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RESEARCH ARTICLE

100% renewable energy policies in U.S. cities: strategies, recommendations, and implementation challenges

David J. Hess and Haley Gentry

Department of Sociology, Vanderbilt University, Nashville, TN, USA

ABSTRACT
Interviews and a survey were conducted with civil society advocates and government officials in U.S. cities and counties that have made a commitment to 100% clean, renewable, community-wide electricity. Survey questions indicated that the characteristics of the cities are consistent with the broader literature on policy adoption for urban sustainability and greenhouse-gas initiatives. For example, a majority of the communities in the sample indicated local concern with air and fossil-fuel pollution and climate-related risk, and they had a liberal (left-leaning) political culture. Policy "entrepreneurs" (initiative leaders) were from environmental organizations and/or the local government, and both often worked with a broad, community-wide coalition. The leading supportive frame other than greenhouse-gas emissions was local job creation, and the leading frame for opposition or skepticism was affordability. Recommendations and political strategy for advocates are discussed, and an analysis of implementation strategy is also provided. Some implementation plans also address affordability and equity for residential customers' energy needs.

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Policy adoption; sustainability; 100% renewable energy; cities; strategy

Introduction

The United Nations Earth Summit in 1992 was one of the first global venues to recognize the important role of cities in sustainability policy. Since then, city governments throughout the world developed initiatives and plans to implement sustainability goals (Bulkeley 2013), and cities are now recognized as one of the front lines of the effects of climate change (Stone 2012). Local-level initiatives to mitigate climate change have been particularly important in the U.S., where leadership from the federal government was lacking. During the presidential administration of George W. Bush (2000–2008), the federal government failed to implement policies supportive of greenhouse-gas mitigation, and attention shifted to state governments and cities. Likewise, recognition of the role of cities grew during the administration of President Obama (2008–2016), when Congress failed to approve national-level legislation in support of carbon-emissions reduction and a renewable portfolio standard. After President Trump took office in 2017, the importance of local efforts to reduce greenhouse-gases became even more pronounced when he withheld support for the Paris Accord and made other policy changes unfavorable to climate-change mitigation.

Policy failures at the federal government level have prompted local governments to step forward. By 2007 over 500 mayors had signed the Mayors Climate Protection Agreement, which called upon cities to meet or to exceed the Kyoto Protocol targets (United States Conference of Mayors 2019). In 2016, the United States Conference of Mayors approved a resolution in favor of 100% renewable energy in cities, and in 2017 mayors, governors, and business leaders launched the "We Are Still In" campaign in reference to President Trump's decision to withdraw from the Paris Accord (United States Conference of Mayors 2016). By 2019 the coalition had grown to represent over 3500 organizations and $9 trillion in annual economic activity (We Are Still In 2019).

Within this context, one important initiative at the local level has been the growth of policy support from local governments for 100% renewable energy. Although a handful of cities showed leadership in this area prior to 2016, the growth of local policy support accelerated after the election of President Trump. By 2019, over 100 cities and counties in the U.S. had passed resolutions or approved related policies with a goal of 100% renewable energy for their communities. To some degree, the development emerged from initiatives among mayors and the

CONTACT David J. Hess david.j.hess@vanderbilt.edu Department of Sociology, Vanderbilt University, PMB 351811, Nashville, TN 37235-1811, USA
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"We Are Still In" campaign, but much of the progress can be attributed to the national "Ready for 100" campaign led by the Sierra Club (2019a). Other national environmental organizations such as 350.org and Environment America and a wide range of local environmental organizations also played an important role. This study seeks to understand better the 100% renewable-energy movement in the U.S. based on three analyses: characteristics of communities that have adopted the policy, political strategy recommendations for advocates and policymakers that may wish to gain support for such policies in their communities, and an analysis of implementation strategy.

Background

Definitions

The terms "community" and "local government" will be used here to refer to the government or an intergovernmental unit (such as a joint powers agency) of a city, county, or group of cities and counties. The term "state" will refer here to a subnational government unit in the U.S., such as New York or Colorado. Clean, renewable energy is understood as including wind, solar, hydropower, geothermal, tidal, and similar renewable-energy sources. A community-wide, 100% renewable-energy policy may focus on electricity only, but in some cases, there is a more ambitious goal to decarbonize energy across sectors, including transportation and heat for buildings. Some cities already have in place policies that include greenhouse-gas reduction and energy-efficiency goals, often related to the Kyoto Protocol, and the new policy goals for 100% renewable energy are being integrated into existing plans and programs.

For the present purposes, the study will define 100% renewable energy as follows: a minimum goal of community-wide electricity (rather than only for the local government's electricity) from renewable energy for the population of a city, county, or other local government units. Policies may go beyond electricity to include community-wide energy such as for buildings and transportation. This definition is similar to that of the Sierra Club (2019a) for its "Ready for 100" Campaign, which recommends community-wide, clean, renewable energy goal for electricity by 2035 and across sectors by 2050. The time period for the implementation ranges from immediate action to 2050, and some policies do not set an exact target date. In parallel with the local initiatives, a few state governments also adopted 100% renewable or clean energy goals, but they will not be included in the analysis that follows.

Because most of the initiatives were approved after 2016, usually as resolutions by a city council or board of county commissioners, to date little research has been completed on the topic. Two exceptions are a review of the initiatives as of early 2018 (Martinez, DeFrancia, and Schroder 2018) and a feasibility study for 53 U.S. towns and cities that shows how the goal can be achieved (Jacobson et al. 2018). Because research on the 100% resolutions and goals is currently undeveloped, this study draws on the broader literature on local sustainability and greenhouse-gas reduction initiatives such as adoption of the Climate Protection Agreement by the United States Conference of Mayors (2016, 2019). Although the 100% renewable energy goal is much more targeted than broad climate-related goals and initiatives, the background of research on the related topic provides a valuable context for understanding the factors that facilitate 100% renewable energy policy adoption. The two sections that follow will review the literature on the conditions that affect policy adoption and the literature on implementation.

Policy adoption: conditions, coalitions, and frames

The literature on the conditions of policy adoption for subnational climate-change mitigation policy has generated a good understanding of favorable conditions. For the purposes of this study, the findings are classified into three main groups of structuring conditions: environmental, industrial, and political-institutional. In addition, the literature has also identified the important role of policy entrepreneurs, coalitions, and the framing that accompanies campaigns and coalition building.

With respect to environmental conditions, previous experience with a natural disaster has been associated with higher rates of climate-mitigation policy adoption (Kalafatis 2018). For example, cities in a coastal area that had previous casualties from natural disasters were more likely to adopt the Cities for Climate Protection campaign sponsored by the International Council for Local Environmental Initiatives—Local Governments for Sustainability (ICLEI), but a composite climate-change risk variable was not significant in multivariate models (Zahran et al. 2008). Another environmental factor, local air pollution, was an important or extremely important motivation for adoption of sustainability policies in over 40% of the cities in a U.S. national sample (Krause 2013). Although environmental variables are generally not the strongest and most consistent predictors of local policy adoption, most of the studies use objective measures and do not

examine perceptions of how important these risk factors are in the community. Moreover, as severe weather events accumulate, prior research may grow out of date quickly.

Researchers have also documented how the industrial composition of the economy of a subnational region or metropolitan area can also affect policy adoption. For example, a strong fossil-fuel or conventional energy sector tends to be associated with lower levels of clean-energy policy adoption for state governments (Dell 2009; Jenner, Ovaere, and Schindele 2013; Lyon and Yin 2010), and a strong manufacturing sector is associated with lower levels of policy support at the city level (Kalafatis 2018; Krause 2012a; Sharp, Daley, and Lynch 2011). Conversely, a stronger or more developed renewable energy industry can positively affect policy adoption (Jenner et al. 2013, Lyon and Yin 2010), and likewise, state and local energy policies are positively associated with higher levels of green jobs (Yi 2013). Because cities often face financial pressures and demands, policies that support industries that create jobs and lead to economic development can be a source of broad political support (Kalafatis 2018; Sharp et al. 2011). When support for the clean-tech industry is framed in economic development and job creation terms, it can overcome partisan divisions that often plague renewable energy and climate mitigation policy in the U.S. (Hess and Sudibjo 2018).

Researchers have also tracked political and institutional variables that affect policy adoption. One of the most consistent findings is the importance of political ideology and political party. In the U.S., support for environmental legislation is generally higher in areas where left-of-center politics (known as "liberal" or "progressive" in the U.S.) and the Democratic Party are more influential (Chandler 2009; Huang et al. 2007; Lyon and Yin 2010; Matisoff 2008; Matisoff and Edwards 2014). A related political factor is the strength of civil society and environmental organizations (Bromley-Trujillo et al. 2016; Vachon and Menz 2006). Cities with better public participation and civic capacity tend to have stronger sustainability policies (Portney and Berry 2010; Zahran et al. 2008). Education also tends to be positively associated with adoption (Huang et al. 2007; Opp et al. 2014), and individuals with a higher-education degree in the U.S. tend to be more liberal or progressive (PEW Research Center 2016). The concentration of Ph.D.'s is also associated with a city's support for the mayor's Climate Protection Agreement and with the implementation of policies (Krause 2012a).

Institutional factors such as the type of government and its financial condition can also affect the adoption of sustainability policies. Cities with a sustainability department and elected city councilmembers or an elected mayor tend to be more likely to show support for greenhouse-gas reduction policies and initiatives (Kalafatis 2018; Krause 2011, 2012a, 2012b; Kwon, Jang, and Feiock 2014). Policy adoption also tends to have a diffusion pattern whereby one state or city will be more likely to adopt environmental or clean-energy policy if neighboring political units have already done so (Bromley-Trujillo et al. 2016; Chandler 2009; Krause 2011; Stoutenborough and Beverlin 2008). Cities in states with strong environmental or energy policy support also rate the policies as important motivation for pursuing climate-related initiatives (Krause 2013). The state government in which a city operates can affect the local level of policy adoption (Sharp et al. 2011), but the results are not consistent across the studies, and state-level effects were non-significant in one multilevel model (Krause 2011).

In addition to research that has identified a range of environmental, industrial, and political-institutional variables that affect state and local sustainability policy adoption, another strand of research, generally more qualitative, has pointed to the importance of agency and strategy. Political strategy is understood here as the general plan of action, including tactics, that advocates adopt in order to build coalitions and to convince local governments to adopt 100% clean-energy resolutions (Hess 2019b). Researchers have identified policy entrepreneurs as an important predictor of adoption (e.g., Kalafatis 2018; Krause 2011, 2012b), and one of the central tasks of entrepreneurs is building coalitions. General research on the role of coalitions with respect to sustainable energy policy has been conducted from the advocacy coalition perspective (e.g., Haukkala 2018; Markard et al. 2016) and from the discourse coalition and framing perspectives (Rosenbloom 2018; Stephan 2017). This research has drawn attention to the need for coalitions to recruit support from a wide range of organizations beyond environmental NGOs and renewable-energy businesses, such as from labor unions, community groups, students, researchers, faith organizations, and the local business community (Hess 2018). Building coalitions also requires attention to framing, and advocates need to modify their frames in response to new coalition partners, the values and beliefs of the broader public, and the counter framing of opponents (Hess 2019a). Frequently, advocates of greenhouse-gas reduction policies in cities have used alternative, nonenvironmental frames, such as economic benefits, to gain support (Lee and Hess 2019; Wood, Hultquist, and Romsdahl 2014). Non-environmental frames for the renewable energy

100% communities have included economic development, cost savings, and pollution reduction (Martinez et al. 2018).

The related literature on local environmental justice mobilizations has provided additional knowledge about effective coalition composition. In a study of opposition to proposed nuclear waste sitings, Sherman (2011) found that a combination of strong community opposition with support from local and state government officials was associated with a successful outcome defined as an end to the siting process. Likewise, in comparative analyses of environmental justice cases, researchers have found that at least some support from government officials has played an important role in successful outcomes for communities (e.g., Grant 2003; Hess and Satcher 2019; McAdam and Boudet 2012). Although this work is focused on the oppositional struggles of local environmental justice cases, it is convergent with the quantitative research that links policy adoption to a strong civil society, public participation, and policy entrepreneurs who may include government officials such as city council members and sustainability officers (e.g., Kalafatis 2018; Portney and Berry 2010). Thus, it would consistent with the existing literature to see coalitions for 100% renewable energy initiatives to include government leaders in addition to advocacy and community organizations.

Implementation: conditions and strategy

It is one matter for a city or county government to approve a plan or goal for climate-mitigation policy, and it can be a different matter for it to implement the policy. The background literature has identified several conditions that affect successful implementation of local sustainability policies, and it has also identified two main mechanisms for implementation.

Although one might assume that having an implementation plan is an important condition for successful implementation of a local sustainability policy goal, the results are mixed to date. On the one hand, there is evidence showing the effects of plans. For example, definitions of sustainability metrics in plans can have important effects on implementation decisions, such as the preference for developing generation within the city versus purchasing it from the grid (Moscovici et al. 2015). Likewise, in a sample of cities in California, those with climate-action plans have a better record of reducing greenhouse-gas emissions than those without such plans (Millard-Ball 2012, 2013). On the other hand, general environmental preferences (e.g., voting behavior, membership in environmental organizations, and employment in carbon-intensive industries) affect both plan adoption and implementation (Millard-Ball 2012, 2013). Thus, plans may codify existing preferences and processes in a community rather than have a direct effect on measurable outcomes such as the percentage of green buildings in a community. Related research indicates that when cities terminated their membership in ICLEI, which provides planning information, their commitments to sustainability program implementation did not change significantly (Yi, Krause, and Feiock 2017). These findings are consistent with work on policy adoption that points to the importance of civil society engagement, public participation, and broad public support (e.g., Portney and Berry 2010). In other words, the adoption of implementation plans may mean little if there is no ongoing support from advocates in the community.

Another condition that affects implementation is local resource availability. In the review of 100% renewable energy initiatives, economic resources were identified as an important condition for successful implementation (Martinez et al. 2018). The finding is consistent with a review of climate-action plans and implementation, which indicated that few resources had been allocated and that implementation had not taken place (Wheeler 2008). Cities with a higher population, larger staff, higher revenues, and lower financial stress tend to be better able to implement plans than those with more limited resources (Krause 2012b; Sharp et al. 2011).

Implementation strategy involves two main pathways: government programs and partnerships with electricity providers. Because climate-action initiatives take place in a context of limited local government financial resources, government programs will tend to favor energy-efficiency and other cost-saving measures. In a survey of cities with a population of more than 50,000 in the U.S., the goal of reducing energy-related expenditures was the leading reason for adopting climate-protection programs in 85% of the cities (Krause 2013). Likewise, in a survey of California cities, improvement of energy efficiency in buildings had the highest rate of implementation among diverse initiatives (Wang 2013), and energy efficiency was also a high priority in a survey of Great Plains states (Wood et al. 2014). A review of implementation in California also concluded that cities tend to be interested in "low-hanging fruit" and symbolic measures (Kwon et al. 2014). Energy-efficiency programs may be popular with both government officials and with voters, but they have shortcomings from other perspectives. For example, they may not be well-suited as a response to climate adaptation concerns, such as the problem of reducing local heat and warming. Responding to these

concerns would require changes in land-use such as tree planting, surface reflectivity, and waste heat mitigation (Stone, Vargo, and Habeeb 2012).

Another important pathway in the implementation strategy involves the relationship with electricity providers. Depending on the local structure of the electricity system, implementing the goal of 100% community-wide electricity may involve negotiations with powerful non-local actors such as investor-owned utilities. The community may face particularly steep challenges if the utility is committed to fossil-fuel investments (Martinez et al. 2018). In contrast, implementation may be facilitated in cases where the electricity is provided by a local public power organization. However, the effects of public power (a municipal utility) are uncertain, and there is some evidence that the effects may vary by type of organization. Small, distribution organizations appear to inhibit policy adoption of the mayor's climate protection agreements, whereas cities with larger public power organizations are more likely to adopt the policy (Krause 2011). As with the general finding about the relationship between resources and implementation, the difference between types of public power organizations may be due to relative capacity to implement changes. The difference may also be related to the dependence of small, local, public utilities on generation utilities that are committed to a non-renewable energy mix.

In summary, although a few communities across the country have already implemented community-wide electricity from 100% renewable resources, for many others the prospect of doing so and of keeping electricity rates affordable remains an important challenge that requires thoughtful consideration of the appropriate mix of government programs and partnerships with the electricity service provider. Thus, the 100% policy initiatives raise a question of feasibility and practicality that needs to be addressed with careful research that documents how such goals can be implemented (Jacobson et al. 2018).

Research questions

The goal of this study emerges from an applied and practical policy orientation that is consistent with this journal's focus on serving as a bridge between researchers and practitioners. To that end, the goal is to understand the characteristics of the set of early adopter cities of 100% renewable energy resolutions and to bring together recommendations that have emerged regarding their political strategies for gaining support for policy adoption and their implementation strategies that have emerged after agreeing to the policy change. The literature on the multivariate analysis of sustainability policy adoption has established a fairly good understanding of the causal conditions for environmental and clean energy policy adoption at the subnational level. This literature is used to guide questions about the characteristics of communities that have adopted 100% renewable energy resolutions in order to develop an overview of the renewable energy 100% movement that can be helpful to practitioners. Although the study is not designed to contribute to this literature in the form of another multivariate analysis, some implications for the sustainability policy adoption research field do emerge from the research. Three research questions address the project's goal:

1. Are the conditions of cities that adopt renewable energy 100% resolutions consistent with those in the existing literature on climate-mitigation policy?
2. What strategic recommendations emerge from the process of gaining support for resolutions?
3. What is the strategy for implementing the policy goal?

Method

Data sources

The data were collected in three phases: an initial set of interviews ($N = 14$), responses from a survey ($N = 41$) sent to 82 communities that had adopted 100% renewable energy resolutions or policies, and a data set compiled from the first two sources and additional information (described below) for the full set of 82 communities. With respect to the first phase, in mid-2018 Gentry conducted preliminary interviews with government officials or advocacy representatives from 14 communities from the four major geographical regions of the U.S. The cities (and in one case county) had an average population of 90,106 and a median of 30,000, with two communities under 5000 and three over 200,000. The interviews provided information about the coalition composition and supporters of resolutions, reasons for opposition (if there was any opposition), recommendations for others who would like to achieve 100% renewable energy resolutions in their cities, and implementation plans. The results of the interviews were analyzed in fall 2018 and winter of 2019.

The resulting information from the first phase was used for the second phrase, which was based on a survey. The survey questions drew on the preliminary interviews, the background scholarly literature described above, and on intensive background reading that included media reports and case studies developed by the Sierra Club (e.g., Sierra Club 2018). The survey included questions that were in response to the three research questions and largely

aligned with the findings of the previous research described above. Question categories 1–9 are associated with research question #1, and question categories 10 and 11 are associated with research questions 2 and 3.

1. The role of the respondent (e.g., environmental advocate, city council member, etc.).
2. Environmental and climate-related risks in the community.
3. Industry-related factors such as opposition to fossil-fuel pollution and nuclear energy, and presence of a clean-tech sector.
4. Background experience of the city or county with similar policies.
5. The categories of actors who were the "main drivers" of the policy.
6. The categories for other supporters.
7. Frames or arguments used to support the policy.
8. Categories of persons opposing or skeptical of the policy.
9. Frames or arguments used by opponents or those with questions and concerns.
10. Recommendations based on a list of possible recommendations derived from the preliminary interviews.
11. Implementation strategies and plans.

After approval by the university's institutional review board, the survey questionnaire was sent by email to a person identified as a local leader from media reports or the Sierra Club "Ready for 100" website. Generally, the person was affiliated with the Sierra Club campaign, a local advocacy group, and/or the local government. The set of survey invitations was drawn from the 120 cities and counties listed on the Sierra Club's Ready for 100 web site as having approved 100% renewable energy policies as of early March, 2019. It should be noted that at the beginning of the study, the set of communities was approximately half the size than when the survey was conducted in March, 2019. Thus, the number of local governments that adopted such policies was growing rapidly.

This list of 120 communities was reduced to 82 communities after exclusions were made based on the following criteria of overlap: (1) a network of similar local resolutions from towns and cities connected by a single campaign; (2) related and sometimes nearly simultaneous resolutions from a city and a county in which the city is located; and (3) multiple cities in one or more counties in California that are part of the same community-choice energy provider, which largely defines the implementation of the goal. (Community choice is a form of customer aggregation where a local government or consortium contracts with energy suppliers in order to achieve better prices and/or a more preferable energy mix than the standard offer of the utility.) Where this type of overlap occurred, one case was generally selected. The resulting list of 82 communities included cities, towns, and counties from all four of the main U.S. census tract regions, but the West was over-represented (40% of the 82 communities) in comparison to its percentage of the U.S. population (24% of the U.S. population). This difference may reflect the salience of climate change in this more arid area of the country, the strength of advocacy campaigns, political culture, or other factors.

The survey was sent to a representative of all communities in the 82 cases described above except for communities that had achieved 100% renewable-energy implementation prior to 2016 ($N = 6$). Reminders were sent, and requests were sent to additional local representatives if the first did not reply. Most responses came from a representative of an environmental organization, the local government's sustainability office, or a city council member, and often survey respondents noted that they had more than one role in the community. This method enabled a response rate of 54% ($N = 41$ out of 76), which is a good level for online surveys. The 41 communities included towns, cities, and counties and were from all four regions of the U.S. with a similar proportion to the 82 communities. The 41 communities had an average population of 264,165 and a median population of 69,000, with three communities under 3000 and three above 1,000,000.

In the third phase, a data set of the full set of 82 cases was constructed from the 41 survey responses, notes from the 14 preliminary interviews, government documents, media reports, and responses to email queries about the coalition composition where this information was not clear from other sources. This data set was compiled into a document of 132,274 words, including references that were keyed to the 11 categories above. This data set was used mainly for research questions 2 and 3, where it made more sense to gain information from multiple sources to have the most complete understanding of political strategy and implementation plans.

Analytic strategy

As noted above, this study is designed as a survey of the 100% renewable energy movement to gain a better understanding of the facilitating conditions and processes, the recommendations for other advocates from those who have been involved in the campaigns, and the implementation possibilities and

plans. Because of the small size of the sample and the research goal of bridging practitioner communities with research, the results are presented as descriptive statistics and qualitative summaries of comments.

The results for research question #1 are based on the 41 cases of survey responses. Statistics are presented as frequency counts to provide a profile of this set of 100% clean energy cities to determine the characteristics of this set of cities. The presentation of results uses categories based on the background research described above. For research question #2, the survey responses are used in the opening part of the analysis, but the remainder of the analysis is a qualitative review of the main recommendations for strategy that emerged from the open-ended questions in the survey responses and from the interviews. For research question #3, the summary of implementation strategies is based on the larger data set of 82 cases, which includes cities that have completed implementation and draws heavily on a review of implementation plans in government documents for these 82 communities. After the analysis was completed, a summary document was sent to the responders for comments and suggestions, which were incorporated into the study. Most said that the summary was a welcome contribution to their efforts.

Table 1. Summary of survey responses ($N = 41$).

Category	Specific item	Percent yes (%)
Environmental concerns	Air pollution and air quality	56
	Climate: storms and floods	51
	Climate: drought	41
	Climate: sea level rise	41
	Traffic congestion	24
Industry factors	Concern with fossil fuel pollution	56
	Strong clean tech, sustainable food	49
	Climate change: tourist industry	44
	Large student population	41
	Climate change: agriculture, etc.	32
	Opposition to nuclear	20
Political-institutional factors	Liberal or very liberal	64
	Strong state government policy	49
	Public power, community choice, cooperative	39
	Government capital region	15
Top drivers of initiatives	Environmental organizations	85
	Member(s) of local government	78
	Community groups	24
	Business leaders	5
Important supporting frames	Greenhouse-gas emissions	90
	Local job creation	76
	Community control over energy	56
	Improving air quality	49
	Equity and fairness	49
	Utility price reduction and stability	44
	Religious	14
Important skeptical frames	Cost of the transition	59
	Reliability of clean energy	49
	Government interference in markets	32
	Workers in fossil fuels may lose jobs	17
	Denial of climate change	12

Results

Conditions, coalition composition, and frames

The survey sought information about three main types of conditions that were associated with the 100% resolutions: environmental, industrial, and political-institutional (See Table 1). These conditions were developed from the policy adoption and implementation literatures described above. The survey also gained information about the local coalition composition of persons who supported or opposed the 100% renewable-energy initiative, and it tracked frames that were used in the campaigns.

With respect to environmental conditions, the background literature pointed to concern with disasters, coastal threats, and local air pollution as favorable factors for policy adoption. Consistent with this literature, respondents noted that the most frequent local environmental concern was air pollution and air quality (56%). Concerns related to climate change included storms and floods (51%), drought (41%), and the rising sea level (41%). The survey builds on the existing literature by drawing attention to the environmental vulnerability of specific industries. In 44% of the communities, respondents noted that there was local concern with climate-related risk to the tourist industry (generally winter sports or coastal tourism), and in 32% there was concern with climate risk for the local agriculture, lumber, or fishing industries. Several of the communities were located near ski resorts, and others were in coastal areas with ocean-related tourism and fishing industries. Thus, having one or more industries that are especially vulnerable to climate change is a factor in some of the cases.

The second area of research on background casual conditions was the local industry composition. The background literature identified a stronger fossil-fuel sector as a negative condition for policy adoption and a stronger renewable energy or clean-technology industries as a favorable condition. Consistent with this literature, the risk of loss to fossil-fuel jobs also surfaced in areas with a local fossil-fuel economy (17%). The survey also found that in 56% of the localities there was local concern with pollution from coal mining, hydraulic fracturing technologies, or other energy-related activities; and opposition to nuclear energy was noted in 20% of the communities. With respect to potentially supportive industrial conditions, 41% of the initiatives were in communities that had colleges or universities as a substantial industry, and 49% had a strong clean tech or sustainable food sector.

With respect to political conditions, the background literature identified various demographic conditions as supportive factors, among them higher levels of liberal political ideology and education, and

it also identified strong state government support as a facilitating condition. In the U.S., most cities are considered politically "liberal" (a term that means left of center in the U.S.), and this pattern was also true for the 100% clean energy cities. Sixty-four percent of the respondents described their community as liberal or very liberal, 29% as moderate or fairly evenly divided, and 7% as conservative. Approximately half of the initiatives took place in communities with a history of strong state-government support for renewable energy and energy efficiency (California, Colorado, Minnesota, New York, and the New England states), whereas the population of these states (87 million) is only about 27% of that of the entire country. Generally, the communities had previous government programs that addressed energy efficiency or renewable energy.

Another set of factors identified in the background literature is local government capacity and a large public power organization. Consistent with the background literature, a pre-existing sustainability advisory committee (a citizen committee that reports to the local government) played a significant role in 29% of the cases, and its role appeared to be especially important in smaller communities that did not have a full-time sustainability officer. Approximately 15% of the communities were in a state-government capital region, where there is likely to be additional policy expertise and social capital. With respect to the type of electricity service, 39% of the communities had public power, community choice aggregation, or a local electricity distribution cooperative. Community choice aggregation was especially important in the California cities, where it is now widespread for retail customers. The study did not track other government institutional factors such as type of government (mayor-council) partly because the unit of analysis included cities, counties, and community choice organizations.

In addition to this set of contextual or structural conditions, the other main set of factors in the literature above involved the formation of coalitions and the framing of issues. The background literature identified policy entrepreneurs or leaders, local government support, and civil society capacity as factors that favor policy adoption. The survey results are consistent with the literature, but they also add some details about the composition of leadership and coalitions. When asked who were the "top drivers" or supporters of the 100% clean-energy resolution, in all cases at least one member of the local government or local environmental organization was listed. The main driver or leader (a question that allowed multiple answers) was at least one representative of the local government in 78% of the cases, at least one representative of an environmental organization in 85% of the cases, and both in 63% of the cases. Narratives of the local policy adoption process, which occurred in some media accounts and were provided in the interviews, indicated that even where one of the two categories was not listed as the initiator or main driver, the process for building support for the resolution or policy decision generally involved a partnership between these two categories of actors. Within the government, one or more city council or county commission members most often played a leadership role (46%) in getting a resolution passed, followed by the mayor (39% of the cases) and other government officials (17%, often a sustainability officer).

With respect to environmental organizations that played a leadership role, the Sierra Club was most frequently listed as the main driver (51% of the cases in this survey). Other national organizations—among them 350.org, Environment America, Mothers Out Front, and iMatter—were active in multiple cities and towns. Frequently, there were diffusion patterns, where one local resolution was connected with others in the same state or region. Sometimes this was because the Sierra Club had an active campaigner in multiple locations in a state, and sometimes it was due to the presence of a local environmental organization that was organizing the resolutions. Prominent examples of local environmental organizations that were playing an important role in the gaining 100% clean energy goals in multiple governments within a region were Chester County Citizens for Climate Protection in the Philadelphia area, the Climate Action Campaign in San Diego, the North Carolina Climate Solutions Coalition, Renewable Energy Long Island, Renewable Taos in New Mexico, and the Sierra Nevada Alliance in the Lake Tahoe area of California. Generally, where multiple environmental organizations were involved, they worked together, and local organizations often were in communication with national organizations. Moreover, individuals often had multiple affiliations.

In addition to the question about the "main drivers" (categories of actors) for the initiatives, there was also a question about the broader coalition composition. This second question showed that in addition to local government and environmental leaders, the local business sector (39% of the localities), community groups (66%), faith-based organizations (34%), and colleges and universities (39%) were also involved. These broad coalitions appeared in 85% of the cases.

The background literature also suggested the importance of adjusting frames to coalition partners, opponents, and local cultural values. The survey confirmed that the central frame or argument in

support of the initiative was reducing greenhouse-gas emissions, which appeared in almost all cases and in the community resolution texts. The next most frequently cited frames were creating local jobs from local renewable energy and energy efficiency industries (76%), enhancing community control over energy (56%), and improving air quality (49%). Other frames are listed in Table 1. Consistent with the background literature, respondents indicated the importance of adjusting frames to local conditions, politics, and coalitions. As would be expected in a country with polarized climate politics, in conservative communities there was some evidence that the frames were based largely on economic grounds rather than using a climate-change rationale. In general, an economic frame can be valuable in building broad consensus across political divisions and among conservatives, and it was not restricted to the small number of conservative communities. For example, the frame of utility price reduction and stability was identified in 44% of communities and was prominent in the colder areas of the country, where concern with energy efficiency for buildings and reduced heating costs was salient.

In 41% of the communities, respondents indicated that there was no opposition to the decision to adopt a 100% renewable energy goal. Expressions of concern or questions about practicality were more common. Where there was opposition or concern, it came from a local government member (32%), local business leader (15%), or the utility (10%). The most frequent expressions of concern or opposition involved potential cost to ratepayers (59%) or the feasibility of implementation (49%). If the proposal was well-researched and accompanied by some expertise (including expert reports and guest speakers from nearby areas that had passed resolutions), it was possible to address most skeptical questions or concerns. Outright and open denial of climate change was rarely expressed as a reason for concern or opposition (12%), but conservative frames about the proper role of the government in the economy and questions of government over-reach were more common (32%).

Two cases of opposition provide some detail about the different forms that it can take. One notable case was in Floyd County, Virginia, where there is support for local coal-mining jobs and opposition to local wind farms. After the 100% resolution was approved, opposition to it mobilized, and the county passed a second resolution that was more supportive of all types of energy (Main 2018). In the progressive college town of Amherst, Massachusetts, the 100% renewable energy resolution was relatively non-controversial, but a sibling resolution in support of net-zero energy buildings had more opposition from groups in the government and community who were concerned with cost versus benefits.

In summary, although every case is unique and there is no single formula for conditions that affect successful policy adoption, the survey responses are broadly consistent with the background literature. First, communities that have adopted 100% policies tend to be concerned with local air pollution and pollution from fossil fuels, and they tend to be concerned with exposure to climate-related risks, especially if some local industries are particularly vulnerable, such as ski resorts or coastal tourism. Second, adopter communities tend to have a record of concern with or opposition to pollution from local fossil fuels (such as hydraulic fracturing technologies or coal-based power plants), and they may have strong education and clean-tech sectors. Third, the communities are likely to have a progressive local political culture with support for and experience with renewable energy and energy efficiency programs, including from the state government. Fourth, the resolutions have strong support from a member of the local government, local environmental community, or both. Because most of the cases involve a vote by the city council or county commission, it was important to develop a partnership with support from several members of these local decision-making units.

The results also point to additional findings that build on and extend the existing literature. For example, support tends to go beyond a small network of environmental and political leaders to include a broad coalition of community organizations, local colleges and universities, the business community, and faith organizations. Framing is an important part of building coalitions, and frames must be adjusted to local values and beliefs. In some cases, advocates of the policy reform encountered questions or even opposition, especially about affordability and feasibility, and they had to be prepared with well-researched and credible responses.

Political strategy recommendations

For people who wish to bring about a 100% renewable energy resolution in their community, some of the respondents pointed to documents and suggestions available on the Sierra Club Ready for 100% web site (Sierra Club 2019b). The preliminary interviews were consistent with the Sierra Club's information, and they highlighted the importance of coalition building and the use of appropriate frames for each community. The survey also identified which recommendations, developed from the

Table 2. Summary of main recommendations and frequencies.

Recommendation	Percentage deemed among the "Most Important" (%)
Identify potential allies and establish a coalition	78
Hold community meetings	76
Involve government leaders in the coalition	73
Include social fairness or social justice issues in the planning	68
Choose frames or arguments that are appropriate for your community	66
Get in touch with other communities for advice and even include them in your planning	66
Do research on the technology, including future costs and an existing greenhouse-gas inventory	56
Stress nonpartisanship and do not be adversarial	51
Involve business leaders in the coalition and stress economic development benefits	46
At an early stage, come up with a draft resolution and a rough plan for implementation	39

preliminary interviews, were considered most important (See Table 2).

Several of the recommendations focused on coalition building and composition as an important element of the overall strategy. Consistent with the research on conditions for policy adoption, respondents strongly recommended that government leaders should be involved in the coalition (73%), but many also recommended that business leaders (46%) should also be involved. In building coalitions, respondents also pointed to framing that is appropriate for the community (66%). When building support in the community, one respondent indicated that it is important to cultivate both "grassroots and grass tops." Respondents indicated the importance of identifying potentially powerful opponents, either in the government or in the local business community, and working with them to answer questions. When working with political leaders, another respondent indicated that it is important not to be adversarial and to create unnecessary opposition. On the topic of avoiding the creation of unnecessary opposition, another respondent suggested that it could be better to gain support from general community organizations rather than local political parties or partisan organizations. Combined, the recommendation to avoid antagonizing opponents and to avoid partisan affiliations was suggested by 51% of the respondents. Another person indicated that advocates need to be aware of the term of office of government officials and to modify the strategy when the composition of the local government or sustainability advisory committee changes.

The respondents also included some recommendations on tactics. For example, one person suggested the value of creating and maintaining a web site with information and reports about the community, another indicated that attending local events and gathering signatures for a petition was helpful, and a third indicated that it was important to attend meetings with local community groups in order to cultivate general support from these groups. An important outcome of such meetings and community outreach efforts is that the members and leaders of community organizations are willing to speak publicly at meetings in support of the 100% renewable energy goal. Meetings with local organizations and community groups prior to public testimony at government meetings also can avoid divisions that can emerge especially over issues of equity, fairness, and costs. These issues were especially salient in large cities with substantial voting blocks of low-income, minority residents. One respondent emphasized the value of addressing these issues at the outset rather than in the implementation process. Another noted that it was important to "blend issues" by using diverse frames (environmental, economic, and human needs).

Another important tactic was to be prepared with information and research. With respect to the strategy for responding to potential questions, concerns, and objections, several people indicated the importance of having the research in place, including data on local energy sources, costs, and carbon emissions. One person indicated that a significant objection was that some people believe that "we can't do it yet," and another emphasized the point as follows: "Do your homework and have all potential questions already answered before you arrive to your community meetings or presentations. Use data to speak your truth and keep it local in regards to what motivates your community and its leaders." Consistent with research on policy diffusion, several people indicated that it has proven important to bring in guest speakers from other communities that have successfully adopted resolutions and begun implementation. To this point, one respondent also indicated that it was important to "build coalitions across communities" and not just within the community where the resolution was planned. Another suggested the importance of working with university-based experts for technical analysis and with government officials if there is a local sustainability office or a sustainability advisory committee.

Also related to research and expertise, in some cases the resolutions have led to frustration from sustainability professionals because of definitional ambiguity and feasibility. A central question is whether the resolution is for community-wide electricity or for all forms of energy (including the heating of buildings and transportation). Questions can also emerge about the definition of renewable or clean energy and how one measures progress toward 100%. Sustainability managers in city governments

can face significant challenges when attempting to implement such programs. For example, the Energy Manager of Lowell, Massachusetts, identified several challenges in a report on the community's goal: definitional ambiguity for the 100% goal and the need to define a clear metric for success; gaps and inconsistencies in the data; the cost of implementing new renewable energy and energy efficiency programs; energy preferences from customers in the private sector, such as for home heating from natural gas; and the energy generation composition of regional supply (Moses 2019). Some of these issues can be addressed at the outset with a resolution that has clear definitions and goals.

Clarity about the goals is related to but also distinct from the level of ambition of the goal. On this point, one respondent indicated that it could be a good strategy to begin with an ambitious goal that might be scaled back: "It is almost never disadvantageous to approach city governments with a draft resolution that is initially aggressive in its timeline and targets. Start big, and then draw down your resolution's language if you meet resistance." Another indicated that it is important to pass resolutions even if they are largely symbolic because they can lead to future collaborations within and across communities. Moreover, even aspirational resolutions provide an important signal to utilities that may affect their long-term, integrated planning because they are becoming aware of the growing level of support from businesses and communities.

Implementation strategy

Most of the resolutions and other policy decisions in support of the 100% renewable energy goal took place after 2016 (34% in 2017 and 44% in 2018). Because they were recent at the time of the analysis, only 40% of the communities in the data set of 82 communities had a climate action plan, a 100% renewable energy implementation plan, or a feasibility report that postdated the 100% policy adoption decision. Roughly a third of the policy goal statements (mostly resolutions) had a target date of 2040–2050 or no date. Unless such long-term goals were accompanied by interim goals or a well-developed implementation plan, they could be considered more aspirational statements than commitments. However, 55% of the resolutions had a target date of 2025 through 2036 (at least for electricity). Consistent with the Sierra Club recommendation, some had an earlier date for community-wide 100% electricity and a later date (in the 2040s or 2050) for community-wide energy (buildings and transportation).

To implement the goal of 100% community-wide electricity from renewable energy, there are two main pathways: changing the electricity mix provided by the electricity supplier and developing local government programs. Because the landscape of electricity provisioning in the U.S. has a complicated set of players with different regulations and markets in each state, it is only possible to summarize some of the variation in the relationships with electricity providers.

In general, communities with electricity supplied by an investor-owned utility (65% in the larger data set) may find it more difficult to switch to 100% renewable electricity than those with alternative organizations such as local public power, a locally controlled electricity cooperative, or community choice aggregation. However, in some cases communities served by an investor-owned utility were negotiating with the utility to achieve the goal. One model of cooperation between a local government and an investor-owned utility is the memorandum of understanding signed by Salt Lake City Corporation and Rocky Mountain Power (2017). The memorandum between the largest city in Utah and the utility has four main mechanisms to help the city reach its goal of 100% community-wide renewable electricity by 2030 and an 80% reduction in carbon emissions by 2040: energy efficiency for residential and commercial buildings, additional local solar energy construction, electrification of transportation, and smart grid improvements such as demand response.

Although the memorandum can serve as a model for other communities that also are served by investor-owned utilities, it does not include a commitment from the utility to shift its overall power mix. There is an emerging trend for some utilities to develop plans for a transition to low-carbon electricity. For example, one of the large investor-owned utilities in the Midwest, Xcel, announced plans to provide 100% carbon-free electricity to all customers by 2035 (Pyper 2018), and its competitor, the nonprofit Platte River Power Authority, followed with a similar goal. Although Xcel's mix would include nuclear energy, the utility also announced that it would work with towns or cities that wanted 100% renewable energy. The causes of shifts in the long-term planning for utilities go beyond 100% renewable energy initiatives and in some cases include a response to local public-power initiatives and to the preferences of large institutional customers. Nevertheless, there is some evidence that industry incumbents are beginning to respond to a variety of signals that indicate the need to plan for 100% carbon-free electricity.

Of the 82 communities examined for implementation, 35% had local public power, a local electricity cooperative, or community choice aggregation. Early

adopters that achieved the 100% renewable energy goal before the "We Are Still In" campaign generally had a municipal utility (Aspen, Colorado; Burlington, Vermont; Georgetown, Texas; Greensburg, Kansas; and Palo Alto, California) or a local electricity cooperative (Kodiak, Alaska). If a community has public power, the local government can direct the local public power organization to shift its procurement of energy to 100% renewable energy, including some electricity from new local sources such as rooftop solar. In several of the early adopter cases, the local public power organization or cooperative also invested in significant renewable energy generation capacity (e.g., the purchase of a local hydropower facility in Burlington, Vermont). The ability of the public power agency to make the shift depends on many factors, including the length of its existing portfolio of contracts, its capacity to make selections for the source of generation, and its financial resources available for investment in new local generation. Often a local public power organization or cooperative is a distribution entity that purchases electricity from another organization. Where generation resources are controlled by a large utility (either investor-owned or government-owned) with a substantial commitment to fossil fuels and/or nuclear energy, there are potential limits on the ability of the local public power agency to make the change. These limits probably account for some of the variation in adoption of 100% renewable-energy goals, such as the nearly complete absence of the resolutions in the multi-state region controlled by the Tennessee Valley Authority. In this region, transmission and generation are controlled by the federal government public power agency, and local public power organizations have few choices beyond the electricity mix provided by the federal agency.

Similar restrictions can apply to regions where electricity is supplied by cooperatives. One notable example is Kit Carson Electricity Cooperative, the electricity cooperative for the Taos, New Mexico, area. It was unable to reach an agreement with its wholesale electricity provider (also a cooperative) to shift to less expensive renewable energy. The conflict became protracted and was resolved by state and federal regulatory authorities, which allowed the local cooperative to buy out its contracts. Although the settlement was expensive, the local electricity cooperative argued that it would save money in the long run by having access to renewable power (Nussey and Easterby 2018).

In addition to a local public power organization or a local cooperative, community-choice aggregation can also facilitate the implementation of the 100% renewable energy goal. Some community-choice organizations offer a 100% renewable energy package at a slightly higher rate than the base service, and in California some also provide 100% renewable energy to all customers. Thus, in some locations a city or county can opt to have 100% renewable energy for electricity merely by joining a community-choice organization or by upgrading to community-wide 100% service with its current community-choice provider. Provisions for low-income households can compensate for any price premium associated with a switch to the 100% electricity option. The community-choice organizations can also invest net revenue in support for local renewable energy generation. In this data set, about 15% of the communities indicated that they were considering forming or joining community-choice organizations as part of their implementation plan, and this figure included communities in states other than California. Only 2% of the communities were investigating the more costly and difficult option of municipalization.

The second main pathway for achieving the goal of 100% renewable electricity is through government programs and initiatives for renewable energy development and energy-efficiency programs. Based on the review of the cities with an updated climate action plan or a renewable energy plan, a typical city had already changed street lighting to LED or was in the process of doing so, and it had programs to reduce electricity consumption in both private-sector and public-sector buildings. Some local governments also had programs to support the installation of solar panels on government buildings and to provide assistance for the solarization of commercial and residential buildings. Some communities (15%) were pursuing plans for community wind or solar at a larger scale than a single building, such as an investment in a wind farm or support for community solar. These investments can include local ownership, or they can be in partnership with outside companies that own and manage the generation resources. Consistent with the background literature described above, these programs tended to be more advanced in communities with a higher population (and hence more government expertise and resources) and in communities with previous experience.

Where there is a community-wide goal for the reduction of greenhouse-gas emissions in sectors other than electricity, typically the local government had some initiatives for carbon reduction for buildings and transportation. A small number of communities (6%) had plans for net-zero energy buildings as a local requirement for future construction, and a few were examining district heating and solar hot-water heating systems for private-sector buildings. With respect to transportation, about half

of the communities had plans for support for electrification (such as charging stations), greater use of public transportation, and alternative mobility such as bikeways.

The inclusion of equity and fairness considerations was evident in about half of the cases, either in the framing of the policy or as part of the implementation plan. Because many of the 100% resolutions were developed in 2017 and later, local governments frequently did not have fully developed implementation plans, but pre-existing climate action plans sometimes included equity goals and provided a basis for future expansion. In cases where an implementation plan was developed after the 100% policy goal was accepted, an important mechanism for addressing equity and fairness considerations was energy efficiency for low-income housing. Because cities have limited resources, the plans tended to configure implementation as working with the nonprofit sector and public housing authority to alleviate the burden of household energy expenses. In some cases, communities were also investigating solarization of low- and middle-income (LMI) housing, and community choice organizations such as Monterey Bay Clean Power had low-income solarization programs. Access to affordable public transportation and equitable car sharing appeared in plans that included transportation. Some plans also mentioned green jobs with living wages, and Portland, Oregon, had a funding mechanism for job creation and training that was associated with local solarization and energy-efficiency programs. A summary of plans or reports that had significant discussions of equity goals in the context of 100% renewable energy is given in Table 3.

In summary, there are two main tracks for implementation: working with the utility or local public power organization and developing programs sponsored by the local government. Both can help to move a city, town, or county toward the goal of 100%, community-wide renewable electricity, and the local government programs are more important for the broader goal of community-wide renewable energy. In California, the process can be as straightforward as joining a community-choice organization and opting for its 100% renewable electricity package. Attention to costs and affordability, especially in developing implementation programs that respond to the needs of LMI customers, is important. This issue is elevated in larger cities with strong LMI constituencies that wish to see decarbonization connected with energy justice.

Discussion

In addition to providing policy- and practice-relevant information, the study has general theoretical and methodological implications for the research literature on local-level sustainability policy adoption. First, this study tracked reports by survey respondents of local perceptions of environmental risk rather than objective variables such as natural disasters, coastal location, or number of storms and casualties. It is possible that a perception measure for environmental risk would have a stronger relationship than an objective measure for the dependent variables of policy adoption and implementation in the multivariate studies. Perceptions of environmental risk related to climate change are likely to be especially strong among the leaders of the energy-transition coalitions that are advocating for the

Table 3. Implementation plans and reports with significant discussions of equity goals.

City	Equity features in plan or report
Atlanta, Georgia (City of Atlanta 2019)	Decrease LMI household budget "burden" from energy expenses with energy-efficiency and solarization, improve public health by reducing emissions from fossil-fuel electricity plants
Boulder, Colorado (City of Boulder 2017)	"Just transition": inclusive planning processes, community grants, ratepayer relief, LMI energy efficiency and energy access, living wage green jobs, entrepreneurial activities
Evanston, Illinois (City of Evanston 2018)	Process for establishing an equity-centered approach with support from the Office of Equity and Empowerment, support for building insulation and alternative transportation options for LMI residents
Kansas City, Missouri (City of Kansas City 2018)	Report to city council on implementation feasibility includes list of options for low-income energy efficiency and barriers to the expansion of programs
Madison, Wisconsin (Sustainable Madison Committee 2018)	Investigate energy improvement districts for LMI housing, job training programs for the underemployed
St. Paul, Minnesota (City of St. Paul 2017)	Lower the household energy burden to 4% of income through various programs
St. Petersburg, Florida (City of St. Petersburg 2019)	Inclusion of LMI households in planning processes, green building standards for affordable housing
San Diego, California (City of San Diego 2016)	Green job creation and workforce development
San Francisco, California (San Francisco Department of the Environment 2016)	Cost effective energy-efficiency upgrades in all housing, access to affordable renewable energy for LMI households
San Jose, California (City of San Jose 2018)	Partnership programs for low-income solarization and weatherization

LMI: low- and middle income.

100% renewable energy resolution, and they may also be more salient in communities with particularly vulnerable industries such as ski resorts or coastal tourism. Thus, one of the reasons why environmental risk has produced somewhat uneven results in the quantitative policy adoption literature may be that it has been measured in a way that does not track the effects of perceptions on the motivations of advocates and community members who support such policies.

Second, the study provided more granularity and detail for the idea of a "policy entrepreneur" than appears in the quantitative studies, and in doing so the study developed the analysis of coalition composition and framing. Although leadership is important, leaders must also build coalitions, and indeed this activity was rated as central in the recommendations that the respondents gave for strategy. The study provided evidence that both civil society advocates and government officials are frequently part of the recipe for successful outcomes, but the coalitions also reached into the whole community to build a wide base of support. In doing so, frames were adjusted to the different constituencies, and advocates often included equity and fairness as well as to affordability and job creation. To enhance the effectiveness of the coalitions, respondents pointed to tactics such as attending meetings, gaining signatures, and cultivating expertise.

The third contribution to the general literature on urban sustainability initiatives involves insights into implementation strategy. If implementation relies mostly on local government programs to support public- and private-sector development of distributed generation and energy efficiency, it could result in a slow process of decarbonization that would make 100% renewable electricity or energy goals elusive. Of course, the local government programs have other benefits, such as keeping the issue in front of the community and providing benefits to schools and low-income households. But the programs can hit a cost barrier for local governments that may limit their feasibility as the sole strategy for implementation.

Consequently, working with electricity providers to have a partnership in attaining the 100% renewable electricity goal is also an important part of the implementation strategy. The topic returns attention to the issue of electricity ownership that generally has not been a focus of the quantitative policy adoption literature (for an exception, see Krause 2011). Representatives of several communities noted lack of interest from investor-owned utilities, but in other cases investor-owned utilities were willing to help communities to achieve the 100% renewable energy goal. With respect to public power, most of the early adopters of the 100% initiatives were communities with public power organizations. Moreover, cities that have large public-power organizations with generation capacity (e.g., Austin, Los Angeles, Sacramento, and Seattle) may also have greater capacity to implement 100% renewable energy goals. However, public power is not a guarantee of success, and the absence of initiatives in the Tennessee Valley Authority area suggests that there may also be an opposing case of public power generation that is less flexible than some of the investor-owned utilities. In states with community-choice aggregation or retail competition, there may also be a more open pathway to achieving the goal than in other states, but to date the capacity to link local control, 100% renewable energy, and community-choice aggregation has been effective mainly in California. In summary, the study draws attention to the need for advocates of 100% renewable energy cities to work with electricity providers to develop partnerships for implementation where they are possible.

Conclusion

The 100% renewable energy initiatives represent a diverse and rapidly growing range of communities across the country. Increasingly, large cities like Atlanta, Chicago, and Los Angeles are joining a movement that initially began more with smaller cities and towns. Other large institutional consumers of energy such as universities and corporations are also adopting similar goals, and state governments are also showing increasing interest in 100% renewable energy goals. This study provides a bridge between the many local efforts to approve and implement such programs and the scholarly literature on conditions for local sustainability initiatives. First, it provides an overview intended to be of value to practitioners, policymakers, and advocates who are attempting to gain political support for such resolutions and policies or who have moved on to the implementation phase. Second, as discussed above, the study provides some new insights that build on and extend the literature on the factors that affect policy adoption and implementation of local energy reform and climate-mitigation initiatives.

These initiatives represent hopeful signs in a world where some governments and political parties remain committed to continued fossil-fuel development. In countries with high greenhouse-gas emissions such as the United States, significant action by the national governments and by the large utilities is still needed to bend the curve of projected global warming to a goal of a 1.5-degree centigrade

warming limit. Although the sum of many local government and private-governance initiatives may be significant environmentally, their greater significance may be to help to educate the public about the need for such policies and their feasibility. To the extent that these policies can help to move public opinion toward greater recognition of the feasibility and urgency of action to reduce greenhouse-gas emissions through energy transitions, there is some hope that the growth of 100% renewable energy goals and implementation plans will affect federal government policy and the plans of the large, investor-owned utilities.

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Disclosure statement

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ORCID

David J. Hess http://orcid.org/0000-0001-8117-0260

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