weight	.12		.34		.29		.25	

Notes:
See the text for details on the construction of the variables. The coefficients are unstandardized. Some cities are not included in each model because we were missing data for them on some independent variables.

$^*p < .05$ $^{**}p < .01$

In the fiscal capacity model, cities with higher per capita tax revenues have more sustainability policies, while cities with higher levels of intergovernmental revenue score lower on the index. The index scores are also higher in cities with high socioeconomic status, more intellectual capital, and more Democratic voters, consistent with predictions of which interest group communities would be most supportive of sustainability policies. However, the regression coefficient for Democratic voters is fairly small and the cluster analysis suggests that a Democratic political culture is neither necessary nor sufficient for establishing sustainability policies. While a Democratic political culture may help support sustainability, the political preferences of the community can be overridden by the need to respond to problems associated with rapid growth. This conjecture is consistent with the high AIC weight on the development model. Furthermore, stores of intellectual capital that foster a culture of innovation to support sustainability policies may be more important than ideology.

The only surprise is that the percent of establishments in development industries is also positively related to the sustainability index, which may reflect the promise of sustainability to provide both economic and environmental benefits. However, this may also reflect that sustainability policies are urban phenomena, and development interests concentrate in those areas with a viable construction market.

Conclusion: Environmental Sustainability as an Urban Phenomenon

This article demonstrates the utility of extending Portney's environmental sustainability index to the regional

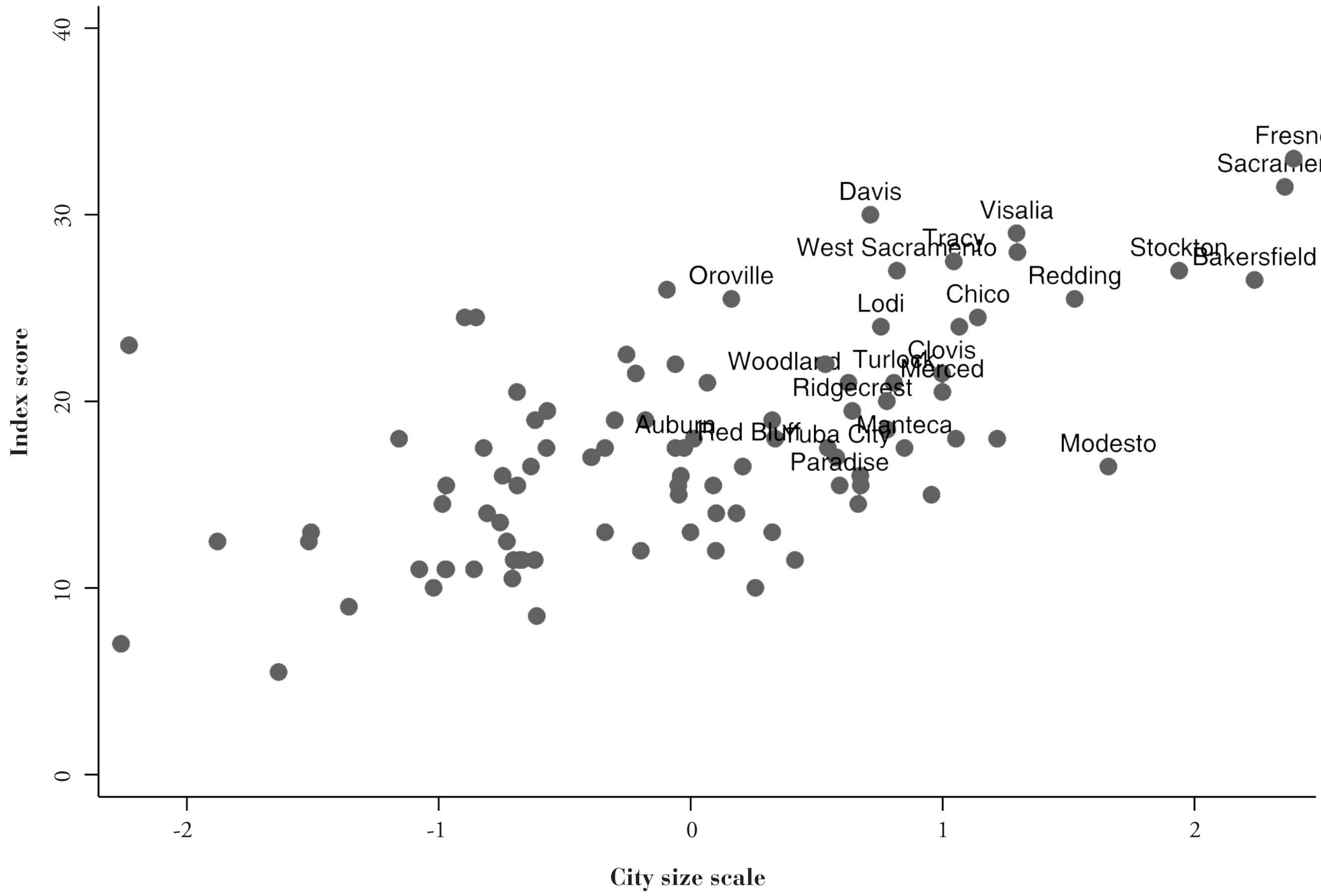

Figure 3. Plot of city size against index score.

Note:
Cities classified by the cluster analysis as established urban centers are labeled with their names.

scale of cities in California's Central Valley. The findings suggest that the adoption of environmental sustainability policies is largely an urban phenomenon. Cities that score high on the index are larger, more populous, more financially independent, more socioeconomically advantaged, and have higher stores of intellectual capital. However, the model selection statistics do not identify a single model as clearly dominant, and it appears that all of the variables have some bearing on the adoption of sustainable policies. The strong correlations among many of the explanatory variables suggest that Central Valley cities are following similar developmental pathways, with some cities further along than others.

By studying an entire region we have demonstrated that it is possible to predict adoption of sustainability policies for cities at more varied stages of development than considered in previous studies. These results bring up important questions about how to shift less developed cities onto sustainable paths. Some of the established urban centers in the Central Valley have made irreversible decisions concerning physical form, created embedded institutions that are difficult to change, and locked in many environmentally unsustainable behaviors. Now some of these cities are recognizing the environmental and socioeconomic costs of such paths, but may be unable to shift to meaningfully different trajectories or take more than symbolic steps. More evidence is needed to investigate this conjecture, especially because this study lacks longitudinal information on exactly when these policies were created.

On the other hand, there is a large group of cities in the Central Valley that are transitioning toward larger, wealthier, and better-educated populations. Because these cities are still at fairly early stages in the development process, they have good opportunities for adopting sustainability policies that could shape their future growth patterns. While they may not need some of the sustainability policies in our index now, they may need them in the future. The importance of thinking seriously about sustainability is especially acute in the fast growing cities of the Sacramento region and other places surrounding urban centers. Just as pollution is easier to prevent than to clean up after it happens, it is often more beneficial to think about sustainability early than to wait for problems to emerge.

This logic raises the important applied question of how to help a city get on a more sustainable path. For example, what types of state or federal programs might be used to encourage sustainability, keeping budget constraints in mind? It is certainly important not to punish the more developed cities (e.g., by excluding them from grant funding opportunities) that now have sustainable policies to try to address problems caused by past development. But there is also a potentially high payoff to helping the transitioning cities leapfrog over the barriers experienced by the more developed cities, perhaps avoiding some of the longer term costs of development. There is also a group of less developed cities that probably do not have the institutional capacity, political environment, or socioeconomic resources to pass and implement these policies.

California has recently undertaken a variety of policies designed to shape local government behavior. In 2004, the Sacramento Area Council of Governments (SACOG) completed a "blueprint" planning process, in which stakeholders from throughout the region developed a Preferred Blueprint Scenario that recommends compact, mixed-use development and alternative transit. This scenario has been incorporated into SACOG's most recent regional transportation plan, and local governments have signed onto the plan with promises of integrating the blueprint scenario into their planning and project review processes. Other regional land use and transportation processes are underway in many California regions, generally centered on councils of government and metropolitan planning organizations (MPOs). Since participation by local governments is voluntary, it is not clear whether or not these regional processes will really change policy outcomes.

At the state level, the California Global Warming Solutions Act of 2006 (AB32) established ambitious targets for the reduction of greenhouse gas emissions. In June 2008, the California Air Resources Board issued a plan to meet the emission target, which recommends that local governments adopt land use and transportation strategies to reduce vehicle travel. Senate Bill 375 passed in September 2008 requires the MPOs in the state to adopt a "sustainable communities strategy" as part of their long-range regional transportation plans, reduces environmental analysis requirements for smart growth projects, and provides some grant funding to help cities pursue sustainable planning. However, in a nod to home-rule traditions, the bill does not require that local plans be consistent with the regional strategy.

It is important to recognize that this article does not consider the potential dynamic interactions among variables like socioeconomic status, population, and fiscal capacity. It would be very desirable to disentangle these influences over time to determine whether one would be more a more effective lever for changing policy than others. For example, higher levels of education or environmental awareness among citizens may change how a city responds to population growth, and it may be easier to influence citizen attitudes than population growth dynamics.

Another important consideration is the timing of policy adoption and whether or not particular types of policies tend to appear at different times. For example, it may be that land use policies emerge earlier than green symbols because the green symbols are essentially advertising for existing programs. We did not have specific information about the start dates of various programs or longitudinal data about the cities themselves, and would have to apply our theories to some type of panel analysis to answer these types of questions.

Last, we have not addressed policy effectiveness. Will cities that score higher on this index have better environmental outcomes, more equitable distribution of resources, and enhanced economic opportunities? Or are sustainability policies largely symbolic with no real influence on the structure on the structure of social institutions, behavior, and ultimately outcomes? Does the effectiveness of a sustainability policy depend on the type of city in which it is adopted? Is it possible to intervene earlier on a city's development path so that sustainability goals are more likely to be met? Answering these questions will be important for understanding the conditions under which sustainability policies will have the desired effects on economic, social, and environmental welfare.

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Notes

1. There is a large body of work on intellectual capital in business organizations, where it is generally defined as the knowledge needed to effectively combine physical and human capital into higher-value economic activities (Bradley, 1997). However, there is still ongoing debate in this literature about the definition and measurement of intellectual capital, which is beyond the scope of this paper.

2. The fact that there are exactly 100 cities is pure coincidence. Note that the definition we use for the Central Valley includes some cities (e.g., South Lake Tahoe) that are actually in the Sierra Nevada Mountains rather than the Central Valley. This does no harm and allows us to include cities of varying sizes as we intended.

3. The main purpose of the survey was to check the data on policies we had obtained from archival data. In the survey, we reformulated the policy definitions as questions, such as: "Does your city have policies to encourage centrally located and/or high density commercial/industrial development?" We also asked each respondent to rate the extent to which these policies achieved their stated goals (on a scale ranging from 1 = *not very well* to 5 = *very well*). Unfortunately this rating was not very informative because the respondents answered the question only for those policies in place for their city, and nearly all policies had average ratings between 3 and 4.

4. We made these decisions on the basis of respondent comments and coder experience, and they represent our best professional judgments about which were most accurate. Given that only 7 out of 50 policies required this type of evaluation, we do not feel that this compromised the integrity of the overall index.

5. We calculated proportion population growth as the difference between 2004 city population estimates and 1990 city population from the Census of Population and Housing, divided by the 1990 city population.

6. We calculated percent intergovernmental revenue per capita as intergovernmental revenue per capita divided by total revenue per capita, multiplied by 100.

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Appendix. Pearson Correlation Matrix for Regression Variables.

	Sustainability index	2004 city size	2000 housing density	1990–2004 % population growth	2002 taxes per capita	2002 % per capita revenue from governmental sources	2002 intellectual capital	2002 development industry	2000 socioeconomic status	2004 voters % Democratic
Sustainability index	1.00									
2004 city size	.63	1.00								
2000 housing density	.36	.14	1.00							
% population growth 1990–2004	.14	.18	–.17	1.00						
2002 taxes per capita	.50	.41	–.08	.32	1.00					
2002 % per capita revenue from intergovernmental. sources	–.41	–.53	–.05	–.33	–.55	1.00				
2002 intellectual capital	.59	.75	.25	.01	.40	–.40	1.00			
2002 development industry	.19	–.11	.01	.11	.27	–.09	.03	1.00		
2000 socioeconomic status	.50	.40	.20	.28	.63	–.41	.54	.36	1.00	
2004 voters % Democratic	.02	–.02	.22	–.02	–.17	.23	–.14	–.39	–.15	1.00

Note:
See the text for details on the construction of the variables.