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COMMUNITY ENERGY CONSERVATION: A REVIEW

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ABSTRACT

The research literature relevant to energy conservation at the community level is examined. Although conservation at this level has a high potential for energy savings, relatively few communities have been successful at implementing community-wide conservation programs. Some major social psychological principles that are associated with the successful implementation of community-wide energy conservation are examined. Conditions conducive to community conservation are: 1) the perception of a major imminent environmental threat; 2) conservation programs designed to be consistent with community values; 3) receptive political leaders; 4) community participation; and 5) the availability of resources. Two general frameworks for community energy conservation efforts have been proposed. The Comprehensive Community Energy Management Program was field-tested and major findings are reported. The second, the Energy Conserving Community Plan, is a conceptual framework based upon the history of successful antilitter campaigns. Although there are major methodological problems to contend with in evaluating community energy conservation programs, certain preliminary public policy recommendations are derived from the available literature and enumerated.

The response to the energy crisis of the 1970s has taken many forms. However, most energy conservation programs target a single behavior or energy sector. Occasionally a whole community will become involved in a more comprehensive approach to energy conservation. Likewise, the research of behavioral scientists has concentrated on the individual and group unit levels of analysis. Although there are examples of energy conservation on the community-wide level that have demonstrated a high potential for effectively reducing energy consumption, they have not been systematically studied. In this review article, some of the

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variables associated with successful community energy conservation are examined. The emphasis is on communities that have a formally integrated, multiple approach conservation plan. Unfortunately, few community conservation programs have been formally evaluated so most of the studies examined here are descriptive in nature.

ENERGY CONSERVATION AT THE COMMUNITY LEVEL

Energy conservation can take place at the individual, group, community, state, and federal levels. While individual and group efforts do save some energy, they usually lack the resources to broaden their efforts. The state and federal levels have more resources available but risk being out of touch with local needs. Therefore, energy conservation at the community level might be at the ideal scale to garner the resources necessary to make a large conservation impact and yet still remain in touch with local needs. In a survey of California local energy initiatives, Tomasi concluded that "local officials deserve much of the credit for what California has accomplished so far" [1, p. 75]. This may be because local governments have jurisdiction over the relevant systems such as "housing construction codes, zoning, master planning for land use, property tax assessments, and the operation of a multitude of municipal buildings including offices, hospitals, and schools" [2, p. 312]. John Arnold, the Fort Collins, Colorado, City Manager, succinctly stated that local governments are "uniquely situated to deal with energy conservation because we control everything" [3, p. 25]. For example, developers wanted to build experimental solar developments in the cities of Davis and Hemet, California. In order to proceed, the developers were required to negotiate a permission process gauntlet which included the planning department, building and safety, environmental health, and county supervisors. Building permits were difficult to obtain because many of the design features of the developments were too innovative for existing guidelines. However, since the city officials in both communities were willing to take a chance on the developments and allow them to be built, a considerable amount of energy was conserved in these communities. The Davis experimental development used 56 percent less total energy than a comparable control group, and the Hemet experimental development used 25 percent less total energy than a comparable control group [4].

Community programs also provide a high potential for citizen involvement. The beneficial effects of participant decision-making on social change has been clearly established [5-8]. Blakely and Schutz point out a bottom/up (community involvement) derived policy can reduce citizen resistance sometimes found in top/down (government control) policy decisions [9]. This conception is consistent with Brehm's reactance theory whereby people are motivated to react against any perceived loss of choice [10]. Community programs can also

be more responsive to local needs. Blakely and Schutz compared energy policy preferences among rural, suburban, and urban California communities. They found rural and suburban people less favorable to a national government role in the energy crisis than urbanites. Apparently, rural residents and suburbanites have a greater need for local control. This implies state and federal energy funds might be better utilized by letting communities apply them according to their local preferences [9].

Community action can be more efficient and cost effective than individual actions. This is analogous to Stern and Gardner's distinction between one-shot and repeated conservation actions. Stern and Gardner point out that one-shot actions have a much higher energy savings potential. An example of a repeated-action conservation measure would be a decision to turn the thermostat down every night while a one-shot action would be to install a more efficient furnace [11]. Communities have the advantage of being in a good position to implement the more efficient one-shot community-wide type actions. For instance, the Davis Energy Conservation ordinance provides that new houses be built in such a manner as to avoid excessive heat gain in the summer and loss in the winter. They were designed to achieve up to an 80 percent reduction in residential heating/cooling energy use through low- or no-cost measures like orientation of the house on the lot and placement of windows. Alternatively, the inefficient repeated actions scenario would involve the cost and time of developing and maintaining various agency programs to locate all future individual new homeowners, convince them to implement heating/cooling conservation devices, and bear the expense of retrofitting each house with these devices.

Communities are also in an ideal position to benefit from the advantages of incorporating the soft-path technologies Lovins argues for so convincingly (e.g., passive solar, organic conversion, etc.). Among the soft path advantages of community-level energy conservation programs are local control, cost-effectiveness, local jobs, keeping capital in the community, and fewer pollution and risk problems [12].

SITUATIONAL VARIABLES ASSOCIATED WITH SUCCESSFUL COMMUNITY ENERGY CONSERVATION

Although communities have had over a decade to respond to the energy crisis, only a relative few have managed to organize community-wide conservation efforts effectively. An analysis of case studies indicates that the presence of certain variables may be important preconditions associated with successful community energy conservation. These variables are presented in Table 1 and specified for selected community conservation programs. Expanded examples are given below of how these variables operating in conjunction have acted as a catalyst to community energy conservation.

Table 1. Situational Variables Associated with Successful Community-Wide Energy Conservation for Selected Communities

Community	*Perceived Threat*	*Community Values*	*Receptive Political Representation*	*Community Participation*	*Resources*
Davis, California	Out of control growth[d]	Protection of farmland, preservation of small town values[a]	City Council[a]	Multiple citizens' committees[d]	$86,000 federal grant, two other federal grants, UC Davis consultants
Seattle, Washington[a]	Impact of proposed nuclear power plants	Preserving agricultural lands	Mayor, city and county councils	Citizens' committees, Seattle 2000 Commission	$30 million county bond issue
Northglenn, Colorado[a]	Loss of water supply and sewage treatment	Model planned community	City officials		$29 million water project bond
Hartford, Connecticut[a]	Eroded tax base, urban blight	Background of service economy	Office of Deputy Mayor	Neighborhood organizations	
Fitchburg, Massachusetts[b]	High dependency on volatile Middle East oil supply		City government	Local community action agency	State and federal grants totaling $42 million, College volunteers
Moloka'i, Hawaii[c]	Facing energy bankruptcy — high electricity rates and poor economy	Extended kinship group	Mayor of Maui		Federal and State grants of ½ million

[a] Ridgeway [24].
[b] Stewart [33].
[c] Canan and Hennessy [25].
[d] McGregor [51].

Perceived Threat

First, communities are motivated to effect change when their members perceive a crisis or imminent threat of sufficient magnitude to challenge the communities' values or economic health. For instance, Soldiers Grove, Wisconsin, was located on a flood plain which was suffering from escalating flood damage. After much study, the townspeople realized their best option was to relocate the town to higher ground. The concept of a solar village grew out of this crisis.

Scheffler, *et al.* compared attitudes about the perceived seriousness of the energy problem in a city with community-wide conservation programs (Davis, California) and a nearby comparable city (Woodland, California) that did not emphasize energy conservation. Davis residents, consistent with the community's response, believed there was a more serious energy problem than Woodland residents [13]. Community structure and issue-specific variables were examined in 124 Illinois communities by Bridgeland and Sofranko to determine which conditions are conducive to community mobilization over environmental quality. Structural variables such as socioeconomic status and organizational density accounted for 2 percent of the variance in community mobilization while a critical environmental incident was the strongest variable in accounting for 6 percent of the variance [14]. In a review of the literature on ecologically responsible behavior, Lipsey found that acute resource shortages or environmental damage were good predictors of community conservation action [15].

Agras, *et al.*, in an analysis of the 1976-1977 California drought, noted that water consumption actually increased during the first year of the drought. However, in the second year water consumption was drastically reduced. The authors found that while fines instituted in the second year did little to reduce water consumption, the unprecedented increase in the second year in local news coverage and appeals may have been responsible for the decrease.

> Such a "crisis stimulus" may be produced by the combination of consistent input of high intensity from multiple independent sources. In the case of the drought, stimuli from highly diversified sources, such as daily news coverage of the drought, lack of rain, dry land, dry vegetation, and empty water reservoirs, converged in a simple internally coherent message indicating the presence of a drought-crisis, and this was hammered in day after day [16, p. 570].

They suggest further research be directed toward the stimulus elements distinguishing a "crisis" from "no crisis" [16].

An overt action may not be guided by an underlying attitude through a direct link [17]. Therefore a belief in the seriousness of the energy crisis or desirability of energy conservation practices may not be enough to result in increased conservation behaviors [18]. Apparently, it takes a perception that the energy problem has direct personal consequences to spur conserving actions [19, 20].

Kahneman and Tversky's research is related; people are more motivated to take action if it will avoid a loss than if it will achieve an equivalent gain [21]. In 1978 Allegheny County, Pennsylvania, was conducting a major energy conservation appeal campaign when a four-month-long coal strike "energy crisis" erupted. While an evaluation of the effects of the conservation campaign found only 7 percent of the residents had heard of the Pacesetter conservation campaign after one year of operation, over half of the county residents reported some curtailment of electricity usage as a result of the coal strike crisis. Since 39 percent of the residents reported perceiving an impact from the strike, the greater reported response to the energy crisis may have been spurred by the personal consequences suffered from the coal strike [22].

Community Values

Second, successful community conservation usually occurs where there are cohesive community values related to the perceived threat [23]. This may mitigate the resistance of opposition factions as well as increase collective participation in change.

Northglenn, Colorado, an upscale planned community differed from its neighbor, Thornton. While Northglenn adopted a no-growth ethic, Thornton favored land development to increase its tax base. A conflict developed over the finite water and treatment facilities which Thornton controlled. Northglenn residents felt compelled to implement a comprehensive water management program in order to gain control over their own density. In the process they accrued those benefits consistent with their community values – control over their own water supply, creating local energy, preservation of open lands, and reduced air pollution [24].

Canan and Hennessy felt that measuring values should be the first step in community level planning. Molokai, Hawaii, officials desired energy self-sufficiency because their diesel generating station had the highest electricity rates in the nation. The island residents had the cohesive values of an extended kinship group. It was recognized that a socially acceptable energy policy would have to be designed to be consistent with these local values. The researchers measured the island values with the Galileo system (the importance of each selected value concept is determined through translating it into physical space). The results were used to help procure a solar water water heating program for the island [25].

Lee points out that a disproportionate number of successful community energy conservation programs have developed in the West. He attributes this condition to an open government tradition. As newer cities, their perception of local government's role has evolved to include open communication channels between the public and elected officials. In addition, western cities value resource management and have therefore played a stronger role in this area [2].

Anecdotal reports also support the notion that community values are related to community conservation. Winett reports on his futile attempts to obtain funding for a research program that used incentives to promote residential energy conservation. One of the reasons cited for his failure to obtain local funding was the heavy dependence of the community's (Lexington, Kentucky) economy on energy production. This might create a community value structure that is cool to energy curtailment proposals [26]. An author of the present article encountered a similar situation in Ventura County, California [27]. The social fabric of Ventura County is inextricably combined with oil production in its history, current production, and future nearby extensive off-shore oil development plans. It is not surprising that the county supervisors responded with indifference to supporting a county-wide energy conservation needs-assessment project. However, it is interesting to note that the county supervisors did shortly thereafter create a water conservation committee. The county's economy also is heavily dependent on agriculture so it would seem very consistent with local values to work toward extending agricultural water.

Receptive Political Representation

Third, receptive political representation is obviously beneficial in implementing community conservation. The director of the French Energy Conservation Agency stated it thus, "If government does not show interest, then all sectors of society imagine that it is not important" [28, p. 179]. The case of Seattle, Washington epitomizes the political role. The City Council, which oversees the city-owned electric utility, requested an option agreement with the Washington Public Power System (WPPS) to participate in the building of three nuclear power plants. An environmentally minded citizens' committee persuaded the City Council to let it first prepare an environmental impact study before the option was finalized. The report of the Citizens' Committee recommended a solution to future electrical demand that favored conservation. This conflicted with the new-power-plant approach favored by the expansion-minded utility. The City Council was swayed by the Citizens' Committee approach and then went on to use its political clout to turn the city of Seattle away from nuclear power and toward a comprehensive energy conservation policy [24]. The result of this policy turned out to be doubly impressive in light of the eventual financial collapse of WPPS.

Lee believes that, because officials face reelection every few years, most have a strong aversion to risk limited city resources on nontraditional programs like energy management. What differentiates cities with successful conservation programs like Seattle, San Diego, and Davis from other cities is their visionary senior elected officials willing to risk reallocating substantial resources into conservation efforts. Lee relates the case of a Minneapolis city council member who was the driving force behind developing a comprehensive city energy policy. However, the policy was never implemented after he left office [2].

Prominent political leaders might also serve to increase community conservation by publicly modeling conservation behavior. In one of the few studies utilizing models for energy conservation, Winett, *et al.* showed a twenty-minute videotape of specific conservation practices to household occupants. The information and discussion group showed reduced electricity consumption of 10 percent. When modeling was added, consumption dropped another 6 percent [29]. Similarly, Aronson and O'Leary used students to model energy conserving shower behavior in a university athletic field house. A large sign prompting people to turn off the water before soaping up increased the requested behavior by 13 percent. However, those turning off the water increased by 43 percent when one person was modeling the behavior, and a 61 percent increase was obtained with two models present [30].

Sears, *et al.* measured energy conservation policy attitudes in Los Angeles during the 1974 energy crisis. They found approval of federal government policies to be correlated with partisanship (approval of President Nixon) [20]. The implication is that citizens will approve of official energy conservation policies as long as they are proposed by the political leaders that meet their approval.

Political leaders are also in a position to provide official social recognition and approval as a means of propagating community energy conservation. Seaver and Patterson mailed residential heating oil consumers a decal to be displayed on their houses that read, "We are saving oil" along with feedback comparing their oil use to the previous year. They found the group rewarded with the decal used significantly less oil during the subsequent two months than the control group or feedback-only group [31].

Community Participation

Fourth, the participation of community groups seems to be an important component in community energy conservation. Seattle City Councilman, Randy Revelle, summed up citizen participation by saying [32, p. 8]:

> Based on our experience in Seattle, effective citizen participation helps produce better energy policies and significantly increases the chances of successfully implementing them. We have therefore concluded knowledgeable, hard-working, and dedicated citizens are an essential ingredient for effective energy policy-making.

An excellent example of community participation occurred in the city of Fitchburg, Massachusetts (population 38,000). Community volunteers were able to motivate residents in over half the city's houses to take some low-cost/no-cost home weatherization conservation measures. An evaluation of the effectiveness of the nine week program found Fitchburg's total residential energy consumption was reduced by 4.3 percent [33].

The importance of participant input in the decision-making process has been pointed out in the organizational behavior literature. For instance, Coch and French investigated workers' resistance to job changes. They found that production increased in direct proportion to the amount of worker participation in the job change decision-making process. Also, job turnover and aggression decreased as the amount of group participation increased [5]. McClelland and Cook tried applying this "participative management" concept to reducing energy consumption in university settings. The traditional method of encouraging conservation through existing management communication pathways was compared to conservation decisions derived from groups of building occupants. Although the conservation program was successful overall, the effects of management procedures could not be determined because of consumption data methodological problems [34].

Typically, communities hinge public involvement mainly on conservation information campaigns. Olsen noted information about the energy crisis and the importance of conserving energy to be a necessary step but not a sufficient factor in promoting energy conservation [35]. Therefore, Olsen and Cluett designed a household energy conservation program based on neighborhood activities in Seattle, Washington. They found that conservation actions increased as exposure to the program activities increased [36].

Cognitive dissonance theory can be applied to strategies aimed at increasing community conservation involvement [37]. This attitude change theory states that a discrepancy between behavior and attitudes causes discomfort. This leads to an effort to reduce the inconsistency (dissonance), possibly by changing the attitude to correspond with the behavior [38]. This has two implications for increasing conservation behavior. The first is called the foot-in-the-door technique. The idea is that once someone has agreed to take action on a small request, his/her attitude may change. This change in attitude then opens the door for compliance with larger requests. Freedman and Fraser found that 55 percent of homeowners who were first asked to sign a safe driving petition agreed to have a large "Drive Safely" sign placed in their front yard while only 17 percent not first asked to sign the petition agreed to the sign [39]. Similarly, Arbuthnot, *et al.* found they could induce recycling by requesting a commitment to either one, two, or three minor actions: complete a survey, save cans for one week, or mail a postcard to local representatives supporting recycling. Recycling behavior increased with the number of commitments [40].

The foot-in-the-door technique may also be applicable beyond the individual commitment level. Winett, in reflecting on his failure to obtain a commitment from various community sectors to fund a residential energy conservation incentive program, felt he may have had a better chance at success by starting out with a smaller request like offering to evaluate an existing program [26]. In a case study evaluation of the sixteen communities participating in the Department of Energy's Comprehensive Community Energy Management

Program, Moore, *et al.* made a similar observation. The communities most successful at maintaining community interest and support were those that focused early on implementing a few select activities rather than getting bogged down in the politics of all-at-once comprehensive plans [41].

Groups and individuals that are included in the decision-making process are in effect publicly committing themselves to the course of action agreed upon by the conservation decision. Pallak and Cummings showed how public commitment can increase conservation behavior by comparing energy consumption between two groups of homeowners. The public-commitment group agreed to attempt energy conservation, with the results to be made public through the media. Under the private commitment condition the homeowners attempting energy conservation were told they would not be identified in the study. Results showed that the public commitment group used significantly less energy during the month of the study than the private commitment group [42].

One of the social factors working against community resource conservation is termed the "tragedy of the commons" [43]. In this social trap, depletable resources available to all are used by individuals to maximize their own gain. The reasoning is that if I don't take it someone else will. The dilemma is that eventually everyone loses with this strategy as it depletes the resources. Stern reviewed the literature on when people act to maintain common resources. Individualistic solutions include dividing management of the resource into individual territories and implementing compelling individual rewards or punishments consistent with conserving the resource. Collective solutions revolve around the cohesiveness found in smaller groups with open communication. Establishing superordinate goals and raising group consciousness through educational programs appear to be ways group cohesiveness might be encouraged [44]. Loukissas offers a model to maximize citizen participation in all phases of the community energy planning process similar to the process suggested by the EPA Community Action Handbook [45, 46].

Community participation also increases the chances of successfully implementing conservation programs in the community because policies derived with community input are more likely to be a soft energy path, which generally is more equitable to all segments of the public [47, 48]. Another effect of citizen input might be an increase in perceived control. Winnepeg residents who viewed pollution as something they could control were more likely to engage in antipollution behaviors [49]. Conservation policies without community input can cause severe public backlash, in a communal form of Brehm's psychological reactance [10]. In 1976 one lane of the Santa Monica, California, freeway was converted into a special lane for carpools and buses, called a diamond lane. The project evaluation reported a 225 percent increase in bus ridership and a 65 percent increase in three-passenger carpools. Technically, this made the project a success although qualified by some drawbacks (the accident rate had doubled during the diamond lane's existence and travel time for commuters in the

non-diamond lanes increased). However, addressing these problems was far overshadowed by the public outrage at the whole project. Animosity rose to such an intensity that the project was abandoned after twenty-one weeks. As a result of this experience officials have not attempted any further preferential lane-usage projects on already existing traffic lanes [50].

Resources

Fifth, a community requires the resources necessary to implement its conservation programs. The primary resource is usually grant money, as in the case of Davis, California. In the early 1970s the City Council adopted a new General Plan with a heavy emphasis on resource conservation. However, the plan could not be implemented until the necessary technical program backup work was financed. An $86,000 grant from the U. S. Department of Housing and Community Development Innovative Grants Program made it possible to begin implementation of the new Davis General Plan [51]. However, the preference for federal money is probably based more on political habit than necessity. The National Association of Counties has a publication, "Alternatives to Federal Energy Funding: Using Your Community as a Resource."

Another resource that energy conserving communities have drawn upon is the university. In the case of Hamburg, Pennsylvania, Loukissas found that the university's contribution to successful community energy conservation can be considerable when applied properly [52].

ENERGY CONSERVING COMMUNITY PLANS

The Comprehensive Community Energy Management Program (CCEMP) was started with a $5,000,000 appropriation in 1978 by the U. S. Department of Energy. This was a pilot project in which sixteen diverse communities analyzed their energy use and developed comprehensive conservation plans. The DOE required the communities to adhere to a traditional planning method that required an organizational structure to develop a project work plan, "audit" community energy supply and demand to establish energy management objectives, choose among strategies to meet these objectives, and (hopefully) adopt the resultant community energy management plan. The Argonne National Laboratory evaluated the CCEMP program under a grant from the DOE [41]. The criteria used to evaluate community energy management success were not based upon whether the community officially adopted the conservation actions resulting from the CCEMP program nor on any energy savings. Rather, the criteria for success were based upon case studies of the practical expected results of the planning process and the form of the final program presented to elected officials along with its supporting analysis.

Major findings included: strong action plans came from those communities that had strong involvement from elected officials, located the energy project in an independent high-status coordinating office (rather than in a planning agency), had active support from the utilities, had a streamlined, efficient committee process, relegated consultants to a minor supporting role, and used the energy analysis to support consensual decisions rather than for screening alternatives. Initially the DOE assumed it would be necessary for planners to develop an extensive energy use analysis in order to convince policymakers of the value of proposed plans. However, it was found that information alone failed to generate support from elected officials who were not committed to energy planning. The most successful strategy involved focusing upon the early implementation of activities selected to be consistent with community objectives or to build upon existing programs. This generated early visibility and helped to maintain interest in the project. Finally, few of the communities were able to develop comprehensive energy action plans including all sectors, types of energy, and aspects of the energy supply system. This was attributed to the restraints on the planning process. Local governments are so crowded with planning functions that it is difficult fully to integrate a new one, like energy planning, especially when it is not traditionally a local function. Furthermore, the authors saw local governments as having limited power to control the processes which shape our cities and limited resources which tend to mitigate whatever control they do have.

Scott Geller has proposed a framework for promoting and organizing community energy conservation efforts based upon his work with the Clean Community System of Keep America Beautiful, Inc. He generated a twenty-four-cell matrix to indicate applicable community conservation target areas. The nature of the intervention can be physical (e.g., more efficient appliances) or psychological (e.g., diffusion of innovation); it can be aimed at three community sectors – residential/consumer, governmental/institutional, and commercial/industrial; and it can cover four domains – heating/cooling, solid waste/water management, transportation, and equipment efficiency [53]. Since each cell requires some degree of expertise, it immediately becomes apparent a truly comprehensive community conservation program would require a large amount of work and resources. In actuality, most community conservation programs target only a handful of the possible cells. However, Geller's conceptual framework makes apparent the vast energy savings potential available to any communities that would make a commitment to pursue all twenty-four targets. Table 2 shows how some conservation programs in one county might be categorized according to Geller's matrix [27].

Geller describes a system designed to motivate communities into becoming Energy Conserving Communities (ECC) based upon positive reinforcement principles. As communities set up the conservation system, they then would ideally be awarded government grants and recognition awards [53].

Table 2. Geller's Energy Conserving Community Framework: Sample Classification of Utility, Government, and Commercial Programs in Ventura County, California

	Physical			*Psychological*		
	Residential/ Consumer	*Commercial/ Industrial*	*Governmental/ Institutional*	*Residential/ Consumer*	*Commercial/ Industrial*	*Governmental/ Institutional*
Heating/Cooling	Showerheads Low-interest loans Weatherization Solar tract Building codes Audit firms Solar firms	Building codes Low-interest loans	Weatherization Building codes	Utility ads Utility audits Utility van Utility hotline Utility rate scale Demonstrations Tax credits	Utility ads Utility audits Utility awards Utility rate scale Tax credits	Utility audits Utility awards Utility rates
Transportation	Bike lanes	Four-day work week	Efficient autos	Carpooling Bus ads Mileage ratings	Vanpooling Site bus stops	Coordinate work hours
Solid Waste/ Water Management	Low-water landscaping Toilet inserts Showerheads Recycling center	Low-water landscaping Drip irrigation Spreading grounds Leak detection	Low-water landscaping	Water saving ads and campaigns	Conservation awards	Conservation awards and campaigns
Equipment Efficiency	Audit firms	Audit firms Water pump efficiency	Street light conversions Public works	Appliance efficiency ratings	Utility audits	Utility audits

METHODOLOGY FOR EVALUATION

Unfortunately, community energy conservation programs are often not evaluated or are evaluated inadequately. This is probably due to funding restrictions and the lack of evaluation skills among program personnel. Also, program administrators may be more interested in the politics of program appearances rather than any real conservation substance.

Nevertheless, some evaluation work has been done. Case studies are a popular method of evaluation. This is probably because case studies are adaptable to complex situations and require the least methodological skill. Although case studies can uncover some difficult-to-get-at variables, they are prone to subjective interpretation. For instance, in evaluating the residential audit program of Greensboro, North Carolina, Ridgeway reports about half the homes audited made some recommended changes while Cose reports only one-third did [24, 54]. In the present review, the evaluations of the communities with major conservation efforts were evenly divided between case studies and survey research.

Although survey research has the advantages of being cost-effective and providing a ready structure for classifying information, good survey research is difficult to achieve because of various limiting factors. Foremost among them is the risk of a biased sample. This can occur when the sample chosen is not truly representative of the population being studied or if the respondents differ from the non-respondents on the dependent variable. Other potential problems occur if the survey instrument is unreliable due to poor design, invalid questions, or inaccurate responses by respondents.

Measuring energy savings presents another set of problems. The over-estimation of savings obtained using self-report survey items is well documented [55]. If actual energy reductions are measured, a control group must be included in the study to rule out alternative explanations like energy price hikes. The Seattle City Light Neighborhood Energy Conservation is an example of a study that did use a control group. A comparison indicated the audited all-electric homes used 8.6 percent less electricity than the unaudited control all-electric homes [56]. Determining the effects of situational variables on successful community energy conservation can be accomplished in a number of ways. A retrospective analysis can be made using archival data [14]. Predictions can also be made about the likelihood of groups of communities implementing community-wide conservation based upon measuring their situational conditions. It would be possible, for instance, to quantify the situational varibles existing in the sixteen CCEMP communities and use them to predict which communities would most likely implement their conservation plans successfully.

Evaluating community conservation efforts is problematical because community energy systems are complex, and it is difficult to isolate relevant variables. In addition, "success" needs to be operationally defined. For the Comprehensive Community Energy Management Program research, the

definition of "success" consisted of devising a community conservation plan even if it was not implemented and saved no energy. Communities also set differing conservation goals. Los Angeles' goal with its 1973 mandatory electricity conservation ordinance was to cut residential *electricity* consumption by 10 percent and industrial consumption by 20 percent while Fitchburg, Massachusetts, set a city goal of reducing *all* energy consumption by 25 percent [33,54].

Community conservation efforts have resulted in a number of guidebooks for the benefit of other communities [24, 57-62]. Since there are no data available on who uses these guidebooks, it is not known to what extent they stimulate community energy conservation. This suggests the desirability of a study following up the distribution and use of these guidebooks.

PUBLIC POLICY IMPLICATIONS

The preliminary recommendations for community energy conservation policies which can be made based on these studies are as follows:

1. Input from the community is necessary to improve the chances of successfully implementing conservation programs. Community input helps identify what the community values are so the conservation program can be designed to be consistent with those values. Furthermore, resistance to change is reduced when the community has some control by contributing to the conservation program design. Whatever program develops is also likely to be more responsive to local needs.
2. Political leaders should give strong, visible support to the local conservation efforts. Taking conservation seriously at the official level demonstrates to the community that it needs to be practiced at all levels in the community. This might be accomplished by establishing a separate conservation coordinator independent of the planning department. Leaders can heavily influence the community's commitment to practice conservation by modeling conservation behavior. Further influence is under leaders' control through social recognition by utilizing official approval and rewards. Information campaigns alone, without a political support structure, are generally ineffective.
3. Programs should be designed to start out small and progressively increase in scope. This helps mitigate the kind of resistance found in all-at-once comprehensive programs. Also, programs can be broken down into segments serving smaller groups like housing projects, work groups, etc. This serves to reduce the "tragedy of the commons" effect and foster open communication and group cohesiveness.
4. There should be a concerted effort to feature how the energy situation threatens the community. A "crisis" stimulus can act as a superordinate community goal to help coalesce the community into a more cohesive response unit.

5. Communities should not let the availability of state or federal funding limit their conservation efforts. Nontraditional resources can be utilized such as volunteers, clubs, businesses, utilities, and universities. Communities should also take advantage of others' experience. There are a number of guidebooks available from previous community conservation efforts. Some systems have been developed that can be used as a model. For instance, the Energy Conserving Community plan utilizes the principles of positive reinforcement and is based upon the history of successful antilitter campaigns.

SUMMARY

Energy conservation at the community level has a high potential for energy savings. Community conservation programs can be more responsive than state or federal programs to local needs. The community can also become more financially stable when energy dollars remain in the local economy. The potential for success in community-wide energy conservation efforts can be affected by various situational variables – whether there is a significant environmental threat to spur the community into action, how cohesive the community values are, the receptiveness of political leaders to environmental change, how much input the community has had in the decision-making process and what resources are available to implement community-wide conservation.

While systematic community-level conservation is still the exception rather than the rule, two attempts have been made to establish an energy conserving community framework. The U. S. Department of Energy funded the Comprehensive Community Energy Management Program to assist communities in planning for systematic community-wide conservation programs. Also, there is the Energy Conserving Community Plan, modeled after the Clean Community System of Keep America Beautiful, Inc., which is based upon positive reinforcement principles in targeting twenty-four separate conservation areas [52].

Most evaluations of community conservation programs are descriptive in nature. It is important to provide for adequate evaluation of community conservation attempts in order to make progress in sorting out those variables associated with successful community-wide energy conservation.

An important public policy implication is that communities and funding agencies should be familiar with current evaluation findings and incorporate those variables associated with successful conservation into their programs. For instance, the chances of successfully implementing community conservation programs are improved when there is input from the community, political leaders give strong, visible support, programs start out small and progressively increase in scope, the "crisis" aspects of the energy situation are emphasized, and the community is creative in garnering nontraditional resources to support conservation efforts. Also, programs should be designed to include and facilitate

program evaluation. Knowledge of outcomes can improve the chances of successfully designing future community-wide conservation programs by building upon the findings from previous evaluations.

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