

*PERCEPTIONS OF ENERGY-EFFICIENT HOUSING ALTERNATIVES  
AMONG SOUTHERN HOUSEHOLDS*

Julia O. Beamish, Anne L. Sweaney, Kenneth R. Tremblay, Jr.,  
Celia Bugg

ABSTRACT

*Several energy-efficient housing alternatives that could substantially reduce residential energy costs have been developed in the United States. Three such alternatives are passive solar, active solar and earth-sheltered housing. However, consumer acceptance and adoption of these housing types is slow. The examination of perceived characteristics and features of these housing types offers insight into their acceptability and provides information useful in developing strategies to increase adoption. The positive and negative perceptions of these three housing alternatives as reported by Southern households who would and would not consider living in the three housing types are examined and compared. While the house types are generally perceived as energy-efficient, their "design/appearance" emerges as a major factor that could be limiting acceptability. A high percentage of "uncertain/don't know" and "nothing" responses also suggests that many potential consumers do not have enough information about the three alternatives to adequately evaluate the advantages and disadvantages associated with them*

INTRODUCTION

The rising cost of energy for residential use has contributed an added dimension to housing affordability. Not only is it difficult for some Americans to purchase or rent adequate housing, but now financial problems can occur in paying high energy bills. In response to the current residential energy situation, housing alternatives have been developed that can substantially reduce energy costs. Three such alternatives are passive solar, active solar, and

---

Julia O. Beamish is Assistant Professor, Department of Consumer Affairs, Auburn University, Auburn, Alabama. Anne L. Sweaney is Assistant Professor, Department of Housing, Home Management and Consumer Economics, University of Georgia, Athens, Georgia. Kenneth R. Tremblay, Jr. is Associate Professor, Department of Consumer Sciences and Housing, Colorado State University, Fort Collins, Colorado. Celia E. Bugg is Extension Agent-Home Economics, Lee County, Florida, Florida Cooperative Extension Service. The results of this paper are based on analyses of data obtained from Regional Research Project S-141, "Housing for Low- and Moderate-Income Families", funded by USDA Agricultural Experiment Station Regional Research funds under the Hatch Act.

Beamish, Sweaney, Tremblay, and Bugg

earth-sheltered housing. Despite the promise of lower energy bills, consumer acceptability and actual adoption of these energy-efficient housing types remain low.

This investigation examines positive and negative perceptions of three energy-efficient housing alternatives as reported by Southern households who would and would not consider living in these housing types. The underlying assumption is that consumers should be asked what they like and dislike about housing alternatives to discover the bases of housing acceptability and adoption. The results of such an investigation should provide information useful in developing strategies to increase both the acceptability and the adoption of energy-efficient housing alternatives.

#### THEORETICAL RATIONALE

Americans consider the traditional, single-family, detached dwelling as the most acceptable housing type (Morris and Winter, 1978; Tremblay and Dillman, 1983). A majority of Americans are most familiar with, have actually lived in and possess the greatest amount of information about this housing form. Previous research reveals that altering the exterior appearance of the conventional house by incorporating energy-efficient features reduces consumer acceptability (Shelton et al., 1983). Passive solar, active solar and earth-sheltered housing types are not traditional in appearance. Therefore, these energy-efficient housing types are not regarded as acceptable by many consumers.

A second issue related to acceptability is the need for consumers to be adequately informed of the advantages of energy-efficient housing (Combs and Madden, 1983; Combs and Parkhurst, 1983; McCray and Weber, 1981; Impson and Impson, 1984). The lack of information regarding passive solar, active solar and earth-sheltered housing may well act as a barrier to consumer acceptance of these housing forms. Information is one of the key components in a model developed by Rogers and Shoemaker (1971) and is also included in a model developed by Klonglan and Coward (1976). The degree of difficulty in understanding information and the amount of information available also contribute to consumer acceptability (McCray and Weber, 1981; Cleveland, 1982; Combs, Tremblay, and Madden, 1983). An examination of perceptions of the three energy-efficient housing types could reveal whether consumer acceptability of these housing alternatives is influenced by nontraditional appearance and lack of information.

Several studies investigate the adoption and diffusion of energy-efficient housing (Combs and Parkhurst, 1983; Dagwell, 1983; McCray and Weber, 1984). Assuming that these housing alternatives can be regarded as innovations, a majority of these studies rely on the work of Rogers and various colleagues (Rogers, 1963a, 1963b, 1972; Rogers and Shoemaker, 1971; and Solo and Rogers, 1972).

Rogers (1963b) suggests that innovations are not immediately adopted following their introduction. The process by which consumers proceed through a decision to accept or reject an innovation is described by Rogers and Shoemaker (1971) as *the adoption process*. The actual adoption of the innovation is depicted

Housing and Society, Vol. 14, No. 1, 1987

as the final step in a multi-phase adoption process outlined as follows:

AWARENESS: The individual is exposed to the innovation.

INTEREST: The individual becomes interested in the innovation and seeks new information.

EVALUATION: The individual mentally applies the innovation to his/her present and anticipated future situation and then decides whether or not to try it.

TRIAL: The individual uses the innovation on a small scale to determine its utility for personal use.

ADOPTION: The individual decides to continue full use of the innovation.

Previous research focused on the demographic and social characteristics of individuals in different stages of the adoption process. McCray and Weber (1984) create an index utilizing respondents' level of familiarity with various innovative housing types to predict consumer propensity to adopt. Other researchers investigate whether the characteristics of an innovation are better predictors of adoption than socio-economic or personality variables (Ostland, 1974; LaBay and Kinnear, 1981). Leonard-Barton (1981) finds that consumers' perceptions of solar equipment are better predictors of adoption of solar energy systems than socio-economic variables, utility costs, attitudes toward the energy crisis and the expectation of increased energy costs in the future.

Many household decisions can be followed through the awareness-adoption continuum. However, decisions regarding energy-efficient housing are difficult for some consumers to make because of constraints such as non-traditional appearance and lack of information. One of the factors affecting this process as it relates to housing is the fact that a household must make a substantial investment to become involved in the trial and adoption stages.

Rogers and Shoemaker (1971) discuss the rate and likelihood of adoption in relation to the consumer's perceptions of the attributes of the innovation. They classify these attributes into five dimensions: 1) relative advantage or the perceived advantage, 2) compatibility or the degree of consistency with the needs, experiences and values of the adopters, 3) complexity or the difficulty of understanding or use, 4) trialability or the extent to which the innovation can be adopted on a less-than-full-scale basis, and 5) observability or the visibility of the outcome of the innovation. A sixth attribute, perceived risk, is conceptualized by Bauer (cited in Ostland, 1974). Combs and Parkhurst (1983) report the results of a study that differentiates the stages of the adoption process in relation to solar heating systems using these dimensions.

The present paper examines how perceptions of the three energy-efficient housing alternatives may influence actual adoption of these housing types. This study uses four of the six dimensions mentioned

Beamish, Sweaney, Tremblay, and Bugg

previously (relative advantage, compatibility, complexity, and perceived risk) to classify the open-ended responses of households concerning their likes and dislikes regarding passive solar, active solar and earth-sheltered housing. Observability and trialability are not used because none of the housing features could be categorized into these two dimensions.

#### *PROCEDURES*

The examination of consumer perceptions of energy-efficient housing presented in this paper is based on data collected as part of the Southern Region Housing Research Project (S-141), "Housing for Low- and Moderate-Income Families". Personal interviews were conducted with an adult member in each of 1,804 households residing in seven Southern states: Alabama, Arkansas, Florida, Georgia, North Carolina, Oklahoma and Virginia. Four non-Standard Metropolitan Statistical Area (non-SMSA) counties in each state were selected for the sample using a two-phase stratification process based on median annual income and number of non-farm households in each county. Households surveyed were randomly selected from the 1980 property tax rolls from each county.

During 1981-82, the selected households were interviewed utilizing the instrument "Perceptions of Alternative Housing," which was developed, pilot tested and revised by the S-141 technical committee. Of interest to the present examination are the questions contained in the instrument relating to perceptions of passive solar, active solar and earth-sheltered housing.

Respondents were first shown black and white pictures and then given the following descriptions of the energy-efficient housing alternatives:

Passive Solar: A house that, through design, construction, materials, landscaping and site orientation, is generally cooler in the summer and warmer in the winter than other houses without these features.

Active Solar: A house equipped with solar collectors which use energy from the sun to heat and cool the house.

Earth-Sheltered: A house surrounded partially or completely by soil, using the earth's natural ability to cool in hot weather and warm in cold weather. Skylights are used to increase natural lighting.

Once the housing types were described, respondents were asked if they would consider living in each alternative if they were to move to a new area or into a different dwelling unit. Possible responses to this question were: "Definitely would consider", "Probably would consider", "Undecided", "Probably would not consider", and "Definitely would not consider".

Respondents were then asked open-ended questions to determine what they would like and what they would dislike about the three energy-efficient housing types. Twenty phrases were developed by the S-141 technical committee to represent the positive and negative perceptions common to all housing types. Two to five additional phrases specific to each housing type were also developed. The instrument was structured so that as many as six comments made by a respondent could be recorded. These possible six responses were combined and all similar responses were divided into separate variables. Specific positive and negative perceptions directed at each housing alternative could then be individually examined and analyzed.

For the purposes of this investigation, respondents were divided into two categories: those who definitely or probably would consider living in the housing alternative and those who definitely or probably would not consider living in the housing alternative. Respondents who answered "undecided" were eliminated from the analysis. The resulting sample sizes were 1,472 respondents who would or would not consider passive solar housing, 1,439 respondents who would or would not consider active solar housing, and 1,616 respondents who would or would not consider earth-sheltered housing. For each house type, respondents were placed into a 2x2 contingency table based on their willingness to consider the alternative and their reporting of a particular perception. Chi-square tests were utilized to test the null hypotheses that there are no associations between willingness to consider and the various perceptions. These tests were completed for all of the positive and negative perceptions reported for each housing type.

### *RESULTS AND DISCUSSION*

Responses to the "would you consider" question reveal that 58 percent of the respondents would consider living in a passive solar house, 50 percent would consider residing in an active solar house and 32 percent of the respondents would consider living in an earth-sheltered house (Shelton et al., 1983). Consumer acceptability of these housing alternatives is moderate at best. Acceptability of the three energy-efficient housing types has previously been shown to be correlated with the demographic characteristics of respondents. Generally, acceptability of all three housing types is higher among smaller households, households in the early stages of the family life cycle, white respondents, younger respondents and households with higher incomes (Dagwell, 1983).

#### *Positive Perceptions*

"Energy efficiency" is the most frequently mentioned positive perception of all three energy-efficient housing types among those respondents who would definitely or probably consider these alternatives (passive solar, 70 percent; active solar, 72 percent; earth-sheltered, 50 percent) (see left-hand portion of Tables 1-3). "Design/appearance" is the second most frequently reported positive feature of passive solar (10 percent) and active solar (8 percent), while "comfort/convenience" is the second most frequently reported positive perception of earth-sheltered housing (28 percent). The third most positive feature is "comfort/convenience" for passive solar housing (8 percent), "using natural environment" for active solar

Beamish, Sweaney, Tremblay, and Bugg

Table 1. Perceptions of Passive Solar Housing by Respondents Who Would and Would Not Consider Living in This Housing Type

Features	Positive Perceptions					Negative Perceptions				
	Would Consider		Would not Consider		x <sup>2</sup>	Would Consider		Would not Consider		x <sup>2</sup>
	(N=973)	(N=489)	(N=973)	(N=489)		(N=973)	(N=489)	(N=973)	(N=489)	
n	%	n	%	n	%	n	%	n	%	
Energy efficiency	685	70.4	124	25.4	267.2***	--	--	--	--	--
Design/appearance	101	10.4	15	3.1	23.8***	144	14.8	104	21.3	9.7**
Comfort/convenience	79	8.1	7	1.4	26.3***	19	2.0	10	2.0	0.0
Using natural environment	63	6.5	12	2.5	10.8***	12	1.2	17	3.5	8.4**
Cost	29	3.0	5	1.0	5.5*	86	8.8	57	11.6	2.9
Innovative/unique	25	2.6	6	1.2	2.8	--	--	--	--	--
Psychological perceptions	23	2.4	8	1.6	0.8	6	0.6	14	2.9	12.2***
Spaciousness	16	1.6	0	0.0	8.1**	--	--	--	--	--
Maintenance/upkeep+	12	1.2	0	0.0	6.1*	41	4.2	20	4.1	0.0
Quality of construction	--	--	--	--	--	10	1.0	5	1.0	0.0
Meets family needs++	--	--	--	--	--	1	0.1	6	1.2	8.6**
Uncertain/DK	42	4.3	155	31.7	209.3***	251	25.8	169	34.6	12.2***
Nothing	19	2.0	127	26.0	208.9***	363	37.3	44	9.0	129.8***
Everything	14	1.4	3	0.6	1.9	1	0.1	26	5.3	48.4***
Other	23	2.4	10	2.0	0.2	17	1.8	11	2.3	0.4

Note: Multiple responses do not add to N

+Positive Perceptions table is so sparse that Chi-square may not be a valid test.

++Negative Perceptions table is so sparse that Chi-square may not be a valid test.

\*p < .05

\*\*p < .01

\*\*\*p < .001

housing (7 percent) and "safety" for earth-sheltered housing (26 percent).

The positive response pattern among those who would not consider the three housing alternatives is similar. "Uncertain/don't know" is the most frequently reported response by this group when respondents are asked what they would like about passive solar housing (32 percent). It is the second most frequent response for those preferring active solar housing (27 percent) and the third most frequent response for those preferring earth-sheltered housing (11

Table 2. Perceptions of Active Solar Housing by Respondents Who Would and Would Not Consider Living in This Housing Type

Features	Positive Perceptions					Negative Perceptions				
	Would Consider		Would Not Consider		x <sup>2</sup>	Would Consider		Would Not Consider		x <sup>2</sup>
	(N=891)	(N=548)	(N=891)	(N=548)		(N=891)	(N=548)	(N=891)	(N=548)	
	n	%	n	%	n	%	n	%		
Energy efficiency	645	72.4	177	32.3	222.7****	8	0.9	7	1.3	0.5
Design/appearance	75	8.4	15	2.7	18.7***	165	18.5	152	27.7	16.8**
Comfort/convenience	49	5.5	9	1.6	13.1***	11	1.2	12	2.2	2.0
Using natural environment	63	7.1	12	2.2	16.4***	16	1.8	15	2.7	1.4
Cost	24	2.7	8	1.5	2.4	136	15.3	84	15.3	0.0
Innovative/unique	44	4.9	7	1.3	13.3***	12	1.4	10	1.8	0.5
Psychological perceptions	--	--	--	--	--	7	0.8	19	3.5	13.8***
Spaciousness	13	1.5	2	0.4	3.9*	--	--	--	--	--
Maintenance/upkeep	--	--	--	--	--	36	4.0	17	3.1	0.8
Extra solar system maintenance	--	--	--	--	--	26	2.9	8	1.5	3.1
Unproven	--	--	--	--	--	21	2.4	21	3.8	2.6
Safety	--	--	--	--	--	11	1.2	7	1.3	0.0
Uncertain/DK	42	4.7	149	27.2	148.9***	189	21.2	159	29.0	11.3***
Nothing	22	2.5	137	25.0	175.3***	266	29.9	30	5.5	123.4***
Everything	10	1.1	4	0.7	0.5	2	0.2	20	3.7	26.4***
Other	18	2.0	10	1.8	0.1	13	1.5	18	3.3	5.4*

Note: Multiple responses do not add to N

\*p <.05

\*\*p <.01

\*\*\*p <.001

percent). "Energy efficiency" is perceived as the most positive attribute of active solar housing. It is the second most positive attribute of earth-sheltered housing (18 percent) and the third most positive attribute of passive solar housing (25 percent). Respondents who would not consider living in earth-sheltered housing most often report that they liked "nothing" about this alternative (44 percent). The "nothing" response is the second most frequent response among those who would not consider living in passive solar housing (26 percent) and third among those who would not consider living in active solar housing (25 percent).

Significant associations are found between respondents' willingness to consider living in the three alternative housing types and most of the positive perceptions. For all three alternatives, the following associations are significant at or below the .05 level: "energy

Table 3. Perceptions of Earth-Sheltered Housing by Respondents Who Would and Would Not Consider Living in This Housing Type.

Features	Positive Perceptions					Negative Perceptions				
	Would Consider		Would Not Consider			Would Consider		Would Not Consider		
	(N=575)		(N=1041)			(N=575)		(N=1041)		
	n	%	n	%	$\chi^2$	n	%	n	%	$\chi^2$
Energy efficiency	285	49.6	189	18.2	176.3***	--	--	--	--	--
Design/appearance	26	4.5	8	0.8	25.3***	80	13.9	109	10.5	4.3*
Comfort/convenience	162	28.2	98	9.4	96.6***	--	--	--	--	--
Using natural environment	23	4.0	3	0.3	32.2***	22	3.8	31	3.0	0.8
Cost	11	1.9	12	1.2	1.5	--	--	--	--	--
Innovative/unique	40	7.0	14	1.3	36.1***	--	--	--	--	--
Psychological perceptions	15	2.6	2	0.2	20.8***	19	3.3	69	6.6	8.0**
Maintenance/upkeep	42	7.3	21	2.0	27.6***	9	1.6	6	0.6	3.9*
Quality of construction+	6	1.0	3	0.0	3.8*	24	4.2	32	3.1	1.3
Safety	152	26.4	114	11.0	64.6***	--	--	--	--	--
Privacy	46	8.0	10	1.0	54.9***	--	--	--	--	--
Confinement	--	--	--	--	--	148	25.7	610	58.6	160.6**
Dampness/mildew, musty odor	--	--	--	--	--	53	9.2	81	7.8	1.0
Location	--	--	--	--	--	3	0.5	31	2.3	10.9**
Uncertain/DK	21	3.7	119	11.4	28.3***	62	10.8	51	4.9	19.7**
Nothing	13	2.3	454	43.6	308.3***	132	23.0	29	2.8	168.0**
Everything	--	--	--	--	--	1	0.2	40	4.6	24.8**
Other	--	--	--	--	--	20	3.5	28	2.7	0.8

Note: Multiple responses do not add to N

+Positive perceptions table is so sparse that Chi-square may not be a valid test.

\*p < .05

\*\*p < .01

\*\*\*p < .001

efficiency", "using natural environment", design/appearance", "comfort/convenience", "nothing", and "uncertain/don't know". Additionally, there are significant associations between the perception "spaciousness" and willingness to consider active and passive solar housing. "Psychological perceptions" and "quality of construction" are significantly associated with willingness to consider living in earth-sheltered housing. There are also significant associations between willingness to consider and perceptions of the "innovative/unique" attribute of earth-sheltered and active solar housing and between willingness to consider and the "maintenance/upkeep"

aspects of earth-sheltered and passive solar housing. Other significant associations are found between willingness to consider and perception of "cost" in passive solar housing and perceptions of "safety" and "privacy" in earth-sheltered housing.

For almost all of these significant associations, there is a higher response rate from those who would consider the three energy-efficient housing types than from those who would not consider these housing types. The two exceptions are "uncertain/don't know" and "nothing". These two responses are most frequently made by respondents who indicate they would not consider living in the alternative housing types. This finding indicates that the respondents stating they would not consider living in the housing alternatives may not have had enough information to accurately evaluate the three housing types. By reporting there is nothing they liked about the three energy-efficient housing types, these respondents may be indicating that they really do not know of any specific negative features about the alternative. It is interesting that earth-sheltered housing is the housing type with the largest percentage of respondents who would not consider living in it. It is also the the housing type with the highest percentage of respondents reporting they liked "nothing" about it.

#### *Negative Perceptions*

The pattern of most frequently mentioned negative perceptions is identical for the respondents who would consider living in passive solar and active solar houses (right-hand portion of Tables 1 and 2). "Nothing" is the most frequently mentioned response when respondents are asked what they would dislike about the housing types (passive solar, 37 percent; active solar, 30 percent). The second most frequently mentioned response to this question is "Uncertain/ don't know" (passive solar, 25 percent; active solar, 21 percent). "Design/appearance" is the third most frequent negative response (passive solar, 15 percent; active solar, 19 percent). The three most frequently reported negative perceptions by respondents who would be willing to live in earth-sheltered housing are "confinement" (26 percent), "nothing" (23 percent) and "design/appearance" (14 percent)

Respondents who would not consider living in passive solar and active solar housing also report a similar pattern of negative perceptions. They are most often "uncertain or do not know" what they dislike about the two alternatives (passive solar, 35 percent; active solar, 29 percent). They also perceive the "design/appearance" of the solar housing types negatively (passive solar, 21 percent; active solar, 28 percent) and indicate the "cost" is a negative factor (passive solar, 12 percent; active solar, 15 percent). Over half of the respondents who would not consider living in earth-sheltered housing report that "confinement" is something they would not like about this housing type (59 percent), followed by "design/appearance" (11 percent) and "dampness/moisture" (8 percent).

When the negative perceptions of the three house types are examined, there are significant associations between willingness to consider living in the alternatives and the following variables:

"design/appearance", "nothing", "uncertain/don't know", "psychological perception" and "everything". Additionally, there are significant associations between willingness to consider living in passive solar housing and the perceptions "using natural environment" and "meeting family needs". There are also significant associations between willingness to consider living in earth-sheltered housing and the perceptions of "confinement" and "location". For most of these significant associations, the respondents who would not consider living in the alternative have a higher response rate than those who would consider living in the alternatives. "Nothing" is an exception among the three energy-efficient housing types, since respondents who would consider the alternatives report most frequently that there is nothing they dislike about the housing types. Two other exceptions are found among the negative perceptions of earth-sheltered housing. A higher proportion of respondents who would consider living in earth-sheltered housing do not like the "design/appearance" of this house type and are "uncertain or don't know" what they dislike about the alternative.

#### *Classification of Attributes*

The various perceptions of each of the three housing types that have significant associations with willingness to consider living in the alternatives are categorized under four of the six attributes of an innovation identified by Rogers and Shoemaker (1971) and Bauer (cited in Ostland, 1974). Table 4 places the positive and negative perceptions of the three energy-efficient housing types within the innovations framework. None of the responses are thought to reflect the attributes of observability or trialability. Therefore, there are no responses categorized under those headings. For all of the positive perceptions (+), except for "uncertain/don't know" and "nothing", the significant associations reflect a higher response rate for those who would consider adopting the alternatives than for those who would not consider adoption. The opposite is true for the significant negative perceptions (-), except that the "nothing" response is more frequently made by those considering the alternatives and the negative perceptions of "uncertain/don't know", "design/appearance", and "maintenance/upkeep" are more frequently reported by respondents who would consider earth-sheltered housing.

Each of the energy-efficient housing types evoke some responses that suggest attributes of relative advantage, perceived risk, compatibility and complexity. All are perceived as "energy-efficient" and have "design/appearance" and "comfort/convenience" features compatible with the housing needs of many of those who would consider adopting the alternatives. "Design/appearance" is also a risk for those who would not consider passive and active solar housing and for those who would consider earth-sheltered housing. The "psychological perceptions" of the alternatives are consistent perceived risks for those respondents who would not consider the alternatives. This variable includes statements about the unfamiliarity and non-traditional aspects of housing.

There are more specific responses and differences in the perceptions of earth-sheltered housing. Although the respondents who would consider this alternative perceive many positive features,

Table 4. Positive and Negative Perceptions of Three Energy-Efficient Alternatives in the Attributes of Innovations Framework

Attributes of Innovation	Housing Alternatives		
	Passive Solar	Active Solar	Earth-sheltered
<b>Relative Advantage</b>			
Energy efficiency	+	+	+
Using natural environment	+	+	+
Safety			+
Privacy			+
Innovative/unique		+	+
<b>Perceived Risk</b>			
Confinement			-
Location			-
Design/appearance	-	-	-
Using natural environment	-	-	-
Maintenance/upkeep			-
Psychological perception	-	-	-
<b>Compatibility</b>			
Comfort/convenience	+	+	+
Psychological perception			+
Spaciousness	+	+	
Quality of construction			+
Meets family needs	-		
Maintenance/upkeep	+		+
Design/appearance	+	+	+
<b>Complexity</b>			
Uncertain/don't know	+-	+-	+-
Nothing	+-	+-	+-
Everything	-	-	-

+ Indicates a significant association between willingness to consider and a positive perception

- Indicates a significant association between willingness to consider and a negative perception

they also have several specific negative perceptions. Those who would not consider the alternative see earth-sheltered housing as confining and located in unsuitable settings (perceived risks).

All housing alternatives have significant associations between willingness to consider adoption and "uncertain/don't know" and "nothing". These responses, along with the "everything" response, seem to reflect a lack of understanding or appreciation for the three energy-efficient housing types and are categorized as indicating the perceived complexity of the alternatives.

#### CONCLUSION

Passive solar and active solar housing is somewhat acceptable to

the Southern households surveyed in this study. Earth-sheltered housing is considered unacceptable by a majority of respondents. Although energy efficiency is the most frequently mentioned specific positive perception that respondents have of the three house types, this feature is not sufficient to make the housing alternatives acceptable and to ultimately convince consumers to live in them.

The data suggest that design/appearance is a major factor in consumer acceptability. Although there are some respondents who like the design/appearance of the three alternatives, many regard this attribute negatively. It is possible that the pictures of the three housing types that were shown to the respondents influenced responses, since these pictures were primarily of contemporary-styled houses. However, respondents clearly prefer traditional housing that would blend into their community. Designers, builders and developers of energy-efficient housing should try to offer homes with fairly traditional exterior appearances if consumer acceptability is to increase.

The high number of "uncertain/don't know" and "nothing" responses directed at both positive and negative perceptions of the three housing types (especially among those who would not consider living in the alternatives) indicates a lack of understanding of the housing alternatives studied. This lack of knowledge regarding the benefits and problems of passive solar, active solar and earth-sheltered housing may have a negative impact on the acceptability of these housing types. Education and demonstration programs that effectively present these alternatives are crucial for consumers to understand and eventually to accept energy-efficient housing.

Many of the items that are mentioned by respondents as positive and negative features of the three housing types can be regarded as attributes that may affect adoption of passive solar, active solar and earth-sheltered housing. Foremost among these attributes are cost and maintenance/upkeep for the solar alternatives and psychological confinement for earth-sheltered housing. Perceived risks, complexity and incompatibility currently outweigh perceived advantages, resulting in low adoption rates. Strategies must be developed to emphasize the advantages of the three energy-efficient housing forms while de-emphasizing the disadvantages, perhaps through marketing efforts. The fact that those respondents who would consider the housing alternatives are more likely than their counterparts to perceive more positive aspects than negative aspects about the alternatives is an indication that increases in both acceptability and adoption of passive solar, active solar and earth-sheltered housing is possible.

#### REFERENCES

- Cleveland, H. Information as a resource. *The Futurist*, 1982, 16, 34-39.
- Combs, E. R. and Madden, C. S. Compatibility of solar home heating systems with values, felt needs and past experiences of households. *Home Economics Research Journal*, 1983, 2 (3), 304-316.

Housing and Society, Vol. 14, No. 1, 1987

- Combs, E. R. and Parkhurst, A. M. Solar home heating system: Differentiation between stages in the innovation-decision process. *Refereed Conference Papers of the American Association of Housing Educators*, 1983, Lincoln, Nebraska, 46-60.
- Combs, E. R., Tremblay, K. R., Jr., and Madden, C. S. Perceived complexity and trialability of solar home heating systems. *Housing Science*, 1983, 7, 117-126.
- Dagwell, C. V. *Energy-efficient, innovative housing: A comparison of probable adopters and nonadopters*. Unpublished Ph.D dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1983.
- Impson, J. and Impson, L. Earth-sheltered housing: Defined, explained, examined. *Housing and Society*, 1984, 11, 39-44.
- Klonglan, G. E. and Coward, E. W. The concept of symbolic interaction: A suggested interpretation. *Rural Sociology*, 1976, 35, 77-83.
- LaBay, D. G. and Kinnear, T. C. Consumer adoption of solar energy systems. In J. Claxton, C. Anderson, G. McDougall, and J. Ritchie (Eds.), *Consumers and Energy Conservation*. New York: Praeger, 1981.
- Leonard-Barton, D. Diffusion of energy conservation and technologies. In J. Claxton, C. Anderson, G. McDougall, and J. Ritchie (Eds.), *Consumers and Energy Conservation*. New York: Praeger, 1981.
- McCray, J. W. and Weber, M. J. Factors affecting the diffusion of two energy-efficient innovative housing systems. *Housing and Society*, 1981, 8, 93-98.
- McCray, J. W. and Weber, M. J. Measurement of propensity to adopt innovative housing. *Refereed Conference Papers of the American Association of Housing Educators*. Washington, D.C., 1984, 178-189.
- Morris, E. W. and Winter, M. *Housing, Family and Society*. New York: John Wiley and Sons, 1978.
- Ostland, L. E. Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*, 1974, 1 (2), 23-29.
- Rogers, E. M. The adoption process (Part I). *Journal of Cooperative Extension*, 1963a, 1 (1), 16-22.
- Rogers, E. M. The adoption process (Part II). *Journal of Cooperative Extension*, 1963b, 1 (2), 69-75.
- Rogers, E. M. *Diffusion of Innovations*. East Lansing, MI: Michigan State University Press, 1972.

Beamish, Sweaney, Tremblay, and Bugg

- Rogers, E. M. and Shoemaker, F. F. *Communication of Innovations*. New York: The Free Press, 1971.
- Shelton, G., Sweaney, A., Day, S., Lentner, M., Lowe, J., McCray, J., Montgomery, J., Navin, J., Plowman, F., Tremblay, K., and Weber, M. *Perceptions of Alternative Housing: A Data Book*. Athens, GA: Southern Cooperative Series Bulletin 298, 1983.
- Solo, R. A. and Rogers, E. M. *Inducing Technological Change for Economic Growth and Development*. East Lansing, MI: Michigan State University Press, 1972.
- Tremblay, K. R., Jr., and Dillman, D. A. *Beyond the American Housing Dream: Accommodation to the 1980s*. Lanham, MD: University Press of America, 1983.